UNITED STATES DEPARTMENT of the INTERIOR

FISH AND WILDLIFE SERVICE

PLANNING AID REPORT

SAN JOAQUIN RIVER MAINSTEM RECONNAISSANCE STUDY

PREPARED FOR:

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

December 1992

INTRODUCTION

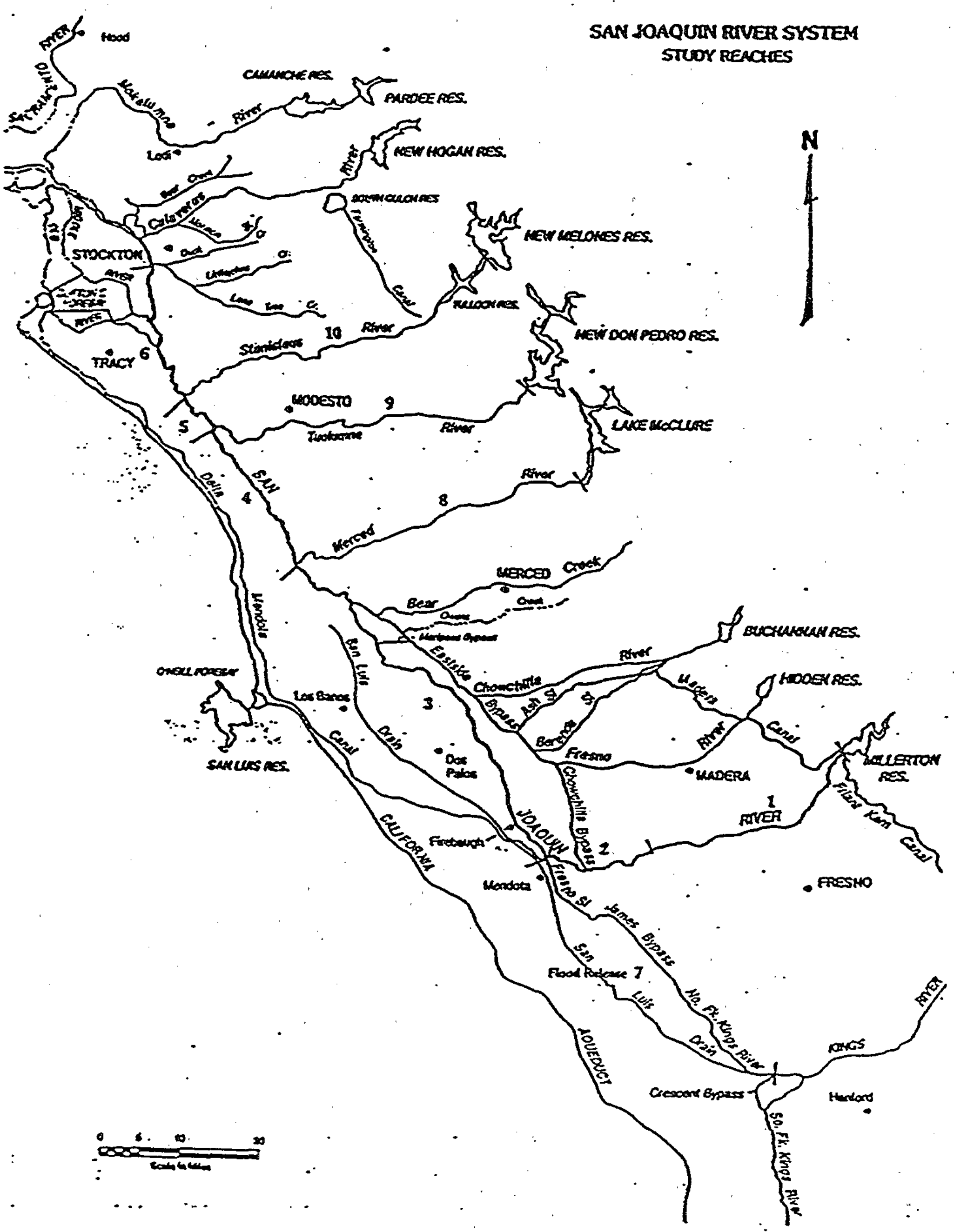
The San Joaquin River Basin covers a 14,000 square mile area in Central California (Figure 1). The San Joaquin River, traversing the eastern side of the basin, extends from glacial lakes in the Sierra Nevada to its mouth in the Sacramento-San Joaquin Delta. The principal tributaries to the San Joaquin River are the Stanislaus, Tuolumne, Fresno, Calaveras, Chowchilla, and Merced rivers.

Historically, the basin has been subject to floods occurring during late fall and winter months, primarily as a result of prolonged general rainstorms, and to floods occurring during the spring and early summer months from unseasonable and rapid melting of the winter snowpack in the Sierra Nevada.

The flood control system of the San Joaquin River and its tributaries is a complex system of levees, channel improvements, dams, and bypass channels. The Flood Control Act of 1944 authorized much of the basic structure of the existing flood control system for the basin including the Lower San Joaquin River and Tributaries Project. This project allowed for improvements by the Federal Government of the then existing channel and levee system along the San Joaquin River from the Sacramento-San Joaquin Delta upstream to the mouth of the Merced River and on several tributaries and distributaries. The project also provided for flood protection above the mouth of the Merced River by the State of California. The project is an integral part of the overall plan for flood protection and other purposes in the San Joaquin Basin. It is designed to supplement the upstream reservoirs by providing channel capacities along the San Joaquin River sufficient to safely pass regulated flows. Federal construction of the project was initiated in 1956 and totally completed in 1972. Construction features include about 100 miles of levees varying from 6 to 15 feet in height. Design flows vary from 45,000 cfs at the upstream end (100-year flood protection) to 52,000 cfs downstream of the Stanislaus River (60-year flood protection).

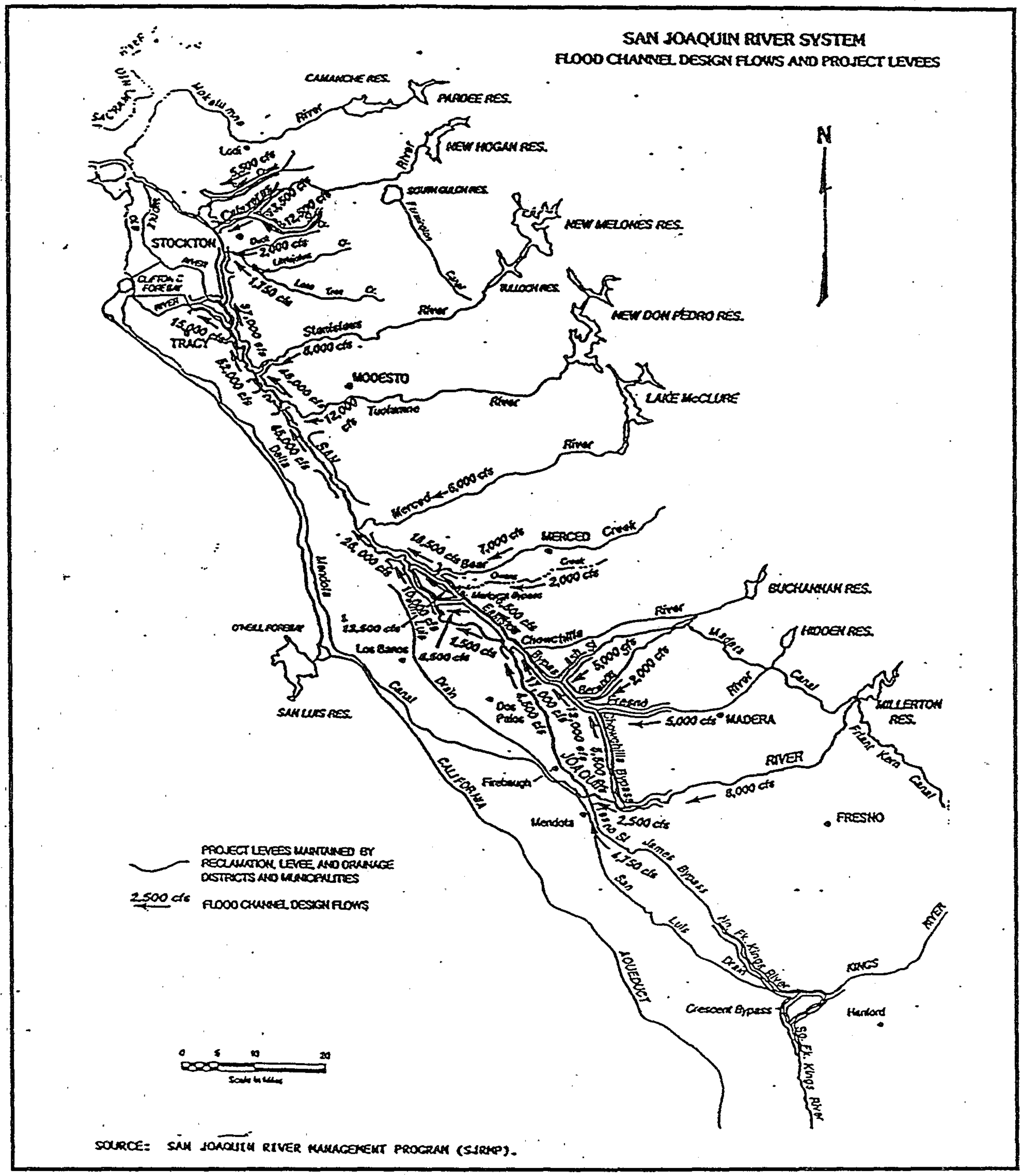
The authorized plan of improvement for the portion of the project developed by the local sponsor was for the State of California to acquire flowage easements in areas subject to flooding. In lieu of flowage easements, however, the State chose to construct a bypass system consisting of levee and channel improvements. These improvements were coordinated with the Federal Government to ensure the effectiveness of the Federal portion of the project. The Eastside and Chowchilla Bypass system includes two parallel channels which divert and carry floodflows from the San Joaquin River near Gravelly Ford along with inflows from other east side tributaries, downstream to just upriver of the Merced River. The system consists of about 193 miles of levees and several control structures. Construction of the system began in 1959 and was completed in 1966. Figure 2 shows the existing flood control project features and design flows.

