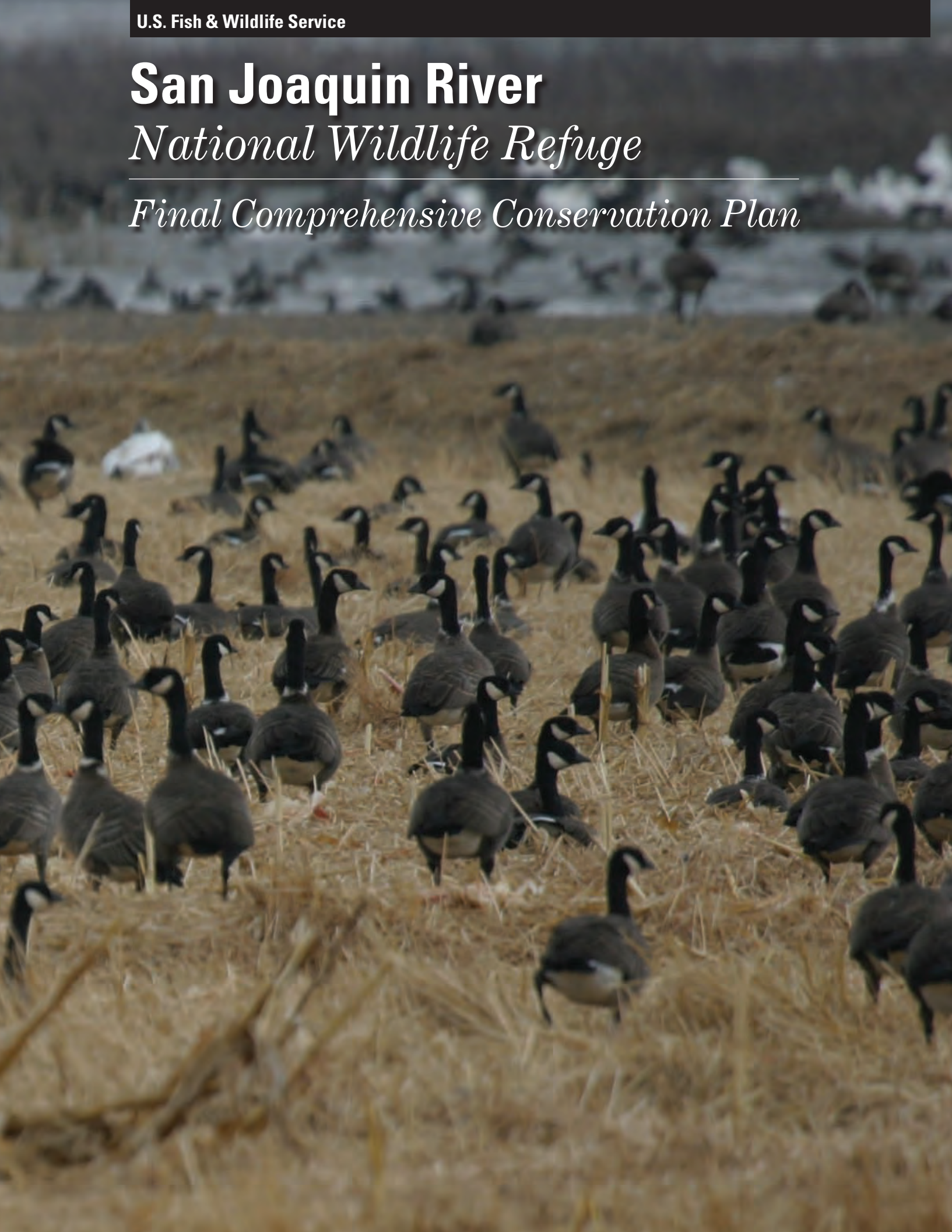


San Joaquin River

National Wildlife Refuge

Final Comprehensive Conservation Plan



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National Wildlife Refuge

Final Comprehensive Conservation Plan

Prepared by:

U.S. Fish and Wildlife Service
California/Nevada Operations Office

San Luis National Wildlife Refuge Complex
947-C West Pacheco Blvd.
Los Banos, CA 93635

California/Nevada Refuge Planning Office
2800 Cottage Way, W-1832
Sacramento, CA 95825

Approved by: _____



California/Nevada Operations Manager

Date SEP 29 2006

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1 Introduction

This Comprehensive Conservation Plan (CCP) will guide the management of the San Joaquin River National Wildlife Refuge (NWR) for the next 15 years. The San Joaquin River NWR is one of over 500 refuges that comprise the U.S. Fish and Wildlife Service's National Wildlife Refuge System. The mission of the National Wildlife Refuge System is to conserve a network of lands and water for the conservation and management of fish, wildlife and plant resources of the United States for the benefit of present and future generations. As part of the system, the San Joaquin River NWR provides a haven for a unique assemblage of both wetland and upland dependent wildlife species of California's Central Valley.

California's Central Valley is ecologically diverse and rich in wildlife. The Valley averages forty miles wide by four hundred miles long and consists of two lesser valleys (Sacramento in the north and San Joaquin in the south) and a delta where the two drainages meet. San Joaquin River NWR is located within the San Joaquin Valley, which is bounded by the Sacramento/San Joaquin Delta to the north, the Tehachapi Mountains to the south, the Sierra Nevada to the east and the Coast Range to the west. The San Joaquin Valley is divided into two distinct drainage basins; the San Joaquin basin in the northern two-thirds, where the Refuge is located, and the Tulare basin in the southern one-third. The San Joaquin River and its tributaries drain the San Joaquin Basin.

Historically, the Central Valley was a vast grassland that graded up the sides of the foothills of the surrounding mountains. The grasslands were once dominated by perennial bunchgrasses, which provided rich forage for numerous grazers, including pronghorn antelope (*Antilocapra*

americana), elk (*Cervus elaphus nannodes*) and mule deer (*Odocoileus hemionus*), and a complex suite of small grazers and seed predators (*Barbour and Billings 1988*). They also supported an array of grassland-dependent birds, including songbirds, birds of prey and gamebirds. Woodlands meandered across these grasslands in belts that varied from half a mile to six miles wide along rivers. Oak woodlands, which had a park-like quality, became more dense and mixed with cottonwoods (*Populus* spp.), sycamores (*Plantanus* spp.), ash (*Fraxinus* spp.) and willow (*Salix* spp.) near the river edges and sloughs (*Barbour and Billings 1988*). Acorns produced by valley oaks (*Quercus lobata*) and other oaks (*Quercus* spp.) provided abundant forage for numerous wildlife species (*Bonnicksen 2000, McShea and Healy 2002*). The riparian tracts and woodlands served as forested habitat for diverse breeding and migratory songbirds, provided nesting sites for birds of prey and colonial nesting waterbirds, and acted as travel corridors for forest-dependent wildlife. Extensive marshes were a dominant feature along the water courses of the valley, some large enough to be almost impassable (*Ornduff 1974*). The marshes were dominated by monocots particularly tules (*Scirpus* spp.), cattails (*Typha* spp.) and sedges (*Carex* spp. and *Cyperus* spp.). These wetlands hosted one of the largest concentrations of wintering waterfowl in the world. In the mid-1800s, early explorers reported vast numbers of waterfowl and other marsh and shorebirds in the Central Valley.

During the last 150 years, the natural resources of the Central Valley have been severely altered with the increase in cultivation, ranching, urban centers and industry. These changes significantly altered or reduced a majority of the valley's

native habitats and ecological processes. The former native, perennial grasslands that once dominated the valley are now composed of “weedy,” non-native annual grasses, such as *Avena*, *Bromus*, *Lolium* and *Erodium* species, plus a large number of non-native forbs (Barbour and Billings 1988). Large, herbivorous wildlife are no longer dominant or, in some cases, present. The once-stately valley oak woodlands, which formerly supported the largest oaks in North America, have been decimated with the changing land use. Much of the riparian forest along stream and river corridors has also been eliminated (Bonnicksen 2000). Of the eight oak woodland types of the Pacific Coast, the valley oak woodland is now the second rarest by total acreage (McShea and Healy 2002). Suppression efforts and changing land use have reduced fire as a natural process within much of the Central Valley; both water demands and flood control activities for urban centers and agriculture have drastically transformed the natural hydrology. As a result, these changes have destroyed or modified over 95 percent of the historic wetlands in California (Heitmeyer et al. 1989).

Although the Central Valley has been altered since settlement, it still supports nationally important and critical natural resources. During the 1970s, an estimated ten to twelve million ducks, geese and swans wintered in, or migrated through, California (Heitmeyer et al. 1989). California wetlands occur primarily in the Central Valley, as do most waterfowl. No other area in North America is as important for wintering waterfowl as California. California supports greater than 60 percent of all waterfowl (excluding sea ducks) wintering in the Pacific Flyway and about 20 percent in the entire United States. The Central Valley plays the most significant role in California’s importance to waterfowl. San Joaquin River NWR supports significant waterfowl and waterbird resources and is capable of providing habitat

for an even greater abundance of these trust resources. The Refuge has the potential for protecting and restoring many of the unique, native upland and wetland habitats of the Central Valley and the wildlife which they support.

Background

San Joaquin River NWR was established in 1987 to primarily protect and manage wintering habitat for Aleutian Canada geese¹ (*Branta canadensis leucopareia*), a federally listed endangered species. Since that time, the Refuge’s focus has expanded to include other threatened and endangered species, migratory birds, wildlife dependent on wetlands and riparian floodplain habitat, and restoration of habitat and ecological processes. Nonetheless, providing wintering habitat for and protecting Aleutian Canada geese has remained a primary objective of the Refuge since its beginning. This Refuge and its management have been important factors in the recovery of the Aleutian Canada goose and its removal in 2001 from the Threatened and Endangered Species List.

The Aleutian Canada goose is a small Canada goose subspecies; its size is between the cackling Canada goose (smallest subspecies) and Taverner’s Canada goose (Johnson et al. 1979). The historic breeding grounds for the Aleutian are believed to have extended from near Kodiak Island, Alaska, to the Kuril Islands in Asia. Their wintering grounds included Japan, and North America, from British Columbia to northern Mexico (Delecour 1954). The population declined during the early 1900s due to the introduction of Arctic (*Alopex lagopus*) and red (*Vulpes vulpes*) foxes to their nesting islands. At the time of listing (1975), the population was estimated at 800 individuals. The species was delisted in 2001 and the population now numbers over 40,000 individuals (Fitzmorris 2002). At present, San Joaquin River NWR and adjacent lands

¹ Subsequent to preparation of this plan, the American Ornithological Union made major revisions to the taxonomy of Canada geese (Banks et al. 2003). Aleutian Canada geese are now classified as Aleutian cackling geese (*Branta hutchinsii leucopareia*). For purposes of this document the old classification (Aleutian Canada goose) will be used in the text.

are the primary wintering grounds for the Aleutian Canada goose population.

The Refuge is part of the San Luis NWR Complex, which includes three other units: Merced NWR, San Luis NWR and the Grassland Wildlife Management Area. All four of the Refuge units, including the San Joaquin River NWR, are managed by the Complex.

Purpose and Need for a Plan

The U.S. Fish and Wildlife Service (Service) is developing comprehensive conservation plans (CCP) to guide the management and resource use for each refuge of the National Wildlife Refuge System (Refuge System). The Refuge System includes over 500 individual Refuges, forming the largest network of public lands in the world managed principally for fish and wildlife.

A CCP provides a description of the desired future conditions and long-range guidance necessary for meeting refuge purposes. The CCP and associated environmental assessment (EA) meet the mandates of the National Wildlife Refuge Improvement Act of 1977 (Improvement Act) and address Service mandates, policies, goals and appropriate National Environmental Policy Act (NEPA) compliance. The Service's future management plan for the San Joaquin River NWR is provided in this document. The final plan is developed according to revisions made during internal and public review.

Refuge staff will use this CCP as a management tool. The CCP will guide management decisions for the next 15 years and sets forth strategies for achieving Refuge goals and objectives within that time frame.

The Refuge does not currently have a comprehensive management plan that provides guidance for managing habitat, wildlife and public use. The intent of the CCP is to describe how the Refuge's founding purposes should be pursued over the next 15 years. The plan sets Refuge goals and objectives and provides strategies

for achieving them based on specific Refuge purposes, Federal laws, National Wildlife Refuge System goals and Service policies. Management activities are selected based on their efficacy in fulfilling Refuge goals and objectives.

The CCP is comprehensive as it addresses all activities that occur on the Refuge; however, the noted management activities or strategies are broadly stated. The Refuge staff will prepare detailed step-down plans that follow the CCP process and describe how a management strategy, such as developing an interpretive program, will be applied. These plans are adjusted based on monitoring results, available funds, staff and current Service policy. The effects of management actions are monitored to provide information for needed modifications of management practices or activities. The CCP has flexibility and will be reviewed periodically to ensure that its goals, objectives, strategies and time frames remain valid.

The Service is preparing this plan for the Refuge to:

- Provide a basis for management that is consistent with the Refuge System mission and Refuge purposes and ensure that the needs of wildlife come first, before other uses.
- Provide a scientific foundation for Refuge management.
- Provide a clear vision statement of the desired future conditions when Refuge purposes and goals have been accomplished.
- Provide visitors with a clear understanding of the reasons for management actions on the Refuge.
- Ensure the compatibility of current and future uses of the Refuge.
- Provide long-term continuity in Refuge management.
- Provide a basis for operation, maintenance and development budget requests.

*The CCP
will guide
management
decisions for
the next 15
years.*

*San Joaquin
River
National
Wildlife
Refuge will
be managed
to conserve,
protect and
enhance
native
communities
of the San
Joaquin
Valley.*

Refuge Purpose and Authority

The Refuge was established in 1987 to provide winter forage and roosting habitat for the threatened Aleutian Canada goose, protect other species federally listed as endangered/threatened, improve and manage habitat for migratory birds and conserve native fauna and flora. The Service established the Refuge as a unit of the San Luis NWR Complex under authority of the Endangered Species Act of 1973, Migratory Bird Conservation Act of 1929 and the Fish and Wildlife Act of 1956.

The Refuge purposes as stated in the law are:

“To conserve fish or wildlife which are listed as endangered species or threatened species or plants...” 16 U.S.C. § 1534 (Endangered Species Act of 1973);

“...For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. § 715d (Migratory Bird Conservation Act); and

“...For the development, advancement, management, conservation, and protection of fish and wildlife resources.” 16 U.S.C. § 742f(a)(4) “...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition and servitude.” 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956).

Refuge Vision Statement

San Joaquin River National Wildlife Refuge will be managed to conserve, protect and enhance native communities of the San Joaquin Valley, with a focus on wildlife and the ecological processes on which they depend. A large segment of the native valley habitats and their associated wildlife communities have been reduced due to intensive land use and development. This Refuge will conserve and restore the area’s native habitats, maintaining its role as an important riparian corridor for natural resources within the state’s Central Valley. It will emphasize management of native

wildlife and the necessary actions that focus on the recovery of Federal and State listed endangered/threatened species and other species of special concern, and protection and/or enhancement of migratory bird resources. Waterfowl and other waterbirds, in particular the Aleutian Canada goose, and neotropical migratory birds, are management priorities. The San Joaquin River NWR will be a key link—along with other National Wildlife Refuges in the Pacific Flyway—in providing high quality, native habitat, particularly wetlands that support an abundance and diversity of waterbirds.

The Refuge will support a variety of native habitats, ranging from valley oak gallery and mixed riparian forests/woodlands to seasonal and permanent wetlands, from native grasslands to modified habitats, in order to support and benefit select trust wildlife species, particularly those of special concern. These habitats will support a wide diversity of native fish, wildlife and plants, such as anadromous fish, neotropical migratory birds, waterfowl and other waterbirds, as well as resident wildlife.

The Refuge will provide an ideal environment for environmental education about native California habitats/wildlife and their conservation/restoration. It will provide the public with excellent wildlife viewing and photographic opportunities, as well as traditional area activities, including waterfowl hunting and fishing.

Location and Size of the Refuge

The Refuge is nine miles west of the City of Modesto, California, and straddles western Stanislaus and San Joaquin counties. The Refuge is located in the northern portion of the San Joaquin Valley, which is enclosed by the foothills of the Sierra Nevada Mountains to the east and the Coast Range to the west. The other units of San Luis NWR Complex, San Luis and Merced NWRs are located approximately thirty-five and forty miles south, respectively, from San Joaquin River NWR. The 12,887 acres within the approved boundary of San Joaquin River NWR are along the main stem of the

San Joaquin River from just south of the confluence with the Tuolumne River; then north to the south bank of the Stanislaus River. The Mohler Tract of the Refuge is a noncontiguous parcel situated on the north bank of the Stanislaus River three miles east from the main portion of the Refuge. The Refuge's landscape represents a locally—as well as regionally—significant remnant of the once broad floodplain of these three major rivers of California's Central Valley (Figure 1—Watershed/ Ecosystem Map and Figure 2—Regional & Project Location Map). Surrounding lands are largely used in agricultural production.

Ownership

Lands within the Refuge boundary have been acquired in both fee title (outright purchases) and through easements (See Figure 3—Land Status Map). All acquisitions were on a willing-seller basis. Fee title lands are owned by the Service and serve as the core of Refuge lands. These lands are managed for wildlife as the priority.

Easement lands are privately-owned lands, where a willing owner has sold restricted land-use rights to the Service to protect or enhance wildlife habitats on these private lands. Typically, Service easement lands occur in proximity to fee title lands. The Service perpetual conservation easements were established to protect existing resource habitat values while retaining land in private ownership. In addition, the U.S. Department of Agriculture National Resource Conservation Service (NRCS) holds both Wetland Reserve Program and floodplain easements on some parcels of the Service-owned lands. The NRCS Wetland Reserve Program and floodplain easements were a funding partnership to acquire fee title land for the Service, whereby the NRCS purchased easements on the land and the Service paid the landowner the remaining fee title value. The land is then owned and managed in perpetuity by the Service with an underlying NRCS easement.

Refuge Acquisition History

The Service became interested in the present Refuge locale in 1976 when the federally-listed Aleutian Canada goose was discovered using the Faith Ranch and Mapes Ranch as winter habitat. At that time, the Faith Ranch was owned by the Paul Davies family and the Mapes Ranch by the Bill Lyons, Sr. family. Both ranches were primarily beef cattle operations, although the Mapes Ranch also had a small amount of row crop agricultural production. Although bounded by riparian habitat to the north, west and south, the uplands of both ranches were dominated by short-cropped irrigated pasture, scattered wetlands and stock ponds. This complex of habitats formed optimum foraging and roosting habitat for wintering Aleutian Canada geese. Subsequent monitoring revealed that more than 98 percent of the Aleutian Canada goose population wintered on these lands. The open terrain of the ranches provided high quality habitat for other geese, lesser and greater sandhill cranes, as well as other wildlife. The Service established the San Joaquin River NWR in 1987 for the primary purpose of meeting the wintering habitat objectives of the Aleutian Canada Goose Recovery Plan. At that time, the approved Refuge acquisition boundary (the area within which the Service could acquire and manage land) totaled 10,295 acres, and included primarily the Faith Ranch and Mapes Ranch east of the San Joaquin River, and a portion of another property west of the river. Initially, all Refuge land acquisition was planned as fee title purchase.

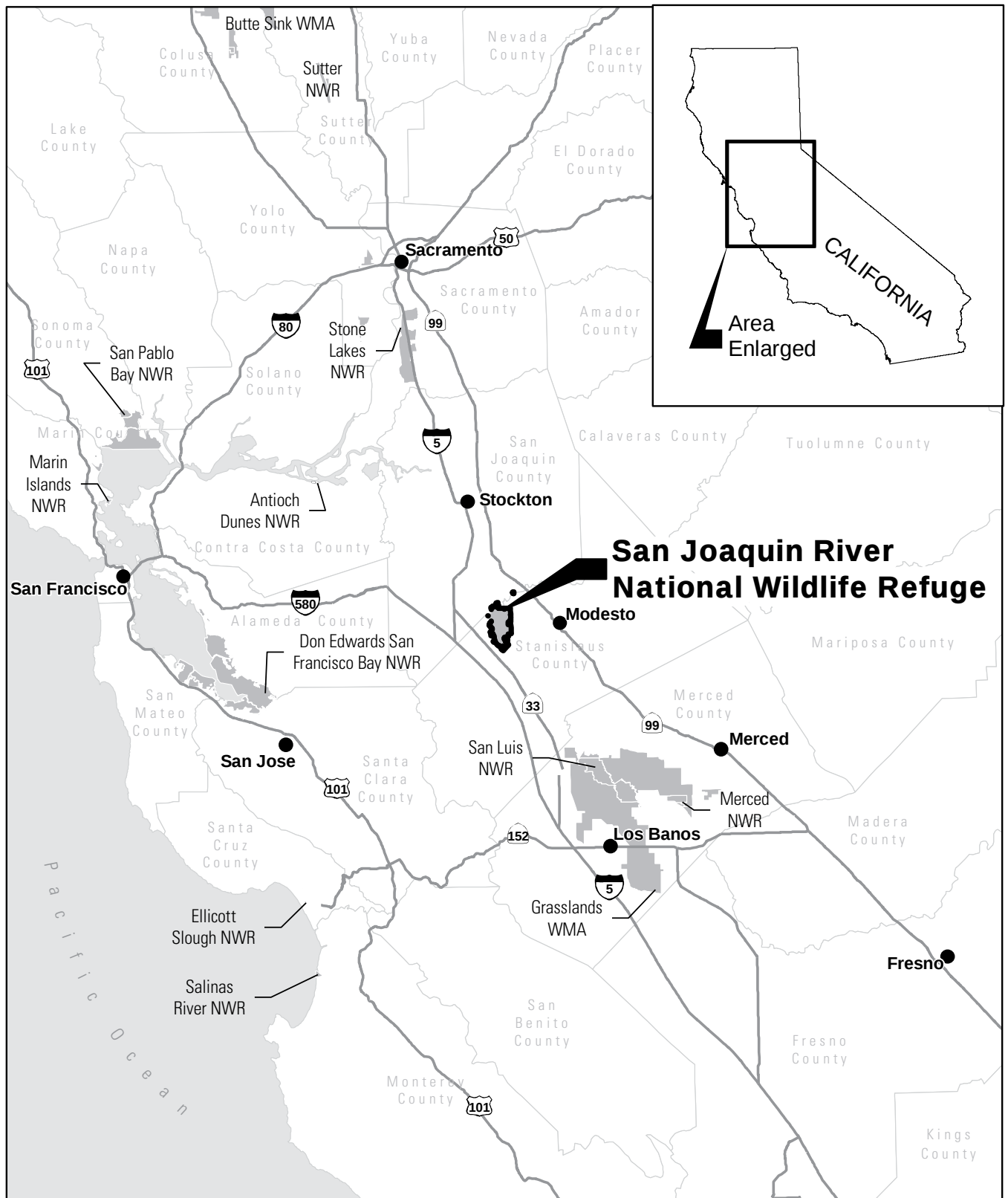
The first land acquisition occurred in 1988 when the Service purchased the 777 acre Christman Island from the National Audubon Society. Christman Island, formerly part of the Mapes Ranch, had been purchased by the Audubon Society in 1986 through a donation from Joseph M. Long and Don Lundberg, with the intent of reselling it the Service. During this time, the Service Realty Office was meeting with the Davies family landowners to pursue purchase of other lands within the acquisition boundary. For a variety

Figure 1: Watershed / Ecosystem Map



CA/NV Refuge Planning Office - April 2006

Figure 2: Location Map



CA/NV Refuge Planning Office - April 2006

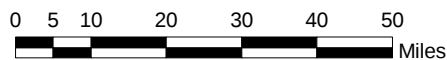
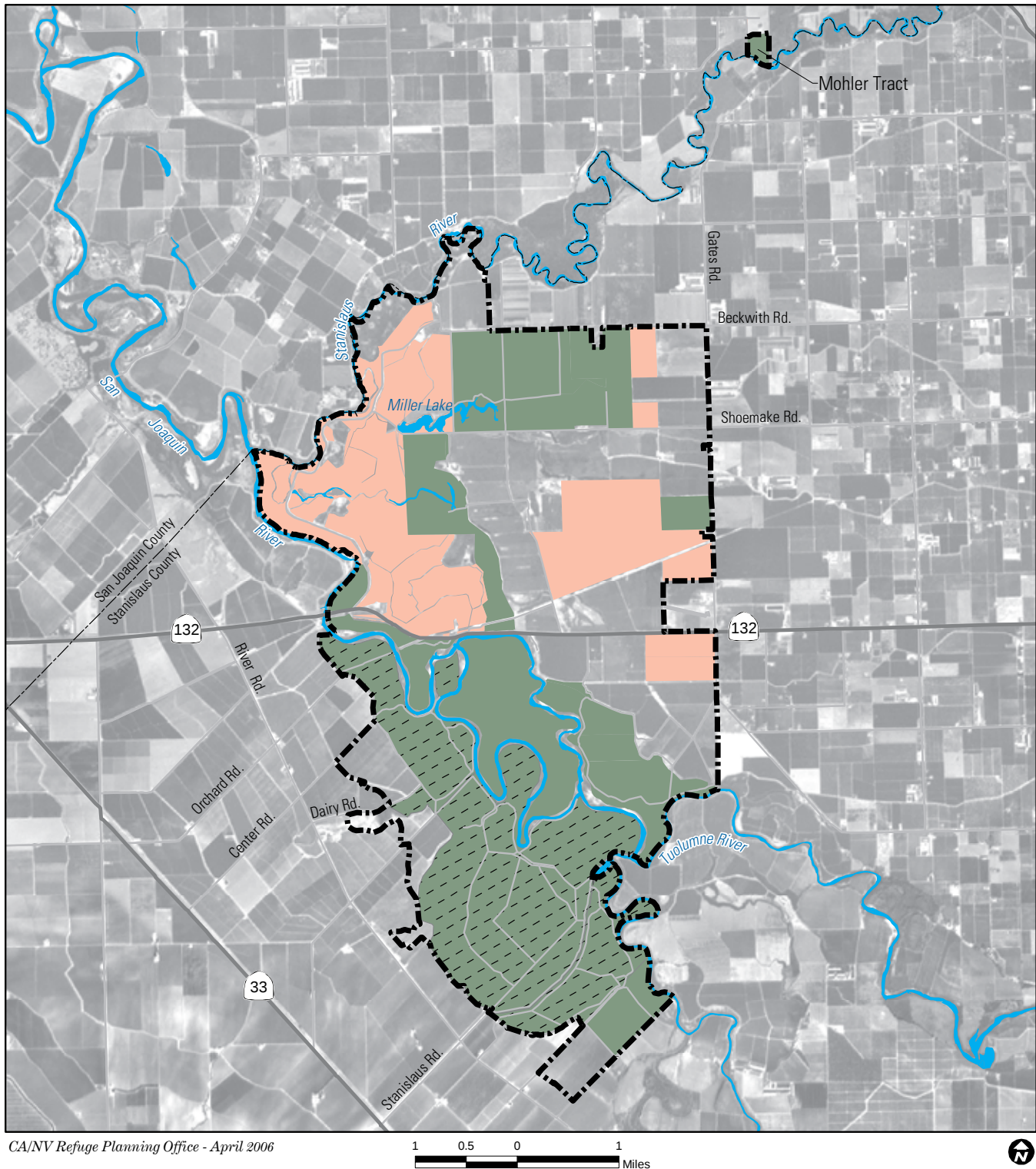


Figure 3: Land Status



- FWS Lands
- FWS Conservation Easement

- Private
- NRCS Wetland Reserve Program Easements

- Approved Refuge Boundary

of reasons these negotiations were unsuccessful.

In 1990, the Robert Gallo family purchased the Faith Ranch. The new landowners were not interested in selling the ranch to the Service, but were willing to enroll the ranch in a conservation easement in the future. From 1990 to 1992, the Lyons family stopped negotiations with the Service because the Mapes Ranch was being considered as one of several potential locations for the site of a future University of California campus. After the Mapes Ranch was eliminated from consideration as a campus site, the landowners reentered acquisition negotiations with the Service; however, by that time, funding that would have allowed purchase of the entire Mapes Ranch in a single acquisition action had been redirected to other projects. Subsequent acquisition proceeded on a parcel-by- parcel basis as funds became available. Fee-title purchases were made of 861 acres in 1993, 662 acres in 1996, and 577 acres in 1997 using Migratory Bird Conservation Act funds. By 1997, the Service owned 2,877 acres within the Refuge.

In January 1997, a catastrophic flood occurred on the lower San Joaquin River system. Flood control levees failed and most of the Refuge and Faith Ranch, and much of the Mapes Ranch, were inundated by floodwaters. Other private lands west of the designated Refuge boundary also received extensive flooding. In all, the areas surrounding the Refuge suffered more than \$2 billion in property damages. Subsequently, several landowners in the floodplain west of the San Joaquin River approached the Service with the intent of selling their flood-prone land for inclusion within the existing Refuge. This coincided with a Congressional mandate for the U.S. Army Corps of Engineers to explore nonstructural alternatives for flood protection; the same time period produced statewide initiatives, such as the San Joaquin River Management Plan, to restore riparian habitat and hydrologic function and provide alternate methods of flood control.

In support of these efforts, the Service proposed a nonstructural flood protection demonstration project in which it would acquire those flood-prone properties, breach or remove the existing flood control levee, and allow periodic floodwaters to spread over the Refuge-owned floodplain to reduce downstream flooding. This proposal grew into a multi agency effort, with the Service partnering with NRCS, U.S. Army Corps of Engineers, U.S. Bureau of Reclamation and the California Department of Water Resources. In 1997, the Service completed an environmental assessment and Land Protection Plan to expand the approved Refuge boundary to 12,887 acres. Following approval, in 1999 the Service acquired 2,037 acres of floodplain and riparian habitat west of the San Joaquin River in fee title, using a combination of Service (Emergency Flood Appropriations) and NRCS (Wetland Reserve Program) funds. In 2000, an additional 210 acres of floodplain habitat immediately south of and adjacent to the Refuge were acquired with CALFED funds, and 35 acres of riparian habitat along the Stanislaus River north of the Refuge were purchased by the Service Anadromous Fish Restoration Program and turned over to the Refuge for management. By 1998, the owners of the Mapes Ranch had reversed their original decision to sell their entire ranch in fee title, and instead, were willing to sell only a small portion of the remaining ranch lands in fee title and enroll the rest in perpetual conservation easements. Accordingly, the Service purchased Mapes Ranch lands both in fee title and in easement, and purchased a perpetual conservation easement on most of the Faith Ranch.

Fee Title Lands

Purchase of fee title land began in 1988 and is ongoing. The past five years have yielded the greatest increase in land acquisition for the Refuge. Figure 3 (Land Status Map) illustrates the approved Refuge boundary for acquisition, totaling close to 13,000 acres, and the current land ownership status. As of 2004, Fee title lands comprise 51 percent of the approved Refuge boundary. Sources of acquisition funds have included

the Land and Water Conservation Fund, Migratory Bird Conservation Act Fund, CALFED Bay-Delta Program, emergency flood control appropriations, Anadromous Fish Restoration Program and the State of California.

Easement Lands

Easements are legal agreements whereby one party has binding authority regarding some aspect(s) of a property owner's land. Easements will influence the management activities and opportunities at the Refuge. In some cases, the Service has easements on adjacent private property; in other instances, other agencies have easements on Refuge lands.

Perpetual Conservation Easements (USFWS)

The Service acquired perpetual conservation easements on 1,834 acres of the 2,050 acre Faith Ranch in 2001, and 1,112.9 acres of the 4,000 acre Mapes Ranches in 2002. Additional funding is currently being sought to enroll much of the rest of the Mapes Ranch into the easement program. Both properties are within the Service's acquisition boundary for the Refuge. The purpose of the easements is to protect critical wintering habitat for Aleutian Canada geese, State threatened greater sandhill cranes, other threatened and endangered species, and migratory birds. The authority to acquire these easements comes from the 1997 Environmental Assessment for the expansion of the Refuge. These easements are subject to all Federal laws pertaining to those rights being acquired through the easement. Locally, the easements are administered by the San Luis NWR Complex under the guidance of the Easement Program Manager to ensure the ecological integrity of the easements are met.

The specific terms of the easements guide the landowners and the Service in protecting the integrity of the agricultural operations (irrigated and native pasture and cereal grains) while sustaining critical habitat for migratory wildlife. In addition, the Service acquired the right to continue providing

wildlife habitat on the property if the landowner can no longer sustain a viable agricultural operation.

The Service is considering an acquisition boundary expansion concurrent with this CCP that would extend along the San Joaquin River floodplain from the southern boundary of the Refuge southward to the existing Grasslands Wildlife Management Area in Merced County. Under this proposal, most acquisitions would be perpetual conservation easements developed in conjunction with other agency easement programs. The Service has prepared a Study Report and drafted a Preliminary Project Proposal, and is seeking the authority to study land acquisition in this area. The Study Report is currently being reviewed within the Service.

Floodplain Warranty Easement Program (NRCS)

This NRCS easement applies to San Joaquin River NWR lands that the Service purchased from J. P. Lara and the El Solyo Ranch. This easement requires the Service and any subsequent landowner, to protect the floodplain and restore and manage for native habitats and natural resource values. The Lara and Vierra Units of the Refuge are both enrolled in this program and comprise 515.69 and 632.65 acres, respectively. The landowner (i.e., Refuge) is required to provide for "the unimpeded reach and flow of any waters in, over, or through the easement area; to retard runoff and prevent soil erosion through the restoration, protection, or enhancement of the floodplain; to restore, protect, manage, maintain, and enhance the functional values of wetlands, riparian areas, conservation buffer strips, and other lands; to conserve natural values including fish and wildlife habitat, water quality improvement, flood water retention, groundwater recharge, open space, aesthetic values, and environmental education; and to safeguard lives and property from floods, drought, and the products of erosion" in perpetuity.

To ensure the enrolled easement lands meet the program's purposes and goals, the management of these lands must conform

to the Planned Conservation Treatment and Compatible Use Permit of NRCS. This permit between the NRCS and landowner addresses short-term management practices that would be applied until fulfilling the long-term goal of restoring riparian/wetland habitat and natural floodplain hydrology to maintain the ecological integrity of the easement are. The permit applies to both the Floodplain Warranty Easement and Wetlands Reserve Program Easements.

Wetland Reserve Easement Program (NRCS)

This NRCS-administered easement applies to lands west of the San Joaquin River that the Service purchased from Mr. Ed Hagemann (*Mehlhoff and Hay, 1999*). It requires the owner to “restore, protect, manage, maintain, and enhance the functional values of wetlands and other lands, and for the conserving of natural values including fish and wildlife habitat, water quality improvement, flood water retention, groundwater recharge, open space, aesthetic values, and environmental education” for 30 years. The Hagemann tract of the Refuge is part of this program and comprises 2,017.8 acres. These lands are also required to conform to the Planned Conservation Treatment and Compatible Use Permit of NRCS, which is described above.

Refuge Management and Monitoring History

The level and type of management activities applied to the Refuge have evolved over time. Beginning in 1976, prior to Refuge establishment, graduate students or contract researchers were present on-site each winter during December to March to monitor the geese as part of the Aleutian Canada goose recovery program. The Service’s Division of Research and Development (now the Biological Research Division of the U.S. Geological Survey) oversaw these monitoring efforts. The researchers collected goose population and distribution data and maintained a daily presence. They also monitored and reported any trespassing or poaching to landowners and Federal and State law enforcement

agents and conducted any necessary disease control activities.

This monitoring effort continued after the Refuge was established in 1987. The Aleutian Canada goose researchers provided daily on-site presence and relayed information regarding the geese and other Refuge issues to the San Luis NWR Complex headquarters in Los Banos. Following the acquisition of Christman Island in 1988, an entry gate was installed, access road improved and boundary signs posted. The management focus remained on Aleutian Canada geese even though the Refuge did not own lands suitable as goose habitat. The main issues at that time were the limited roost pond habitat on the Faith and Mapes Ranches due to prolonged drought and the presence of Aleutian Canada geese at the Modesto Sewage Treatment Facility, south of the Refuge, where they were exposed to recurring avian cholera outbreaks and experienced losses to that disease.

In 1991, the Service entered into cooperative agreements with the owners of the Faith and Mapes Ranches in which the Service compensated the landowners to flood wetlands on their properties to provide roost ponds for the geese. An additional agreement with the owners of the Faith Ranch provided that they would grow and mow down corn on their property as forage for Aleutian Canada geese. From 1991 to 1993, Service funds were not available and the landowners elected to provide those services at their own expense. During this same time, the Service contracted with U.S. Department of Agriculture–Wildlife Services to haze the geese at the sewage treatment facility to move them away from the disease outbreak sites. The combination of hazing and the provision of roost ponds and cereal grain forage were successful in getting the geese to shift back to the Refuge area.

With the acquisition of irrigated pasture, cropland and roost pond habitat in 1993, the Service gained a limited ability to manage for goose and sandhill crane wintering habitat on Refuge lands. To

provide needed forage habitat, the Refuge entered into a cooperative agreement with the Lyons family. Under this agreement, the Cooperator planted and grew corn on a sharecrop basis and then harvested a share as silage. The Refuge's share of corn was grown to maturity, and then mowed down by the Cooperator on a schedule developed by the Refuge to provide forage for the geese. Cattle grazing was allowed on Refuge-owned irrigated pasture and uplands to create the short-grass foraging habitat preferred by Aleutian Canada geese and other arctic nesting geese, once they arrived in autumn/winter. The Cooperator compensated the Refuge for the value of grazing by planting winter wheat on Refuge lands to provide green forage for the geese (where the silage corn was harvested), and providing water to flood and maintain seasonal wetlands and roost ponds on the Refuge.

The amount of habitat available for goose and sandhill crane management increased as new lands were acquired from the Mapes Ranch. The existing Page Lake roost pond was enhanced through a cooperative project in 1996 by the Service, the Lyons family, and Ducks Unlimited, and additional roosting habitat (Goose Lake) was developed by the Service in 1999. By 1999, 335 acres of corn and winter wheat fields, 469 acres of irrigated pasture, 371 acres of native uplands, and 191 acres of roost ponds/wetlands were actively managed for Aleutian Canada geese, sandhill cranes, and other migratory birds on the Refuge. Although increasing numbers of geese made use of Refuge lands, there continued to be goose use at the Faith and Mapes Ranches.

In 1995, responsibility for monitoring wintering Aleutian Canada geese for the recovery program shifted to Region 1, Division of Refuges. Since that time, seasonal biologists of the San Luis NWR Complex have been based at the Refuge each winter to monitor Aleutian Canada geese and cackling Canada geese (*Branta canadensis minima*). While Refuge staff maintained the same level of goose monitoring as did the previous researchers, they were also available to perform other Refuge management activities. The staff increased disease control activities, took more control of water management, and initiated biological inventories, such as Refuge species lists, heron/egret rookery counts, sandhill crane counts, and vernal pool surveys.

Since 1996, a permanent Refuge staff member has been assigned the oversight and day-to-day management of the Refuge as a primary duty. This, and assistance from other San Luis NWR Complex staff, has allowed for an expansion of management activities at the Refuge. Management has included removing debris and unneeded facilities on new Refuge lands; demolishing buildings, including asbestos removal in Gardner's Cove and the former El Solyo Dairy site; repairing and upgrading lift pumps, pipelines, water control structures, and other water delivery facilities; developing new wetlands on former agricultural fields; initiating volunteer projects; constructing a cooperatively-funded observation tower for public use; preparing habitat restoration plans; and submitting major land acquisition and habitat restoration grant funding requests.



San Joaquin River on the Refuge.
Photo: USFWS

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2 The Comprehensive Conservation Planning Process

The purpose of the Comprehensive Conservation Plan (CCP) for the San Joaquin River National Wildlife Refuge is to guide the management of the Refuge. The CCP provides managers with a 15-year strategy for achieving Refuge purposes and contributing toward the mission of the National Wildlife Refuge System, consistent with sound principles of fish and wildlife conservation and legal mandates. A CCP is needed because the Refuge does not have a current plan that provides direction for managing wildlife, habitat and public uses.

This CCP for the Refuge is intended to meet the compliance requirements of the National Wildlife Refuge Improvement Act of 1997 (Improvement Act) and the National Environmental Policy Act (NEPA). Refuge planning policy also directed the process and development of the CCP, as outlined in Part 602, Chapters 1, 3 and 4 of the U.S. Fish and Wildlife Service Manual (May 2000).

The Refuge initiated the comprehensive conservation planning process in February 1999. Initially, members of the Complex staff and planning team identified preliminary issues, concerns and opportunities that were derived from wildlife and habitat monitoring and field experience associated with the past management of the Refuge. This preliminary list of issues, concerns and opportunities was further refined and developed through the planning process.

Service policy, the Improvement Act and NEPA provide specific guidance for the planning process, such as seeking public involvement in the preparation of the environmental assessment document.

This planning process included the development and analysis of “reasonable” management alternatives, including a “no action” alternative that reflects current conditions and management strategies. The CCP highlights the Service’s selected management alternative for the Refuge; other management alternatives were developed and considered as part of this planning process, and are found in Appendix B of the Draft Comprehensive Conservation Plan and Environmental Assessment.

The Planning Process

Part of comprehensive conservation planning includes preparation of a NEPA document. Key steps in the CCP and the parallel NEPA process are listed below:

1. Preplanning and team formation
2. Public scoping and involvement
3. Identifying issues, opportunities, and concerns
4. Defining and revising vision statement and Refuge goals
5. Developing and assessing alternatives
6. Identifying preferred alternative plan
7. Draft CCP and EA
8. Revising draft documents and releasing final CCP
9. Implementing the CCP
10. Monitoring/feedback

Figure 4 shows the overall CCP steps and process in a linear cycle, but the planning process is actually a non-sequential movement among the steps, with many revisions occurring during the development of the plan. The following sections provide additional detail on individual steps in the planning process.

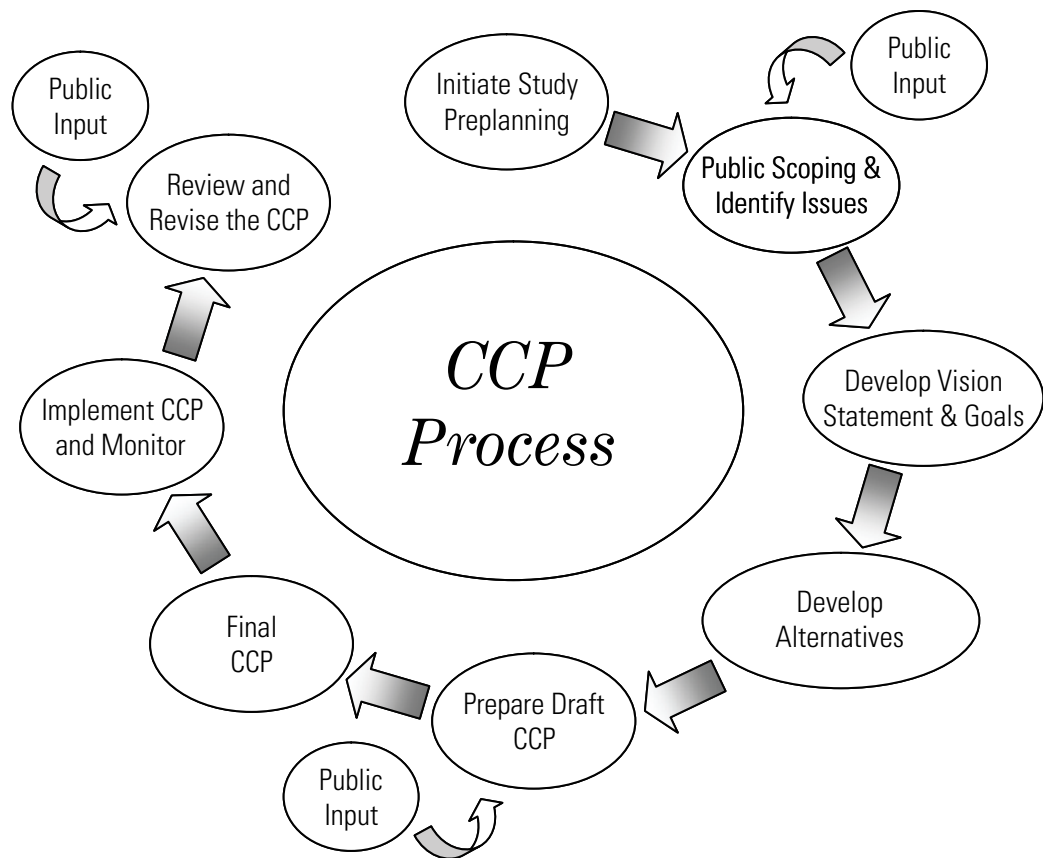


Figure 4: The Comprehensive Conservation Planning Process

The Planning Team

Two planning teams were created and used for this CCP. A core working team was formed to develop the majority of the documents and research background information. An expanded team was also formed comprising the core team, other Service staff, California Department of Fish and Game personnel and technical personnel to provide overview and guidance through the planning process. See Appendix M for the list of team members. As with all long-term projects, changes in the team membership occurred throughout the planning process.

Public Involvement in Planning

Public involvement is an important and necessary component of the CCP and NEPA process. The public involvement process for the San Joaquin River CCP is summarized below and describe in detail in Appendix C.

The Refuge held a public scoping workshop in March 1999 to further develop and ascertain planning issues for the Refuge. The Refuge held quarterly Community Forum Meetings to keep the public and agencies informed regarding CCP progress and determine, refine and clarify Refuge issues. Several planning updates were mailed during this process to interested individuals, agencies, and organizations to apprise them of the planning progress and information generated.

The draft CCP and EA were provided to other agencies and the public for review and comment. Responses to comments on the draft CCP and EA are included in Appendix B.

Overview of Public Scoping Comments and Discussions

The planning team identified issues, concerns and opportunities internally and

through discussions with members of the technical panel, other key contacts and through the public scoping process. The team received comments in writing via regular mail and e-mail.

The following key issues, concerns and opportunities were identified during the planning process and compiled by the Service. Resource issues and opportunities were also identified during this process:

- Wildlife Management and Restoration
- Recreation and Public Use
- Refuge Staffing and Resources
- Flood Management
- Wetland and Water Management
- Refuge Proximity to Private Lands

Development of Alternatives

The development of management alternatives for the San Joaquin River National Wildlife Refuge, assessment of their environmental effects, and identification of the preferred management alternative are described in Appendix B: Environmental Assessment of the Draft Comprehensive Conservation Plan and Environmental Assessment. The final CCP highlights the selected management alternative for the Refuge.

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3 Refuge Settings

Flyway Setting

The San Joaquin River NWR is situated within the Pacific Flyway. The flyway extends from the crest of the Rocky Mountains west to the Pacific Ocean within North America. It is used by millions of waterfowl and shorebirds for migration to and from wintering and breeding grounds. California's Central Valley is the largest watered flatland in the flyway, providing critical winter habitat for waterfowl, in particular. Autumn/winter rains and melting snow from the Sierra Nevada and Coast ranges provide water for wetlands, and mild winters make this area a major center for wintering waterfowl. Approximately 60 percent of the flyway's waterfowl winter in the Central Valley, with wintering duck populations ranging from two to five million birds. Common valley waterfowl species include the snow goose (*Anser caerulescens*), Ross' goose (*Anser rossii*), white-fronted goose (*Anser albifrons*), Aleutian Canada goose, green-winged teal (*Anas crecca*), northern shoveler (*Anas clypeata*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), cinnamon teal (*Anas cyanoptera*), gadwall (*Anas strepera*), American widgeon (*Anas americana*), canvasback (*Aythya valisineria*), ring-necked duck (*Aythya collaris*), bufflehead (*Bucephala albeola*) and ruddy duck (*Oxyura jamaicensis*) (Root 1988).

The Central Valley is also a key region for many other waterbirds, including the sandhill crane (*Grus canadensis*), American coot (*Fulica americana*), moorhen (*Gallinula chloropus*), sora rail (*Porzana carolina*), Virginia rail (*Rallus limicola*), killdeer (*Charadrius vociferous*), black-necked stilt (*Himantopus mexicanus*), American avocet (*Recurvirostra americana*), greater yellowlegs (*Tringa*

melanoleuca), spotted sandpiper (*Actitis macularia*), long-billed curlew (*Numenius americanus*), western sandpiper (*Calidris mauri*), least sandpiper (*Calidris minutilla*) and long and short-billed dowitchers (*Limnodromus scolopaceus* and *L. griseus*) (Root 1988, Shuford et al. 1998).

Ecoregion

The San Joaquin River NWR is situated in the Central Valley/San Francisco Bay Ecoregion. The Central Valley is an elongate depression that lies between the Coast Ranges and the Sierra Nevada Mountains. It is approximately 400 miles long and 40 miles wide. Historically, three principal habitats dominated this ecoregion—valley grasslands, wetlands and riparian woodlands/forests. Valley grasslands consisted of perennial grasses and dominated the landscape, comprising 81 percent of the area (Schoenherr 1992). Wetlands were associated with rivers and streams and widespread in low elevation areas, comprising approximately 15 percent of the ecoregion (Schoenherr 1992). Wetlands, particularly seasonal wetlands, were fed by winter rains and runoff from the surrounding mountain ranges. Riparian woodlands and forests, frequently associated with rivers and streams, encompassed four percent of the ecoregion (Schoenherr 1992). Wildlife of the ecoregion was diverse, with grassland-dependent species, including large grazers, which were a dominant component of the community. The ecoregion's large wetland element provided significant habitat for large concentrations of waterfowl, shorebirds and other waterbirds.

Following settlement and in the past 150 years major changes have occurred in the ecoregion. Today, the ecoregion has been converted into one of the most productive

*Refuge
lands were
historically
a mosaic
of riverine
channels,
broad
riparian
floodplains,
wetlands and
grassland
savannas
dominated
by valley
oaks.*

agricultural areas in the world (*Schoenherr 1992*). With this increase in land devoted to agricultural use there was an associated loss of wildlands. The valley grasslands dominated by native perennial grasses that once covered all well-drained areas now only occur in a pristine condition on just one percent of the ecoregion (*Schoenherr 1992*). Likewise, approximately 94 percent of the wetlands and 89 percent of the riparian woodlands/forests have also disappeared (*Schoenherr 1992*). Despite these losses, the remaining wildlands in the ecoregion still provide significant habitats for unique Central Valley wildlife communities; they also offer critical habitat for many wildlife species both regionally and nationally, particularly waterfowl and other waterbirds.

Historic Refuge Environment

Refuge lands were historically a mosaic of riverine channels, broad riparian floodplains, wetlands and grassland savannas dominated by valley oaks. This area was bisected by the main stem of the San Joaquin River and was bounded to the north by the Stanislaus River and to the south by the Tuolumne River. Historically, the San Joaquin River and its tributaries would overtop natural levees and inundate the floodplain following winter rains and Sierra snow melt. This system was dynamic, depositing rich alluvium, creating and cutting streambanks, creating and maintaining riparian forests, creating oxbow lakes and backwater sloughs by changing the rivers' course, clearing and depositing debris, scouring streambeds, and exposing and depositing gravel and sand. The resulting floodplain corridor was vegetated by trees, such as button willow, black willow and sandbar willow in the lower areas. The upper areas were dominated by box-elder, Fremont's cottonwood, Oregon ash, arroyo willow and valley oak. The most common mid- and ground-story shrubs included California rose, California blackberry, elderberry and wild grape. Dominant grasses and forbs included creeping wild rye, basket sedge, mugwort and goldenrod. The uplands adjacent to the floodplain were less frequently inundated by floods and were dotted with valley oaks with an understory of perennial grasses

and forbs, such as creeping wild rye, saltgrass, alkali sacaton, gum plant and spikeweed. Wetlands and vernal pools were abundant throughout the upland savannas. These habitats supported a wide array of migratory birds, salmonids and other fish, large herbivores and other wetland and upland associated wildlife.

American Indians lived in permanent villages on elevated locations above the floodplain. These native people, the Yokuts, made their homes along the San Joaquin River and its tributaries in part, because of the abundance of natural resources in the area. When Lieutenant Gabriel Moraga led the Spanish cavalry into the San Joaquin Valley in 1805, the explorers were astonished by the abundance of wildlife. The Spaniards saw ducks, geese, cranes, herons, pelicans, curlews, pronghorn antelope, tule elk and grizzly bears, in large numbers.

Conditions began to rapidly change by the 1850s, following European settlement and development. Pronghorn antelope were extirpated, tule elk were nearly made extinct and other wildlife were diminished by commercial hunting that was driven by the meat markets of San Francisco and mining camps of the California Gold Rush. Valley oaks and riparian forests were cut down for lumber and firewood to fuel steamboat traffic on the rivers. By the late 1800s and early 1900s, wetlands were being drained, creeks channelized and floodplains cleared of trees to create farmland.

During the 1940s and 1950s, Friant Dam and other water storage/flood control facilities were built on the San Joaquin River and its major tributaries, and water diversions were made for agricultural, industrial and metropolitan uses. Flood control levees were constructed along the river's course to contain and greatly narrow the floodplain. Nearly two centuries after Moraga's expedition, the San Joaquin Valley landscape is dominated by agriculture and is now one of the most intensively farmed regions in North America.

The Refuge area was drastically altered, but to a lesser extent than most of the lands along the San Joaquin River. Levees were built on both sides of the river. To the west, White Lake was drained, Ingram and Hospital Creeks channelized and much of the floodplain cleared for orchard and row crop agricultural development in the early 1900s; however, the riparian forest and associated sloughs on Christman Island and along both sides of the river corridor were retained. East of the river, much of the floodplain and adjacent uplands was cleared of trees and converted to grazing lands for cattle. Stock ponds were developed and natural slough channels were maintained to provide water for cattle. Eventually, much of the eastern land was leveled, canals and pipelines were constructed for irrigation, and native grass/forb plant communities were replaced by domestic pasture grasses.

Habitat alteration has continued into recent times. Valley oaks and other trees in the river corridor were cut down in the 1960s and 1970s, one-third of the riparian forests on Christman Island were cleared in the 1980s, and much of the pasture land was converted to row crop agriculture in the 1980s and 1990s. Even with these recent developments, the area provides critically important habitat for a wide array of wildlife species. The river channels and associated oxbows serve as migration corridors and rearing habitat for salmonids and other fish species. The riparian forest and fallow fields provide migration and nesting habitat for neotropical birds and other riparian associated species. The uplands provide foraging and roosting habitat for migratory birds, such as waterfowl, cranes and shorebirds.

Special Status Lands and Wilderness

The Refuge is located on the northern boundary of the Grasslands area, which contains the largest remaining acreage of freshwater wetlands in California. The importance of this critical area for waterfowl and other waterbirds has been recognized by the Central Valley Joint Venture and the North American Waterfowl Management

Plan. It is considered of international importance for migratory waterfowl and shorebirds of the Pacific Flyway. This area also provides key habitats for several priority species listed in the Service's list of Birds of Conservation Concern (*USFWS in preparation*). Because of its value to wildlife, the San Joaquin River NWR functions as a northern extension of the Grasslands area.

The San Joaquin River NWR is not considered a federal wilderness study area as it does not meet wilderness designation criteria (Appendix N). The Refuge contains no special status lands.

Climate

The San Joaquin Valley lies between the Coastal Range and the Sierra Nevada Range. Well-protected from the Pacific Ocean, the area displays continental climate characteristics of hot, dry summers, with mild winters. Its location on the western edge of the continent protects the region from the weather extremes found farther inland. The climate of the valley promotes widespread grasslands. Precipitation occurs during winter and spring months, but is reduced because of the rain shadow effect of the Coast Range. Patterson, a town near the Refuge, has an average annual rainfall of approximately 10 inches. The San Joaquin Valley has a frost-free growing season of 270 to 300 days. The average temperature ranges from a low of 38 degrees F to a high of just over 100 degrees F; however, extreme temperatures, as low as 20 degrees and as high 115 degrees, have been recorded. Cold-air drainage from the surrounding mountains becomes trapped, forming a persistent inversion layer in the valley. During winter this is manifested in a dense, ground-hugging fog known as tule fog. Summer days are hot and hazy. Air quality of the Central Valley is poor.

Soils and Geology

Schoenherr (1992) provides a broad overview of the soils and geology of California's Central Valley:

“The Central Valley is a huge basin filled with sediments. The deepest parts of the gravels and sands are marine sediments that have accumulated since the late Jurassic—145 million years ago. The sea retreated from the Central Valley at about the same time that the southern Coast Ranges were uplifted, and during the long history of accumulation of marine sediments in the valley, the basement rock continued to subside. During most of the Pleistocene the area was occupied by shallow brackish and freshwater lakes. During the last 5 million years, sediments accumulated as alluvial deposits washed out of the mountains. These deposits are only a few thousand feet deep over most of the valley floor.”

Physical conditions at the Refuge, especially the geology of the watersheds, are different on lands east or west of the San Joaquin River. A soil survey for eastern and western Stanislaus County used the San Joaquin River to delineate a boundary (*McLaughlin and Huntington 1968*). Refuge lands on both sides of the river consist primarily of recent alluvial floodplains and basin lands. Soil types are often mixed alluvium mapped as soil associations. Basin soils are affected by high water tables from river water seepage, as well as saturation of the land by deep penetration of rain and irrigation water. Most soils exhibit very poor drainage, with a high water table at a depth of just three to six feet from December through April (*Arkley 1964*). If the land is irrigated, it provides prime farmland, although it floods every few years.

Topography and River Geomorphology

Elevations on the Refuge vary from 20 feet along the edge of the San Joaquin River to 40 feet in several locations near the eastern boundary. The Refuge is bisected by the San Joaquin River, which has flood control levees on both banks. Most of the Refuge lands along the river have been laser-leveled and intensively farmed in the past for row crops and irrigated pasture. Small parcels that retain the natural topography are present on the East Unit (for Refuge management purposes the area east of the San Joaquin

River is referred to as the East Unit and lands west of the river as the West Unit). The riparian corridors inside the levees were not intensively developed and retain their natural topography. Within the levees, the sizes of the riparian areas range from narrow corridors to large floodplains of 900 acres or more (i.e., Christman Island and Gardner’s Cove areas). A remnant of what used to be the main river channel is present on the West Unit and forms the western boundary of Christman Island.

Two major tributaries of the San Joaquin River occur on the East Unit. The Stanislaus River is located along part of the Refuge’s north boundary where it flows into the San Joaquin River. The Tuolumne River forms the southern boundary of the East Unit and flows into the San Joaquin River near the Refuge’s southern end. Both rivers contribute significant flows to the San Joaquin River system and both have been modified by levees, gravel mining and water diversions, but to a lesser extent than the San Joaquin River.

Eight smaller tributaries cross western Stanislaus County, draining from the eastern slopes of the Diablo Range to the San Joaquin River. From north to south they are: Hospital, Ingram, Kern, Del Puerto, Salado, Crow, Orestimba and Garzas creeks. These creeks have watersheds of similar size and are spaced three to five miles apart. Though rainfall is infrequent in these creek watersheds, it is often heavy, making them prone to erosion. None of the creeks flow continuously. Two of these, Hospital and Ingram creeks, cross the West Unit of the Refuge. Both have been heavily channelized on farmland located upslope from the Refuge and essentially, act as agricultural drains. Agricultural tailwater makes up the largest contribution of flows entering the Refuge from the watersheds of these two creeks.

Nearly all Refuge lands have been separated from river flood water by human-made levees. The course of the San Joaquin River has been modified and channelized to enhance water delivery and flood control. Modification, levee construction and water

diversions to enhance water deliveries and flood control throughout the San Joaquin River system have greatly altered the hydrology and fluvial processes, such as river meandering (*Katibah 1984*). Except for extreme flood events that result in levee failure, water in the river remains within the levee corridor and does not spread across the floodplain. These fluvial processes are reduced most years, even in the riparian areas inside the levee corridor, because the river flows are reduced from historic levels.

Drainage

Due to the low elevation of Refuge lands and the location of natural river channels, numerous sources of surface water drain onto the Refuge. Field drains, community ditches and tributaries of the San Joaquin River collect surface and subsurface drainage from nearby agricultural fields. Several irrigation districts that supply irrigation water to upslope farmlands also operate and maintain drainage channels that flow into the Refuge as water proceeds to the river.

In the East Unit, several lateral canals from Modesto Irrigation District terminate on or adjacent to the Refuge and contribute intermittent flows to the Refuge or the San Joaquin River. The Riley Slough portion of the East Unit is saturated year round due to the high water table and tail-water from adjacent pasture lands.

On the West Unit, drainage rights and maintenance costs have been recorded in legal documents by previous landowners for several locations on the Refuge. White Lake Mutual Water Company pays 35 percent of drainage facility maintenance and pumping costs for the drainage ditch system over Refuge lands purchased from Ed Hagermann. White Lake Mutual Water Company has drainage rights over those lands arising from a 1941 drainage easement in the deed conveying the land from Burkhard Investment Company to the predecessor of Hagermann (i.e., Pietro Rampone).

West Stanislaus Irrigation District obtained a memorandum of agreement on May 8, 1928 with Burkhard Investment Company. The agreement was amended in 1939. The agreements address the right of access and construction for the West Stanislaus Irrigation District intake channel, as well as the obligation to protect the Refuge land from canal seepage. West Stanislaus Irrigation District also has an obligation to operate drainage pumps on Refuge property purchased from J. P. Lara. The 1928 agreement refers to “maintain the water level and seepage from the main canal at 22 U.S.E.D. and at least eight feet below the natural, average ground level, the district to install, maintain the necessary pumps and operate the pumping of the seepage water.” Access across the West Stanislaus Irrigation District canal is required by installation and maintenance of three pile bridges by the District. The West Stanislaus Irrigation District has expressed a desire to revise the 1928 drainage agreement to eliminate the pumping and bridge maintenance requirements.

