

# Appendix A

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## Land Protection Plan

Proposed Expansion  
San Joaquin River National Wildlife Refuge  
San Joaquin, Stanislaus, and Merced Counties, California

United States Department of the Interior

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**U.S. Fish & Wildlife Service**

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# Land Protection Plan Proposed Expansion

**San Joaquin River National Wildlife Refuge  
San Joaquin, Stanislaus, and Merced Counties, California**

*Prepared by*  
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Date

Habitat connectivity is a characteristic feature of natural environments. Protection and restoration of connectivity is not an artificial change to the landscape: rather, it is the loss of connectivity and the isolation of natural environments that is an artificial change (Noss 1991).

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## **A. Land Protection Plan**

### **Chapter 1 – Introduction and Project Description**

#### **Introduction**

This draft Land Protection Plan (LPP) identifies the U.S. Fish and Wildlife Service's proposed acquisition boundary expansion for the San Joaquin River National Wildlife Refuge (Refuge). This proposed expansion presents a unique conservation opportunity to restore a major riparian corridor along the second largest river in California to benefit endangered species, migratory birds, and numerous other aquatic and terrestrial species. Recreational opportunities are expected to increase with this effort. The proposed expansion described in this LPP represents Alternative 3, the preferred alternative identified in the draft Environmental Assessment. This plan proposes to protect this important river corridor through fee title acquisition, conservation easements, and other voluntary methods (cooperative agreements, memorandums of understanding, etc). This plan is intended to guide the U.S. Fish and Wildlife Service's proposed land protection activities subject to the availability of funds and willing sellers.

The purposes of this LPP are to:

- Provide landowners and the public with an outline of Service policies, priorities, and protection methods for land in the project area,
- Inform landowners about the long-standing policy of acquiring land only from willing sellers (the Service will not buy any lands or easements if the owners are not interested in selling).

The draft Environmental Assessment (EA) evaluates the environmental effects of the No Action alternative compared to two different expansion alternatives. The Conceptual Management Plan (Appendix B), and the Refuge's 2006 Comprehensive Conservation Plan describe the Service's general management approaches for the proposed expansion area.

#### **Project Description**

The Service proposes to expand the acquisition boundary for San Joaquin River National Wildlife Refuge to protect and restore up to 22,156 acres of lands using fee title acquisition, easements, and/or conservation agreements with willing landowners. It is estimated that 95 percent of acquisitions would be in fee, and acquisition of important blocks of land could take several decades to acquire. Fee acquisition would allow the Service to restore riparian habitat of sufficient size to be functional as habitat for many sensitive, listed, and important species.

The proposed expansion includes two segments along the San Joaquin River. The northern portion of the proposed expansion area includes a reach of the San Joaquin River from the existing boundary of the San Joaquin River National Wildlife Refuge (NWR) or Refuge, north to Interstate 5 (I-5) in Lathrop. It also includes a narrow strip along Paradise Cut north of I-5 that supports one of the few known populations of the endangered riparian brush rabbit. The southern portion lies between the Refuge and the Grasslands Ecological Area.

The proposed expansion would connect the existing Refuge lands with the Sacramento-San Joaquin River Delta to the north and the Grasslands Ecological Area to the south. The Grasslands Ecological Area is a 160,000-acre mosaic of Central Valley floor habitats located in the historic floodplain of the San Joaquin River. This vast network of freshwater marshes, alkali

grassland, and riparian thickets is the result of decades of collaborative conservation involving private duck clubs, California State Parks, California Department of Fish and Game, Natural Resources Conservation Service, and the U.S. Fish and Wildlife Service (Service). Creating connectivity between these remaining natural areas and minimizing further fragmentation is crucial to the long-term viability of the endangered riparian brush rabbit, the endangered riparian woodrat, and the migratory birds of California's Central Valley.

## **Project Purpose**

The purposes of expanding the Refuge are to 1) protect and restore a diversity of rare and native habitats and their associated populations of fish, wildlife, invertebrate, and plant species of the San Joaquin River; 2) protect, restore, and develop a diversity of habitats for migratory birds such as neotropical songbirds, wading birds, and shorebirds; 3) protect and restore floodplain values and benefits associated with the San Joaquin River, including improved water quality, flood storage, and increased water recharge; 3) protect, restore, and develop habitats for and otherwise support recovery of federally and State listed endangered and threatened species and help prevent the listing of candidate species and species of management concern; and, 4) provide high-quality opportunities for wildlife-dependent recreation.

## **Purposes of the San Joaquin River National Wildlife Refuge**

### ***Introduction***

The San Joaquin River National Wildlife Refuge was established in 1987 to provide winter forage and roosting habitat for the threatened Aleutian cackling goose (formerly known as the Aleutian Canada goose), protect other species federally listed as threatened, improve and manage habitat for migratory birds, and conserve native fauna and flora. The Refuge lands encompass a mosaic of valley oak riparian forest, riverine and slough habitats, seasonal and permanent wetlands, vernal pools, natural uplands, and agricultural fields. The Service has restored over 2,220 acres of riparian habitat on the Refuge, and great potential for riparian and wetland restoration exists within the proposed expansion area.

The Refuge is the primary wintering site of Aleutian cackling geese, and protection/management of the area has been identified as a critical element in the Aleutian cackling goose recovery plan. In addition, the Refuge is a major wintering and migration area for lesser and greater sandhill cranes, cackling geese, and white-fronted geese. The riparian forest at the Refuge contains a large heron/egret rookery and provides important migration and breeding habitat for neotropical migratory land birds. Federally listed vernal pool invertebrate have been documented within the Refuge and valley elderberry longhorn beetles may be present (USFWS 1991).

The Refuge also supports one of the few know populations of the endangered riparian brush rabbit. The endangered riparian brush rabbit was nearly wiped out in 1997 when a severe flood threatened the largest existing population. There were two small known populations, though 95 percent of their natural habitat has been destroyed. A captive propagation and reintroduction program was initiated. To date, 1,100 captive bred riparian brush rabbits have been released at the San Joaquin River Refuge's West Unit, the San Joaquin River Refuge's East Unit (Buffington Tract), and the Faith Ranch, which has a Service easement. The Refuge now supports the largest and most robust population of riparian brush rabbits in the world, and they are beginning to populate newly restored riparian woodlands at the Refuge.

### ***San Joaquin River National Wildlife Refuge***

Each refuge in the National Wildlife Refuge System (Refuge System, NWRS) is managed to fulfill the mission of the Refuge System and the specific purposes for which the refuge was established. The following purposes identified for San Joaquin River Refuge are defined by language within a number of acts of Congress that grant the Service general authority to acquire land for national wildlife refuges.

"...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).

### ***Goals of the Refuge***

The Refuge has five broad goals that were developed while preparing the Comprehensive Conservation Plan in 2006 for the existing Refuge. They are broad, descriptive statements of the desired future conditions that help achieve Refuge purposes, as well as the mission and goals of the National Wildlife Refuge System.

**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.*

**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.*

**Goal 3 (Aleutian Cackling Goose)** *Provide optimum wintering habitat for Aleutian cackling geese to ensure the continued recovery from threatened and endangered species status.*