Figure 1 - San Joaquin River Basin



SOURCE: SAN JOAQUIN RIVER MANAGEMENT PROGRAM (SJRMP). THE NUMBERS ON THE MAP REFER TO THE SPECIFIC STUDY REACHES IN THE SJRMP STUDY.

Figure 2 - San Joaquin River System Flood Control Features



C-104540

DESCRIPTION OF THE AREA

The San Joaquin Valley comprises the southern half of the Central Valley of California. Defined on the east and west by the crests of the Sierra Nevada and Coast Ranges, respectively, on the north by the Sacramento-San Joaquin Delta, and on the south by the crests of the San Emigdio and Tehachapi mountains, the watershed of the San Joaquin Valley is approximately 280 miles long, 115 miles wide, and encompasses approximately 20.5 million acres. The San Joaquin Valley floor is approximately 265 miles long, averages 47 miles wide, and encompasses approximately 8 million acres.

The San Joaquin Valley has an arid climate characterized by hot summers and cool winters. On the valley floor, summer temperatures often exceed 100° F and winter temperatures seldom fall below 32° F. Precipitation occurs from November through April, and amounts vary greatly among years and regions in the valley. Substantial amounts of snowfall occur in the higher elevations of the Sierra Nevada and snowmelt feeds higher-elevation and valley waterways. The rain-shadow effect on the east side of the Coast Ranges produces arid to semi-arid conditions in the southernmost and western portions of the valley. Annual precipitation in these areas of the valley ranges from only ≤5 inches in the south to approximately 14 inches in the north. A characteristic of the winter months in much of the San Joaquin Valley is the occurrence of dense ground fog that develops at night and often persists through the day.

The San Joaquin Basin occupies the northern portion of the San Joaquin Valley. The basin's floor is approximately 150 miles long, averages 45 miles wide, and encompasses approximately 4.3 million acres. This area includes major portions of San Joaquin, Stanislaus, Merced, Madera, and Fresno counties. In modern times, the San Joaquin Basin has been hydrologically distinct from the Tulare Basin (a narrow divide, formed by the merging of the alluvial fans of the Kings River to the east and Los Gatos Creek to the west, divides the two basins). During most years, there is virtually no inflow to the San Joaquin River from the Tulare Basin. Drainage from the San Joaquin Basin follows a series of natural or man-made waterways which eventually discharge into the San Joaquin River and/or the Sacramento-San Joaquin Delta.

The San Joaquin River drains an area extending from the Sacramento-San Joaquin Delta on the north to the alluvial fan of the Kings River on the south. All major natural tributaries to the San Joaquin River flow from headwaters in the Sierra Nevada, including the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, and Merced rivers. The Central Valley Project's (CVP) Delta-Mendota Canal delivers water pumped from the Sacramento-San Joaquin Delta south to Mendota Pool (a small reservoir on the San Joaquin River) for northern release through major irrigation canals which service agricultural lands on the west side of the San Joaquin Valley. The CVP's Madera Canal services east side agricultural lands with water stored and diverted from the San Joaquin River at Millerton Lake, the reservoir behind Friant Dam. Other tributaries from the south (Fresno Slough), east (e.g., Bear Creek and Mariposa Bypass), and west (e.g., Mud Slough [North], Salt Slough, and Los Banos Creek) also contribute varying amounts of water to the San Joaquin

River.

This reconnaissance investigation studies the flood control and other natural resource problems of the San Joaquin River. It is being carried out to identify problems, formulate and evaluate solutions, determine Federal interest in participating in solution implementation and recommend appropriate future action. The reconnaissance study is being conducted in coordination with the State's San Joaquin River Management Program (SJRMP). This program is a 5-year comprehensive, multi-agency program designed to identify the many natural resource problems and issues of the San Joaquin River. Components of this comprehensive program include evaluation of flood control, fish, and wildlife problems.

DESCRIPTION OF PROJECT

The area of this study is the San Joaquin River from Friant Dam downstream to the vicinity of Stockton, including the major tributaries (Stanislaus, Tuolumne, Fresno, Calaveras, Chowchilla, and Merced rivers) up to the first major dam. The area also includes the North Fork of Kings River from the southerly boundary of the James Reclamation District Number 1606 to Mendota Dam.

FLOOD CONTROL PROBLEMS/ALTERNATIVES

Flood control problems have been identified related to vegetation encroachment, sedimentation, levee structural stability, and operational inefficiencies.

Vegetation Encroachment

Completion of Friant Dam severely diminished flushing flows in the San Joaquin River channel below the dam. This allowed riparian vegetation to firmly establish in areas where high flows had previously scoured the channel. The additional vegetation is thought to have decreased channel capacity.

In 1968, 1969, and 1970 the Corps conducted channel clearing under authority of Section 208 of the 1954 Flood Control Act. The work was in response to requests from the Upper San Joaquin River Association and included clearing vegetated growth and snags from about 8-1/2 miles of channel at critical locations from near Highway 41 to Gravelly Ford. Required assurances, including maintenance responsibility for the cleared areas, were provided by the Upper San Joaquin River Flood Control Association. However, maintenance of these cleared areas did not occur. Commencing in 1984 the Corps again looked at clearing and snagging activity on the San Joaquin River (Lower San Joaquin River Clearing and Snagging Project). For a variety of reasons including high mitigation costs, minimal reduction in flood stage, and lack of a local cost sharer, the project was dropped.

It is anticipated that a clearing and/or snagging alternative will be developed for specific sites in the project area. A survey is being made of

C-104542

the flood control districts along the mainstem river to identify vegetation encroachment problems. The impact of vegetation clearing is direct loss of riparian vegetation and possibly Shaded Riverine Aquatic (SRA) Cover. No quantification of impacts can be made until specific sites and methods are determined. The work previously completed by the Fish and Wildlife Service (Service), California Department of Fish and Game, and Corps on the Clearing and Snagging Project provides some indication of potential mitigation needs for this type of alternative.

Sedimentation

Sediment has been identified as a significant contributor to the aggradation of the San Joaquin River and reduces its capacity to carry flood waters.

The Soil Conservation Service (1992) made an assessment of the average annual streambank erosion from natural streams and drains into the San Joaquin River. Streambank erosion did not appear to be a significant factor in the total erosion and sedimentation problem. The primary source of sediment reaching the San Joaquin River comes from eroded soil on furrow irrigated cropland. Much of this sediment comes from the West Stanislaus area. During the irrigation process, water must be available at the end of the furrow long enough to infiltrate the desired amount of water. To achieve this on sloping furrows, which predominate in this area, some runoff is usually necessary. Thus, on many fields, water is applied at rates that exceed the infiltration rate of the soil, which generates excessive runoff. The large amounts of excess water running off the ends of the furrows into tailwater ditches can be seen carrying soil particles that have been eroded from the furrows. More soil may be eroded as the water moves through the tailwater ditch. By the time the water has reached the drainage ditch, it is often sediment laden and a chocolate brown in color.

In the process of investigations for the Lower San Joaquin River Clearing and Snagging Project, a serious flood problem was discovered in the Eastside Bypass at its confluence with the San Joaquin River. The design capacity had decreased from 16,500 cubic feet per second (cfs) to between 6,000 and 7,000 cfs. Two primary causes for the capacity reduction were identified: buildup of sand beginning at the confluence and extending for 2 miles (approximately 1 million cubic yards) and bypass levee subsidence. Removal of the sand by the Corps restored approximately 30 percent of the design capacity and reduced backwater effects which will lower the water surface upstream along San Joaquin River. The work was accomplished between November 1984 and February 1985 at a cost of about $2.3 million. The Lower San Joaquin River Levee District initiated construction to raise the west levee in February 1985.

It is expected that a sediment removal alternative will be developed. The idea proposed by the flood protection subcommittee of the SJRMP is to establish sediment catch basins within the river channel with a commercial operator removing the sediment for sale to finance the project. No specific details have been developed although ten sites have been tentatively identified on the San Joaquin River between River Miles 55 (Mossdale) and 216 (Gravelly Ford).