On February 12, 1947 West Stanislaus Irrigation District obtained an agreement for “use of a strip of land for ditch and road purposes” 30 feet wide. This agreement provides “free ingress, egress and regress” for West Stanislaus Irrigation District along a route generally parallel to Hospital Creek. The agreement allows West Stanislaus Irrigation District to construct “a ditch of twenty (20) cubic feet per second capacity...” and provides for West Stanislaus Irrigation District to maintain the ditch, culvert pipes and road right-of-way on Refuge lands.

The agricultural drainage water carries suspended sediment that tends to drop out of the water as flows slow down on the flat basin land near the San Joaquin River. Over time the deposition of sediment causes water to back up in the creek channel. Maintenance of drainage channels is a concern to the West Stanislaus Irrigation District, adjacent private landowners, Turlock Mosquito Abatement District, as well as the Refuge (Figure 6–Wetland Units Map).

Flood Management

Most of the Refuge lands are within the 100-year floodplain of the San Joaquin River. Historic records indicate the area is subject to periodically significant rainfall and flooding. Damaging floods occurred in 1937-38, 1950-51, 1952, 1955-56, 1962-63, 1982-83, 1986, 1995, 1996-97 and 1998. Expanding the Refuge west of the San Joaquin River was motivated by a desire to expand the floodplain and associated riparian habitat beyond the existing levees.

All Refuge lands in the West Unit are within the 100-year floodplain of the San Joaquin River and subject to inundation during floods. This entire unit (at the time private land) was inundated due to levee failure during the January 1997 flood. Some lands in the West Unit were within Reclamation Districts 2099, 2100 and 2102 prior to their acquisition by the Service. When the Service acquired lands in the West Unit, those Reclamation Districts were disbanded. Lands in the East Unit are within Reclamation District 2031, which experienced extensive flooding during 1997. The environmental assessment (EA) of the effects of expanding the San Joaquin River NWR was completed in 1997. Part of the EA identified Refuge participation in a partnership with the Natural Resource Conservation Service (NRCS), U.S. Army Corps of Engineers (Corps), California Department of Water Resources and California Reclamation Board regarding a nonstructural flood control project for the Refuge. This project involved acquiring lands protected by Corps levees and breaching the levees in up to seven locations to allow future floods to inundate the new Refuge lands which, in turn, would provide flood protection to areas downstream by offering temporary storage of peak flood flows. The temporary flooding of the Refuge lands would also return a more natural flood regime to the San Joaquin River floodplain and support the riparian habitat that benefits from periodic inundation. Another component of implementing the nonstructural flood control alternative is the Corps' acquisition of flowage easements from landowners adjacent to the three

reclamation districts (Appendix H: Levee Breach Study). A Corps project report selected this nonstructural flood control project as the best flood control proposal for the area in response to damage caused by the January 1997 flood.

Water Quality

Water quality in the San Joaquin River is degraded by irrigation drainwater and urban runoff during summer and by flushing of accumulated pollutants in urban stormwater and other runoff in the winter. The California State Water Resources Control Board (SWRCB) designated 100 miles of the San Joaquin River, including the reach in Stanislaus County, as an impaired water body in 1990 (SWRCB 1990). In addition, the lower San Joaquin River, from Mendota Pool to Vernalis (130 mile stretch of the River including the Refuge), is currently listed as impaired in accordance with Section 303(d) of the Clean Water Act, for exceeding salinity and boron water quality objectives. Portions of the watershed upstream of the Refuge are listed under the Clean Water Act for organophosphorus pesticides, diazinon, chlorpyrifos and selenium (Regional Water Quality Board 2002). The greatest problems occur on the River and its tributaries upstream of its confluence with the Merced River. At the Refuge and downstream, relatively cleaner waters from Merced, Tuolumne and Stanislaus rivers flow into the San Joaquin River, which improves overall water quality. Nevertheless, water quality levels for some contaminants in the San Joaquin River upstream of the Refuge are still some of the highest in the nation (*USGS 1998*).

The Refuge is located in a reach of the San Joaquin River that has also been identified as the main contributor of nonpoint source sediment in the San Joaquin River. Erosion from agricultural irrigation is the main contributor of the sediment, producing 1.2 million tons of sediment per year. Organochlorine pesticides, such as DDT, are adsorbed in the sediment carried by the tailwater and transported to the San Joaquin River.

Although there is substantial data on water quality for the four rivers that flow into the Refuge, little data has been collected from the Refuge's smaller waterways, including the lateral canals that enter the Refuge from agricultural and urban lands. Contaminants monitoring data is not yet available for the sloughs and managed wetlands. In July 1999 the Service's Contaminants Branch of the Sacramento Fish and Wildlife Office conducted a one-time survey on the lands west of the San Joaquin River. The report concluded that further monitoring was warranted, organochlorines should continue to be a concern to the Refuge and the Vierra Dairy should be closed (USFWS 1999).

Vegetation

The Central Valley contains three major plant communities—riparian, wetland and grassland—all of which occur at the San Joaquin NWR (Schonenherr 1992) (Figure 5–Land Cover Map). Within each habitat group, the Refuge identified communities using Smith et al. (1995), Sawyer and Keeler-Wolf (1995) and DFG (1999); they include great valley oak riparian, black willow riparian forest, permanent wetland, semipermanent wetland, seasonal wetland, vernal pool, tilled cropland, irrigated pasture and native grassland (Figure 5–Land Cover Map and Table 1–Existing Habitat Cover Types).

Riparian Habitats

Great Valley Oak Riparian

Oak woodland once covered much of the landscape surrounding the San Joaquin River NWR; however, only a remnant of this habitat remains. Most of the oak woodland was destroyed by logging, ranching or conversion to agricultural fields. Most of California's oak woodlands were relatively stable during the long period of use by American Indians. Beginning with European settlement approximately 150 years ago, oak densities and their dominance declined in California due to the introduction of livestock and land clearing for intensive agriculture (McShea and Healy 2002).

Virtually all of the great valley oak riparian community on the Refuge occurs within



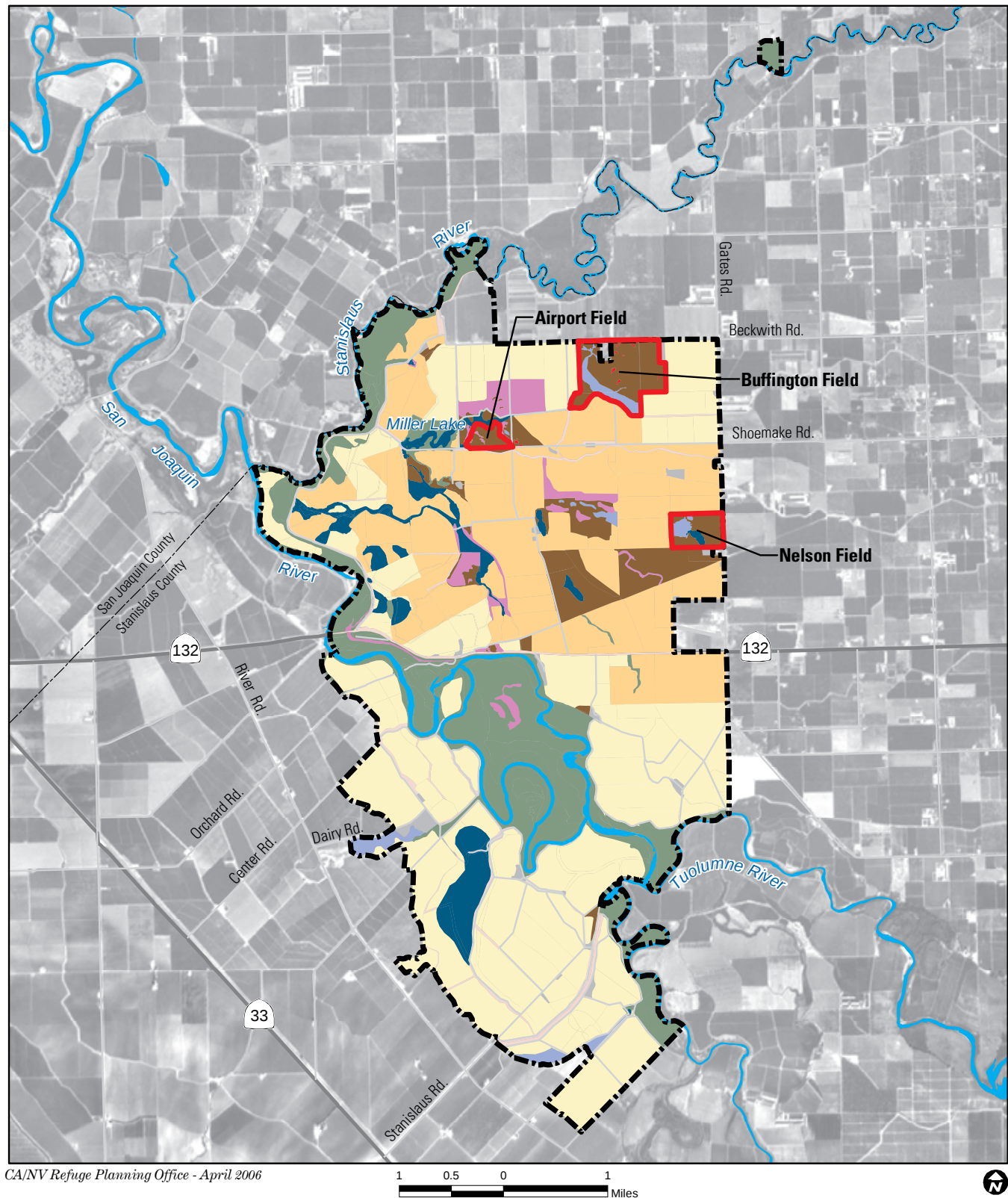
the flood control levees. The overstory is dominated by mature valley oaks, with varying amounts of Fremont cottonwood (*Populus fremontii*), box-elder (*Acer negundo*) and willow (*Salix* spp.) present. The understory is dominated by creeping wild rye (*Leymus triticoides*), basket sedge (*Carex barbarae*), California rose (*Rosa californica*), California blackberry (*Rubus ursinus*), and in more open areas, mugwort (*Artemisia douglasiana*) and western goldenrod (*Euthamia occidentalis*). Although individual and scattered groves of valley oaks are present on the floodplain and adjacent uplands, most were previously cleared for agricultural development.

The largest valley oaks and best examples of this community type are present at the Gardner's Cove area, Christman Island, Colwell Bottoms and the former Lara property. Grazing and public use have suppressed the regeneration of oaks and other riparian species in the Gardner's Cove area; yet, during the past decade, the cessation of those land uses and the presence of soil scarification (i.e., clearing and soil turning) due to flooding (1997 and 1998) have allowed previously suppressed valley oak seedlings/saplings to begin to grow. Valley oak and other hardwood trees are naturally regenerating, and a native understory of mugwort, goldenrod, basket sedge, creeping wild rye grass, wild rose and California blackberry have become more common and,

Beaver crossing waterway; good water quality is a critical issue for many wildlife at the Refuge.

Photo: Jerry Baldwin

Figure 5: Land Cover Map



in most places, have excluded nonnative vegetation (Griggs 2000). Great valley oak saplings are naturally regenerating on Christman Island and a few other locations on the Refuge; however, in other locations, perennial pepperweed (*Lepidium latifolium*), an invasive nonnative weed species, has become established and is expanding rapidly in the oak woodland understory.

Black Willow Riparian Forest

The woody overstory of this vegetative community, which typically grows along water courses, is dominated by black willow (*Salix gooddingii*) with varying amounts of sandbar willow (*Salix hindsiana*), box-elder, buttonbush (*Cephalanthus occidentalis*) and Oregon ash (*Fraxinus latifolia*) (Ornduff 1974). Widely-spaced individual or small groups of Fremont cottonwood (*Populus fremontii*) are present and black walnut (*Juglans hindii*) occurs in a few locations.

The black willow riparian forest community at the San Joaquin River NWR occupies much of the river corridor inside the levees along the San Joaquin, Tuolumne, and Stanislaus rivers, as well as Hospital and Ingram creeks which drain into the San Joaquin River. The quality of riparian habitat that currently exists on the Refuge is highly variable due to stand age and successional stage. Black willow riparian forest on the Refuge is classified into early and late successional habitats. Early successional habitat often occurs in retired farmland that was inundated by the floods of 1997 and 1998. Young black willows and cottonwoods dominate these areas. Scattered coyote bush has become established as well. Forbs include mugwort, goldenrod, and nettle (*Urtica dioica* var. *holosericea*); however, invasive weeds, such as poison hemlock (*Conium maculatum*), perennial pepperweed, and Johnson grass (*Sorghum halepense*), now dominate the understory of some areas. The late successional habitat is characterized by a greater diversity of trees and a more developed understory consisting of California blackberry, California rose, basket sedge and forbs. Introduced invasive weeds are present in varying degrees in much of these riparian areas.

Table 1: Existing Habitat Cover Types

<i>Habitat Cover Type</i>	<i>Acreage</i>
Cropland	744
Permanent Wetland	342
Riparian	1,919
Wet Meadow	0
Seasonal Wetland	218
Irrigated Pasture	506
Native Grassland	372
Semi-Permanent Wetland	132
Vernal Pool	4
Developed	56
Fallow	2,098
Irrigation / Drainage Canal	197
Total:	6,588

Wetlands

Permanent Wetlands

Permanent wetlands are those that remain flooded all year and support hydrophytes (water-loving plants)—either herbaceous or woody species (Gritsch and Gosselink 2000). These wetlands at the San Joaquin River NWR are ringed by a perimeter of emergent vegetation, such as hardstem bulrush (*Scirpus acutus*) and/or cattail (*Typha latifolia*); oxbows are bordered by riparian forest. Permanent wetlands cover approximately 340 acres of the San Joaquin River NWR. Wetlands that have been present for decades include Miller Lake, Quesma Field and Nelson Lake, which are situated on the northern unit of the Refuge. Oxbow lakes occur near Gardner's Cove and Christman Island. In 1999, changed drain pump management in a former agricultural field allowed the naturally high water table and irrigation run-off from neighboring agricultural lands to inundate the site and form White Lake. A permanent wetland, which fluctuates with the level of the San Joaquin River, also exists on the west side of the Refuge.

Semipermanent Wetlands

Semipermanent wetlands are flooded most of the year but are dry during late summer to early winter (Smith et al. 1995). There

are 132 acres of semipermanent wetlands on the Refuge, including the upper benches of Riley Slough, part of an abandoned field on the southwest corner of the Refuge and oxbow sloughs along the San Joaquin River. Bulrush and cattails thickly vegetate these areas; the oxbows are ringed by riparian forest.

Seasonal Wetlands

Seasonal wetlands are flooded during autumn and maintained throughout the

winter until drawdown occurs in spring (Smith et al. 1995). A total of 218 acres of managed seasonal wetlands currently occur on the Refuge. Depending on the water regime, the dominant vegetation is swamp timothy (*Heleochoa schoenoides*), watergrass (*Echinochloa crusgalli*), smartweed (*Polygonum* spp.), sprangletop (*Leptochloa fascicularis*) and cocklebur (*Xanthium strumarium*). Seasonal wetlands on the East unit of the Refuge include Page Lake,

Watergrass Unit and Goose Lake, which are maintained for roosting and feeding ponds for Aleutian Canada geese and other migratory birds. In addition, seasonal wetlands develop on former agricultural fields in the West Unit of the Refuge on an irregular basis due to high flows in the San Joaquin River, rainfall and upslope drainage of irrigation water.

Vernal Pools

Vernal pools are a unique wetland that can be found in the shallow basins of valley grasslands where an impermeable soil layer causes a perched water table to form (Ferren and Pritchett 1988). They become filled by winter rains and dry in the spring by evaporation. Showy wild flowers, such as

downingia (*Downingia* spp.) and goldfields (*Lasthenia* spp.), bloom as the pools dry, but during the summer, the basins are bare except for prostrate plants, such as annual atriplexes (*Atriplex* spp.). The plants and animals of vernal pools, including the federally-listed endangered vernal pool fairy shrimp (*Branchinecta lynchi*) and vernal pool tadpole shrimp (*Lepidurus packardii*), are highly restricted to specific locations and are dependent on this shallow basin habitat for their survival (Jain and Moyle 1981).

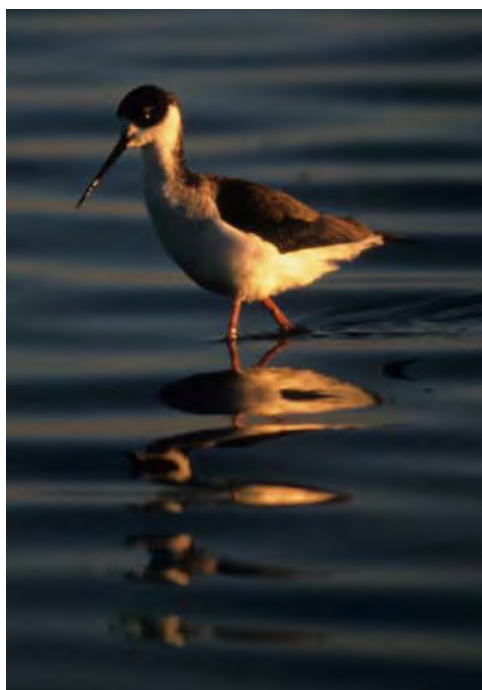
Based on examination of 1938 aerial photography, vernal pools were once common on lands within the Refuge acquisition boundary east of the San Joaquin River. Today only a remnant survives on the few parcels of land where the topography has not been altered. Four acres of vernal pools in three locations occur on Refuge lands (Figure 4–Land Cover Map). A vernal pool complex of 14 pools, ranging in size from 51 to 562 square yards, is present on the Buffington Field unit. Some vernal pools were eliminated or altered prior to Service ownership. On the south and west sides of the vernal pool complex, small channels were installed to connect and deliver water to several shallow pools, which are now filled with vegetation typical of a seasonal wetland. A raised dirt road in the center of the field divides one vernal pool into halves.

A smaller complex of three vernal pools is present in the Airport Field next to Miller Lake. Invertebrates associated with vernal pools have been found in one of the pools. Pools are also present in the uplands adjacent to Nelson Lake; although these are characteristic of vernal pools, no vernal pool invertebrates have been found in surveys.

Grasslands (Uplands)

Native Grasslands

Native grasslands on the Refuge consist of lands with native undulating topography modified by small channels and berms, but not land-leveled. Central Valley grassland habitats have been severely altered over the past one hundred and fifty years. Exotic annual grass species, principally of Mediterranean origin, replaced the native



Shorebirds are dependent on wetlands such as this black necked stilt.

Photo: Jerry Baldwin

perennial grasses that likely once dominated these grasslands. Many annual exotics, including ripgut brome, soft chess, wild oats and others, now prevail on the grasslands; however, native grassland species, such as alkali sacaton, saltgrass and spikeweed, are still common in some areas. Restoration of native habitats, including these grasslands, is a critical element for Refuge management. Noxious weedy species, such as yellow starthistle and pepperweed, are also beginning to invade some of these habitats. Aggressive control of exotic species is critical to maintain native habitat.

Tilled Cropland

Tilled croplands consist of lands that have been converted from a more natural condition by land-leveling and installation of pipelines for irrigation, and are under active management for agricultural crop production. The Service acquired close to 3,000 acres of tilled croplands. The majority is presently in fallow condition and will be restored to a combination of native upland, riparian and wetland habitats. A small portion of tilled cropland remains on the Refuge to produce winter forage for Aleutian Canada geese, sandhill cranes, and other migratory birds. Most of the Refuge tilled croplands are east of the San Joaquin River and planted to corn (grain forage) and winter wheat (green browse forage). Privately owned tilled croplands within the Refuge acquisition boundary are planted to these and other cereal grains, alfalfa, tomatoes, beans, and melons for commercial production.

Fallow Field

Fallow fields are tilled croplands that have been taken out of active agricultural production. No irrigation water is applied to these sites and the land develops a cover of weedy, mostly nonnative, broadleaf plants. The Service has purchased close to 3,000 acres of formerly tilled cropland that has been allowed to lie fallow. Most of the Refuge-owned fallow fields are on the west side of the San Joaquin River. Fallow fields will be restored as funds permit to a variety of natural habitats, including riparian forest, wetlands and grasslands. Very little

fallow field habitat is present on private lands within the acquisition boundary of the Refuge east of the San Joaquin River.

Irrigated Pasture

Irrigated pasture consists of lands that have been converted from a more natural condition by land-leveling, installing pipelines to facilitate flood irrigation, and planting a mixture of domestic grasses and legumes. They are maintained by frequent irrigation and are typically grazed by cattle year round, following a rotational cycle that averages about eight months of grazing per year. The Service has purchased approximately 500 acres of irrigated pasture as part of the Refuge; irrigation has been continued to provide shortgrass foraging habitat for Aleutian Canada geese, sandhill cranes and other migratory birds.

Wildlife

California's diverse terrain and vegetative communities provide conditions for a high degree of wildlife diversity. San Joaquin Valley NWR contains elements of the Central Valley's three major vegetative types and has the potential to provide habitat for over 325 species of wildlife. Appendix E provides a species list of fish and wildlife on the Refuge. A significant portion of the Refuge consists of fallow agricultural lands; their planned restoration has the potential to increase the number of wildlife species and their abundance over the present distribution and abundance on the Refuge.

Invertebrates

The Refuge provides habitat for both aquatic and terrestrial invertebrate species. Past invertebrate surveys have been limited to the sampling of vernal pools for the presence of tadpole and fairy shrimp, but it is believed that the aquatic and terrestrial invertebrate fauna is representative for the Central Valley. Non-systematic field observations have detected the presence of representatives from nine of the thirteen insect orders with aquatic species (*Merritt and Cummins 1996*), as well as two types of native bees. Future work on invertebrates is dependent on funding and may include

surveys for the endangered valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) and native bee inventories.

Fish

Habitats for fish on the Refuge include rivers, permanent wetlands, oxbows and sloughs. Three major rivers (i.e., San Joaquin, Tuolumne and Stanislaus) join on the Refuge and provide an important nexus for migratory fish. The stretch of the San Joaquin River and tributaries on the Refuge provide habitat and connectivity to aquatic habitats for a wide range of fish, including fall-run chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss*) and Sacramento splittail (*Pogonichthys macrolepidotus*)—all species which are or proposed for federal listing under the Endangered Species Act. Appendix E provides the species list of fish known to occur or have the potential to occur at the Refuge.

Historically, California supported over 90 freshwater species of native fishes; the Sacramento-San Joaquin Valley sustained approximately 60 native species (Schoenherr 1992). Although there is still a diversity of aquatic habitats in the Central Valley, the natural assemblages of Central Valley fish communities have been degraded by altered flow regimes, levee construction/maintenance and associated loss of floodplain, reduction in riparian habitats, the introduction of exotic fish species and other factors. At San Joaquin River NWR, many native fish species have been extirpated or are severely reduced in number; but several still occur, including fall-run chinook salmon, steelhead, Pacific lamprey (*Lamptera tridentata*), river lamprey (*Lamptera ayresi*), hitch (*Lavinia exilicauda*), Sacramento splittail, Sacramento blackfish (*Orthodon microlepidotus*), Sacramento sucker (*Catostomus occidentalis*), tule perch (*Hysterocarpus traski*), and prickly sculpin (*Cottus asper*). Some of these species are dependent on large river systems while others use sloughs and other backwater habitats. Introduced species now dominate many of the aquatic habitats of the Central

Valley, including those at San Joaquin River NWR. Thirty-six introduced fish species are present in the Central Valley (Schoenherr 1992). Refuge aquatic habitats are now dominated by the following non-native species: black bass (*Micropterus salmoides*), carp (*Cyprinus carpio*), bluegill (*Lepomis macrochirus*), threadfin shad (*Dorosoma petenese*), red shiner (*Cyprinella lutrensis*) and striped bass (*Morone saxatilis*).

Although the Refuge was originally established to benefit endangered and other migratory birds, it has the potential to benefit and enhance populations of native fish. The restoration of floodplain habitats on the Refuge, including riparian forest, and a return to more natural water regimes have the potential to benefit many natives dependent on floodplains for spawning and rearing purposes (Moyle 2002).

Amphibians and Reptiles

San Joaquin River NWR has the potential for twenty-seven species of reptiles and amphibians to occur (Appendix E). Semi-arid regions such as the Central Valley frequently possess diverse communities of both lizards and snakes; by contrast, whereas the turtle and amphibian communities generally have a low species diversity (Schoenherr 1992). The most easily observable Refuge species include the western pond turtle (*Clemmys marmorata*), western fence lizard (*Sceloporus occidentalis*), racer (*Coluber constrictor*), Pacific gopher snake (*Pituophis melanoleucus*), common garter snake (*Thamnophis sirtalis*) and introduced bullfrog (*Rana catesbeiana*).

A preliminary survey of reptiles and amphibians was conducted at the San Joaquin River NWR in 1998; the survey was not meant to be all encompassing, but to focus on reptile/amphibian use of major habitats. The survey indicated low overall capture rates, but documented 13 of the 27 species of reptiles and amphibians with the potential to occur on the Refuge. The survey detected reptile and amphibians in woodlands and native grasslands, but none in fallow agricultural fields.

Birds

The San Joaquin River NWR was initially established due to its importance to migratory birds, particularly the Aleutian Canada goose. The Refuge has the potential to provide habitat for all the avian species known to occur in the Central Valley, which includes over 225 species of birds.

The most spectacular bird use at the Refuge is by waterbirds, especially waterfowl. Close to 30 species of ducks, geese and swans make use of the Refuge and the most common include the Aleutian Canada goose, snow goose, white-fronted goose, green-winged teal, northern shoveler, mallard, northern pintail, cinnamon teal, gadwall, widgeon and ruddy duck. Other conspicuous Refuge waterbirds include the pied-billed grebe (*Podilymbus podiceps*), double-crested cormorant (*Phalacrocorax auritus*), white-faced ibis (*Plegadis chihi*), white pelican (*Pelecanus erythrorhynchos*), sandhill crane, American coot, moorhen, killdeer, black-necked stilt, American avocet, greater yellowlegs, western sandpiper, least sandpiper, as well as long and short-billed dowitchers. Colonial nesting waterbirds maintain colonies on the Refuge, such as the great blue heron (*Ardea herodias*), great egret (*Ardea alba*) and double-crested cormorant.

Aside from waterbirds, the Refuge is an important area to many other resident and migratory bird species. Many species of neotropical migrants have been detected on the Refuge, including the lazuli bunting (*Passerina amoena*), blue grosbeak (*Guiraca caerulea*), ash-throated flycatcher (*Myiarchus cinerascens*), western wood-pewee (*Contopus sordidulus*), black-headed grosbeak (*Pheucticus melanocephalus*), Savannah sparrow (*Passerculus sandwichensis*), horned lark (*Eremophila alpestris*), yellow warbler (*Dendroica petechia*), Nashville warbler (*Vermifora ruficapilla*), orange-crowned warbler (*Vermivora celata*), yellow-rumped warbler (*Dendroica coronata*), Pacific-slope flycatcher (*Empidonax difficilis*), and ruby-crowned kinglet (*Regulus calendula*) (Appendix E). A survey was conducted

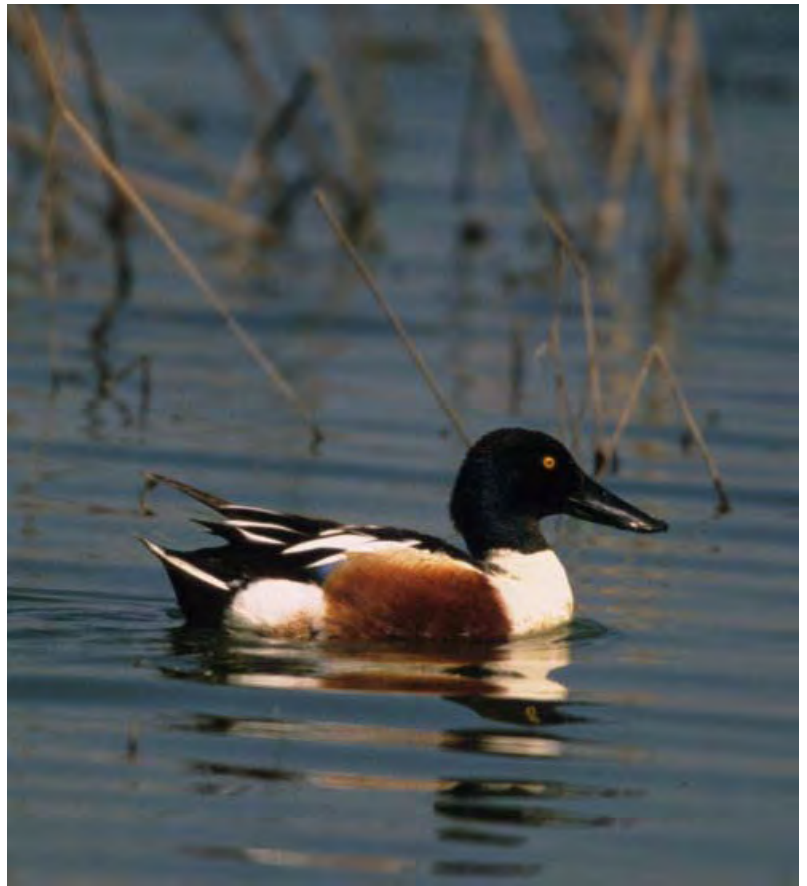
for the yellow-billed cuckoo (*Coccyzus americanus*), a rare species in the Central Valley, but none was found, although the Refuge does fall within its historic range (Sawyer, et al. 1997, Gains and Laymon 1984, Laymon 1998). Compared to other habitats, oak woodlands and riparian habitats, which support multiple vegetation layers, have the highest diversity of bird species on the Refuge. Typically, natural habitats supported the greatest diversity of bird species, whereas crop fields and fallow agricultural lands supported few birds (Hammond et al. 2002).

Mammals

California hosts an array of mammals principally due to the state's large size and variety of habitats. Over 200 species of mammals have been documented in California, one of the largest state species counts in the nation (Zeiner et al. 1990). Before European settlement, tule elk (*Cervus elaphus nannoides*), grizzly

Drake northern shoveler.

Photo: Jerry Baldwin



bear (*Ursus arctos*), pronghorn antelope (*Antilocapra americana*), California black-tailed deer (*Odocoileus hemionus*), mountain lion (*Felis concolor*) and bobcat (*Felis catus*) were conspicuous in the Central Valley. The mammal composition today is quite different, however, due to the loss of suitable habitat, over-harvest and introduction of nonnative plants and animals. Most of the aforementioned large mammals are no longer found in the area.

Rodent and rabbit species make up the largest segment, approximately one third, of the mammals found on San Joaquin River NWR as in most areas (Eisenberg 1982). Three rabbit species occur on the Complex, including the desert cottontail (*Sylvilagus audubonii*), black-tailed hare (*Lepus californicus*) and endangered riparian brush rabbit (*Sylvilagus bachmani riparius*). Both the hare and the desert cottontail are conspicuous species at the Refuge. Large rodents, which are also conspicuous on the Refuge, include the aquatic muskrat (*Ondatra zibethicus*) and beaver (*Castor canadensis*) – both of which leave obvious signs and play important roles in aquatic systems. Dominant rodents at the Refuge, which also act as keystone species because of their grazing/seed predation and/or tunneling, include the deer mouse (*Peromyscus maniculatus*), California vole (*Microtus californicus*) and California ground squirrel (*Spermophilus beecheyi*). The endangered San Joaquin Valley woodrat

(*Neotoma fuscipes riparia*), as well as the introduced black rat (*Rattus rattus*), also occur on the Refuge

An inventory of the bat community has not been conducted at the San Joaquin River NWR, although by potential species number they make up a sizable component of the mammalian fauna. The most common species probably include the big brown bat (*Eptesicus fuscus*), western pipistrelle (*Pipistrellus hesperus*), little brown bat (*Myotis lucifugus*) and Brazilian free-tailed bat (*Tadarida brasiliensis*).

Although the largest carnivore species of the Central Valley were eliminated during the settlement period, mid-size and small carnivores are prevalent at the Refuge and comprise approximately one fifth of the potential mammalian community. The most common carnivores/omnivores on the Refuge include the coyote (*Canis latrans*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), northern river otter (*Lutra canadensis*), longtailed weasel (*Mustela frenata*) and Virginia opossum (*Didelphis virginiana*) while the gray fox (*Urocyon cinereoargenteus*) and mink (*Mustela vison*) are present, but rarely encountered.

Other mammals that occur on the Refuge include the ornate shrew (*Sorex ornatus*) and mule deer (*Odocoileus hemionus*), and several domestic mammals which either trespass onto the Refuge or are used in the Refuge's grazing program. A permanent mule deer population does not exist at the San Joaquin River NWR, although transient deer are periodically observed.

Threatened and Endangered Species

Several threatened and endangered species occur or have the potential to occur on the San Joaquin River NWR. The Refuge was originally established for the Aleutian Canada goose, which was listed as endangered in 1967. Much of the population had been ravaged by arctic foxes introduced onto the Aleutian Islands in Alaska where this subspecies breeds (USFWS 1991). The population numbered 800 birds when the

Coyote, a conspicuous predator at the Refuge.

Photo: Gary Powell



Aleutian Canada Goose Recovery Program was implemented in the 1970s. Since then, breeding islands have been cleared of foxes, captive-breeding programs started and implemented and geese reestablished on fox-free islands. By 1991, the Aleutian Canada goose population had recovered to more than 7,000 birds and, as a subspecies, was down-listed to threatened status. By 1998 the population numbered more than 28,000 and the process of delisting Aleutian Canada geese from threatened status began. More than 95 percent of the world's Aleutian Canada goose population winters on the Refuge. Most years, Page Lake is the main roost pond. Aleutian Canada geese also use Nelson Lake and the new Goose Lake. Annual monitoring of these birds has been conducted as part of the Aleutian Canada Goose Recovery Program since 1976. Corn and winter wheat are planted on the Refuge annually to provide forage for the increasing population. Aleutian Canada geese populations have recovered dramatically and have been delisted as a federally threatened species. Managing and monitoring the Aleutian Canada geese population continues on the Refuge. Existing roost ponds have been improved and expanded to potentially reduce deaths from avian cholera by physically spreading out the population. These improvements and others would further minimize avian cholera mortality and local crop depredation, and discourage poaching.

The federally listed endangered species that occur or which could potentially occur on the Refuge include the riparian brush rabbit (*Sylvilagus bachmani riparius*), San Joaquin Valley woodrat (*Neotoma fuscipes riparia*), San Joaquin kit fox (*Vulpes macrotis mutica*), bald eagle (*Haliaeetus leucocephalus*), least Bell's vireo (*Vireo bellii pusillus*), giant garter snake (*Thamnophis couchi gigas*), chinook salmon, Sacramento splittail, steelhead trout, valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), vernal pool fairy shrimp, and vernal pool tadpole shrimp.

The riparian brush rabbit is a subspecies of the brush rabbit. Its original distribution

was the most limited of all the brush rabbit subspecies, restricted to a small stretch of the San Joaquin River and some of its tributaries (Orr 1940). Presently, the riparian brush rabbit only occurs in three isolated populations, none of which is considered secure for maintaining the long-term status of the population. Plans call for reestablishing a population on the San Joaquin River NWR through a captive breeding program (Williams et al. 2002). Existing riparian vegetation at the Refuge, coupled with planned restoration of riparian habitat on the Refuge, will provide this subspecies the largest block of contiguous habitat in its existing range.

The San Joaquin Valley woodrat uses similar habitat as the riparian brush rabbit. Unlike the rabbit, the woodrat has not disappeared from the Refuge and small numbers of the woodrat occur. The planned riparian habitat restoration will benefit not only the rabbit but the endangered woodrat, as well.

No records exist for the San Joaquin kit fox on the Refuge, although there are records within 20 miles. Bald eagles are routine Refuge visitors, particularly during the winter months, and are usually attracted to the large concentrations of waterfowl. Least Bell's vireo nested in recently planted riparian habitat at the Refuge in 2005. Planned riparian restoration activities will likely produce additional suitable habitat for this endangered songbird. The giant garter snake is listed as endangered and requires permanent water as habitat. Although suitable habitat appears to exist on the Refuge, there have been no documented records for the species. All three species of listed or candidate fish species – Chinook salmon, steelhead and Sacramento splittail—occur on the Refuge. The valley elderberry longhorn beetle is dependent on elderberry (*Sambucus mexicanus*) for its life cycle. Little elderberry habitat exists on the Refuge but the small amount that does occur may support populations of the endangered beetle. Two vernal pool listed shrimp have been documented at some of the Refuge's vernal pools; these habitats will be maintained in perpetuity on the Refuge.

State of California listed endangered and threatened species which occur on the Refuge include the greater sandhill crane, yellow-billed cuckoo, Swainson's hawk, willow flycatcher and bank swallow. The greater sandhill crane annually winters on and around the Refuge. Existing pastures, agricultural lands, and wetlands are used for foraging and roosting (*Lewis 1979, Reinecke and Drapu 1979, Iverson et al. 1982, Walker and Schemnitz 1987*). Unlike lesser sandhill cranes, greater sandhill cranes within the Pacific Flyway have shown precipitous population declines because of destruction of wetlands and riparian habitat, lack of nesting habitat, and low productivity (*Pogson and Lindstedt 1991*). This area is one of eight geographic regions in which greater sandhill cranes winter in the Central Valley. The yellow-billed cuckoo, which relies upon riparian woodland, and the willow flycatcher, which depends on wet, shrubby habitat, have not recently been documented on the Refuge, although planned habitat restoration activities will likely create additional habitat for these species. The bank swallow require large cut banks for its breeding colonies; although such areas exist at the Refuge, there have been no bank swallow colonies during the last decade. The Swainson's hawk is conspicuous at the Refuge, which provides habitat for several breeding pairs.

Historical and Cultural Resources

Cultural resources are physical remains, sites, objects, records, oral testimony and traditions that connect us to our nation's history and the land's past. Cultural resources include archaeological and historical artifacts, sites, landscapes, plants, animals, sacred locations and cultural properties that play an important role in the traditional and continuing life of a community.

Little formal cultural resources survey work has been conducted on the Refuge. The known cultural resources in and within one mile of the acquisition boundary of the San Joaquin River NWR consist of eight prehistoric sites and two historic sites. Cultural resources, especially archaeological

sites, are fragile and nonrenewable. Most consist of worked stone, fire-altered rocks and organically enriched soil on or close to the surface. When compared to the surrounding landscape and contemporary cultural features, such as roads, ditches and structures, archaeological sites are small and subtle.

Prehistory

The Refuge is in the homeland of several Indian groups collectively known as the Northern Valley Yokuts. Within the Refuge, one group, the Tuolumnes aboriginal group, has been identified. The Tuolumnes' home was east of the San Joaquin River, between the Stanislaus and Tuolumne rivers (*True 1981*). The Refuge borders the territory of, and at various times, was probably occupied by, the Miwok tribe (*Silverstein 1978*). As neighbors, the Yokuts and Miwok traded, intermarried and shared many cultural practices. Acorns (valley oak) and salmon were dietary staples, as were tule elk, antelope and jackrabbit (*Levy 1995*). Major Northern Valley Yokuts settlements were located within a short distance of the San Joaquin River banks and along major tributaries. As the San Joaquin and Tuolumne rivers have changed and meandered considerably over the years, these sites may appear most anywhere on the Refuge. Villages were typically built on ground higher than the surrounding area, situated to best exploit the rich subsistence resources without being consistently flooded. Yokuts would mainly congregate in the winter; during spring, summer and fall, groups would disperse to gather different resources (*Jensen 1996*). Villages were typically a scatter of four or five to several dozen structures. Each house served as a home to one family. Large villages might also have a great communal earth lodge for ceremonial use.

History

Spanish colonization of California began with the readily accessible coastal areas, avoiding the interior valleys during the 18th century. Early in the 19th century, military explorers and missionaries moved away from the coast and to the inland

valleys. Early settlement by the Spanish in California was accomplished through the mission system, where livestock and farming were mainstays. The arrival of the Spanish into California shifted the use of the land from hunting/gathering to an agrarian use. By the 1820s many Native Americans were assimilated into the mission system. The Spanish also introduced both cattle and sheep into California; at the height of the mission period, there were 400,000 cattle and 300,000 sheep (*Schoenherr 1992*). During the late 1840s, there was a decline in the Spanish/Mexican influence in California, particularly during the gold rush years; however, livestock production continued as a major agricultural activity. Due to a rapid increase in miners and settlers during the gold rush years, numbers of livestock were vastly increased to meet this new demand; by the 1860s, there were 3 million cattle and 9 million sheep in the state. Damage to California's rangeland from overgrazing was extensive by the 1870s and it has never fully recovered (*Schoenherr 1992*). Agriculture continued to be the primary land use of the Central Valley into the 1900s. Dry farming (i.e., farming without irrigation) for wheat became popular in the late 1880s but declining wheat prices brought an end to this practice during the 1920s. Irrigated agriculture in the Central Valley was common in the 1850s but became widespread during the 1900s, as it is today. The Central Valley remains an agricultural center as it was under the Spanish. The primary agriculture products from the Central Valley are dairy products, beef, grapes, rice, orchard crops and cotton. Hay and alfalfa production for livestock are also common agricultural products.

Refuge Facilities

Most existing facilities at the San Joaquin River NWR were on the land prior to acquisition by the Service to establish and develop the Refuge. Conditions of the facilities vary greatly and range from very good to hazardous. Some facilities and structures are being used and maintained, while others need to be removed.

Roads

There are numerous public roads within and surrounding the approved Refuge boundary (Figure 6–Refuge Roads & Facilities Map). The Refuge is partially bounded by Beckwith Road to the north, Gates Road to the east, and Dairy and Pelican Roads to the southwest. The Refuge is bisected by Highway 132. Shoemake and Page Roads (nonpublic) traverse the approved Refuge boundary.

In addition to public roads, the Refuge contains many interior roads, many of which are unpaved. Most of these roads are shared with other parties, such as the Faith and Mapes ranches. Two paved roads that run through the Refuge are the West Stanislaus Road and an unnamed road that extends south off Shoemake Road. There are no existing walking trails on the Refuge.

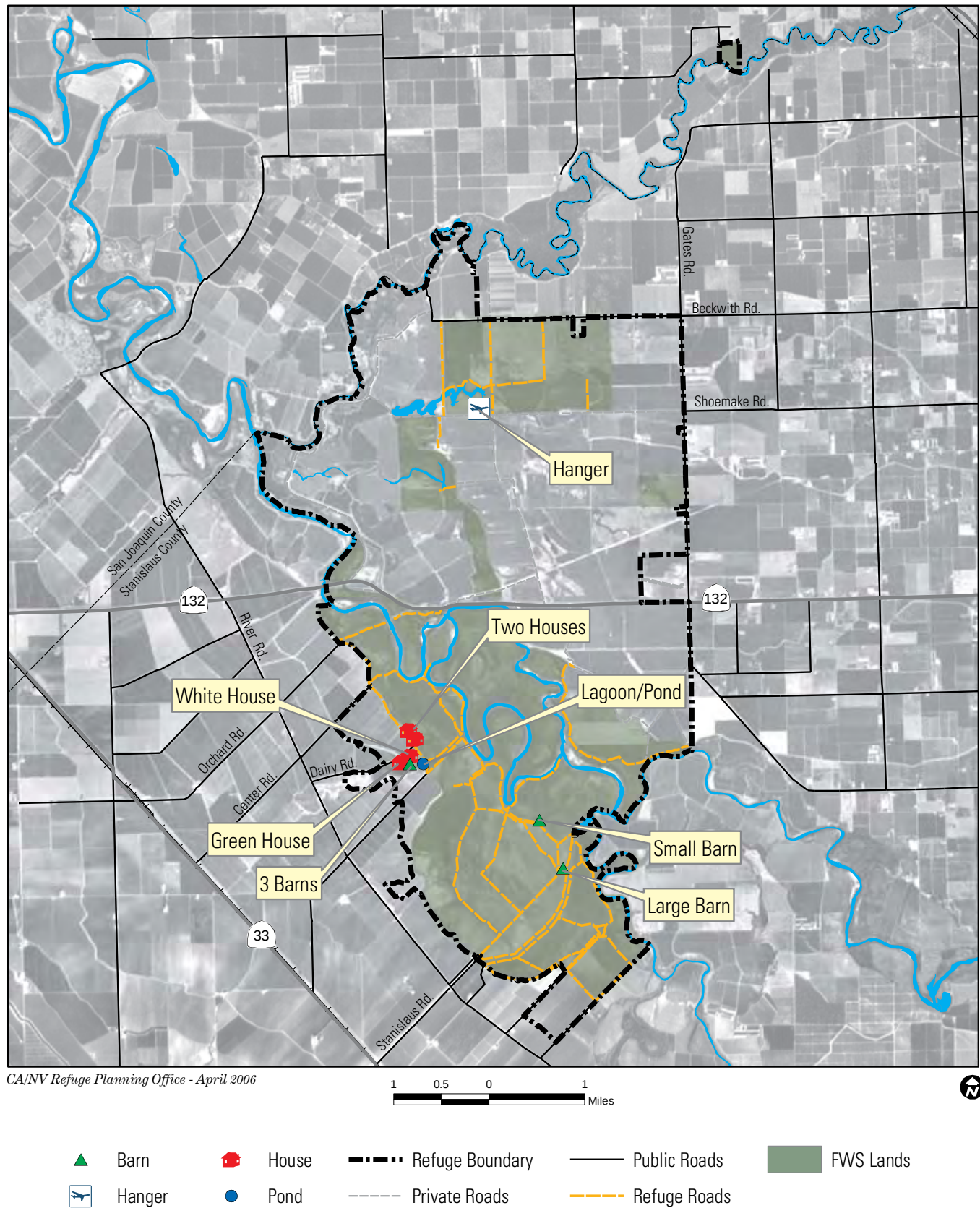
Buildings

There are twenty-four buildings/structures on the Refuge. These structures are concentrated on the west side of the Refuge, particularly the Vierra, Hagerman and Lara Units. These structures range from milk barns to pole sheds, livestock run-in shelters, houses, and railroad cars. All of these were acquired with the land when purchased for the Refuge. Most of the buildings and structures are in poor condition and were not maintained for many years. The three exceptions are houses in good condition, one of which is a life estate, one a government quarters and the remaining used as the office for the Refuge. The majority of the buildings and structures are a safety hazard and an attractive nuisance and need to be removed.

Wetland Units and Water Infrastructure

Most of the facilities now owned by the Refuge are old and are in varying conditions of usability. Many lift pumps and pipelines on both the East and West units were damaged during the January 1997 flood. In addition, the reliability, cost and quality of water provided by these facilities has a wide range of variability (Figure 7–Wetland Units). To date, much

Figure 6: Refuge Roads and Facilities



of the operational water delivery for Refuge wetlands and uplands management has been driven by the configuration and condition of the agricultural wells, pumps, pipelines and canals that were in place at the time of purchase. In part of the East Unit, water is provided by lift pumps and wells, or conveyed by pipelines and canals, owned by the Mapes Ranch as part of their CLMA with the Refuge. Refuge-owned water production facilities in the East Unit include: a lift pump next to the MID Main Drain and another along Riley Slough (both rehabilitated after the 1997 flood); a 70 h.p. agricultural well at the Dairy Field (installed by the Refuge in 2000); a domestic well at the Quesma Field wetlands (condition uncertain); and a lift pump along the Tuolumne River (damaged in 1997 flood and needs to be rehabilitated and fitted with a fish screen before operation). Water is conveyed to Refuge wetlands and uplands via a network of pipelines, concrete lined ditches and earthen canals. Portions of the MID Main Drain, MID Lateral 4, and MID Lateral 7 water delivery canals run through or adjacent to Refuge lands. Most of the managed wetland units have inlet and outlet structures that have been installed since 1993 and all have staff gauges to facilitate water management.

A total of 12 lift pumps, six drain pumps, nine domestic wells, and one agricultural well were present on West Unit lands when acquired by the Service. Many of these facilities are currently inoperable due to damage from the 1997 flood. Three lift pumps (two 50 h.p. and one 34 h.p.) along the West Stanislaus Irrigation District Intake Canal were rehabilitated and fitted with fish screens in the summer of 2001 to use for habitat restoration and management. The Refuge plans to rehabilitate and screen additional lift pumps to meet restoration and management needs, but others will be abandoned. The drain pump at the White Lake outlet was rehabilitated in 2000 and is used to manage water levels of White Lake wetlands and to meet Refuge drainage obligations to the White Lake Mutual Water Company. Five domestic wells were filled and capped in 2001. The remaining

wells are operational and are being used for restoration purposes, but water quality concerns associated with these wells, as well as test wells drilled in 2001, will limit the use of ground water for long term management of Refuge lands. An agricultural well on the southern end of the unit (former Arambell and Rose property) is currently being used to irrigate alfalfa grown on the Refuge through a CLMA. The water quality of that well is unknown. The West Unit is overlaid by a network of pipelines and canals that were used to deliver and drain off irrigation water to the former agricultural fields. Part of these facilities will be maintained and used for habitat restoration and subsequent management. Canals and pipelines that are not needed for management purposes will be filled in or blocked (pipelines) as part of the habitat restoration efforts.

Visitor Facilities

A wildlife viewing platform, information kiosk and associated parking lot located off of Beckwith Road are available to the public for wildlife observations. These facilities were constructed in 2002 and provide the only public use facilities at the Refuge

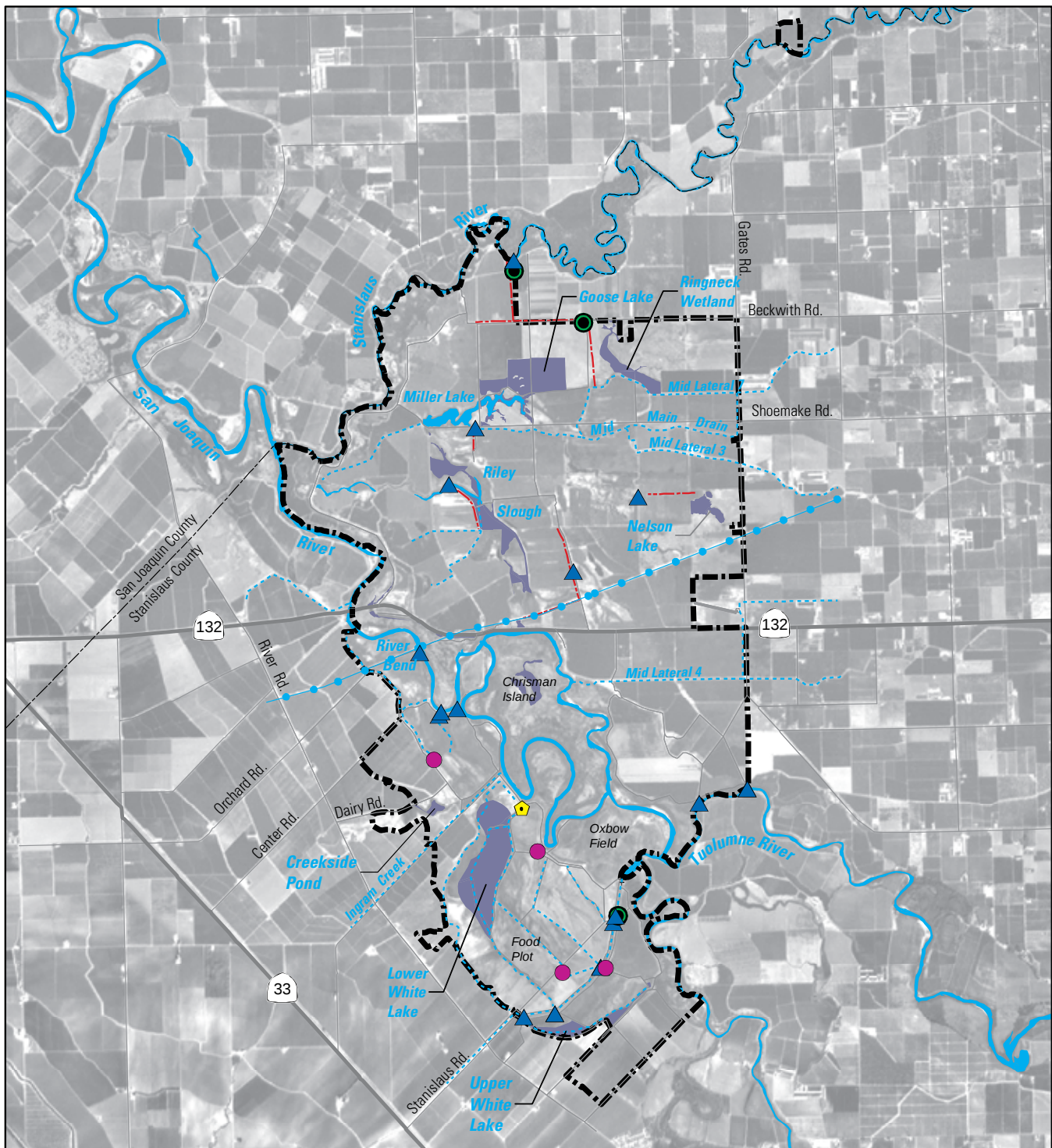
Current Management Activities

Most of the past habitat management, wildlife management, and biological monitoring and research at the Refuge were focused on supporting the recovery goals for Aleutian Canada geese. As the Refuge's land base increased and additional staff support became available, these activities were expanded to include additional species and other resource concerns. Management changed after acquisition of the large floodplain area west of the San Joaquin River. Currently, the Refuge is actively managing upland and wetland habitats, as well as restoring the riparian floodplain, for the benefit of endangered species and migratory birds. Refuge management units are identified on Figure 8.

Habitat Management ***Wetland Management***

Water management is required for most of the wetlands on the San Joaquin River NWR due to alteration of the original or natural

Figure 7: Wetland Units



CA/NV Refuge Planning Office - April 2006

1 0.5 0 1
Miles



- | | | | | | | | |
|--|-------------------|--|------------|--|----------|--|-----------------|
| | Agricultural Well | | Drain Pump | | Aqueduct | | Pipelines |
| | Domestic Well | | Lift Pump | | Canals | | Refuge Boundary |

hydrology of the area for agricultural and urban purposes and needs. Water for managed Refuge wetlands is supplied through various lift pumps on the San Joaquin, Stanislaus and Tuolumne rivers, deep wells, Modesto Irrigation District supplies, operational spill, and tailwater from adjacent farming operations. It is conveyed via irrigation district, privately-owned, or Refuge-owned canals and other infrastructure (Figure 6. Wetland Units). Most of the wetland units have staff gauges in place to monitor water levels. Current water management practices have developed over time based on land acquisitions, partnerships, location in the Modesto Irrigation District service area, legal drainage obligations to upslope landowners, pumping constraints due to anadromous fish and the availability of operating funds to pay power costs. Refuge wetlands are managed as single units or complexes, as described below (Figure 7. Wetland Units Map).

Page Lake Complex

The Page Lake complex consists of Page Lake, Goose Lake, Watergrass Unit and Upper Miller Lake. Water is supplied from the Stanislaus River via a lift pump owned and operated by the Lyons family, a deep well owned by the Refuge, and operational spill from the end of the Modesto Irrigation District system. The management objective of Page and Goose lakes is to serve as winter roost habitat for Aleutian Canada geese and other migratory birds. Both lakes are drawn down in mid-April and not irrigated during the summer. The pond bottoms become vegetated with swamp timothy. In autumn, the lakes' islands, shorelines and any tall vegetation, such as cocklebur, are mowed prior to floodup to provide loafing habitat and to maintain the open character necessary for goose roost ponds. Page and Goose lakes are flooded in early October prior to the arrival of Aleutian Canada geese and water levels are maintained through the winter. The Watergrass Unit, immediately west of and an extension of Page Lake, is managed to provide foraging habitat for ducks in the winter and shorebirds in spring. Irrigation tailwater from Refuge cornfields (grown as

goose forage) immediately north of the unit is allowed to drain into the unit to promote a thick stand of watergrass. It is flooded in October with the arrival of waterfowl, and then drawn down slowly in April (as are Page and Goose lakes) to provide mudflat foraging habitat for migrating shorebirds. Miller Lake, immediately south of Page Lake and the Watergrass Unit, is managed as a permanent wetland. It is ringed by cattail and roundstem bulrush and provides habitat for grebes, marsh nesting birds and other wetland dependent wildlife.

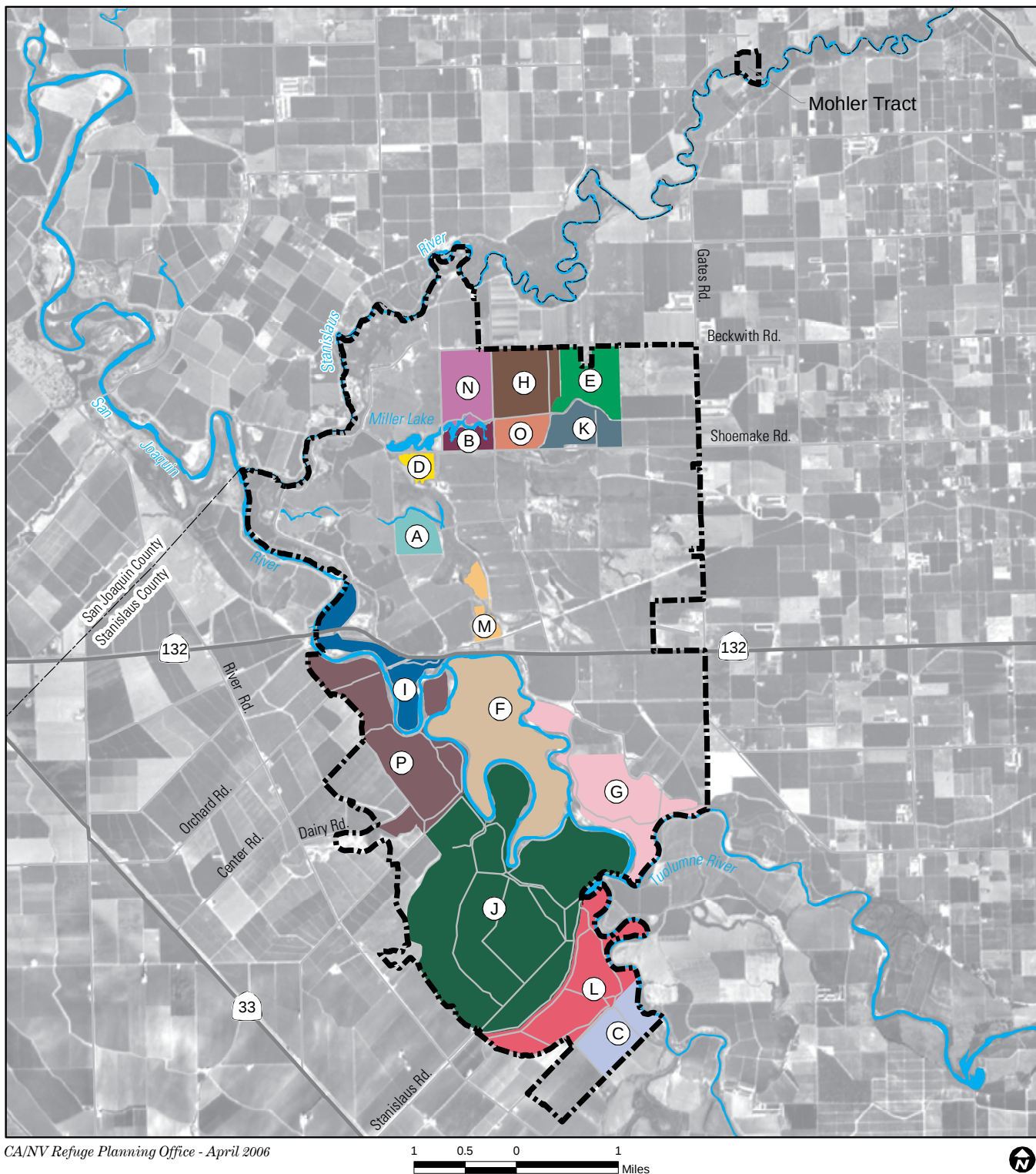
Nelson Lake Complex

East and West Nelson lakes are managed as a complex of seasonal and permanent wetlands. These units are situated within the Modesto Irrigation District service area. Water is supplied by the irrigation district from spring through fall, and by a well owned and operated by the Lyons family during the winter. East Nelson Lake is the deepest (three to six feet deep) and is the only permanent pond in the unit. West Nelson Lake is a seasonal extension of East Nelson Lake and averages approximately 12 inches deep when filled. It is drawn down in mid-April. It is irrigated by tailwater and subirrigation from adjacent irrigated pasture, and grows a mixed stand of swamp timothy, watergrass and smartweed. The unit is flooded up in late September or early October and the water level maintained through the winter. The cattail-lined East Nelson Lake is used throughout the year by waterfowl, marsh nesting birds and other wetland dependent wildlife. West Nelson Lake is primarily used as a roost site by Aleutian Canada geese during autumn, but is heavily used from fall through spring by white-fronted geese (*Anser albifrons frontalis*), ducks, sandhill cranes, wading birds and shorebirds.