**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.*

**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 National Wildlife Refuge.*

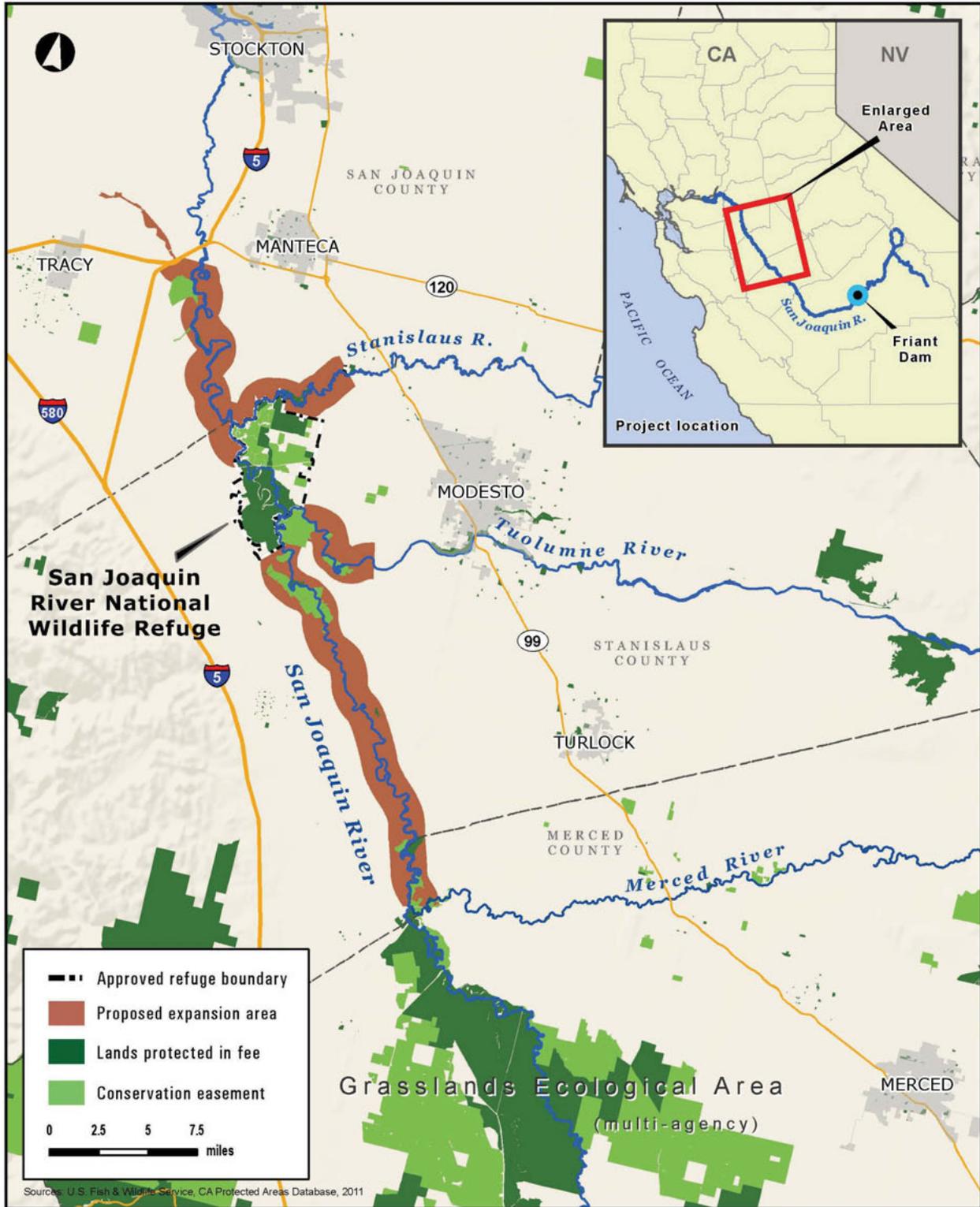


Figure 1. Location of San Joaquin River National Wildlife Refuge

## Chapter 2 – Project Area

The Refuge is nine miles west of the city of Modesto and straddles western Stanislaus and San Joaquin Counties, California. The 12,887 acres within the approved Refuge boundary are within the historic floodplain of the confluences of the Stanislaus and Tuolumne Rivers and are situated on the San Joaquin River (Figure 1). The Refuge boundary includes wetland, upland, and riparian cover types. The proposed expansion area that the Service is considering includes two sections.

The proposed northern expansion area is approximately 19 river miles (RM) (4.6 miles as the crow flies) downstream of the existing Refuge. This section of the river is almost entirely in San Joaquin County. From the confluence of the Stanislaus River (RM 75), downstream to the Interstate 5 (I-5; RM 60) overpass, the river is actively meandering, with recent and older oxbow cutoffs. Three sloughs are present: Tom Paine, Red Bridge, and Walthall, which could act as overflow channels but are currently disconnected from the river by project levees that were designed and built by the U.S. Army Corps of Engineers.

This northern portion of the proposed Refuge expansion area is experiencing urban growth, though the majority of this reach is bounded by agriculture, with narrow patches of riparian habitat along the banks. Along the right bank, project levees extend along the entire length; on the left bank, the levees are along the lower 16 miles (RM 54-70). Beyond I-5, the proposed northern expansion includes Paradise Cut, an overflow channel of the San Joaquin that flows to the Delta. There are 10-foot-high levees on the land side of both banks of this (likely) straightened channel. Flows into Paradise Cut are controlled by a weir that has a 15,000 cfs capacity. There is a band of riparian vegetation that supports a small population of endangered riparian brush rabbits along Paradise Cut.

The proposed southern expansion area lies between the Refuge and the Grasslands Ecological Area; it includes approximately 34 river miles (20.9 miles as the crow flies) to the south, in Stanislaus County, with a small portion into Merced County. This Alternative (Alternative 3) includes 12 river miles of the Stanislaus River, consisting of 2,521 acres, of which some parcels are adjacent to Caswell Memorial State Park (Caswell MSP). As with the proposed northern expansion area, agriculture is prevalent on both sides of the Stanislaus and San Joaquin Rivers.

From the confluence of the Tuolumne River at RM 83, to RM 94, the San Joaquin River is actively meandering with old and recent cutoffs. There is a mix of project levees and local levees, and between 22-31 percent of the banks are eroding, with some use of broken concrete as armoring. In this section, the river has abandoned a portion of its channel and occupies Laird Slough for 4.5 miles. In 1997, severe flooding of farmlands occurred on up to 400 acres which experienced levee breaches and sand splays (Jones and Stokes 2001).

From RM 99 to the Merced River (RM 118), this section is the least leveed section of the San Joaquin River. This section includes the City of Modesto's sewage treatment plant and Del Puerto and Orestimba Creeks, which contribute gravel to the river. There is a section (RM 112 to RM 118) with high floodplains and dry oak savannahs, with the lower floodplain and bars showing active riparian regeneration, and mature black willow and ash. The Merced River almost doubles the flow of the San Joaquin River at its confluence at RM 118 (Mussetter Engineering and Jones and Stokes 2000).

## Chapter 3 – Threats and Status of Resources

### Threats to the Resources

#### *Historic*

Historic impacts, such as gravel mining, construction of dams and diversions, and habitat clearing, dewatered the river and destroyed the surrounding wetlands that used to span a wide swath of the valley floor. Current threats, especially habitat destruction and insufficient water supply, continue to degrade the river and can derail efforts to bring it back to life. Today, the San Joaquin River is one of the most highly-altered systems in the State. For decades, the diversion of water from the San Joaquin has caused at least 20 miles of the river to be dry for much of the year, and nearly all of the riparian vegetation has been cleared. Today, less than five percent of historic riparian habitat exists, and wetland habitats have shrunk to roughly five percent of their former extent. Along the San Joaquin River, crop conversion from wildlife compatible crops such as small grains and pasture lands to vineyards, orchards, and dairies is occurring at a relatively rapid rate. This loss of habitat has had substantial effects on mammals, aquatic species, and migratory and resident bird populations.

#### *Urbanization*

Urban growth is occurring, and plans are approved along the San Joaquin River near the City of Lathrop. In 2007, the City of Lathrop was the fifth fastest growing city in the State of California. According to the City of Lathrop, 13,130 homes are either approved or pending approval, with another 6,000 homes under a development application, and all of this development is planned adjacent to and on both sides of the San Joaquin River, near the northern reaches of the proposed expansion area.

#### *Surface Water Quality*

The San Joaquin River has water quality issues, and several agencies are working to reduce the pollutant loads. Between 1992 and 1995, some 49 pesticides were detected in the San Joaquin River and three subbasins, 22 of which were detected in more than 20 percent of the samples. Available drinking water standards were not exceeded, but the concentrations of seven pesticides exceeded the criteria for the protection of aquatic life. Pesticides in the river have been correlated to agricultural application rates and times (Brown et al. 1999). Selenium, boron, and other trace elements are found naturally in the soils, and nitrates have been found in ground water in the area. Nitrates that are generated from the disposal of human and animal waste products or from the inefficient application of fertilizer and irrigation water have contaminated 200 square miles of groundwater in the region and threaten some domestic water supplies.

Within the proposed expansion area, between river miles 58 and 118, there are 74 diversion points and 83 discharge/inflow sites, according to a report published by the California Regional Water Control Board (CRWCB 1989). The report further states that a “majority of the river in many months of the year is made up entirely of agricultural return flows, both surface and subsurface.”

Agriculture will be the dominant source of the pesticides in the San Joaquin River Basin since the United States Environmental Protection Agency (USEPA) has banned the sale of all non-agricultural uses of diazinon and most non-agricultural uses of chlorpyrifos (EPA 2011).

There are four major routes through which pesticides reach the water: (1) it may drift outside of the intended area when it is sprayed, (2) it may percolate, or leach, through the soil, (3) it may be carried to the water as runoff, or (4) it may be spilled accidentally or through neglect. They may

also be carried to water by eroding soil. Factors that affect a pesticide's ability to contaminate water include its water solubility, the distance from an application site to a body of water, weather, soil type, presence of a growing crop, and the method used to apply the chemical.