A second alternative to be examined to solve the loss of channel capacity problem is construction of in-channel gradient control structures or turn-outs that will allow the diversion of peak flood flows through the existing levees onto State and Federally owned wetlands adjacent to the San Joaquin River. These lands historically received San Joaquin River floodwaters on an annual basis. Details on the quantity of water potentially diverted, seasonal timing of diversion, duration of retention, and design of the structure are not yet available. In a related effort, the Grasslands Resource Conservation District has been trying to secure a water right from the State of California to divert up to 50,000 acre-feet of flood waters, when available, from Mendota Pool through existing delivery canals. This alternative would not solve any ongoing sedimentation process, but would increase the flood carrying capacity of the system.

Additional alternatives to solve sedimentation problems should also be examined, in particular, on-farm solutions. There are a wide range of practices with varying degrees of effectiveness available. A discussion of various practices is included in the Soil Conservation Service's West Stanislaus Sediment Reduction Plan, Stanislaus County, California, dated February 1992. The wildlife subcommittee of the SJRMP has recommended one of the solutions (on-farm siltation basins) as a possible means of providing seasonal wetland wildlife habitat. Migratory waterfowl and shorebirds, including some endangered species, could be benefitted with proper planning.

The adverse impacts to fish and wildlife of on-farm practices to reduce sedimentation would likely be relatively small, since the lands required for the on-farm alternatives are generally relatively low-valued agricultural lands that would be converted to higher-valued seasonal or permanent wetlands.

Levee Structural Stability

Possible structural stability problems include erosion, seepage, boils, and sloughing. Information is being gathered to verify the extent of these problems. Construction alternatives to solve the problems could include levee crown raising, toe drains, levee berms, impermeable walls within the levees and constructing new off-set levees.

The proposed raising of levees, with or without construction of a stabilizing berm, would adversely affect grasses and other herbaceous and woody vegetation growing on the existing levee slope and beyond the toe of the berm out approximately 50 feet. Depending on the location of the work (landside, waterside, or straddle), the impacts would differ greatly.

Waterside construction would adversely affect SRA Cover, associated riparian vegetation, and grasses along the levee slope. Any adverse effects on SRA Cover and riparian habitat could adversely impact anadromous fish (adults and smolts) and resident fish species. Loss of these habitat types would reduce

C-104544

cover and food for fish, and nutrient input to the aquatic system. Any further adverse effects on anadromous fish would be significant, because San Joaquin River system populations are already severely depressed.

The loss of riparian vegetation along the river could adversely affect many wildlife species. The riparian forest, with its multi-layered vegetation and high plant species density, supports the largest populations and most diverse wildlife along watercourses. The high diversity of tree growth, cover conditions and vegetation layers, and close proximity to water provide a wide variety of easily accessible habitats and niches. Any loss of plant diversity could adversely affect those species inhabiting the area.

The impact on grassland habitat on the levee slopes would be minimal and temporary. Disturbance or loss of this habitat would adversely impact some small mammals, raptors, game birds and other species. However, grasses should recover to pre-project conditions and be repopulated by similar wildlife species within 2 to 3 years after project construction.

Landside construction would impact grasses on the levee slopes, trees and shrubs growing on and along the levee toe, and wetland habitats along existing toe drains and seepage areas. Also, construction activity during raptor nesting periods could lead to the failure of nesting success.

Overall, however, the impacts on fish, wildlife, and vegetation would be significantly reduced with landside versus waterside construction. Landside modifications would primarily eliminate or reduce any adverse project effects on riparian vegetation and SRA Cover.

Impacts from straddle construction (placing material on both sides of the levee to raise it's height) could limit most of the habitat losses to the grassy levee slopes. However, any riparian vegetation found immediately adjacent to either levee toe would generally be lost. Depending on the locations of any existing toe drains, impacts could be reduced or eliminated to wetland habitats. Impacts to SRA Cover could still occur; however, they could be much less severe than with the construction alternatives involving waterside modifications.

Any losses of SRA Cover could have significant adverse impacts on anadromous fish, raptors, songbirds, aquatic furbearing mammals and other species that use these areas to meet part or all of their life needs. Cover and food sources for anadromous and resident fish could be diminished, nesting habitat for raptors could be eliminated or greatly reduced. Construction activity during raptor nesting periods can also result in reduced nesting success. Cover and nesting habitat for songbirds could be lost, and cover, food, and a portion of the migration corridor for small mammals could be eliminated.

If a landside berm is constructed in concert with straddle construction, the impacts would be similar to landside construction.

A significant amount of borrow material would be required to raise and reinforce the levees. The impacts of borrow acquisition on vegetation and wildlife could be adverse. However, the magnitude of such impacts would vary with site location and amount of borrow material required.

The impacts of constructing toe drains would vary, depending on their location and whether they were covered. An open toe drain would provide a protected area for wildlife (depending on how it is maintained), especially in areas presently farmed. If water is allowed to drain naturally into a drainage ditch at the levee toe, and the water flow is directed to a nearby pond, wildlife values could be enhanced. The drainage ditch and bordering vegetation, if allowed to grow, could provide excellent cover for wildlife nesting and feeding. This type of drainage arrangement is preferred over culverting the seepage water and transporting it underground. A covered toe drain would have no wildlife value.

Construction of levee berms would have similar impacts to those described for levee raising. Landside construction of a berm, coupled with revegetation would provide escape cover for wildlife when high water events occur in the floodway.

Construction of impermeable (cut-off) walls within the crown of the levee should have only minimal adverse effects on vegetation and wildlife of the area. Since construction would occur on top of the levee, little or no disturbance of wildlife habitat (aquatic habitat, riparian vegetation, toe drain, seeps) would occur. However, construction activity could adversely affect raptor nesting success if it is conducted during the nesting periods. Construction of cut-off walls at the toe of the levee (landside or waterside) would have impacts similar to those described for toe drains. Waterside construction could also adversely impact SRA Cover.

Construction of off-set levees, sited to avoid existing riparian and seasonal wetlands, could have minimal impacts on fish and wildlife resources. Presumably, new levees would be placed on agricultural lands where impacts would vary depending on the cropping practices (orchard, row crops, pasture, etc.) and trends. Off-set levees in some cases could actually improve values for fish and wildlife with proper planning.

Operational Inefficiencies

Current operating procedures for the various dams in the San Joaquin Valley involve coordination between the various agencies responsible for flood control; however, an overall flood control systems operation should be developed to optimize the use of water resources in the basin as well as provide optimal levels of flood protection.

The Corps has recently evaluated the potential of modifying the emergency flood control release schedule for Friant Dam and has determined that modifications could improve the operational efficiency of the flood control system. Procedures for implementation of the changes to the flood control diagram at Millerton Lake are proceeding. Other reservoir facilities in the

San Joaquin Valley with gated outlets may provide the same opportunity. The flood control benefit to be achieved is absorption of brief peak reservoir inflows in a reservoir's designated flood space to avoid brief peaks in downstream releases. Under the newly proposed emergency spillway release diagram for Friant Dam, the peak flow in the San Joaquin River downstream of Friant Dam would be 23,400 cfs, compared to 27,400 cfs under the existing release diagram. The 4,000 cfs reduction in flow is the equivalent to a change of about 6 inches in the stage height of the river, based on informal information provided by the Federal Emergency Management Agency.

Any alternative proposing to change the emergency flood release diagram of reservoirs could have both direct and indirect impacts on fish and wildlife. The Service provided a discussion of these possible impacts in a draft planning aid letter to the Corps dated June 11, 1992 concerning the Friant Dam/Millerton Lake Flood Control Operation Investigation. The discussion related to direct and indirect impacts from that letter is excerpted in the following seven paragraphs. (This discussion is generally applicable to all reservoirs in the basin where release changes could be proposed.)

"At this time, we do not have sufficient information to make any quantitative predictions about the direct impacts of the proposed project; our discussion here is thus limited to a brief, qualitative analysis of the range of possible impacts. Direct impacts would result from changes in the flow regime of the San Joaquin River and changes in the elevation of the surface of Millerton Lake relative to no action. These changes could affect both aquatic and terrestrial habitats. Fish and wildlife species, in turn, would be impacted by changes in the abundance and availability of their habitats.

"Impacts to the blue oak/digger pine woodland, blue oak woodland, and grassland habitats around Millerton Lake would likely be of low magnitude. As the proposed changes would apparently not affect either the minimum or maximum elevation of the lake, only the uppermost drawdown area would be affected. However, impacts to the riparian forest downstream of the dam could be more extensive. Since the proposed change is designed to reduce peak flood flows, the extent and duration of inundation of riparian habitats could be altered. This could in turn affect the species composition and areal extent of riparian forest.

"Further dewatering of the San Joaquin River would have adverse effects on riparian habitat. If peak flows are sufficiently reduced, some areas that are inundated would no longer be flooded during similar-sized rainfall and flooding events; other areas could be flooded for shorter periods. The transition from cottonwood-willow to sycamore-oak-cottonwood-willow, and then to oak woodland, may occur nearer the river channel; the end result may be a narrowed riparian corridor. Cottonwoods, in particular, could be affected. These trees typically regenerate on the silt deposited downstream by large, scouring flows upstream; the proposed change may reduce this type of flow. These changes could affect both the area of riparian forest and the structural diversity of the forest; such changes would decrease the habitat value for wildlife.