Ringneck Pond

This wetland unit consists of a permanent cattail-dominated wetland adjacent to a Modesto Irrigation District canal and a meandering seasonal channel extending from the wetland across native uplands. The Modesto Irrigation District Canal supplies water to the unit. Management

Figure 8: Refuge Management Units



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1 0.5 0 1 Miles



- | | | | |
|-------------------|----------------------------------|--------------------|-------------------------|
| (A) 90 Acre Field | (E) Buffington | (I) Gardner's Cove | (M) Maze Bottom |
| (B) Airport Field | (F) Christman Island | (J) Hagerman | (N) Page Field |
| (C) Arambel | (G) Christman and Colwell Fields | (K) Johnson Corral | (O) So. Johnson Pasture |
| (D) Beet Field | (H) Dairy Field | (L) Lara | (P) Vierra |

capabilities are extremely limited due to the poor condition of the water control structure and limited operating season of the Modesto Irrigation District canal system. Within that limitation, the management regime is to flood-up the seasonal channel in November and maintain levels until May. The area is heavily used by sandhill cranes, ducks, wading birds and shorebirds, and is minimally used by geese.

White Lakes

Upper and Lower White lakes are the remnants of a larger White Lake complex that was drained and converted to agricultural fields in the early 1900s. Upper White Lake is supported by a high water table which is supplemented by upslope drainage from off-refuge lands. It is maintained as a permanent wetland and its management flexibility is limited. Prior to Service acquisition, Lower White Lake was recently agricultural cropland bisected by a series of ditches that conveyed drainwater from upslope agricultural fields to the San Joaquin River. The Service is required by law to allow surface tailwater to continue draining across the Refuge. In spring 2000, Refuge staff allowed these drain flows to recreate part of Lower White Lake by restricting flows at the drainage outlet and letting water back into lower portions of the former fields. Within one growing season, scattered clumps of cattail and roundstem bulrush vegetated the area, which was being used by waterfowl, pelicans, cormorants, wading birds, marsh-nesting birds and other wetland-dependent wildlife. White Lake is currently managed as a permanent wetland, but Refuge staff has the ability to alter wetland regimes by controlling flows from the outlet structure. Monitoring was, and continues to be, conducted to ensure that water levels remain lower than the upslope field drains and do not impact drainage of adjacent private lands. There is an opportunity to expand the size of Lower White Lake by recontouring the former wetland basins and installing additional water control structures.

San Joaquin River Oxbows, Creeks and Sloughs

The Refuge staff has little-to-no control over water levels in the sloughs, creeks and

oxbows that are present on the Refuge. Riley Slough meanders across the Mapes Ranch, Refuge lands and the Faith Ranch, and ultimately drains into the San Joaquin River. It is maintained by groundwater and surface tailwater from adjacent irrigated pastures and fields and has highly variable water levels. The Refuge portion of the slough is heavily vegetated by cattails and roundstem bulrush. It is used by ducks, grebes, marsh nesting birds, beaver, western pond turtles (*Clemmys marmorata*) and other wetland-dependent wildlife. The channelized Hospital Creek, on the west side of the Refuge, conveys agricultural drainwater from upslope sources to the San Joaquin River. The Service is required by law to allow continued drainage of this surface tailwater flow across Refuge lands. Water levels in Hospital Creek are variable. A narrow oxbow (former main channel of the San Joaquin River) extends from the San Joaquin River and forms the west side of Christman Island. The north end of the oxbow is connected to the river, while the south end is connected only during high water. It is maintained by river flows, groundwater and drainage from Hospital Creek. The oxbow and associated plant community supports ducks, cormorants, herons, egrets, riparian associated songbirds, western pond turtles and other wetland dependent wildlife.

Vernal Pools

Vernal pools are managed by strictly protecting the sites and avoiding any earthmoving activities or other development on native uplands. Seasonal cattle grazing is used to manage for short grass and native forb communities associated with vernal pools.

Upland Management

Current management of upland habitats includes cattle and sheep grazing by cooperators, sharecropping and custom farming, invasive weed control, prescribed burning and floodplain riparian restoration by staff, cooperators and contractors (Figure 5. Refuge Management Unit Map).

Irrigated Pasture and Native Grasslands

Refuge pastures and native grasslands are

grazed by cattle through a long-standing CLMA with the Lyons family to provide short grass foraging habitat for Aleutian Canada geese, other geese, sandhill cranes, long-billed curlew (*Numenius americanus*), white-faced ibis (*Plegadis chihi*) and mountain plover (*Charadrius montanus*). In consultation with the grazing cooperator, the Refuge develops annual grazing plans to produce the desired habitat conditions and maintain the long-term viability of pastures and native grassland communities. The irrigated pastures are under a year round grazing regime where cattle are rotated so individual pastures are grazed eight out of 12 months. Native grasslands are grazed seasonally from December 1 through May 15. Due to the size of these grasslands, cattle are moved off and on individual units to avoid overgrazing. In wet springs, grazing may be extended to June 15 to control nonnative invasive weeds. Under terms of the CLMA, grazing fees owed to the Service by the Cooperator are exchanged for an equivalent value in pumping costs to provide water for wetlands, and the production of winter wheat for goose and crane forage on Refuge lands.

Croplands

Corn, winter wheat and alfalfa are grown on Refuge lands to provide winter forage supplies for geese, sandhill cranes and other migratory birds. On the east side of the San Joaquin River (East Unit), approximately 335 acres of corn (Page and Dairy Fields) are grown on a sharecrop basis. The cooperator (Lyons family) harvests his share as silage in September and continues to grow the Refuge share to full maturity as grain corn. The Refuge share of the corn is later mowed by Refuge staff in December or January to provide forage for geese and sandhill cranes. The acreage on which the cooperator's share of corn was grown is disked down and planted to winter wheat in October for the Refuge. Irrigation dates for the wheat are timed to provide a suitable forage height (three to six inches) for geese arriving in October and November.

Forage crops are grown on the west side of the San Joaquin River (West Unit) to

promote goose and sandhill crane use on the more recently acquired lands. A 130-acre alfalfa field, which was present prior to the Service acquiring the land in 2000, is being maintained by a cooperator via a CLMA. The management objective for this unit is not only to provide goose and crane habitat in the winter, but also year round foraging habitat for white-faced ibis and long-billed curlew. CLMA revenues owed to the Service are used to pay for Refuge infrastructure repair, water pumping costs and producing winter wheat. Approximately 100 acres of winter wheat are planted each fall as foraging habitat for geese and cranes.

Fallow Agricultural Fields

Guided by this CCP, Refuge staff will restore the fallow agricultural fields to a mosaic of forested riparian and wetland habitats in much of the Refuge land in the floodplain west of the San Joaquin River. Interim management objectives for these lands are to limit the spread of introduced noxious weeds and provide short vegetation winter foraging areas for geese, sandhill cranes and other migratory birds. This is accomplished through mowing and prescribed burning by Refuge staff, and sheep grazing by a cooperator via a CLMA.

Riparian Forest Management

Little or no active habitat manipulation occurs within the Refuge's riparian habitats. Cattle are excluded from riparian corridors to allow understory and mid-story vegetation to be grown in areas that were grazed prior to acquisition.

Invasive Weed Control

The Refuge uses an integrated approach using herbicide application, mowing, prescribed burning, and grazing to control invasive weeds. The amount of weed control to date has been limited due to staffing constraints. Past efforts have focused on herbicide application and mowing to control yellow star thistle on native grasslands on the East Unit and roadside corridors on the West Unit. Removing and foliar spraying of giant reed in the riparian corridor of the West Unit started in summer 2000 and is ongoing.

Habitat Restoration

Recent land acquisition at the Refuge particularly in the western portion consists of fallow agricultural lands. A key element for Refuge management during the next 15 years will be the restoration of these lands.

Wetland Restoration

The Refuge has been funded, through the CALFED program, to restore 300 acres of wetland habitat in the West Unit. A restoration plan has been approved. Engineering design and construction will be initiated in the next few years.

Riparian Restoration

Much of the riparian restoration to date has been passive. Cottonwood, willow, valley oak and other species have become established on portions of the floodplain in recent years after floods and other high water events. Refuge staff and volunteers have also planted cottonwood, valley oak, California rose, box elder and other riparian plant species at Gardner's Cove and the Christman Island area in 1997 and 1999. The Refuge has been funded, through the CALFED program, to restore 800 acres of riparian floodplain in the West Unit. A reforestation plan has been developed and a nursery was established on the Refuge in spring 2000 to supply cuttings for that reforestation effort. Planting and growing native trees, shrubs, forbs and grasses began in the winter/spring 2002 through a contract with Sacramento River Partners.

Wildlife Management and Monitoring

Wildlife management and biological monitoring activities to date have been conducted through the Aleutian Canada Goose Recovery Program, special projects funding and grants. Operational biological monitoring has been limited due to staff constraints, and focused on endangered species, flyway and state-wide surveys and avian disease management.

Baseline information on migratory birds, mammals, fish, amphibians, reptiles and vernal pool invertebrates on the Refuge has been expanded through a biological inventory conducted as part of a CALFED

habitat acquisition and restoration grant (Phase 1). Biological monitoring will be expanded through funding provided in a current CALFED grant (Phase 2). Data collected would be used to compare long-term wildlife population and habitat use trends as Refuge lands are restored and subsequently managed.

Avian Disease Control

The Refuge staff monitors roost ponds regularly during the winter for bird carcasses or birds displaying disease symptoms. Disease management activities follow the protocols established in the San Luis Complex/Grasslands Management Area Disease Contingency Plan (FWS 1991) and the Aleutian Canada Goose Disease and Contaminant Hazard Contingency Plan (FWS 1987). Mortality and morbidity from avian diseases is common in the Central Valley of California.

Low-level chronic die offs are ordinary, while large avian epidemics are rare. Generally, disease outbreaks occur seasonally in relation to high densities of waterbirds and extreme hot or cold weather conditions. In recent years, avian cholera has been the primary concern for refuge disease managers; however, other important diseases include avian botulism, fungal infections, lead poisoning and chemical toxin poisoning.

Most disease control activities at the Refuge involve avian cholera and are concentrated around goose roost ponds. Avian cholera is a highly contagious bacterial disease that causes the greatest amount of mortality and morbidity in mid to late-winter when waterfowl are concentrated and daily temperatures remain below 10 degrees Celsius. Annual Refuge die-offs range from <50 to >1,200 per year. Beginning in November, the Refuge staff makes regular visits to roost ponds searching for carcasses or birds displaying disease symptoms. All recovered birds are removed from the site and either buried or shipped to the National Wildlife Health Research Center to confirm cause of death. Once an outbreak occurs, daily bird pick-up and disposal is initiated to

limit the spread of pathogens to uninfected birds. Under severe epidemics, hazing of waterfowl is initiated to disperse populations and reduce the likelihood of disease transmission. Avian botulism, another disease more common in the southern end of the Central Valley, is uncommon in the northern San Joaquin Valley and has never been recorded at the Refuge. Control activities and documented losses are summarized in annual disease management reports.

Aleutian Canada Goose Monitoring

Refuge staff monitor abundance and habitat use of Aleutian Canada geese to assess response to habitat management actions, document deaths and address crop depredation complaints. In joint operation with the CDFG personnel, refuge staff and volunteers conduct rocket-netting each December to band and neck-collar geese. As funding allows, intensive neck collar observations are made during winter to determine annual population levels and survival rates as outlined in the Pacific Flyway Aleutian Canada Goose Management Plan and meet Service Endangered Species Act obligations for post delisting monitoring.

Riparian Brush Rabbit Reintroduction

The Refuge staff participates with other Federal, State and university personnel in an interagency working group to plan and implement recovery actions for the federally listed endangered riparian brush rabbit. A reintroduction of riparian brush rabbits onto Refuge lands was initiated in the summer of 2002. An elevated mound, to be used as an island refugium by the endangered rabbits during floods, was built and planted to vegetation in the summer of 2001.

Other Migratory Bird Monitoring

Waterfowl

The Refuge staff participates in flyway and state-wide surveys by conducting ground counts to determine species and subspecies flock composition in the November dark goose surveys, periodic white goose surveys, annual midwinter waterfowl surveys and other special surveys. Refuge

specific surveys are generally limited to nonsystematic observations to document use of restored and managed habitat. To promote nesting by wood ducks and other cavity nesting birds, nest boxes are maintained by Refuge staff and volunteers. Nest production data is forwarded to the California Waterfowl Association's Wood Duck Program for inclusion in a state-wide database.

Sandhill Cranes

The Refuge staff participates in flyway-wide greater sandhill crane surveys in October. Refuge-specific counts are conducted periodically to document sandhill crane use and abundance on restored and managed habitats.

Shorebirds

Refuge specific surveys are generally limited to nonsystematic observations to document species occurrence and abundance on restored and managed habitat.

Neotropical Migratory Land Birds

The Refuge, jointly with the Point Reyes Bird Observatory, has completed a three year study (2000 to 2002) of avian distribution, abundance, and productivity on Refuge riparian and floodplain habitats. A permanent MAPS (Monitoring Avian Productivity and Survival) station has been established on the Refuge.

Heron and Egret Rookeries

Counts are conducted each spring to determine the status and abundance of great blue herons and great egrets nesting at traditional rookery sites on Christman Island.

Vernal Pool Fauna Monitoring

Fauna associated with vernal pools are periodically surveyed. Sampling is done on a presence/absence basis rather than more intensive quantitative methods, to avoid impacting populations of federally-listed vernal pool fairy shrimp species and vernal pool tadpole shrimp.

CALFED Restoration Monitoring

A multiyear biological monitoring

program was initiated in the autumn of 2001 by Refuge staff and contractors as part of the current CALFED habitat restoration grant (Phase 2). Elements of the monitoring program include migratory bird use of riparian, floodplain and wetland habitats; success of riparian brush rabbit reintroduction efforts; survival of native tree and shrub plantings; development of shaded riverine aquatic habitat; effectiveness of natural versus cultivated riparian restoration; and floodplain habitat changes that result from levee breaching. Depending on a request to amend the CALFED proposal, the monitoring would be expanded to inventory anadromous fish populations; monitor hydrological/fluvial processes following floodplain restoration; determine the status of the endangered species (giant garter snake) and valley elderberry longhorn beetle; and inventory primary pollinator (native bee) populations.

Fire Management

One large wildfire (>500 acres) on Refuge lands occurs on average once every five years and several firestarts usually caused by trespassers occur each year. The borders of interior roads are usually mowed during early summer to reduce the occurrence and spread of any wildfire. The Refuge lands west of the San Joaquin River, due to their relative isolation and fuel type, pose the greatest risk for wildfire. Wildfire suppression capability is primarily provided through the San Luis NWR Complex fire crews and other fire-trained Refuge staff as detailed in the Complex-wide Wildlands Fire Management Plan. The Service also has a signed Memorandum of Understanding with the West Stanislaus County Fire Protection District to provide mutual firefighting support. If necessary, additional firefighting support from other Federal, State, and county agencies can be deployed through the State of California Master Mutual Aid Agreement.

Prescribed fire has been used by the Refuge in an effort to control weeds and prepare lands for restoration work. Plans call for the continued use of fire for site preparation/habitat maintenance, where it is determined

to be the most beneficial and/or cost efficient way to produce desired results. Since 1999, prescribed burning has been used on 300 to 500 acres annually at the Refuge.

Public Use Program

The Refuge has been closed to all public uses since its establishment. This CCP will provide guidance for the future visitor services of the Refuge. Limited public access has been made available for an observation platform, special events and tours led by Refuge staff. Occasional tours are also provided by the Modesto Rotary Club on the Faith Ranch.

Law Enforcement and Public Safety

Law enforcement patrol and surveillance is conducted primarily by the San Luis Complex law enforcement officer and/or collateral-duty officers. Most problems encountered on the Refuge involve trespass into closed areas, illegal fishing, littering, marijuana cultivation, other drug-related activities, campfires and violation of Migratory Bird Treaty and Endangered Species Act regulations. Additional support is provided as necessary by Service Special Agents, CDFG wardens and other law enforcement agencies.

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4 Opportunities and Problems

All National Wildlife Refuges possess inherent distinctive characteristics and infrastructure which influence and impact management of the Refuge's resources. These refuge-specific attributes at times can be challenges, needs and/or opportunities and can augment, enhance, diminish or facilitate the management of natural resources at a National Wildlife Refuge. In order to meet management goals and planning requirements, these challenges, opportunities, restrictions and needs of the Refuge must be identified and addressed. The following list contains attributes and characteristics of the San Joaquin River NWR which present either opportunities, needs and/or challenges to the management of the Refuge and which need to be considered for this planning process.

Water Quantity and Quality

Supplies

Lack of a reliable water supply is a critical problem for this Refuge. Water is needed for management of wetland habitats, as well as for management of some upland habitats and riparian woodland restoration activities. Unlike most Central Valley National Wildlife Refuges, the San Joaquin River NWR does not receive a water allocation from the Bureau of Reclamation under the authority of the Central Valley Project Improvement Act. Only a small portion of the San Joaquin River NWR is within the Modesto Irrigation District and use of that water is restricted to their service area. Water used for Refuge management east of the San Joaquin River has been provided by the privately-owned Mapes Ranch as value due to the Service through their CLMA, as tailwater from adjacent grazing/farming operations or as water in excess of their needs. This CLMA does not generate

enough fees to cover the cost of providing water. Supply of free tailwater and excess water will likely be limited in the future due to water conservation measures and potential water marketing. The availability of water from existing lift pumps on Refuge lands recently acquired by the Service is restricted due to limited resources, funding and other constraints. Service-owned wells, which could meet some water supply needs, are present on the Refuge but funds for their operation are lacking. The water supply available to the Refuge will impact the management of both upland and wetland habitats.

Infrastructure

Water production and associated delivery systems on Refuge lands are either in poor or in flood-damaged condition. Of the six lift pumps along the San Joaquin (five) and the Tuolumne (one) rivers, five need to be rehabilitated to make them operational and upgraded to meet OSHA safety standards, and all need fish screens installed to preclude impacts to threatened and endangered fish. The Service-owned canals and other water conveyance systems need to be repaired and in some cases, realigned to more efficiently deliver water to Refuge habitats. In addition, water used to manage lands east of the San Joaquin River must be transported across lands and through delivery systems owned by private owners. An alternate delivery system or formal conveyance agreements need to be developed and completed to ensure the long-term ability to provide water to the Refuge's habitats.

Contaminants

The San Joaquin River is designated as an impaired waterway by the U.S. Environmental Protection Agency. Although

water quality is generally acceptable, there are times of the year when this water should not be applied to Refuge wetlands due to potential long-term impacts to wildlife and habitat. Regional mandates associated with managing salt, boron, dissolved oxygen and selenium levels/loads may in future years restrict the ability of the Service to use its water rights to manage Refuge lands.

Surface drainage and tailwater are also used from upslope agricultural operations to manage part of the Refuge's wetlands. The Refuge needs to ascertain if the quality of this water is acceptable for use in managing wetlands or whether it should be conveyed directly through the Refuge only to meet the legal drainage requirements for adjacent lands.

Water Rights and Other Rights

Water is a critical element for management of the majority of lands in the Central Valley, including the management of wildlife on wildlands. Because of the high cost of water in the Central Valley, wetland management for wildlife on a per acre basis in the Central Valley is probably the highest in the nation (Heitmeyer et al. 1989). Access to water, as well as its quantity and quality, will impact land management activities. Water rights and agreements associated with land will influence and constrain natural resource management planning and decisions at the San Joaquin River NWR. The following sections detail these rights for Refuge lands.

Water Rights

The availability and cost of water will impact the planned wildlife management programs which could occur at the San Joaquin River NWR. The State Water Resources Control Board conducted a review to determine the water rights associated with the San Joaquin River NWR. The State of California recognizes both appropriative and riparian water rights. The use of water for a beneficial purpose establishes an appropriative water right that must be accompanied by a water use permit issued by the State. A riparian water right is established by ownership of land abutting a natural water course. The review indicated

that there are two appropriative and one riparian water right. These three water rights supplied water to a portion of the lands purchased from the El Solyo Dairy, Ed Hagemann and J. P. Lara (*Rausch 1999*). There are also one appropriative and three riparian water rights on lands within the approved Refuge boundary that are not owned by the Service. This inquiry did not detail water rights with points of diversion outside the area considered (for example, the Modesto Irrigation District water right which serves the western portions of the Refuge, but the point of diversion is outside the vicinity of the Refuge).

Drainage (White Lake Mutual Water Company)

This agreement maintains that the West Stanislaus Irrigation District has drainage rights over land purchased from Hagemann (*Mehlhoff and Hay, 1999*), now Service-owned land, which arise from a drainage reservation easement in the 1941 deed conveying the land from Burkhard Investment Company to Hagemann's predecessor (Mr. Pietro Rampion). The agreement protects those lands against seepage from the District's canal, except those lands outside of the District. West Stanislaus Irrigation District obtained a Memorandum of Agreement on May 8, 1928 with Burkhard Investment Company, which was later amended in 1939. The agreement addresses the right of access and construction for the White Lake Mutual Water Company intake channel, as well as the obligation to protect the Refuge land from canal seepage.

In addition, the White Lake Mutual Water Company pays 35 percent of drainage facility maintenance and pumping costs for the drainage ditch system over land purchased from Hagemann (*Mehlhoff and Hay 1999*). White Lake Mutual Water Company also has an obligation to operate drainage pumps on Refuge property purchased from J. P. Lara. The 1928 agreement requires the landowner (now the Service) to "maintain the water level and seepage from the main canal at 22 U.S.E.D. and at least eight feet below the

natural, average ground level, the district to install, maintain the necessary pumps and operate the pumping of the seepage water.” Access across the White Lake Mutual Water Company canal was previously provided by three pile bridges, which are now unusable.

Rights-of Way

White Lake Mutual Water Company Right of Way

This agreement grants “free ingress, egress and regress” to White Lake Mutual Water Company and the “use of a strip of land thirty feet wide along the natural channel of Hospital Creek” extending from the existing creek crossing along the main river levee to the confluence with the San Joaquin River for “drainage ditch and road purposes.” The White Lake Mutual Water Company shall, at its own cost, maintain 20 cubic feet per second (cfs) capacity and replace the culvert when necessary.

Hetch Hetchy Aqueduct Right of Way

The January 2, 1924 agreement between the Central-California Orchard Company (Grantor) and the City and County of San Francisco, a municipal corporation, to “grant, bargain and sell” parcel 1 and 2 (as described in the indenture) to the “Grantee and to its successors (Service) assigns forever” upon which the center line of the two parcels is a part of the center line of the Hetch Hetchy Aqueduct right of way. The City and County of San Francisco own “all the lands of Grantor included within a strip of land 110 feet in width” along the aqueduct corridor (certain reservations and conditions are outlined in the official document). Easements also exist on Parcel 1 and 2 for three canals. Parcel 1 includes an easement for road purposes and Parcel 2 includes an easement for single pole transmission lines, conveyed to the Pacific Gas and Electric Company.

Floodplain and Riparian Restoration

The majority of Refuge lands west of the San Joaquin River are abandoned agricultural fields that currently provide little benefit to riparian and wetland dependent wildlife species. A major Refuge initiative and need is to restore

natural habitats for wildlife. A project to restore wetland and riparian habitats on approximately one-third of these lands has been funded and planning has been initiated. Additional habitat restoration funding is needed to restore the remaining floodplain to maximize benefits to riparian and wetland dependent species.

Grassland Communities

Central Valley grassland habitats have been severely altered over the past 150 years. Exotic annual grasses, principally of Mediterranean origin, replaced the valley’s native perennial grasses, which probably dominated these grasslands. Restoration of native habitats is a critical element of Refuge management. Typically, techniques for restoring native Central Valley grasslands have not been successful on a large scale, or have been too costly. To reestablish native grasslands at the Refuge, successful methods based on reasonable costs will need to be adopted and/or developed.

Invasive Weeds & Other Exotic Species

Invasive weeds are non-native plants which have the capacity to invade and dominate a plant community. These invasive weeds frequently reduce the quality of the habitat to wildlife, are extremely costly to eradicate, resist control efforts and are a major source of concern for many natural resource managers in many regions.

Non-native plants dominate major portions of the Central Valley landscape. Serious pest plants occurring in the Refuge’s uplands include yellow star thistle, perennial pepperweed, poison hemlock, Russian thistle, milk thistle, bull thistle and prickly lettuce. Infestations are greatest in fallow agricultural fields, roadsides, canal banks, and undergrazed pastures, as well as other disturbed sites. Efforts to control thistles need to be addressed within managed pastures, especially those undergoing rehabilitation. Control of these invasive weeds will improve the quality of upland wildlife habitat at the Refuge.

A major effort is also required to control invasive weeds in areas being restored to natural riparian and wetland habitats.

Perennial pepperweed is established throughout the Refuge's riparian areas and stands of arundo are scattered along the banks of the San Joaquin River. These invasive plants, if left untreated, will crowd native plants and eventually dominate the riparian corridor, reducing the quality of the habitat for wildlife. Efforts need to be greatly expanded to control perennial pepperweed and ensure the eradication of arundo. At certain times of the year, the San Joaquin River can be heavily infested with water hyacinth. These floating plants have a rapid growth rate and high reproductive capabilities, which lead to clogged water delivery canals and impenetrable surfaces covering oxbows and other wetlands. Physical barriers and other control measures need to be established to ensure that hyacinth is not transported to Refuge wetland habitats.

The black rat is another invasive species that may be impacting the Refuge. Originally restricted to Europe and Asia, this species has colonized portions of North America. In California, the black rat is found in the Central Valley and coastal areas. Its preferred habitat is urban areas and stream courses (i.e., riparian habitat). The black rat is considered to have a negative impact on the endangered San Joaquin Valley woodrat. Although the black rat is known to occur at the Refuge, its abundance and impact on native fauna and flora is not known. Control programs regarding the black rat may become necessary if research indicates the woodrat or other indigenous species are severely impacted by this species.

Threatened and Endangered Species

Threatened and endangered species are wildlife and plants designated by the Service as species whose population or local population is in danger of extirpation. The management of threatened and endangered species is a priority for the Service's National Wildlife Refuge System. The San Joaquin River NWR supports and has the potential to benefit a number of these rare species. Programs conducted at the Refuge for threatened and endangered species can also set limits on other activities at the Refuge.

Riparian Brush Rabbit

This endangered rabbit remains in only four known locales -- one of which is the San Joaquin River NWR. The riparian brush rabbit's decline is largely attributed to the loss of riparian forest in the Central Valley. The Refuge has the potential to significantly increase the population of this endangered species due to its present riparian forested habitats and plans for the restoration of additional riparian forest. Management for the riparian brush rabbit will require that the Refuge protect, manage and restore riparian habitats.

San Joaquin Valley Woodrat

The presence of the San Joaquin Valley woodrat requires that it become a management priority. Similar to the riparian brush rabbit, the endangered San Joaquin Valley woodrat requires riparian forest as habitat, and in particular, an overstory of oak with a dense woody understory. The loss of riparian forest within the San Joaquin Valley has led a decline in this species. This endangered woodrat has been documented at the San Joaquin River NWR; however, no systematic surveys have been conducted. Initially, the Refuge needs to determine this species' current distribution and abundance; future plans will depend on the outcome of this survey work.

San Joaquin Kit Fox

The endangered San Joaquin Kit Fox is the smallest canid in North America. Its habitat includes arid grasslands in the southern half of the Central Valley. No sightings of kit fox have been documented at the San Joaquin River NWR and the fox's preferred habitat is scarce at the Refuge. The kit fox is known to occur directly to the west of the Refuge. The Complex will monitor the Refuge for kit fox use and, depending on its presence, modify its management programs, as needed, for the species.

Bald Eagle

The threatened bald eagle is a sporadic winter visitor to the San Joaquin River NWR. It tends to be attracted to waterfowl concentrations on the Refuge. Eagles are largely absent from the Refuge during

the breeding season. Wetland restoration efforts will likely benefit this species.

Aleutian Canada Geese

Although the Aleutian Canada goose was delisted as a Federal Threatened Species in March 2001, it remains a Service Species of Special Concern. The Endangered Species Act mandates that populations of recovered species be monitored for five years post-delisting to ensure that recovery goals continue to be met. The long-standing monitoring program at the Refuge needs to continue to comply with the law and document whether Aleutian Canada goose numbers remain stable, increase or decrease. This is part of a larger monitoring program and cannot be sustained with existing Refuge funds. Specific project funds are needed to implement this monitoring. In addition, on-refuge monitoring is necessary to evaluate use of Refuge habitat and address localized crop depredation complaints from nearby landowners.

Least Bell's Vireo

This federally-designated endangered songbird was documented as breeding for the first time at the Refuge in 2005. It used as breeding habitat, a unit with restored riparian habitat. Although once a common breeder in the Central Valley, least Bell's vireo during the last few decades has been confined to southern California. Plans to restore significant tracts of riparian habitat at the Refuge will likely provide additional habitat for this species and the Refuge will need to monitor for the presence and abundance of this species during the next fifteen years.

Giant Garter Snake

The status of the federally-designated endangered giant garter snake at the San Joaquin River NWR is unknown. No systematic surveys have been conducted for this species, although the Refuge appears to contain suitable habitat. The Refuge needs to conduct surveys to determine if the giant garter snake is present and, if so, at what locations and habitats so that appropriate protective measures can be taken.

Anadromous and Other Listed Fish Species

Chinook salmon, Sacramento splittail, and potentially, steelhead trout can be impacted by Refuge management. Fish screens need to be installed on the Refuge lift pumps along the San Joaquin and Tuolumne rivers to ensure that juvenile fish are not negatively affected by pump operation. The design for levee breaching and floodplain restoration at the Refuge needs to be closely coordinated with fisheries biologists to avoid creating conditions that promote fish entrapment (Appendix H: Levee Breach).

Because salmon and splittail fry would probably use the floodplain wetlands during high-water or flood years, wetland management must limit populations of predatory non-native fish. Through design and management, the floodplain wetlands have the potential to benefit Chinook salmon and Sacramento splittail populations by providing high quality rearing habitat.

Valley Elderberry Longhorn Beetle

To date, there has been little effort to document the presence of the valley elderberry longhorn beetle at the Refuge or to inventory elderberry locations, the only habitat it uses. It is necessary to increase knowledge of the actual and potential distribution of this species on the Refuge to ensure that ongoing and future restoration incorporates its habitat needs and subsequent management contributes to species recovery.

Vernal Pool Invertebrate Species

Two federally-listed vernal pool invertebrates (i.e., vernal pool fairy shrimp and vernal pool tadpole shrimp) occur at the San Joaquin River NWR. Protection of vernal pool habitats at the Refuge needs to be established and rigorously enforced. Protocols for monitoring these invertebrates and their habitats also need to be developed and implemented.

State-Listed Species

The State of California has also developed its own list of threatened and endangered species. The species addressed in the

preceding descriptions are federally designated threatened/endangered species, although many of these are also listed by the State. State-listed species known to occur or with the potential to occur at the San Joaquin River NWR include the greater sandhill crane, yellow-billed cuckoo, Swainson's hawk, willow flycatcher and bank swallow. As a first step, the Refuge needs to determine the distribution and abundance of these species on the San Joaquin River NWR; then, the Refuge should develop and implement management plans for each species that is present.

Fire

Wildfire is a natural process in most terrestrial systems. Wildfires are a major ecological process impacting vegetative succession and structure in many regions. Many species of plants and wildlife are adapted to fire disturbance. Climate, terrain, vegetation and drainage all influence the role and timing of wildfire occurrence and impacts. Some areas have short interval wildfire regimes, while others have extremely long interval wildfire regimes (greater than 500 years). Typically, grassland-dominated areas have short interval fire regimes and many species of grass are well adapted and suited to wildfire disturbance.

However, grassland habitats in California's Central Valley, including the Refuge, have been severely altered over the past 150 years. Exotic annual grass species principally of Mediterranean origin replaced native perennial grasses that likely dominated these grasslands. Although there is some thought that the original fire regime in the Central Valley was a short-time interval, there is little information available to land managers regarding suitable time intervals and seasonal timing for the use of fire in maintaining or restoring native grasslands, as well as other Central Valley native habitats. The Refuge will face challenges in determining suitable fire regime intervals and seasonal timing for the application of fire in terrestrial habitats, restoring native grasslands from exotic annual-dominated grasslands, and

implementing a prescribed fire program to mimic a natural ecological process in an area with air quality problems.

Mosquito Abatement

Issues concerning mosquitoes and their associated problems (i.e., nuisance biting and vector-borne diseases) are frequently encountered with aquatic habitats, particularly when they are in proximity to human habitations (*Pratt and Moore 1993*). Aquatic habitats and wetlands, as well as irrigated pasture, provide conditions for breeding mosquitoes on the Refuge. The San Joaquin River NWR is situated within two local mosquito control agencies (Turlock and Eastside Mosquito Abatement Districts). Both are active districts and conduct mosquito monitoring programs (both larvae and adults), as well as disease monitoring programs (i.e., encephalitis, malaria and West Nile Fever) on the Refuge. Both districts also conduct larvaciding programs on the Refuge with the approval of the Refuge Manager and when conditions warrant. Control programs for adult mosquitoes are not permitted on the Refuge unless there is a declared public health emergency. In the past 15 years, only one public health emergency has been declared concerning a mosquito-borne disease at the San Joaquin River NWR or its vicinity. Mosquito abatement on Refuge lands will require that the USFWS ensures that mosquito programs do not negatively impact natural resources and addresses legitimate mosquito nuisance and disease issues in neighboring communities.

Public Use Programs

Public use programs can be extremely beneficial in promoting wildlife and National Wildlife Refuges, establishing community involvement with the Refuge, creating cooperative partnerships to benefit wildlife, offering environmental educational opportunities and providing wildlife-dependent recreational opportunities for the public. The San Joaquin River NWR has never been opened to public use, with the exception of a recently-established roadside wildlife observation platform.

Opening the Refuge to the public offers a major opportunity and challenge. This will require developing and implementing a step-down public use plan for the Refuge that will outline which activities will occur, where they will occur, and what precautions are needed to assure that the public use program does not negatively impact the wildlife resource. National Wildlife Refuges have public use programs to allow for the enjoyment of our nation's fish and wildlife resources. The Improvement Act for the National Wildlife Refuge System identified wildlife as the principal management goal of all Refuges. If the Refuge can accommodate a public use program, the Act indicates it should focus on six wildlife-dependent public uses—wildlife viewing, photography, hunting, fishing, environmental education and nature interpretation.

Law Enforcement

During its first 15 years, there has been no staff permanently stationed at the Refuge. As a result, a strong Service presence has been lacking and trespass has routinely occurred, as well as other illegal activities, such as all terrain vehicle use, dumping, marijuana cultivation and vandalism. To rectify this situation, over the past two years USFWS personnel have been permanently stationed at the San Joaquin River NWR. Additional measures are still required to protect Refuge natural resources and assure public safety, including increased public contact, patrols, interagency cooperation and coordination, boundary posting and signage.

Cultural Resources

The Central Valley has a rich Native American cultural history. The cultural resources on the San Joaquin River NWR have not been determined or mapped, even though most of the present Refuge lands were previously disturbed (principally for agricultural activities) by former landowners. Any activity identified in this plan, including land development, grazing, and changes in public use, has the potential to impact cultural resources; however, Federal legislation (National Historic Preservation Act of 1966) protects cultural resources and requires agencies, such as

the Service, to consider, and if necessary, mitigate the impacts of its projects on cultural resources before implementation. The Service will comply by consulting with the USFWS Region 1 Cultural Resources Team regarding management activities and programs at the San Joaquin River NWR. The Service is not proposing any project, activity or program that would result in changes in the character of, or would potentially adversely affect, any historic cultural resource or archaeological site.

Refuge Farming Program

Irrigated pastures, which are part of the Refuge's CLMA program, provide critical foraging habitat for Aleutian Canada geese, sandhill cranes, white-faced ibis and other migratory birds. Several of these pastures, especially those north of Highway 132, have not been rehabilitated or rotated for decades. Although the fields are maintained in a short-cropped condition by grazing, the grasses and forbs are decreasing in forage quality for wildlife. Ultimately, wildlife use of the pastures will decline. These pastures need to be rehabilitated by disking under the existing vegetation, reseeding with a mix of grass and forbs and controlling invasive weeds as pastures are established. Refuge funding is currently unavailable to accomplish this work, and the current CLMAs do not generate enough value to allow cooperators to rehabilitate the pastures in exchange for grazing fees owed to the Service. Pasture rehabilitation needs to be pursued through the USFWS Refuge Operating Needs (RONS) process and/or other funding initiatives.

The current practices of sharecrop production of corn and farming of winter wheat on the Refuge provide winter foraging habitat for geese, sandhill cranes, and other migratory birds; however, these practices do not provide any benefits for ground nesting birds during the breeding season. Normally, the wheat field is disced to prepare it for planting corn in the spring. Producing corn by a means other than sharecropping would free the cooperator's share (80 percent) of this acreage, which could be left as a fallow wheat field in the spring and summer.

*Partnerships
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Wildlife
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Such a practice would provide high quality habitat for ground nesting birds such as waterfowl, northern harriers (*Circus cyaneus*), savannah sparrows (*Passerculus sandwichensis*), and other grassland-dependent songbirds. The value of the CLMA grazing at the Refuge is insufficient to pay for the production of corn on a custom farming basis. The farming program will provide limited benefits to ground nesting birds until another mechanism is found to pay for the production of corn, where the Refuge owns all of the crop for use as wildlife forage—thus reducing the acreage needed for planting.

Partnerships

Partnerships are key to the management of National Wildlife Refuges. These partnerships can be with other agencies, private groups and/or individuals and have a focus on accomplishing some aspect of the Refuge's mission. Although the San Joaquin River NWR's direction to date has principally focused on land acquisition, the Refuge has formed significant partnerships for a variety of natural resource management issues and activities. Partnerships are beneficial to the Refuge, not only in accomplishing projects which would not have been possible with limited Refuge staff and funds, but also by expanding public outreach for the Refuge, bringing community input and support into the management process and providing for natural resource management on a landscape scale.

Refuge partnerships have resulted in land acquisition, enhanced programs for endangered/threatened species, natural resource monitoring, and habitat restoration activities, among other projects. Partners involved with the Refuge include local landowners and representatives from the NRCS, California Department of Fish and Game (CDFG), CALFED Bay-Delta Program (CALFED), U.S. Army Corps of Engineers (Corps), Endangered Species Recovery Program, Central Valley Habitat Joint Venture, Tuolumne River Technical Advisory Committee, U.S. Fish and Wildlife Service's Anadromous Fish Restoration

Program (AFRP), Bureau of Reclamation (BOR) and Ducks Unlimited, Inc. These existing and potential partnerships for the San Joaquin River NWR will influence planning and management efforts.

Point Reyes Bird Observatory

The Point Reyes Bird Observatory and the San Luis NWR Complex initiated a project in 2000 to monitor songbird use of Refuge lands along the San Joaquin River between the Stanislaus and Tuolumne rivers. A large-scale riparian restoration project planned by the Refuge is in the planning stage and involves 3,300 acres of former agricultural lands within the floodplain. The objective of this partnership is to establish a long-term songbird monitoring program to determine the baseline condition of the bird community, assess bird population responses to the riparian habitat expansion and monitor songbird recolonization and use of restored areas. Prerestoration data on songbird abundance, distribution and reproductive success were collected in existing riparian habitat and in the fallow agricultural fields slated for restoration. Preliminary results from the first year's data indicate the Refuge's potential as an important area for songbirds.

San Joaquin River Resource Management Coalition

The purpose of this organization is "to create a clearly defined, landowner-led organization that partners with nongovernmental organizations and Federal, State and local agencies with diverse interest, mandates and fiscal responsibilities in the San Joaquin River to collaboratively and proactively address resource management challenges and can communicate more effectively across jurisdictional boundaries" (*San Joaquin River Resource Management Coalition Workplan*). The coalition would work together to increase political understanding, increase awareness of the importance of a balanced healthy river ecosystem, provide a forum to address resource management issues and address current and proposed legislation that affects the San Joaquin River.

Tuolumne River Technical Advisory Committee

The Tuolumne River Technical Advisory Committee (TRTAC) was formed as result of the 1995 Federal Energy Regulatory Commission (FERC) Settlement Agreement for relicensing the new Don Pedro Dam. The group is composed of representatives from Federal, State, and local agencies, non-governmental organizations and interested private parties, and has been directed to coordinate and administer restoration and management activities on the Tuolumne River. The Service participates in the committee and provides funding for projects. The Refuge boundary includes the confluence of the San Joaquin and Tuolumne rivers, and approximately 1.5 shoreline miles of the Tuolumne River. Restoration and management of Refuge riparian habitat contributes to the objectives of the TRTAC, and in turn, upstream actions of TRTAC will improve the ecological health of Refuge lands and assist in attaining -large-scale ecosystem restoration goals of the Service.

CALFED Bay-Delta Program

The CALFED Bay-Delta Program (CALFED) is a collaborative effort among 23 state and federal agencies to improve water supplies in California and the health of the San Francisco Bay-Sacramento-San Joaquin River Delta watershed. It is cooperatively implemented by those signatory agencies through their respective program authorities and pertinent funding mechanisms. Restoration and subsequent management of Refuge lands directly contribute to the goals of CALFED's Ecosystem Restoration Program. CALFED has become a funding partner with the Refuge through issuance of major habitat protection/restoration grants. Since 1997, the Refuge has obtained CALFED grants for land acquisition, habitat restoration and biological inventories/monitoring.

Nonstructural Flood Control Alternative—Corps

The U.S. Army Corps of Engineers, Sacramento Office, has been working to develop a nonstructural flood control alternative on the west side of the Stanislaus

River to address flooding problems at and adjacent to the San Joaquin River NWR. The purpose of this project is to replace existing flood control measures via levees with a more natural, resources-friendly alternative. The Corps' proposal is a joint project with the Service to acquire lands for the Refuge protected by the levee; obtain and/or offer easements for areas that were not within the project boundary but received flood protection provided by the freeboard of the project levee; construct ring levees to protect structures and buildings on the Refuge; and work cooperatively to deauthorize the levees and create breeches in the levees to establish a more natural floodplain hydrology on Refuge lands. A joint-agency agreement for this project is in place. The Corps' environmental assessment for this project has also been approved. The Service has already acquired the properties previously protected by the Corps' project levee in accordance with the agreement and the Corps has obtained/offered easements to private landowners whose property is not within the project levee boundary but which received some level of flood protection. The ring levees to protect buildings on the Refuge are scheduled to be constructed the summer of 2004.

Sacramento-San Joaquin River Comprehensive Study—Corps

In response to the January 1997 floods along the Sacramento and San Joaquin rivers, the U.S. Army Corps of Engineers and the California Reclamation Board are preparing the Sacramento and San Joaquin River Basins Comprehensive Study. The study will include a comprehensive master plan for flood damage reduction and ecosystem restoration within the Sacramento River and San Joaquin River basins. Due to the physical, socioeconomic and political complexities, and resource issues within the study area, the master plan will consist of different components and corresponding evaluation of the components. The study will develop broad scale systematic components and the resulting report will present a system-wide analysis of the physical and/or operation changes to the exiting flood control system. Other programmatic components

*Refuge
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could identify new or modified land use management and flood damage reduction programs.

The study first looked at the flood control and environmental problems in the system. Topographic and bathymetric data of the Sacramento and San Joaquin River basins were collected, describing the contour of the existing land surface and river channels to be used in the analysis of hydraulic and environmental effects of potential measures. Using this data, hydrologic and hydraulic models of the Sacramento and San Joaquin Rivers systems were developed. These basin-wide models incorporated historic rainfall-runoff, reservoir operations and flood routing, including unsteady flow along the major river systems. A conceptual plan for an Ecosystems Function Model was developed. In combination with the hydrologic modeling, the Ecosystems Function Model will focus on physical processes that drive biological responses in river systems and floodplains and will be used to evaluate the effects of hydrologic and hydraulic changes on existing and potential aquatic, wetland and riparian habitats.

The comprehensive study is scheduled for completion in the next few years. Complex staff have been interacting with personnel working on the Comprehensive Study to integrate issues involving the San Joaquin River NWR into the process. It is anticipated that the plan would be implemented in stages.

Highway 132 Realignment—Caltrans

The California Department of Transportation (Caltrans) began investigating the possibility of the expansion and/or realignment of Highway 132 before the San Joaquin River NWR was established. Highway 132 is the east-west highway that roughly bisects the Refuge. Although the project has remained inactive for years, recent increases in traffic volume have made these improvements a higher priority. Currently, Caltrans anticipates that an expressway would be constructed within the 15- year planning cycle of this CCP. During the establishment of the Refuge in

1987, the Service issued a formal letter to Caltrans stating that the Service would not oppose expanding Highway 132, but would work with the State agency and others to address and minimize impacts to the Refuge and meet environmental regulations.

Anadromous Fish Restoration Program

The Anadromous Fish Restoration Program was established by the Secretary of Interior through the Central Valley Project Improvement Act, with the mandate to double the natural production of anadromous fish in Central Valley streams. The program is administered by the Service and BOR in cooperation with State agencies, such as CDFG and other partners. The three rivers present on the San Joaquin River NWR make it a key area for this joint program.

Local Landowners

The Refuge has greatly benefited from a long-term partnership with the Bill Lyons Sr. family, owners of the Mapes Ranch; and the Robert Gallo family, owners of the Faith Ranch. The owners of those two ranches have worked with the Service to provide high quality wildlife habitat. While conducting their regular ranching and farming operations, the Gallo and Lyons families have limited disturbance to wildlife on their properties, maintained waterfowl roost ponds and tolerated increasing levels of goose foraging on their pastures and fields. In previous years, the Service contracted with both ranches to grow crops exclusively for waterfowl. Currently, the Service has a cooperative land management agreement (CLMA) and sharecropping agreement with the Lyons family on Refuge lands. The Gallo family, in conjunction with a local Rotary Club and the Service, has implemented a regular tour program on the Faith Ranch and Refuge lands for school groups from Stanislaus County.

Cooperative Land Management Agreement (CLMA)

Since its inception, the San Joaquin River NWR has entered into a number of cooperative land management agreements with members of the community. These

agreements allow a limited agricultural program (i.e., grazing, small grains, etc.) to occur which benefit both specific wildlife resources, as well as the cooperator. The CLMA process is a tool of the Refuge that allows an expanded management program for wildlife, while not depleting limited Refuge staff and funds.

Other Restoration and Management Partners

The San Joaquin River NWR has benefited from the research of many agency and non-agency personnel who have conducted annual Aleutian Canada goose monitoring on site as part of the Aleutian Canada Goose

Recovery Program since 1975. Complex and CDFG staffs have jointly banded and neck-collared Aleutian Canada geese at the Refuge annually since 1995. Staff and students of CSU-Stanislaus and Modesto Junior College have assisted Refuge staff in goose banding and other management activities. The Complex staff is working jointly with the Service's Endangered Species Office, BOR, the California State University—Stanislaus Endangered Species Recovery Program and CDFG to reintroduce the riparian brush rabbit onto the Refuge as part of its Recovery Program.

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5 Management Goals, Objectives, and Strategies

Introduction

This chapter focuses on the goals, objectives and strategies selected for the management of San Joaquin River NWR. During the preparation of this Comprehensive Conservation Plan, the Service examined and analyzed various management alternatives for the San Joaquin River NWR to best achieve the mission of the National Wildlife Refuge System, Refuge purposes, vision statement and goals; it also considered the existing infrastructure of the Refuge as outlined in Chapters 1 and 3 and the Refuge's resource challenges and needs, listed in Chapter 4. Agencies, non-governmental organizations and the public provided input used to develop the management alternatives. The alternatives were examined for both natural resource management and public use activities at the Refuge. These alternatives were considered and their impacts were reviewed in an environmental assessment (EA) as part of this plan's compliance with the National Environmental Policy Act (Appendix B).

Prior Management Activities at the Refuge

The San Joaquin River NWR was established in 1987 and its original purpose was to provide winter habitat for the then endangered Aleutian Canada goose. Original fee title lands comprising the Refuge included the East Unit parcels and Christman Island. Since Service acquisition, the East Unit lands have been actively managed as winter habitat for the Aleutian Canada goose. In 1996, the Refuge developed a set of interim informal goals to guide Refuge management until a management plan could be developed. These interim goals include the following:

- Provide feeding and resting habitat for wintering waterfowl;
- Provide habitat and manage for

endangered, threatened and/or sensitive species of concern;

- Protect and provide habitat for neotropical migratory landbirds;
- Preserve a natural diversity and abundance of plants and animals;
- Provide an area for compatible, wildlife-oriented research; and
- Provide public use activities such as wildlife observation, photography, environmental education, fishing, and hunting.

Although activities were conducted to meet these interim goals on the Refuge, the dominant management activities remained managing winter habitat for the Aleutian Canada goose. Expansion of the existing program was largely precluded due to a shortage of staff and funding, although groundwork was laid for future development of the Refuge's programs. The principle public use activities at the Refuge were wildlife viewing and photography from an observation platform. The only prepared and approved plan for the San Joaquin River Refuge was the Wildland Fire Management Plan, completed by San Luis National Wildlife Refuge Complex in 2001, and a Spill Response Plan, completed in 2003.

Goals, Objectives and Strategies to Support the Proposed Management Action

This section presents long-term guidance for the Refuge in the form of goals, objectives and strategies. Goals guide the future direction of the Refuge. Goals support the Refuge purpose and System mission by providing guidance regarding how the Refuge should operate and what the Refuge should be. Goals represent end results and provide management direction for the Refuge purposes. Each goal is supported

by measurable, achievable objectives, where appropriate; these are the efforts or action items required to achieve the goals. The intent is to accomplish objectives during the duration of this plan; however, actual implementation may vary due to funding and staffing. Objectives, in most cases, provide quantitative benchmarks that indicate progress toward achieving goals. Strategies are specific actions or projects that would lead to the accomplishment of management objectives.

Five broad goals were developed for San Joaquin River NWR. They are consistent with the Refuge purposes, ecoregion goals, National Wildlife Refuge System goals, Refuge Improvement Act, Service policy and international treaties. These goals, objectives and strategies are detailed below. Figure 9 shows the proposed habitat management plan for the Refuge.

Goal 1 (Biological Diversity)

Conserve and protect the natural diversity of migratory birds, resident wildlife, fish and plants through restoration and management of riparian, upland and wetland habitats on Refuge lands.

Narrative: Healthy, high quality habitats are a key to functioning, self-sustaining fish and wildlife communities. Natural conditions that existed during the mid-1800s provide a reference point for comparisons with existing conditions. An assumption is that at this point in time, ecological processes were functioning at a natural frequency and intensity and were not as influenced, as they are today, by human activities (land clearing, water diversions, etc.).

Native assemblages of fish and wildlife are best restored and maintained by providing a diversity of natural habitats typical of the ecoregion prior to European settlement. Restoring natural diversity is a desired direction for management of the San Joaquin River NWR. Some restoration at the Refuge can be accomplished passively by allowing natural processes to resume. However, because of regional changes in river hydrology, presence of flood control levees, the proliferation of invasive species, as well as other factors, many restoration activities will require direct action, such as planting trees and shrubs, breaching levees, recontouring leveled land, reintroducing wildlife, building water control structures, managing invasive species, rehabilitating derelict building sites, restoring fire regimes, etc. Once restored, various levels of management will be required to replicate natural processes and maintain those habitat conditions in the highly altered San Joaquin Valley ecosystem. This management will range from allowing periodic flood events to inundate and maintain natural river functions in the West Unit floodplain to actively managing wetland units, grazing uplands, mimicking natural fire regimes and controlling invasive weed species.

Objective 1. Restore and enhance 2,500 acres of wetlands, riparian forest and upland habitats on Refuge lands within six years of this plan's approval and restore and enhance an additional 1,000 or more acres by the end of this 15 year planning cycle to provide the diversity of habitats necessary to support native assemblages of fish, wildlife and plants.

Foraging white-faced ibis.

Photo: Gary Powell

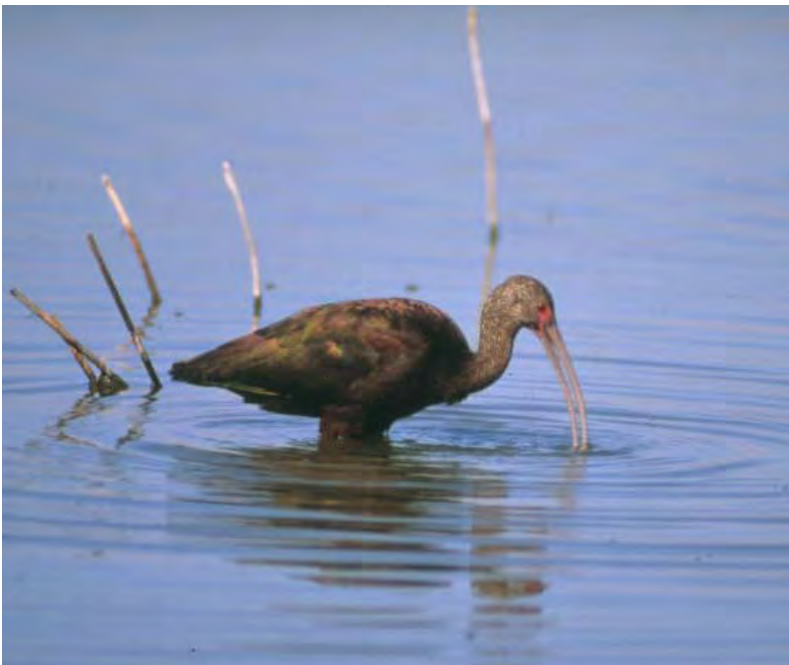
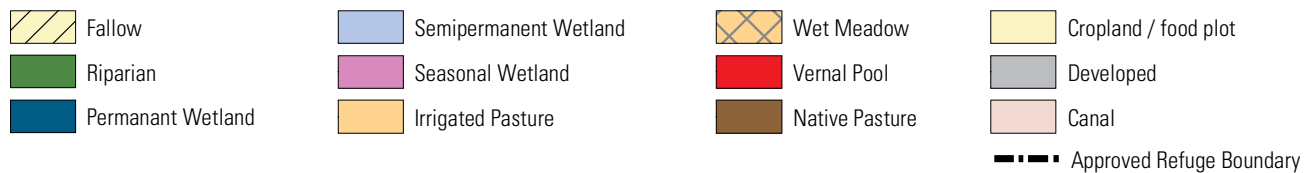
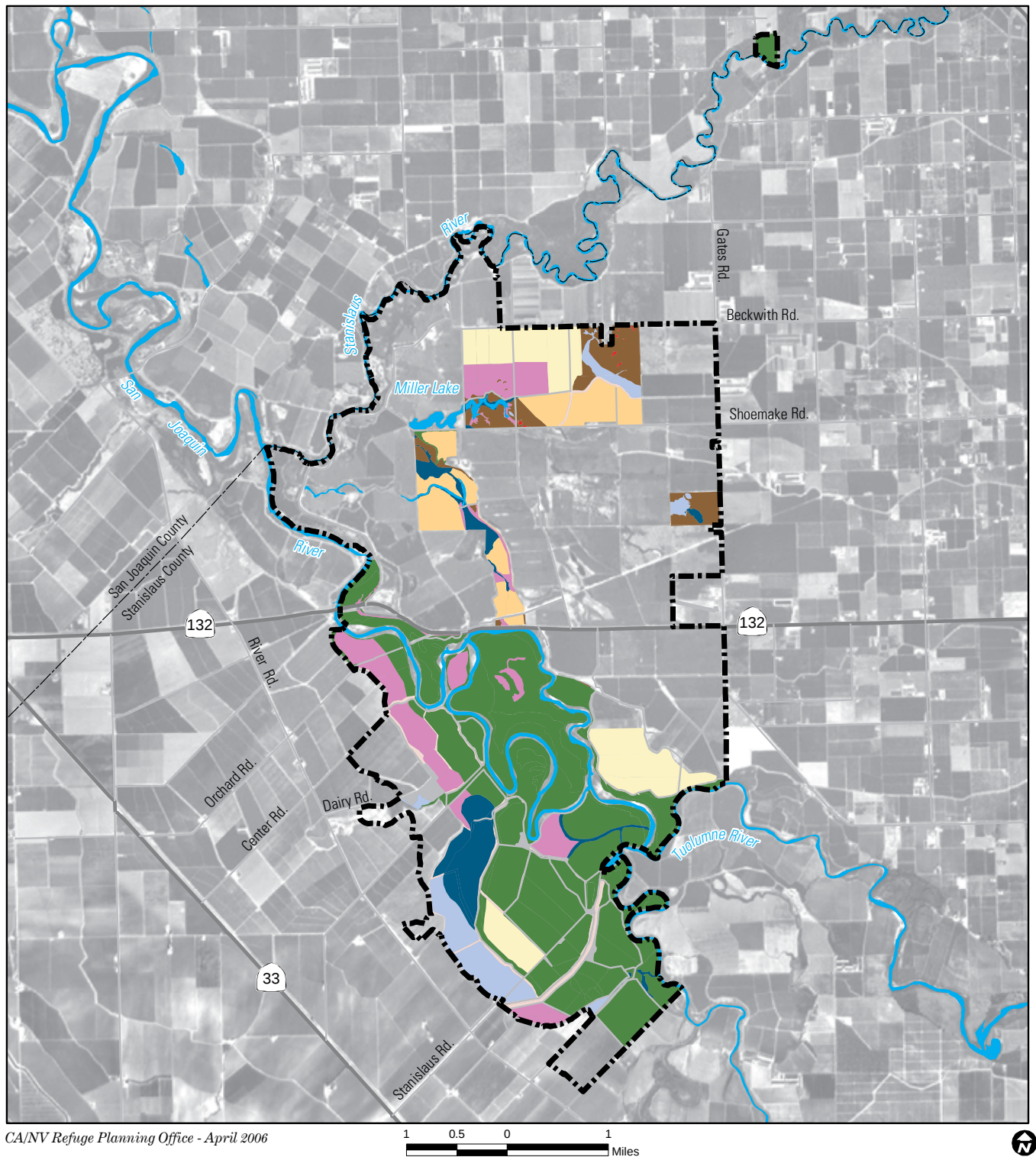


Figure 9: Proposed Habitat Management for San Joaquin River NWR



Narrative: Most of the existing Refuge lands have been highly altered through drainage, farming, wildfire suppression and flood control activities. Large scale restoration projects and active management will be required to recreate the natural diversity of habitats found on the floodplain and adjacent uplands of the San Joaquin River.

Strategies:

1.1.1 Maintain the wetlands and riparian forest restoration and the uplands enhancement on the West Unit of the San Joaquin River NWR, as identified in the CALFED ERP-01-N08 habitat restoration grant.

1.1.2 Coordinate with the staff of the FWS Anadromous Fisheries Recovery Program and other fisheries professionals to ensure that restored wetlands and riparian habitats support and enhance rearing, migration and spawning habitat for native fish species.

1.1.3 Work cooperatively with the U.S. Army Corps of Engineers to breach the flood control levees on Refuge lands west of the San Joaquin River as part of a non-structural flood alternative program and facilitate natural flood events and restore natural floodplain function.

1.1.4 Finalize and implement the restoration plan to create riparian habitat and restore natural floodplain function on the Mohler Tract.

1.1.5 Develop and implement plans to restore and enhance wetland and riparian habitats in the East Unit focusing on the Page/Goose Lake complex, Quesma Field wetlands, Buffington Fields, Riley Slough, Nelson Lake and the Colwell/Christman fields and bottoms.

1.1.6 Develop and implement projects to protect and enhance riparian habitat at Christman Island and the Gardner's Cove area, and restore eroded river stream banks to minimize erosion and subsequent sedimentation.

1.1.7 Develop and implement restoration projects for the remaining fallow agricultural lands outlined in the Pre-Restoration Plan for the West Units of the San Joaquin River NWR, as prepared by River Partners in 2000.

1.1.8 Develop and implement projects to restore the West Unit's current alfalfa field (former Arambel property) to riparian forest.

1.1.9 Prioritize proposed riparian restoration projects with areas and give the highest priority to those that provide corridors from lowland to upland habitats, are within the 100-year floodplain and are adjacent to existing riparian habitat.

1.1.10 Clean up and remove abandoned buildings, farming operation equipment and debris, concrete pads, trash dumps and unneeded fences. Restore these sites to natural habitats.

1.1.11 Prepare a North American Wetlands Conservation Act project proposal for wetlands and riparian habitat restoration/enhancement on the East Unit and parts of the former Vierra property for submittal in 2003 and implement, if funded.

1.1.12 Prepare CALFED habitat restoration proposals (phases 3 and 4 of a 4-phase project) as a follow-up to ERP-01-N08 to continue habitat restoration of the West Unit; implement if funded.

1.1.13 Prepare restoration project funding requests through Service funding programs, the North American Wetlands Conservation Act and other sources.

Objective 2. Manage approximately 700 acres of seasonal wetlands and approximately 750 acres of semipermanent/permanent wetlands to meet the habitat needs of migratory waterfowl, shorebirds, sandhill cranes and other wetland-dependent wildlife.

Narrative: The altered hydrology and loss of historic wetlands in the Central Valley of California requires that natural resource managers actively manage wetland habitats by manipulating water through its delivery and retention and by controlling vegetation and maintaining water control structures in order to provide a diversity of habitats for wetland dependent wildlife species.

Strategies:

1.2.1 Develop a water management facilities inventory and wetland management plan for the San Joaquin River NWR and incorporate both into the San Luis NWR Complex Wetland Management Plan.