**The proposed expansion area of San Joaquin River is listed as impaired on the Clean Water Act Section 303(d) list for the following pollutants; (EPA 2011b).**

Pollutant	Toxicity- Birds	Toxicity - Fish	Toxicity - Invertebrates	Toxicity - other
<b>Diazinon (a)</b>	High	Moderate to High	High – bees & aquatic Invertebrates	High- Amphibians
<b>Chlorpyrifos (b)</b>	High	High	High - bees & aquatic Invertebrates	
<b>DDT (c)</b>	Moderate, egg shell thinning	High	High – aquatic invertebrates	Moderate for adult frogs
<b>DDE (d)</b>	Moderate, egg shell thinning	High	High – aquatic invertebrates	Moderate for adult frogs
<b>Diuron (e)</b>	Moderate	Moderate to high	High– aquatic invertebrates	
<b>Toxaphene (f)</b>	High	High	High	
<b>Malathion (g)</b>	Moderate to high	Moderate	High - bees	Low for mammals
<b>Pyrethroids (h)</b>	Low	High	Moderate for bees and aquatic invertebrates	High for tadpoles
<b>Dieldrin (i)</b>	Moderate to high	High	High for aquatic invertebrates	
<b>Dimethoate (j)</b>	Very high	Moderate	High – bees & aquatic invertebrates	
<b>Azinphos-methyl (guthion) (k)</b>	Moderate	Very high	High - bees	High for mammals
<b>Trifluralin (l)</b>	Very low	Very high	High – aquatic invertebrates	Low for mammals
<b>Mercury (m)</b>	High, lowered reproduction	Low		High for methyl mercury in amphibians

Pollutant	Toxicity- Birds	Toxicity - Fish	Toxicity - Invertebrates	Toxicity - other
<b>Boron (n)</b>	High, lowered reproduction	High		
<b>Alpha-BHC (o)</b>	Moderate, egg shell thinning	High	High – bees & aquatic invertebrates	Effects the liver of mammals
<b>E. coli</b>				
<b>Sediment toxicity</b>	–	–	–	–
<b>Unknown toxicity</b>	–	–	–	–
<b>Water temperature</b>	–	Species dependent		–
<b>Electrical conductivity</b>				

Source: a – Eisler 1986, b- Odenkirken and Eisler 1988, c- National Pesticide Information Center (NPIC) 1999, d- NPIC 2000, e- Journal of Pesticide Reform 2003, f- EPA 1971, g- Gervais et al 2009, h- NPIC 1998, i- Jorgenson 2001, j- Pesticides News 2002, k- EXTOXNET 1996, l- EXTOXNET 1996, m- Wolfe et al 1998, n- Eisler 1990, o- EXTOXNET 1993

In addition to the above listed pollutants, the California State Water Control Board used a 1972 National Academy of Sciences document to group a select list of organochlorine pesticides and a level of concentration in the water and in fish residue to protect non-human fish consumers (EPA 1972). This grouping was named “Group A” pesticides, which include at least one of the following: aldrin, dieldrin, endrin, heptachlor, heptachlor epoxide, chlordane, endosulfan, and hexachlorocyclohexane (total including lindane). The San Joaquin River is listed as impaired in the 303(d) list for “Group A” pesticides as well.

The sources of these compounds are agricultural and urban runoff. Pesticides have been linked to declines in amphibian populations. For example, chlorpyrifos is the most widely used organophosphorus pesticide in California. Chlorpyrifos blocks acetylcholinesterase (AChE) at neural synapses, which leads to repeated firing of neurons. This can cause death through respiratory failure. In addition, chlorpyrifos can be degraded into chlorpyrifos oxon that is at least 100 times more toxic. Endosulfan is the second most commonly used pesticide in California. Endosulfan also impairs neurological function. The U.S. Geological Survey funded experiments have shown that endosulfan is the most toxic of the commonly used pesticides in California. Whereas all three forms of endosulfan are toxic, a mixture of alpha and beta endosulfan resulted in an LC50 of 0.3 µg/kg body weight in *Rana boylii* (foothill yellow-legged frog) and ca. 3 µg/kg body weight in *Pseudacris regilla* (Pacific chorus frog) and *Bufo boreas* (western toad). Approximately 86 percent of adult *P. regilla* collected from an area that had experienced declines had trace amounts of one or more of the endosulfans. Although endosulfan use is less than that of chlorpyrifos in California, its longer half life and high toxicity may make it more dangerous (USGS 2012). Endosulfan has been detected in the San Joaquin River, and according to the

Environmental Protection Agency, it will be phased out by 2016 in the United States (Ross et al 2000, EPA 2010).

The most obvious pollution prevention function of riparian areas kept in a naturally vegetated condition is that such land is not in and of itself a pollution generator. In other words, the more that riparian lands along a particular watercourse are maintained in a naturally vegetated state as opposed to being converted to other pollution-generating land uses, the less pollution will get into that waterway from the riparian lands themselves. As an increasingly larger share of pollution in our rivers and streams is attributable to nonpoint source pollution originating from development of riparian areas along rivers and streams, merely keeping the remaining undeveloped riparian areas in a naturally vegetated condition is a highly effective means of pollution prevention.

### ***Groundwater Quality***

As a result of declining groundwater levels, poor quality water has been moving east along a 16-mile front on the east side of the Delta (DWR 1967). As of 2003, groundwater accounted for 30 percent of overall water supply in the San Joaquin Basin (DWR 2003).

#### Salinity

The degradation was particularly evident in the Stockton area, where the saline front was moving eastward at a rate of 140 to 150 feet per year. Data from 1980 and 1996 indicate that the saline front continues to migrate eastward up to about one mile beyond its 1963 extent (USACE 2001).

#### Nitrates

Because the occurrence of nitrate is anthropogenic, most areas of higher concentrations are extremely localized and usually are attributed to localized position sources such as septic tanks, dairies, or feed lots (Bertoldi et al. 1991). Higher nitrate concentration, ranging from 5 to 30 mg/L, may adversely affect select crops. Large areas of elevated nitrate in groundwater exist within the subbasin located southeast of Lodi and south of Stockton and east of Manteca extending towards the San Joaquin–Stanislaus County line. Municipal use of groundwater as a drinking water supply is impaired due to elevated nitrate concentrations in the Tracy, Modesto-Turlock, Merced, and Madera areas (SWRCB 1991).

#### Boron

Agricultural use of groundwater is impaired due to elevated boron concentrations in western Stanislaus and Merced counties (SWRCB 1991) due to boron's excessive phytotoxicity. High boron concentrations occur in the groundwater in the northwestern part of the San Joaquin River Region from the northernmost edge of the region to the southernmost edge of the region (Bertoldi et al. 1991).

### ***Groundwater Overdraft***

California is the only western state in which groundwater use is almost completely unregulated, and the San Joaquin Valley is considered the location of the maximum subsidence within the United States. California well owners are not required to report pumping or consumption patterns. Increased pumping of groundwater contributes to increased stream flow capture, whereas a gradient leading away from the river causes water to flow from the river into the groundwater. Groundwater near the San Joaquin River is fairly shallow due to this gradient. Groundwater pumping reduces base flow, reduces groundwater outflows to the Delta, lowers the water table, and increases the likelihood of land subsidence (Hanson et al. 2012).

Although groundwater overdraft does not seem to be a problem in the proposed expansion area, it is a problem within the basin. Measurements over the past 40 years show a fairly continuous decline in groundwater levels in eastern San Joaquin County (USACE 2001). Groundwater levels have declined at an average rate of 1.7 feet per year and have dropped as much as 100 feet in some areas. It is estimated that groundwater overdraft during the past 40 years has reduced storage in the basin by as much as two million acre feet. Although a comprehensive assessment of overdraft in California's subbasins has not been completed since 1980, the California Water Plan Update reports that three of the subbasins in the San Joaquin River Hydrologic Region (Chowchilla, Eastern San Joaquin, and Madera) are in a critical condition of overdraft (DWR 2009).

### ***Climate Change***

The impacts of climate change will extend beyond the boundaries of any single refuge and will therefore require large-scale, landscape level solutions that extend throughout California and beyond.

Climate change has been acknowledged as already happening by the majority of prominent scientists in the field (Oreskes 2004). By the end of this century, air temperatures are projected to increase by 2.7 to 8.1 degrees Fahrenheit (°F) in the California region (Cloern et al. 2011). Precipitation in the form of snowfall is expected to decrease and rainfall increase, surface water temperatures are predicted to increase; and the sea level is rising, shifts in reproductive timing and distribution of plants and animals are occurring now and are expected to increase as the effects of climate change increase (Meyer et al. 1999, Barnett et al. 2005, Parmesan 2007, Palmer et al 2008, Rosenzweig et al. 2008). Native plants and animals will not be protected from the effects of climate change unless we make a concerted effort to physically link isolated reserves and to keep suitable migration corridors open (Field et al. 1999).

### **Surface Water**

It is expected that in the next 50-100 years, California will experience further declines in snow accumulation; and sea levels are expected to rise 2.29–6 feet above the present-day level. A one-foot rise in sea level resulting from climate change would transform the current high tide peak on the lower San Joaquin from an event that occurs every 100 years on average to one that occurs every 10 years, making the now rare event in the Delta a common one (Field et al. 1999).

Increased winter precipitation will fall mostly as rain rather than snow. Thus, less water will be stored in the snow pack while more water will runoff immediately, adding to winter flooding and landslide problems. In addition, the warmer atmosphere can hold more water vapor and result in more intense warm winter-time precipitation events that result in flooding. During anticipated high flow, reservoirs need to release water to maintain their structural integrity. California is at risk of water shortages, floods, and related ecosystem stresses. Changes in the water cycle will probably lead to water shortages during the late spring and summer, worsening drought conditions, irrigation needs, and water use conflicts. Crops that require large amounts of irrigated water, such as grapes, cotton, and alfalfa will be among the hardest hit (Field et al. 1999).

### **Temperature**

With an increase of 2.7 to 8.1 (°F) in air temperature expected by the end of this century, native terrestrial plant communities that require cooler temperatures and more moisture may move higher, move north, or seek northern exposures. Plant species that are not able to make the shift may exhibit vastly reduced ranges or eventually die off (Sykes 2009). More than half of the mammal species scientists previously projected could expand their ranges in the face of climate change will instead see their ranges contract because the animals won't be able to expand into new areas fast enough, according to some scientists (Schloss et al. 2012).

Most North American turtles and several other reptile species could exhibit vulnerability to climatic change because the temperature experienced as they develop inside the egg determines their sex. Such temperature-dependent sex determination makes these animals uniquely sensitive to temperature change, meaning that climatic change could potentially cause severely skewed sex ratios, which could result in dramatic range contractions (Root and Schneider 2002).