"Impacts to riparian forest could also affect aquatic habitats. In particular, shaded riverine aquatic habitat along flowing streams provides valuable spawning and rearing cover for warmwater fishes; also, shade moderates water temperatures. Changes in the flow regime could affect shaded aquatic habitat by leading to a change in species composition of the forest immediately adjacent to the stream. Shade may be reduced during the transition from one community type to another; however, the extent of shade following the transition is difficult to predict.

"Changes in flow regimes could also affect stream habitat. Construction of Friant Dam greatly reduced channel scouring flows in the San Joaquin River; if peak flows are further reduced, channel encroachment may increase at the expense of the existing stream. Also, a reduction in peak stream flow, and thus floodplain inundation, could affect offstream marshes and ponds, and other seasonally flooded wetlands, to the extent that they are recharged by surface water.

"We are concerned about the possibility that changes in the Friant Dam and other dams emergency spillway release diagrams may lead to changes in the floodplain below the dam. A reduction in the stage height of, for example, a 100-year flood event may facilitate increased development in the floodplain; this may reduce the area of existing wildlife habitats. While such development is not a component of the project under consideration, we believe that increased development in the floodplain is a reasonably foreseeable result of the change in flood control operations at Friant Dam and Millerton Lake. The Corps should examine the likelihood of such development and its related impacts in the environmental documentation of the project.

"Impacts of the habitat alterations associated with increased development in the floodplain (which could be increased agriculture, or municipal and industrial development) are likely to be more severe than the direct impacts of the change in the emergency flood release diagram. The direct impacts would be largely limited to a very slow transition, if any, from one habitat type to another; while the overall habitat value of the project area may decrease, most habitats would retain some value. However, the development of existing fish and wildlife habitat, either into agricultural land or for municipal and industrial purposes, would greatly reduce any existing habitat values."

ENVIRONMENTAL RESTORATION ALTERNATIVES

Five environmental restoration alternatives are currently being proposed for this project. The alternatives, unranked in priority, are presented below.

<u>Wetland and Riparian Habitat Restoration, California Department of Fish and Game North Grasslands Wildlife Area, China Island Unit</u>

This unit is about 3,300 acres of former San Joaquin River floodplain southwest of the river upstream of its confluence with the Merced River (Figure 3). Historically, most of these lands flooded annually prior to completion of upstream dams. Flooding of these areas now only occurs in very wet years, such as 1983. The land no longer displays wetland characteristics, including hydrophytic soils and vegetation, and now visually resembles valley grassland. Mud Slough North and two river overflow channels traverse the property.

Riparian vegetation is non-existent or severely degraded. Very little seasonal wetlands remain on the site. Current land use consists of 1,100 acres of levelled, formally irrigated, agricultural lands between a non-project levee and the Newman Wasteway; 300 acres of former duck club property southwest of the agricultural acreage; and 1,900 acres of degraded floodplain, dry channels, and degraded riparian corridors along Mud Slough, and the San Joaquin and Merced rivers.

Figures 3 and 4 show the Department of Fish and Game's conceptual development plan for the China Island Unit. Plans include the creation of 600 acres of seasonal and semi-permanent wetlands within the agricultural lands, with the remainder used to grow waterfowl food crops and nesting cover. The 300-acre duck club would be restored to seasonal and permanent wetland, and the 1,900 acres of floodplain would be seasonally flooded. Water would be maintained in the dry channels to support creation of a riparian corridor.

The restoration of seasonal and permanent wetlands and riparian vegetation requires movement of surface water and groundwater pumping onto the area and control structures to contain the water. Other work needed on the area would consist of riparian revegetation along the San joaquin River, Mud Slough, and overflow channels. Facilities to be constructed include low earthen levees, tide gates, weirs and other water control structures, culverts with risers, and irrigation systems. In addition, the old levee which separates the agricultural lands from the floodplain would need to be breached in two places and tide gates installed. This would permit the former agricultural land to flood during high flow events.

<u>Wetland and Riparian Habitat Restoration, Lands within the Grassland Water District</u>

Grassland Water District provides water to approximately 50,000 acres of land, most of which is managed as wetlands by duck clubs (Figure 5). About 30,000 acres of this land is under Service conservation easements. This alternative would create wetlands at four sites within the District (Figure 6). They include: (1) the Menezes Property, about 1,520 acres near the San Luis Spillway Ditch and Los Banos Creek (Sections 7, 17, 18, and 20, T9S, R9E); (2) the Ornallus-Carlucci-Silva Properties, about 930 acres to the west of the Los Banos Wildlife Management Area (Sections 24, 25, and 26, T9S, R9E); (3) the Amabile-Sansoni Property, about 640 acres east of the Santa Fe Canal and north of Highway 152 (Section 16, 17, T10S, R12E); and (4) the Thiercoff Ranch, about 800 acres west of the Santa Fe Canal and south of Highway 152 (Sections 21 and 28, T10S, R12E).

Figure 3. California Department of Fish and Game North Grasslands Wildlife Area, China Island Unit

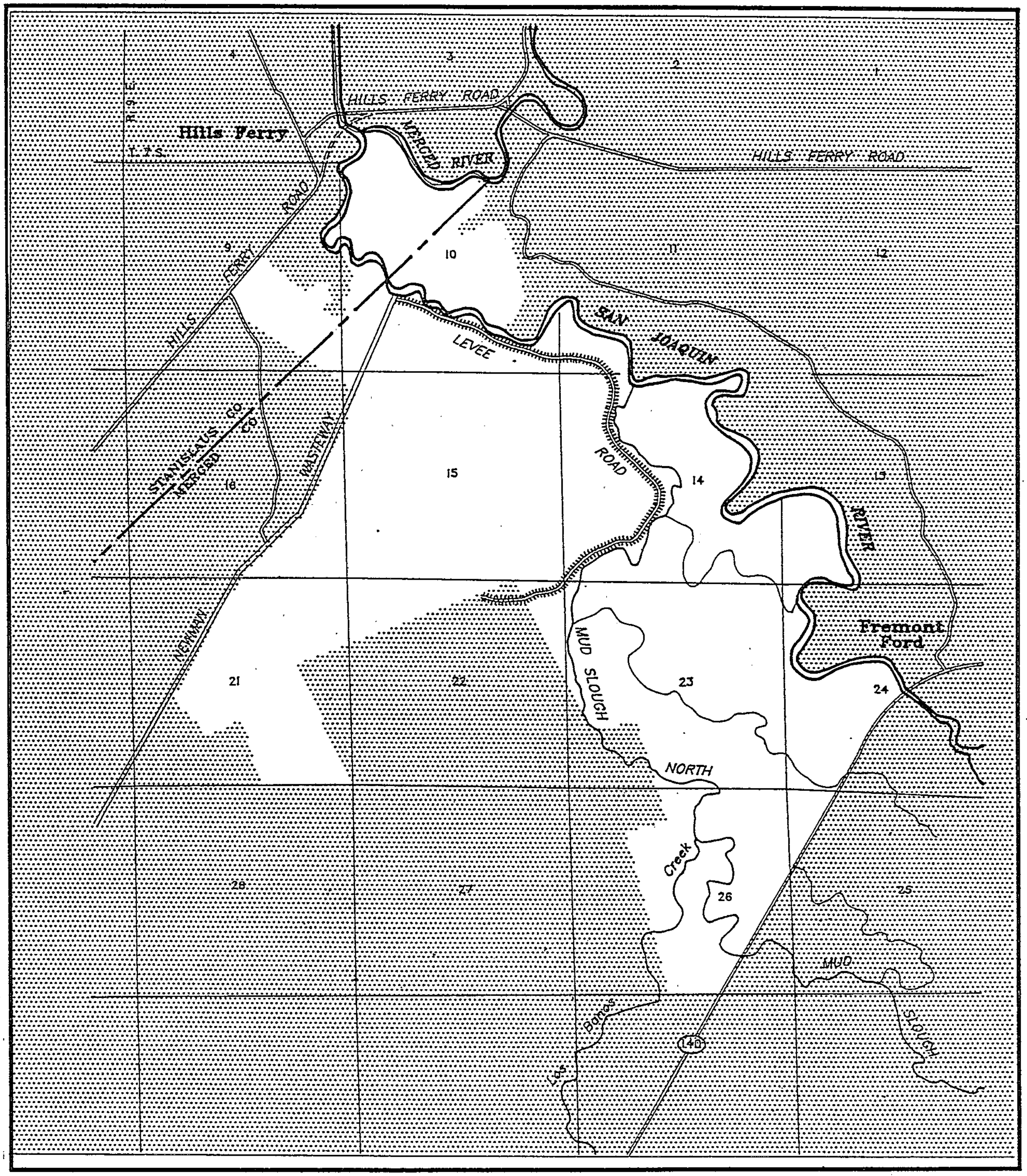
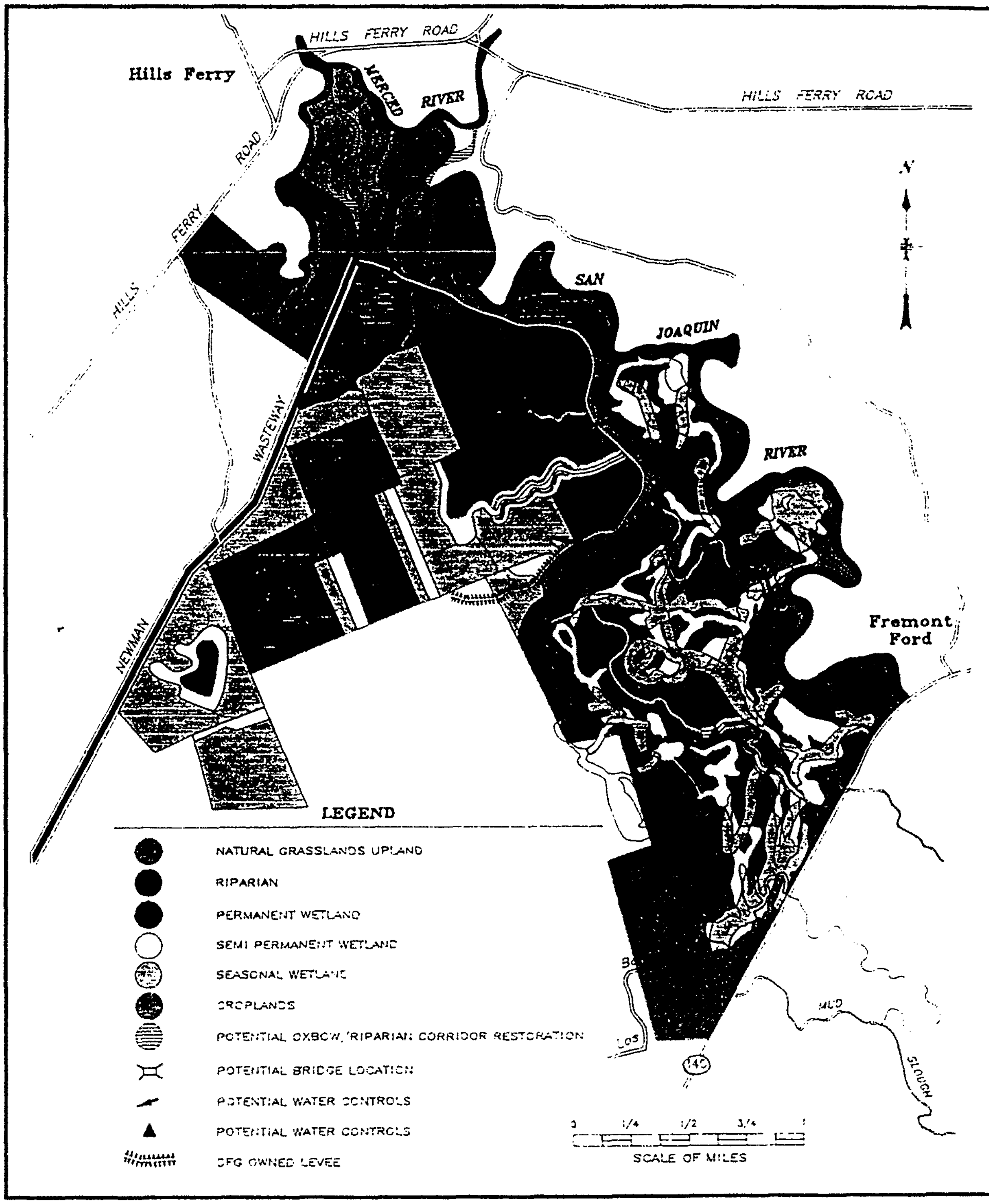