1.2.2 Prepare and implement annual draw-down and flood-up plans for seasonal and semipermanent wetlands at the Refuge.

1.2.3 Maintain stable water levels in permanent wetlands such as Miller Lake, Nelson Lake and Lower White Lake to provide summer water and habitat for wildlife and limit encroachment by emergent vegetation.

1.2.4 Maintain a regular schedule of staff gauge water level readings to monitor water management and regulate water control structures and water deliveries to maintain prescribed water levels and provide maintenance flows.

1.2.5 Control excessive robust vegetation (i.e., cocklebur, cattail, roundstem bulrush, etc.) in goose roost ponds and other wetlands through water management practices, pre-flood-up mowing, prescribed burning and herbicide application.

1.2.6 Conduct annual evaluations to see if management objectives are being met, units need to be rehabilitated and water control structures/delivery systems need to be replaced. Schedule and implement unit rehabilitation activities and water control structure/delivery system replacement, as needed.

1.2.7 Record unit prescriptions, management activities, staff gauge readings

and other records and incorporate into a long-term database.

Objective 3. Manage 3,500 to 3,700 acres of riparian forest and floodplain habitat to meet the needs of neotropical migratory birds, colonial nesting waterbirds and other riparian forest associated wildlife.

Narrative: Active management of riparian forest and floodplain habitats will be much less intensive than that required for wetlands. Once restored and established, natural processes will dominate in these habitats. Over time, floodwaters coming through the levee breaches will carve out channels and oxbows and recontour the floodplain on the West Unit. In addition, the disturbance effects of periodic flood flows will increase diversity by creating different age and species structures within the riparian forest communities. Nonetheless, certain management practices will be required to offset the impacts of altered hydrology, and to protect riparian habitat from the effects of adjacent land uses and Refuge operations.

Strategies:

1.3.1 Promote the establishment of native riparian trees, shrubs and herbaceous plants after restoration projects are complete through periodic replanting, irrigation and weed control.

1.3.2 Breach levees to allow floodwaters to inundate the West Unit floodplain to benefit riparian habitat systems.

1.3.3 Limit the amount of roads, grazing, food plots and unnecessary disturbance adjacent to riparian habitats to reduce negative edge effects, such as brown-headed cowbird nest parasitism.

1.3.4 Install fences around riparian habitats adjacent to pastures to preclude grazing damage.

1.3.5 Incorporate riparian forest habitat needs into the Refuge fire management plan and annual invasive weed management plans.

1.3.6 Repair eroded stream banks where appropriate to reduce sedimentation and stabilize trees.

Objective 4. Manage 1,250 acres of agricultural lands (irrigated pasture, alfalfa, small cereal grains and corn) and 350 acres of native grasslands and oak savannah uplands to meet the habitat needs of sandhill cranes, arctic-nesting geese, other migratory birds and other grassland associated wildlife.

Narrative: Since the early 1900s many species of migratory birds have become highly dependent on agricultural lands during part of their annual life cycle. There is a long history of geese, sandhill cranes and other migratory birds using the croplands and pastures of the Faith and Mapes Ranches, and that use is a major reason the San Joaquin River NWR was established. In addition, other unique wildlife, such as white-faced ibis and long-billed curlew, heavily use the grasslands and pastures for foraging. A portion of the lands that were farmed or grazed at time of acquisition, especially those on the East Unit, need to remain in that type of management to maintain the resource values that first attracted birds into the area.

Few stands of native grasslands or oak savannah uplands remain in this part of the San Joaquin Valley. It is important that these plant communities on the Refuge be maintained and enhanced for the benefit of ground nesting birds and other wildlife associated with these habitats. Without grazing or other management, these habitats would become infested with invasive weeds, such as yellow starthistle, milk thistle and poison hemlock, thus reducing the habitat quality for wildlife.

Management of the agricultural lands and native grasslands for the benefit of migratory birds and other upland-associated wildlife will be an integral part of the farming and grazing management program (see Goal 3, Objective 6 and Goal 4, Objectives 1 and 2).

Strategies:

1.4.1 Continue livestock grazing through a CLMA on irrigated pasture and native grasslands to maintain short-cropped winter foraging habitat in accordance with annual grazing plans.

1.4.2 Limit grazing on native grasslands from December through May-June to accommodate invasive weed control objectives and allow vegetative growth for ground nesting birds.

1.4.3 Continue growing corn and winter wheat for winter forage through sharecropping agreements and CLMAs.

1.4.4 Continue growing alfalfa through a CLMA to provide winter forage for geese and cranes. Work with the CLMA operators on ways to reduce pesticide use and minimize impacts of hay harvest on ground-nesting birds.

1.4.5 Protect existing young valley oak trees in areas being grazed and, where appropriate, plant additional oaks to increase the amount of oak savannah habitat.

1.4.6 Incorporate upland habitat management needs into the Refuge fire management plan and the annual weed management plan.

Objective 5. Within two years, develop and implement an invasive weed management plan to reduce the area coverage of non-native invasive plants that adversely impact native plant and wildlife communities and meet Refuge habitat management objectives.

Narrative: Non-native invasive plants are present at varying degrees throughout the Refuge. They have the potential to dominate sites; in some locations, they have already proliferated, altering the vegetative community, lowering overall diversity and creating marginal or unsuitable habitat conditions for native plants and wildlife. The spread of invasive plants threatens successful restoration of riparian plant communities of the San Joaquin River

floodplain, maintenance of current plant communities in existing riparian forest and native grassland habitats, and successful production of wildlife forage in managed wetlands and cropfields. Species of greatest management concern on the Refuge include, but are not limited to, yellow starthistle, perennial pepperweed, arundo, poison hemlock, milk thistle, tobacco tree and salt cedar.

Strategies:

1.5.1 Inventory the occurrence and map the distribution of non-native invasive weeds on the Refuge and incorporate into the GIS database to allow monitoring through time.

1.5.2 Develop and implement an integrated invasive pest management plan for the San Joaquin River NWR. Within the plan include weed management strategies for individual pasture units, cropland fields and native upland units. Incorporate specific needs and constraints associated with invasive management of wetlands, riparian and upland habitats into the plan. Incorporate integrated pest management principles, such as grazing, mowing, burning and herbicide application, into the management plan.

1.5.3 Conduct weed control and monitoring activities on the West Unit as outlined in the CALFED ERP-01-N08 restoration grant.

1.5.4 Use grazing, planting of cover crops and other techniques to control the spread of invasive weeds in the fallow fields of the West Unit until they are planted to native trees and shrubs as part of the ongoing riparian restoration projects.

1.5.5 Assume responsibility for weed control of restored riparian areas in the West Unit after River Partners have met their restoration contract obligations.

1.5.6 Place a high priority on eradicating non-native invasive weed species, such as Russian knapweed and Himalaya berry, that are currently present in low levels but have the potential to become widespread throughout the Refuge.



1.5.7 Conduct regular monitoring to assess results of control activities and to detect the presence of any new infestations of current or newly established species.

1.5.8 Continue to participate as a member of the multi-agency Northern San Joaquin Valley Weed Management organization.

1.5.9 Seek opportunities for funding pest management activities through local, State and Federal initiatives.

Prescribed burn by Refuge staff to control invasive plants.

Photo: Perry Grissom

Objective 6. Within 10 years develop a dependable water supply and delivery system, and ensure that at least 20,000 acre/feet of water is available for Refuge use annually to manage habitats for native assemblages of fish and wildlife.

Narrative: Adequate water supplies and the ability to efficiently move water is a critical component in the management of Refuges in the Central Valley of California. Water will be used on the Refuge to manage wetlands and agricultural habitats and for the restoration of riparian forests.

Strategies:

1.6.1 Document annual water needs, status of existing water delivery infrastructure, existing water rights, water allotment from Modesto Irrigation District, existing well capacity, and potential water sources, and incorporate into a water management plan.

1.6.2 Continue to work with CLMA operators to provide water for management of the Refuge agricultural and wetland habitats.

1.6.3 Use groundwater supplies by upgrading existing wells if feasible and, where necessary, develop new wells to meet the water needs of the Refuge.

1.6.4 Repair and fit with fish screens existing lift pumps on the San Joaquin and Tuolumne rivers so existing riparian rights can be employed for Refuge water needs.

1.6.5 Initiate negotiations with Modesto Irrigation District for additional water supplies to the Refuge. Consider using accretion supplies and well supplies.

1.6.6 Upgrade existing, and where necessary, construct new canals, ditches, pipelines and other water delivery infrastructure facilities necessary to manage existing and proposed Refuge habitats.

Objective 7. Within 10 years ensure that Refuge water supplies meet Regional Water Quality Control Board (RWQCB) standards for use on wetlands and Refuge discharges from managed wetlands do not exceed total daily maximum load limits established by that Board.

Narrative: Water quality is an important aspect of Refuge operations and is critical to maintaining the health and productivity of fish and wildlife communities. Water discharges from the Refuge should not contribute to the degradation of the San Joaquin River. This is complicated by the fact the San Joaquin River, which is the predominant source of water for the West Unit, has been designated as an impaired waterway and the Refuge is forced to accept agricultural surface drainwater from upslope lands.

Strategies:

1.7.1 Collect published reports and documents on the water quality of existing and potential water supplies within five years to determine potential water quality problems.

1.7.2 Develop a monitoring program to determine the baseline water quality for Refuge lands and monitor Refuge water supply quality on a quarterly basis.

1.7.3 Work with local water districts to conduct voluntary assessments of quality of water delivered to the Refuge.

1.7.4 Ensure that water applied to Refuge wetlands does not exceed 2 parts per billion (ppb) selenium (minimum RWQCB standards).

1.7.5 Clean up the dairy waste lagoon at the former Vierra dairy operation to preclude impacts to the Refuge's water quality.

1.7.6 Work with the FWS Sacramento Ecological Services office to fund and implement water quality and contaminants assessments on the Refuge.

1.7.7 Work with NRCS and upstream landowners to reduce sediment loads of drainwaters coming onto the Refuge by implementing recommendations outlined in the U.S. Dept. of Agriculture Sediment Reduction Plan (*USDA 1992*) and, where possible, implement those same recommendations on the Refuge to further reduce sediment flow into the San Joaquin River.

1.7.8 Participate in the Regional Water Quality Control Board process to establish total maximum load limits of salts, boron and other constituents in the San Joaquin River.

Objective 8: Within two years, develop and implement a Refuge inventory and monitoring program that incorporates existing and new surveys/censuses of plants, fish and wildlife, as well as their responses to restoration/management activities that can be employed to guide the management of the Refuge.

Narrative: Knowledge of the distribution and abundance of species, species' needs and status is critical for the management of the Refuge. Biological monitoring is necessary to assess the status of fish and wildlife populations, as well as how they respond

to management actions. Management effectiveness can be evaluated and corrected, if needed, based on a monitoring program. Monitoring will consist of both long and short-term projects and be conducted by Complex staff, partners, contractors and other researchers. Some monitoring efforts will be conducted to meet Refuge data needs, while others will contribute to or be a part of larger-scale ecoregion, Flyway or National monitoring initiatives.

Strategies:

1.8.1 Develop and implement a monitoring plan to determine the abundance, distribution and productivity of neotropical migratory landbirds, wetland dependent birds, mammals, reptiles, amphibians and fish using Refuge lands.

1.8.2 Work with both public and private partners to monitor threatened and endangered species found at the Refuge to facilitate their recovery (see Goal 3).

1.8.3 Update inventories of fish, amphibian, reptile, bird and mammal species present in the established and restored waterways, wetlands, riparian areas and uplands of the Refuge.

1.8.4 Develop and implement a habitat monitoring plan to measure habitat changes and results/impacts of restoration efforts.

1.8.5 Expand and update the Refuge GIS database to document habitats, land use practices and restoration project results.

1.8.6 Integrate wildlife population data (i.e., abundance and distribution) with GIS habitat layers to facilitate management actions.

1.8.7 Work with USGS/BRD, universities, organizations and individuals to develop research projects regarding natural resource issues to guide management at the Refuge.

Objective 9. Restore natural processes where possible to ensure ecosystem function.

Narrative:

Ecosystem health depends not only on ecosystem components but also, the natural processes that drive ecosystem functions. Many natural processes that are vital to ecosystems, such as river events and wildfire, have been eliminated or suppressed by flood control structures and fire suppression programs respectively. Many of these natural processes maintain ecosystem diversity by their actions. Impediments preventing natural processes to function will be minimized or eliminated, if deemed appropriate.

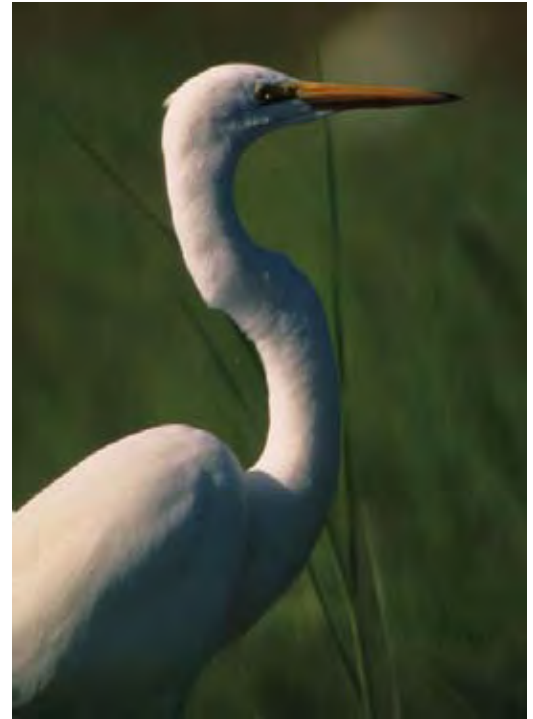
Strategies:

1.9.1 Work cooperatively with the U.S. Army Corps of Engineers to breach the flood control levees on Refuge lands west of the San Joaquin River as part of a non-structural flood alternative program and to facilitate natural flood events and restore natural floodplain function. (Same as strategy 1.1.3.)

1.9.2 Finalize and implement the restoration plan to create riparian habitat and restore natural floodplain function on the Mohler Tract. (Same as strategy 1.1.4.)

1.9.3 Develop and implement projects to protect and enhance riparian habitat at Christman Island and the Gardner's Cove area, and restore eroded river stream banks to minimize erosion and subsequent sedimentation. (Same as strategy 1.1.6.)

1.9.4 Ascertain past and suitable fire regimes for habitat types at the San Joaquin River NWR to develop fire plans.



Great egret, a conspicuous species at the Refuge.
Photo: Jerry Baldwin

1.9.5 Restore the role of fire through a prescribed fire program at the San Joaquin River NWR.

1.9.6 Work with NRCS and upstream landowners to reduce sediment loads of drainwaters coming onto the Refuge through implementing recommendations outlined in the U.S. Dept. of Agriculture Sediment Reduction Plan (USDA 1992) and, where possible, implement those same recommendations on Refuge to further reduce sediment flow into the San Joaquin River. (Same as strategy 1.7.7.)

Goal 2 (Threatened and Endangered Species)

Contribute to the recovery of threatened/endangered species, as well as the protection of populations of special status wildlife and plant species and their habitats.

Narrative: Federal and State threatened and endangered species and other special status species are a high priority for the management of the San Joaquin River NWR. The Refuge will aid in the protection and recovery of these species by maintaining and managing the habitats on which they depend, pursuing other measures, as needed, and participating in species recovery efforts.

Objective 1. Reestablish two self-sustaining populations of riparian brush rabbits (Federal/State–Endangered) on Refuge lands within 10 years.

Narrative: The Riparian Brush Rabbit Working Group, comprised of the Service, BOR, CDFG, California Dept. of Parks and Recreation and CSU-Stanislaus Endangered Species Recovery Program is actively working to recover riparian brush rabbits from their endangered species status. With funding from the aforementioned Federal and State agencies, CSU-Stanislaus ESRP has conducted studies to better understand the ecology of the rabbit, established and run a captive propagation facility, released rabbits on the Refuge in 2002/03 to establish

a population and is monitoring the status of the released rabbits.

The Refuge is within the historic range of the riparian brush rabbit and is in proximity to an existing population at Caswell State Park. It has high potential to support the long term establishment of brush rabbit populations. The necessary habitat features required to enhance the area for this species include increasing the amount of California blackberry, California rose and other dense growing shrubs/forbs; expanding the riparian forest on the San Joaquin River floodplain; and creating vegetated, elevated mounds to provide refugia for the rabbits during flood events.

Strategies:

2.1.1 Continue to work with ESRP and participate as a member of the Riparian Brush Rabbit Recovery Working Group to introduce captive-bred brush rabbits at two separate release sites and assist in monitoring their survival, productivity and distribution.

2.1.2 Create elevated, earthen mounds in the floodplain to provide refugia during flood events and vegetate these areas with native blackberry, rose and herbaceous plants as escape cover.

2.1.3 Establish thick stands of native blackberry and rose along the banks of levees and ensure that patches of these plants are incorporated in riparian forest restoration plantings within the floodplain.

2.1.4 Increase the amount of riparian forest habitat and ensure that a mix of riparian forest growth stages exist on the Refuge.

Objective 2. Maintain and enhance at least one self-sustaining population of San Joaquin Valley woodrats (Federal—Endangered) on Refuge lands consistent with recovery actions and other parameters established by the FWS Endangered Species Office.

Narrative: San Joaquin Valley woodrat recovery efforts are being conducted in

coordination with many of the participants of the riparian brush rabbit recovery program. CSU-Stanislaus ESRP is conducting research and monitoring at nearby Caswell State Park to better understand the ecology of the woodrat and the impacts of competition by non-native black rats. However, no direct management recovery actions are occurring for the species. The Refuge is within the historic range of the San Joaquin Valley woodrat, but it is unknown to what extent they presently occur at the Refuge.

Strategies:

2.2.1 Determine the level of occurrence of the San Joaquin Valley woodrat at the San Joaquin River NWR.

2.2.2 Work with the FWS Endangered Species Office, ESRP and other partners to evaluate the suitability of habitat and feasibility, if needed, of reestablishing/maintaining woodrats on the Refuge.

2.2.3 Participate in and foster any on-Refuge population management projects initiated by the FWS Endangered Species Office.

Objective 3. Protect populations of vernal pool fairy shrimp (multiple species Federal–Endangered), vernal pool tadpole shrimp (Federal–Endangered) and California tiger salamander (Federal–Candidate) by maintaining existing vernal pools (15 total; combined size < 1.0 ac.), associated plant communities and surrounding micro-watersheds.

Narrative: Multiple species of fairy shrimp, as well as vernal pool tadpole shrimp and California tiger salamanders, depend on vernal pools for survival. The most important components of preserving vernal pools are maintaining their natural hydrology. Vernal pools are supplied entirely by rainwater. To protect vernal pool habitats, the integrity of the underlying claypan of the basin and topography of the micro-watershed must be preserved. An additional problem for vernal pools is that during dry years, upland plant species tend to encroach in the dry vernal pools, which

results in thatch accumulation that hinders the growth of vernal pool plant species.

Strategies:

2.3.1 Map locations of vernal pools on the Refuge GIS database and document status of individual vernal pool communities.

2.3.2 Continue the Complex-wide policy of no alteration of the topography of native uplands.

2.3.3 Use grazing to maintain short grass plant communities (3–6 in. high) and reduce thatch accumulation around vernal pool habitats.

Objective 4. Complete an abundance and distribution inventory of valley elderberry longhorn beetle (Federal–Endangered), giant garter snake (Federal–Threatened), willow flycatcher (State–Endangered) and western yellow-billed cuckoo (State–Endangered) on the San Joaquin River NWR. Develop Refuge management plans for the species, if deemed necessary, within 10 years.

Narrative: Little is known regarding the status of these species on the Refuge. Information is required to determine if Refuge habitats are suitable for supporting populations of these species, and if they currently exist on the Refuge. Once their distribution and abundance on the Refuge is determined, restoration and management of habitats to meet species needs can be implemented, if needed and direct participation in recovery efforts initiated, as appropriate.

Strategies:

2.4.1 Seek funding for species and habitat inventories through CALFED grants, FWS/RONS projects, or other funding sources, and conduct inventories when funded.

2.4.2 Ascertain the distribution and abundance of valley elderberry longhorn beetle, giant garter snake, willow flycatcher and western yellow-billed cuckoo on the Refuge.

2.4.3 Incorporate the species and habitat inventories into the Refuge GIS database.

2.4.4 Develop and implement species management plans that incorporate habitat requirements from the literature and guidelines from species recovery plans.

Objective 5. Provide and enhance migration, spawning and rearing habitat for fall-run Chinook salmon Federal–Threatened), Central Valley steelhead (Federal–Threatened), Sacramento splittail (Federal–Threatened), and any other listed fish species by establishing and maintaining a minimum of seven miles of shaded riverine aquatic habitat and 3,500 acres of floodplain habitat along the San Joaquin, Stanislaus and Tuolumne Rivers.

Narrative: The Refuge is downstream from tributaries where Chinook salmon and steelhead spawn and within the spawning area for Sacramento splittail. These species are currently excluded from most of the Refuge floodplain by the presence of flood control levees. Breaching on-Refuge levees as part of floodplain restoration and as an alternative flood control project will allow the river to assume a more natural pattern of flooding and inundation, giving these and other special status native fish species access to the floodplain during flood events. During periods of inundation, the restored floodplain can provide valuable spawning and rearing habitat for Sacramento splittail, and rearing habitat for salmon and steelhead smolts, thus contributing to the recovery these listed species. However, if designed or managed incorrectly, floodplain channels and wetlands could cause stranding and mortality of these same fish as the floodwater recedes. In addition, operation of any unscreened Refuge lift pumps along the San Joaquin, Tuolumne, and Stanislaus rivers could result in fish mortality.

Strategies:

2.5.1 Coordinate with staff from the FWS-Anadromous Fish Restoration Program and National Marine Fisheries Service to ensure that levee breaching and floodplain

restoration is designed and implemented in ways that maximize spawning and rearing habitat benefits to listed and special status fish species, while minimizing potential for stranding.

2.5.2 Implement levee breaching and riparian floodplain restoration as outlined in the CALFED ERP-01-N08 habitat restoration grant.

2.5.3 Develop a fisheries management strategy that is compatible with other Refuge management objectives and maximizes habitat benefits to listed and special status fish species.

2.5.4 Work with partners to evaluate floodplain rearing potential, conduct monitoring to document actual use by and benefits to listed and special status species, and resolve any fisheries issues on Refuge lands.

2.5.5 Install fish screens on all Refuge riverine lift pumps to avoid entrapment of juvenile Chinook salmon, steelhead, Sacramento splittail or any other special status species of fish.

2.5.6 Seek funding sources and establish partnerships to continue additional riparian floodplain restoration and implement projects when funded.

Objective 6. Provide winter foraging and roost habitat for greater sandhill cranes (State–Threatened) by managing and enhancing 830 acres of irrigated pastures and native grasslands, 550 acres of corn and cereal grain fields and 400 acres of roost pond habitat in conjunction with Aleutian Canada goose and other migratory bird management.

Narrative: Greater sandhill cranes winter on the Refuge in association with larger numbers of lesser sandhill cranes. Cranes are highly dependent on croplands and irrigated pasture, as well as native grasslands, for foraging habitat. They require shallow, open wetlands for use as mid-day loafing sites and night roosts.

Cranes are less tolerant of disturbance than most other migratory birds using the Refuge. Management actions for greater sandhill cranes will be an integral part of the overall management of wetlands and uplands for migratory birds and other wildlife (See Goal 1, Objectives 2 and 4, and for Aleutian Canada geese see Goal 4.)

Strategies:

2.6.1 Continue livestock grazing or other suitable methods on irrigated pasture and native grasslands to maintain short-cropped winter foraging habitat in accordance with annual grazing plans through a CLMA.

2.6.2 Continue growing corn and winter wheat for winter forage through sharecropping agreements and CLMAs.

2.6.3 Where compatible with other foraging habitat objectives, allow winter wheat to mature over the summer and then mow or disc down standing wheat to provide forage for cranes during autumn and early winter.

2.6.4 Manage wetlands to provide shallow (< 1 ft. deep) open loafing areas and roost sites.

2.6.5 Limit disturbance in crane roosts and foraging areas by maintaining sanctuaries.

2.6.6 Participate with other agencies and researchers in conducting Flyway-wide population surveys, population monitoring and other research.

Objective 7: Provide habitat for and monitor least Bell's vireo at the Refuge.

Narrative: This endangered species was first detected nesting on the refuge in 2005. The vireo nested in recently restored riparian habitat. It is likely that the riparian habitat being restored at the Refuge will provide additional habitat for this endangered species as well as other riparian dependent wildlife.

Strategies:

2.7.1 Monitor presence and abundance of breeding pairs of least Bell's vireo at the Refuge.

2.7.2 Document vegetation characteristics of vireo nesting habitat and use to guide riparian restoration and riparian woodland management.

2.7.3 Manage and restore 3,500 acres of riparian habitat at the Refuge.

Goal 3 (Aleutian Canada Goose)

Provide optimum wintering habitat for Aleutian Canada geese to ensure the continued recovery from threatened and endangered species status.

Narrative: Although Aleutian Canada geese have been delisted from threatened species status, they remain a species (subspecies) of special emphasis. Mandates of the Endangered Species Act and Service policies direct that management actions be taken to ensure that recovery is maintained. Because the Refuge continues to be the most important wintering area for Aleutian Canada geese and is critical for continued recovery, management to provide winter habitat will remain a priority of the Refuge.

Objective 1. Manage and enhance a minimum of 500 acres of irrigated pasture and 350 acres of native grasslands as short grass foraging habitat (< 8 inches high) through grazing and other pasture management activities for Aleutian Canada geese and other wildlife.

Narrative: Availability of short-cropped tender grasses is a critical component of the winter forage base for this small race of Canada goose. The birds feed on the fast-growing meristems (tips of the plants), which are the most tender portion of the plant and where the highest protein levels are concentrated. Aleutian Canada geese heavily use irrigated pasture during initial arrival in October and November, and irrigated pasture and native grasslands during late January until their departure in April. The availability of this habitat is especially important during the early spring months as the geese switch from a maintenance diet dominated by corn (high carbohydrate) to a higher protein

grass diet to build fat reserves to meet the physiological needs associated with migration and subsequent reproduction.

Grazing is the current, preferred method of maintaining short grass conditions rather than mowing, because grazing has proved to be compatible with goose use, is more economical than mowing and does not promote thatch build-up. Grazing is conducted at the Refuge by private individuals through a CLMA.

Strategies:

3.1.1 Continue grazing on irrigated pasture and native grasslands via a CLMA(s) as needed in accordance with annual grazing plans.

3.1.2 Use a combination of force account and CLMA operators to mow and apply herbicides to irrigated pasture, as necessary, to control weeds such as cocklebur, milk thistle and yellow starthistle.

3.1.3 Work with CLMA operators to temporarily flood portions of pastures that receive high goose and other wildlife use during October and November to create wet meadow condition. Coordinate pasture flooding with neighboring landowners to

ensure an optimal amount of wet meadow conditions.

3.1.4 Submit a FWS/RONS proposal to rehabilitate a rank pasture in the Johnson Corral Field and implement, if funded.

Objective 2. Maintain a minimum of 115 acres of grain corn, 430 acres of winter wheat, and 200 acres of foraging habitat.

Narrative: Most species of geese in North America, including Aleutian Canada geese, have become dependent on agricultural crops for their winter forage base. Growing grain (corn) and green forage (winter wheat and alfalfa) on the Refuge provides a high quality diet to meet the nutritional needs of wintering Aleutian Canada geese and reduces the amount of crop depredation caused by geese on nearby private lands. The carbohydrates provided by corn are important in maintaining body condition during the winter months and corn forms the major part of the diet from late November to early February. Winter wheat and alfalfa are heavily used by the geese from the time of initial arrival in October until final departure in April. As with grass, the higher protein levels associated with winter wheat and alfalfa are important in

Geese using crop field on Refuge.

Photo: Gary Powell



building fat reserves for spring migration and the subsequent reproductive cycle. However, by late February, much of the winter wheat has been eaten out, or where not foraged upon, has grown too tall and rank to be attractive to geese.

Strategies:

3.2.1 Continue growing corn and winter wheat on the East Unit through use of share cropping agreements and CLMAs.

3.2.2 Reduce reliance on share cropping of corn if the CLMA program is expanded (on any newly acquired lands or alfalfa fields) and sufficient CLMA credits are generated to allow direct funding of corn production.

3.2.3 Grow approximately 80 acres of winter wheat through a CLMA or force account on the West Unit.

3.2.4 Mow standing corn in sequential blocks from late November to early January to provide grain forage. Review the mowing sequence and timing annually to meet program needs

3.2.5 Assume management of alfalfa fields in the North/South Christman Fields after December 2003 through a CLMA.

3.2.6 Maintain an additional 200 acres of goose foraging habitat by CLMA in the agricultural field north of Beckwith Road (Buffington property) if the parcel is acquired.

Objective 3. Manage Page, Goose and Nelson Lakes (250 acres combined) as roosting and loafing habitat, and create a 60-acre roost pond in the Christman/Colwell Fields area by 2010.

Narrative: Shallow wetlands that provide areas for mid-day loafing and night roosts are a critical component of wintering habitat for Aleutian Canada geese. These areas are necessary for resting, preening, maintaining social bonds and providing security from predators. Important features of such roost ponds include an open aspect with limited emergent cover that has islands

with low vegetative cover and having an open shoreline on at least part of the wetland. Page, Goose and Nelson Lakes have been the main roost pond sites to date, but additional roosting and loafing habitat will be necessary as the goose population increases.

Strategies:

3.3.1 Maintain Page and Goose Lakes as open aspect seasonal wetlands and Nelson Lake as a permanent pond.

3.3.2 Graze or mow shorelines and islands of roost ponds prior to flood-up to provide loafing habitat for geese.

3.3.3 Create and subsequently manage as a seasonal wetland a 60-acre roost pond on the west side of the Christman/Colwell Field area adjacent to the San Joaquin River levee.

Objective 4. Provide 1,200 -1,400 acres of sanctuary in the foraging and roost areas of the East Unit by minimizing disturbance from public use and other disturbance factors in those areas.

Narrative: Migratory birds, including Aleutian Canada geese, require disturbance-free areas in which to rest and feed. Although Aleutian Canada geese can be tolerant of human presence in certain feeding areas at the Refuge, excessive disturbance causes birds to flush and relocate to other areas, resulting in loss of feeding opportunity, expenditure of nutrient reserves and added stress. These impacts are especially critical in late winter and early spring, when geese are actively acquiring nutrient reserves for spring migration and the subsequent reproductive cycle.

Strategies:

3.4.1 Restrict public use in the Goose Lake/Page Lake and Dairy Field/Page Field area to the viewing platform site along Beckwith Road.

3.4.2 Design any photo blind or walking trail developed east of the Dairy Field so that disturbance to Aleutian Canada geese and

other migratory birds is minimized.

3.4.3 Keep Johnson Corral fields, Beet Field, Maze Bottoms, 90-Acre Field and Colwell/Christman fields and bottoms closed to public use.

Objective 5. Minimize losses to avian cholera and other diseases by conducting regular disease monitoring annually from December through April and by management of roost pond water levels.

Narrative: Avian cholera is the primary disease that affects waterbirds at the Refuge and in the Northern San Joaquin Valley. Recent research indicates that the bacterium is endemic in certain waterfowl populations and that outbreaks can be triggered by bird to bird transmission during periods of overcrowding and stress. Birds can die quickly after exposure and once an outbreak occurs, large numbers can die in a short period of time. Past outbreaks at the Refuge have coincided with the presence of large numbers of snow and Ross' geese and periods of cold foggy weather.

Strategies:

3.5.1 Conduct weekly surveys for the presence of sick or dead geese around the roost ponds from December through April. Survey frequency will be increased during periods of cold, foggy weather or if diseased birds are encountered.

3.5.2 Monitor turbidity of water in roost ponds and provide flushing flows to maintain good water quality and clarity.

3.5.3 Implement disease outbreak notification and control activities procedures as outlined in the San Luis NWR Complex Disease Contingency Plan and the Aleutian Canada Goose Disease and Contamination Hazard Contingency Plan. In the annual work plan, a Refuge staff member will be given responsibility for disease monitoring, notification and coordination of disease control activities

3.5.4 Submit specimens picked up in disease control activities to the National

Wildlife Health Research Center for official confirmation of disease outbreaks.

3.5.5 Incorporate documentation of disease losses and disease control activities into the San Luis NWR Complex-wide annual disease reports.

Objective 6. Manage habitat and populations in the context of FWS post-delisting obligations and Pacific Flyway management objectives.

Narrative: The Endangered Species Act requires that species be monitored for five years following delisting to ensure recovery goals remain accomplished. Once Aleutian Canada geese were delisted, management authority shifted from the Service's Endangered Species Office to its Migratory Bird Management Office, and the species was incorporated into the Flyway Council process. An Aleutian Canada Goose Management Plan, which will be updated every five years, has been approved by the Pacific Flyway Council. Since most of the Aleutian Canada goose population winters on the Refuge, management and monitoring actions taken here will be coordinated with, and be an integral part of, larger scale population management of the subspecies.

Strategies:

3.6.1 Coordinate with the FWS Region 7 Endangered Species Office on recovery issues for the five years following delisting.

3.6.2 Participate as an advisor of the Aleutian Canada Goose Management Subcommittee of the Pacific Flyway Study Group.

3.6.3 Monitor Aleutian Canada goose use of the Refuge and surrounding lands to determine numbers present, evaluate effectiveness of habitat management and document crop depredation issues.

3.6.4 Band and neck-collar geese on an annual basis in partnership with California Department of Fish and Game.

3.6.5 Conduct population and off-Refuge distribution monitoring to the extent

permitted by funding from the Endangered Species or Migratory Bird programs.

GOAL 4 (Ecosystem Management)

Coordinate the natural resource management of the San Joaquin River National Wildlife Refuge within the context of the larger Central Valley/San Francisco Ecoregion.

Narrative: Although the San Joaquin River NWR contains significant wildlife resources, including on a national level for species such as the Aleutian Canada goose and riparian brush rabbit, the surrounding land use and its management impacts the natural resources within the Refuge. Working cooperatively with both public and private entities provides the opportunity to affect natural resource management on a landscape or ecoregion level. Resources of the Refuge which can be addressed at this larger scale include migratory birds, anadromous fish, water issues, endangered and threatened species, contaminants, habitat patch size and riparian corridors, amongst others.

The U.S. Fish and Wildlife Service has divided the nation into ecoregions to coordinate natural resource management. The San Joaquin River NWR is situated in the Central Valley/San Francisco ecoregion which includes the San Joaquin and Sacramento valleys and their drainages, as well as the Sacramento delta. This ecoregion contains significant wetland habitats which support some of the largest waterfowl and waterbird concentrations in the Pacific Flyway.

Objective 1. Seek the acquisition of lands for the San Joaquin River NWR from within the approved Refuge boundary from willing landowners.

Narrative: Approximately half the acreage in the approved Refuge boundary has been purchased. The remaining lands are in private ownership. These lands have been previously identified as having suitable or potential significant wildlife values.

Acquisition of lands within the approved Refuge boundary will enhance existing wildlife resources on present Refuge lands and enhance wildlife resources by increasing the land base; it will also provide for increased flexibility in the management of wildlife resources and offer greater opportunities for wildlife-dependent public use at the Refuge.

Strategies:

4.1.1 Maintain a database of private lands within the approved Refuge boundary.

4.1.2 Work with the Service's Realty Office on the acquisition of the Buffington parcel.

4.1.3 Work with the Service's Realty Office on the acquisition of any private land parcels within the approved Refuge boundary as they become available from willing sellers.

Objective 2. Work with partners to protect other high value habitat along the San Joaquin River corridor.

Narrative: Opportunities to benefit wildlife at the San Joaquin River NWR exist outside of the present Refuge acquisition boundary. Lands outside the current boundary offer the potential for increasing the amount of both wetland and riparian habitats, as well as offering the possibilities for increasing the connectivity of Refuge lands with similar wildlands in the San Joaquin Valley.

Strategies:

4.2.1 Expand the San Luis NWR Complex's Geographic Information System (GIS) capabilities over the next ten years to include lands outside the acquisition boundary of the San Joaquin River NWR, particularly in regards

White-crowned sparrow, a common winter songbird.



to riparian corridors.

4.2.2 Identify lands outside of the approved acquisition boundary for the San Joaquin River NWR which have key or the potential for key natural resources and/or would protect or enhance existing Refuge resources.

4.2.3 Work with the Refuge Planning Office to prepare and process a boundary expansion proposal.

Objective 3. Manage the U.S. Fish and Wildlife Service's easement program on private lands for the benefit of wildlife within the acquisition boundary of the San Joaquin River NWR and explore the potential for additional wildlife easements in the vicinity of the Refuge.

Narrative: Service easements on private lands provide benefits to wildlife at lower cost than Refuge land acquisition, although they do not provide the same degree of flexibility of land management and overall benefit to wildlife. However, easements provide an opportunity to increase the level of protected habitats for wildlife surrounding Refuge lands and yield added benefits for wildlife when full land acquisition is neither feasible nor desirable.

Strategies:

4.3.1 Monitor existing easement agreements with private landowners to ensure program compliance and wildlife benefits.

4.3.2 Identify and implement natural resource projects to benefit wildlife on easement lands to be funded through the Service's Partners for Fish and Wildlife Program or other funding mechanisms.

4.3.3 Seek additional lands within the Refuge's acquisition boundary for the Service easement program, if deemed appropriate.

Objective 4. Create and cultivate partnerships, wherever possible, with other landowners including agencies,

organizations, businesses, universities and/or private individuals, to coordinate and foster natural resource management in the ecoregion.

Narrative: In addition to Refuge management, other ecosystem management efforts are being undertaken along this portion of the San Joaquin River. The U.S. Army Corps of Engineers' Comprehensive Study (see Chapter 1, Other Projects), the San Joaquin River Management Plan, NRCS' Wetlands Reserve Program and others are seeking to connect natural lands and foster natural resource management along the San Joaquin River. Refuge involvement with these initiatives will provide greater benefits for wildlife and the San Joaquin River NWR.

Strategies:

4.4.1 Provide natural resource information collected at the San Joaquin River NWR to other interested agencies, groups and researchers to foster collaborative efforts and support ecoregion-wide natural resource databases.

4.4.2 Participate in the regional planning for the conservation of the riparian brush rabbit, San Joaquin Valley woodrat, Aleutian Canada goose, California tiger salamander, vernal pool communities, San Joaquin kit fox and other species of special concern.

4.4.3 Participate in joint natural resource projects at the ecoregion level involving partners on issues pertaining to the management and protection of resources at the San Joaquin River NWR.

4.4.4 Develop a Refuge Friends group with interested parties for either the San Joaquin River NWR or the San Luis NWR Complex to promote and foster the natural resources of the Refuge and ecoregion. (Same as strategy 5.9.5.)

Objective 5. Foster natural resource research opportunities on the San Joaquin River National Wildlife Refuge for

investigators involved in ecoregion-wide research efforts.

Narrative: Natural resource management direction and techniques employed at National Wildlife Refuges are developed through cooperative and coordinated research projects between the Refuge and investigators. All major advances and improvements in natural resource management at Refuges are developed through the research process.

Strategies:

4.5.1 Encourage universities and researchers conducting ecoregion natural resource investigations to include the San Joaquin River NWR.

Goal 5 (Public Use of the Refuge)

Provide the public with opportunities for compatible, wildlife-dependent visitor services to enhance understanding, appreciation and enjoyment of natural resources at the San Joaquin River NWR.

Narrative: Wildlife-dependent recreational activities, as identified in the Refuge Improvement Act, were given primary consideration over all other public uses. These wildlife-dependent priority public uses were considered and analyzed for implementation at the Refuge. These six priority uses include hunting, fishing, wildlife observation, wildlife photography, environmental education and interpretation. Existing public uses for the Refuge are limited to wildlife viewing and photography from an observation platform, occasional interpretive walks or programs, and guided visits for schoolchildren.

Planning for visitor services is influenced by other criteria, including wildlife needs, land use, habitat and wildlife protection, as well as accommodating the public's desire for different types of recreational activities and the potential for one activity to impact others. The Refuge's relatively small size and site specific issues that guided the development of habitat management required a similarly habitat-driven

development for visitor services.

Objective 1: Implement a wildlife observation and photography program for the public on the San Joaquin River NWR by developing five public use facilities within the next five years and within the following five years, develop an additional five public use facilities.

Narrative: The Refuge's proximity to and access from major California highways and population centers provides numerous and constant opportunities for the general public and groups to visit, enjoy and learn about the Refuge and its wildlife resources. Two major highways flank the Refuge, providing convenient access for the public. Major population centers in proximity to the Refuge include Modesto, Stockton, Sacramento and San Francisco.

The general area is lacking in other public-owned wildlands, where the public has the opportunity to enjoy and view wildlife, plants and habitats. A public use program at the Refuge will help to fill a regional need for outdoor recreation with a focus on wildlife.

Strategies:

5.1.1 Prepare and begin implementation of a public use plan focusing on wildlife observation, photography, environmental education and nature interpretation at the San Joaquin River NWR. The plan will integrate all aspects of a public use program with the other programs at the Refuge. This plan will be completed within three years and provide specific guidance for program implementation.

5.1.2 Construct either an auto-tour route or foot-trail that features wildlife observation and photographic opportunities for the public through a diverse array of habitats on the west side of the San Joaquin River. The tour route or foot-trail will include route/trail surface modification, signage, information kiosk, observation platform(s), side foot-trails, brochures and maps, among other features.

5.1.3 Complete the wildlife observation platform and kiosk on Beckwith Road

(landscaping, interpretive panels, parking lot improvements and signage).

5.1.4 Develop and construct two wildlife-photography blinds at the Refuge.

5.1.5 Develop part of Christman Island as a free-roaming birding and wildlife viewing area. Construct a trail from a developed parking area to the wildlife viewing area and develop signage and maps to restrict public access from sensitive natural resource areas on Christman Island.

5.1.6 Develop one or more walk-in car-top boat launching facilities to facilitate the public's ability to view wildlife from small watercraft and to promote recreational angling.

5.1.7 Develop the Gardener's Cove area as a visitor use area (i.e., wildlife observation and photography as well as recreational angling), if deemed safe and compatible with the proposed Caltrans expansion of Highway 132. The current roadway is not safe; before this area can be opened to the public, the Refuge must complete coordination with Caltrans designers and engineers to create a safe entrance and exit.

5.1.8 Develop maps and guides showing visitor facilities and wildlife viewing areas at the Refuge. Develop interpretive materials to promote public use and understanding of the Refuge and the role it plays in the Central Valley Ecosystem and Pacific Flyway.

Objective 2. Within 10 years, develop a visitor contact station and trailhead in proximity to and in coordination with development of the Refuge's headquarters area on Dairy Road.

Narrative: A visitor contact station will be a center for visitor orientation and information at the Refuge. The contact station will provide visitors their first impression of the Refuge and parking, access to an auto tour route and/or nature trails, and a locale to begin their wildlife observation hikes, garner information about opportunities on the Refuge, and learn about the Refuge from interpretive displays and

materials.

The main administrative headquarters for the Refuge are in the buildings of a former dairy. This existing complex is close to the center of the Refuge and provides easy access and security for visitor services activities and opportunities to coordinate visitor services with Refuge maintenance and management programs. Visitor access to many parts of the Refuge will be possible after restoration and maintenance programs have been developed for the West Unit.

Strategies:

5.2.1 Construct and install an informational and interpretive kiosk at Dairy Road, serving as the main visitor contact station on the Refuge. Provide an associated 20 vehicle parking lot (with the capacity for two school buses).

5.2.2 Develop and install entrance, directional and regulatory signs at public access areas.

5.2.3 Construct restroom facilities adjacent to the visitor contact station.

5.2.4 Ensure the main auto-tour route or foot-trail (strategy 5.1.2) is in proximity to and accessible via the main visitor contact station.

Objective 3. Within five years, develop and implement a recreational hunt program.

Narrative: Recreational hunting is one of the six priority public uses for the National Wildlife Refuge System. Recreational waterfowl hunting has a long tradition in California's Central Valley. A step-down management plan will be prepared prior to implementing hunting of migratory and upland birds after population monitoring indicates a hunting program could be sustained. This plan would identify suitable hunting areas and game species on the Refuge and the means to implement a hunt program on those areas. If conditions warrant, opportunities to hunt waterfowl would be available in select wetland areas

and opportunities to hunt dove, quail and/or other species would be available in upland areas. Hunting opportunities may be limited by time of day, season, game species, numbers of permits issued and may also include a youth and/or disabilities component. Special consideration will be taken to ensure that the recently delisted Aleutian Canada goose population is not adversely affected by hunting on the Refuge.

Strategies:

5.3.1 Evaluate the potential for a recreational hunt program at the San Joaquin River NWR and if warranted develop and implement the step-down hunt management plan.

5.3.2 Coordinate with the California Department of Fish and Game (CDFG) in the development and administration of a recreational hunt program on the Refuge.

5.3.3 Develop maps showing facilities and hunt areas and distribute Refuge program pamphlets to participating sportsmen during the process of implementing a recreational hunting program.

5.3.4 Develop seasonal parking areas, travel routes and provide comfort stations for the hunt program.

5.3.5 Provide sanctuaries for the Aleutian Canada geese and ensure the protection of all threatened and endangered species, as well as other resources.

Objective 4. Develop and implement a recreational fishing program at the San Joaquin River NWR within 10 years.

Narrative: The presence of three rivers on the San Joaquin River NWR offers a variety of fishing opportunities. Gardner's Cove provides one good possibility for bank fishing. Safe access will be available to the site once the Caltrans extension of Highway 132 is completed. Boat and bank fishing opportunities are also possible in the West Unit along the San Joaquin River.

Strategies:

5.4.1 Work and coordinate with CDFG and the FWS Stockton Fishery Office to develop a recreational fishing program on the Refuge. Develop and implement a recreational fishing and boating section in the step-down Public Use Plan for the San Joaquin River NWR (See strategy 5.1.1.)

5.4.2 Develop one or more walk-in car-top boat launching facilities (as per strategy 5.1.6) to promote and facilitate recreational angling.

5.4.3 Provide opportunities for both recreational angling from a boat and the shore after finding suitable locations for these activities that minimize shoreline damage and potential conflicts with sensitive natural resources, as well as other public use programs at the Refuge.

5.4.4 Develop access for recreational fishermen and other visitors at the Gardner's Cove portion of the San Joaquin River NWR once the Caltrans expansion of Highway 132 is completed.

5.4.5 Create and distribute a fact sheet on the Refuge fishing program to the public.

Objective 5. Within five years, establish four interpretive programs, facilities, or publications for a diverse audience that reveals the natural and cultural history of the Refuge, migratory birds, endangered species, natural habitats, habitat restoration programs, wetland ecosystems amongst other topics. Establish an additional four programs, facilities, or publications during the following five years.

Narrative: Organized, well-managed, effective interpretive programs greatly enhance the quality of the public's wildlife experience during their visits and field trips to National Wildlife Refuges.

Strategies:

5.5.1 Develop interpretive programs and events that incorporate Refuge themes and reveal the natural and cultural history of the area.

5.5.2 Construct interpretive kiosks at the observation platform on Beckwith Road and the headquarters' visitor contact station.

5.5.3 Develop and provide maps, brochures and other interpretive materials showing visitor facilities. Distribute Refuge pamphlets at entrance stations to help visitors orient and appreciate the Refuge and the role it plays in the Central Valley ecosystem and the Pacific Flyway.

Objective 6. Develop and implement an environmental education program at the San Joaquin River NWR. Facilitate the use of the Refuge by educational groups.

Narrative: Environmental education serves many purposes including showcasing the Refuge's unique resources in a controlled setting and fostering public education of the Refuge, wildlife and natural resources. Students provided environmental educational opportunities frequently understand the uniqueness of the Refuge and its fish and wildlife and develop a greater appreciation and sense of ownership for the Refuge. School groups and other educational groups from San Joaquin, Stanislaus and Merced counties will be encouraged to use the Refuge.

Strategies:

5.6.1 Develop an educator-led age-appropriate curriculum for school children that is specific to the resources and goals of the San Joaquin River NWR.

5.6.2 Develop outdoor educational facilities, restroom facilities, parking, guides and other infrastructure necessary to accommodate school groups and buses.

5.6.3 Create an outreach program to recruit and educate teachers to use the Refuge for their environmental education programs.

5.6.4 Expand school use of the San Joaquin River NWR within five years to include four college or university groups and four secondary/primary school groups per annum.

5.6.5 Promote partnerships with educational groups (i.e., such as the existing partnership with the Modesto Rotary Club) to foster and facilitate environmental education opportunities at the San Joaquin River NWR.

Objective 7. Ensure public safety and security at the San Joaquin River NWR.

Narrative: A law enforcement presence at National Wildlife Refuges is crucial for the protection of the public and natural resources. Refuge law enforcement programs are proactive and seek to inform the public regarding Refuge regulations and prevent problems, rather than only enforcing statutes.

Strategies:

5.7.1 Use signs, brochures/fact sheets and the Complex's website to provide Refuge regulations to the visiting public.

5.7.2 Conduct periodic patrols by Refuge law enforcement staff at the San Joaquin River NWR to ensure compliance with Refuge regulations, public safety and natural resource protection.

5.7.3 Routinely examine and maintain public use facilities at the San Joaquin River NWR to determine and remedy unsafe conditions.

Environmental education at the Refuge.

Photo: USFWS



5.7.4 Extinguish all wildfires immediately on the San Joaquin River NWR by following the San Luis NWR Complex dispatch plan. Evacuate the public from the Refuge in the event of wildfire in public use areas.

Objective 8. Develop a public outreach program to provide information on the San Joaquin NWR, San Luis NWR Complex, National Wildlife Refuge System and the U.S. Fish and Wildlife Service.

Narrative: An outreach program is a key component in helping the public become aware of the Refuge, its resources and the public use programs developed for their use and enjoyment. An outreach program would also inform the public about the National Wildlife Refuge System and the Service.

Strategies:

5.8.1 Develop and install entrance and regulatory signs on all public access points to the San Joaquin River NWR.

5.8.2 Work with Caltrans to develop and install directional signs on public roads directing visitors to the San Joaquin River NWR.

5.8.3 Work with the news media to highlight the programs at the San Joaquin River NWR.

5.8.4 Conduct outreach activities regarding the San Joaquin River NWR at local festivals and events.

5.8.5 Develop and produce products to conduct public outreach for the San Joaquin NWR, including a new Complex general brochure, trail guides, posters, fact sheets and other items.

Objective 9. Establish both a volunteer program and Friends group to benefit the San Joaquin River NWR, its resources and its programs.

Narrative: Volunteer programs provide the capacity, at low economic cost, to benefit the Refuge in many different facets. Refuge volunteers can provide valued services in many programmatic areas, including biological monitoring, resource management, administration, nature interpretation, maintenance, and other areas. Volunteers frequently increase the productivity of a station, particularly when it is limited by staffing and funding shortages. A volunteer program also provides avenues for greater community involvement with the Refuge. A Friends group includes community residents who serve as advocates for the Refuge, sharing their enthusiasm about the Refuge with staff and the public. A Friends group typically focuses on conducting or facilitating some large-scale projects at the Refuge each year.

Strategies:

5.9.1 Develop a protocol for a San Joaquin River NWR volunteer program and integrate it with the San Luis NWR Complex's program.

5.9.2 Determine tasks and projects suitable for the volunteer program on a quarterly basis and implement.

5.9.3 Actively recruit volunteers through the media and via Refuge facilities.

5.9.4 Hold a volunteer recognition event annually for the San Luis NWR Complex.

5.9.5 Develop a Refuge Friends group with interested parties for either the San Joaquin River NWR or the San Luis NWR Complex to promote and foster the natural resources of the Refuge and ecoregion. (Same as strategy 4.4.4.)

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6 Management Plan Implementation

This CCP will serve as the primary reference document for San Joaquin River NWR planning, operations and management for the next 15 years or until it is formally revised or amended within that period. The Service will implement the CCP with assistance from existing and new partner agencies and organizations and the public. The timing and achievement of the management strategies proposed in this document are contingent upon a variety of factors, including:

- Funding & Staffing
- Step Down Plans
- Compliance Requirements
- Adaptive Management
- Plan Amendment and Revision

Each of these factors is briefly discussed as it applies to the CCP.

Funding & Staffing

The funding required to operate any national wildlife refuge includes initial capital outlay for equipment, facilities, labor and other expenditures, as well as annual, ongoing costs for staff, contracts, supplies, management, maintenance and other recurring expenses (See Table 2: Estimated Initial Capital Outlay to Implement the CCP). Initial expenditures for the Refuge as described in the CCP would cost approximately eight million dollars. Not all of these capital expenditures would accrue during the first year of implementation. For example, habitat development and research would be implemented over the entire length of the plan and select equipment, vehicles and staff may be borrowed or shared from other refuge units of the San Luis NWR Complex. The largest costs for this initial outlay are for habitat restoration and

implementation of a public use program. Funding for many of these individual projects will be sought through grants and cooperative partnerships.

At full staffing, personnel dedicated to the Refuge would include a refuge manager, maintenance worker, tractor operator and wildlife biologist. A new public use specialist would be shared with the other units comprising the San Luis NWR Complex. The other staff positions of the Complex are also shared among the different refuge units. Annual contracts or cooperative agreements will be issued for additional law enforcement, fire protection, invasive pest control and other activities as needed. These recurring costs are expected to annually total over half a million dollars (See Table 3: Estimated Annual Cost to Implement the CCP).

Step-Down Management Plans

Some projects or types of projects require more in-depth planning than the CCP process is designed to provide. For these projects, the Service prepares step-down management plans. In essence, step-down management plans provide the additional details necessary to implement management strategies identified in a CCP (See Appendix G: Step-Down Plans).

The National Wildlife Refuge System Manual lists more than 25 Step-Down Management Plans that might be needed at a refuge. These step-down management plans are typically revised at a more frequent interval than a CCP.

Current or anticipated step-down plans for the San Joaquin River NWR include:

- Plans that are current and up-to-date:
- Fire Management Plan (2001)

Table 2. Estimated Initial Capital Outlay to Implement the CCP

<i>Expenditure</i>	<i>Unit Cost</i>	<i>Unit</i>	<i>Quantity</i>	<i>Total Cost</i>
Office Rehabilitation	\$50,000	ea	1	\$50,000
Maintenance Shop Construction	\$250,000	ea	1	\$250,000
Parking Lot	\$5,000	ea	3	\$15,000
Replace Fencing	\$10,000	l.m.	2	\$20,000
Replace Gates	\$1,000	ea	7	\$7,000
Install Automatic Entrance Gate	\$10,000	ea	1	\$10,000
Erosion Control Materials/Supplies	\$10,000	NA	1	\$10,000
Habitat Restoration (Upland & Wetland)	\$6,000,000	NA	NA	\$6,000,000
Brush Rabbit Habitat Restoration	\$40,000	NA	NA	\$40,000
Lift Pump Rehabilitation & Fish Screens	\$100,000	ea	3	\$300,000
Pasture Rehabilitation	\$200	ac	150	\$30,000
Refuge GIS Capability	\$30,000	NA	NA	\$30,000
Public Tour Route and/or Trails	\$250,000	NA	NA	\$250,000
Photography Blinds	\$12,000	ea	2	\$24,000
Public Restrooms	\$20,000	ea	2	\$40,000
Information Kiosks & Display Panels	\$50,000	ea	3	\$150,000
Boundary Posting	\$30,000	NA	NA	\$30,000
Refuge and Regulatory Signs	\$3,000	ea	6	\$18,000
Boat Launch Facilities	\$25,000	ea	2	\$50,000
Structure Removal	\$20,000	ea	10	\$200,000
Recreational Hunt Infrastructure	\$10,000	ea	1	\$10,000
Recreational Fishing Infrastructure	\$40,000	ea	2	\$80,000
Concrete Removal	\$100,000	NA	NA	\$100,000
Dairy Waste Lagoon Cleanup	\$35,000	ea	1	\$35,000
Tractor	\$150,000	ea	1	\$150,000
Tractor Implements	\$8,000	ea	3	\$24,000
All Terrain Vehicle	\$6,000	ea	1	\$6,000
Misc. Fire Equipment	\$10,000	NA	NA	\$10,000
Security Alarms for Buildings	\$1,500	ea	3	\$4,500
Maintenance Equipment	misc	misc	misc	\$10,000
Environmental Education Equipment	misc	misc	misc	\$10,000
Grand Total:				\$7,963,500

Table 3. Estimated Annual Cost to Implement the CCP

<i>Expenditure</i>	<i>Unit Cost</i>	<i>Unit</i>	<i>Quantity</i>	<i>Total Cost</i>
Salaries and Benefits				
Complex Project Leader—GS 14	\$109,040	ea	0.2	\$21,808
Deputy Complex Project Leader—GS 13	\$92,270	ea	0.2	\$18,454
Refuge Manager—GS 12	\$83,000	ea	1.0	\$83,000
Complex Admin. Assistant—GS 9	\$50,164	ea	0.2	\$10,032
Complex Budget Technician—GS 6	\$34,070	ea	0.2	\$6,814
Engineering Equipment Operator—WG 9	\$61,100	ea	1.0	\$61,100
Tractor Operator—WG 6	\$57,200	ea	1.0	\$57,200
Complex Supervisory Wildlife Biol.—GS 12	\$83,000	ea	0.2	\$16,600
Complex Wildlife Biologist—GS 11	\$60,696	ea	0.2	\$12,139
Complex Wildlife Biologist—GS 11	\$60,696	ea	0.2	\$12,139
Complex Wildlife Biologist—GS 9	\$50,164	ea	0.2	\$10,032
Refuge Wildlife Biologist—GS 9	\$50,164	ea	1.0	\$50,164
Complex Public Use Specialist—GS 12	\$83,000	ea	0.2	\$16,600
Complex Public Use Specialist—GS 9	\$50,164	ea	0.3	\$15,049
Complex Park Ranger—GS 9	\$50,164	ea	0.2	\$10,032
Complex Fire Mgmt. Officer—GS 11	\$60,696	ea	0.2	\$12,139
Complex Fire Specialist—GS 9	\$50,164	ea	0.2	\$10,032
Complex Lead Forest Tech—GS 8	\$45,417	ea	0.2	\$9,083
Complex Perm. Seas. Forest Tech—GS6	\$34,070	ea	0.1	\$3,407
Complex Perm. Seas. Forest Tech—GS5	\$33,107	ea	0.1	\$3,311
Complex Perm. Seas. Forest Tech—GS5	\$33,107	ea	0.1	\$3,311
Complex Temp. Seas. Forest Tech—GS5	\$25,467	ea	0.1	\$2,547
Complex Temp. Seas. Forest Tech—GS4	\$22,762	ea	0.1	\$2,276
Complex Temp. Seas. Forest Tech—GS3	\$20,277	ea	0.1	\$2,027
Maintenance	\$50,000	ea	1.0	\$50,000
Invasive Weed Program	\$20,000	ea	1.0	\$20,000
Water/Pumping Costs	\$25,000	ea	1.0	\$25,000
Riparian Brush Rabbit Monitoring	\$10,000	ea	1.0	\$10,000
Water Quality Monitoring	\$10,000	ea	1.0	\$10,000
Travel/Training	\$5,000	NA	1.0	\$5,000
Supplies	\$25,000	ea	1.0	\$25,000
Printing	\$5,000	ea	1.0	\$5,000
Pump-out for restroom	\$5,000	ea	4.0	\$20,000
Grand Total:				\$619,296

- Spill Response Plan (2003)
- Safety Management Plan (2000)
- Continuity of Operations Plan (1999)

Plans that exist but need to be updated:

- Disease Management Plan (1983)
- Emergency Management Plan (1993)

Plans that need to be initiated:

- Water Management Plan
- Law Enforcement Plan
- Public Use Management Plan
- Upland Management Plan
- Fisheries Management Plan
- Invasive Exotic Plant Control Plan

Compliance Requirements

This CCP was developed to comply with all applicable Federal laws, executive orders, and legislative acts. Some activities, particularly those that involve revising an existing step-down management plan or preparing a new one, will need to comply with additional laws or regulations besides NEPA and the National Wildlife Refuge Improvement Act. In addition to these acts, full implementation of all components of this CCP requires compliance with other laws and mandates (See Appendix J: Relevant Federal Laws and Mandates).

Adaptive Management & Monitoring Evaluation

Adaptive management is the process of implementing policy decisions as scientifically driven experiments that test predictions and assumptions about management plans, using the resulting information to improve the plans. Management direction is periodically evaluated via a system of applying several options, monitoring the objectives, and adapting original strategies to reach desired objectives. Habitat, wildlife and public use management techniques and specific objectives will be regularly evaluated as results of a monitoring program and other new technology and information become available. These periodic evaluations would be used over time to adapt both the

management objectives and strategies to better achieve management goals. Such a system embraces uncertainty, reduces option foreclosure, and provides new information for future decision-making while allowing resource use. At a minimum, each year a checklist of the goals, objectives and management strategies of this CCP will be completed to assist in tracking and evaluating progress (Appendix P).

Monitoring

Monitoring is an essential component of the CCP. Monitoring strategies have been integrated into many of this plan's goals and objectives. Specific details, including monitoring strategies, methods, techniques and locations, will be outlined in a step-down Monitoring Plan. In this CCP, habitat monitoring receives an important emphasis.