The San Joaquin River is already listed as impaired for water temperature, and climate change will continue to increase the temperatures of open waters. All native anadromous fishes were rated as highly or critically vulnerable to climate change. Such fishes are already stressed by other man-made changes to their streams (Katz et al. 2012).

### Phenology

Climate changes that affect the timing of plant or animal life history events such as leaf emergence, flowering, and egg hatching could also threaten biodiversity by disrupting vital interactions between species, from predation to pollination (Menzel et al. 2006, Schwartz et al. 2006, van Asch and Visser 2007). In California, 70 percent of 23 butterfly species advanced the date of first spring flights by an average 24 days over the period from 1972 to 2002 (Forister and Shapiro 2003). Climate warming during spring is the only factor that was able to explain this shift in the date of the butterfly's first flight.

There is some evidence, for example, that climate change could disrupt plant pollinator relationships and dispersal of seeds by animals in Mediterranean-climate ecosystems, such as the San Joaquin Valley. Pollination by bats, bees, beetles, birds, butterflies, and other animals is required for the successful reproduction of most flowering plants, including both wild and crop species. In California agriculture, pollinators are critical to production of many orchard, field, and forage crops, as well as the production of seed for many root or fiber crops. The continued availability of pollinators depends on the existence of a wide variety of habitat types needed for their feeding, successful breeding, and completion of their life cycles (Buchmann and Nabhan 1996).

### Weeds and Invertebrates

Although increased atmospheric concentrations of carbon dioxide, the most prevalent greenhouse gas, may stimulate plant growth, weed and pest populations are also predicted to increase (NRCS 2007). Crops grown under elevated carbon dioxide levels can have up to twice as many insects and higher levels of insect damage compared to control groups. Warmer temperatures will likely lead to the northern migration of invasive species and weeds (Dermody et al. 2008).

### ***Resources to be Protected***

California's diverse terrain and vegetative communities provide conditions for a high degree of wildlife diversity. The Refuge contains elements of the Central Valley's three major plant communities—riparian, wetland, and grassland—and has the potential to provide habitat for over 325 species of wildlife. These include invertebrates, birds, fish, mammals, reptiles, and amphibians. Federally listed animal species found within the San Joaquin River watershed include the endangered riparian brush rabbit, least Bell's vireo, and riparian woodrat; and the threatened delta smelt, Central Valley steelhead, giant garter snake, and Valley elderberry longhorn beetle.

Although currently degraded, the San Joaquin River basin once supported a highly diverse ecosystem. The valley floor was composed of a complex matrix of channels, swales, ridges, flood basins, and sloughs that were periodically inundated and supported a great diversity of permanent and seasonal wetlands, riparian scrub and forest, and aquatic habitat teeming with fish and

wildlife. These seasonal and permanent freshwater marsh and wetlands were, and continue to be, important habitat for migratory birds of the Pacific Flyway. Tens of millions of migratory waterfowl darkened the skies each winter. Nearly 50,000 acres of riparian forest rich with neotropical migratory birds and unique small mammal species flanked the streams and rivers in the basin. Historically, the San Joaquin River's Chinook salmon runs accounted for up to 40 percent (over 300,000) of the San Joaquin Valley's total Chinook salmon.

Despite past habitat lost and current and future threats, the Refuge contains important remnants of riparian habitat. Riparian habitats have been identified as the most important habitats to landbird species in California (Manley and Davidson 1993, Davidson 1995). Due to their biological wealth and severe degradation, riparian areas are the most critical habitat for conservation of neotropical migrants and resident birds in the West (Miller 1951, Gaines 1974, Manley and Davidson 1993, Rich 1998, Donovan et al. 2002).

The proposed expansion area supports diverse wildlife habitats, including declining native California savanna, oak woodlands, and wetland and riparian habitats along a network of rivers, sloughs, and creeks. These habitats support numerous federally listed threatened and endangered species on a year-round or seasonal basis, including the riparian brush rabbit, the riparian woodrat, giant garter snake, Central Valley steelhead, and Valley elderberry longhorn beetle, among others.

The endangered riparian brush rabbit and the endangered riparian woodrat are dependent upon riparian habitat along the lower San Joaquin and Stanislaus River corridors. The remaining riparian forests are small, isolated, and vulnerable to major flood events (Williams and Basey 1986); whether they can support viable populations of these subspecies over the long-term is questionable.

Protection and restoration of the proposed expansion area would contribute to the establishment of a riparian corridor for wildlife along California's second largest river. The residents of and visitors to the region would benefit from protection and management of these diverse wildlife habitats, abundant wildlife, and the scenic open space of San Joaquin, Stanislaus, and Merced Counties.

## **Chapter 4 – Project Implementation**

The selection and approval of a project boundary only allows the Service to acquire lands or interest in lands from willing sellers at fair market value or to enter into management agreements with interested landowners. An approved project boundary does not grant the Service jurisdiction or control over lands within the boundary, and it does not automatically make lands within the project boundary part of the Refuge System. Lands do not become part of the Refuge System unless they are acquired by the Service from willing sellers or are placed under a voluntary agreement that provides for management as part of the Refuge System.

No new or additional zoning laws would be imposed by the Service within an approved project boundary. Any landowner within an approved project boundary retains all existing rights, privileges, and responsibilities of private land ownership as determined by local, city, or county jurisdictions. Again, lands remain under the control of the owner until management rights or title to the property has been voluntarily transferred to or has been acquired by the Service.

The Service land protection policy is to acquire land only when other protective means are not appropriate, available, or effective. The Service strives to obtain the minimum interest necessary to reach management objectives once land is acquired or retained.

The Service is looking at the long-term protection of this area primarily through fee title acquisition. Approximately 95 percent of the lands proposed to be acquired are expected to be fee

title acquisitions. Acquisition of private land will be phased in over time as funds become available and willing participants come forward. The acquisition and habitat protection program is expected to take over 45 years to acquire 50 percent of the lands within the proposed expansion area. Initial acquisition efforts would focus primarily on protecting blocks of land having the highest biological values. The Service recognizes that some lands identified within the approved project boundary may never become part of the National Wildlife Refuge System.

### **Willing Seller Policy**

Service policy is to acquire lands or interest in lands only from willing participants under general authorities such as the Fish and Wildlife Act of 1956, the Endangered Species Act, the Migratory Bird Conservation Act, and the Refuge Recreation Act. Landowners within the project boundary who do not wish to sell their property or any other interest in their property are under no obligation to enter into negotiations or to sell to the Service.

In all cases, the Service is required by law to offer 100 percent of fair market value for lands to be purchased as determined by an approved appraisal that meets professional standards and Federal requirements.

Under the Uniform Relocation Assistance and Real Property Acquisition Policies Act, landowners who sell their property to the Service are eligible for certain benefits and payments, which include:

1. Reimbursement of reasonable moving and related expenses or certain substitute payments.
2. Replacement housing payments under certain conditions.
3. Relocation assistance services to help locate replacement housing, farm, or business.
4. Reimbursement of certain necessary and reasonable expenses incurred in selling real property to the Federal government.

### **Protection Methods**

A variety of habitat protection methods can be used to conserve the natural resources of the area within the boundary of the proposed San Joaquin River National Wildlife Refuge expansion. Service policy is to adopt habitat protection measures and strategies that involve acquiring the minimum possible interest or rights in lands and waters. The goal is to leave as large a proportion of these rights as possible in private ownership and still meet the defined resource objectives.

The Service first considered the likelihood of the land/habitat in question being protected under local government action (e.g., zoning, ordinances), designating specific geographic areas where particular uses are either permitted or prohibited, such as residential, business, or open space for parks. The Service also considered the likelihood of the land/habitat in question being protected under a Federal, State, or local permit, license, or other program. Since these protection methods are not available or not being used at the local and State level to protect these lands, the Service examined the degree of land acquisition that may be needed to protect habitat resources.

The acquisition options range from the acquisition of land by the Service in fee title, conservation easements, cooperative agreements, or memorandums of understanding. Since habitat protection and enhancement by means of local or State regulatory controls appears unlikely, the Service believes a majority of lands (95 percent) require fee title acquisition to meet the goal of restoring large portions of riparian habitat along the San Joaquin River. It is expected (based on past acquisitions) that it may take 45 years or more to acquire only 50 percent of the proposed expansion area. Expansion of the Refuge would provide a coordinated effort to protect native habitats and assist recovery of declining fish and wildlife populations of the San Joaquin Valley.

The Service Proposed Action is to expand the Refuge. Habitat protection methods that could be used by the Service to protect habitats within the proposed expansion of the San Joaquin River National Wildlife Refuge are described in the following text.

### **Fee Title Acquisition**

The Service acquires land by outright purchase (fee title) when (1) the land's fish and wildlife resources require permanent protection that is not otherwise available, (2) the land is needed for development associated with public use, (3) a pending land use could otherwise harm fish and wildlife resources, or (4) purchase is the most practical and economical way to assemble small tracts into a manageable unit. Fee title acquisition often transfers all property rights owned by the landowner, including mineral and water rights, to the Federal government. A fee title interest may be acquired by purchase, donation, exchange, or transfer. For restoration of large tracts of land, fee title is the best method of acquisition.