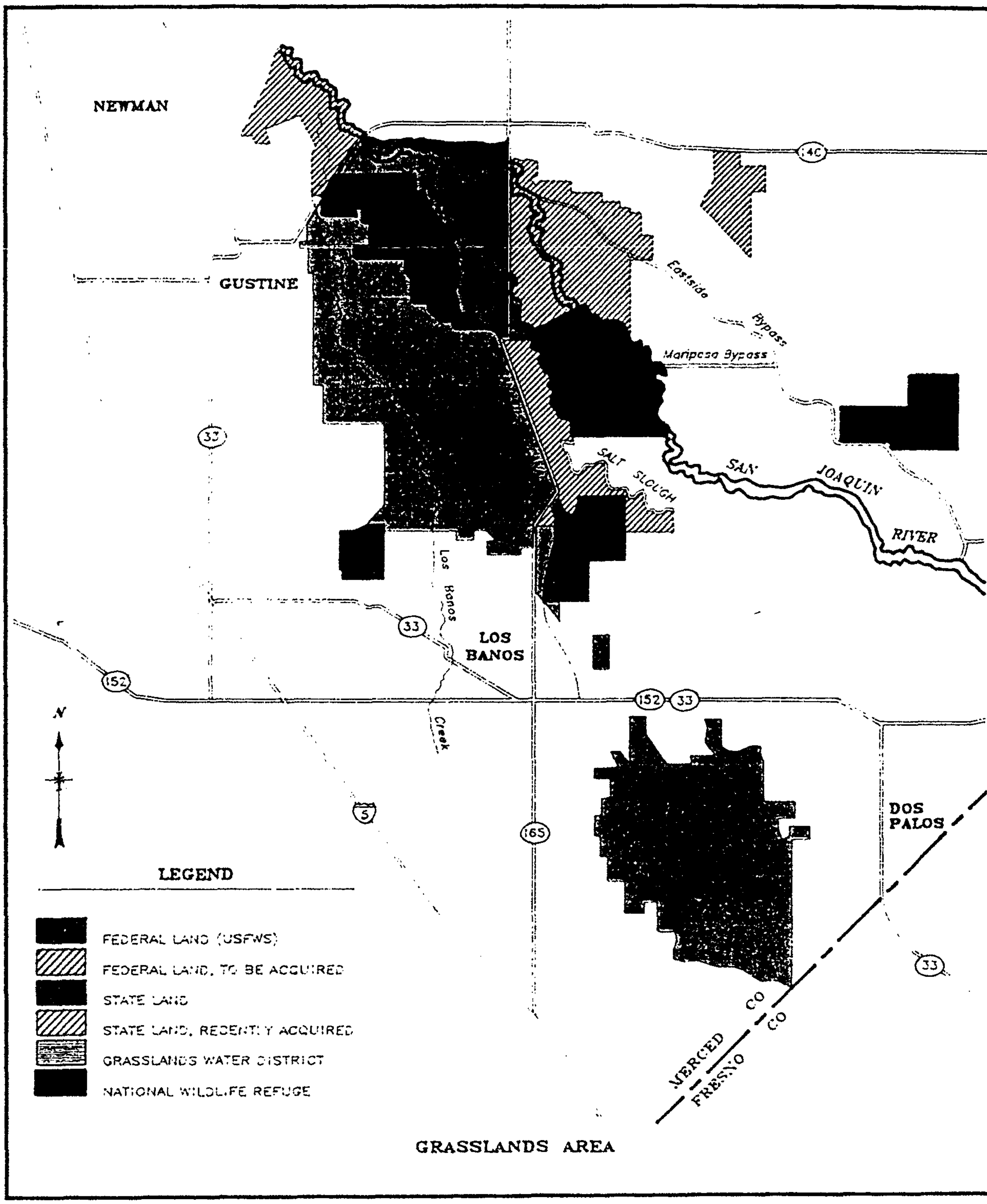
Figure 4. China Island Unit Development Plan