All habitat management activities will be monitored to assess whether the desired effects on wildlife and habitat components have been achieved. Baseline surveys will be conducted for wildlife species for which existing or historical numbers and occurrences are not well known. Studies will also monitor wildlife responses to increased public use of the Refuge for fishing, hunting, wildlife observation and environmental education.

Monitoring will be designed and developed in cooperation with universities and non-governmental organizations to the greatest extent possible. Applied research can provide insight into ecological questions concerning habitat, wildlife and public use management. Refuge staff would work with researchers to ensure that investigations are applicable and compatible with Refuge objectives.

Maintaining and restoring habitat quality and quantity are a major means of accomplishing Refuge goals and objectives. Monitoring would focus on measuring vegetative diversity and abundance, water quality and quantity and wildlife response to management practices. Baseline surveys would be established for other species for which existing or historical numbers are not established.

Progress toward Refuge goals and objectives will be evaluated based on the results of this station's monitoring activities.

Plan Amendment and Revision

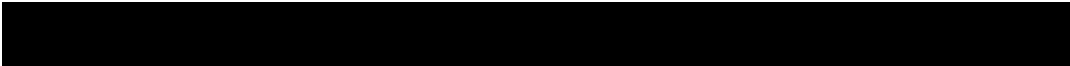
This CCP is intended to evolve as the Refuge changes, and the Improvement Act specifically requires formal revision and updating of CCPs at least every 15 years. The formal revision process would follow the same steps as the CCP creation process. In the meantime, the Service would be reviewing and updating this CCP periodically based on the results of its adaptive management program. This CCP would also be informally reviewed by Refuge staff while preparing annual work plans and updating Refuge databases. It may also be reviewed during routine inspections or programmatic evaluations. Results of any or all of these reviews may indicate a need to modify the plan.

The goals described in this CCP would not change until they are reevaluated as part of the formal CCP revision process. However, the objectives and strategies may be revised to better address changing circumstances or to take advantage of increased knowledge of

the resources at the Refuge. If changes are required, the level of public involvement and associated NEPA documentation would be determined by the Refuge Manager.

Refuge objectives and strategies are intended to be attained over the next 15 years. Management activities would be phased in over time and implementation is contingent upon and subject to results of monitoring and evaluation, funding levels and staffing.

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Appendices

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Appendix A: Glossary of Terms

Abiotic Factors. The non-living parts of an ecosystem, such as light, temperature, water, oxygen, and other nutrients or gases.

Accumulation. The build-up of a chemical in an organism due to repeated exposure (Henry and Hickey 1991).

Acorn. Fruit of an oak.

Acre-feet (AF). An acre-foot of water is the amount of water required to cover 1 acre of land to a depth of 1 foot; it is the equivalent of 325,851 gallons.

Adaptive Management. The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. A process that uses feedback from refuge research and monitoring and evaluation of management actions to support or modify objectives and strategies at all planning levels.

Alkalinity. Refers to the extent to which water or soils contain soluble mineral salts. Waters with a pH greater than 7.4 are considered alkaline.

Alluvial Fan. Accumulation of sediment where a stream moves from a steep gradient to a flatter gradient and suddenly loses transporting power.

Alluvium. Clay, sand, or other sediment that is gradually deposited by moving water (see also alluvial-fan).

Alternatives. Different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues. (1) A reasonable way to fix the identified problem or satisfy the stated need. (40 CFR 150.2) (2) Alternatives are different means of accomplishing refuge purposes and goals and contributing to the System mission (Draft Service Manual 602 FW 1.5).

Animal Unit Month (AUM). The amount of forage necessary to maintain one 1,000-pound animal for one month.

Appropriated Water. Surface water in an irrigation district that has been assigned or allocated to owners of water rights.

Appurtenant Land. The land base to which water rights legally pertain or belong.

Aquatic. Pertaining to water, in contrast to land. Living in or upon water.

Aquatic Habitat. The physical, chemical, and vegetative features that occur within the water of lakes, ponds, reservoirs, rivers, irrigation canals, and other bodies of water.

Aquifer. An underground layer of porous rock, sand, or gravel containing large amounts of water.

Artifact. An object made by humans; usually in reference to primitive tools, vessels, weapons, etc.

ATV. All Terrain Vehicle (either 3 or 4-wheeled vehicles).

Backward Linkages. The impacts associated with the purchase of inputs needed to produce a good whose output will change as a direct consequence of the water rights acquisition program.

Bank. The rising ground bordering a body of water or forming the edge of a cut or hollow.

Basin. A depressed area with little or no surface water; an area where water flows in, but where surface water does not flow out.

Bench Land. Eligible land with a water duty of 4.5 AF/acre/year.

Berries. Pulpy fruit of relatively small size.

Biodiversity (biological diversity). Refers to the full range of variability within and among biological communities, including genetic diversity, and the variety of living organisms, assemblages of living organisms, and biological processes. Diversity can be measured in terms of the number of different items (species, communities) and their relative abundance, and it can include horizontal and vertical variability. The variety of life, including the variety of living organisms, the genetic differences among them, and the communities in which they occur.

Biological Control. The use of organisms or viruses to control weeds or other pests.

Biological Integrity. Biotic composition, structure, and functioning at the genetic, organism, and community levels consistent with natural conditions, including the natural biological processes that shape genomes, organisms, and communities.

Biosphere. Synonym: ecosphere. Literally, the “living circle.” The portion of our planet (or any other, should life be discovered elsewhere) that contains and supports life. On Earth, this layer is roughly 7 to 8 miles high and, at the deepest depths of the oceans, about 7 miles (a little more than 38,000 feet) deep. All life exists within this thin veneer circling the globe. The biosphere is subdivided into three main sections: lithosphere (the solid part of the planet’s surface), hydrosphere (the water on and under the planet’s surface), and atmosphere (the mass of air surrounding the planet).

Biome. A broad category of habitat; a type of ecosystem. Often characterized by a particular type of climax vegetation. May also be characterized by crucial abiotic factors, such as rainfall or temperature (both of which greatly influence what kind of climax vegetation will be present) values.

Biota. The plant and animal life of a region.

Biotic Factors. All the living organisms—fungi, protists, vertebrate, invertebrate, plants, etc.—and their impacts on other living things within an ecosystem.

Bogs. Low-lying and inadequately drained areas rich in plant residues.

Bottom Land. Eligible land with a water duty of 3.5 AF/acre/year.

Canal Losses. Seepage, evaporation, and operational spills from main-line canals and regulatory reservoirs.

Carbon Banking. The storage of atmospheric carbon in living tissues. Carbon is the most fundamental element of organic chemistry, so it is a major component of all living organisms.

The largest “banks” are primary growth forests, especially tropical forests. The value of carbon banking is the removal of carbon from the atmosphere, where it contributes to the greenhouse effect.

Carcinogenic. Any substance that produces or causes cancer.

Carnivore. An animal that kills and eats other animals.

Categorical Exclusion (CE, CX, CATEX, CATX). A category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a Federal agency pursuant to the National Environmental Policy Act (40 CFR 1508.4).

CFR. Code of Federal Regulations.

Community. The combined populations of all organisms in a given area, and their interactions. For example, the frogs, fish, algae, cattails, and lily pads in a backyard pond make up a community.

Compatible Use. A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the Mission of the System or the purposes of the refuge (Draft Service Manual 603 FW 3.6).

Comprehensive Conservation Plan (CCP). A document that describes the desired future conditions of the refuge or planning unit; and provides long-range guidance and management direction to accomplish the purposes of the refuge, helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates.

Concern. See Issue.

Cones. Ovule-bearing mass of scales or bracts of gymnosperm trees.

Coordination Area. A wildlife management area made available to a State, by “(A) cooperative agreement between the United States Fish and Wildlife Service and the State fish and game agency pursuant to Section 4 of the Fish and Wildlife Coordination Act (16 U.S.C. 664); or (B) by long-term leases or agreements pursuant to the Bankhead-Jones Farm Tenant Act (50 Stat. 525; 7 U.S.C. 1010 et seq.).” States manage Coordination Areas, but they are part of the Refuge System. We do not require CCPs for Coordination Areas.

Cultural Resource. The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, such as a sacred area of native peoples) of an area. It includes historical, archaeological and architectural significant resources.

Cultural Resource Inventory. A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4 (Service Manual 614 FW 1.7).

Cultural Resource Overview. A comprehensive document prepared for a field office that discusses, among other things, its prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved. An overview should reference or incorporate information from a field offices background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).

Delivery. The amount of irrigation water delivered to a water-users head gate during the irrigation season.

Demand. The amount of water that a water-right holder calls for or requests in any one irrigation season. Under Nevada State law demand should not exceed entitlement.

Deposits. Material that is laid down through the actions of wind, water, ice, or other natural process.

Designated Wilderness Area. An area designated by the United States Congress to be managed as part of the National Wilderness Preservation System (Draft Service Manual 610 FW 1.5).

Detritus. An accumulation of decomposing plant and animal remains.

Dissolved-Solids. Particles that are dissolved and suspended in water. See also total dissolved solids.

Diversion. A structure in a river or canal that diverts water from the river or canal to another water course.

Downzoning. The act of reclassifying a land use of a particular area or property to a lower development-intensity land use classification; such as from moderate density residential to agriculture.

Drain. A canal that collects and transports excess water from irrigated farmland.

Drainwater. See irrigation drainwater.

Easement. A privilege or right that is held by one person or other entity in land owned by another.

Ecological Integrity. The integration of biological integrity, natural biological diversity, and environmental health; the replication of natural conditions.

Ecology. The branch of biology that studies the interactions of organisms within an environment, either with other organisms (biotic factors) or with the non-living components (abiotic factors) of that ecosystem.

Ecosystem. The sum of all interacting parts of the environment and associated ecological communities within a particular area; an ecological system. Many levels of ecosystems have been recognized. Very few, if any ecosystems are self-contained; most influence, or are influenced by, components or forces outside the system. For administrative purposes, we have designated 53 ecosystems covering the United States and its possessions. These ecosystems generally correspond with watershed boundaries, and their sizes and ecological complexity vary.

Ecosystem Approach. Protecting or restoring the natural function, structure, and species composition of an ecosystem, recognizing that all components are interrelated.

Effect. A change in a resource, caused by a variety of events including project attributes acting on a resource attribute (direct), not directly acting on a resource attribute (indirect), another project attributes acting on a resource attribute (cumulative), and those caused by natural events (e.g., seasonal change).

Efficiency. With reference to an irrigation water delivery system, the proportion of the amount of water delivered for irrigation use compared to the total amount of water released to meet that delivery (i.e., amount of delivery divided by amount of release).

Effluent. Waste material discharged into the environment from a wastewater treatment facility.

Emergent Vegetation. Rooted, aquatic plants that have most of their vegetative (nonroot) parts above water.

Endemic Species. Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

Endangered Species. Any species that is in danger of extinction throughout all or a significant portion of its range and listed as such by the Secretary of the Interior in accordance with the Endangered Species Act of 1973. Endangered species are afforded protection under the Act as amended and under various State laws for State-listed species.

Entitlement. The annual maximum amount of water which can be delivered to a parcel of land, a product of eligible acres and water duty (expressed in acre-feet).

Environment. The sum total of all biological, chemical, and physical factors to which organisms are exposed; the surroundings of a plant or animal.

Environmental Assessment (EA). A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).

Environmental Health. Abiotic composition, structure, and functioning of the environment consistent with natural conditions, including the natural abiotic processes that shape the environment

Environmental Impact Statement (EIS). A detailed written statement required by section 102(2)(C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).

Ephemeral. Pertains to streams, lakes and wetlands that exist temporarily each year.

Ethnography. The branch of anthropology that deals descriptively with specific cultures, especially those of non-literate peoples.

Evapotranspiration. The collective processes by which water is transferred from the surface of the earth, including from the soil and the surface of water-bodies (through evaporation) and from plants (through transpiration).

Exotic and Invading Species (Noxious Weeds). Plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insects or disease; or nonnative, new, or not common to the United States, according to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or has adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

Fallow. Allowing land that normally is used for crop production to lie idle.

Farm Profits. Sales minus fixed and variable costs.

Fauna. All the plant species of a determined area.

Federal Trust Resources. A trust is something managed by one entity for another who holds the ownership. The Service holds in trust many natural resources for the people of the United States of America as a result of Federal Acts and treaties. Example are species listed under the Endangered Species Act, migratory Birds protected by the Migratory Bird Treaty Act and other international treaties, and native plant or wildlife species found on the Refuge System.

Ferns. Spore-forming vascular plants with leaf-like fronds.

Finding of No Significant Impact (FONSI). A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a Federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).

Flyway. A route taken by migratory birds between their breeding grounds and their wintering grounds. Four primary migration routes have been identified for birds breeding in North America: the Pacific, Central, Mississippi, and Atlantic Flyways.

Foraging. The act of feeding; another word for feeding.

Forbs. Herbaceous dicotyledonous plants.

Forward Linkages. Impacts that are associated with the use of goods whose production will change as a direct consequence of the water rights acquisition program. For instance, if additional cost to an alfalfa producer is incurred due to water rights acquisitions, this cost will be passed on to dairy producers by forward linkages.

Fragmentation. The process of reducing the size and connectivity of habitat patches.

Friable Soil. Easily crumbled or pulverized soil.

Fruit. Pulpy fruit reproductive body of a seed plant.

Fungi. Saprophytic spore-forming, nonvascular plants such as mushrooms, molds, etc.

GIS. Geographic Information System. Refers to such computer mapping programs as ArcView, ArcInfo, ERDAS, etc.

Goal. Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Draft Service Manual 620 FW 1.5).

Grain. A single, hard seed of a cereal grass.

Graminoids. Grasses and grass-like plants.

Gravelly Soil. Soil dominated by gravel size grains 2 to 75 mm (.08 to 3.0) in diameter).

Greenhouse Effect. Warming of the surface and lower atmosphere of a planet caused by conversion of solar radiation into heat. The process of gases trapping heat from the sun in the Earth's atmosphere is called the greenhouse effect.

Habitat. Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.

Habitat Restoration. Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy forestlands, rangelands, and aquatic systems.

Head gate. The control works or gate at the entrance to a canal or conduit system.

Head gate entitlement. The amount of water/AF/year to which a particular water right is entitled.

Humus. The nutrient-rich, dark dirt found in areas with lots of decaying organic material suspended in the soil. Commonly referred to as "topsoil." Humus is generally rich in saprobes and saprophytes (things that get their nutrients by decomposing dead organic materials, thereby speeding the nutrient cycles and making the soil richer).

Hydrologic Regime. The local pattern and magnitude of water flow influenced by season.

Hydrology. The science dealing with the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere. The distribution and cycling of water in an area.

Hydrothermal. Relating to hot water-especially to the formation of minerals by hot solutions rising from a cooling magma. Underwater volcanoes can form hydrothermal chimneys.

Impoundment. A body of water created by collection and confinement within a series of levees or dikes thus creating separate management units although not always independent of one another.

Impact. See effect.

Informed Consent. The grudging willingness of opponents "to go along" with a course of action that they actually oppose (Bleiker).

Indigenous. Native to the area.

Industry Outputs. The estimated value of commodities produced in any given year.

Integrated Pest Management (IPM). Methods of managing undesirable species, such as weeds, including education; prevention, physical or mechanical methods or control; biological control; responsible chemical use; and cultural methods.

Invertebrate. Animals that do not have backbones. Included are insects, spiders, mollusks (clams, snails, etc.), and crustaceans (shrimp, crayfish, etc.).

Irrigated Acreage. The amount of land that is irrigated.

Irrigation Delivery. Refers to the delivery of water for irrigation purposes.

Irrigation Drainwater. Ideally, subsurface water which flows from irrigated land and generally transports higher concentrations of dissolved salts than the water applied to the land.

Irrigation Return Flow. Water which reaches surface drainage by overland flow or through groundwater discharge as a result of applied or natural irrigation.

Issue. Any unsettled matter that requires a management decision, e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition.

Lacustrine. Of or pertaining to lakes. More specifically, this term refers to permanent, seasonal, and intermittent lakes and reservoirs that typically have depths exceeding 6 feet and are larger than 20 acres, and that have less than 30 percent of their area covered by emergent wetlands vegetation.

Landowner. A person or entity indicated as the owner of property on the various ownership maps maintained by the Office of the County Assessor.

Lease. A legal contract by which water rights are acquired for a specified period of time for a specified rent or compensation.

Levee. An embankment along the river to prevent water from overbank flooding.

Lichens. Algal-fungal symbiotic associations on solid surfaces.

Linear Regression. A mathematical technique used to determine the functional relationship between two variables; the resulting model can be used to predict the values of one variable when values of the other variable are given.

Lithic. A scatter of rocks less than 254 mm (10 in) in diameter on the ground.

Management Alternative. See Alternative.

Management Concern. See Issue.

Management Opportunity. See Issue.

Marsh. A periodically wet or continually flooded area where the water is shallow enough to allow the growth of emergent vegetation such as sedges, rushes, and cattails.

Marsh Habitat. Habitat that is characterized by shallow water and emergent vegetation. Unless otherwise specified, this term does not apply to similar habitat found in rivers, drains, or canals.

Migration. The seasonal movement from one area to another and back.

Migratory Bird. A bird that seasonally moves between geographic areas. In reference to birds in the Great Basin, a bird that breeds in Great Basin and subsequently moves south of the Great Basin for the winter months. Birds that migrate south of Mexico for the winter are considered neotropical migrants.

Mission Statement. Succinct statement of the unit's purpose and reason for being (Region 7 Planning Staff).

Mitigation. To avoid or minimize impacts of an action by limiting the degree or magnitude of the action; to rectify the impact by repairing, rehabilitating, or restoring the affected environment; to reduce or eliminate the impact by preservation and maintenance operations during the life of the action.

Mobilization. Transport or movement of an element or other substance into the water column.

Model. A mathematical formula that expresses the actions and interactions of the elements of a system in such a manner that the system may be evaluated under any given set of conditions.

Moist-Soil. A process where water is drawn down intentionally or naturally to produce mudflats (i.e., moist soil) that are required for germination of many desirable plants.

Moss. Bryophytic plants.

Mud Flat. Expanses of mud contiguous to a water body often covered and exposed by tides.

Multiplier. A number by which another number is multiplied. Used in economic analysis to show linkages.

National Environmental Policy Act (NEPA). An act which encourages productive and enjoyable harmony between humans and their environment, to promote efforts that will prevent or eliminate damage to the environment and atmosphere, to stimulate the health and welfare of humans. The act also established the Council on Environmental Quality (CEQ). Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making (from 40 CFR 1500).

National Wildlife Refuge (Refuge or NWR). A designated area of land or water or an interest in land or water within the system, including national wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas (except coordination areas) under the Service jurisdiction for the protection and conservation of fish and wildlife. A complete listing of all units of the Refuge System may be found in the current *Report of Lands Under Control of the U.S. Fish and Wildlife Service*.

National Wildlife Refuge System, Refuge System, or System. Various categories of areas that are administered by the Secretary for the conservation of fish and wildlife, including species that are threatened with extinction; all lands, waters, and interest therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; game ranges; wildlife management or waterfowl production areas.

National Wildlife Refuge System Mission (mission). “The mission of the System is to administer a national network of lands and waters for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”

Native Species. Species that normally live and thrive in a particular ecosystem.

NEPA. National Environmental Policy Act of 1969.

Nectar. The sweet fluids secreted by flowers.

Nest Box. A box constructed to provide secondary cavity nesters a nesting site.

Nest Platform. An elevated platform constructed as a large bird nesting site.

Nest Island. An island constructed for bird nesting.

Niche. An organism’s “place,” or role, in an ecosystem. This involves many components of the organism’s life: where it lives (habitat), what it eats, by whom it is eaten, when it migrates or breeds, etc. All of these factors combine to determine the role of the organism in its ecosystem.

No Action Alternative. An alternative under which existing management would be continued.

Non-Priority Public Uses. Any use other than a compatible wildlife-dependent recreational use.

Non-Structural Alternative: A hydraulically based flood control design alternative versus an engineered “hard” solution for control of flood waters.

Notice of Intent (NOI). A notice that an environmental impact statement will be prepared and considered (40 CFR 1508.22). Published in the *Federal Register*.

Nuts. Hard-shelled, dry fruit.

NWR. National Wildlife Refuge.

Objective. A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Make objectives attainable, time-specific, and measurable.

Operation and Maintenance (O&M) Costs. Charges paid by water users for delivery of water in the Newlands Project that are paid to the Newlands Project operator for reasonable and customary operation and maintenance of the delivery system.

Opportunities. Potential solutions to issues.

Organic Soil. Soil which contains greater than 20 percent of organic matter by weight.

Overbank Flooding. River flows that exceed the boundaries of the existing river channel and flood the adjacent riparian areas and bottomlands.

Palustrine. Of or pertaining to marshes or marsh habitat. More specifically, for this document, this term refers to permanently, seasonally, and intermittently flooded areas that typically have depths less than six feet and that have more than 30 percent of their area covered by emergent wetland vegetation.

Passerine Bird. A songbird or other perching bird that is in the order Passeriformes. Blackbirds, crows, warblers, sparrows, and wrens for example.

Perennial. In reference to a body of water; one that contains water year-to-year and that rarely goes dry.

Pasture Land. Eligible land with a water duty of 1.5 AF/acre/year.

Peak Flow. The maximum discharge of a stream during a specified period of time.

Permeability. The property or capacity of porous rock, sediment, or soil to transmit water.

Phenology. Life cycle of particular species.

Phreatophytes. Plants whose roots penetrate to the water table.

Physiographic. Physical geography of a particular region of the U.S.

PILT. Payment-in-Lieu-of-Taxes.

Planning Area. The area upon which the planning effort will focus. A planning area may include lands outside existing planning unit boundaries currently studied for inclusion in the Refuge System and/or partnership planning efforts. It also may include watersheds or ecosystems outside of our jurisdiction that affect the planning unit. At a minimum, the planning area includes all lands within the authorized boundary of the refuge.

Planning Team. A team or group of persons working together to prepare a document. Planning teams are interdisciplinary in membership and function. Teams generally consist of a Planning Team Leader, Refuge Manager and staff biologists, a state natural resource agency representative, and other appropriate program specialists (e.g., social scientist, ecologist, recreation specialist). We also will ask other Federal and Tribal natural resource agencies to provide team members, as appropriate. The planning team prepares the CCP and appropriate NEPA documentation.

Planning Team Leader. The Planning Team Leader typically is a professional planner or natural resource specialist knowledgeable of the requirements of NEPA and who has planning experience. The Planning Team Leader manages the refuge planning process and ensures compliance with applicable regulatory and policy requirements.

Planning Unit. A single refuge, an ecologically or administratively related refuge complex, or distinct unit of a refuge. The planning unit also may include lands currently outside refuge boundaries.

Plant Community. An assemblage of plant species of a particular composition. The term can also be used in reference to a group of one or more populations of plants in a particular area at a particular point in time; the plant community of an area can change over time due to disturbance (e.g., fire) and succession.

Playa. A shallow basin where water collects and is evaporated.

Pollutant. Any introduced gas, liquid, or solid that makes a resource unfit for a specific purpose.

Population. All the members of a single species coexisting in one ecosystem at a given time.

Preferred Alternative. This is the alternative determined (by the decision maker) to best achieve the Refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management. The Service's selected alternative at the Draft CCP stage.

Prescribed Fire. The skillful application of fire to natural fuels under conditions of weather, fuel moisture, soil moisture, , etc., that allows confinement of the fire to a predetermined area and produces the intensity of heat and rate of spread to accomplish planned benefits to one or more objectives of habitat management, wildlife management, or hazard reduction.

Prescribed Natural Fires. A fire ignited by natural process (usually lightning) and allowed to burn within specified parameters of fuels, weather, and topography to achieve specified resource management objectives.

Primary Wetland Habitat. Habitat provided by shallow or deep water (up to 6-feet deep), with or without emergent and aquatic vegetation. Primary wetland habitat only exists when and where a primary wetland or portion of a primary wetland is flooded with water (visible surface water). Consequently, the size and shape of "primary wetland habitat" will fluctuate from season-to-season and year-to-year while the size and shape of the "primary wetland" within which primary wetland habitat occurs will remain constant from season to season and from year to year. Primary wetlands only provide habitat for waterfowl, shorebirds, muskrats, aquatic insects, and other wetland-dependent wildlife when they contain surface water (i.e., when they provide wetland habitat).

Prime Farmland. Farmland in an area or region that is considered to be the most ideal farmland based on several criteria; usually soil types and land productivity of the land are two of the most important criteria.

Prime Water. Any water delivered via a canal to a head gate.

Priority Public Uses. Compatible wildlife-dependent recreation uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).

Proposed Action. The Service's proposed action for Comprehensive Conservation Plans is to prepare and implement the CCP.

Public. Individuals, organizations, and groups; officials of Federal, State, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in Service issues and those who do or do not realize that Service decisions may affect them.

Public Involvement. A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.

Public Involvement Plan. Broad long-term guidance for involving the public in the comprehensive planning process.

Public Scoping. See public involvement.

Purposes of the Refuge. “The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit.” For refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge. .

Purveyor. A private land owner or association that controls water rights for the ability to use the water.

Raptor. A bird of prey, such as a hawk, eagle, or owl.

Recommended Wilderness. Areas studied and found suitable for wilderness designation by both the Director and Secretary, and recommended for designation by the President to Congress. These areas await only legislative action by Congress in order to become part of the Wilderness System. Such areas are also referred to as “pending in Congress” (Draft Service Manual 610 FW 1.5).

Record of Decision (ROD). A concise public record of decision prepared by the Federal agency, pursuant to NEPA, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).

Recreation Day. A standard unit of use consisting of a visit by one individual to a recreation area for recreation purposes during any reasonable portion or all of a 24-hour period.

Refuge. Short of National Wildlife Refuge.

Refuge Goal. See goal.

Refuge Operating Needs System (RONS). The Refuge Operating Needs System is a national database that contains the unfunded operational needs of each refuge. We include projects required to implement approved plans and meet goals, objectives, and legal mandates.

Refuge Purposes. The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, a refuge unit, or refuge subunit (Draft Service Manual 602 FW 1.5).

Refuge Revenue Sharing Program or RRSF. Proves payments to counties in lieu of taxes using revenues derived from the sale of products from refuges.

Refuge Use. Any activity on a refuge, except administrative or law enforcement activity carried out by or under the direction of an authorized Service employee.

Remediation. The act or process of correcting a problem.

Reservoir. An artificially created lake in which water is collected and stored for future use.

Reservoir Storage. The volume of water held in a reservoir at any particular time.

Return Flow. See irrigation return flow.

Riparian Area. The land adjacent to rivers, streams, and irrigation canals and drain ditches where vegetation is influenced by higher amounts of water than the surrounding lands. For the purpose of this EIS, riparian areas do not include the land surrounding lakes and basin marshes.

Riverine. Living or situated on the banks of a river; related to, formed by, or resembling a river.

RMIS. Refuge Management Information System database

Roots. The underground parts of plants.

Sales. Gross cash receipts.

Saline Soil. Soils which are saline or alkaline, supporting vegetation which is salt tolerant (e.g., pickleweed, salt grass, shadscale, iodine bush).

Salinity. An expression of the amount of dissolved solids in water.

Sand Dune. A hill or ridge of sand piled up by the wind.

Sandy Soil. Soil dominated by sand grain .05 to 2 mm (.002 to .08 in) in diameter.

Sap. The fluid part of a plant.

Secretary. Short of the Secretary of the Interior.

Sediment. Any material, carried in suspension by water, which ultimately settles to the bottom of water courses. Sediments may also settle on stream banks or flood plains during high water flow.

Seeds. The ovules of plants.

Service. Or USFWS. Short for U.S. Fish and Wildlife Service.

Shorebirds. Long-legged birds, also known as waders, belonging to the Order Charadriiformes that use shallow wetlands and mud flats for foraging and nesting.

Shrubs. Woody plants of smaller stature than trees when fully grown.

Soil Erosion. The wearing away of the land's surface by water, wind, ice, or other physical process.

Sound Professional Judgement. A finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to the requirements of the Refuge Administration Act and other applicable laws.

Spatial Distribution. The pattern of frequency of a specific habitat type over a larger area.

Species. A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.

Species Composition. A group of species that inhabit a specific habitat type in its healthy state. To enhance species composition is to ensure that all or as many species as possible inhabit the appropriate habitat by improving the quality of that habitat.

Spill. With reference to a reservoir operations, water that is released, either inadvertently or through precautionary releases, in excess of that required to compensate for delivery system losses and to meet irrigation demand.

Spillway. The overflow channel of a dam.

Step-Down Management Plan. A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives.

Strategy. A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (Draft Service Manual 602 FW 1.5).

Submergent Vegetation. Plants that grow completely submerged except when flowering.

Sub-surface Drainage. Irrigation water that percolated into the soil and subsequently flows under the surface of irrigated farmland into drains.

Surface Water. A body of water that has its upper surface exposed to the atmosphere.

System or Refuge System. National Wildlife Refuge System.

Talus. A slope formed by an accumulation of rock debris, often at the base of a cliff.

Targeting. A technique for acquiring or protecting water-rights whereby specific areas could be targeted, based on soil type classification or other relevant variables.

Terminus. In reference to a stream or river; its end point; where it flows into a lake or other basin.

Threatened Species. Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, and one that has been designated as a threatened species in the *Federal Register* by the Secretary of the Interior. Threatened species are afforded protection under the Endangered Species Act of 1973.

Tiering. The coverage of general matters in broader environmental impact statements with subsequent narrower statements of environmental analysis, incorporating by reference, the general discussions and concentrating on specific issues (40 CFR 1508.28).

Total Dissolved-Solids (TDS). The total concentration of solids (or salts) dissolved in water; specific conductance is a surrogate measure of dissolved solids. More specifically, total dissolved-solids is an aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, nitrates, etc. of calcium, magnesium, manganese, sodium, potassium, and other cations that form salts.

Trace Elements. Metallic elements (with atomic number >21) generally occurring in trace amounts in water, including iron, manganese, copper, chromium, arsenic, mercury, and vanadium.

Transfer Rate. The use-rate for a water right that is transferred from an owner to a buyer during a transaction.

Transient Species. Animals that migrate through a locality without breeding or overwintering.

Trust Species. Species for which the U.S. Fish and Wildlife Service has primary responsibility, including, most federally listed threatened and endangered species, anadromous fishes once they enter inland U.S. waterways, migratory birds, and certain marine mammals.

Turbidity. Cloudiness of a water body caused by suspended silt, mud, pollutants, or algae.

Understory. Shrubs and herbaceous plants that typically grow beneath larger trees in a woodland.

Unit Objective. See objective.

Unconsolidated. A geological term that describes soil that is not compacted.

Upland. An area where water normally does not collect and where water does not flow on an extended basis. Uplands are non-wetland areas.

Use-rate. The amount of water/AF/year to which a particular water right is entitled.

USFWS or Service. Short for U.S. Fish and Wildlife Service.

U.S. Fish and Wildlife Service Mission. Our mission is working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

Vegetation Community. See plant community.

Vegetation Type or Habitat Type. A land classification system based upon the concept of distinct plant associations.

Vernal Pool. Seasonally flooded depressions found on ancient soils with an impermeable layer such as a hardpan, claypan, or volcanic basalt. The impermeable layer allows the pools to retain water much longer than the surrounding uplands; nonetheless, the pools are shallow enough to dry up each season. Vernal pools often fill and empty several times during the rainy season. Only plants and animals that are adapted to this cycle of wetting and drying can survive in vernal pools over time.

Vertebrate. An animal having a segmented backbone or vertebral column; includes mammals, birds, fish, amphibians, and reptiles.

Vision Statement. A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System mission and specific refuge purposes, and other mandates. We will tie the vision statement for the refuge to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates.

VOW. Valley oak woodland habitat

Water Duty. The maximum rate at which water can legally be delivered to a farm head gate to satisfy a water right, usually expressed in AF/acre/year.

Water Year. That period of time between October 1 of one calendar year and September 30 of the next calendar year. Traditionally, hydrologic data (i.e., stream flows, precipitation, etc.) was summarized or totaled for this period of time.

Waterfowl. A group of birds that include ducks, geese, and swans (belonging to the order Anseriformes).

Water-righted Acreage. The land base for which there are water rights.

Water Rights. A grant, permit, decree, appropriation, or claim to the use of water for beneficial purposes, and subject to other rights of earlier date of use, called priority, or prior appropriation.

Watershed. The entire land area that collects and drains water into a river or river system.

Wetland. Land that is transitional between upland (terrestrial) and aquatic systems (greater than about 6-feet deep) where the water table is usually at or near the surface or the land is covered by shallow water... wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes (plants that require wet conditions); (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin and others, 1979).

Wetland Habitat. Habitat provided by shallow or deep water (but less than 6-feet deep), with or without emergent and aquatic vegetation in wetlands. Wetland habitat only exists when and where a wetland or portion of a wetland is covered with water (visible surface water). Consequently, the size and shape of “wetland habitat” will fluctuate from season-to-season and year-to-year while the size and shape of the “wetland” within which wetland habitat occurs will remain constant from season to season and from year to year. Wetlands only provide habitat for waterfowl, shorebirds, muskrats, aquatic insects, and other wetland-dependent wildlife when they contain surface water (i.e., when they provide wetland habitat).

Wilderness Review. The process we use to determine if we should recommend Refuge System lands and waters to Congress for wilderness designation. The wilderness review process consists of three phases: inventory, study, and recommendation. The inventory is a broad look at the refuge to identify lands and waters that meet the minimum criteria for wilderness. The study evaluates all values (ecological, recreational, cultural), resources (e.g., wildlife, water, vegetation, minerals, soils), and uses (management and public) within the Wilderness Study Area. The findings of the study determine whether or not we will recommend the area for designation as wilderness.

Wilderness Study Areas. Lands and waters identified through inventory as meeting the definition of wilderness and undergoing evaluation for recommendation for inclusion in the Wilderness System. A study area must meet the following criteria: (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 contiguous roadless acres or is sufficient in size as to make practicable its preservation and use in an unimpaired condition (Draft Service Manual 610 FW 1.5).

Wilderness. See designated wilderness.

Wildfire. A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

Wildland fire. Every wildland fire is either a wildfire or a prescribed fire (Service Manual 621 FW 1.3)

Wildlife. All nondomesticated animal life; included are vertebrates and invertebrates.

Wildlife Corridor. A landscape feature that facilitates the biologically effective transport of animals between larger patches of habitat dedicated to conservation functions. Such corridors may facilitate several kinds of traffic, including frequent foraging movement, seasonal migration, or the once in a lifetime dispersal of juvenile animals. These are transition habitats and need not contain all the habitat elements required for long-term survival of reproduction of its migrants.

Wildlife-Dependent Recreational Use. "A use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation." These are the six priority public uses of the Refuge System as established in the National Wildlife Refuge System Administration Act, as amended. Wildlife-dependent recreational uses, other than the six priority public uses, are those that depend on the presence of wildlife. We also will consider these other uses in the preparation of refuge CCPs; however, the six priority public uses always will take precedence.

Zoning. The act of dividing a city or county into zones, and assigning particular, allowable land uses for each of the defined zones; also used in reference to the end product of such a process.

Zooplankton. Small animals free-floating in the oceans and lakes of the world. Unable to control their movements through the oceans, they are at the mercy of the currents and tides. They feed on smaller zooplankton or on phytoplankton. Examples of zooplankton would include true plankton (animals that will remain planktonic all their lives) such as jellyfish, ctenophores, chaetognaths, and—the most important of all plankton—the shrimp-like krill of the south oceans. Zooplankton also includes transient plankton (organisms that will not remain planktonic for their whole lifecycle) such as baby crabs and lobsters, newly hatched fish, coral larvae, etc.

Appendix B: Response to Comments on the Draft CCP/EA

Comments by the public, organizations, and agencies on the draft Comprehensive Conservation Plan (CCP) of the San Joaquin River National Wildlife Refuge (NWR) were solicited during July 2006. Electronic and hard copies of the draft CCP were placed in four local libraries, and were made available at the main office of the San Luis NWR Complex, for the convenience of the public. The document was also available to the public on the U.S. Fish and Wildlife Service's California-Nevada Operations Planning Office's website. A FWS press release was issued regarding the opportunity for public comment on the CCP in July 2006. A local newspaper (Patterson Irrigator) printed a story on the CCP during this process to encourage public comment. In addition, 150 hard copies and 150 compact disks of the CCP were mailed to individuals, organizations, and agencies listed on the CCP mailing list (Appendix K).

A limited number of comments (less than ten) were received from this effort. Several phone calls from the public or organizations/agencies were also received regarding the CCP; all were in favor of the preferred management alternative in the CCP. The California State Clearinghouse, which includes all state agencies including the California Department of Fish and Game, indicated they had no comments regarding the draft CCP. All written and or oral comments were grouped by category for response. Most of these issues had previously been identified during the planning process and addressed in the CCP.

Selection of Alternative

All respondents which indicated a preference selected the Service's preferred alternative – Alternative D: Biodiversity Focus. All felt this alternative met the broadest needs of the resources and a public use program at the San Joaquin River NWR.

Wetland Management

One respondent was unclear on the definition of the different wetland types mentioned in the CCP. These are defined in Chapter 3 – Refuge Settings. The need for shorebird management on the Refuge was also expressed; FWS agrees, and this need is included under Goal 1 (Biological Diversity), Objective 1 (management of wetlands), Objective 2 (management of seasonal wetlands), and Objective 8 (developing a Refuge inventory and monitoring plan).

Upland and Cropland Management

One reviewer stressed the need to not only control invasive weeds on pasture/grasslands as listed in Goal 3 (Aleutian Canada Goose), Objective 1; but also to control these invasives in winter wheat. This issue is covered in Goal 3 (Aleutian Canada Goose), Objective 2.

It was also suggested that Goal 3 (Aleutian Canada Goose), Objective 1.3 Work with CLMA operators to temporarily flood portions of pastures that receive high goose and other wildlife use during October and November to create wet meadow conditions be done in conjunction with neighboring landowners rather than on the Refuge. The Service agrees with part of this suggestion and has modified Objective 3.1.3 to read "Work with CLMA operators to temporarily flood portions of pastures that receive high goose and other wildlife use during October and November to create wet meadow condition. Coordination of pasture flooding with neighboring landowners will be conducted to ensure an optimal amount of wet meadow conditions."

It was also suggested for Goal 3 (Aleutian Canada Goose), Objective 2.4 that standing corn mowing be reviewed annually and modified as necessary. This strategy was changed by adding the following sentence to Objective 2.4A: Review the mowing sequence and timing annually to meet program needs.

Public Use Activities

Most respondents agreed with the Service's preferred alternative of focusing the Refuge's public use program on the Service's six priority public use activities: wildlife observation, nature interpretation, photography, hunting, fishing, and environmental education.

Several respondents indicated that the different public use activities should not conflict with one another. In order to reduce and/or eliminate potential conflicts, the CCP indicates several step-down plans will be prepared; these plans will address any concerns including potential conflicts of different public use activities. Any hunting program implemented will be developed to eliminate/reduce conflicts with other public use activities, and will be designed to reduce disturbance to sensitive wildlife -- including greater sandhill cranes. One strategy of the CCP (Objective 2.6.5) is to limit disturbance in crane roosts and foraging areas by maintaining sanctuaries.

One respondent indicated a visitor center should be constructed by Dairy Road on the Refuge. Because the Refuge is in its early stages of developing a public use program it was felt that instead of a visitor center a visitor contact station be developed first as indicated in Goal 5 (Public Use of the Refuge), Objective 2.

One comment indicated that no boat launching facilities should be developed on the Refuge because enough launch facilities already exist in proximity to the Refuge. The Service's original scoping process indicated that suitable launch facilities did not exist; however, the issue will be re-examined when the Refuge prepares a step-down public use plan.

Water Supplies and Infrastructure

One letter indicated a local irrigation district's concerns regarding water conveyance infrastructure and water supplies. The CCP indicates a water management plan for the Refuge will be prepared which will address water needs and issues. No impacts will occur to any non-Refuge water conveyance system and any needed water supplies will be sought only through identified willing sellers and existing procedures.

Refuge Complexing

The San Joaquin River NWR is one of four Refuge units comprising the San Luis NWR Complex. The other units include San Luis NWR, Merced NWR, and Grasslands Wildlife Management Area. One comment indicated that the San Joaquin River NWR should not be part of the Complex, but should be a stand-alone Refuge because of its size, complexity, and resource value; ensuring that it receives the needed attention it deserves. The reason the Refuge is part of the Complex is to make it more efficient and more productive. More activities can be and are accomplished at the Refuge by it being part of a Complex than would be accomplished if it were not part of a Complex. The San Joaquin River NWR was made part of a Complex to help reduce costs, including annual operation, by being able to share staff and other resources with other units to provide effective law enforcement, public use, administrative, fire, and resource management programs. Due to budget constraints, refuges are being complexed nationwide expressly for the purpose of such cost-effectiveness and efficiency.

Appendix C: Public Scoping & Involvement Process

The Planning Process

The planning process followed for the development of this CCP was guided by the Refuge Planning Chapter of the Fish and Wildlife Manual (Part 602 FW 2.1, November 1996) and evolving policy related to the Refuge System Improvement Act of 1997. Key steps have included: (1) preplanning; (2) identifying issues and developing vision; (3) gathering information; (4) analyzing resource relationships; (5) developing alternatives and assessing environmental effects; (6) identifying a preferred alternative; (7) publishing the draft plan; (8) documenting public comments on the draft plan; (9) preparing the final plan; (10) securing approval of the Regional Director; and finally (11) implementing the plan. The life-span of the plan is 15 years, but the Service will review the CCP periodically. The CCP may be amended as necessary at anytime under the adaptive management strategy.

The Refuge held quarterly Community Forum Meetings to develop components of the draft plan, identify issues, concerns, and opportunities, and update the public on refuge operations.

In a Federal Register Notice dated February 23, 1999, the Service announced that it was preparing a plan for the Refuge. A series of planning updates were used to inform the public of the CCP Process and potential refuge operations. These updates were a forum to announce upcoming public workshops and meetings, as well as update the public on the progress the CCP team was making. These updates were mailed to interested and affected parties. The first planning update for the Refuge was released in March 1999. This update informed the public about the Refuge and Refuge planning process and announced a public workshop to be held to identify issues, concerns, and described preliminary goals and key areas of management focus to be discussed in a management plan and environmental assessment. The planning update also encouraged the public to provide comments and concerns about Refuge management via e-mail, phone, and US Postal Service. The second planning update, released in October 1999, described the issues, concerns, and opportunities identified at the public workshop. The Refuge held quarterly Community Forum Meetings during this time. The third planning update released January 2000, reported on issues identified by the Community Forum. A fourth planning update released in April 2006 announced the pending release of the Draft CCP and EA.

Public input received in response to these updates, workshops and briefings is incorporated into the CCP and EA, and a summary of comments is included in this appendix. The original comments are being maintained in planning team files at the California/Nevada Refuge Planning Office in Sacramento, CA, and are available for review upon request.

The Service published a Notice of Availability of the draft CCP and EA in the Federal Register on June 22, 2006. The Draft CCP and EA were distributed to Refuge partners, adjacent landowners, government agencies, local jurisdictions, community groups and private citizens. The 30-day comment period closed on July 24, 2006. A total of seven comment letters were received during the review period. Our response to these comments is included in Appendix B of the final CCP.

CCP implementation began with the signing of the Finding of No Significant Impact. The CCP will be reviewed by Refuge staff while preparing annual work plans and updating the

Refuge Management Information System (RMIS) database. RMIS is a master database that contains refuge realty information, operation needs, maintenance needs, as well as CCP schedules. It may also be reviewed during routing inspections or programmatic evaluations. Results of the reviews may indicate a need to modify the plan. The periodic review of the objectives and strategies is an integral part of plan implementation, and management activities may be modified if the desired results are not achieved. If minor changes are required, the level of public involvement and NEPA documentation will be determined by the Project Leader. The CCP will be formally revised about every 15 years.

Detailed Listing of all Issues, Concerns, and Opportunities and Service Responses to Each Item

Issues, concerns, and opportunities were identified through early planning discussions and through the public scoping process, which began with the mailing of the first planning update in March 1999. The planning team held a public open house in March 1999 and a second open house in April 2000. The first meeting was a scoping meeting held to gather the public's issues and concerns about the refuge. The Core team presented preliminary alternatives at the second meeting. In addition, Service staff held quarterly Community Forums to meet with the public and discuss concerns in further detail. Other comments were received orally from meetings and in writing.

The following issues, concerns, and opportunities are a compilation of information received by the Service throughout the planning process:

Wildlife Management and Restoration:

One person stated that they support the concept of multiple use land management and considered cattle and cropping to be compatible with wildlife. They wanted the Service to consider strongly any decision to discount cattle on the Refuge. Others felt that the Refuge's primary concern should be wildlife and that the Refuge should remain focused on what attracted geese and waterfowl to the area in the first place before making improvements. Others felt that the Refuge should have an interest in permanent wetlands in addition to other habitat types. Also, dairies to the east are concerned about crop depredation. One person suggested that the Refuge consider the reintroduction of Tule elk. Lastly, a comment was made that any environmental restoration that would involve levee breaching in the new Refuge land west of the San Joaquin River must consider potential fish entrapment.

One individual strongly advised the Service to pursue screening water diversions by the West Stanislaus Irrigation District to prevent fish from entering into the irrigation pumps and dying. Another suggested that the operator of the 262 cfs pump should screen their diversion on the new Refuge property to prevent fish entrainment and mortality and that the operator should be able to fund the screen to release them from their responsibility of their unscreened diversion.

A duck club operator expressed that the Refuge was causing a disruption of waterfowl distribution because waterfowl would tend to migrate toward the Refuge, where there is no hunting, and abundant food.

Concern was expressed about the restoration of the new Refuge addition. Sacramento River Partners, a nonprofit organization, has been hired by the Refuge to prepare a pre-restoration plan for the new Refuge lands west of the San Joaquin River. This plan has subsequently been sent to the USDA Natural Resources Conservation Service for review.

Visitor Services (Recreation and Public Use):

Several comments were raised about public use. Many people felt that the Service should preserve the Refuge for wildlife and people to enjoy and that the Service should provide access which would provide something there for the people. It was felt that people would want to protect and support the Refuge if the Service provided them with access and educated them. One person felt that no public camping should be allowed at the Refuge, with the possible exceptions of the Boy Scouts and educational groups.

Several people were concerned about the impact of visitors on the adjacent landowners. One individual said that an observation tower may bring in too many people. Another comment that the Service shouldn't let too many people into the Refuge and that the Refuge should be kept as private as possible in the near term. Another commented that the Service should monitor public use. Local landowners have expressed that Refuge public access should not be located near private residences.

Several people requested access to the Refuge, especially at Christman Island. Others wanted the Refuge to provide interior access where compatible with sensitive species and allow access to the river to show and educate students about the river and Refuge. Others requested canoeing access.

Members of the public suggested many non-consumptive activities and facilities, including a docent program so that volunteers could be trained to provide tours for adults, students, and families. Others requested that the program with the outdoor recreation specialist and school groups be allowed to continue to provide opportunities for community building and environmental education. Others requested birding and photography opportunities in the form of maps that identify good areas for these activities that minimize bird disturbance but provide viewing opportunities. Requested facilities include photography blinds with north, east, and west camera ports and a visitor education center needed. However, it was requested that the visitor center be located away from any houses.

Comments were made that were in favor and against hunting. Some felt that the Service should minimize hunting and promote non-consumptive activities such as catch and release fishing. Other individuals requested that there be no hunting on the Refuge, "even of birds."

Others wanted the Refuge to include hunting opportunities, including waterfowl and upland game and felt that local support would increase if hunting were considered. One individual expressed concern that Refuge operations affects waterfowl distribution by attracting waterfowl away from hunting clubs onto the Refuge. Members of the Old Fisherman's Club members expressed concern that the Service will acquire the club or limit their activities. However, the land on which the club is located is owned by the Lyon's family, who have said that they weren't interested in selling the land, and the Service is not interested in acquiring it.

Refuge Staffing:

Members of the community said that they would feel better if one consistent person were available at the Refuge to communicate with, such as a full time Refuge Manager and that they would like to see continuity of Refuge management as well as an operational budget for the Refuge. Another individually felt strongly that the plan was like putting the cart before the horse and that the Service should not develop CCP before a manager is in place for the Refuge. A request was made for staff presence on weekends for public access

Flood Management:

Some people offered support for Non-Structural Agreement (NSA). The Refuge staff expressed concern that the Corps has not signed their agreement to implement its portion of the NSA. Congressman Condit's representative stated that their number one priority is the adjacent landowners' desire to complete the NSA flood control project with the Corps. One individual felt that dredging San Joaquin River was not an appropriate method of flood control. Another was concerned about flood control at Red Bridge slough. Other landowners are concerned about flood control and their ability to continue to drain across the Refuge's newly acquired property on the west side of the San Joaquin River.

Modesto Irrigation District (MID) pays to operate Miller Lake pumps to prevent flooding in winter. Water is pumped into river when the water in Miller Lake is high, otherwise, Miller Lake water flows by gravity into the river. One individual expressed concern over who would pay for the pumping in the future and questioned whether MID or the Service would pay for the pumping or would the area flood instead.

Wetland and Water Management:

One individual expressed concern that winter water storm drainage of probably poor quality drains from Modesto into Miller Lake. Another was concerned about the impacts of poor quality water from upstream on the Refuge and wondered what the Refuge would do to avoid attracting waterfowl to a site with poor water quality on the Refuge.

Concern was expressed by a Community Forum participant that water management on the new Refuge lands west of the San Joaquin River was causing a rise in the groundwater level. Adjacent landowners expressed concern that an elevated groundwater level would make the lands surrounding the Refuge more difficult to farm. Refuge staff informed those attending the Community Forum that a letter had been sent to adjacent landowners requesting permission to establish observation wells on lands adjacent to the Refuge. These observation wells would monitor groundwater levels.

Refuge Proximity to Private Lands:

Adjacent landowners are concerned that the Refuge will curtail their abilities to operate and use their lands. They are concerned that the Refuge will limit their use of chemicals, require adjacent landowners to have buffers, and/or fill their fields with endangered species. Landowners were also concerned about trespassing from the Refuge onto their property. Adjacent farmers to the west are concerned about additional restrictions on them that may be placed on them because of their proximity to the Refuge.

Public Issues Pertaining to All Alternatives

There are certain issues addressed by the public that would remain consistent under all alternatives of the Environmental Assessment. The following describes issues and concerns received by the Service throughout the planning process, that will be addressed separately from the above:

Land Protection and Boundary Expansion:

Several people at the public workshop and in letters expressed a desire for the Refuge to expand its boundary as did other agencies and programs within the U.S. Fish and Wildlife Service such as the Anadromous Fish Restoration Program. Landowners outside the current Refuge boundary, up to several miles south of the Refuge, expressed an interest in either selling an easement on their property or selling their property in fee to the Service. Also, Stanislaus County is interested in complementing San Joaquin River NWR with mitigation banking proposal.

Transportation:

California Department of Transportation (Caltrans) has been investigating the expansion and realignment of State Highway 132 since the 1980's. One person commented that they did not want a freeway. Others complained about the danger of Highway 132, including people driving 65 - 100 mph, passing on double yellow lines, and 2 accidents per month at the intersection of Gates and 132. One person said that the Refuge should construct pullouts along 132, however others commented that Highway 132 is not safe for a pull out because traffic moves so fast. Another individual commented that it was very helpful to close Page Road because it resulted in much less traffic in the area.

Mosquito Abatement:

At one of the community forums, Turlock Mosquito Abatement District (TMAD) and East Side Mosquito Abatement District (ESMAD), were concerned that they will be unable to control mosquitoes produced on the Refuge the way they traditionally do. The Districts expressed their concern that people within their Districts may be exposed to mosquito-transmitted diseases. The Community of Grayson is concerned that mosquito levels will be higher than they have been in the past, should TMAD and ESMAD not be allowed to control mosquitoes in the traditional way on the Refuge.

U.S. Fish and Wildlife Service Staff Key Issues

The following key issues, concerns and opportunities were identified during the planning process by FWS Staff:

Wildlife Management and Restoration:

Refuge staff commented that Aleutian Canada goose, anadromous fish, and other former and current endangered species should receive a high level of consideration in the CCP process. Goose flyway management and control of nonnative weeds, such as *Arundo* will continue to be an important issue for the Service.

Fish have a tendency to be come entrapped by unscreened diversions, adversely affecting fish resources.

Avian cholera is a disease that affects the birds on the Refuge. If it is uncontrolled, this disease has the potential to decimate the waterfowl population on the Refuge, including the Aleutian Canada geese. Furthermore, waterfowl using the Stanislaus County sewage treatment plant located about seven miles southeast of the Refuge are especially in danger of contracting avian cholera due to the high concentrations of birds using the area.

Nonnative weeds on the Refuge adversely affect native plants.

Recreation and Public Use:

The Service recognizes public access as an important issue to address in the CCP and sees uncontrolled access, or trespassing as an issue for the Refuge and adjacent landowners.

Refuge staff noted that they would like to avoid locating visitor facilities near adjacent private residences.

Refuge staff have expressed that the hunting on the Refuge may not be of sufficient quality or quantity to justify a hunting program. Refuge staff have also expressed that fishing access must be controlled to prevent trespassing on other parts of the Refuge.

Refuge Staffing:

The lack of a Refuge Manager has been an ongoing issue. Law enforcement continues to be an issue for FWS staff with vandalism, illegal dumping of hazardous waste, trespass, theft included on the list of crimes committed at the Refuge.

Flood Management:

The Service is concerned that the Corps' non-structural alternative for levees be implemented as soon as possible.

Wetland and Water Management:

The Service is concerned about the water quality of the San Joaquin River since it has been designated as a water quality impairment area. The river carries a high load of sediment from the steeper gradient of the incoming Stanislaus and Tuolumne rivers which are sometimes exacerbated by human activity. The sediment carries contaminants.

The Service is also concerned that the Refuge has sufficient reliable water supply and rights for habitat management.

Agricultural drainage has presented challenges for the Refuge. When the Refuge acquired the properties west of the Stanislaus River, it acquired two drainage systems that provide drainage for about 8,000+ acres of agricultural lands. The first system drains through what was formerly the Hagemann property. Agricultural lands southwest of the Hagemann property formerly drained through ditches running through the Hagemann property. Originally, these waters drained to the river with a gravity drainage system. Water would pool in Upper White Lakes, a low spot on the Hagemann property. Sometime in the 1930's or 1940's, a drainage system was constructed that allowed Upper White Lakes to drain via tile drains, and the drainwater was pumped into the San Joaquin River. The pumping lowered the water table enough so that the Upper White Lakes area could be farmed. After the Refuge acquired the Hagemann property, the pumps which drain agricultural water into the San Joaquin River broke, resulting in a rise in the water table. Since the flooding of Upper White Lakes was beneficial for wildlife, the Refuge opted to replace the pump drainage system to the original gravity drainage system. Nevertheless, adjacent landowners (Chunn and Bettencourt) complained that the increased water table adversely affected their farms. Neighbors are also concerned about their ability to continue to drain across the Refuge's newly acquired property, particularly Chunn, Tosta, NASCA, Lopes and Bettencourt.

The Refuge inherited another drainage system north of the Hagemann system when it acquired the Lara, Hagemann, and Vierra properties. Hospital Creek provides drainage into the San Joaquin River for properties north of Ingram Creek, all of which are in the West Stanislaus Irrigation District (WSID). Hospital Creek has a tendency to accumulate silt. In the summer 1999, silt accumulation blocked a culvert, causing water to back up in Hospital Creek, flooding an adjacent landowner. Although WSID is responsible for clearing Hospital Creek, the Refuge opened a gate from Hospital Creek onto Refuge property so that Refuge, rather than private agricultural lands, would flood. The arrangement suited the farmer. However, the mosquito population in these temporarily flooded Refuge lands increased, drawing the attention of the local mosquito abatement district and the community of Grayson.

Refuge Proximity to Private Lands:

FWS staff are concerned about land use changing on properties adjacent to the Refuge.

FWS Staff Issues Pertaining to All Alternatives

There are certain issues addressed by FWS staff that would remain consistent under all alternatives of the Environmental Assessment. The following describes issues and concerns received by the Service throughout the planning process, that will be addressed separately from the above:

Land Protection and Boundary Expansion:

Refuge staff have identified land acquisition as a beneficial and necessary tool for managing wildlife. However, other entities may have an issue with converting farmland to wildlife habitat.

Transportation:

Caltrans is investigating the expansion and realignment of State Highway 132. Refuge staff are concerned that the realignment and expansion of State Highway 132 realignment does not harm the Refuge.

Mosquito Abatement:

Same as public issues. A memorandum of understanding (MOU) is currently being developed by the Service with ESMAD and TMAD and should be completed. In response to a request from TMAD and ESMAD, the MOU and CCP will provide a written plan of Refuge management activities.

Refuge Opportunities

Although there are many issues facing the Refuge, there are also opportunities. There are many opportunities to work with other entities. Through CALFED, restoration and land protection opportunities exist. The Anadromous Fish Restoration Program has funding to acquire land, but no funding or authority for management. They have approached the Refuge on several occasions to partner and manage lands that they acquire. The nonstructural project with the Corps provides the Refuge staff an opportunity to combine flood management with environmental restoration. The Endangered Species Recovery Program is also working with the Refuge to create habitat for the listed riparian brush rabbit and riparian wood rat. The Natural Resources Conservation Service's Wetlands Reserve Program has been working with the Service on land protection and is active in the Merced area with Refuge expansion. The Nature Conservancy has also agreed to assist the Refuge with land protection (Mapes Ranch). The Sierra Club (observation platform), Safari Club (interpretive panels), and Ducks Unlimited (Page Lakes expansion) have participated in Refuge construction projects and may continue to do so. Audubon continues to provide political support for the Refuge.

There are also opportunities to open the Refuge to a variety of public uses, including volunteerism. With so many entities, such as the Sierra Club, and Old Fisherman's Club, interested in the Refuge, there is a large pool of potential volunteers.

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Appendix D: Compatibility Determinations

COMPATIBILITY DETERMINATION for Recreational Waterfowl Hunting on the San Joaquin River National Wildlife Refuge

Use Considered: Recreational Waterfowl Hunting

Refuge Name:

San Joaquin River National Wildlife Refuge (Refuge)—a unit of the San Luis National Wildlife Refuge (NWR) Complex. The Refuge is located in western Stanislaus and San Joaquin Counties, California. The Refuge presently consists of approximately 6,500 acres situated along the San Joaquin River from just south of the confluence with the Tuolumne River north to the north bank of the Stanislaus River. The approved boundary for the Refuge comprises 12,887 acres; land presently not part of the Refuge is proposed for the conservation easement program.

Establishing and Acquisition Authority(ies):

The Refuge was established in 1987 to protect the, at the time, endangered Aleutian Canada goose, listed as endangered in 1967 and relisted as threatened in 1991. The Refuge was originally established under the authority of the Endangered Species Act. Other Refuge lands were acquired under the Migratory Bird Conservation Act and the Fish and Wildlife Act of 1956.

Refuge Purpose(s):

The Refuge purposes are

“To conserve fish or wildlife which are listed as endangered species or threatened species or plants...” 16 U.S.C. 1534 (Endangered Species Act of 1973).

“For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act)

For the development, advancement, management, conservation, and protection of fish and wildlife resources.” 16 U.S.C. 742f(a)(4) “... For the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition and servitude.” 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956).

National Wildlife Refuge System Mission:

The mission of the National Wildlife Refuge System (NWRS) is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” 16 U.S.C. 668dd-668ee (National Wildlife Refuge Administration Act of 1966, as amended).

Description of Use:

The Refuge would establish a recreational waterfowl hunt program for the public. No hunting activity is presently allowed at the Refuge. A waterfowl hunt program similar to programs at other Central Valley National Wildlife Refuges would be established and developed after significant progress in habitat restoration, particularly wetlands, on the Refuge has been accomplished and the necessary infrastructure for a waterfowl hunt program has been developed. It is expected that this will occur within the first five years of the Comprehensive Conservation Plan (CCP).

Hunting is identified as a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Improvement Act of 1997 (Act). Other priority wildlife-dependent public uses identified by the Act include fishing, wildlife observation, photography, environmental education and interpretation. Hunting would be permitted on designated areas of the Refuge, pursuant to the conditions of a cooperative agreement with the State of California, Department of Fish and Game, during the established state waterfowl hunting season. The Refuge would remain closed to all other forms of hunting and target shooting.

Before any hunt program is opened at the Refuge a waterfowl hunt plan and associated compliance documents will be developed. This plan will outline any proposed program including season, hunt areas, hunter carrying capacity, and procedures. Associated with the plan will be an environmental assessment to meet National Environmental Policy Act (NEPA) compliance which will address impacts to the environment and community. Interested individuals and agencies will have the opportunity for input into the plan and to comment on any proposed hunt program. Any waterfowl hunt program developed will conform to state and federal regulations and be similar to existing waterfowl hunt programs at other National Wildlife Refuges in the Central Valley of California.

Availability of Resources:

Adequate funding and staff exist to manage a waterfowl hunt program at the Refuge. To facilitate this use, the Refuge can provide adequate staff which includes administrative, managerial, biological, and when available, a Refuge law enforcement officer to perform hunter compliance enforcement. Due to changes in Service policy regarding refuge law enforcement personnel, there may be times when a trained Service law enforcement officer (LEO) will not be available on the Refuge in a full time capacity. When this is the case, LEO's from other refuges will be detailed to the Refuge to provide the necessary patrol activities. Additional law enforcement can be provided by California Department of Fish and Game wardens and on occasion, Fish and Wildlife Service special agents.