### **Conservation Easements**

The option to place conservation easements on private land is an important private property right that comes with land ownership in the United States. Private property owners have a number of private rights that go along with the ownership of property. With a conservation easement, the landowner sells some of those rights. In a conservation easement, the owner of the property, also known as the Grantor of the easement, retains all rights of ownership not specifically prohibited or limited by the easement. These include the rights to exclude public access and to sell the property. The easement holder, or Grantee, only has rights specifically included in the easement. The objectives and conditions of our conservation easements will recognize lands for their importance to wildlife habitat, and any other qualities that recommend them for wildlife conservation. Activities that are normally restricted under the terms of a conservation easement include:

- Destruction of native habitats,
- Subdividing for the purposes of development,
- Alteration of the area's natural topography (unless for restoration),
- Constructing, erecting, or placing structures or buildings.

In the acquisition of a conservation easement, the Service would acquire the minimum rights needed to preserve and protect habitat. The easement interests acquired would be considered components of the Refuge System and would be subject to those laws and regulations that are applicable to the easement interest acquired. We anticipate easements would total approximately five percent of the total land base of the 22,156-acre acquisition goal within the proposed expansion area. The Service would seek to acquire easements in areas where the acquisition would meet Refuge objectives and be acceptable to the landowner. The landowner would remain responsible for all property taxes.

## Summary of Planning and Land Acquisition Processes

The Director of the Service, in consultation with the Regional Director of the Pacific Southwest Region, would approve the designation of the project boundary upon completion of the planning and environmental coordination process. This process includes compliance with the National Environmental Policy Act (NEPA), the Endangered Species Act, and other Federal regulations and Executive orders. Based on NEPA and other compliance documents, the Regional Director, in consultation with the Regional Chief of the National Wildlife Refuge System, will decide whether to select an expanded project boundary or not. If the decision is to expand the Refuge project boundary, the Regional Director will determine if an expanded Refuge project boundary would have a significant impact upon the quality of the human environment and make a formal recommendation to the Director for approval. If the selected alternative is determined not to have a significant impact, a Finding of No Significant Impact will be issued. If the selected alternative is determined to have a significant impact, a Notice of Intent to prepare an Environmental Impact Statement (EIS) will be issued.

With the selection of an approved boundary and successful completion of the NEPA process, the selected project alternative can be implemented as described in this Land Protection Plan and Conceptual Management Plan.

The Service's planning process includes the following steps:

- Preliminary agency planning
- Public scoping
- Environmental Assessment and other planning documents released
- Public review period of planning documents
- Notice of Decision (whether to expand the Refuge or complete an EIS)

## Priority Areas

The Service would seek acquisition of fee title and, to a lesser degree, conservation easements, of all or part of the lands within the proposed Refuge expansion boundary. Prioritizing the lands within the proposed boundary is difficult, as land uses and conditions can change rapidly. For purposes of this plan, the highest priority for acquisition are existing riparian areas, grasslands, non-irrigated pastures, and habitat that may be occupied or used by native species. Second in priority are farmlands with annual row crops (e.g., small grains) and irrigated pastures. Third in priority would be lands with permanent crops (e.g., vineyards, orchards) and residential, commercial, and industrial development.

In selecting the priorities, satellite images were analyzed, noting likely natural features. In an effort to reduce the overall footprint of the proposed project, the planning team attempted to prioritize sites along the San Joaquin River, looking at existing habitat and eliminating properties that are already protected in some form, such as lands under a conservation easement, lands held under the Public Trust by the State of California, State parks, State wildlife areas, and State recreation areas. We also eliminated industrial areas and places with high occupancy (e.g., San Joaquin City) and lands with extensive agricultural facilities such as dairies and poultry farms. We then noted if sites were adjacent to existing native habitat to maximize our efforts to provide a functional riparian zone. Parcels adjacent to existing riparian habitat are considered more valuable than parcels far removed from native habitat. Connecting large blocks of riparian habitat to form a corridor for wildlife movement is the goal of this effort.

## Chapter 5 – Alternatives

### Alternatives Including Proposed Action

The Service considered three alternatives: the No Action alternative, and two action alternatives that would expand the Refuge boundary and allow the Service to acquire an interest in additional lands as part of the Refuge. Under the No Action alternative, the Refuge boundary would not be expanded, and the Service would not pursue acquiring additional interest in lands.

### Alternatives Development

The planning team considered the following elements when they developed the alternatives for this project: (1) verbal comments provided during informal public scoping between 2011 and the preparation of this document; (2) issues raised during meetings with various agencies, organizations, elected officials, and individuals during the informal scoping process; (3) goals of ongoing programs to benefit federally listed species, including the Recovery Plan for Upland Species of the San Joaquin Valley (USFWS 1998); (4) breeding riparian songbird goals and objectives of the Central Valley Joint Venture Implementation Plan (2006); (5) Refuge goals, and (6) the mission of the Service to conserve, protect, and where necessary recover the nation's fish, wildlife, and plant resources for the enjoyment of present and future generations.

### Alternatives Considered but Determined to be Impractical

The Service considered acquiring only parcels with existing native habitat along the river corridor. This alternative was eliminated because existing native habitat is only five percent of its original size, is fragmented and narrow in most places, and is not managed for wildlife. These characteristics do not allow for a fully functioning riparian habitat and are clearly not sufficient for the reestablishment of neotropical migratory birds, such as the least Bell's vireo, or riparian dependent mammals, such as the riparian brush rabbit and riparian woodrat; thus, this alternative does not fully support the goals established for the Refuge.

### Description of Alternatives

The three alternatives developed in detail are presented in this section. Each alternative was analyzed for its effectiveness in meeting the San Joaquin River National Wildlife Refuge purposes the missions of the Service and the Refuge System, and the needs of the public.

For each of the action alternatives, it is important to note that land acquisition is a slow process that is expected to take at least 45 years to acquire 50 percent of the proposed expansion area. Since acquisition is governed by the willingness of landowners to sell to the Service and availability of funds, management and public use may be limited until such time as a manageable unit of land is acquired. The uncertainty of land acquisition under the willing seller policy, coupled with the unpredictability of the future economic and social climate, prevents the impact analysis from being an exact science.

If an action alternative is selected, lands acquired by the Service would be administered in accordance with the National Wildlife Refuge System Administration Act, Refuge Recreation Act, Executive Order 12996 (Management and General Public Use of the National Wildlife Refuge System), National Wildlife Refuge System Improvement Act, and other relevant legislation, Executive orders, regulations, and policies. Management activities would include monitoring the status and recovery of endangered, threatened, and sensitive species; controlling non-native species; restoring native habitats; developing and providing wildlife-dependent recreational, interpretive, and educational opportunities; and coordinating with State and Federal agencies.

A Conceptual Management Plan (Appendix B) for the proposed expansion area of the San Joaquin River National Wildlife Refuge contains a general description of the proposed management program. The Refuge's Comprehensive Conservation Plan also describes management of the Refuge in more detail. Subject to annual appropriations by Congress, Refuge Revenue Sharing Act payments would be made to counties where lands are acquired in fee title. Public use would be authorized only when it is compatible with the mission of the National Wildlife Refuge System and Refuge purposes.

### **Alternative 1: No Action**

Under this alternative, the Service would not expand the boundary of the San Joaquin River National Wildlife Refuge. The Service would only pursue acquisition of the remaining 3,280 acres within the existing 13,914-acre boundary. Management of the Refuge would continue be guided by the Comprehensive Conservation Plan (USFWS 2006).

### **Alternative 2: Southern Expansion**

Under Alternative 2, the Service would expand the Refuge south to connect to the North Grasslands Wildlife Area, approximately 21 miles south along the river corridor (Figure 1). Under Alternative 2, the Service would work with willing participants to protect and eventually restore native riparian habitat on up to 14,306 acres to conserve wildlife and eventually restore native riparian habitats. Habitat protection measures would include fee title acquisition, conservation easement acquisition, and/or cooperative agreements.

This alternative would also connect the San Joaquin River National Wildlife Refuge to the project area of the San Joaquin River Restoration Program, which is a comprehensive long-term effort to restore flows to the San Joaquin River from Friant Dam to the confluence of Merced River and restore a self-sustaining Chinook salmon fishery in the river while reducing or avoiding adverse water supply impacts from restoration flows. The entire reach of the San Joaquin River encompassed by this proposed expansion alternative is designated critical habitat for the Central Valley steelhead.

This alternative would support the San Joaquin River Partnership's San Joaquin River Blueway, which was selected as a key project of the Secretary of Interior's America's Great Outdoors Initiative. The Partnership's mission is to restore a working river to the Valley to benefit its human and natural communities from the headwaters to the Delta.

### **Alternative 3: Northern and Southern Expansion (Preferred Alternative)**

In addition to the southern expansion described in Alternative 2, Alternative 3 would expand the Refuge boundary approximately 10 miles along the San Joaquin River corridor to the north. Under Alternative 3, the Service would work with willing participants to protect and eventually restore native riparian habitat on up to 22,156 acres within the northern and southern expansion areas. Habitat protection measures would include fee title acquisition, conservation easement acquisition, and/or cooperative agreements. The northern expansion area is considered to be part of the Sacramento/San Joaquin Delta, and includes a portion of the delta smelt critical habitat. This alternative includes a greater portion (over Alternative 2) of the San Joaquin River Partnership's San Joaquin River Blueway. The entire reach of the San Joaquin River encompassed by this proposed expansion alternative is designated critical habitat for the Central Valley steelhead.