C-104551

C-104551

Figure 5. Grassland Water District and Vicinity



C-104552

C-104552

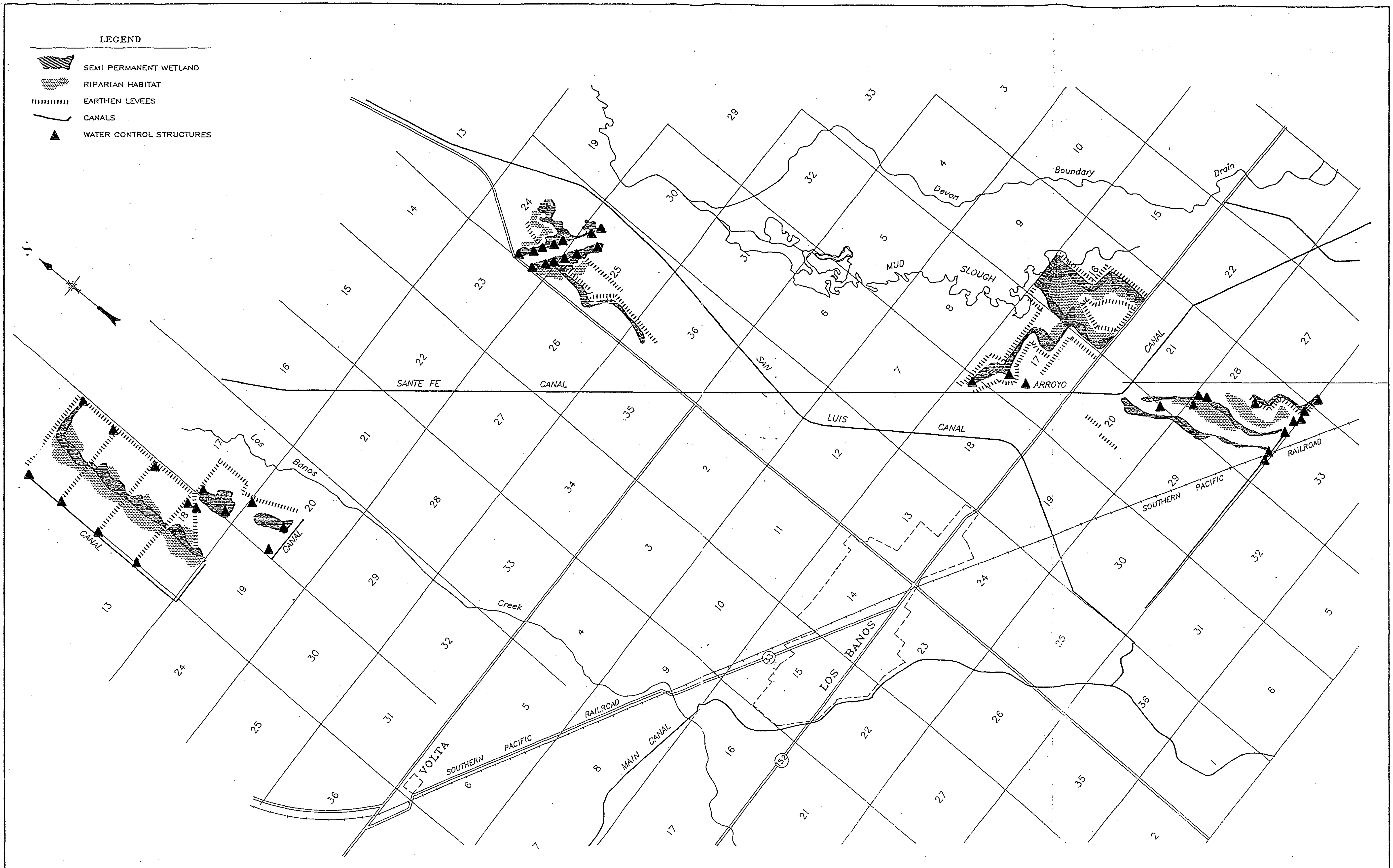


FIGURE 6. WETLAND RESTORATION SITES, GRASSLAND WATER DISTRICT

Construction would include excavation of deep and shallow basins for wetlands, 119,000 feet of low earthen levees, 50-55 water control structures, 25,000 feet of new internal canal, and about 84,000 feet of delivery canal. The new canal and water control structures would be designed to benefit proposed wetland areas and existing adjacent wetlands.

Wetland and Riparian Habitat Restoration, Arena Plains National Wildlife Refuge (Sunrise Ranch) and nearby Service Easement Lands

The Service recently purchased the Sunrise Ranch (2,700 acres) and created the Arena Plains National Wildlife Refuge (NWR). There are also 8,832 acres of land in Service conservation easement in the area east of the San Joaquin River (Figure 7). This alternative would restore wetlands and riparian habitat on idle agricultural lands and along degraded channels.

General facilities needed include water control structures and topographical modifications to create 400-600 acres of shallow basins for wetlands, levee rehabilitation within the refuge, and rehabilitation of the water delivery system on and off the refuge.

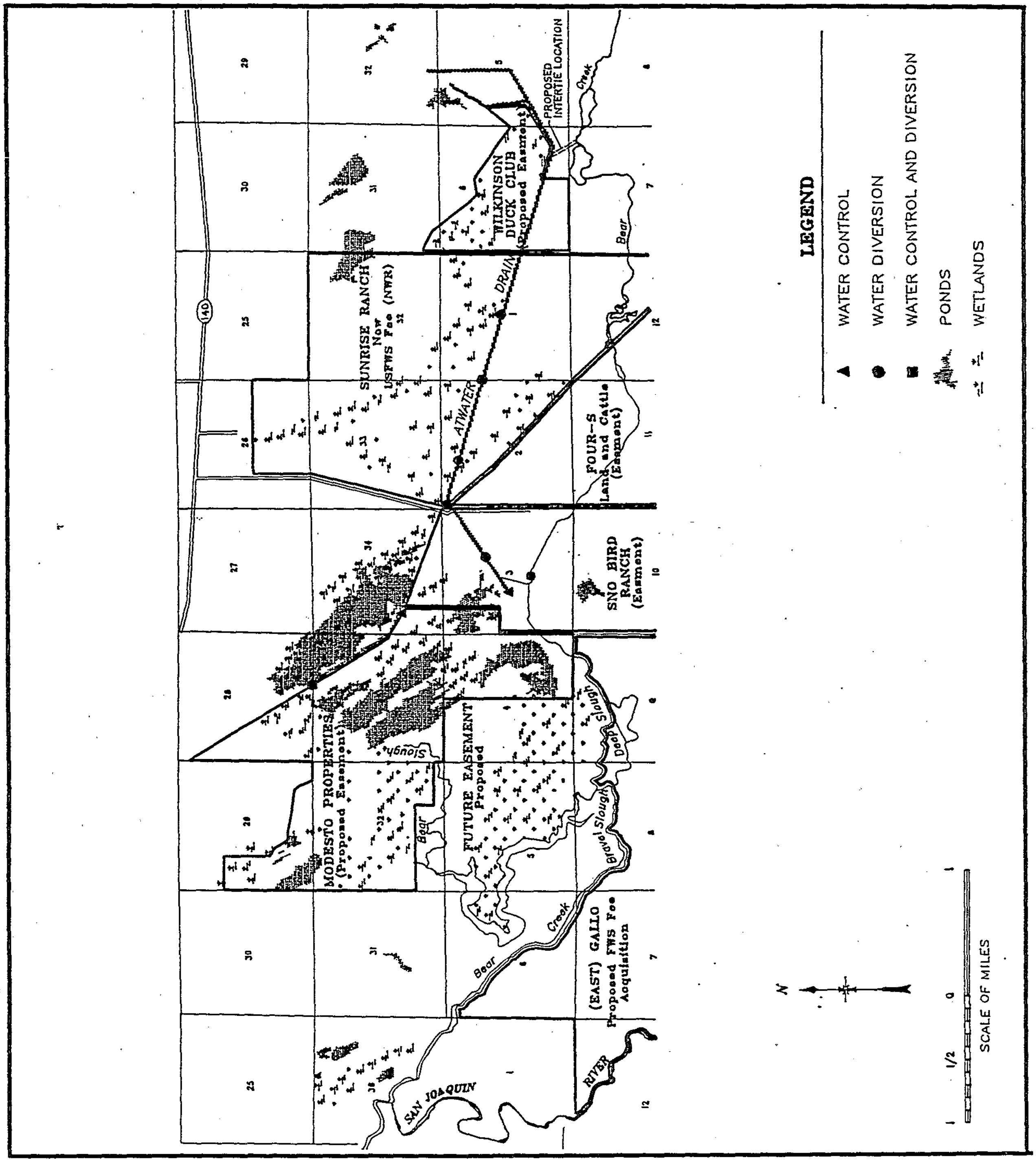
Specific features include construction of: (1) a 1,320-foot-canal connecting Bear Creek and the Atwater Drain to divert high flows into the Atwater Drain (250 cfs capacity; (2) in-line water diversion structures in Bear Creek; (3) 4 in-line water diversion structures in the Atwater Drain within the refuge; (4) 2 water control structures in an old extension of the Atwater Drain; (5) 2 water control structures in the Eastside Canal west of the refuge; and (6) a water control structure on the east boundary of the refuge by the Wilkinson Duck Club. These structures would supply water and control water levels within the refuge and easement properties. Approximately 15 culverts with risers would enable further control of water within these areas.

Shaded Riverine Aquatic (SRA) and Riparian Habitat Restoration along the San Joaquin River, River Mile 63 to 70

This alternative focuses on restoring riparian vegetation and SRA habitats at selected sites along the mainstem San Joaquin River. Figure 8 shows the section of the river (SJRMP designated Reach 6) where restoration would occur. Based on our review of the Corps' San Joaquin River Aerial Atlas (1976 photographs), the areas selected appear to be either barren of riparian vegetation, or have severely degraded riparian vegetation. However, this is a preliminary assumption that must be confirmed by site visit and review of new photography taken in 1992 when it becomes available to the Service.