The California Department of Fish and Game (CDFG) may provide employees to administer any waterfowl hunt program including staffing any hunter check station for the processing of hunters and monitoring of game taken. Public hunt programs on other NWRs in California are administered cooperatively with the California Department of Fish & Game under the provisions of a Cooperative Agreement last amended in 2001. This agreement details the responsibilities and costs associated with the implementation of the hunt program on each refuge and provides a detailed list of costs to be reimbursed to the Service by the State. Some of the cost items listed for reimbursement include: signs, brochures, permit compliance, access control, maintenance of the check station, blinds, and parking lots, and administrative functions such as managerial, biological and clerical support. In addition to staffing the hunter check station and performing Refuge clean-up duties, the CDFG staff also perform all Refuge sign posting tasks as directed by the Refuge Manager to conform with current habitat conditions.

Anticipated Impacts of the Use:

The proposed hunt program will be limited to waterfowl, coots, and moorhens only within portions of the wetland areas of the Refuge. Sportsmen associated with this activity may disturb or harm both target and non-target migratory birds but only in some riparian, and wetland habitats on the Refuge. Hunters may accidentally take non-target migratory birds due to misidentification, however, this is rare and usually reported to Refuge or CDFG staff by other hunters. A certain level of self enforcement is expected by the Refuge hunters. Select numbers of waterfowl belonging to target species would be taken by hunters each season, but this is not expected to result in significant adverse effects on their populations. Hunting regulation frameworks which include hunting limits are established annually through the adaptive harvest management process which includes factors such as anticipated hunter harvest of waterfowl. These guidelines are proposed for the Pacific Flyway and the State establishes hunting limits which fall within these framework guidelines.

Litter discarded by Refuge visitors including sportsmen could entangle wildlife or possibly be ingested, resulting in death or injury. Litter control will be a major emphasis item in the routine maintenance of the Refuge public use areas. Trash cans and restrooms will be provided year round in parking areas for use by the public while involved in wildlife observation, photography, education, interpretation as well as hunting.

Additional potential impacts to resident and migratory wildlife include the trespass of hunters outside the established hunt zone and dogs harassing wildlife. The hunt area will be patrolled on shoot days and Refuge employees performing routine work also actively watch for hunters outside of their assigned areas. While hunter trespass may cause a temporary disturbance to wildlife in the immediate vicinity of the activity, this violation is deemed rare and wildlife temporarily displaced have large areas closed to hunting in which to seek refuge. Dogs have not generally been observed harassing wildlife at other refuges with hunt programs and are normally kept under close control by the hunters themselves.

Public Review and Comment:

The public was provided the opportunity to review and comment on current and potential Refuge programs as part of the Comprehensive Conservation Planning process for the Refuge. This process included three large mailings of plan updates encouraging public input on the development of Refuge programs as well as having the opportunity to participate at a public planning workshop. Main topics of public interest were visitor access and appropriate recreational or educational uses of the Refuge. Some public comments expressed interest in a waterfowl hunt program at the Refuge. A step-down public use plan or recreational hunt plan and supporting environmental assessment will be developed for any recreational hunt program at the Refuge. During this process, input will be sought from the public regarding proposed public use activities and hunting at the Refuge.

Determination (check one below):

- ☐ Use is Not Compatible
- ☒ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

The following stipulations are required to ensure compatibility of this activity:

- When the draft CCP is finalized a Public Use Plan and/or a Refuge Hunt Plan will be

developed as a step down along with associated compliance documents from the CCP that will provide management guidelines for operation of the Refuge hunting program.

- Fallow agricultural lands at the Refuge will be restored to natural habitats before public use facilities/programs are fully developed.
- All Refuge rules and regulations must be followed unless otherwise excepted, in writing, by project leader.
- All laws applicable to any refuge hunting program included in the Code of Federal Regulations and the State of California Fish and Game Code will be enforced. Law enforcement patrols will be conducted on a routine basis in cooperation with California Department of Fish and Game wardens to ensure regulation compliance and the protection of Refuge resources. The Refuge will increase law enforcement patrols when staff is available, particularly during opening weeks of waterfowl hunting season, to document hunter use and ensure compliance with Refuge and California regulations
- For any developed Refuge hunt program, regulatory directional signs, as well as maps, will clearly mark hunting areas (free roam and blind site units), closed areas, and available parking lots. Additional pamphlets at the Refuge headquarters will provide further information including special season restrictions, California, and Refuge regulations. Signs will be maintained and replaced on an as needed basis.
- When a recreational hunt program is established, annual monitoring of waterfowl hunter use and impacts will continue to be implemented. The information gathered will be used to review and possibly revise hunting regulations to enhance the quality and safety of the Refuge's hunting program, and ensure hunting would continue to be compatible with the Refuge purpose and the mission of the National Wildlife Refuge System.

Justification:

The Refuge was established to conserve fish or wildlife which are listed as endangered species or threatened species or plants...; as an inviolate sanctuary, or for any other management purpose, for migratory birds; for the development, advancement, management, conservation, and protection of fish and wildlife resources; and for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Recreational waterfowl hunting by the public at the Refuge as indicated in this determination is compatible with the purposes for which the Refuge was established. Hunting is a high priority public use for the National Wildlife Refuge System.

Mandatory Re-Evaluation Date:

___2021___ Mandatory 15 year Re-Evaluation Date (for priority public uses)

_____ Mandatory 10 year Re-Evaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
 X Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Literature Cited:

Williams, B.K. and F.A. Johnson, 1995. Adaptive Management and the Regulation of Waterfowl Harvests. The Wildlife Society Bulletin, Vol. 23(3):430-436.

Refuge Determination:

Prepared by:

RWR 22 Sept 2006
(Signature and Date)

Refuge Manager Approval:

[Signature] 25 Sept 06
(Signature and Date)

Concurrence:

Refuge Supervisor:

[Signature] 10/13/06
(Signature and Date)

Assistant Manager,
National Wildlife
Refuge System

[Signature] 10/14/06
(Signature and Date)

COMPATIBILITY DETERMINATION for Recreational Fishing on the San Joaquin River National Wildlife Refuge

Use Considered: Recreational Fishing

Refuge Name:

San Joaquin River National Wildlife Refuge (Refuge)—a unit of the San Luis National Wildlife Refuge (NWR) Complex. The Refuge is located in western Stanislaus and San Joaquin Counties, California. The Refuge presently consists of approximately 6,500 acres situated along the San Joaquin River from just south of the confluence with the Tuolumne River north to the north bank of the Stanislaus River. The approved boundary for the Refuge comprises 12,887 acres; land presently not part of the Refuge is proposed for the conservation easement program.

Establishing and Acquisition Authority(ies):

The Refuge was established in 1987 to protect the, at the time, endangered Aleutian Canada goose, listed as endangered in 1967 and relisted as threatened in 1991. The Refuge was originally established under the authority of the Endangered Species Act. Other Refuge lands were acquired under the Migratory Bird Conservation Act and the Fish and Wildlife Act of 1956.

Refuge Purpose(s):

The Refuge purposes are

“To conserve fish or wildlife which are listed as endangered species or threatened species or plants...” 16 U.S.C. 1534 (Endangered Species Act of 1973).

“For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act)

“For the development, advancement, management, conservation, and protection of fish and wildlife resources.” 16 U.S.C. 742f(a)(4) “.... For the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition and servitude.” 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956).

National Wildlife Refuge System Mission:

The mission of the National Wildlife Refuge System (NWRS) is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” 16 U.S.C. 668dd-668ee (National Wildlife Refuge Administration Act of 1966, as amended).

Description of Use:

The Refuge would establish a recreational fishing program for the public. No fishing activity from the Refuge is presently allowed at the Refuge, however, the San Joaquin, Tuolumne and Stanislaus Rivers, which are all navigable waters, extend across the Refuge and it is legal for boaters to fish in these waters without accessing them through the Refuge. A recreational fishing program on the Refuge would include developing several bank sites where sportsmen could fish and a small boat launch area where they could launch

watercraft. This program would be established and developed after significant progress in habitat restoration on the Refuge has been accomplished and the necessary infrastructure for a fishing program has been developed. It is expected that this will occur within the first five years of the Comprehensive Conservation Plan (CCP).

Recreational fishing is identified as a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Improvement Act of 1997 (Act). Other priority wildlife-dependent public uses identified by the Act include hunting, wildlife observation, photography, environmental education and interpretation. Fishing would be permitted on designated areas of the Refuge. Game species found on the Refuge are American shad, rainbow trout, black crappie, white crappie, smallmouth and largemouth bass, striped bass, sunfish, bluegill, catfish, bullhead, and occasionally Chinook salmon.

Before any fishing program is opened at the Refuge a public use plan and associated compliance documents will be developed. This plan will outline any proposed program including locations, roads, public carrying capacity, and procedures. Associated with the plan will be an environmental assessment to meet National Environmental Policy Act (NEPA) compliance which will address impacts to the environment and community. Interested individuals and agencies will have the opportunity for input into the plan and to comment on any proposed public use program. Any recreational fishing program developed will conform to state and federal regulations and be similar to existing fishing programs at other National Wildlife Refuges in the Central Valley of California.

Availability of Resources:

Adequate funding and staff exist to manage a recreational fishing program at the Refuge. To facilitate this use, the Refuge can provide adequate staff which includes administrative, managerial, biological, and when available, a Refuge law enforcement officer to perform compliance enforcement. Additional law enforcement can be provided by California Department of Fish and Game wardens and on occasion, Fish and Wildlife Service special agents.

Anticipated Impacts of the Use:

Short-term impacts for the recreational fishing program will be associated with the establishment of fishing sites, parking lots and a boat launch facility. These short-term impacts include increased noise from construction activities, an increase in the number of vehicles and people on the Refuge, and soil disturbance where signs, posts and the boat launch are situated. Wildlife will likely avoid areas where work is being conducted but are expected to resume normal activities and patterns when these facilities have been completed. Once these facilities are in place, we expect that terrestrial and aquatic animals will continue to use the fishing sites and surrounding areas.

Litter discarded by Refuge visitors including sportsmen could entangle wildlife or possibly be ingested, resulting in death or injury. Litter control will be a major emphasis item in the routine maintenance of the Refuge public use areas. Trash cans and restrooms will be provided year round in parking areas for use by the public while involved in wildlife observation, photography, education, interpretation as well as hunting.

Long-term impacts will be associated with the construction of a parking lot(s), boat launch facility, signs, and use of the roads. These include loss of habitat, increase in manmade permanent structures, and increased use by the public. The creation of the parking lots will result in the permanent loss of less than two acres of introduced grasses and will not impact any sensitive, threatened, or endangered plant or animal species. Terrestrial and burrowing animals will be displaced by this action but are expected to continue to use the area. The

increase in permanent structures will add a vertical and human-made component to an otherwise natural and relatively flat environment. Disturbance to wildlife will be increased for select species at and along the developed facilities. The major anticipated impact of these activities is disturbance of wildlife and trampling of plants. However, the disturbance to wildlife including migratory birds will be minimal by keeping sportsmen confined to specific areas for fishing and confining their movement across the Refuge to specific trails/roads.

Public Review and Comment:

The public was provided the opportunity to review and comment on current and potential Refuge programs as part of the Comprehensive Conservation Planning process for the Refuge. This process included three large mailings of plan updates encouraging public input on the development of Refuge programs as well as having the opportunity to participate at a public planning workshop. Main topics of public interest were visitor access and appropriate recreational or educational uses of the Refuge. Few public comments were received regarding fishing at the Refuge. A step-down public use plan including a section on a recreational fishing program and supporting environmental assessment will be developed for any recreational fishing program at the Refuge. During this process, input will be sought from the public regarding proposed public use activities at the Refuge.

Determination (check one below):

☐ Use is Not Compatible

☒ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

The following stipulations are required to ensure compatibility of this activity:

- When the draft CCP is finalized a Public Use Plan including a section on recreational fishing will be developed as a step down along with associated compliance documents from the CCP that will provide management guidelines for operation of the Refuge fishing program.
- Fallow agricultural lands at the Refuge will be restored to natural habitats before public use facilities/programs including recreational fishing are fully developed.
- All laws applicable to any Refuge fishing program included in the Code of Federal Regulations and the State of California Fish and Game Code will be enforced. Law enforcement patrols will be conducted on a routine basis in cooperation with California Department of Fish and Game wardens to ensure regulation compliance and the protection of Refuge resources.
- For any developed Refuge fishing program, regulatory directional signs, as well as maps, will clearly mark fishing areas, closed areas, and available parking lots. Additional pamphlets at the Refuge headquarters will provide further information including special fishing restrictions, California, and Refuge regulations. Signs will be maintained and replaced on an as needed basis.
- When a recreational fishing program is established, annual monitoring of angler use and impacts will be implemented. The information gathered will be used to review and possibly revise the fishing program to enhance the quality and safety of the Refuge's fishing program, and ensure fishing would be compatible with the Refuge purpose and the mission of the National Wildlife Refuge System.

The Refuge was established to conserve fish or wildlife which are listed as endangered species or threatened species or plants...; as an inviolate sanctuary, or for any other management purpose, for migratory birds; for the development, advancement, management, conservation, and protection of fish and wildlife resources; and for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Recreational fishing by the public at the Refuge as indicated in this determination is compatible with the purposes for which the Refuge was established. Fishing is a high priority public use for the National Wildlife Refuge System.

____2021____ Mandatory 15 year Re-Evaluation Date (for priority public uses)

_____ Mandatory 10 year Re-Evaluation Date (for all uses other than priority public uses)

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

 X Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

RUB 22 Sept 2006
(Signature and Date)

(Signature and Date)

25 Sept 06

(Signature and Date)

DeWalworth 10/13/06
(Signature and Date)

Maigret J. Kolac 10/17/06
(Signature and Date)

COMPATIBILITY DETERMINATION for Wildlife Observation, Nature Interpretation and Photography on the San Joaquin River National Wildlife Refuge

Use Considered: Wildlife observation, nature interpretation, and photography uses by the public.

Refuge Name:

San Joaquin River National Wildlife Refuge (Refuge) - a unit of the San Luis National Wildlife Refuge (NWR) Complex. The Refuge is located in western Stanislaus and San Joaquin Counties, California. The refuge presently consists of approximately 6,500 acres situated along the San Joaquin River from just south of the confluence with the Tuolumne River north to the north bank of the Stanislaus River. The approved boundary for the Refuge comprises 12,887 acres; land presently not part of the Refuge is proposed for the conservation easement program.

Establishing and Acquisition Authority(ies):

The San Joaquin River National Wildlife Refuge was established in 1987 to protect the, at the time, endangered Aleutian Canada goose, listed as endangered in 1967 and relisted as threatened in 1991. The Refuge was originally established under the authority of the Endangered Species Act. Other refuge lands were acquired under the Migratory Bird Conservation Act and the Fish and Wildlife Act of 1956.

Refuge Purpose(s):

The Refuge purposes are

“To conserve fish or wildlife which are listed as endangered species or threatened species or plants...” 16 U.S.C. 1534 (Endangered Species Act of 1973).

“...For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act)

“For the development, advancement, management, conservation, and protection of fish and wildlife resources.” 16 U.S.C. 742f(a)(4) “.... For the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition and servitude.” 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956).

National Wildlife Refuge System Mission:

The mission of the National Wildlife Refuge System (NWRS) is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” 16 U.S.C. 668dd-668ee (National Wildlife Refuge Administration Act of 1966, as amended).

Description of Use:

At the present time, public opportunities for wildlife viewing, nature interpretation and photography at the Refuge are limited to the wildlife observation deck off of Beckwith Road. However, once habitat restoration projects on the Refuge have progressed converting

fallow agricultural land to native habitats, additional public use facilities will be developed for increased public use for wildlife observation, nature interpretation and photography similar to the facilities at the San Luis NWR and Merced NWR. These facilities will include nature trail(s), auto tour route (if feasible), interpretive panels, observation platforms, comfort stations, benches, waste receptacles, photography blinds and parking lots. Only portions of the Refuge will be open to public use, other sections will be closed to public use to limit disturbance to select habitats and wildlife. A public use plan will be developed to guide the implementation of an expanded public use program at the Refuge. This plan will be developed by the staff of the San Luis National Wildlife Refuge Complex working in conjunction with the FWS's Regional Office along with local partners and the public.

Once facilities are developed, access to the Refuge will be daily from 2 hour before sunrise to 2 hour after sunset. The current estimate of public use at the Refuge is 1,500 per annum, however, with the development of additional facilities, use is expected to increase to approximately 50,000 per annum - similar to other refuge units in the Central Valley. The majority of this use would occur from autumn through spring coinciding with bird migrations, waterfowl/waterbird use of wetland habitats, and spring vegetative green-up. Lesser use is expected during the summer months when conditions are dry and daytime temperatures are high. Visitors will have use of the facilities for wildlife observation, nature interpretation and photography during the approved hours and seasons which are set by the Refuge Manager.

Availability of Resources:

Adequate funding and staff exist, are available or are attainable for the San Luis National Wildlife Refuge Complex to conduct and expand a public use program involving wildlife viewing, interpretation and photography at the Refuge.

Initial costs would include the preparation or construction of the following: trails, auto tour route (if feasible), interpretive panels, observation platforms and blinds, benches, comfort stations, parking lots, access gates, signage, and brochures. The project can be completed in phases with each phase consisting of individual trails. Annual maintenance costs will involve trail and parking area maintenance, entrance road maintenance, cleaning and maintenance of comfort stations, refuse removal, periodic maintenance of wooden structures (i.e., benches, platforms and blinds), and repair/replacement of signs and gates.

Anticipated Impacts of the Use:

Short-term impacts will be associated with the establishment of the trails (and auto tour route if feasible) and observation platform. These short-term impacts include increased noise from construction activities, an increase in the number of vehicles and people on the Refuge, and soil disturbance where signs, posts and the observation platforms/blinds are situated. Wildlife will likely avoid areas where work is being conducted but are expected to resume normal activities and patterns when these facilities have been completed. Once these facilities are in place, we expect that terrestrial animals will continue to use the trail corridors and surrounding areas.

Long-term impacts will be associated with the construction of a parking lot(s), observation platform(s), signs, and use of the trail(s)/tour route. These include loss of habitat, increase in manmade permanent structures, and increased use by the public, especially from autumn through spring. The creation of the parking lots will result in the permanent loss of less than two acres of introduced grasses and will not impact any sensitive, threatened, or endangered plant or animal species. Terrestrial and burrowing animals will be displaced by this action but are expected to continue to use the area. The increase in permanent

structures will add a vertical and human-made component to an otherwise natural and relatively flat environment. Disturbance to wildlife will be increased for select species along the nature trail(s), observation platforms/blinds, kiosks, and parking areas. The major anticipated impact of these activities is disturbance of wildlife and trampling of plants. However, the disturbance to wildlife including migratory birds will be minimal if the stipulations listed below are followed. Trampling of plants and erosion of sensitive habitats from this activity are minimized by only allowing public access to a trail/tour route system.

Public Review and Comment:

The public was provided the opportunity to review and comment on current and potential Refuge programs as part of the Comprehensive Conservation Planning process for the Refuge. This process included three large mailings of plan updates encouraging public input on the development of Refuge programs as well as having the opportunity to participate at a public planning workshop. A main topic of public interest for many individuals was the opportunity for public use at the Refuge specifically wildlife viewing, nature interpretation, and photography. The vast majority of individuals indicated a preference for these activities to occur on the Refuge. Some landowners adjacent to the Refuge preferred that public use activities occur away from Refuge boundaries to preclude potential trespassing problems on private lands.

Determination (check one below):

☐ Use is Not Compatible

☒ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

The following conditions apply to ensure compatibility of these activities with the Refuge's primary purpose: 1) a public use plan for the Refuge with public input is completed for the facility along with compliance documents, 2) restoration of fallow agricultural land is restored to native habitats before public use facilities are developed, 3) wildlife and habitat surveys (with an emphasis on key trust species) are conducted and the results reviewed by Refuge staff to check for negative trends in wildlife/habitat use associated with public use activities, 4) monitoring visitor use to accurately gauge use levels, 5) periodic and random law enforcement patrols, 6) adequate signage indicating Service regulations and refuge public use policies, and 7) reduction of elements of this public use program if it is ascertained that wildlife or habitat is being negatively impacted..

Justification:

Wildlife observation, nature interpretation, and photography are public uses that will allow the visiting public to enjoy, experience, and learn about native wildlife, plants and habitats. Since the majority of the land near and adjacent to the Refuge has been highly modified and converted to agriculture, opening these trails/tour route on a regulated basis will provide wildlife-dependent recreational opportunities for the public. All three of these uses (i.e., wildlife observation, interpretation and photography) are considered priority public uses for the National Wildlife Refuge System. This program will confine the visiting public to designated trail systems for a quality experience while leaving the majority of Refuge land free from disturbance for wildlife. Concerns about the protection of native plants and animals, and the overall integrity of the wetland and upland habitats, require that public access be limited to select designated areas (i.e., contact stations, trails, parking lots, etc.) which will permit other portions of the Refuge to provide sanctuary areas (i.e., free of

disturbance) to wildlife resources (Burger 1981). The stipulations listed above will protect migratory birds from disturbance on the Refuge.

Limited public access and restrictions will reduce the likelihood of adverse long-term impacts to plant and wildlife resources. The Refuge was established to conserve fish or wildlife which are listed as endangered species or threatened species or plants...; as an inviolate sanctuary, or for any other management purpose, for migratory birds; for the development, advancement, management, conservation, and protection of fish and wildlife resources; and for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. A public use program featuring wildlife observation, nature interpretation and photography by individuals or small groups will not negatively impact the natural resources at the Refuge as indicated in this determination and these programs are deemed compatible with the purposes for which the Refuge was established.

Mandatory Re-Evaluation Date:

2021 Mandatory 15 year Re-Evaluation Date (for priority public uses)

 Mandatory 10 year Re-Evaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

 Categorical Exclusion without Environmental Action Statement

 Categorical Exclusion and Environmental Action Statement

 X Environmental Assessment and Finding of No Significant Impact

 Environmental Impact Statement and Record of Decision

Literature Cited:

Burger, J. 1981. The effect of human activity on birds at coastal bay. Biol. Conserv.; 21: 231-241).

Refuge Determination:

Prepared by:

RWP 22 September 2006
(Signature and Date)

Refuge Manager Approval:

[Signature] 25 Sept 06
(Signature and Date)

Concurrence:

Refuge Supervisor:

[Signature] 10/13/06
(Signature and Date)

Assistant Manager,
National Wildlife
Refuge System

[Signature] 10/17/06
(Signature and Date)

COMPATIBILITY DETERMINATION for Environmental Education on the San Joaquin River National Wildlife Refuge

Use Considered: Environmental education programs for the public.

Refuge Name:

San Joaquin River National Wildlife Refuge (Refuge) - a unit of the San Luis National Wildlife Refuge (NWR) Complex. The Refuge is located in western Stanislaus and San Joaquin Counties, California. The Refuge presently consists of approximately 6,500 acres situated along the San Joaquin River from just south of the confluence with the Tuolumne River north to the north bank of the Stanislaus River. The approved boundary for the Refuge comprises 12,887 acres; land presently not part of the Refuge is proposed for the conservation easement program.

Establishing and Acquisition Authority(ies):

The San Joaquin River National Wildlife Refuge was established in 1987 to protect the, at the time, endangered Aleutian Canada goose, listed as endangered in 1967 and relisted as threatened in 1991. The Refuge was originally established under the authority of the Endangered Species Act. Other Refuge lands were acquired under the Migratory Bird Conservation Act and the Fish and Wildlife Act of 1956.

Refuge Purpose(s):

The Refuge purposes are

“To conserve fish or wildlife which are listed as endangered species or threatened species or plants...” 16 U.S.C. 1534 (Endangered Species Act of 1973).

“...For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act)

“For the development, advancement, management, conservation, and protection of fish and wildlife resources.” 16 U.S.C. 742f(a)(4) “.... For the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition and servitude.” 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956).

National Wildlife Refuge System Mission:

The mission of the National Wildlife Refuge System (NWRS) is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” 16 U.S.C. 668dd-668ee (National Wildlife Refuge Administration Act of 1966, as amended).

Description of Use:

Environmental education programs at a Refuge provide opportunities for the visiting public to learn about and experience native wildlife and their habitats. At the present time, environmental educational opportunities for the public at the Refuge are limited to

the wildlife observation deck off of Beckwith Road. However, once habitat restoration projects on the Refuge have progressed in converting fallow agricultural land to native habitats, additional public use facilities will be developed for increased public use for wildlife observation, nature interpretation and photography similar to the facilities at the San Luis NWR and Merced NWR. These facilities will include nature trail(s), auto tour route (if feasible), interpretive panels, observation platforms, comfort stations, benches, waste receptacles, photography blinds and parking lots. These facilities will also be used for environmental education programs both those performed by schools and the Refuge. Only portions of the Refuge will be open to public use including environmental education, other sections will be closed to public use to limit disturbance to select habitats and wildlife. A public use plan including environmental education programs will be developed to guide the implementation of an expanded public use program at the Refuge. This plan will be developed by the staff of the San Luis National Wildlife Refuge Complex working in conjunction with the FWS's Regional Office along with local partners and the public.

Once facilities are developed, access to the Refuge will be daily from 2 hour before sunrise to 2 hour after sunset. The current estimate of public use at the Refuge is 1,500 per annum, however, with the development of additional facilities, use is expected to increase to approximately 50,000 per annum - similar to other refuge units in the Central Valley. It is expected that between 5,000 and 10,000 visits to the Refuge per annum will be for environmental education. The majority of public use would occur from autumn through spring coinciding with bird migrations, waterfowl/waterbird use of wetland habitats, and spring vegetative green-up. Lesser use is expected during the summer months when schools are closed and conditions are dry and daytime temperatures are high. Environmental education visitors will have use of the facilities developed for wildlife observation, nature interpretation and photography during the approved hours and seasons which are set by the Refuge Manager.

Availability of Resources:

Adequate funding and staff exist, are available or are attainable for the San Luis National Wildlife Refuge Complex to conduct and expand an environmental education program at the Refuge. Initial costs for expanding the environmental education program at the Refuge would include the preparation or construction of the following: trails, auto tour route (if feasible), interpretive panels, observation platforms and blinds, benches, comfort stations, parking lots, access gates, signage, and brochures. The project can be completed in phases with each phase consisting of individual trails. Annual maintenance costs will involve trail and parking area maintenance, entrance road maintenance, cleaning and maintenance of comfort stations, refuse removal, periodic maintenance of wooden structures (i.e., benches, platforms and blinds), and repair/replacement of signs and gates.

Anticipated Impacts of the Use:

Short and long-term impacts are similar to the public uses of wildlife observation, nature interpretation and photography as the same facilities will be used for environmental education programs. Short-term impacts will be associated with the establishment of the trails (and auto tour route if feasible) and observation platform. These short-term impacts include increased noise from construction activities, an increase in the number of vehicles and people on the Refuge, and soil disturbance where signs, posts and the observation platforms/blinds are situated. Wildlife will likely avoid areas where work is being conducted but are expected to resume normal activities and patterns when these facilities have been completed. Once these facilities are in place, we expect that terrestrial animals will continue to use the trail corridors and surrounding areas.

Long-term impacts will be associated with the construction of a parking lot(s), observation platform(s), signs, and use of the trail(s)/tour route. These include loss of habitat, increase in manmade permanent structures, and increased use by the public, especially from autumn through spring. The creation of the parking lots will result in the permanent loss of less than two acres of introduced grasses and will not impact any sensitive, threatened, or endangered plant or animal species. Terrestrial and burrowing animals will be displaced by this action but are expected to continue to use the area. The increase in permanent structures will add a vertical and human-made component to an otherwise natural and relatively flat environment. Disturbance to wildlife will be increased for select species along the nature trail(s), observation platforms/blinds, kiosks, and parking areas. The major anticipated impact of these activities is disturbance of wildlife and trampling of plants. However, the disturbance to wildlife including migratory birds will be minimal if the stipulations listed below are followed. Trampling of plants and erosion of sensitive habitats from this activity are minimized by only allowing public access to a trail/tour route system.

Public Review and Comment:

The public was provided the opportunity to review and comment on current and potential Refuge programs as part of the Comprehensive Conservation Planning process for the Refuge. This process included three large mailings of plan updates encouraging public input on the development of Refuge programs as well as having the opportunity to participate at a public planning workshop. A main topic of public interest for many individuals was the opportunity for public use at the Refuge specifically wildlife viewing, nature interpretation, and photography. The vast majority of individuals indicated a preference for these activities to occur on the Refuge. Environmental educational activities were also requested to occur on the Refuge but to a lesser degree than wildlife observation. Some landowners adjacent to the Refuge preferred that public use activities occur away from Refuge boundaries to preclude potential trespassing problems on private lands.

Determination (check one below):

☐ Use is Not Compatible

☒ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

The following conditions apply to ensure compatibility of these activities with the Refuge's primary purpose: 1) a public use plan including environmental education for the Refuge with public input is completed for the facility along with compliance documents, 2) restoration of fallow agricultural land is restored to native habitats before public use facilities are developed, 3) wildlife and habitat surveys (with an emphasis on key trust species) are conducted and the results reviewed by Refuge staff to check for negative trends in wildlife/habitat use associated with public use activities, 4) monitoring visitor use to accurately gauge use levels, 5) periodic and random law enforcement patrols, 6) adequate signage indicating Service regulations and refuge public use policies, and 7) reduction of elements of this public use program if it is ascertained that wildlife or habitat is being negatively impacted..

Justification:

Environmental education is one of six priority public uses for the National Wildlife Refuge System. Environmental educational activities will confine the visiting public to designated trail systems for a quality experience while leaving the majority of Refuge land free from

disturbance for wildlife. Concerns about the protection of native plants and animals, and the overall integrity of the wetland and upland habitats, require that public access including for environmental education be limited to select designated areas (i.e., contact stations, trails, parking lots, etc.) which will permit other portions of the Refuge to provide sanctuary areas (i.e., free of disturbance) to wildlife resources (Burger 1981). The stipulations listed above will protect migratory birds from disturbance on the Refuge

Limited public access and restrictions will reduce the likelihood of adverse long-term impacts to plant and wildlife resources. The Refuge was established to conserve fish or wildlife which are listed as endangered species or threatened species or plants...; as an inviolate sanctuary, or for any other management purpose, for migratory birds; for the development, advancement, management, conservation, and protection of fish and wildlife resources; and for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. A public use program featuring environmental education by individuals or small groups will not negatively impact the natural resources at the Refuge as indicated in this determination and these programs are deemed compatible with the purposes for which the Refuge was established.

Mandatory Re-Evaluation Date:

2021 Mandatory 15 year Re-Evaluation Date (for priority public uses)

 Mandatory 10 year Re-Evaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

 Categorical Exclusion without Environmental Action Statement

 Categorical Exclusion and Environmental Action Statement

 X Environmental Assessment and Finding of No Significant Impact

 Environmental Impact Statement and Record of Decision

Literature Cited:

Burger, J. 1981. The effect of human activity on birds at coastal bay. Biol. Conserv.; 21: 231-241).

Refuge Determination:

Prepared by:

 RW P 22 Sept 2006
(Signature and Date)

Refuge Manager Approval:

 [Signature] 25 Sept 06
(Signature and Date)

Concurrence:

Refuge Supervisor:

Don Walsworth 10/13/06
(Signature and Date)

Assistant Manager,
National Wildlife
Refuge System

Margaret J. Kolar 10/17/06
(Signature and Date)

COMPATIBILITY DETERMINATION for Scientific Study on the San Joaquin River National Wildlife Refuge

Use Considered: Scientific Study

Refuge Name:

San Joaquin River National Wildlife Refuge (Refuge) - a unit of the San Luis National Wildlife Refuge (NWR) Complex. The Refuge is located in western Stanislaus and San Joaquin Counties, California. The Refuge presently consists of approximately 6,500 acres situated along the San Joaquin River from just south of the confluence with the Tuolumne River north to the north bank of the Stanislaus River. The approved boundary for the Refuge comprises 12,887 acres; land presently not part of the Refuge is proposed for the conservation easement program.

Establishing and Acquisition Authority(ies):

The San Joaquin River National Wildlife Refuge was established in 1987 to protect the, at the time, endangered Aleutian Canada goose, listed as endangered in 1967 and relisted as threatened in 1991. The Refuge was originally established under the authority of the Endangered Species Act. Other Refuge lands were acquired under the Migratory Bird Conservation Act and the Fish and Wildlife Act of 1956.

Refuge Purpose(s):

The Refuge purposes are

“To conserve fish or wildlife which are listed as endangered species or threatened species or plants...” 16 U.S.C. 1534 (Endangered Species Act of 1973).

“...For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act)

“For the development, advancement, management, conservation, and protection of fish and wildlife resources.” 16 U.S.C. 742f(a)(4) “... For the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition and servitude.” 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956).

National Wildlife Refuge System Mission:

The mission of the National Wildlife Refuge System (NWRS) is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” 16 U.S.C. 668dd-668ee (National Wildlife Refuge Administration Act of 1966, as amended).

Description of Use:

Scientific studies concerning natural resources conducted by private individuals, groups and/or agencies at the Refuge.

Availability of Resources:

Adequate funding and staff exist to manage scientific studies concerning natural resources conducted by private individuals or groups at the Refuge. Administrative staff costs associated with this use consists of Refuge staff time to review research proposals, collected data, special use permits, research summaries, and to evaluate impacts and that researchers are in compliance. Other staff time includes monitoring the use of the Refuge temporary quarters where researchers are allowed to stay during their data collection period if space is available. Annual monetary costs expended by the Refuge to administer this use averages \$1,000.00. Most of the research conducted on the Refuge in the past has been funded from outside sources and this trend is expected to continue.

Anticipated Impacts of the Use:

The principal potential impact by this activity on the Refuge's natural resources is disturbance to wildlife and habitat. However, research conducted on the natural resources of the Refuge can benefit the management of those resources (Leopold et al. 1968 and Primack 1993). To conduct research on the Refuge, an investigator needs to submit a research proposal on a project and indicate the purpose of the research, techniques to be used in the field and for analyses, time frame for the field work, and the proposed study area on the Refuge. If the research project is deemed valuable for the Refuge and that it will not negatively impact the natural resources than a Special Use Permit (SUP) is issued to the investigator and any controls or stipulations regarding the research are indicated on the permit to ensure protection of the Refuge's natural resources. The permit is issued on an annual basis and an annual or final report on the research is required to be sent to the Refuge at the start of each year. Failure to comply with the SUP results in a revocation of the permit or failure to renew the annual permit. Scientific studies conducted under these guidelines have minimal negative impact on Refuge lands, waters and interests and frequently provide benefits in the information they provide on natural resource inventories and processes at the Refuge.

Public Review and Comment:

The public was provided the opportunity to review and comment on current and potential Refuge programs as part of the Comprehensive Conservation Planning process for the Refuge. This process included three large mailings of plan updates encouraging public input on the development of Refuge programs as well as having the opportunity to participate at a public planning workshop. Main topics of public interest were visitor access and appropriate recreational or educational uses of the Refuge. No public comments addressed scientific research concerning natural resources conducted by private individuals or groups on the Refuge.

Determination (check one below):

☐ Use is Not Compatible

X Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

The following stipulations are required to ensure compatibility of this activity: a research proposal is required for any investigation, the proposal is reviewed by San Luis NWR Complex staff as to its potential value and impacts to the Refuge's natural resources, a one year SUP is issued to approved research projects, restrictions regarding the specific research project are listed in the SUP, and an annual/final report are required for all investigations. Failure to comply with the provisions of the SUP results in revocation of permit privileges. Specifically all scientific studies on the Refuge will require the following:

- The principal investigator submit a study proposal for approval to the Complex.
- All work will be coordinated with the project leader, or designated Refuge staff, and researcher.
- Research will adhere to current approved protocols for data collection as indicated in the study proposal and special use permit.
- Proposed research methods which will adversely affect, or would have the potential to adversely affect Refuge resources will require the researcher to develop mitigation measures to minimize potential impacts; mitigation measures will be listed as a condition in the SUP.
- Refuge staff will be free to accompany researchers at any time to assess potential impacts; to insure SUPs are adhered to; and to determine if approved research proposals and SUPs should be terminated because of adverse impacts.
- All refuge rules and regulations must be followed unless otherwise excepted, in writing, by project leader.
- The researcher will be responsible for acquiring all necessary permits, both from the State of California or U.S. Fish and Wildlife Service, if applicable, and to demonstrate that these permits are up to date prior to the beginning of research approval.

Justification:

The Refuge was established to conserve fish or wildlife which are listed as endangered species or threatened species or plants...; as an inviolate sanctuary, or for any other management purpose, for migratory birds; for the development, advancement, management, conservation, and protection of fish and wildlife resources; and for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Scientific studies by individuals or groups on the natural resources at the Refuge as indicated in this determination is compatible with the purposes for which the Refuge was established.

Mandatory Re-Evaluation Date:

 Mandatory 15 year Re-Evaluation Date (for priority public uses)

 2016 Mandatory 10 year Re-Evaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

 X Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

Literature Cited:

Leopold, A.S., C. Cottam, I.M. Cowan, I.N. Gabrielson and T.L. Kimball. 1968. The National Wildlife Refuge System-1968. Trans. N. Am. Wildl. and Nat. Res. Conf. 33:30-53.

Primack, R.B. 1993. Essentials of Conservation Biology. Sinauer, Mass.

Refuge Determination:

Prepared by:

RWP 22 September 2006
(Signature and Date)

Refuge Manager Approval:

[Signature] 25 Sept 06
(Signature and Date)

Concurrence:

Refuge Supervisor:

Dan Walsworth 10/13/06
(Signature and Date)

Assistant Manager,
National Wildlife
Refuge System

Margaret J. Kolar 10/17/06
(Signature and Date)

COMPATIBILITY DETERMINATION for Grazing by Livestock on the San Joaquin River National Wildlife Refuge

Use Considered: Grazing by livestock (cattle and sheep) to enhance habitats for wildlife.

Refuge Name:

San Joaquin River National Wildlife Refuge (Refuge) - a unit of the San Luis National Wildlife Refuge (NWR) Complex. The Refuge is located in western Stanislaus and San Joaquin Counties, California. The Refuge presently consists of approximately 6,500 acres situated along the San Joaquin River from just south of the confluence with the Tuolumne River north to the north bank of the Stanislaus River. The approved boundary for the Refuge comprises 12,887 acres; land presently not part of the Refuge is proposed for the conservation easement program.

Establishing and Acquisition Authority(ies):

The Refuge was established in 1987 to protect the, at the time, endangered Aleutian Canada goose, listed as endangered in 1967 and relisted as threatened in 1991. The refuge was originally established under the authority of the Endangered Species Act. Other refuge lands were acquired under the Migratory Bird Conservation Act and the Fish and Wildlife Act of 1956.

Refuge Purpose(s):

The Refuge purposes are

“To conserve fish or wildlife which are listed as endangered species or threatened species or plants...” 16 U.S.C. 1534 (Endangered Species Act of 1973).

“...For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act)

“For the development, advancement, management, conservation, and protection of fish and wildlife resources.” 16 U.S.C. 742f(a)(4) “... For the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition and servitude.” 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956).

National Wildlife Refuge System Mission:

The mission of the National Wildlife Refuge System (NWRS) is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” 16 U.S.C. 668dd-668ee (National Wildlife Refuge Administration Act of 1966, as amended).

Description of Use:

A grazing program, where sheep and cattle are used to enhance Refuge habitats for the benefit of wildlife and native plant communities. This Compatibility Determination is a re-evaluation of a 1994 Compatibility Determination for the Refuge Biological Program which specifically addressed grazing on the Refuge.

The ongoing grazing program uses both sheep and cattle as habitat management tools. Cattle grazing occurs in both improved irrigated pastures and natural uplands on a long-term annual basis. Sheep grazing is currently a short-term practice used to control exotic invasive weeds in fallow agricultural fields until those areas are restored to riparian forest or wetland communities. Grazing would be used to manage habitats in a manner that is consistent with the Refuge System mission and the purposes for which the Refuge was established:

- 1) In irrigated pastures, the results of grazing provide foraging habitat for wintering and migratory birds that require habitat characterized by short vegetation heights. These wildlife species include Aleutian Canada goose, white-fronted goose, snow and Ross' goose, sandhill crane, white-faced ibis, and long-billed curlew.
- 2) In natural uplands, the results of grazing provide winter foraging habitat for the migratory birds listed above. It also provides foraging, denning and nesting habitat for species which are characteristic of Central Valley grasslands and require habitat characterized by short vegetation heights. Such species include California ground squirrel, Heermann's kangaroo rat, American badger, burrowing owl, and long-billed curlew.
- 3) In natural uplands, grazing maintains and improves the health and integrity of native plant and vernal pool communities by decreasing the amount of accumulated litter (dead plant material) and by decreasing the competitive influence of exotic grasses and forbs.
- 4) In irrigated pastures, natural uplands and fallow agricultural fields, grazing reduces and controls the abundance and proliferation of exotic invasive weeds such as yellow star thistle, prickly lettuce, Russian thistle, perennial pepperweed, amongst others.

The grazing period for irrigated pastures is year-round with the objective of having individual pastures grazed a total of eight months out of a year. Late summer/fall grazing levels are managed with the objective of having the pastures in a short-cropped condition when geese arrive in mid-October. Projected annual stocking rates on individual fields range from 0.6 to 1.3 AU/acre/month for eight months depending on productivity, condition of the pasture and Refuge management objectives.

The grazing period for natural uplands during years with average to high precipitation amounts is from December 1 through June 15 with the objective of having individual pastures grazed for a total of four months. Projected annual stocking rates are 1 AU/acre/month for four months. During years with below-average precipitation amounts, stocking levels are decreased accordingly and/or periods of use are reduced.

All livestock used in the proposed grazing program are owned and managed by local agricultural producers. Grazing privileges are awarded by the Refuge when a producer enters into a Cooperative Land Management Agreement with the Refuge. Part 29.2 of Title 50, Code of Federal Regulations, entitled "Cooperative Land Management," states that:

Cooperative agreements with persons for crop cultivation, haying, grazing, or the harvest of vegetative products, including plant life, growing with or without cultivation on wildlife Refuge areas may be executed on a share-in-kind basis when such agreements are in aid of or benefit to the wildlife management of the area.

Grazing cooperators are chosen according to the process described in the U.S. Fish and Wildlife Service Refuge Manual, 5 RM 17.

The value of cattle grazing in both natural uplands and irrigated pastures is set at \$10.00/AUM and reflects fair-market pasture rental rates characteristic of Stanislaus County, with adjustments made for water and irrigation costs incurred by the Cooperator. The value of sheep grazing is adjusted downward from fair-market pasture rental rates to reflect costs associated with temporary fencing, repeated movements of animals between pastures, required presence of a sheep-herder, and quality of forage. The value of grazing is credited against the Cooperator's cost of performing work for the Refuge, such as the planting of wildlife food-crops (corn and winter wheat), in lieu of cash payment.

Availability of Resources:

The grazing program is administered by Refuge staff who identify the desired objectives of the grazing program, prepare Cooperative Land Management Agreements and Refuge Grazing Plans, provide coordination for grazing Cooperators as well as compliance monitoring. The grazing Cooperator is responsible for the cost of installation and/or maintenance of all range improvements (watering facilities, cross-fencing, etc.) associated with grazing activities. Facilities installed primarily for Refuge purposes are constructed or maintained at Refuge expense. Adequate funding and staff exist to manage the grazing program at the Refuge.

Anticipated Impacts of the Use:

Anticipated positive impacts of the grazing program at the Refuge include the following:

- The creation and maintenance of short-cropped foraging habitat for wintering and migratory birds in irrigated pastures and natural uplands.
- The creation and maintenance of year-round foraging, denning and nesting habitat, characterized by short vegetation, in natural uplands.
- Improvement and maintenance of the health and integrity of native plant and vernal pool communities in natural uplands.
- A reduction in the abundance and proliferation of noxious weeds in irrigated pastures and natural uplands.
- A reduction in the seed bank of exotic invasive weeds in fallow agricultural fields which are scheduled to be restored to riparian forest communities.

Potential negative impacts of a grazing program at the Refuge include:

- Improper fence placement and rotation of livestock within pastures can result in sensitive areas, such as wetlands and riparian corridors, being grazed and/or trampled excessively. This can result in damage to desirable vegetation, soil erosion, noxious weed invasion and reduced water quality of streams and wetlands.
- Poor management of livestock distribution within a pasture can result in portions being grazed and/or trampled excessively (i.e., around watering or mineral facilities). This can result in the same negative impacts mentioned above.
- Poor management of periods when livestock are present in pastures can reduce or prevent the use of those pastures by wildlife species that would otherwise benefit from the habitat enhancements provided by livestock grazing.

Positive impacts can be maximized and negative impacts can be minimized through:

- The establishment of Cooperative Land Management Agreements and Grazing Plans which clearly identify Refuge goals, objectives, strategies and prescriptions.
- Continuous and effective collaboration and coordination between Refuge staff and

- Cooperators.
- Diligent compliance monitoring by Refuge staff.

Public Review and Comment:

The public was provided the opportunity to review and comment on current and potential Refuge programs as part of the Comprehensive Conservation Planning process for the Refuge. This process included three large mailings of plan updates encouraging public input on the development of Refuge programs as well as having the opportunity to participate at a public planning workshop. Main topics of public interest were visitor access and appropriate recreational or educational uses of the Refuge. No public comments addressed the topic of grazing on the Refuge to benefit wildlife habitat.

Determination (check one below):

_____ Use is Not Compatible

 X Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

The Cooperator will operate under the terms and conditions of a Cooperative Land Management Agreement and a Refuge Grazing Plan. These documents provide the necessary information and assistance from the Refuge to determine periods of use and stocking rates. Refuge staff will set the value of grazing so as to reflect current fair market values, monitor Cooperator compliance, and maintain complete files on all grazing activities.

Justification:

The Refuge was established to conserve fish or wildlife which are listed as endangered species or threatened species or plants...; as an inviolate sanctuary, or for any other management purpose, for migratory birds; for the development, advancement, management, conservation, and protection of fish and wildlife resources; and for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. A grazing program to protect and enhance wildlife habitat at the Refuge as indicated in this determination is compatible with the purposes for which the Refuge was established.

Mandatory Re-Evaluation Date:

_____ Mandatory 15 year Re-Evaluation Date (for priority public uses)

 2016 Mandatory 10 year Re-Evaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

___X___ Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

Refuge Determination:

Prepared by:

RWP 22 September 2006
(Signature and Date)

Refuge Manager Approval:

[Signature] 25 Sept 06
(Signature and Date)

Concurrence:

Refuge Supervisor:

[Signature] 10/13/06
(Signature and Date)

Assistant Manager,
National Wildlife
Refuge System

Margaret J. Nolan 10/17/06
(Signature and Date)

COMPATIBILITY DETERMINATION for Mosquito Monitoring and Control on the San Joaquin River National Wildlife Refuge

Use Considered: Mosquito Monitoring and Control

Refuge Name:

San Joaquin River National Wildlife Refuge (Refuge) - a unit of the San Luis National Wildlife Refuge (NWR) Complex. The Refuge is located in western Stanislaus and San Joaquin Counties, California. The Refuge presently consists of approximately 6,500 acres situated along the San Joaquin River from just south of the confluence with the Tuolumne River north to the north bank of the Stanislaus River. The approved boundary for the Refuge comprises 12,887 acres; land presently not part of the Refuge is proposed for the conservation easement program.

Establishing and Acquisition Authority(ies):

The Refuge was established in 1987 to protect the, at the time, endangered Aleutian Canada goose, listed as endangered in 1967 and relisted as threatened in 1991. The Refuge was originally established under the authority of the Endangered Species Act. Other Refuge lands were acquired under the Migratory Bird Conservation Act and the Fish and Wildlife Act of 1956.

Refuge Purpose(s):

The Refuge purposes are

“To conserve fish or wildlife which are listed as endangered species or threatened species or plants...” 16 U.S.C. 1534 (Endangered Species Act of 1973).

“...For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act)

“For the development, advancement, management, conservation, and protection of fish and wildlife resources.” 16 U.S.C. 742f(a)(4) “... For the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition and servitude.” 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956).

National Wildlife Refuge System Mission:

The mission of the National Wildlife Refuge System (NWRS) is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” 16 U.S.C. 668dd-668ee (National Wildlife Refuge Administration Act of 1966, as amended).

Description of Use:

The Turlock and Eastside Mosquito Vector Control Districts (Districts) propose to continue the monitoring and controlling of mosquitoes at the Refuge to address nuisance and human health concerns of neighboring communities. The Refuge is located in the San Joaquin Valley.

While mosquitoes at certain levels are considered a nuisance because of their biting, many species are also known vectors of serious diseases in California. Twelve mosquito-borne viruses are known to occur in California, however, only western equine encephalomyelitis virus (WEE) and St. Louis encephalitis virus (SLE) have caused significant outbreaks of human disease in the past (CA Dept. of Health Services 2003). Within the last few years, California has also been at risk for West Nile virus (WNV) which was first detected in the summer of 2003. WEE tends to be most serious in very young children, whereas elderly people are most at risk to SLE and WNV (CA Dept. of Health Services 2003). WEE and WNV can cause serious diseases in horses and emus, and WNV kills a wide variety of endemic and imported birds. Mosquito control is the only known practical method of protecting people and animals from WEE, SLE, and WNV (CA Dept. of Health Services 2003).

The mosquito species identified by the Districts for monitoring and control are *Culex erythrothorax*, *C. pipiens*, *C. tarsalis*; *Ochlerotatus dorsalis*, *O. melanimon*, *O. nigromaculis*, and *Aedes vexans*. *C. tarsalis* is the primary vector of WEE and SLE in California and is also considered to be a significant vector of WNV (CA Dept. of Health Services 2003). *C. pipiens*, *C. erythrothorax*, *O. melanimon*, *O. dorsalis*, and *A. vexans* may also contribute to disease transmission (Goddard et al 2002).

Mosquito Monitoring

The Districts' monitoring activities are designed to ascertain the abundance of immature (larvae and pupae) and adult mosquito populations. During an average mosquito monitoring period, typically between the months of April through October, the Districts assess larval mosquito populations by using the 'dipper' method in various wetlands, moist soil units, irrigated pastures, and riparian areas. Adults are monitored using carbon dioxide (CO₂) and light traps.

The Districts' monitor larval stage mosquito populations and identify species using the dipper method. This entails using a long-handled ladle (ca 500 ml) called a dipper to collect water samples from water potentially serving as mosquito sources. Dipping occurs from every one to two weeks depending on breeding conditions. Dip counts are used to estimate the abundance of immature mosquitoes and to determine the need for mosquito control.

The Districts use carbon dioxide (CO₂) baited traps to monitor the abundance of adult mosquitoes and to identify species. The trap used is baited with 1-2 kg of dry ice. The use and placement of CO₂ baited traps on the Refuge depends on perceived numbers and the potential disease threat. Increased use of CO₂ baited traps occurs when adult numbers are high or the disease threat is significant. A single light trap is operated at the Refuge's shop and checked weekly throughout most of the year. Light traps are cylinders with a light, fan, and collecting jar. The mosquitoes are attracted to the light and enter the cylinder.

The monitoring activities described above are conducted under a Special Use Permit (SUP) between the Refuge and the Districts.

Mosquito Control with larvicides:

The Districts control mosquitoes by treating areas infested with larval stages of *C. erythrothorax*, *C. pipiens*, *C. tarsalis*; *O. dorsalis*, *O. melanimon*, *O. nigromaculis*, and *A. vexans*. Mosquito control would be initiated with the use of larvicides when breeding is considered widespread in an area as determined by the larval sampling program. Permission needs to be given by the Refuge Manager to the Districts immediately prior to any application of larvicides on the Refuge. The Districts treat larval mosquitoes using

Bacillus thuringiensis serovar. *israelensis* (Bti) and methoprene, which are applied mainly with ground application methods and occasionally with aerial methods. Depending on need, multiple treatments can be used in the same area during a season but typically are separated by at least a two week period.

Bti is a microbial insect pathogen used to control larval stages of mosquitoes and black flies. It is a naturally occurring anaerobic spore forming bacteria that is mass produced using modern fermentation technology. Bti produces protein endotoxins that are activated in the alkaline mid-gut of insect species and subsequently bind to protein specific receptors of susceptible insect species resulting in the lethal response (Lacey and Mulla 1990). Bti must be ingested by the target insect to be effective. It is most effective on younger mosquito larval instars. The Districts use the formulated Bti product Teknar HP-D at rates of 0.5-1.0 pt/acre and Vectobac 12AS at rates of 0.25-1 pt/acre.

Methoprene is a synthetic insect growth regulator that mimics juvenile hormones (Tomlin, 1994). It interferes with the insect's maturation stages preventing the insect from transforming into the adult stage, thereby precluding reproduction. Methoprene is a contact insecticide that does not need to be ingested. It is most effective on early larval instars (Extension Toxicology Network, 1996). Treated larvae will pupate, but will not emerge as adults. The Districts use the formulated methoprene product Altosid Liquid Larvicide Concentrate at a rate of 0.75-1.0 oz/acre.

During the early stages of larval growth, typically stages 2-4, Bti is most effective for control as larvae at these stages of life tends to feed on bacteria. Altosid is used at later stages of larval growth when feeding ceases. Altosid is absorbed into the bodies of larvae, inhibiting their growth into adults.

Applications of larvicides may occur anywhere in wetlands, moist soil units, irrigated pastures and/or riparian habitat at the Refuge depending on larval abundance. The potential areas for mosquito breeding and consequently mosquito treatment total approximately 3,000 acres. Mosquito control applications can occur anytime between April through November, depending on environmental conditions, but normally occur during August, September, and October when water is being added to the wetland units. Annual precipitation amounts can also have a direct effect on mosquito populations. During drought years mosquito populations tend to be low, and during wet years mosquito populations tend to be high. Mosquito control is consequently conducted as a response to seasonality and/or climatic cycles. The Districts have been controlling mosquito populations with larvicides on the refuge since its creation in 1987. The larvaciding activities described above are conducted under a SUP between the Refuge and the Districts.

Treatment has been conducted mainly by ground application in areas where monitoring has documented high mosquito larval densities or high concentrations of a specific vector bearing mosquito species. Aerial application has been done only rarely using either fixed-wing or rotary aircraft flown at an altitude of 10-20 feet above the vegetation and at airspeeds of 130-140 miles per hour. Treatment duration would average 20 minutes, but would vary given the size of the treatment area. Aerial pass distance would vary depending on the treatment area, but would average 70 feet. The pilot would use a map of units to be treated as well as utilizing a GPS as an additional guide.

Mosquito control with adulticides

The preferred mosquito control technique on the refuge is the use of larvicides. However, in cases where a public health emergency is declared due to adult mosquitoes, permission to use adulticides on the refuge by the Districts will be approved through the use of a SUP. In

such cases, the Districts would use the adulticides Pyrocyde or Pyrenone, which have natural pyrethrins as their active ingredient.

Pyrethrins are naturally occurring compounds produced by certain species of chrysanthemum flowers. The flowers of the plant are harvested shortly after blooming and are either dried and powdered, or oils within the flowers are extracted by solvents. Pyrethrins are non-systemic contact poisons which quickly penetrate the nerve system of the insect and cause paralysis and subsequent death (EXTOXNET 1994, Tomlin 1994). A few minutes after application, the insect cannot move or fly away. But, a “knockdown dose” does not mean a killing dose. Pyrethrins are swiftly detoxified by enzymes in the insect. Thus, some pests will recover. To delay the enzyme action so a lethal dose is assured, commercial products are formulated with synergists such as piperonyl butoxide, which inhibit detoxification (Tomlin, 1994). Both products KMVCD proposes, Pyrocyde and Pyrenone, are composed of 5% pyrethrins and 25% piperonyl butoxide. These adulticides are applied as an ultra-low volume (ULV) fog at a rate of 0.1 fluid oz/ac (0.0025 lbs ai/ac pyrethrin) by air and/or ground.

Availability of Resources:

Adequate funding and staff exist to manage this activity. Monitoring and control will be conducted by the Districts and not require the direct involvement of Refuge staff with the exception of oversight by the Refuge Manager. Monitoring of treatments would include observations of sprayed areas before and after treatment and coordination of permitting, documentation, and record keeping.

Anticipated Impacts of the Use:

This activity has three principal potential impacts on Service lands, waters or interests. These include disturbance to wildlife caused by the application of Bti/Altosid, impacts to wildlife by the periodic elimination of mosquito larvae from the Refuge, and the impacts of Bti/Altosid on nontarget organisms. All three potential impacts are somewhat minimized by only allowing treatment of habitats when mosquito breeding has been documented as widespread by Refuge staff and by requiring approval for treatment by the Refuge Manager. Thus instead of being treated weekly, whether needed or not, like many sites, Refuge lands will only be treated when sampling has documented a need. Disturbance from the ground or by aircraft usually is of short duration for the unit being treated.

The impacts of monitoring will be confined to pathways to shorelines where dip net samples will be taken. Small areas of vegetation may be crushed in transit to pools of water; but the vegetation will likely spring back after it has been bent under foot. There will be relatively little of this impact, as dipping is done at most once a week. Placing and checking of CO₂ traps might also create a transient impact from footsteps on the vegetation going to and from the traps. Again, this is done at most once a week. There will be no disturbance of habitat associated with the single light trap, as it is in the maintenance yard at headquarters.

Toxicity and Effects to Non-target Organisms

The dominant impact of mosquito control will relate to the toxicity and effects of the treatments on non-target organisms. Both Bti and Altosid treatments are more target specific and less persistent in the environment than most chemical insecticides and thus impacts the Refuge biota to a lesser degree than other chemical treatments available (Fleming et al. 1985, Fortin et al. 1987, Lee and Scott 1989, Marten et al. 1993, Mittal et al. 1991, Parsons and Surgeoner 1991, and Purcell 1981). The possible effects of each compound will be discussed individually.

Bacillus thuringiensis var. *israelensis* (Bti). Bti has practically no acute or chronic toxicity to mammals, birds, fish, or vascular plants (U.S. EPA, 1998). Extensive acute toxicity studies indicated that Bti is virtually innocuous to mammals (Siegel and Shadduck, 1992). These studies exposed a variety of mammalian species to Bti at moderate to high doses and no pathological symptoms, disease, or mortality were observed. Laboratory acute toxicity studies indicated that the active ingredient of Bti formulated products is not acutely toxic to fish, amphibians or crustaceans (Brown et al. 2002, Brown et al. 2000, Garcia et al. 1980, Lee and Scott 1989, and Wipfli et al. 1994). However, other ingredients in formulated Bti products are potentially toxic. The acute toxicity response of fish exposed to the formulated Bti product Teknar® HPD was attributed to xylene (Fortin et al. 1986, Wipfli et al. 1994). Field studies indicated no acute toxicity to several fish species exposed to Bti (Merritt et al. 1989, Jackson et al. 2002); no detectable adverse effects to breeding red-winged blackbirds using and nesting in Bti treated areas (Niemi et al. 1999, Hanowski 1997); and no detectable adverse effects to tadpole shrimp 48 hours post Bti treatment (Dritz et al. 2001).

In addition to mosquitoes (Family Culicidae), Bti affects some other members of the suborder Nematocera within the order Diptera. Also affected are members of the Family Simuliidae (black flies) and some chironomids midge larvae (Boisvert and Boisvert 2000, Garcia et al. 1980). The most commonly observed Bti effects to non-target organisms were to larvae of some chironomids in laboratory settings when exposed to relatively high doses (Boisvert and Boisvert 2000, Lacey and Mulla 1990, Miura et al. 1980). In field studies, effects to target and susceptible nontarget invertebrates have been variable and difficult to interpret. Field study results are apparently dependent on the number, frequency, rate and aerial extent of Bti applications; the Bti formulation used; the sample type (e.g. benthic, water column or drift); the sampling interval (e.g. from 48 hrs to one or more years after treatment); the habitat type (e.g. lentic or lotic); the biotic (e.g. aquatic communities), and abiotic factors (e.g. suspended organic matter or other suspended substrates, temperature, water depth); the mode of feeding (e.g. filter feeder, predator, scraper or gatherer); the larval development stage and larval density (Ali, 1981, Boisvert and Boisvert 2000, Lacey and Mulla, 1990). Bti activity against target and susceptible nontarget invertebrates is also related to Bti persistence and environmental fate which are in turn affected by the factors associated with field study results (Dupont and Boisvert 1986, Mulla 1992). Simulated field studies resulted in the suppression of two unicellular algae species, *Closterium* sp. and *Chlorella* sp. resulting in secondary effects to turbidity and dissolved oxygen of aquatic habitats, with potential trophic effects (Su and Mulla, 1999). For these reasons, Bti effects to target and susceptible nontarget organisms, and potential indirect trophic impacts in the field are difficult to predict.