## **Habitat Restoration**

Habitat restoration is a term that refers to return of former agricultural or other lands into native plant communities that provide habitat for endangered species, migratory birds, anadromous fish, and/or native plants. After the Service acquires lands with marginal value to wildlife, it is often necessary to pursue some type of restoration activity to help meet the goals of the Refuge.

The number of acres restored each year will vary and will be dependent on available funding and the rate and extent of acquisitions. The Refuge is currently spending about \$1 million per year in grant money on restoration. For Alternatives 2 and 3, it is expected that future grant funding will continue to average about \$1 million per year. At this funding rate, an average of 150 acres of acquired lands and one mile of levee will be restored per year.

A general goal of restoration is to reestablish an ecosystem's ability to maintain its function and organization without continued human intervention. Horticultural restoration requires knowledge of local site conditions in order for a planting to successfully establish. It is common for restoration projects to include a three-year maintenance regime, during which the plants are irrigated, weeds are controlled, and mortality is kept under a specified level by re-planting. Beyond this period of maintenance, species will only survive if they are well matched to the site conditions. Species of plants must be matched to soil types and hydrologic conditions under which they will grow and prosper. Consequently, the first step in developing a plan and a list of species for any riparian restoration project is a detailed site evaluation that describes soils and local hydrology (RHJV 2009).

## **Socioeconomic and Cultural Impacts**

The majority of the acquired land will be native riparian and grassland properties and land in agricultural production. Of those acres currently in production, the Service intends to target lands that are in wildlife-friendly crops such as grain, hay, and alfalfa. These crops have relatively low economic contributions compared to other high-value crops grown in the region, so targeting wildlife-friendly croplands will minimize impacts to the local agricultural sector.

Acquired agricultural lands would be converted from farmland to riparian and upland habitat, which could result in a loss of agricultural production income for farmers and the elimination of purchases of farming-related inputs. Payments to landowners for conservation easement and fee title purchases would substitute the loss of agricultural income. The degree of economic impacts associated with the conversion of croplands to Refuge lands will be a function of the specific lands that are acquired, the time at which they are acquired, farming technology, commodity markets, and the evolution of the regional economy, which are all highly uncertain over the 45-year (or longer) expansion horizon. Restoration activities on Service lands will support jobs and generate income and value added in the local economy through the purchase of materials and services from local businesses. Many of the same businesses and employees that could be adversely impacted by reduced agricultural activity will be positively impacted by restoration activities, thus limiting the overall impact on the agricultural sector.

The proposed expansion of the Refuge will have numerous public benefits. Restoration of wildlife habitat will increase conservation and ecosystem service values by enhancing and preserving wildlife habitat and providing flood mitigation services, and adjacent land owners may experience increased property values through their proximity to permanently protected lands. Newly acquired and restored riparian Refuge lands would provide additional water access points, trails, and wildlife viewing opportunities that will benefit local residents. These new and/or enhanced recreational opportunities are also anticipated to draw additional non-local visitors to the Refuge,

thus increasing economic activity associated with visitor spending in the local economy. Furthermore, the proposed expansion of the Refuge would create additional local economic activity through increased spending by the Refuge on operations and maintenance and increased salary spending by Refuge personnel.

The effects of the proposed San Joaquin River National Wildlife Refuge expansion are complex and speculative. There are many variables at play, and it is not possible to precisely predict the economic impacts of the proposed expansion. The conversion of private land to Refuge land will happen incrementally over a greater than 45-year horizon; thus, the changes described in this analysis will happen slowly, giving the local economy time to adjust. Over time, losses in local government revenues and agricultural production will be offset by gains from restoration activities and spending generated through Refuge visitation and operations. These changes are well within the normal evolution of an economy.

A full discussion of the possible fiscal effects is discussed in Appendix C, *Economic Impacts of the Proposed San Joaquin River National Wildlife Refuge Expansion*.

## Chapter 6 – Strategic Habitat Conservation

Strategic Habitat Conservation (SHC) is a means of applying adaptive management across large landscapes. SHC involves an ongoing cycle of biological planning, conservation design, conservation delivery, outcome-based monitoring, and assumption-based research. SHC uses science to focus conservation in the right places (USFWS 2008).

### Focal Species

The Riparian Bird Conservation Plan (RHJV 2004), a collaborative effort of the Riparian Habitat Joint Venture and California Partners in Flight, was developed to guide riparian conservation, and provides a vital link between science and habitat management (Golet 2001). The Riparian Bird Conservation Plan (RBCP) relies on the requirements of 17 species that were selected by ornithologists based on the criteria listed in this section. These species were also selected because they depend on differing successional stages and types of vegetation and/or critical ecosystem elements associated with riparian systems (Geupel and Elliott 2001, Golet 2001).

Based on the methods advanced by Chase and Geupel (2005), the Central Valley Joint Venture (CVJV) selected 7 of the 17 focal species found in the RBCP to develop its conservation objectives. The yellow-billed cuckoo was removed from the list in this document, as the CVJV does not have a population goal in the San Joaquin Basin for this species. The CVJV added the spotted towhee, as it meets the criteria listed in this section (CVJV 2006).

In the Central Valley Joint Venture Implementation Plan (2006), it is estimated that the San Joaquin Basin has 12,249 acres of existing riparian habitat and approximately 188,000 acres of restorable riparian habitat. The Service will be using CVJV focal species to guide several components of this conservation planning effort: (1) the selection and design of habitat reserves, (2) habitat restoration and management, and (3) population monitoring, both of population trends over time and effects of management actions.

Riparian songbirds are expected to benefit from habitat restoration. Focal species of riparian songbirds found in the CVJV Implementation Plan include song sparrow, yellow-breasted chat, black-headed grosbeak, common yellowthroat, yellow warbler, and the spotted towhee. One waterbird focal species in the CVJV Implementation Plan is the snowy egret, which has a habitat

goal in the San Joaquin Basin of 1,000 riparian acres. These focal species meet at least one of the following criteria:

- Use riparian habitat as a principal breeding habitat in most basins throughout the Central Valley.
- Warrant special management status or have experienced reduction in breeding range or populations in the Central Valley.
- Are useful for monitoring effects of management actions because they are:
  - Abundant in riparian habitats throughout the Central Valley or basin in order to provide adequate sample sizes for statistically valid analysis.
  - Amenable to monitoring (e.g., nests can be found and adults are tolerant of researcher disturbance).
  - Indicate quick strong and/or consistent responses to habitat management or restoration (CVJV 2006).

### **Population Objectives**

Current population estimates from a specific area can be derived by multiplying appropriate estimates (birds per hectare) by the area of current available habitat as mapped by the best available GIS layers. Population targets may be derived by multiplying the target density by the amount of area to be restored or enhanced, also based on GIS –based habitat layers. This process was used to derive population estimates for riparian focal species in the Central Valley Joint Venture's current implementation plan (CVJV 2006).

If bird densities in restored areas reach the targets established in the CVJV implementation plan, then the restoration of 10,000 riparian acres along the San Joaquin River, under optimum conditions, could support 7,800 spotted towhees, 1,300 yellow warblers, 2,000 common yellowthroats, 1,500 black-headed grosbeaks, 2,100 yellow-breasted chats, and 6,800 song sparrows.

Habitat objectives for riparian songbirds were based on several inputs; (1) existing and restorable riparian habitat; (2) population estimates and targets; (3) recommended values of nest success; (4) species distribution and richness; and (5) annual rates of riparian restoration.

Multiple species of neotropical migratory birds, including possibly the least Bell's vireo, would use the structurally diverse vegetation for breeding, migration stopover, and overwintering.

Vegetation cover and habitat structure are key elements in restoring riparian vegetation for the benefit of migratory birds. Avian diversity and density increases as the: (1) vertical layers of vegetation increase (ground, shrub, and canopy); (2) vegetation diversity increases; (3) the width of the riparian zone increases; (4) riparian areas are connected to each other; (5) riparian areas are connected to healthy upland habitat (MacArthur and MacArthur 1961, Whitmore 1975, Finch 1989, Croonquist and Brooks 1993). Shorebirds, waterfowl, and wading birds (among others) would benefit from increased native habitat restoration, too, as restoration will include wetlands and open water.

The riparian brush rabbit and riparian woodrat would also benefit from increased habitat, and once sufficient riparian habitat is restored, it is likely that another population of riparian rabbits will be established by the Service as a way to promote recovery. It is unknown if captive breeding of the riparian woodrat will occur.

Table 1. Current and potential population densities and population targets for breeding riparian songbirds in the San Joaquin Basin. (Central Valley Joint Venture Implementation Plan 2006):

Species	Current Birds/Acre (±SE) <sup>1</sup>	Current Population Size (±SE)	Target Birds/Acre <sup>2</sup>	Target Population Size for Alternative 3 <sup>4</sup>	Target Population Size for San Joaquin Valley
<b>Song sparrow</b>	2.867(±0.088)	5,757(± 438)	0.68	11,261	128,901
<b>Yellow-breasted chat</b>	0.00	0	0.21	3,477	40,425
<b>Black-headed grosbeak</b>	0.3667 (± 0.0282)	736 (± 140)	0.15	2,484	28,984
<b>Common yellowthroat</b>	0.2247 (±0.021)	451 (±100)	0.20	3,312	38,137
<b>Yellow warbler<sup>3</sup></b>	0.0538(±0.0163)	108 (± 81)	0.13	2,152	24,491
<b>Spotted towhee</b>	3.302 (± 0.0787)	6,629 (±390)	0.78	12,917	146,444

Table based on 12,249 existing riparian acres, and 188,394 restorable riparian acres in the San Joaquin Valley.