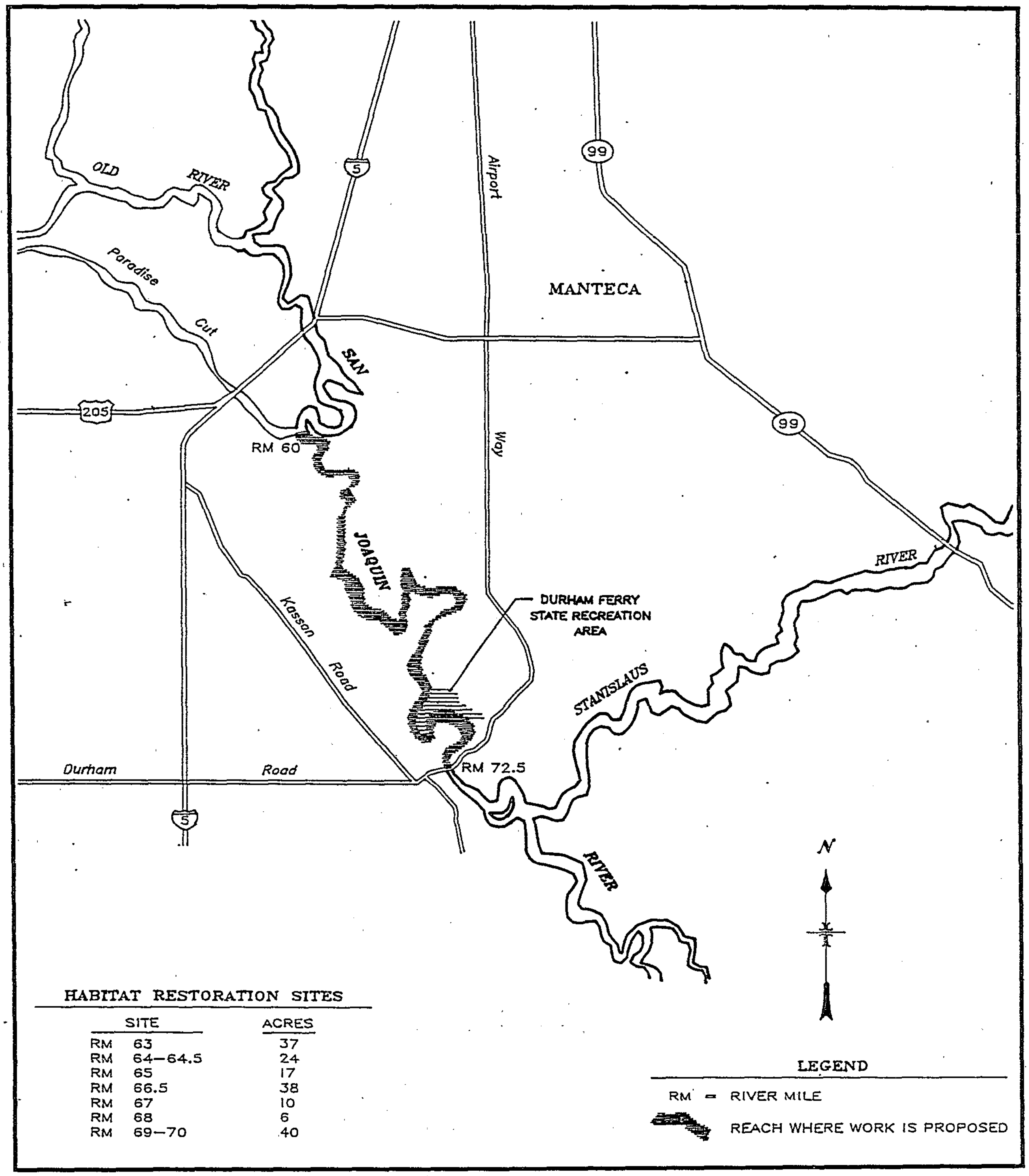
Restoration activities would include planting native riparian trees and shrubs on about 172 acres, development of irrigation system(s), and possibly fencing and erosion control work. Erosion control would involve construction of berms or other bank protection measures. This alternative would provide incidental flood protection benefits to certain agricultural lands in the area that are experiencing seepage problems and help protect project levees in the area threatened by erosion. The local cost-sharing sponsor(s) would be required to secure these areas in fee or easement to ensure long-term protection. Table 1 summarizes the proposed SRA and riparian habitat restoration alternative.

Figure 7. U.S. Fish and Wildlife Service Arena Plains NWR and Service Easement Land Habitat Restoration.



C-104555

Figure 8. San Joaquin River Restoration Sites



HABITAT RESTORATION SITES

SITE	ACRES
RM 63	37
RM 64–64.5	24
RM 65	17
RM 66.5	38
RM 67	10
RM 68	6
RM 69–70	40

Table 1. San Joaquin River SRA and Riparian Habitat Restoration Sites

Location	Acreage
Three field at River Mile (RM) 63, east bank	37
Area south of Banta Carbona Canal, RM 64 to 64.5, west bank	24
Field at bend, RM 65, east bank	17
Bare areas, RM 66.5, east bank south of oxbow, and east bank of oxbow	38
Narrow field, RM 67, east bank	10
Small area north of pond, RM 68, east bank	6
RM 69-70, west bank	40
Total	172

Combination of Alternatives

This alternative would be a combination of the habitat restoration efforts at the State's North Grasslands Wildlife Area, China Island Unit and SRA and riparian habitat restoration plan for the mainstem San Joaquin River, RM 63-70 discussed above.

BIOLOGICAL RESOURCES

EXISTING CONDITIONS

Vegetation

Riparian wetland habitat is the most important wildlife habitat type found in the project area. Numerous wildlife species are supported by this diverse habitat. Riparian communities can be grouped into three classes that reflect successional status and location in the floodplain relative to flood flows and elevation above the water table. These three classes of riparian communities are gravel bar, low terrace, and high terrace.

Gravel bar communities tolerate seasonal flooding, although flooding is responsible for pruning and burying newly established vegetation. Two vegetative communities typically develop on gravel bars: willow scrub and willow-cottonwood forests.

Willow scrub vegetation is the pioneering vegetation in two topographic areas of the river. Dense thickets of one or more species of willows develop on pointbars and low river terraces. Occasionally the low terrace willow thickets contain small amounts of cottonwood and alder. Interior live oak, valley oak, and elderberry may grow on the upper edge. Willow-cottonwood forests form dense sapling stands or forests up to 60 feet in height. Black willow, arroyo willow, and cottonwood dominate the canopy. Older stands typically have a mid-story of willows or thickets of shrub species. Herbaceous vegetation may be sparse or dense. The gravel bar community is used by a variety of wildlife species that feed on seeds, vegetation, insects, and vertebrate prey.

Low terrace communities develop as sediment accumulates on gravel bars, elevating them above the floodplain. These habitats are sensitive to floodplain water level fluctuations and changes in flood intensity or duration. These communities are typically inundated only during flood flows.

Three plant communities develop on low terrace sites: mature cottonwood forest, mixed riparian herb/scrub, and alder-willow forests. Mature cottonwood forests develop from young willow-cottonwood forests. A mid-story of black walnut, box elder, and willows is typical if dense herb-vine growth is not present.

The mixed riparian herb/scrub community is located on riverbanks, berms, and terraces where disturbance from levee maintenance and farming practices prevent the development of mature forests. Herbaceous dominants include weedy annual grasses, sedges, rushes, and numerous forbs. The scrub layer consists of shrub, vine, and tree saplings such as willow and cottonwood. Alder-willow forests are primarily associated with the river where steep gravel, rock or riprap banks extend to the shoreline defined by sustained summer water levels. Typically, these forests form narrow bands along the shoreline often overhanging the water. These communities provide habitat elements required by numerous diverse wildlife species for nesting, feeding, migration, and cover.

High terrace communities are developed from mature cottonwood forests as terrace elevations increase and cottonwoods senesce and die, thereby releasing the mid-story trees from the inhibition of over-story shading. High terrace communities are inundated only during peak storm runoff events and are usually not subject to severe physical battering, erosion, or long-term flooding. The high terrace riparian forests are one of the rarest communities in the San Joaquin Valley relative to their original extent. This is primarily related to the attractions for urban and agricultural development due to high soil fertility and water infiltration rates, and low flood frequency. Gravel bar and low terrace communities are the most common in the project area.

Riparian habitats are in a state of perpetual succession because of the dynamic nature of topography and hydrology. This constant change ensures habitat diversity and related wildlife diversity.

Wildlife

The plant communities found along the San Joaquin River and its tributaries are an integral part of the total San Joaquin Valley ecosystem upon which fish and wildlife resources depend. Although most of the historical riparian woodland habitat has been replaced by agriculture and urbanization, the San

Joaquin River and its tributaries, including Kings River North, support a variety of wildlife (Appendix A).

Upland game species in the study area include California quail, ring-necked pheasant, mourning dove, band-tailed pigeon, Audubon cottontail, brush rabbit, black-tailed jackrabbit, and gray squirrel. Furbearers are represented by coyote, red and gray foxes, bobcat, raccoon, opossum, spotted and striped skunk, badger, muskrat, weasel, and beaver.

About 200 species of birds are known to inhabit the project area riparian community as resident or seasonal visitors. This habitat also provides nesting and feeding areas for resident birds. Birds are probably the most common, conspicuous wildlife in riparian ecosystems. Birds using riparian ecosystems can be categorized into at least four groups based on their seasonal occurrence: (1) summer (breeding) residents, (2) winter residents, (3) transients (migratory), and (4) permanent residents (non-migratory). As a result, bird populations are distinctly different from season to season.