Methoprene. Methoprene has moderate acute fish toxicity, slight acute avian toxicity, and practically no acute mammalian toxicity (U.S. EPA 2000, and U.S. Fish and Wildlife Service 1984). In mallard ducks, dietary concentrations of 30 parts per million (ppm) caused some reproductive impairment (U.S. EPA 1991). This figure exceeds the estimated environmental concentration by a factor 10 (Table 1). Methoprene residues have been observed to bioconcentrate in fish and crayfish by factors of 457 and 75, respectively (U.S. EPA 1991). Up to 95 % of the residue in fish was excreted within 14 days (U.S. EPA 1991). Risk quotients for birds, fish and mammals are below EPA levels of concern for endangered species indicating negligible risk to those taxa resulting from direct exposure using maximum labeled rates for mosquito control (Urban et al. 1986). In field studies no detectable adverse effects to breeding red-winged blackbirds using and nesting in areas treated with methoprene were observed (Niemi et al. 1999).

Methoprene affects terrestrial and aquatic invertebrates and is used to control fleas, sciarid flies in mushroom houses; cigarette beetles and tobacco moths in stored tobacco; Pharaoh's

ants; leaf miners in glasshouses; and midges (Tomlin 1994). Methoprene may also be fed to livestock in a premix food supplement for control of hornfly (WHO, undated). Methoprene is highly toxic to aquatic invertebrates with a 48 hour EC50 of 0.89 ppm for *Daphnia magna* (U.S. EPA, 1991). Laboratory studies show that methoprene is acutely toxic to chironomids, cladocerans, and some decapods, (Horst and Walker 1999, Celestial and McKenney 1994, McKenney and Celestial 1996, Chu et al. 1997). In field studies, significant declines of aquatic invertebrate, mollusk and crustacean populations have been directly correlated to methoprene treatments for mosquito control (Breaud et al. 1977, Miura and Takahashi 1973, Niemi et al. 1999, and Hershey et al., 1998).

Methoprene has a ten day half life in soil, a photolysis half life of ten hours, and solubility in water is 2 ppm (Zoecon 2000). Degradation in aqueous systems is caused by microbial activity and photolysis (U.S. EPA 1991). Degradation rates are roughly equal in freshwater and saltwater systems and are positively correlated to temperature (U.S. EPA 1991).

Pyrethroids. There are only two general classes of adulticides, organophosphates and pyrethroids. The pyrethroids include both natural products called pyrethrins and synthetic molecules that mimic the natural pyrethrins, such as permethrin, resmethrin, and sumithrin.

In general, pyrethroids have lower toxicity to terrestrial vertebrates than organophosphates. Although not toxic to birds and mammals, pyrethroids are very toxic to fish and aquatic invertebrates (Anderson 1989, Siegfried 1993, Milam et al. 2000). The actual toxicity of pyrethroids in aquatic habitats, however, is less than may be anticipated because of the propensity of these pesticides to adsorb organic particles in water (Hill et al. 1994). The Districts use only natural pyrethrins on Refuge lands.

Wildlife:

Anticipated impacts from mosquito monitoring and control by the Districts is expected to be minimal. In an extensive literature review on the effects of Bti on mammals, Siegel and Shadduck (1992) found the bacterium to be innocuous. These studies exposed a variety of mammalian species to Bti at moderate to high doses and observed no pathological symptoms, nor disease, or mortality. Continued use of the bacterium, Bti, at moderate rates is likely to have a negligible effect on mammalian species residing on the Refuge.

Fish

Areas most likely to be treated with larvacides include irrigated pasture and seasonal wetland basins recently filled—both of which are unlikely to contain fish. Aquatic habitats which have a fish community are unlikely to be significant sources of mosquitos on the Refuge. Toxicity of any of these pesticides to fish populations is not likely to be an issue, since fish rarely occur in mosquito production areas at the Refuge.

Wetlands and Waterfowl:

The Refuge was established in part to provide habitat for migratory birds, in particular waterfowl which includes geese, swans, ducks, and coots. These species occur on the Refuge during August, September, and October when newly flooded wetlands are being treated to control mosquitoes, so there is a potential impact on them. There is not likely to be much impact on geese and swans are year round herbivores. Geese feed mainly on grasses and agricultural lands, while swans feed mainly on roots, tubers, stems, and leaves of submerged and emergent aquatic vegetation. While applications of Bti and Altosid would be likely to occur over areas of vegetation which may be used by geese and

swans, it has been found that birds are not negatively affected by using foods exposed to Bti or methoprene (Niemi et al. 1999). In contrast, ducks are known to be opportunistic feeders on both plants and invertebrates, using the most readily available food sources. Invertebrates, plants, and seeds compose the majority of their diet, varying with the season and the geographic location. A study in California's Sacramento Valley has shown that plant foods are dominant in fall diets of northern pintails, while invertebrate use increases in February and March (Miller 1987). Seeds of swamp timothy comprise the most important duck food in the summer-dry habitats of the San Joaquin Valley (Miller 1987). Thus any food chain impacts resulting from larvicide and adulticide treatment will have limited impacts to the mainly seed diet of newly arriving ducks. Their diet shifts to invertebrates after mosquito treatments are expected to be reduced in frequency, thereby allowing the invertebrate populations to recover. Recent studies have shown that aquatic invertebrates are a dominant food of non-breeding waterfowl during the summer molt, and the fall and winter periods (Heitmeyer and Raveling 1988). Invertebrates are also critical for egg production during the spring (Swanson et al. 1979), and duckling growth during the summer rearing period (Krapu and Swanson 1975). Mosquitoes and chironomids make an important contribution to invertebrate food resources throughout the year. Other significant food resource contributors of the invertebrate community are Coleoptera, Odonata, and Trichoptera. However, during fall flood-up and peak mosquito populations, ducks tend to feed on seed and other plant material. Waterfowl in general tend to feed on seeds when they reach their wintering areas, perhaps to regain energy lost during long flights (Heitmeyer and Raveling 1988, Miller 1987). Thus any food chain impacts resulting from larvicide and adulticide treatment will have limited impacts to the mainly seed diet of newly arriving ducks. Their diets shift to invertebrates after treatments are expected to be reduced in frequency thereby allowing invertebrate populations to recover.

Shorebirds feed on a wide variety of invertebrates all year, feeding which intensifies at the onset of spring migration. Documentation of indirect food-chain effects have not come to light. Hanowski et al. (1997) studied 19 different bird species after collecting data on wetlands 2 years before treatment and 3 years after treatment of both Bti and methoprene applications and found no negative effects. Niemi et al. (1999) found the same results from the same study site of a 3 year study on zooplankton or breeding birds. There are primarily two California State Species of Concern which forage and nest on the Refuge, they are tri-colored blackbirds, and white-faced ibis. Both species are associated with wetland habitats. While resident endangered species are limited to upland habitat on the Refuge, these sensitive species prefer wetland habitat or habitat bordering wetlands. While Hanowski et al. (1997) found no direct evidence to indicate Bti or methoprene negatively impacted the reproduction, growth, or foraging of red-winged blackbirds, to minimize impacts to these species, in particular, during their breeding season, no applications will occur where tri-colored blackbirds or white-faced ibis are nesting.

While treatment on the ground may seem ideal because the impact area is small and can be accomplished from existing roads and levees, aerial treatment is preferred as the impacts to the ground are non-existent and the amount of coverage is larger, less time consuming, and effective over a large area.

Low flying aircraft will undoubtedly cause disturbances to wildlife. However, the number of treatment days per year is low, and if the applicator (pilot or ground) follows the stipulations previously outlined and within the SUP, mosquito abatement practices should not materially interfere with or detract from the Refuge purpose or the mission of the National Wildlife Refuge System. If additional biological monitoring of this activity documents substantial negative impacts to migratory birds or other wildlife, this determination would be re-analyzed on the basis on new evidence.

Public Review and Comment:

The public was provided the opportunity to review and comment on current and potential Refuge programs as part of the Comprehensive Conservation Planning process for the Refuge. This process included three large mailings of plan updates encouraging public input on the development of Refuge programs as well as having the opportunity to participate at a public planning workshop. Main topics of public interest were visitor access and appropriate recreational or educational uses of the Refuge. No public comments addressed mosquito management at the Refuge.

Determination (check one below):

☐ Use is Not Compatible

☒ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

The following stipulations are required to ensure compatibility: that the Districts apply for and receive a SUP annually from the Refuge, that larvae control only be conducted when breeding is widespread as documented by sampling efforts, that only BTI and altosid may be applied on the Refuge as a larvicide, that the Refuge Manager has final approval for any larvicide treatments on the Refuge, that mosquito adulticide only be used on the Refuge during a declared public health emergency, that only Pyrocid or Pyrenone be used as an adulticide, that the Refuge Manager has final approval for any adulticide treatments on the Refuge, and that a final report of all control activities conducted on the by the Districts be sent at the end of the year to the Refuge Manager. Specifically for mosquito monitoring and control to occur on the Refuge will require the following:

1. All application of pesticides/biological agents must be coordinated and approved by the Refuge Manger to avoid conflicts with nesting birds, public use, management activities, etc. Prior to all larvicide applications, the Districts will provide a map and sampling results to the Refuge Manager and obtain verbal approval.
2. Mosquito larvae will be widespread and abundant as documented by sampling for permission to be granted for the Districts to larvicide any portion of the Refuge.
3. The Districts will provide the Refuge with interim and final reports regarding mosquito sampling on the Refuge.
4. Mosquito adulticides will only be allowed in cases of a declared health emergency, following a specific request to the Refuge and written concurrence from appropriate Service or Department bureaus. A human-health emergency is defined by the presence of human disease virus-positive mosquitoes, virus-positive birds and/or human disease at or by the Refuge in Stanislaus or San Joaquin Counties.
5. Spraying of any kind will not be conducted on vernal pools or other such water basins resulting from rainwater accumulations in upland sites.
6. At the end of the permitting period, the Districts will provide the Refuge Manager with a list of all pesticides/biological agents used, and the quantities of each that were applied.
7. Application of mosquito control measures is to be conducted in accordance with approved Pesticide Use Proposals and labels.

8. Mosquito control will be authorized on an annual basis by a SUP. SUP condition will stipulate that all mosquito control work will be carried out under the guidance of pre-approved Pesticide Use Proposals.

Justification:

The Refuge was established to conserve fish or wildlife which are listed as endangered species or threatened species or plants...; as an inviolate sanctuary, or for any other management purpose, for migratory birds; for the development, advancement, management, conservation, and protection of fish and wildlife resources; and for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Mosquito monitoring and control by the Districts at the Refuge as indicated in this determination is compatible with the purposes for which the Refuge was established. For many years the Refuge has worked cooperatively with these two Districts and their mosquito control activities. After a review of these activities, the Refuge has determined that allowing these uses to continue would not interfere with the purposes for which the Refuge was established, nor the mission of the National Wildlife Refuge System.

Mandatory Re-Evaluation Date:

_____ Mandatory 15 year Re-Evaluation Date (for priority public uses)

__2016__ Mandatory 10 year Re-Evaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

__X__ Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

Literature Cited:

- Ali, A. 1981. *Bacillus thuringiensis* serovar *israelensis* against chironomids and some non-target aquatic invertebrates. *Journal of Invertebrate Pathology* 38: 264-272.
- Anderson, R.L. 1989. Toxicity of synthetic pyrethroids to freshwater invertebrates. *Environmental Toxicology and Chemistry* 8: 403-410.
- Boisvert, M., and J. Boisvert. 2000. Effects of *Bacillus thuringiensis* var. *israelensis* on target and nontarget organisms: a review of laboratory and field experiments. *Biocontrol Science and Technology* 10: 517-561.
- Breaud, T.P., J.E. Farlow, C.D. Steelman, and P.E. Schilling. 1977. Effects of the insect growth regulator methoprene on natural populations of aquatic organisms in Louisiana intermediate marsh habitats. *Mosquito News*. 37(4); 704-712.
- Brown, M.D., T.M. Watson, S. Green, J.G. Greenwood, D. Purdie, and B.H. Kay. 2000. Toxicity of insecticides for control of freshwater *Culex annulirostris* (Diptera: Culicidae) to the nontarget shrimp, *Caradina indistincta* (Decapoda: Atyidae). *Journal of Economic Entomology*. 93(3): 667-672.

- Brown, M.D., J. Carter, D. Purdie, D. Thomas, D.M. Purdie, and B.H. Kay. 2002. Pulse-exposure effects of selected insecticides to juvenile Australian Crimson-Spotted Rainbowfish (*Melanotaenia duboulayi*). *Journal of Economic Entomology* 95(2):294-298.
- California Department of Health Services. 2003. California mosquito-borne virus surveillance and response plan.
- Celestial, D.M and C.L. McKenney, Jr. 1994. The influence of an insect growth regulator on the larval development of the mud crab *Rhithropanopeus harrisii*. *Environmental Pollution*. 85: 169-173.
- Centers for Disease Control and Prevention. 1999. Epidemic/Epizootic West Nile virus in the United States: Guidelines for Surveillance, Prevention, and Control. From a workshop co-sponsored by the Department of Health and Human Services, CDC, and the U.S. Department of Agriculture. Fort Collins, Colorado, November 8-9, 1999.
- Chu, K.H., Wong, C.K., and Chiu, K.C. 1997. Effects of the insect growth regulator (S)-methoprene on survival and reproduction of the freshwater cladoceran *Moina macrocopa*. *Environmental Pollution*. 96: 173-178.
- Dritz, D.A., S.P. Lawler, J. Albertson, W. Hamersky, and J.R. Rusmisel. 2001. The impact of Bti on survival of the endangered tadpole shrimp *Lepidurus packardii*. In *Proceedings and Papers of the Sixty-ninth Annual Conference of the Mosquito and Vector Control Association of California*. Jan. 21-24. pp. 88-91.
- Dupont, C. and J. Boisvert. 1986. Persistence of *Bacillus thuringiensis* serovar. *israelensis* toxic activity in the environment and interaction with natural substrates. *Water, Air, and Soil Pollution* 29:425-438.
- Euliss, N.H., and S.W. Harris. 1987. Feeding ecology of northern pintails and green-winged teal wintering in California. *Journal of Wildlife Management* 51(4): 724-732.
- Extension Toxicology Network. 1994. Pyrethrin Pesticide information profile.
- Extension Toxicology Network. 1996. Methoprene Pesticide information profile. <http://ace.ace.orst.edu/info/extoxnet/pips/methopre.htm>
- Fleming, W.J.; Heinz, G.H.; Franson, J.C.; Rattner, B.A. 1985. Toxicity of Abate 4E to mallard ducklings and the influence of cold. *Environ. Toxicology and Chemistry* 4:193-200.
- Fortin, C.; Marie, A.; and Leclair, R. 1987. The residual effect of Abate on nontarget communities. *J. Am. Mosquito Control Association* 3:282-288.
- Fortin, C, D. Lapointe, and G. Charpentier. 1986. Susceptibility of brook trout (*Salvelinus fontinalis*) fry to a liquid formulation of *Bacillus thuringiensis* serovar. *Israelensis* (Teknar®) used for blackfly control. *Canadian Journal of Fisheries and Aquatic Science* 43:1667-1670.
- Garcia, R., B. Des Rochers, and W. Tozer. 1980. Studies on the toxicity of *Bacillus thuringiensis* var. *israelensis* against organisms found in association with mosquito larvae. *California Mosquito and Vector Control Association Proceedings and Papers* 48:33-36.

- Goddard, L.B., A.E. Roth, W.K. Reisen, and T.W. Scott. 2002. Vector competence of California mosquitoes for West Nile virus. *Emerging Infectious Diseases* 8/12 1385-1391.
- Hanowski, J. M., G. J. Niemi, A. R. Lima, and R. R. Regal. 1997. Do mosquito control treatments of wetlands affect red-winged blackbird (*Agelaius phoeniceus*) growth, reproduction, or behavior? *Environmental Toxicology and Chemistry* 16(5):1014-1019.
- Hershey, A. E., A. R. Lima, G. J. Niemi, and R. R. Regal. 1998. Effects of *Bacillus thuringiensis israelensis* (Bti) and methoprene on non-target macroinvertebrates in Minnesota wetlands. *Ecological Applications* 8:41-60.
- Heitmeyer, M. E. and D. G. Raveling. 1988. Winter resource use by three species of dabbling ducks in California. Delta Waterfowl and Wetlands Research Station, Portage la Prairie, Man., Can.
- Horst, M.N., and A.N. Walker. 1999. Effects of the pesticide methoprene on morphogenesis and shell formation in the blue crab *Callinectes sapidus*. *Journal of Crustacean Biology* 19: 699-707.
- Jackson, J. K., R.J. Horowitz, and B.W. Sweeny. 2002. Effects of *Bacillus thuringiensis israelensis* on black flies and nontarget macroinvertebrates and fish in a large river. *Transactions of the American Fisheries Society* 131:910-930.
- Krapu, G. L. and G. A. Swanson. 1975. Some nutritional aspects of reproduction in prairie nesting pintails. *Journal of Wildlife Management* 39:156-162.
- Lacey, L.A., and Mulla, M.S. 1990. Safety of *Bacillus thuringiensis* var. *israelensis* and *Bacillus sphaericus* to non-target organisms in the aquatic environment. In Laird, M., L.A. Lacey, E.W. Davidson, eds. *Safety of microbial insecticides*. CRC Press.
- Lee, B. M. And G. I. Scott. 1989. Acute toxicity of temephos, fenoxycarb, diflubenzuron, and methoprene and *Bacillus thuringiensis* var. *israelensis* to the mummichog (*Fundulus heteroclitus*). *Bulletin of Environmental Contamination and Toxicology* 43:827-832.
- Marten, G.G.; Che, W.; and Bordes, E.S. 1993. Compatibility of cyclopoid copepods with mosquito insecticides. *J. Am. Mosquito Control Association* 9:150-154.
- McKenney, C.L., Jr., and D.M. Celestial. 1996. Modified survival, growth, and reproduction in an estuarine mysid (*Mysidopsis bahia*) exposed to a juvenile hormone analogue through a complete life cycle. *Aquatic Toxicology* 35:11-20.
- Merritt, R. W., E. D. Walker, M. A. Wilzbach, K. W. Cummings, and W. T. Morgan. 1989. A broad evaluation of Bti for black fly (Diptera: Simuliidae) control in a Michigan River: Efficacy, carry, and non-target effects on invertebrates and fish. *Journal of the American Mosquito Control Association* 5:397-415.
- Millam, D.C., J.L. Farris, and J.D. Wilhide. 2000. Evaluating mosquito control pesticides for effect on target and nontarget organisms. *Mosquito News* 40:619-622.
- Miller, M. R. 1987. Fall and winter foods of northern pintails in the Sacramento Valley, California. *Journal of Wildlife Management*. 51:405-414.
- Mittal, P.K.; Adak, T.; and Sharma, V.P. 1991. Acute toxicity of certain organochlorine, organophosphorus, synthetic pyrethroid and microbial insecticides to the mosquito

- fish. Indian J. of Malariology 28:167-170.
- Miura, T., and R.M. Takahashi. 1973. Insect development inhibitors. 3. Effects on nontarget aquatic organisms. Journal of Economic Entomology. 66(4):917-922.
- Miura, T.; Takahashi, R. M.; and Mulligan, F.S. 1980. Effects of the bacterial mosquito larvicide *Bacillus thuringiensis* stereotyp H-14 on selected aquatic organisms. Mosquito News. 40:619-622.
- Mulla, M.S. 1992. Activity, Field Efficacy, and Use of *Bacillus thuringiensis israelensis* against Mosquitoes. Pp. 134-160 in de Barjac, Hugette and Donald J. Sutherland, eds. Bacterial Control of Mosquitoes and Blackflies: Biochemistry, Genetics, and Applications of *Bacillus thuringiensis israelensis* and *Bacillus sphaericus*. Kluwer Academic.
- Niemi, G. J., A. E. Hershey, L. Shannon, J. M. Hanowski, A. Lima, R. P. Axler, and R. R. Regal. 1999. Ecological Effects of Mosquito Control on Zooplankton, Insects, and Birds. Environmental Toxicology and Chemistry, 18(3):549-559.
- Parsons, J.T. and Surgeoner, G.A. 1991. Acute toxicities of permethrin, fenitrothion, carbaryl and carbofuran to mosquito larvae during single pulse or multiple pulse exposures. Environ. Toxicology and Chemistry 10:1229-1233.
- Purcell, B.H. 1981. Effects of *Bacillus thuringiensis* on *Aedes taeniorhynchus* and some nontarget organisms in the salt marsh. Mosq. News 41:476-484).
- Reisen, W. K.; R. P. Meyer; M.M. Milby; S. B. Presser; R. W. Emmons; J. L. Hardy; and W. C. Reeves. 1992. Ecological Observations on the 1989 outbreak of St. Louis encephalitis virus in the Southern San Joaquin Valley of California. Entomological Society of America. 29(3):472-482.
- Siegel, Joel, P. and J. A. Shaddock. 1992. Mammalian safety of *Bacillus thuringiensis israelensis* and *Bacillus sphaericus*. Pp. 202-217 in de Barjac, Huguette and Donald J. Sutherland, eds. Bacterial control of mosquitoes and blackflies: biochemistry, genetics, and applications of *Bacillus thuringiensis israelensis* and *Bacillus sphaericus*. Kluwer Academic.
- Su, T., and M.S. Mulla. 1999. Microbial agents *Bacillus thuringiensis* ssp. *israelensis* and *Bacillus sphaericus* suppress eutrophication, enhance water quality, and control mosquitoes in microcosms. Environmental Entomology 28:761-767.
- Swanson, G.A., G.L. Krapu, and J.R. Serie. 1979. Foods of laying female dabbling ducks on the breeding grounds. Pages 47-57 in T.A. Bookhout, ed. Waterfowl and wetlands-An integrated review. Proc. Symp. North Cent. Sect., The Wildl. Soc.
- Tomlin, C. 1994. The Pesticide Manual. Farnham: British Crop Protection Council/Cambridge: Royal Society of Chemistry.
- Urban, J. D. and N.J. Cook. 1986. Standard evaluation procedure: Ecological risk assessment. U. S. EPA. Office of Pesticide Programs. Hazard evaluation division
- U.S. EPA. 1991. Re-registration eligibility document. Isopropyl (2E, 4E)-11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate (Referred to as methoprene). List A. Case 0030. Office of pesticide Programs. Special Review and Registration Division.

- U.S. EPA. 1998. Re-registration eligibility document. *Bacillus thuringiensis*. Office of Prevention, Pesticides and Toxic Substances. EPA738-R-98-004.
- U.S. EPA. 2000. Ecotoxicity online database. Division of Environmental Fate and Effects. Office of Pesticide Programs.
- U.S. Fish and Wildlife Service. 1984. Acute toxicity rating scales. Research Information Bulletin No. 84-78.
- WHO. Undated. Data sheet on pesticides no. 47. Methoprene. World Health Organization. Food and Agriculture Organization.
http://www.inchem.org/documents/pds/pds/pest47_e.htm
- Wipfli, M.S., R.W. Merritt. And W.W. Taylor. 1994. Low toxicity of the blackfly larvicide *Bacillus thuringiensis* var. *israelensis* to early stages of brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and steelhead trout (*Oncorhynchus mykiss*) following direct and indirect exposure. Canadian Journal of Fisheries and Aquatic Science 41:1451-1458.

Zoecon. 2000. MSDS Altosid Liquid Larvicide Concentrate

Refuge Determination:

Prepared by:

RWP 22 Sept 2006
 (Signature and Date)

Refuge Manager Approval:

[Signature] 25 Sept 06
 (Signature and Date)

Concurrence:

Refuge Supervisor:

Don Walworth 10/13/06
 (Signature and Date)

Assistant Manager,
 National Wildlife
 Refuge System

Margaret J. Rolan 10/17/06
 (Signature and Date)

Appendix E: Species List

Invertebrates

<i>Artemia franciscana</i>	brine shrimp
<i>Branchinecta coloradensis</i>	Colorado fairy shrimp
<i>Branchinecta conservatio</i>	Conservancy fairy shrimp (E)
<i>Branchinecta lindahli</i>	(no common name)
<i>Branchinecta longiantenna</i>	longhorn fairy shrimp (E)
<i>Branchinecta lynchi</i>	vernal pool fairy shrimp (T)
<i>Branchinecta mackini</i>	(no common name)
<i>Branchinecta mesovallensis</i>	midvalley fairy shrimp
<i>Lepidurus packardii</i>	vernal pool tadpole shrimp (E)
<i>Lindieriella occidentalis</i>	California linderiella
<i>Anticus antiochensis</i>	Antioch Dunes anthicid beetle (CS)
Anticus sacramento	Sacramento anthicid beetle (CS)
<i>Desmocerus californicus dimorphus</i>	Valley elderberry longhorn beetle (T)
<i>Hygrotus curvipes</i>	curved-foot hygrotus diving beetle (CS)
<i>Lytta moesta</i>	moestan blister beetle (CS)
<i>Lytta molesta</i>	molestan blister beetle (CS)

Vertebrates

AMPHIBIA

Caudata:		
Ambystomatidae	<i>Ambystoma californiense</i>	California tiger salamander (CP, CS)
Anura:		
Pelobatidae	<i>Spea hammondi</i>	western spadefoot (CP, CS)
Bufonidae	<i>Bufo boreas</i>	western toad
Hylidae	<i>Hyla regilla</i>	Pacific treefrog
Ranidae	<i>Rana aurora</i>	red-legged frog (FT, CP, CS)
	<i>Rana boylei</i>	foothill yellow-legged frog (CP, CS, FS)
	<i>Rana catesbeiana</i>	bullfrog (H)

REPTILIA

Testudines:		
Emydidae	<i>Clemmys marmorata</i>	western pond turtle (CP, CS, FS)
	<i>Trachemys scripta</i>	slider
Squamata:		
Iguanidae	<i>Gambelia sila</i>	blunt-nosed leopard lizard (FE, CE, CP)
	<i>Sceloporus occidentalis</i>	western fence lizard
	<i>Uta stansburiana</i>	side-blotched lizard
	<i>Phrynosoma coronatum</i>	coast horned lizard (CP, CS)
	<i>Eumeces gilbertii</i>	Gilbert's skink
Scincidae	<i>Cnemidophorus tigris</i>	western whiptail
Teiidae	<i>Elgaria multicarinatus</i>	southern alligator lizard
Anguidae	<i>Elgaria coerulea</i>	northern alligator lizard
	<i>Anniella pulchra</i>	California legless lizard

Colubridae	<i>Coluber constrictor</i> <i>Masticophis flagellum</i> glossy snake Pacific gopher snake <i>Lampropeltis getula</i> <i>Rhinocnelys lecontei</i> Thamnophis sirtalis <i>Thamnophis gigas</i> <i>Crotalus viridis</i>	racer coachwhip (CP, CS) common kingsnake long-nosed snake common garter snake giant garter snake (FT, CT, CP) western rattlesnake
Viperidae		

FISH

Petromyzontidae	<i>Lampetra tridentata</i>	Pacific Lamprey*
Acipenseridae	<i>Acipenser transmontanus</i>	white sturgeon*
Clupeidae	<i>Alosa sapidissima</i> <i>Dorosoma petenese</i>	American shad threadfin shad
Cyprinidae	<i>Cyprinus carpio</i> <i>Carassius auratus</i> <i>Notemigonus crysoleucas</i> <i>Lavinia exilicauda</i> <i>Orthodon microlepidotus</i> <i>Pogonichthys macrolepidotus</i> <i>Ptychocheilus grandis</i> <i>Cyprinella lutrensis</i> <i>Pimephales promelas</i> <i>Catostomus occidntalis</i> <i>Ameiurus catus</i> <i>Ameiurus nebulosus</i> <i>Ameiurus melas</i> <i>Ictalurus punctatus</i> <i>Oncorhynchus tshawytscha</i> <i>Oncorhynchus mykiss</i> <i>Gambusia affinis</i> <i>Menidia beryllina</i> <i>Cottus asper</i> <i>Morone saxatilis</i> <i>Pomoxis nigromaculatus</i> <i>Pomoxis annularis</i> <i>Lepomis gulosus</i> <i>Lepomis cyanellus</i> <i>Lepomis macrochirus</i> <i>Lepomis microlophus</i> <i>Micropterus salmoides</i> <i>Micropterus dolomieu</i> <i>Percina macrolepidota</i> <i>Hysterocarpus traski</i>	common carp goldfish golden shiner hitch* Sacramento blackfish* Sacramento splittail** Sacramento pikeminnow* red shiner fathead minnow Sacramento sucker* white catfish brown bullhead black bullhead channel catfish chinook salmon** rainbow trout* western mosquitofish inland silverside prickly sculpin* striped bass black crappie white crappie warmouth green sunfish bluegill redear sunfish largemouth bass smallmouth bass bigscale logperch tule perch*
Catostomidae		
Ictaluridae		
Salmonidae		
Poeciliidae		
Atherinidae		
Cottidae		
Percichthyidae		
Centrarchidae		
Percidae		
Embiotocidae		

AVES

Podicipediformes:		
Podicipedidae	<i>Aechmophorus clarkii</i> <i>Aechmophorus occidentalis</i> <i>Podiceps auritus</i>	Clark's grebe western grebe horned grebe

	<i>Podiceps nigricollis</i>	eared grebe
	<i>Podilymbus podiceps</i>	pied-billed grebe
Pelecaniformes:		
Pelecanidae	<i>Pelecanus erythrorhynchos</i>	American white pelican
Phalacrocoracidae	<i>Phalacrocorax auritus</i>	double-crested cormorant
Ciconiiformes:		
Ardeidae	<i>Ixobrychus exilis</i>	least bittern
	<i>Botaurus lentiginosus</i>	American bittern
	<i>Nycticorax nycticorax</i>	black-crowned night heron
	<i>Butorides striatus</i>	green-backed heron
	<i>Bubulcus ibis</i>	cattle egret
	<i>Egretta thula</i>	snowy egret
	<i>Ardea alba</i>	great egret
	<i>Ardea herodias</i>	great blue heron
	<i>Plegadis chihi</i>	white-faced ibis
Threskiornithidae		
Anseriformes:		
Anatidae	<i>Cygnus columbianus</i>	tundra swan
	<i>Anser albifrons</i>	greater white-fronted goose
	<i>Chen caerulescens</i>	snow goose
	<i>Chen rossii</i>	Ross' goose
	<i>Branta canadensis leucopareia</i>	Aleutian Canada goose (T)
	<i>Branta canadensis minima</i>	cackling Canada goose
	<i>Branta canadensis moffitti</i>	Great Basin Canada goose
	<i>Branta canadensis parvipes</i>	lesser Canada goose
	<i>Branta bernicla</i>	brant
	<i>Anas platyrhynchos</i>	mallard
	<i>Anas strepera</i>	gadwall
	<i>Anas crecca</i>	green-winged teal
	<i>Anas americana</i>	American wigeon
	<i>Anas penelope</i>	Eurasian wigeon
	<i>Anas acuta</i>	northern pintail
	<i>Anas clypeata</i>	northern shoveler
	<i>Anas discors</i>	blue-winged teal
	<i>Anas cyanoptera</i>	cinnamon teal
	<i>Oxyura jamaicensis</i>	ruddy duck
	<i>Aix sponsa</i>	wood duck
	<i>Aythya valisineria</i>	canvasback
	<i>Aythya americana</i>	redhead
	<i>Aythya collaris</i>	ring-necked duck
	<i>Aythya marila</i>	greater scaup
	<i>Athya affinis</i>	lesser scaup
	<i>Bucephala clangula</i>	common goldeneye
	<i>Bucephala albeola</i>	bufflehead
	<i>Mergus merganser</i>	common merganser
	<i>Lophodytes cucullatus</i>	hooded merganser
	<i>Aix galericulata</i>	Mandarin duck
	<i>Branta rufficollis</i>	red-breasted goose (accidental)
Gruiformes:		
Rallidae	<i>Rallus limicola</i>	Virginia rail
	<i>Porzana carolina</i>	sora
	<i>Gallinula chloropus</i>	common moorhen
	<i>Fulica americana</i>	American coot

Charadriiformes:		
Recurvirostridae	<i>Recurvirostra americana</i>	American avocet
	<i>Himantopus mexicanus</i>	black-necked stilt
Charadriidae	<i>Charadrius alexandrinus</i>	snowy plover
	<i>Charadrius semipalmatus</i>	semipalmated plover
	<i>Charadrius vociferus</i>	killdeer
	<i>Charadrius montanus</i>	mountain plover
	<i>Pluvialis squatarola</i>	black-bellied plover
	<i>Pluvialis dominica</i>	American golden plover
Scolopacidae	<i>Limosa fedoa</i>	marbled godwit
	<i>Newmenius phaeopus</i>	whimbrel
	<i>Newmenius americanus</i>	long-billed curlew
	<i>Catoptrophorus semipalmatus</i>	willet
	<i>Tringa melanoleuca</i>	greater yellowlegs
	<i>Tringa flavipes</i>	lesser yellowlegs
	<i>Tringa solitaria</i>	solitary sandpiper
	<i>Actitis macularia</i>	spotted sandpiper
	<i>Phalaropus tricolor</i>	Wilson's phalarope
	<i>Phalaropus lobatus</i>	red-necked phalarope
	<i>Limnodromus griseus</i>	short-billed dowitcher
	<i>Limnodromus scolopaceus</i>	long-billed dowitcher
	<i>Gallinago gallinago</i>	common snipe
	<i>Calidris alpina</i>	dunlin
	<i>Calidris mauri</i>	western sandpiper
	<i>Calidris minutilla</i>	least sandpiper
	<i>Calidris bairdii</i>	Baird's sandpiper
	<i>Calidris melanotos</i>	pectoral sandpiper
Laridae	<i>Larus philadelphia</i>	Bonaparte's gull
	<i>Larus delawarensis</i>	ring-billed gull
	<i>Larus argentatus</i>	herring gull
	<i>Larus californicus</i>	California gull
	<i>Larus glaucescens</i>	glaucous-winged gull
	<i>Sterna forsteri</i>	Forster's tern
	<i>Chlidonias niger</i>	black tern
	<i>Sterna caspia</i>	Caspian tern
Falconiformes:		
Cathartidae	<i>Cathartes aura</i>	turkey vulture
Accipitridae	<i>Aquila chrysaetos</i>	golden eagle
	<i>Haliaeetus leucocephalus</i>	bald eagle (T)
	<i>Elanus leucurus</i>	white-tailed kite
	<i>Circus cyaneus</i>	northern harrier
	<i>Accipiter striatus</i>	sharp-shinned hawk
	<i>Accipiter cooperii</i>	Cooper's hawk
	<i>Buteo lineatus</i>	red-shouldered hawk
	<i>Buteo jamaicensis</i>	red-tailed hawk
	<i>Buteo swainsoni</i>	Swainson's hawk
	<i>Buteo lagopus</i>	rough-legged hawk
	<i>Buteo regalis</i>	ferruginous hawk
	<i>Pandion haliaetus</i>	osprey
Falconidae	<i>Falco sparverius</i>	American kestrel
	<i>Falco columbarius</i>	merlin
	<i>Falco mexicanus</i>	prairie falcon
	<i>Falco peregrinus</i>	peregrine falcon (E)

Galliformes: Phasianidae	<i>Callipepla californica</i> <i>Phasianus colchicus</i>	California quail ring-necked pheasant
Columbiformes: Columbidae	<i>Columba livia</i> <i>Zenaida macroura</i>	rock dove mourning dove
Cuculiformes: Cuculidae	<i>Coccyzus americanus</i>	yellow-billed cuckoo
Strigiformes: Tytonidae Strigidae	<i>Tyto alba</i> <i>Asio flammeus</i> <i>Asio otus</i> <i>Bubo virginianus</i> <i>Otus kennicottii</i> <i>Athene cunicularia</i>	barn owl short-eared owl long-eared owl great horned owl western screech owl burrowing owl
Caprimulgiformes: Caprimulgidae	<i>Chordeiles acutipennis</i>	lesser nighthawk
Apodiformes: Apodidae	<i>Chaetura vauxi</i> <i>Aeronautes saxatalis</i> <i>Archilochus alexandri</i> <i>Calypte anna</i> <i>Selasphorus rufus</i>	Vaux's swift White-throated swift black-chinned hummingbird Anna's hummingbird rufous hummingbird
Trochilidae		
Coraciiformes: Alcedinidae	<i>Ceryle alcyon</i>	belted kingfisher
Piciformes: Picidae	<i>Colaptes auratus</i> <i>Melanerpes formicivorus</i> <i>Melanerpes lewis</i> <i>Picoides pubescens</i> <i>Picoides nuttalli</i>	northern flicker acorn woodpecker Lewis' woodpecker downy woodpecker Nuttall's woodpecker
Passeriformes: Tyrannidae	<i>Tyrannus verticalis</i> <i>Tyrannus vociferans</i> <i>Myiarchus cinerascens</i> <i>Contopus sordidulus</i> <i>Sayornis nigricans</i> <i>Sayornis saya</i> <i>Empidonax oberholseri</i> <i>Empidonax traillii</i> <i>Empidonax difficilis</i> <i>Eremophila alpestris</i> <i>Tachycineta bicolor</i> <i>Tachycineta thalassina</i> <i>Progne subis</i> <i>Riparia riparia</i> <i>Stelgidopteryx serripennis</i> <i>Petrochelidon pyrrhonata</i> <i>Hirundo rustica</i> <i>Aphelocoma californica</i> <i>Pica nuttalli</i> <i>Corvus brachyrhynchos</i> <i>Corvus corax</i>	western kingbird Cassin's kingbird ash-throated flycatcher western wood-pewee black phoebe Say's phoebe dusky flycatcher willow flycatcher Pacific-slope flycatcher horned lark tree swallow violet-green swallow purple martin bank swallow northern rough-winged swallow cliff swallow barn swallow western scrub jay yellow-billed magpie American crow common raven
Alaudidae		
Hirundinidae		
Corvidae		

Regulidae	<i>Regulus satrapa</i>	golden-crowned kinglet
Muscicapidae	<i>Regulus calendula</i>	ruby-crowned kinglet
	<i>Chamaea fasciata</i>	wrentit
	<i>Sialia mexicana</i>	western bluebird
	<i>Catharus ustulatus</i>	Swainson's thrush
	<i>Catharus guttatus</i>	hermit thrush
Paridae	<i>Ixoreus naevius</i>	varied thrush
	<i>Turdus migratorius</i>	American robin
	<i>Baeolophus inornatus</i>	oak titmouse
	<i>Psaltiriparus minimus</i>	bushtit
	<i>Certhia americana</i>	brown creeper
Aegithalidae	<i>Sitta carolinensis</i>	white-breasted nuthatch
Certhiidae	<i>Sitta canadensis</i>	red-breasted nuthatch
Sittidae	<i>Troglodytes aedon</i>	house wren
Troglodytidae	<i>Troglodytes troglodytes</i>	winter wren
	<i>Thyromanes bewickii</i>	Bewick's wren
	<i>Cistothorus palustris</i>	marsh wren
	<i>Salpinctes obsoletus</i>	rock wren
	<i>Lanius ludovicianus</i>	loggerhead shrike
Laniidae	<i>Mimus polyglottos</i>	northern mockingbird
Mimidae	<i>Toxostoma redivivum</i>	California thrasher
Motacillidae	<i>Anthus rubescens</i>	American pipit
	<i>Bombycilla cedrorum</i>	cedar waxwing
	<i>Sturnus vulgaris</i>	European starling
	<i>Vireo cassinii</i>	Cassin's vireo
	<i>Vireo gilvus</i>	warbling vireo
Bombycillidae	<i>Vireo bellii pusillus</i>	least Bell's vireo (E)
	<i>Vermivora celata</i>	orange-crowned warbler
	<i>Vermivora ruficapilla</i>	Nashville warbler
	<i>Dendroica coronata</i>	yellow-rumped warbler
	<i>Dendroica nigriscens</i>	black-throated gray warbler
Sturnidae	<i>Dendroica townsendi</i>	Townsend's warbler
	<i>Dendroica occidentalis</i>	Hermit warbler
	<i>Dendroica petechia</i>	yellow warbler
	<i>Oporornis tolmiei</i>	MacGillivray's warbler
	<i>Wilsonia pusilla</i>	Wilson's warbler
Vireonidae	<i>Geothlypis trichas</i>	common yellowthroat
	<i>Icteria virens</i>	yellow-breasted chat
	<i>Pheucticus melanocephalus</i>	black-headed grosbeak
	<i>Guiraca caerulea</i>	blue grosbeak
	<i>Passerina amoena</i>	lazuli bunting
Emberizidae	<i>Pipilo maculatus</i>	spotted towhee
	<i>Pipilo crissalis</i>	California towhee
	<i>Ammodramus savannarum</i>	grasshopper sparrow
	<i>Poocetes gramineus</i>	vesper sparrow
	<i>Passerculus sandwichensis</i>	savannah sparrow
	<i>Melospiza melodia</i>	song sparrow
	<i>Chondestes grammacus</i>	lark sparrow
	<i>Amphispiza belli</i>	sage sparrow
	<i>Spizella passerina</i>	chipping sparrow
	<i>Junco hyemalis</i>	dark-eyed junco
	<i>Zonotrichia leucophrys</i>	white-crowned sparrow
	<i>Zonotrichia atricapilla</i>	golden-crowned sparrow

	<i>Passerella iliaca</i>	fox sparrow
	<i>Melospiza lincolnii</i>	Lincoln's sparrow
	<i>Sturnella neglecta</i>	western meadowlark
	<i>Xanthocephalus xanthocephalus</i>	yellow-headed blackbird
	<i>Agelaius phoeniceus</i>	red-winged blackbird
	<i>Agelaius tricolor</i>	tricolored blackbird
	<i>Euphagus cyanocephalus</i>	Brewer's blackbird
	<i>Molothrus ater</i>	brown-headed cowbird
	<i>Icterus bullockii</i>	Bullock's oriole
	<i>Icterus cucullatus</i>	hooded oriole
	<i>Piranga ludoviciana</i>	western tanager
Passeridae	<i>Passer domesticus</i>	house sparrow
Fringillidae	<i>Carduelis pinus</i>	pine siskin
	<i>Carduelis tristis</i>	American goldfinch
	<i>Carduelis psaltria</i>	lesser goldfinch
	<i>Carduelis lawrencei</i>	Lawrence's goldfinch
	<i>Carpodacus purpureus</i>	purple finch
	<i>Carpodacus mexicanus</i>	house finch
MAMMALIA MAMMALS		
Marsupialia:		
Didelphidae	<i>Didelphis virginiana</i>	Virginia opossum (H)
Insectivora:		
Soricidae	<i>Sorex ornatus</i>	ornate shrew (CS)
Talpidae	<i>Scapanus latimanus</i>	broad-footed mole (CS)
Chiroptera:		
Vespertilionidae	<i>Myotis lucifugus</i>	little brown myotis (CS)
	<i>Antrozous pallidus</i>	pallid bat (CS)
	<i>Myotis ciliolabrum</i>	western small-footed myotis
	<i>Myotis evotis</i>	long-eared myotis
	<i>Myotis thysanodes</i>	fringed myotis
	<i>Myotis volans</i>	long-legged myotis
	<i>Myotis yumanensis</i>	Yuma myotis
	<i>Plecotus townsendii</i>	Townsend's big-eared bat (CS)
	<i>Tadarida brasiliensis</i>	Brazilian free-tailed bat
	<i>Eumops perotis</i>	western mastiff bat (CS)
Molossidae		
Carnivora:		
Canidae	<i>Canis latrans</i>	coyote (H)
	<i>Canus domesticus</i>	domestic dog
	<i>Urocyon cinereoargenteus</i>	gray fox (H)
	<i>Vulpes vulpes</i>	red fox (H)
	<i>Vulpes macrotis mutica</i>	San Joaquin kit fox (FE, CT)
Procyonidae	<i>Procyon lotor</i>	raccoon (H)
Mustelidae	<i>Lutra canadensis</i>	northern river otter (CS)
	<i>Mephitis mephitis</i>	striped skunk (H)
	<i>Spilogale gracilis</i>	western spotted skunk (CS)
	<i>Mustela frenata</i>	long-tailed weasel (H)
	<i>Mustela vison</i>	mink (H)
	<i>Taxidea taxus</i>	badger (H)
Felidae	<i>Felis catus</i>	housecat
	<i>Lynx rufus</i>	bobcat (H)
Perissodactyla:		
Equidae	<i>Equus caballus</i>	domestic horse

Artiodactyla:		
Suidae	<i>Sus scrofa</i>	wild pig (H)
Cervidae	<i>Odocoileus hemionus</i>	mule deer (H)
Bovidae	<i>Bos taurus</i>	domestic cattle
	<i>Ovis aries</i>	domestic sheep
Rodentia:		
Sciuridae	<i>Spermophilus beecheyi</i>	California ground squirrel
Geomyidae	<i>Thomomys bottae</i>	Botta's pocket gopher
Heteromyidae	<i>Dipodomys heermanni</i>	Heerman's kangaroo rat (FE, CE, CP)
	<i>Perognathus inornatus</i>	San Joaquin pocket mouse (CS)
Castoridae	<i>Castor canadensis</i>	beaver (H)
Cricetidae	<i>Neotoma fuscipes riparia</i>	San Joaquin Valley woodrat (FE, CE)
	<i>Peromyscus boylii</i>	brush mouse
	<i>Peromyscus maniculatus</i>	deer mouse (CS)
	<i>Reithrodontomys megalotis</i>	western harvest mouse
Arvicolidae	<i>Microtus californicus</i>	California vole
	<i>Ondatra zibethicus</i>	muskrat
Muridae	<i>Mus musculus</i>	house mouse
	<i>Rattus norvegicus</i>	Norway rat
	<i>Rattus rattus</i>	black rat
Lagomorpha:		
Leporidae	<i>Lepus californicus</i>	black-tailed hare (CS, H)
	<i>Sylvilagus audubonii</i>	Desert cottontail (H)
	<i>Sylvilagus bachmanii riparius</i>	riparian brush rabbit (CE)

Source of statuses: www.dfg.ca.gov/wmd/cwhr/natives.html

FE: federally endangered
FT: federally threatened
CE: California endangered
CT: California threatened
CP: California protected
CS: California special concern
FS: Forest Service sensitive
BS: BLM sensitive
H: harvest

NOTE:

1. Confirmed species appear in bold print
2. List from *San Joaquin River National Wildlife Refuge Riparian Habitat Protection and Flood Restoration Project*, Biological Inventory and Monitoring 1998, USFWS, August

Appendix F: Intra-Service Section 7 Consultation

Originating Refuge: San Luis NWRC

Telephone Number: (209) 826-3508

Date: August 3, 2006

- I. Region: CA/Nevada Operations Office
- II. Service Activity (Program): Riparian/Wetland/Upland Restoration (Refuge Management), San Joaquin River NWR Comprehensive Conservation Plan

III. Pertinent Species:

A. **Listed species and/or their critical habitat within the action area:**

Bald eagle (*Haliaeetus leucocephalus*) (T)
Willow flycatcher (*Epidonax trailli extimus*) (E)
Least Bell's vireo (*Vireo bellii pusillus*) (E)
Fresno kangaroo rat (*Dipodomys nitratooides exilis*) (E)
San Joaquin kit fox (*Vulpes macrotis mutica*) (E)
Riparian brush rabbit (*Sylvilagus bachmani riparius*) (E)
San Joaquin Valley woodrat (*Neotoma fuscipes riparia*) (E)
Giant garter snake (*Thamnophis gigas*) (T)
Blunt-nosed leopard lizard (*Gambelia sila*) (E)
Conservancy fairy shrimp (*Branchinecta conservatio*) (E)
Vernal pool fairy shrimp (*Branchinecta lynchi*) (T) (CH)
Vernal pool tadpole shrimp (*Lepidurus packardii*) (E)
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (T)
California tiger salamander, central pop. (*Ambystoma californiense*) (T)
Delta smelt (*Hypomesus transpacificus*) (T) (CH)
California red-legged frog (*Rana aurora draytonii*) (T)

B. **Proposed species within the action area:**

None

C. **Candidate species within the action area:**

None

D. **Include species/habitat occurrence on a map:**

See species narrative accounts section VII A

IV. Geographic area or station name and action:

The San Joaquin River National Wildlife Refuge (Refuge) was established in 1987 as part of the San Luis NWR Complex. The main focus of the management of the refuge over the years has been to protect and manage wintering habitat for Aleutian Canada geese, a Federally listed endangered species. This management has been instrumental in the recovery of the Aleutian Canada goose and its removal in 2001 from the Threatened and Endangered Species list. In recent years, as staffing and funding increased, Refuge management focus has been

expanded. In 1999 a major initiative was launched to protect floodplain lands through acquisition and to restore floodplain habitats and function on those lands. In 2002 a project to re-establish the federally endangered riparian brush rabbit onto the Refuge was initiated as part of the recovery program for that species.

V. Location:

- A. Ecoregion Number and Name: San Joaquin Valley
- B. County and State: Stanislaus County, California
- C. Latitude and longitude: 37 4' x 121 1'
- D. Distance and direction to nearest town: Modesto, 9 miles west
- E. Species/habitat occurrence: See species narrative accounts section VIIA

VI. Description of proposed action:

The U.S. Fish and Wildlife Service (Service) is developing a Comprehensive Conservation Plan (CCP) to guide management and resource use at the Refuge. This plan for the San Joaquin National Wildlife Refuge is a management tool to be used by the Refuge staff. It describes how the purposes for which the Refuge was established are to be pursued over a 15 year period. The plan sets Refuge goals and objectives, and provides strategies for achieving these goals and objectives based on Refuge purposes, other Federal laws, National Wildlife Refuge System goals, and Fish and Wildlife Service policies.

The plan is comprehensive in the sense that it addresses all activities that occur on the Refuge. . The stated Refuge goals, objectives and management strategies are intended to guide wildlife and other natural resource management and public use for the next 15 years. The effects of these management actions will be monitored to provide information for future managers and managers of other refuges. The plan has flexibility; it will be reviewed periodically to ensure that its goals, objectives and implementation strategies and timetables are still valid.

Five broad goals are proposed for the Refuge that are consistent with the Refuge purpose, ecoregion goals, NWRS goals, the National Wildlife Refuge System Improvement Act of 1997, Service Policy, and international treaties. One of these goals specifically addresses conservation and recovery of threatened and endangered species, and outlines actions to be taken by the Refuge to assist in recovery efforts for those species. Special emphasis will be given to recovery efforts for the riparian brush rabbit, San Joaquin Valley woodrat, and listed anadromous fish. Another goal addresses the Refuge role and the management actions necessary to maintain continued recovery of the recently delisted Aleutian Canada goose.

The Refuge goals with stepped down objectives and the management strategies to implement them are presented in Chapter 5 of the CCP.

Determination of effects:

Species occurrence provided below are compiled from data in the refuge biological files, and include information from operational refuge surveys and monitoring, special surveys and inventories, special studies, and observations during refuge operations. Projected species effects (Both beneficial and adverse) are based on the biology of individual species and their habitat needs as documented in literature and agency documents, discussions with species experts, and refuge personnel observations of species response to similar restoration and management

activities. Actual species effects will be evaluated through regular surveys and habitat monitoring conducted by refuge personnel and cooperators.

2. Explanation of effects of action on species and critical habitats in items III. A, B, and C:

Bald Eagle: This species does not nest in the area but is periodically observed preying on geese (including Aleutian Canada goose) and other waterfowl on refuge lands during the winter and spring months. It has been seen most frequently at roost ponds and goose foraging areas on the east side of the Refuge but probably also occurs on the west units, especially during high water events. The wetland habitat to be restored, enhanced, and managed under this action will provide additional foraging areas for the bald eagle. The effects of this action would potentially benefit this species by enhancing prey populations (waterfowl and fish) which may lead to an increase in winter survival and reproductive fitness.

Willow Flycatcher: This species has been documented on the Refuge during spring and fall banding efforts. The riparian forest to be restored and enhanced under this action will provide additional habitat for this species. The effects of this action would potentially benefit this species by restoring and managing riparian habitat necessary for this species during migration stopovers.

Least Bell's Vireo: This species was documented as breeding on the Refuge for the first time in the past year. The species used newly restored riparian vegetation as breeding habitat. The efforts to restore significant amounts of riparian habitat at the Refuge will benefit this species.

Fresno Kangaroo Rat: The San Joaquin River NWR is within the historical range of this species. However, extensive landscape changes in the San Joaquin Valley have reduced their present range, and the closest recent record of Fresno kangaroo rat is from the south end of Merced County in 1972. There are currently no known populations in or near the Refuge. Due to the fact that most of the Refuge land base is floodplain with heavy soils, native arid grassland habitat is limited. The species has not been documented by Refuge biologists during biological inventories in 1998, nor during operational Refuge activities conducted since 1987. The existing and proposed (wetland and riparian restoration) habitats within the Refuge are not suitable for this arid uplands associated species. There would be no effects of this project upon the species due to a lack of presence.

San Joaquin Kit Fox: The San Joaquin River NWR is within the historical range of this species. However, there have been no recent observations by species experts or Refuge staff that would indicate the species are present on the Refuge. Kit fox have been recorded in recent years in the Coast Range about 20 miles west of the Refuge. The periodic flooding of the Refuge and intensity of agricultural operations on surrounding lands limits suitability of the area for Kit Fox. No evidence of Kit Fox nor their burrows has ever been observed during operational activities conducted on the refuge since its establishment in 1987, nor on surveys conducted as part of a biological inventory in 1998. There would be no effects of this project upon the species due to a lack of presence.

Riparian Brush Rabbit: The project area is within the historic range of this subspecies. Two small existing populations of Riparian Brush Rabbit had previously been known to occur at Caswell State Park northwest of the Refuge and near Paradise Cut in San Joaquin County. Past surveys by Refuge staff, CSU-Stanislaus Endangered Species Recovery Program (ESRP), and other research personnel staff found no evidence that brush rabbits were present on the Refuge in recent years. It was believed that the lack of rabbits was due to construction of flood control levees along the San Joaquin River and land conversion to agriculture, prior to establishment of the Refuge, which had altered the vegetative communities and hydrology thus making the floodplain unsuitable for the species. Management activities proposed under this CCP include breaching existing flood control levees to restore natural floodplain function, replanting former agricultural lands back to riparian and floodplain plant communities, and building and vegetating mounds to provide refugia during flood events. The Refuge was selected as a re-establishment site for riparian brush rabbit as part of the species recovery program. A total of

134 captive-reared rabbits were released on the Refuge in summers 2002 and 2003, and are being intensively monitored through radio telemetry. Although unquantified, multiple litters of riparian brush rabbits have been born on the Refuge. Releases have been made on the refuge in 2003 and 2004. This recovery effort is being implemented by ESRP, and closely coordinated with the Sacramento FWO Endangered Species Program, the Refuge, California Dept. of Fish and Game, and U.S. Bureau of Reclamation. Major funding is being provided by the U.S. Bureau of Reclamation and the FWS. The Refuge staff is actively participating in the re-establishment effort and is coordinating with species experts to ensure that habitat restoration and subsequent management maximizes benefits to riparian brush rabbits. Avoidance measures during the habitat restoration/management, as well as other Refuge programs such as public use, are being implemented. The effects of the actions proposed under this CCP will greatly benefit riparian brush rabbits and contribute to recovery goals.

San Joaquin Valley Woodrat: The project area is within the historic range of the species. Existing populations are known to occur at Caswell State Park northwest of the Refuge and along the riparian corridor of the San Joaquin River on private land north of the refuge. Surveys prior to 2003 by Refuge and ESRP staff, as well as other researchers found no evidence that San Joaquin Valley woodrats were present on the Refuge in recent years. However, 5 woodrats, including a lactating female were documented in summer 2003 by ESRP staff during riparian brush rabbit monitoring activities. Actual size and status of the population is not known at this time. Suitability of the area for woodrats has been degraded due to reduction of floodplain riparian habitat through past construction of flood control levees along the river and land conversion to agriculture, altered river hydrology, and competition by non-native black rats.

Management activities proposed under this CCP include breaching existing flood control levees to restore natural floodplain function, and replanting former agricultural lands back to riparian and floodplain plant communities. Management activities being conducted for riparian brush rabbit recovery, such as building and vegetating mounds to provide refugia during flood events, will provide direct benefits to San Joaquin Valley woodrats. When a specific recovery plan is developed and funded, the Refuge will work closely with the Sacramento FWO Endangered Species Program, ESRP, and other partners to assist in species recovery activities. Refuge staff are currently coordinating with species experts so that ongoing restoration and subsequent management maximizes benefits to woodrats, and that avoidance measures during that restoration/management, as well as other Refuge programs such as public use, are implemented. The effects of the actions proposed under this CCP will greatly benefit San Joaquin Valley woodrat populations.

Giant Garter Snake: The San Joaquin River NWR is within the historical range of this species and is part of the San Joaquin Valley Recovery Unit of the draft FWS Recovery Plan. However, limited surveys in recent years have not documented any occurrence on or near the Refuge. Part of the wetlands and sloughs appear to be suitable habitat for the species. The wetlands restoration proposed by this CCP, primarily consisting of contouring dry basins in former agricultural fields, constructing water control structures, and connecting the basins to delivery system, will take place on dry uplands away from potential habitat. Subsequent management of these restored wetlands will beneficially impact giant garter snakes by increasing potential habitat for the species. In addition, giant garter snake surveys on the Refuge, as directed in the monitoring component of the CCP will add to the knowledge of distribution of the species and potentially contribute to recovery efforts.

Blunt-nosed Leopard Lizard: The historic range of this species includes the San Joaquin NWR but it has not been documented as present on or near the Refuge. The existing floodplain and riparian habitats are not suitable habitat for this arid uplands associated species. There would be no effects of this action upon the species due to a lack of presence.

Conservancy Fairy Shrimp; Vernal Pool Fairy Shrimp; Vernal Pool Tadpole Shrimp: Less than a dozen small vernal pools are present on the refuge and are limited to two areas east of the San Joaquin River that had not been altered prior to Refuge ownership. The Vernal Pool Fairy Shrimp and Tadpole Shrimp have been documented to

occur within the refuge vernal pools. The other two species are considered as potentially present based on habitat availability and presence of other vernal pool obligate species. The San Luis NWR Complex has a long-standing policy to avoid any actions that adversely impact vernal pools. All the vernal pools within the Refuge are located away from the construction areas and would not be directly impacted by any restoration/ enhancement activities. Subsequent water levels of nearby existing wetlands will continue to be managed to avoid adversely impacting any of the vernal pools. Vernal pool habitat will be subject to seasonal cattle grazing as part of the Refuge grazing program. The effects of the actions proposed under this CCP, specifically continuation of the existing grazing program, will have positive impacts by maintaining short grassland communities and limiting the growth of invasive plants in and around the vernal pools.

Valley Elderberry Longhorn Beetle: The historic range of this species includes the San Joaquin River NWR; however, the beetle has not been documented to occur on or near the Refuge. Habitat (elderberry shrubs) is relatively abundant on the Refuge east of the San Joaquin River, but limited west of the river. Large quantities of elderberry seedlings are being planted on the west side of the Refuge as part of an ongoing 800-acre riparian restoration effort. Additional plantings are planned dependent on funding. The effects of the actions proposed under this CCP, specifically the riparian restoration, would benefit the species by increasing native habitat (i.e., elderberry shrubs).

California Tiger Salamander: California tiger salamanders are relatively abundant in suitable vernal pool communities throughout the San Joaquin Valley. Less than a dozen small vernal pools are present on the refuge and are limited to two areas east of the San Joaquin River that had not been altered prior to Refuge ownership. The presence of California tiger salamanders have been documented by Refuge staff during surveys of these vernal pools. The San Luis NWR Complex has a long-standing policy to avoid any actions that adversely impact vernal pools. All the vernal pools and associated ground squirrel burrows are located away from any areas that would be subject to restoration/enhancement related earth moving activities or management related disturbance such as farming and wetland rehabilitation. Subsequent water levels of existing wetlands will be managed to avoid impacting any of the vernal pools communities. Vernal pool habitat will be subject to seasonal cattle grazing as part of the Refuge grazing program. The effects of the actions proposed under this CCP, specifically continuation of the existing grazing program, will have positive impacts by maintaining short grassland communities, promoting ground squirrel habitat, and limiting the growth of invasive plants in and around the vernal pools.

3. Explanation of actions to be implemented to reduce adverse effects:

The San Joaquin River NWR is not included in the Central Valley Project Improvement Act and does not receive water as mandated by the legislation. However, if a listed species has been documented to occur within the proposed action boundaries, all precautions and avoidance measures will be taken during restoration and operational management activities consistent with the Programmatic Biological Opinion on National Wildlife Refuge and Wildlife Area Water Conveyance Projects within Tulare, Kern, Fresno, Madera and Merced Counties. For instance, any restoration associated earth moving activities or operational canal maintenance along or adjacent to existing wetlands or potential giant garter snake habitat will be conducted only during the May to November period, and the site will be surveyed by a qualified FWS biologist prior to any construction. Also, no native uplands or vernal pools will be modified and we will restrict/avoid equipment use in these areas.

In the case of riparian brush rabbits and San Joaquin Valley woodrats, current Refuge management practices limit potential for adverse impacts or take in existing habitat. There is very little habitat manipulation, mowing, or earth-moving conducted within the currently forested riparian corridor. Earth-moving to restore floodplain wetlands, and the disking, site preparation, planting, mowing, irrigating, and herbicide application to re-establish riparian forest is being conducted on former agricultural fields which are currently unsuitable habitat for either species. Radio-telemetry of brush rabbits during 2002 and 2003, and woodrats in 2003 indicate that those species are not using the restoration sites. The intensive floodplain restoration activities will be

completed by the time the riparian forest communities become established and the area becomes attractive habitat to either species. The specific work sites where levees will be breached and rabbit flood refugia mounds constructed will be searched for the presence of rabbits and woodrats by a qualified FWS biologist immediately prior to any earth-moving to minimize potential for any take. Ongoing Refuge management activities such as roadside mowing and vehicle traffic on Refuge roads (as well as traffic associated with future public use programs) do result in a potential for take. However the risk of this occurring is minimized by the habits of both species to avoid open areas, slow speed of mowing tractors, and establishment of Refuge speed limits (25 mph). Locations of public use facilities, such as walking trails and tour routes will be sited to avoid main use areas and important habitat of each species. Environmental education on the importance of these species and how to avoid disturbing them will be incorporated into the public use program.