1 Current density estimates are derived from Point Reyes Bird Observatory point count survey.

2 Target densities were based on the 75th percentile value of all point counts in each valley, adjusted by a detectability coefficient.

3 Target densities for yellow warbler were based on spot-map densities from Clear Creek study plots, which are outside CVJV basins.

4 Target population based on restorable acres under Alternative 3.

## Limiting Factors

Riparian habitat loss may be the most important cause of population declines among songbird species in western North America (DeSante and George 1994). Riparian habitats have been identified as the most important habitats to landbird species in California (Manley and Davidson 1993, Davidson 1995). Due to their biological wealth and severe degradation, riparian areas are the most critical habitat for conservation of neotropical migrants and resident birds in the West (Miller 1951, Gaines 1974, Manley and Davidson 1993, Rich 1998, Donovan et al. 2002).

The loss of 95 percent of riparian habitat has taken its toll on the wildlife that existed along the San Joaquin River corridor. The endangered riparian brush rabbit and the endangered riparian woodrat are dependent upon riparian habitat along the lower San Joaquin and Stanislaus River corridors. The remaining riparian forests are small, isolated, and vulnerable to major flood events (Williams and Basey 1986); whether they can support viable populations of these subspecies over the long-term is questionable.

Given the biology and behavior of both the riparian brush rabbit and riparian woodrat, and the small amount and highly fragmented distribution of the remaining habitat, natural dispersal cannot be expected. Thomas (1990) suggested that to assure the medium- to long-term persistence of birds or mammals, the geometric mean of population size should be about 1,000 for species with normally varying numbers, and about 10,000 for species exhibiting a high variability in population size. With its maximum population size limited by the size of the available habitat, the riparian brush rabbit and riparian woodrat (no population data) are both at high risk of imminent extinction from several consequent threats related to population genetics and dynamics and environmental variability.

### **Riparian Brush Rabbit**

At the time of listing, the Service described one extant population of riparian brush rabbits on protected property within the 104-hectare (258-acre) Caswell MSP located on the northern bank of the Stanislaus River in San Joaquin County, California. In 1998, a second extant population of riparian brush rabbits was confirmed in small, degraded remnants of riparian habitat in the south part of California's Sacramento-San Joaquin River Delta (the South Delta) (Williams et al. 2000; Williams et al. 2002). Riparian brush rabbits were subsequently discovered in approximately nine other small South Delta riparian remnants, all near Stewart Tract and the town of Lathrop (Williams et al. 2002, Lloyd and Williams 2003, Hamilton et al. 2010).

Due to the urgent threats faced by the Caswell MSP population and the South Delta population, a reintroduction project was initiated (Williams et al. 2002). In November 2001, the Endangered Species Recovery Program (ESRP) at California State University, Stanislaus, began raising riparian brush rabbits in a controlled propagation facility. The ESRP was attempting to reintroduce riparian brush rabbits in suitable habitat located within their historical range, including habitat on the Refuge.

The Recovery Plan for Upland Species of the San Joaquin Valley (USFWS 1998) states that riparian brush rabbits need to have a minimum of four protected populations at carrying capacity to be eligible for further distribution. There are three known populations within the proposed expansion area: a small remnant population near Paradise Cut (Stewart Tract) in the Delta, the reintroduced rabbits at the Refuge, and a population at Caswell MSP. There are no other adequately-sized habitat patches to establish another protected population along the San Joaquin River at this time. Since the time of listing, reoccurring floods, fires, and other natural events have adversely affected both native and the translocated riparian brush rabbit populations. All riparian brush rabbit populations remain at risk of imminent extinction from these stochastic threats. Although there have been captive breeding successes with the riparian brush rabbit, no one has attempted to captively breed riparian woodrats.

### **Listed Fish**

Riparian loss affects aquatic species as well. The San Joaquin River is on the Environmental Protection Agency's 303(d) list for several factors, including temperature. Riparian restoration of the proposed expansion area will support the recovery of native fisheries by creating more potential shaded riverine aquatic habitat in the proposed expansion area, as well as increasing terrestrial inputs such as vegetation, woody debris, and insects to the aquatic environment. These inputs provide increased food, habitat diversity, and cover. Riparian restoration, in combination with the SJRRP efforts, should provide increased habitat and resiliency from stressors in the aquatic environment. Since the San Joaquin River is listed as impaired for temperature, riparian vegetation should help to reduce the temperature during the summer. Temperature changes

caused by the presence or absence of riparian vegetation have been shown to account for variability in trout populations (Barton et al. 1985, Wesche et al. 1987).

### **Conservation Delivery**

Habitat protection will occur through the purchase lands and, to some extent, conservation easements. It is the long-established policy of the Service to acquire minimum interest in land from willing sellers to achieve habitat acquisition goals. Since the established goals are riparian habitat restoration, fee title is the minimum interest required for most properties.

The acquisition authority for the project is the Fish and Wildlife Act of 1956 (16 U.S.C. 742 a-742j). The Federal money used to acquire conservation easements from the Land and Water Conservation Fund are derived primarily from oil and gas leases on the outer continental shelf, motorboat fuel tax revenues, and sale of surplus Federal property. There could be additional funds to acquire lands, waters, or interest therein for fish and wildlife conservation purposes through congressional appropriations, the Migratory Bird Conservation Fund, the North American Waterfowl Conservation Act funds, and donations from non-profit organizations. The basic considerations in acquiring an interest in private land are the biological significance of the area, existing and anticipated threats to wildlife resources, landowner interest in the project, and the size and location of the parcel. The purchase of an interest in land will occur with willing sellers only and will be subject to available funding.

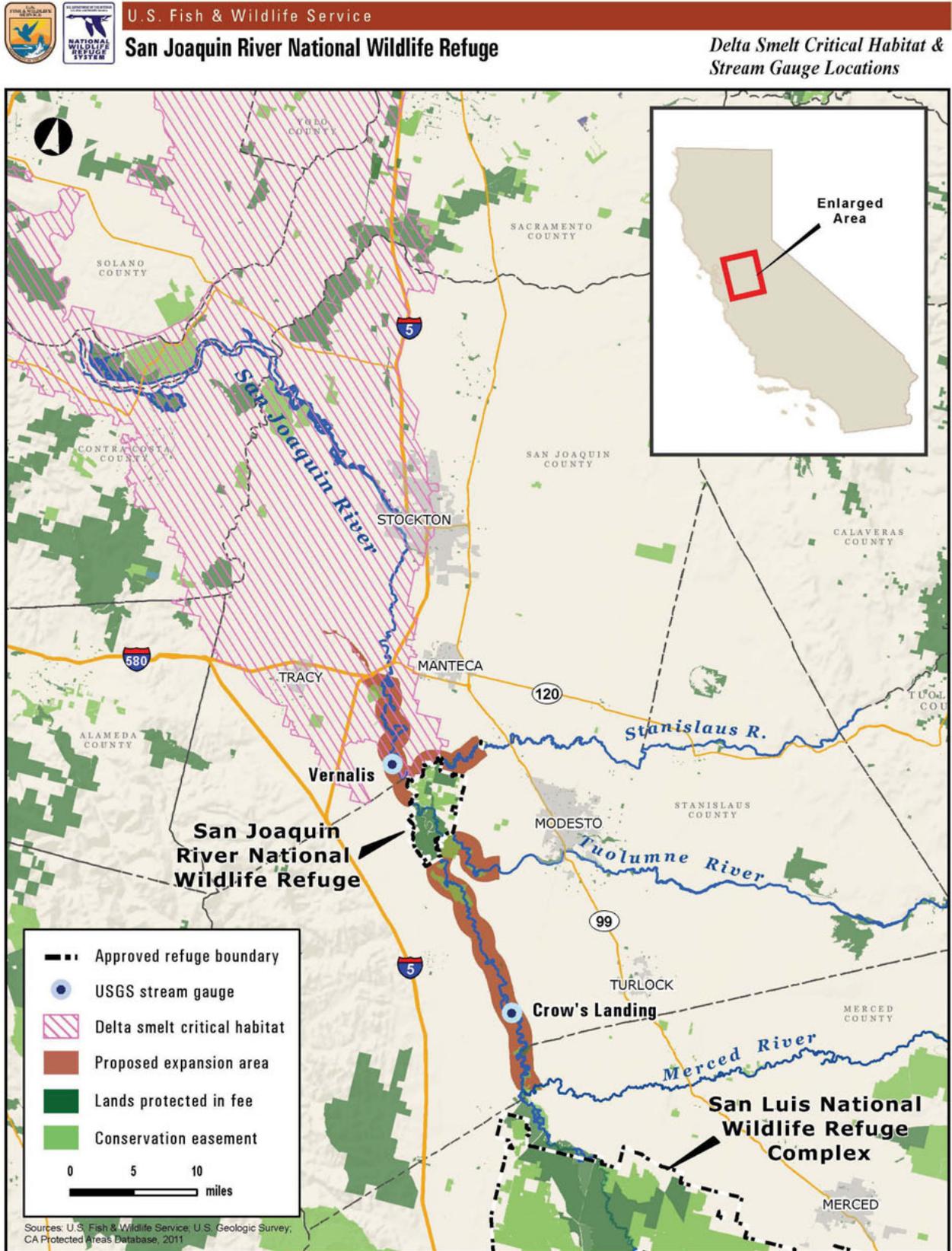


Figure 2. Critical Habitat Map for Delta Smelt

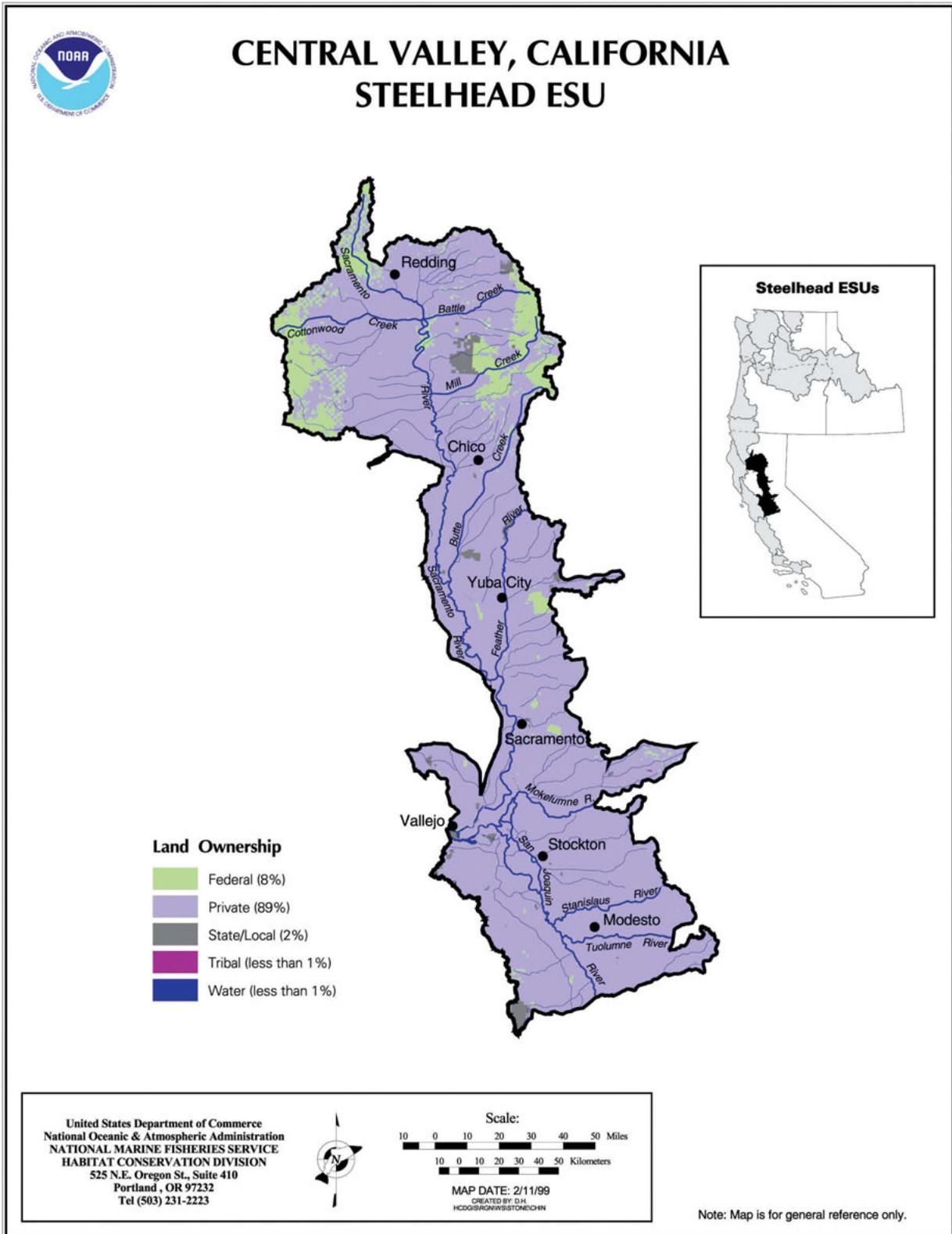


Figure 3. Central Valley, California Steelhead ESU Map

## Monitoring and Research

The Refuge conducts annual and periodic surveys as described in Appendix B (Conceptual Management Plan). In addition, Point Reyes Bird Observatory (PRBO) Conservation Science, in collaboration with The Nature Conservancy and Audubon California, has designed and implemented a new regional monitoring program for riparian breeding birds in the Central Valley.

### *Landscape Conservation Cooperatives*

Strategic habitat conservation is a means of applying adaptive management across large landscapes. Landscape conservation cooperatives will facilitate strategic landscape conservation.

The northern San Joaquin Valley lies within the Service's California landscape conservation cooperative (CALCC). The CALCC is undergoing a Strategic Planning process and recently completed a report on their first phase. Under Phase One, they interviewed a variety of interest groups to help us identify the common science needs across the landscape to maximize conservation benefits throughout California.

As the CALCC continues to develop, an overarching priority will be to serve as a convening body, bringing together partners to address existing and future issues related to climate change and landscape scale conservation. The Service will work with existing partnerships, and likely form new partnerships within the northern San Joaquin Valley, to further refine priorities and leverage resources for acquisition.

### *Summary of Proposed Action*

Under the Endangered Species Act, the Service is charged to protect and recover endangered and threatened plants and animals and the habitats upon which they depend. The Service is also the principal Federal agency charged with protecting and enhancing the populations and habitats of more than 800 species of migratory birds that spend all or part of their lives in the United States. The loss of 95 percent of riparian habitat has taken its toll on the wildlife that that existed along the San Joaquin River corridor.

The Service proposes to expand the approved boundary of the San Joaquin River National Wildlife Refuge.

The purposes of expanding the Refuge are to 1) protect and restore a diversity of rare and native habitats and their associated populations of fish, wildlife, invertebrate, and plant species of the San Joaquin River; 2) protect, restore, and develop a diversity of habitats for migratory birds, such as neotropical songbirds, wading birds, and shorebirds; 3) protect and restore floodplain values and benefits associated with the San Joaquin River, including improved water quality, flood storage, and increased water recharge; 3) protect, restore, and develop habitats for and otherwise support recovery of federally and State listed endangered and threatened species and help prevent the listing of candidate species and species of management concern; and 4) provide high-quality opportunities for wildlife-dependent recreation.

### *National Environmental Policy Act*

As a Federal agency, the Service must comply with provisions of the National Environmental Policy Act. An Environmental Assessment is required under the act to evaluate reasonable alternatives that will meet stated objectives and to assess the possible impacts to the human environment.

## Coordination and Consultation

### *Public Scoping and Involvement*

Issues, concerns, and opportunities were identified through early planning discussions and through the public scoping process, which began with mailings of the first planning update. Planning updates for the proposed project were sent to a mailing list of more than 550 individuals, groups, and agencies on May 16, 2011. This update summarized the proposal to protect additional habitat upstream and downstream of the San Joaquin River and described the steps in the environmental assessment process. Public meetings were held in Los Banos and in Modesto, California, on June 1 and 2, 2011, respectively. The purpose of these meetings was to gather the issues and concerns that the public had with the Refuge's proposed expansion and to solicit comments from the public, Tribes, other governmental agencies, and non-governmental organizations.

During the two scoping meetings, a presentation was given on the proposed project, and verbal comments were recorded on flipcharts. Additional comments were received via letters, emails, and comment cards. The scoping comment period ended July 15 and was extended until August 15 by request. Notices announcing this extended comment period were sent out to known interested parties and the media. The issues, concerns, and opportunities are a compilation of information received by the Service throughout the planning process. Public scoping and involvement helped direct and provided important elements in the development of the alternatives.

Public input received in response to these updates, workshops, and briefings is incorporated into this EA, and a summary of comments is included in Appendix D. The original comments are being maintained in planning files at the Service's Region 8 Refuge Planning Office in Sacramento, California, and are available for review upon request.

Throughout the scoping process, the Service has consulted with a number of Federal, State, and local elected officials and agencies and private organizations to solicit their views of the proposal. Parties contacted have included California Department of Water Resources; California Department of Fish and Game; San Joaquin, Stanislaus, and Merced Counties; and a number of private organizations. As a result of the public involvement, the Service selected the preferred alternative represented in this Land Protection Plan.

### *Distribution and Availability*

Copies of the Environmental Assessment, Land Protection Plan, and Conceptual Management Plan were sent to Federal and State legislative delegations, tribes, agencies, landowners, private groups, and other interested individuals.

Additional copies of the document are available from the following offices and websites.

U.S. Fish and Wildlife Service  
Region 8, Refuge Planning  
2800 Cottage Way, W-1916  
Sacramento, CA 95825

<http://www.fws.gov/cno/refuges/sanjoaquin/SJRNWR-expansion.cfm>

U.S. Fish and Wildlife Service  
San Luis NWR Complex  
P.O. Box 2176  
Los Banos, CA 93635

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