Any inventories, monitoring, or special studies of listed species on San Joaquin River NWR will be conducted only by qualified personnel (FWS or otherwise) and under the appropriate permits. Results from these investigations will be used to assess effects (both beneficial and adverse) of restoration and subsequent management upon individual listed species and where necessary implement changes in restoration/management activities to avoid/reduce any adverse impacts.

2. Effect determination and response requested:

A. Listed species/designated critical habitat:

<u>Determination</u>	<u>Response requested</u>
May affect, but not likely to adversely affect species: <u>Bald Eagle</u>	☒ Concurrence
May affect, but not likely to adversely affect species: <u>Willow Flycatcher</u>	☒ Concurrence
May affect, but not likely to adversely affect species: <u>Least Bell's Vireo</u>	☒ Concurrence
May affect, but not likely to adversely to affect species: <u>Riparian Brush Rabbit</u>	☒ Concurrence
May affect, but not likely to adversely affect species: <u>San Joaquin Wood rat</u>	☒ Concurrence
May affect, but not likely to adversely affect species: <u>Giant Garter Snake</u>	☒ Concurrence
May affect, but not likely to adversely affect species: <u>Valley Elderberry Longhorn Beetle</u>	☒ Concurrence
May affect; but not likely to adversely affect species: <u>Conservancy Fairy Shrimp</u>	☒ Concurrence
May affect; but not likely to adversely affect species: <u>Vernal Pool Fairy Shrimp</u>	☒ Concurrence

May affect; but not likely to adversely affect
species: Vernal Pool Tadpole Shrimp

✓ Concurrence

May affect; not likely to adversely affect
species: California Tiger Salamander

✓ Concurrence

No effect/No adverse modification
species: Fresno Kangaroo Rat

✓ Concurrence

No effect/No adverse modification
species: San Joaquin Kit Fox

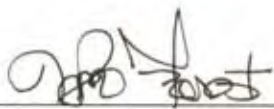
✓ Concurrence

No effect/No adverse modification
species: Blunt-nosed Leopard Lizard

✓ Concurrence

B. Proposed species/proposed critical habitat:
None

C. Candidate species:
None



Signature

21 Sept 06
date

Project Leader, San Luis National Wildlife Refuge Complex

Document prepared by:

Dennis Woolington, Supervisory Wildlife Biologist, San Luis NWR Complex

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Appendix G: Step-Down and Other Plans Pertaining to the San Joaquin River National Wildlife Refuge—a Unit of the San Luis National Wildlife Refuge Complex

<i>Title of Plan</i>	<i>Status</i>	<i>Purpose</i>
–Station Plans–		
Fire Management Plan	Completed (2001)	Provides the proper procedures for all management activities involving fire on the Refuge including wildfire presuppression activities, wildfire suppression, and the use of prescribed fire. Step-down portions of this plan include the wildfire dispatch plan and step-up plan.
Disease Management Plan	Completed (1983)	Outlines procedures for the prevention and control of disease in migratory birds.
Chronic Wasting Disease Surveillance and Response Plan	Completed (2005)	Provides guidelines for dealing with chronic wasting disease issues with mule deer on the Refuge Complex.
Water Management Plan	Needs to be Completed	Provides guidelines for the management of wetlands on the Refuge.
Law Enforcement Plan	Needs to be Completed	Plan provides guidance for the law enforcement program on the Refuge.
Emergency Management Plan	Completed (1993)	Provides the protocol for the Complex when dealing with disaster and emergency situations.
Public Use Management Plan	Needs to be Completed	Describes and provides the procedures/guidance for all aspects of the Refuge's public use program.
Hunt Management Plan	Needs to be Completed	Documents the waterfowl resource and associated recreational waterfowl hunt program on the Refuge.
Upland Management Plan	Needs to be Completed	Document provides the upland management goals and implementation procedures for upland habitats on the Refuge.
Spill Response Plan	Completed (1973)	Outlines procedures for the prevention, handling and cleanup of hazardous materials and oil spills.
Safety Management Plan	Completed (1970)	Safety procedures outline for the San Luis National Wildlife Refuge Complex.
Fisheries Management Plan	Needs to be Completed	Documents the fisheries resource and associated aquatic management activities on the Refuge.
Biological Inventory Plan	Needs to be Completed	Procedures for documenting, monitoring and analyses of biological resources on the Refuge.

<i>Title of Plan</i>	<i>Status</i>	<i>Purpose</i>
Invasive Exotic Plant Control Plan	Needs to be Completed	Documents goals and techniques/procedures for controlling invasive, exotic plants on the Refuge.
–FWS Region 1 Plans–		
FWS Migratory Bird Disease Contingency Plan - Region 1	Completed (1984)	Documents the procedures and responsibilities for prevention and management of migratory bird diseases.
FWS Recovery Plan for Upland Species of the San Joaquin Valley, California–Region 1	Completed (1998)	Includes recovery plans for threatened and endangered species in the San Joaquin Valley including San Joaquin kit fox, riparian brush rabbit and riparian woodrat.
FWS Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes–Region 1	Completed (1995)	Includes recovery plans for threatened and endangered native fish species of the Sacramento-San Joaquin Delta including the chinook salmon, Sacramento splittail and Sacramento perch.
–FWS National or Other Regional Plans–		
FWS Director’s Priorities	Completed (1999)	Provides goals and action items for the management of the National Wildlife Refuge System.
FWS Energy Management Plan	Completed (1986)	Outlines procedures and responsibilities for the FWS to reduce energy use and costs on its facilities.
FWS Aleutian Canada Goose Recovery Plan–Region 7	Completed (1982)	Plan outlines the efforts needed for the recovery of the Aleutian Canada Goose in North America.
–Other Plans–		
U.S. Shorebird Conservation Plan–Southern Pacific Region	Completed (1999)	Provides a review of issues and regional goals concerning the management of shorebirds.
California Partners in Flight. Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Birds Associated with Riparian Habitats in California	Completed (1998)	Outlines migratory birds of special concern which use Californian riparian habitats and provides recommendations for their monitoring, preservation and management.

Appendix H: Levee Breach Study

San Joaquin River National Wildlife Refuge—Phase I Analysis of the Proposed Levee Breaches

CONTEXT AND RATIONALE FOR THE PWA (Phil Williams & Assoc.) STUDY

As a result of the January 1997 floods several levees failed along the west side of the San Joaquin River in the vicinity of the Tuolumne River confluence. After the flood, the levees were partially repaired; however, the San Joaquin River National Wildlife Refuge (SJRNR) worked with the US Army Corps of Engineers (USACE) to plan a non-structural flood management alternative (NSA). This alternative includes breaching existing mainstream San Joaquin River levees on recently acquired Refuge land to restore wetland and riparian habitat. The proposed NSA will provide floodplain inundation behind project levees of up to 3,100 acres of Refuge land in some years.

The focus of this study is to examine habitat effects of proposed levee breaches and NSA refinements with particular emphasis on the needs of fish. The primary analysis tool used in this study was a one dimensional, looped network hydrodynamic model, MIKE II. Model results include depth and time of inundation as well as simulated flow on reactivated floodplain at the Refuge.

The PWA report describes the historical setting of the site, the hydrodynamic modeling, evaluation criteria being used to assess the results and finally, the challenges of the project. Evaluation criteria being used include: frequency, duration, depth and area of flooding; potential for fish stranding; and potential for creation of non-native or predator fish species habitat. In addition, potential refinements of the currently proposed NSA are identified.

LIMITATIONS OF THE STUDY

Phase 1 of the present study (PWA phase one) represents an initial overview of the proposed non-structural flood management alternative proposed by the USACE. Refinements to the proposed alternative will be made in Phase 2 of the project. The results contained in the report represent the potential conditions of the Refuge under the existing topographical conditions and flow regimes. Modifications to these parameters are likely under proposed Phase 2 alternatives to improve potential habitat conditions at the Refuge.

No hydrodynamic model calibration or validation data were available at the time of the Phase One study and therefore the results should be considered with this in mind. In addition, no sensitivity analysis has been conducted in this Phase of the study.

FINDINGS

1. The floodplains outside the project levees at the SJRNR (i.e. Lara, Hagemann, and Vierra properties) are likely to flood at approximately 16,000 cfs if breaches are made as proposed in the USACE NSA, and are cut to the depth of the adjoining ground elevation.
2. Implementation of the NSA is expected to cause flooding of this SJRNR floodplain every two to three years, on average; this frequency is appropriate to achieve anadromous fish habitat enhancement goals.

Additional work has been funded by AFRP in concert with the Refuge to conduct a more detailed study which includes design recommendations. The results of this work are anticipated shortly after completion of the Refuge CCP.

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Appendix I: References & Resources

Reports and Studies

DRAFT SAN JOAQUIN RIVER NWR, PRE-RESTORATION REPORT, USFWS, 18 Oct 1999 Phase III Basin Project Information Report
Final Emergency Levee Repairs, San Joaquin River Basin
Reclamation Districts 2100 and 2102, Stanislaus County, California USACE

NORTHERN CALIFORNIA STREAMS: TUOLUMNE RIVER, CALIFORNIA,
RECONNAISSANCE STUDY, Section 905 (b) (WRDA 86) Analysis, Division: South
Pacific District: Sacramento Date: 30 September 1998

Project Study Plan TUOLUMNE RIVER, CALIFORNIA
Modesto, California, U.S. Army Corps of Engineers Sacramento District July 1999

San Joaquin River National Wildlife Refuge—Phase 1, Analysis of the Proposed Levee Breaches, Phillip Williams & Associates, May 2001.

Report of Recommended Alternatives, Refuge Water Supply and San Joaquin Basin action Plan Lands, Bureau of Reclamation-Mid-Pacific Region and Fish and Wildlife Service, April 1995

The Grasslands Water Summary, Grasslands Water District, Jayne Philport Casey, 1962, Reprint.

References

Arkley, R. J. 1964. Soil Survey - Eastern Stanislaus area, California. Series 1957, No. 20. USDA, Soil Conservation Service, in cooperation with University of California Agricultural Experiment Station. 210pp.

Anderson, B. and A. DeGange. 2001. Final rule to remove the Aleutian Canada goose from the federal list of endangered and threatened wildlife. 50 Code Fed. Reg. Part 17, 66:15643-15656.

Barbour, M.G. and W.D. Billings. North American Terrestrial Vegetation. Cambridge University Press, New York, New York. 434pp.

Bonnicksen, T.M. 2000. America's Ancient Forests. John Wiley and Sons, Inc. 594pp.

California Regional Water Quality Control Board. 1998. Water Quality of the Lower San Joaquin River: Lander Avenue to Vernalis October 1995 through September 1997. Staff Report. 80 pp.

Claudill, James, and Andrew Laughland. 1998. 1996 National and State Economic Impacts of Wildlife Watching: Based on the 1996 National Survey of Fishing, Hunting and Wildlife-Associated Recreation. US Department of the Interior, USFWS, Division of Economics, Arlington, Virginia.

- Ferren, W. R., Jr., and D. A. Pritchett. 1988. Enhancement, restoration, and creation of vernal pools at Del Sol Open Space and Vernal Pool Reserve, Santa Barbara County, California. Environmental Report No. 13, University of California, Santa Barbara. 169pp.
- Fisher, R. In Press. Protocol for Herp study field personnel. USGS Biological Resource Division, San Diego, California.
- Flannery, T. 2001. The Eternal Frontier, An Ecological History of North American and its Peoples. Atlantic Montly Press, New York, New York. 404pp.
- Gains, B. and S. Laymon. 1984. Decline, status and preservation of the yellow-billed cuckoo. Western Birds 15:49-80.
- Hansen, G. E. 1988. Review of the status of the giant garter snake (*Thamnophis couchi gigas*) and its supporting habitat during 1986-1987. Final Report for California Dept. Fish and Game.
- Hansen, G.E. and J.M. Brode. 1980. Status of the giant garter snake, *Thamnophis couchi gigas* (Fitch). Special Publication 80-5, Inland Fisheries Endangered Species Program, Dept. of Fish and Game.
- Heitmeyer, M.E., D.P. Connelly and R.L. Pedersen. 1989. The Central, Imperial, and Coachella Valleys of California. Pp 475-506 IN Habitat Management for Migrating and Wintering Waterfowl in North America. Texas Tech University Press, Lubbock. 560 pp.
- Holland, R. F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Non-game Heritage Program, Dept. of Fish and Game, Sacramento, California. 155pp.
- Isola, C.R., M.A. Colwell, O.W. Taft and R.J. Safran. 2000. Interspecific differences in habitat use of shorebirds and waterfowl foraging in managed wetlands of California's San Joaquin Valley. Waterbirds 23(2):196-203.
- Iverson, G. C., and T. C. Tacha. 1982. Food contents of Sandhill Cranes during winter and spring. P. 95-98 in J. C. Lewis [ed.], Proc. 1981 Crane Workshop, Nat. Audubon Soc., Tavernier, FL.
- Jain, S., and P. Moyle. 1981. Vernal Pools and Intermittent Streams. Symposium of the Institute of Ecology University of California, Davis. Institute of Ecology Publication No. 28. 280 pp.
- Jensen, P.M. 1996 Archaeological Survey Report (ASR)–Negative. Proposed Fresno-Tracy Fiberoptics Data Transmission Line. CALTRANS' Rights-Of-Way at Six State Highway Crossings. Caltrans District 3, Portions of Fresno, Madera, Merced, Stanislaus, and San Joaquin Counties, California. Jensen and Associates, Durham, California.
- Johnson, D.H., D.E. Timm, and P.F. Springer. 1979. Morphological characterisitics of Canada geese in the Pacific Flyway. Pp. 56-80 in R.L. Jarvis and J.C. Bartonek, eds. Management and Biology of Pacific Flyway Geese: A Symposium. Oregon State Univ. Book Stores, Inc., Corvallis.

- Katibah, E. F. 1984. A brief history of riparian forests in the Central Valley of California *in* California Riparian Systems: Ecology, Conservation, and Productive Management. Edited by R. E. Warner and K. M. Hendrix. Univ. of Cal. Press, California. Pages 23-29.
- Laymon, S. A. 1998. Partners in Flight bird conservation plan: yellow-billed cuckoo (*Coccyzus americanus*). Admin. Rept. to California Partners in Flight.
- Levy, R.S., et al. 1995. Archaeological Survey Report for the Proposed Seismic Retrofit of California State Highway Bridge #38-45 on Route 132 over the San Joaquin River, East of Venalis in Stanislaus County, California 10-Sta-132, PM \$2.43. Department of Transportation District 10.
- Lewis, J. C., G. W. Archibald, R. C. Drewien, C. R. Frith, E. A. Gluessing, R. D. Klataske, C. D. Littlefield, J. Sands, W. J. D. Stephen, and L. E. Williams. 1977. Sandhill Cranes, p. 5-43 *in* G. C. Sanderson [ed.], Management of migratory, shore, and upland game birds in North America. Intl. Assoc. Fish. And Wildl. Agency.
- McLaughlin, J.C. and G.L. Huntington. 1968. Soils of Westside Stanislaus Area California. University of California, Davis.
- McShea, W.J. and W.M. Healy, 2002. Oak Forest Ecosystems. John Hopkins University Press, Baltimore. 432pp.
- Mitsch, W.J. And G.G. Gosselink. 2000. Wetlands. John Wiley & Sons, Inc. New York. 920pp.
- MBMO (Migratory Bird Management Office, U. S. Fish and Wildlife Service). 1997. Equipment and Techniques for Observing Neckbanded Canada Geese. Non-pub. 8pp.
- Modesto Irrigation District. 1998. Modesto, California.
- Moyle, P.B. 2002. Inland fishes of California: revised and expanded. University of California Press, Ltd. London England.
- Ornduff, R. 1974. Introduction to California Plant Life. University of California Press, Berkeley. 152pp.
- Orr, R.T. 1940. The Rabbits of California. Occasional Papers of the California Academy of Sciences, San Francisco, California. 227pp.
- Page, P. J. 1970. San Joaquin River rookery study. State of California Department of Fish and Game, Wildlife Management Branch.
- Pogson, T. H. and S. M. Lindstedt. 1991. Distribution and abundance of large sandhill cranes, *Grus canadensis*, wintering in California's Central Valley. Condor 93:266-278.
- Root, T. 1988. Atlas of Wintering North American Birds. University of Chicago Press, Chicago. 312pp.
- Schoenherr, A.A. 1992. A Natural History of California. University of California Press, Berkley. 772pp.

- Shuford, W.P., G.W. Page and J.E. Kjelson. 1998. Patterns and dynamics of shorebird use of California's Central Valley. *Condor* 100:227-244.
- Silverstein, M. 1978. Yokuts: Introduction. *Handbook of North American Indians*. Vol. 8 California. Heizer, Robert F. Volume Editor; Sturtevant, William C. General Editor. Pp 446-447.
- Speulda, Lou Ann. 1999. USFWS. Historic Properties Identification and Evaluation Report of the Vierra Dairy. 22.
- Swernoff, Michael. 1982. Archeological Investigations at the Lower Stanislaus River Recreation Areas, Calaveras, Tuolumne, Stanislaus, and San Joaquin Counties, California. Final Report submitted to Interagency Archeological Services, National Park Service. Prepared under the supervision of Dr. Elliott A. Gehr. Professional Analysts, Eugene, Oregon.
- True, D.L., et al. 1981. Archaeological Survey of the Proposed San Luis Drain Project: Kesterson Reservoir to the Sacramento-San Joaquin Delta, California.
- U.S. Fish and Wildlife Service. 1987. Aleutian Canada Goose Disease and Contamination Hazard Contingency Plan. Unpubl. report-updated 1995. Fish Wildl. Serv., U.S. Dep Int., Anchorage, AK. 26 pp.
- U.S. Fish and Wildlife Service. 1991. Aleutian Goose Recovery Plan.
- U.S. Fish and Wildlife Service. 1991. San Luis NWR/Grasslands Wildlife Management Area Disease Contingency Plan. Unpubl. report. Fish Wildl. Serv., U.S. Dep Int., Los Banos, CA. 42 pp.
- Werner, R. H. 1984. Archaeological Record Search and Field Survey Lower San Joaquin River and Tributaries Channel Clearing Project. Archaeological Services, Clearlake, California.
- Williams, D.F., P.A. Kelly and L.P. Hamilton. 2002. Controlled propagation and reintroduction plan for the riparian brush rabbit (*Sylvilagus bachmani riparius*). Endangered Species Recovery Program, California State University, Stanislaus. 75pp.
- Woolington, D.W., P.F. Springer, and D.R. Yparraguirre. Migration and wintering ecology of Aleutian Canada geese. Pages 299-309 in R.L. Jarvis and J.C. Bartonek, eds. Management of Pacific Flyway Geese. Ore. St. Univ. Corvallis. 346pp.

Websites:

- EDD. <http://www.edd.ca.gov/>
- <http://cache.census.gov/hhes/www/saipa/estimate/cty/cty06077.htm>
- <http://www.Cathedralcity.org/sa6.htm>
- <http://www.Cathedralcity.org/st1.htm>
- <http://cache.census.gov/hhes/www/saipa/estimate/cty/cty06077.htm>

<http://cache.census.gov/hhes/www/saipa/estimate/cty/cty06099.htm>

<http://gocalif.ca.gov/research/county.html>

Scedco.org. Stanislaus County Economic Development Corporation. <http://www.scedco.org>

SJPNET. San Joaquin Partnership. [Http://www.sjpnet.org](http://www.sjpnet.org)

USFWS. 1998. USFWS Economic Study Shows Wildlife Watching is Big Business. Luery
Parramore. June 10, 1998. <http://www.fws.gov/r9extaff/pr9833.html>

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Appendix J: Relevant Federal Laws and Mandates

American Indian Religious Freedom Act (1978):

Directs agencies to consult with native traditional religious leaders to determine appropriate policy changes necessary to protect and preserve Native American religious cultural rights and practices.

Americans With Disabilities Act (1992):

Prohibits discrimination in public accommodations and services.

Architectural Barriers Act (1968):

Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

Clean Water Act (1977):

Requires consultation with the Corps of Engineers (404 permits) for major wetland modifications.

Emergency Wetland Resources Act of 1986:

This Act authorized the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. The Act also requires the Secretary to establish a National Wetlands Priority Conservation Plan, requires the States to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund amount equal to import duties on arms and ammunition.

Endangered Species Act of 1973:

(16 U.S.C. 1531-1544, 87 Stat. 884), as amended

Public Law 93-205, approved December 28, 1973, repealed the Endangered Species Conservation Act of December 5, 1969 (P.L. 91-135, 83 Stat. 275). The 1969 act had amended the Endangered Species Preservation Act of October 15, 1966 (P.L. 89-669, 80 Stat. 926). The 1973 Endangered Species Act provided for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend, both through Federal action and by encouraging the establishment of State programs. The Act:

- Authorizes the determination and listing of species as endangered and threatened;
- Prohibits unauthorized taking, possession, sale, and transport of endangered species;
- Provides authority to acquire land for the conservation of listed species, using land and water conservation funds;
- Authorizes establishment of cooperative agreements and grants-in-aid to States that establish and maintain active and adequate programs for endangered and threatened wildlife and plants;
- Authorizes the assessment of civil and criminal penalties for violating the Act or regulations; and
- Authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the Act of any regulation issued thereunder.

Environmental Education Act of 1990:

(20 USC 5501-5510; 104 Stat. 3325)

Public Law 101-619, signed November 16, 1990, established the Office of Environmental Education within the Environmental Protection Agency to develop and administer a Federal environmental education program.

Responsibilities of the Office include developing and supporting programs to improve understanding of the natural and developed environment, and the relationships between humans and their environment; supporting the dissemination of educational materials; developing and supporting training programs and environmental education seminars; managing a Federal grant program; and administering an environmental internship and fellowship program. The Office is required to develop and support environmental programs in consultation with other Federal natural resource management agencies, including the Fish and Wildlife Service.

Executive Order 11988, Floodplain Management:

The purpose of this Executive Order, signed May 24, 1977, is to prevent Federal agencies from contributing to the “adverse impacts associated with occupancy and modification of floodplains” and the “direct or indirect support of floodplain development.” In the course of fulfilling their respective authorities, Federal agencies shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

Executive Order 11990:

E.O. 11990 directs Federal agencies to (1) minimize destruction, loss, or degradation of wetlands and (2) preserve and enhance the natural and beneficial values of wetlands when a practical alternative exists.

Executive Order 12372:

(Intergovernmental Review of Federal Programs):

Directs the Service to send copies of the Environmental Assessment to Iowa State Planning Agencies for review.

Executive Order 12898 (1994):

Establishes environmental justice as a Federal government priority and directs all Federal agencies to make environmental justice part of their mission. Environmental justice calls for fair distribution of environmental hazards.

Executive Order 12996 Management and General Public Use of the National Wildlife Refuge System (1996):

Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the System.

Executive Order 13006 Locating Federal Facilities on Historic Properties in Our Nation's Central Cities:

Directs Federal agencies to select, utilize and maintain historic properties and districts, especially those located in cities' central business districts, whenever operationally appropriate and economically prudent.

Executive Order 13007 Indian Sacred Sites (1996):

Directs Federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

Executive Order 13112, Invasive Species (1999):

Directs federal agencies to prevent introduction and provide control of invasive species.

Executive Order 13186, of Jan. 10, 2001:

Responsibilities of Federal Agencies to Protect Migratory Birds. FR 66(11), Jan. 17, 2001.

Federal Farmland Protection Policy Act (1979)

as amended: Minimizes the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses.

Federal List of Birds of Conservation Concern:

Draft Region 1 and BCR 32 Birds of Conservation Concern.

Federal Noxious Weed Act (1990):

Requires the use of integrated management systems to control or contain undesirable plant species, and an interdisciplinary approach with the cooperation of other Federal and State agencies.

Federal Records Act (1950):

Directs preservation of evidence of the government's organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

Fish and Wildlife Act of 1956:

(16 U.S.C. 742a-742j, not including 742 d-l; 70 Stat. 1119), as amended:

The Act of August 8, 1956, as frequently amended, establishes a comprehensive national fish, shellfish, and wildlife resources policy with emphasis on the commercial fishing industry but also with a direction to administer the Act with regard to the inherent right of every citizen and resident to fish for pleasure, enjoyment, and betterment and to maintain and increase public opportunities for recreational use of fish and wildlife resources. Among other things, it directs a program of continuing research, extension, and information services on fish and wildlife matters, both domestically and internationally.

Section 7(a) of the Act (16 U.S.C. 742f; 70 Stat. 1122) requires the Secretary of the Interior to: 1) develop measures for "maximum sustainable production of fish"; 2) make economic studies of the industry and recommend measures to insure stability of the domestic fisheries; 3) undertake promotional and information activities to stimulate consumption of fishery products; 4) take steps "required for the development, advancement, management, conservation, and protection of the fisheries resources," and take steps "***required for the development, management, advancement, conservation, and protection of fish and wildlife resources***" through research, acquisition of land and water or interests therein, development of existing facilities, and other means. (Note: subsection 5 was amended and combined into subsection 4 by P.L. 95-616, November 8, 1978.).

Fish and Wildlife Conservation Act, 1988:

Amendment. Requires the Service to identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, likely to become candidates for listing under the Endangered Species Act of 1973". The Act also requires the Service monitor and assess migratory nongame birds and track efforts of environmental changes on these species. Report every 5 years to Congress. The Services' list of Birds of Conservation Concern derives from this legislation.

Fish and Wildlife Coordination Act (1934):

as amended: Requires that the Fish and Wildlife Service and State Fish and Wildlife agencies be consulted whenever water is to be impounded, diverted or modified under a Federal permit or license. The Service and State agency recommend measures to prevent the loss of biological resources, or to mitigate or compensate for the damage. The project proponent must take biological resource values into account and adopt justifiable protection measures to obtain maximum overall project benefits. A 1958 amendment added provisions to recognize the vital contribution of wildlife resources to the Nation and to require equal consideration and coordination of wildlife conservation with other water resources

development programs. It also authorized the Secretary of Interior to provide public fishing areas and accept donations of lands and funds.

Fish and Wildlife Improvement Act of 1978:

This act was passed to improve the administration of fish and wildlife programs and amends several earlier laws, including the Refuge Recreation Act, the National Wildlife Refuge Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out volunteer programs.

Historic Preservation Acts:

There are various laws for the preservation of historic sites and objects.

Antiquities Act: (16 USC 431–433)—The Act of June 8, 1906, (34 Stat. 225) authorizes the President to designate as National Monuments objects or areas of historic or scientific interest on lands owned or controlled by the United States. The Act required that a permit be obtained for examination of ruins, excavation of archaeological sites and the gathering of objects of antiquity on lands under the jurisdiction of the Secretaries of Interior, Agriculture, and Army, and provided penalties for violations.

Archeological and Historic Preservation Act: (16 U.S.C. 469-469c)—Public Law 86-523, approved June 27, 1960, (74 Stat. 220) as amended by Public Law 93-291, approved May 24, 1974, (88 Stat. 174) to carry out the policy established by the Historic Sites Act (see below), directed Federal agencies to notify the Secretary of the Interior whenever they find a Federal or Federally assisted, licensed or permitted project may cause loss or destruction of significant scientific, prehistoric or archaeological data. The Act authorized use of appropriated, donated and/or transferred funds for the recovery, protection and preservation of such data.

Archaeological Resources Protection Act: (16 U.S.C. 470aa–470ll)—Public Law 96-95, approved October 31, 1979, (93 Stat. 721) largely supplanted the resource protection provisions of the Antiquities Act for archaeological items.

This Act established detailed requirements for issuance of permits for any excavation for or removal of archaeological resources from Federal or Indian lands. It also established civil and criminal penalties for the unauthorized excavation, removal, or damage of any such resources; for any trafficking in such resources removed from Federal or Indian land in violation of any provision of Federal law; and for interstate and foreign commerce in such resources acquired, transported or received in violation of any State or local law.

Historic Sites, Buildings and Antiquities Act: (16 USC 461-462, 464-467)—The Act of August 21, 1935, (49 Stat. 666) popularly known as the Historic Sites Act, as amended by Public Law 89-249, approved October 9, 1965, (79 Stat. 971) declared it a national policy to preserve historic sites and objects of national significance, including those located on refuges. It provided procedures for designation, acquisition, administration and protection of such sites. Among other things, National Historic and Natural Landmarks are designated under authority of this Act. As of January, 1989, 31 national wildlife refuges contained such sites.

National Historic Preservation Act of 1966: (16 U.S.C. 470-470b, 470c-470n)—Public Law 89-665, approved October 15, 1966, (80 Stat. 915) and repeatedly amended, provided for preservation of significant historical features (buildings, objects and sites) through a grant-in-aid program to the States. It established a National Register of Historic Places and a program of matching grants under the existing National Trust for Historic Preservation

(16 U.S.C. 468-468d). The Act established an Advisory Council on Historic Preservation, which was made a permanent independent agency in Public Law 94-422, approved September 28, 1976 (90 Stat. 1319). That Act also created the Historic Preservation Fund. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register. As of January, 1989, 91 historic sites on national wildlife refuges have been placed on the National Register.

Public Law 100-588:

approved November 3, 1988, (102 Stat. 2983) lowered the threshold value of artifacts triggering the felony provisions of the Act from \$5,000 to \$500, made attempting to commit an action prohibited by the Act a violation, and required the land managing agencies to establish public awareness programs regarding the value of archaeological resources to the Nation.

Land and Water Conservation Fund Act of 1948:

(1965) This act provides funding through receipts from the sale of surplus federal land, appropriations from oil and gas receipts from the outer continental shelf, and other sources of for land acquisition under several authorities. Appropriations from the fund may be used for matching grants to states for outdoor recreation projects and for land acquisition by various federal agencies, including the Fish and Wildlife Service.

Migratory Bird Conservation Act of 1929:

(16 U.S.C. 715-715d, 715e, 715f-715r)

This Act established the Migratory Bird Conservation Commission which consists of the Secretaries of the Interior (chairman), Agriculture, and Transportation, two members from the House of Representatives, and an ex-officio member from the state in which a project is located. The Commission approves acquisition of land and water, or interests therein, and sets the priorities for acquisition of lands by the Secretary for sanctuaries or for other management purposes. Under this Act, to acquire lands, or interests therein, the state concerned must consent to such acquisition by legislation. Such legislation has been enacted by most states.

Migratory Bird Hunting and Conservation Stamp Act:

(16 U.S.C. 718-718j, 48 Stat. 452), as amended:

The “Duck Stamp Act,” as this March 16, 1934, authority is commonly called, requires each waterfowl hunter 16 years of age or older to possess a valid Federal hunting stamp. Receipts from the sale of the stamp are deposited in a special Treasury account known as the Migratory Bird Conservation Fund and are not subject to appropriations.

Migratory Bird Treaty Act (1918):

Designates the protection of migratory birds as a Federal responsibility. This Act enables the setting of seasons, and other regulation including the closing of areas, Federal or non-Federal, to the hunting of migratory birds.

National and Community Service Act:

Will make grants to States for the creation of full-time and/or part-time programs for citizens over 17 years of age. Programs must be designed to fill unmet educational, human, environmental, and public safety needs. Initially, participants will receive post-employment benefits of up to \$1000 per year for part-time and \$2500 for full-time participants.

Thousand Points of Light B

Creates a non-profit Points of Light Foundation to administer programs to encourage citizens and institutions to volunteer in order to solve critical social issues, and to discover new leaders and develop institutions committed to serving others.

National and Community Service Act of 1990:

(42 U.S.C. 12401; 104 Stat. 3127)

Public Law 101-610, signed November 16, 1990, authorizes several programs to engage citizens of the U.S. in full- and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Several provisions are of particular interest to the U.S. Fish and Wildlife Service.

American Conservation and Youth Service Corps B As a Federal grant program established under Subtitle C of the law, the Corps offers an opportunity for young adults between the ages of 16-25, or in the case of summer programs, 15-21, to engage in approved human and natural resources projects which benefit the public or are carried out on Federal or Indian lands.

To be eligible for assistance, natural resources programs will focus on improvement of wildlife habitat and recreational areas, fish culture, fishery assistance, erosion, wetlands protection, pollution control and similar projects. A stipend of not more than 100 percent of the poverty level will be paid to participants. A Commission established to administer the Youth Service Corps will make grants to States, the Secretaries of Agriculture and Interior and the Director of ACTION to carry out these responsibilities.

National Environmental Policy Act of 1969:

(P. L. 91-190, 42 U.S.C. 4321-4347, January 1, 1970, 83 Stat. 852) as amended by P. L. 94-52, July 3, 1975, 89 Stat. 258, and P. L. 94-83, August 9, 1975, 89 Stat. 424).

Title I of the 1969 National Environmental Policy Act (NEPA) requires that all Federal agencies prepare detailed environmental impact statements for “every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment.”

The 1969 statute stipulated the factors to be considered in environmental impact statements, and required that Federal agencies employ an interdisciplinary approach in related decision-making and develop means to ensure that unquantified environmental values are given appropriate consideration, along with economic and technical considerations.

Title II of this statute requires annual reports on environmental quality from the President to the Congress, and established a Council on Environmental Quality in the Executive Office of the President with specific duties and functions.

National Trails System Act:

Assigns responsibility to the Secretary of Interior and thus the Service to protect the historic and recreational values of congressionally designated National Historic Trail sites.

National Wildlife Refuge System Administration Act of 1966:

(16 U.S.C. 668dd-668ee) -- as amended:

This Act, derived from sections 4 and 5 of Public Law 89-669 (October 15, 1966; 80 Stat. 927), provides guidelines and directives for administration and management of all areas in the system, including “wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, or waterfowl production areas.” The Secretary is authorized to permit by regulations the use of any area within the system provided “such uses are compatible with the major purposes for which such areas were established.” The purchase consideration for rights-of way go into the Migratory Bird Conservation Fund for the acquisition of lands. By regulation, up to 40% of an area acquired for a migratory bird sanctuary may be opened to migratory bird hunting unless the Secretary finds that the taking of any species of migratory game birds in more than 40% of such area would be beneficial to the species. The Act requires an Act of Congress for the divestiture of lands in the system, except (1) lands acquired with Migratory Bird Conservation Commission

funds, and (2) lands can be removed from the system by land exchange, or if brought into the system by a cooperative agreement, then pursuant to the terms of the agreement.

National Wildlife Refuge System Improvement Act of 1997:

Public Law 105-57, amends the National Wildlife System Act of 1966 (16 U.S.C. 668dd-ee), providing guidance for management and public use of the Refuge System. The Act mandates that the Refuge System be consistently directed and managed as a national system of lands and waters devoted to wildlife conservation and management.

The Act establishes priorities for recreational uses of the Refuge System. Six wildlife-dependent uses are specifically named in the Act: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. These activities are to be promoted on the Refuge System, while all non-wildlife dependant uses are subject to compatibility determinations. A compatible use is one which, in the sound professional judgement of the Refuge Manager, will not materially interfere with or detract from fulfillment of the Refuge System Mission or refuge purpose(s).

As stated in the Act, “The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”

The Act also requires development of a comprehensive conservation plan for each refuge and management of each refuge consistent with the plan. When writing CCP, planning for expanded or new refuges, and when making management decisions, the Act requires effective coordination with other Federal agencies, state fish and wildlife or conservation agencies, and refuge neighbors. A refuge must also provide opportunities for public involvement when making a compatibility determination or developing a CCP.

National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act (1998):

Amends the Fish and Wildlife Act of 1956 to promote volunteer programs and community partnerships for the benefit of national wildlife refuges, and for other purposes.

Native American Graves Protection and Repatriation Act (1990):

Requires Federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

North American Wetlands Conservation Act:

(103 Stat. 1968; 16 U.S.C. 4401-4412)

Public Law 101-233, enacted December 13, 1989, provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, U.S. and Mexico.

The Act converts the Pitman-Robertson account into a trust fund, with the interest available without appropriation through the year 2006 to carry out the programs authorized by the Act, along with an authorization for annual appropriation of \$15 million plus an amount equal to the fines and forfeitures collected under the Migratory Bird Treaty Act.

Available funds may be expended, upon approval of the Migratory Bird Conservation Commission, for payment of not to exceed 50 percent of the United States share of the cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on Federal lands). At least 50 percent and no more than 70 percent of the funds received are to go to Canada and Mexico each year.

A North American Wetlands Conservation Council is created to recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. The Council

is to be composed of the Director of the Service, the Secretary of the National Fish and Wildlife Foundation, a State fish and game agency director from each Flyway, and three representatives of different non-profit organizations participating in projects under the Plan or the Act. The Chairman of the Council and one other member serve ex officio on the Commission for consideration of the Council's recommendations.

The Commission must justify in writing to the Council and, annually, to Congress, any decisions not to accept Council recommendations.

Oil Pollution Act of 1990:

Public Law 101-380 (33 U.S.C. 2701 et. seq.; 104 Stat. 484) established new requirements and extensively amended the Federal Water Pollution Control Act (33 U.S.C. 1301 et. seq.) To provide enhanced capabilities for oil spill response and natural resource damage assessment by the Service. It required Service consultation on developing a fish and wildlife response plan for the National Contingency Plan, input to Area Contingency Plans, review of Facility and Tank Vessel Contingency Plans, and to conduct damage assessments associated with oil spills. The following are the pertinent provisions.

Title I, section 1006, provided that Federal trustees shall assess natural resource damages for natural resources under their trusteeship. Federal trustees may, upon request from a State or Indian tribe, assess damages to natural resources for them as well. Trustees shall develop and implement a plan for the restoration, rehabilitation, replacement, or acquisition of the equivalent of natural resources under their trusteeship.

Title I, section 1011, provides that trustees are to be consulted on the appropriate removal action to be taken in connection with any discharge of oil.

Title I, section 1012, provided for the uses of the oil pollution fund. In addition to response costs, the fund may be used without appropriations to pay the costs of assessments, as well as to pay claims for natural resource damages if there are no funds or insufficient funds from a responsible party. (A claims procedure was to be developed under section 1013.) This section also stipulated deadlines for the submission of removal cost claims and damage claims.

Title IV, section 4202, amended subsection 311(j) of the Federal Water Pollution Control act with respect to the National Planning and Response System. It defined area committees and area contingency plans, and requirements and deadlines for agencies. Under this section, the Service is required to generate a list of all equipment, including fire fighting equipment, as well as personnel and any other equipment and supplies that could be used to expedite the removal of oil or mitigation of a spill.

One aspect of particular interest to the Service involves the identification of ecologically sensitive areas and the preparation of scientific monitoring and evaluation plans. Research conducted by the Service is to be directed and coordinated by the National Wetland Research Center.

Public Law 98-293:

approved May 22, 1984 (98. Stat. 207)

Renamed the Brigantine National Wildlife Refuge and Barnegat National Wildlife Refuge, collectively, as the Edwin B. Forsythe National Wildlife Refuge, in memory of the late Congressman Forsythe of New Jersey, ranking member of the House Merchant Marine and Fisheries Committee for many years.

Refuge Recreation Act of 1962:

This Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational

facilities and the acquisition of land for incidental fish and wildlife oriented recreational development or protection of natural resources. It also authorizes the charging of fees for public uses.

Refuge Revenue Sharing Act:

(16 U.S.C. 715s)

Section 401 of the Act of June 15, 1935, (49 Stat. 383) provided for payments to counties in lieu of taxes, using revenues derived from the sale of products from refuges.

Public Law 93-509, approved December 3, 1974, (88 Stat. 1603) required that moneys remaining in the fund after payments be transferred to the Migratory Bird Conservation Fund for land acquisition under provisions of the Migratory Bird Conservation Act.

Public Law 95-469, approved October 17, 1978, (92 Stat. 1319) expanded the revenue sharing system to include National Fish Hatcheries and Service research stations. It also included in the Refuge Revenue Sharing Fund receipts from the sale of salmonid carcasses. Payments to counties were established as:

1) on acquired land, the greatest amount calculated on the basis of 75 cents per acre, three-fourths of one percent of the appraised value, or 25 percent of the net receipts produced from the land; and

2) on land withdrawn from the public domain, 25 percent of net receipts and basic payments under Public Law 94-565 (31 U.S.C. 1601-1607, 90 Stat. 2662), payment in lieu of taxes on public lands.

This amendment also authorized appropriations to make up any difference between the amount in the Fund and the amount scheduled for payment in any year. The stipulation that payments be used for schools and roads was removed, but counties were required to pass payments along to other units of local government within the county which suffer losses in revenues due to the establishment of Service areas.

Rehabilitation Act of 1973:

(29 U.S.C. 794)as amended:

Title 5 of P. L. 93-112 (87 Stat. 355), signed October 1, 1973, prohibits discrimination on the basis of handicap under any program or activity receiving Federal financial assistance.

Rivers and Harbor Act (1899):

(33 U.S.C. 403): Section 10 of this Act requires the authorization by the U.S. Army Corps of Engineers prior to any work in, on, over, or under a navigable water of the United States.

Surface Mining Control and Reclamation Act (1977):

(Public Law 95-87) (SMCRA):as amended:

Regulates surface mining activities and reclamation of coal-mined lands. Further regulates the coal industry by designating certain areas as unsuitable for coal mining operations.

Transfer of Certain Real Property for Wildlife Conservation purposes Act of 1948:

This Act provides that upon determination by the Administrator of the General Services Administration, real property no longer needed by a Federal agency can be transferred, without reimbursement, to the Secretary of the Interior if the land has particular value for migratory birds, or to a State agency for other wildlife conservation purposes.

Uniform Relocation and Assistance and Real Property Acquisition Policies Act (1970):

as amended:

Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the Service. The Act requires that any purchase offer be no less than the fair market value of the property.

Wilderness Act of 1964:

(16 U.S.C. 1131-1136; 78 Stat. 890)

Public Law 88-577, approved September 3, 1964, The Wilderness Act of 1964 directs the Secretary of the Interior to review, within ten years, every roadless area of 5,000 acres or more and every roadless island regardless of size within the National Wildlife Refuge System and to recommend suitability of each such area. The Act permits certain activities within designated Wilderness Areas that do not alter natural processes. Wilderness values are preserved through a “minimum Tool” management approach which requires refuge managers to use the least intrusive methods, equipment and facilities necessary for administering the areas.

Youth Conservation Corps Act:

(16 U.S.C. 1701-1706, 84 Stat. 794) as amended:

Public Law 91-378, approved August 13, 1970, declares the YCC pilot program a success and establishes permanent programs within the Department of Interior and Agriculture for young adults who have attained the age of 15, but not the age of 19, to perform specific tasks on lands and waters administered under jurisdiction of these Secretaries. Within the Fish and Wildlife Service, YCC participants perform various tasks on National Wildlife Refuges, National Fish Hatcheries, research stations, and other facilities.

The legislation also authorizes the Secretary of Interior and the Secretary of Agriculture to establish a joint grant program to assist States employing young adults on non-Federal public lands and waters throughout the U.S.

Requires the Secretaries of Interior and Agriculture to prepare a joint report to the President and Congress prior to April 1 of each year.

Appendix K: Mailing List

Elected Federal Officials

U.S. Senator Feinstein
U.S. Senator Boxer
U.S. Representative Condit

Federal Agencies

USDA/Natural Resource Conservation Service
USDI/Fish and Wildlife Service, Region 1 (Portland, Oregon), Region 2 (Albuquerque, New Mexico), Region 3 (Fort Snelling, Minnesota), Region 4 (Atlanta, Georgia), Region 5 (Hadley, Massachusetts), Region 6 (Denver, Colorado), Region 7 (Anchorage, Alaska), National Conservation Training Center (Shepherdstown, West Virginia)
U.S. Army Corps of Engineers
U.S. Department of Agriculture
Bureau of Reclamation
Cooperative Alliance for Refuges
Fish and Wildlife Service–CVPIA Implementation Team
Fish and Wildlife Service–CA/NV Operations Office
Fish and Wildlife Service–Central Valley Habitat Joint Venture
Fish and Wildlife Service–Realty, Sacramento
U.S. Environmental Protection Agency
Farm Bureau

Elected State Officials

Governor Arnold Schwarzenegger
State Representative Monteith
State Assemblyman Cordoza
State Assemblyman Frusetta

State Agencies

Tuolumne River Restoration Center - DFG
CALTRANS
California Reclamation Board
California Department of Fish and Game
California Department of Conservation
State Water Resources Control Board-Delta Unit
California Department of Food & Agriculture
California Department of Parks & Recreation
California State Clearinghouse
California Department of Water Resources
Resources Agency–Water Policy and Science Advisor
CALFED Bay-Delta Program
ESRP–Endangered Species Recovery Program

Tribes

Me-Wuk Tribe
Ione Band of Miwok Indians
American Indian Council of Mariposa County
Table Mountain Rancheria
Picayune Rancheria
Tuolumne Rancheria

Santa Rosa Rancheria
Tuolumne Band of Me-Wuk
Native American Heritage Commission
American Indian Council of Mariposa County

City/County/Local Governments

City of Atwater
City of Modesto
San Joaquin County Board of Supervisors
Stanislaus County Board of Supervisors
City of Ripon Fire Department
El Solyo Water District
San Joaquin Valley-Southern Sierra Region
City of Patterson
Stanislaus County Parks
Stanislaus County Farm Bureau Board
Stanislaus County Fish and Wildlife Committee
City of Ripon
City of Oakdale
Turlock Mosquito Abatement District
Farm Bureau Stanislaus County
Farm Bureau Modesto
Sacramento/San Joaquin Estuary FRO
Turlock Irrigation District
Department of Planning and Community Development, Stanislaus County
Stanislaus County
Fire Chief, City of Patterson
City of Merced
Stanislaus Area Ass. of Governments
White Lake Mutual Water Dist.
Resources Agency, Water Policy and Science Advisor
West Stanislaus Irrigation District
City of Modesto, Community Development Dept.
Grasslands Water District
AICP-City of Modesto, Community Development Dept.
City of Tracy
City of Stockton
Resource Conservation District-West Stanislaus County
East Side Mosquito Abatement District-Modesto

Public Libraries

Modesto Public Library
Atwater Public Library
Tracy Public Library
Stockton Public Library
Stanislaus Public Library

Organizations

Defenders of Wildlife
Ducks Unlimited
National Audubon Society
National Wildlife Refuge Association
Sierra Club

The Conservation Fund
 The Nature Conservancy
 Wilderness Watch
 Wildlife Management Institute
 Sacramento/San Joaquin Estuary FRO
 California Striped Bass Association
 San Joaquin Audubon Society
 California Farm Bureau Federation
 Golden Gate Audubon Society
 Napa-Solano Audubon Society
 Central Sierra Audubon Society
 Morro Coast Audubon Society
 National Marine Fisheries Service
 All Pro Environmental Corporation
 CAFF
 Stanislaus Audubon Society
 Sacramento River Partners
 American Farmland Trust
 Trust for Public Land
 Stanislaus Stakeholders Group
 Tulare Audubon Society
 Yokuts Group of the Sierra Club
 EDAW
 Yosemite Audubon Society–Field Trip Chair
 American Farmland Trust
 Mt. Diablo Audubon Society
 Sacramento Audubon Society
 Ecology Action
 Community Resource Center, Modesto
 Friends of the Tuolumne
 Sutter Basin Corporation
 Jones & Stokes Associates, Inc.
 Stanislaus Connections
 Point Reyes Bird Observatory
 Stillwater Sciences
 Tuolumne River Preservation Trust
 Yolo Audubon Society-Field Trip Chair
 James J. Stevinson Corp.
 Old Fisherman’s Club
 David Evans & Associates, Inc.
 Rocky Mountain Elk Foundation
 Beveridge & Diamond
 Stanislaus Fly Fisherman
 Fresno Audubon Society
 Cal Trout
 Central Sierra Audubon Society
 Pacific Institution
 Friends of the River-Senior Policy Advocate
 William and Flora Hewlett Foundation
 Riparian Habitat Joint Venture/CA Audubon Society
 Dry Creek Homeowners Association
 Great Valley Center
 Wolfe & Associates

Office of Historic Preservation
National Wildlife Federation
Natural Heritage Institute
Great Valley Center
Native American Heritage Comm.
California Waterfowl Association
Marjal Corp.
California Native Plant Society
Sacramento River Partners
Natural Resources Defense Council
National Fish and Wildlife Foundation
Sierra Club-Tehipite Chapter
San Joaquin Wildlife Rescue Center
Trust for Public Land
Environmental Defense Fund

Colleges/Universities

Modesto Junior College
Stanislaus State University
California State University, Stanislaus

Local Landowners

Faith Ranch
G&H Farms
PMZ Ranch RE
The Orchard RV Park
Chicken Ranch Rancheria of Me-Wuk
Joseph Gallo Farm
El Solyo Dairy
Collier Farms Inc.
Maring Farms, Inc.

Newspapers

The Modesto Bee
Stockton Record

Others

Individuals who participated in open house session or focus group or who requested to be on the mailing list
National Wildlife Refuge, planning team members, other agencies

Note: This list includes individuals and organizations who were mailed the Draft and/or Final CCPs upon their release. Others were made aware of these documents' availability through notices, the World Wide Web, word of mouth, etc, and/or requested copies.

Appendix L: List of Preparers

CCP Core Team:

Tina Chouinard, Refuge Biologist–San Luis NWR Complex
Scott Fraser, Refuge Operations Specialist–San Luis NWR Complex
Miki Fujitsubo, Refuge Planner–FWS CNO Office
Leslie Lew, Refuge Planner–FWS CNO Office
Dennis Woolington, Supervisory Wildlife Biologist–San Luis NWR Complex

CCP Expanded Team:

John Beam, Biologist–California Department of Fish and Game
Mike Chouinard, Easement Program Manager–San Luis NWR Complex
Tina Chouinard, Refuge Biologist–San Luis NWR Complex
Scott Frazer, Refuge Operations Specialist–San Luis NWR Complex
Miki Fujitsubo, Refuge Planner–FWS CNO Office
John Fulton, Refuge Operations Specialist, Visitor Services–San Luis NWR Complex
Leslie Lew, Refuge Planner–FWS CNO Office
Mark Pelz, Refuge Planner–FWS CNO Office
Dennis Woolington, Supervisory Wildlife Biologist–San Luis NWR Complex
Gary Zahm–Independent Consultant

CCP Contributors:

Richard Albers, Assistant Refuge Manager–San Luis NWR Complex
Sharon Bakeman, Refuge Biologist–San Luis NWR Complex
Penny Beale, Secretary–FWS CNO Office
John Castellano, Land Planner–FWS CNO Office
Kim Forrest, Project Leader–San Luis NWR Complex
Kenneth Griggs, Refuge Biologist–San Luis NWR Complex
Eric Hopson, Assistant Refuge Manager–San Luis NWR Complex
Tim Keldsen, Refuge Biologist–San Luis NWR Complex
Yvette Laredo, Refuge Biologist–San Luis NWR Complex
Victor Lyon, Refuge Biologist–San Luis NWR Complex
Loretta McCorkle, Writer/Editor–FWS CNO Office
Jeff McLain, Biologist–FWS AFRP
Anthony Merrill, Park Ranger–San Luis NWR Complex
Shawn Milar, Refuge Biologist–San Luis NWR Complex
R.W. Parris, Deputy Project Leader–San Luis NWR Complex
Brian Paul, Prescribed Fire Specialist–San Luis NWR Complex
Rhonda Reed, AFRP Biologist–California Department of Fish and Game
Chris Schoneman, Assistant Refuge Manager–San Luis NWR Complex
Scott Spaulding, Biologist–FWS AFRP
Todd Williams, Refuge Biologist–San Luis NWR Complex

Note: During the CCP process numerous changes and transitions in personnel and team make up occurred.

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Appendix M: Wilderness Review

Introduction

The purpose of a wilderness review is to identify and recommend for Congressional designation National Wildlife Refuge System (System) lands and waters that merit inclusion in the National Wilderness Preservation System (NWPS). Wilderness reviews are a required element of comprehensive conservation plans (CCPs) and conducted in accordance with the refuge planning process outlined in 602 FW 1 and 3, including public involvement and the National Environmental Policy Act (NEPA) compliance.

There are three phases to the wilderness review: 1) inventory, 2) study; and 3) recommendation. Lands and waters that meet the minimum criteria for wilderness are identified in the inventory phase. These areas are called wilderness study areas (WSAs). WSAs are evaluated through the CCP process to determine their suitability for wilderness designation. In the study phase, a range of management alternatives are evaluated to determine if a WSA is suitable for wilderness designation or management under an alternate set of goals and objectives that do not involve wilderness designation. The recommendation phase consists of forwarding or reporting recommendations for wilderness designation from the Director through the Secretary and the President to Congress in a wilderness study report.

If the inventory does not identify any areas that meet the WSA criteria, we document our findings in the administrative record for the CCP, fulfilling the planning requirement for a wilderness review. We inventoried Service lands and waters within the San Joaquin River NWR and found no areas that meet the eligibility criteria for a WSA as defined by the Wilderness Act. This appendix summarizes the wilderness inventory for the San Joaquin River NWR.

Inventory Criteria

The wilderness inventory is a broad look at the planning area to identify WSAs. These are roadless areas that meet the minimum criteria for wilderness identified in Section 2(c) of the Wilderness Act.

“A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions, and which: (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological or other features of scientific, educational, scenic, or historical value.”

A WSA must be a roadless area or island, meet the size criteria, appear natural, and provide outstanding opportunities for solitude or primitive recreation. The process for identification of roadless areas and islands in the San Joaquin River NWR and application of the wilderness criteria are described in the following sections.

Identification of Roadless Areas and Roadless Islands

Identification of roadless areas and roadless islands required gathering and evaluating land status maps, land use and road inventory data, and aerial photographs for the San Joaquin River NWR. “Roadless” refers to the absence of improved roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use. Only lands currently owned by the Service in fee title were evaluated.

Evaluation of the Size Criteria

Roadless areas or roadless islands meet the size criteria if any one of the following standards apply:

- An area with over 5,000 contiguous acres. State and private lands are not included in making this acreage determination.
- A roadless island of any size. A roadless island is defined as an area surrounded by permanent waters or that is markedly distinguished from the surrounding lands by topographical or ecological features.
- An area of less than 5,000 contiguous Federal acres that is of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management.
- An area of less than 5,000 contiguous Federal acres that is contiguous with a designated wilderness, recommended wilderness, or area under wilderness review by another Federal wilderness managing agency such as the Forest Service, National Park Service, or Bureau of Land Management.

Evaluation of the Naturalness Criteria

In addition to being roadless, a WSA must meet the naturalness criteria. Section 2(c) defines wilderness as an area that “... generally appears to have been affected primarily by the forces of nature with the imprint of man’s work substantially unnoticeable.” The area must appear natural to the average visitor rather than “pristine.” The presence of historic landscape conditions is not required. An area may include some human impacts provided they are substantially unnoticeable in the unit as a whole. Significant human-caused hazards, such as the presence of unexploded ordnance from military activity, and the physical impacts of refuge management facilities and activities are also considered in evaluation of the naturalness criteria. An area may not be considered unnatural in appearance solely on the basis of the “sights and sounds” of human impacts and activities outside the boundary of the unit.

Evaluation of Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation

In addition to meeting the size and naturalness criteria, a WSA must provide outstanding opportunities for solitude or primitive recreation. The area does not have to possess outstanding opportunities for both solitude and primitive and unconfined recreation, and does not need to have outstanding opportunities on every acre. Further, an area does not have to be open to public use and access to qualify under this criteria; Congress has designated a number of wilderness areas in the Refuge System that are closed to public access to protect resource values.

Opportunities for solitude refer to the ability of a visitor to be alone and secluded from other visitors in the area. Primitive and unconfined recreation means non-motorized, dispersed outdoor recreation activities that are compatible and do not require developed facilities or mechanical transport. These primitive recreation activities may provide opportunities to experience challenge and risk; self reliance; and adventure.

These two “opportunity elements” are not well defined by the Wilderness Act but, in most cases, can be expected to occur together. However, an outstanding opportunity for solitude may be present in an area offering only limited primitive recreation potential. Conversely, an area may be so attractive for recreation use that experiencing solitude is not an option.

Evaluation of Supplemental Values

Supplemental values are defined by the Wilderness Act as “...ecological, geological, or other features of scientific, educational, scenic, or historic value.” These values are not required for wilderness but their presence should be documented.

Inventory Findings

As documented below, none of the parcels in the San Joaquin River NWR meet the criteria necessary for a WSA.

Roadless Areas and Roadless Islands

The San Joaquin River NWR is bisected by numerous roads including both paved county-maintained roads and gravel access roads. One exception is the Christman Island unit which is bound by the San Joaquin River on the east and a abandoned river meander on the west. However, the abandoned river meander which forms the western boundary of the Christman Island unit is not continuous so is not technically an island.

Size Criteria

San Joaquin River NWR contains no units which meet the size criteria for a wilderness study area. The Refuge is bisected by numerous paved county roads and gravel access roads into relatively small (averaging less than 100 acres) management units. The 720-acre Christman Island unit is the largest roadless unit on the Refuge.

Naturalness Criteria

The riparian habitat on the Christman Island and Gardner’s Cove units would appear natural to the average visitor. However, the rest of the units are either currently intensive managed wetlands or croplands or contain evidence of these past agricultural activities including roads, canals, water structures, levees, and other signs of development.

Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation

Both the Christman Island and Gardner’s cove units are adjacent the the heavily used State Highway 132. The units are also adjacent to parcels with active agricultural operations. Although the Refuge does provide opportunities for escape from the developed environment, the sites and sounds of vehicular traffic and agricultural operations are always present just beyond the unit boundaries.

Supplemental Values

The abundant wildlife and wetland and riparian habitats on San Joaquin River NWR provides significant scenic value to visitors of the Refuge. The Refuge’s expansive riparian corridors and managed wetlands also provides regionally significant ecological value for migratory birds and other wildlife.

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Appendix N—Estimate of Refuge Water Needs

9-10-01, rev. 9/18

Land use Areas

1. Wetlands

Permanent units require 10 acre feet (AF) per year

Semi-permanent units require 8 AF per year

Seasonal units require 6.5 AF per year

<i>East units</i>	<i>Size</i>	<i>Water Regime</i>	<i>Consumptive Use</i>
Upper Miller Lake	16 ac.	permanent	160 AF
Nelson Lake	56 ac.	semi-perm.	448
Goose Lake	80 ac.	seasonal	520
Page Lake	70 ac.	seasonal	455
Ringneck Slough	100ac.	seasonal	650
Colwell Roost	80 ac.	seasonal	520
Subtotal	402 ac.		2753 AF / year
<i>West Units</i>			
River Bend	95 ac.	seasonal	618
Creekside	5 ac.	seasonal	32
Lower White Lake	367 ac.	permanent	3670
Upper White Lake	182 ac.	semi-perm	1456
Subtotal	649 ac.		5776 AF /year
Total Wetland use			8,529 AF/ year

2. Irrigated pasture 467 ac. 3736 AF

- 8 AF per year gross application (as per NRCS pers. comm. Dan Johnson 9-11-01)

List of Irrigated Pastures

90 acre field	97 ac.
Beet field	48 ac.
Johnson field	102 ac.
South Johnson field	68 ac.
Lower 34	17 ac.
Maze Bottom	105 ac.
Quresma field	30 ac.

467 acres

3. Irrigated cropland 700 ac. 3325 AF

- 4.75 AF per year with double cropping corn and winter wheat
- Consider alternative use of alfalfa (alfalfa uses 41.85 inches of water (3.5 AF) per year; as per NRCS, Modesto Field Office)
- Riparian restoration planting varies each year of implementation. Assume 700 acre maximum irrigation at full development and water requirement assumed to be same as a mature orchard at 5.5 AF per acre. Total: 3,850 AF

List of Irrigated Crop Fields

Page field	65 ac.
Dairy field	205 ac.
Colwell new	150 ac.
Arambel hay	130 ac.
Hagemann food plot	150 ac.

700 acres

Grand total, all water requirements 19,440 AF/YR

4. Water Delivery “System”

Water sources for the Refuge are varied by field location. Some portions of the Refuge have combinations of the following water sources; wells, Modesto Irrigation District canal, riparian lift pump, and agricultural tail water. The reliability, cost and quality of water varies within a wide range of variation. The dry upland sites on the Refuge are in close proximity to wetland or irrigated fields. Therefore habitat quality and conditions are closely associated with the type of water available.

Generally the East units have water sources that were used by the previous landowner for agricultural operations. These sources are intertwined with the continuing operation of neighboring ranches. Distribution of Refuge water sources is accomplished as part of the Cooperative Land Management Agreement with the Mapes Ranch. A new ground water well was installed in 2000 in the Dairy field.

Water sources for the West units consist primarily of riparian diversions and tail water. Three lift pump stations have been abandoned due to concerns of fish screen installation, maintenance cost and flood damage. Selected lift pump stations will be retained for continued use. The Refuge is conducting a consultation with the National Marine Fisheries Service as required by section seven of the endangered species act on the potential impact of lift pumps on salmon and steelhead. Additional consultations are anticipated to consider potential impacts to other listed fish species (ie. Sacramento splittail). Well water quality and cost has prohibited sustained use to meet Refuge requirements from ground water sources.