Throughout North America, riparian ecosystems are valuable as breeding habitats for birds. Large stands of high-value riparian woodland may have 10-50 breeding bird species. Population densities of birds breeding in riparian areas generally fall between 40-900 pairs per 40 ha. Table 2 shows typical breeding bird densities observed in several California studies.

Because of its linear distribution and edge effect, the value of riparian vegetation to wildlife typically far exceeds the value of an equivalent acreage of non-riparian woody cover occurring in a single large block. Naturalists and wildlife managers recognize that the numbers and kinds of wildlife species in a given habitat relates largely to the amount of interface or "edge" between diverse habitat types. The amount of suitable cover and diversity of habitat is a major factor in determining the productivity and carrying capacity of the San Joaquin-Kings River North system.

The San Joaquin River system is part of the Pacific Flyway and provides important resting and feeding areas for migratory waterfowl, shorebirds, and other water associated birds. For example, nearly one-half of the wintering ducks of the Flyway utilize the Central Valley during mid-winter, and a significant portion of this use occurs within the San Joaquin Valley (Figure 9). Historically, San Joaquin Basin wetlands were flooded nearly every year during the winter and spring by natural overflow from the San Joaquin River and tributaries; waterfowl use under such conditions was extremely high. Waterfowl use in the study area of the San Joaquin Basin is still extensive at times on State and Federal wetlands and on waterfowl hunting clubs, when flooding occurs. The wetlands and some agricultural lands provide important food and resting areas for waterfowl. Waterfowl use of the San Joaquin Valley has diminished since 1980 based on mid-winter counts (Figure 10). Part of this decline in use is due to lack of suitable habitat. Waterfowl populations have also declined.

Table 2. Number of breeding bird species and breeding bird densities observed on selected riparian study areas in California.

Number of breeding bird species in riparian ecosystems

Community and location	No. of species	Source
Desert riparian, California	13	Berry 1977
Willow-cottonwood, California	20	Ingles 1950
Cottonwood-willow, California	27	Gaines 1977

Breeding bird densities in riparian ecosystems

Plant community type and location	Density (pairs per 40 ha)	Source
Cottonwood-willow forest, CA.	840	Gaines 1977
Willow-cottonwood streambotton, CA.	197	Ingles 1950
Sacramento Valley riparian, CA.	240-450	Gaines 1977
Desert riparian, CA.	863	Berry 1977

Breeding season is generally in spring and early summer months

In 1986, the United States and Canadian governments, concerned over the decline in duck populations, developed and signed the North American Waterfowl Management Plan. This plan provides a broad framework for waterfowl conservation and management based on regional population and habitat goals needed to meet public demand.

Implementation of the North American Waterfowl Management Plan is the responsibility of designated joint ventures, in which agencies and private organizations collectively pool their resources to solve waterfowl habitat problems. The California Central Valley Habitat Joint Venture was formally established by a working agreement in 1988. The goal of the joint venture is to protect, maintain, and restore habitat to increase waterfowl populations to desired levels in the Central Valley. The San Joaquin Basin (Figure 11) is included in the Central Valley Habitat Joint Venture Plan. The current wetland restoration goal for the entire San Joaquin Basin is 20,000 additional acres.

Figure 9.

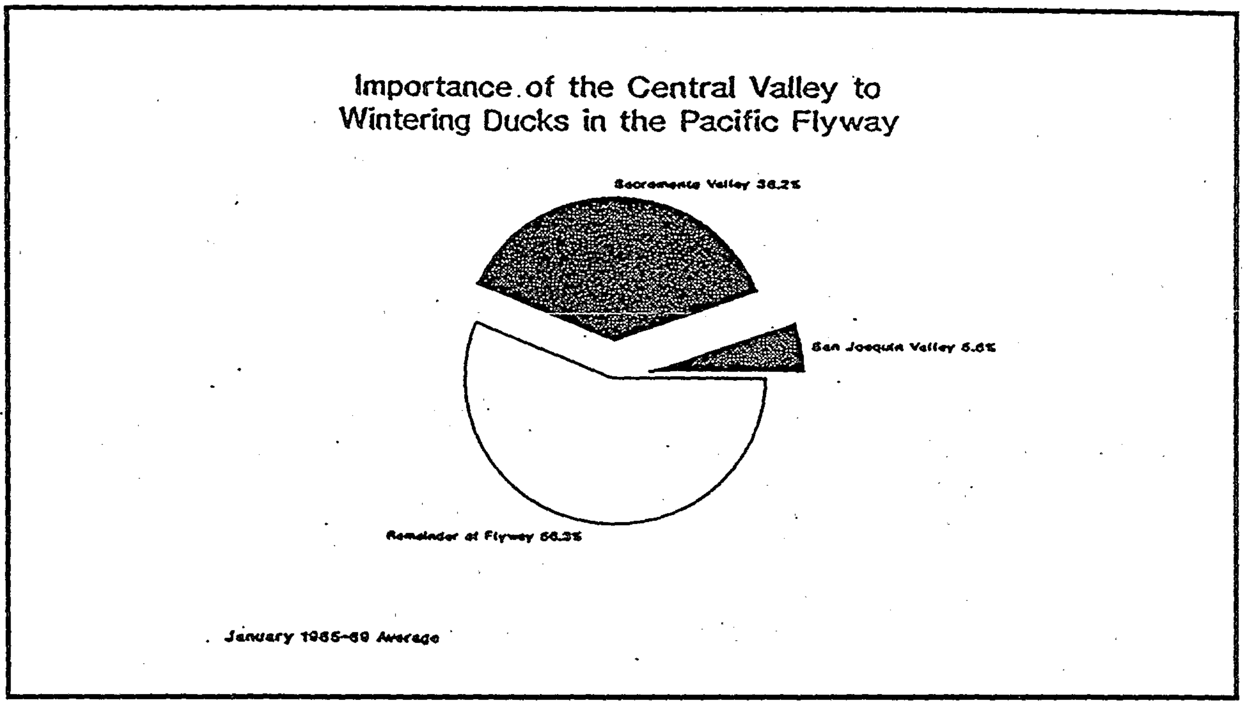


Figure 10.

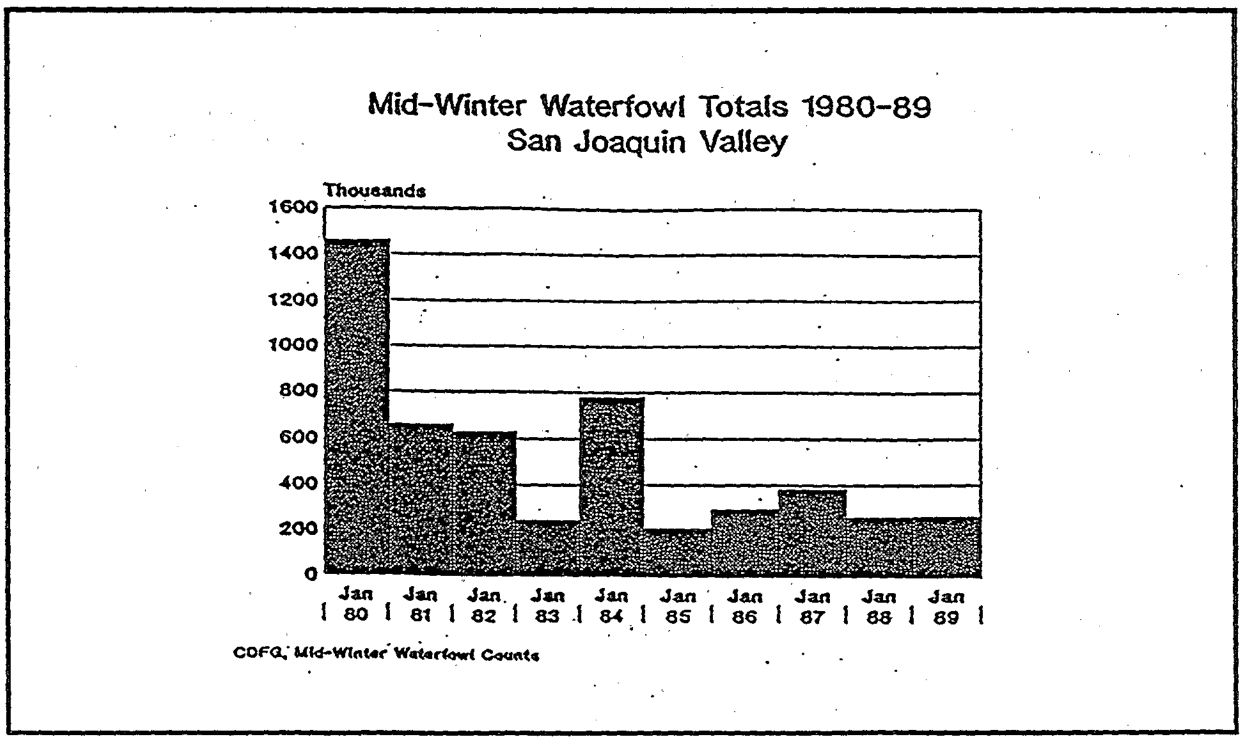
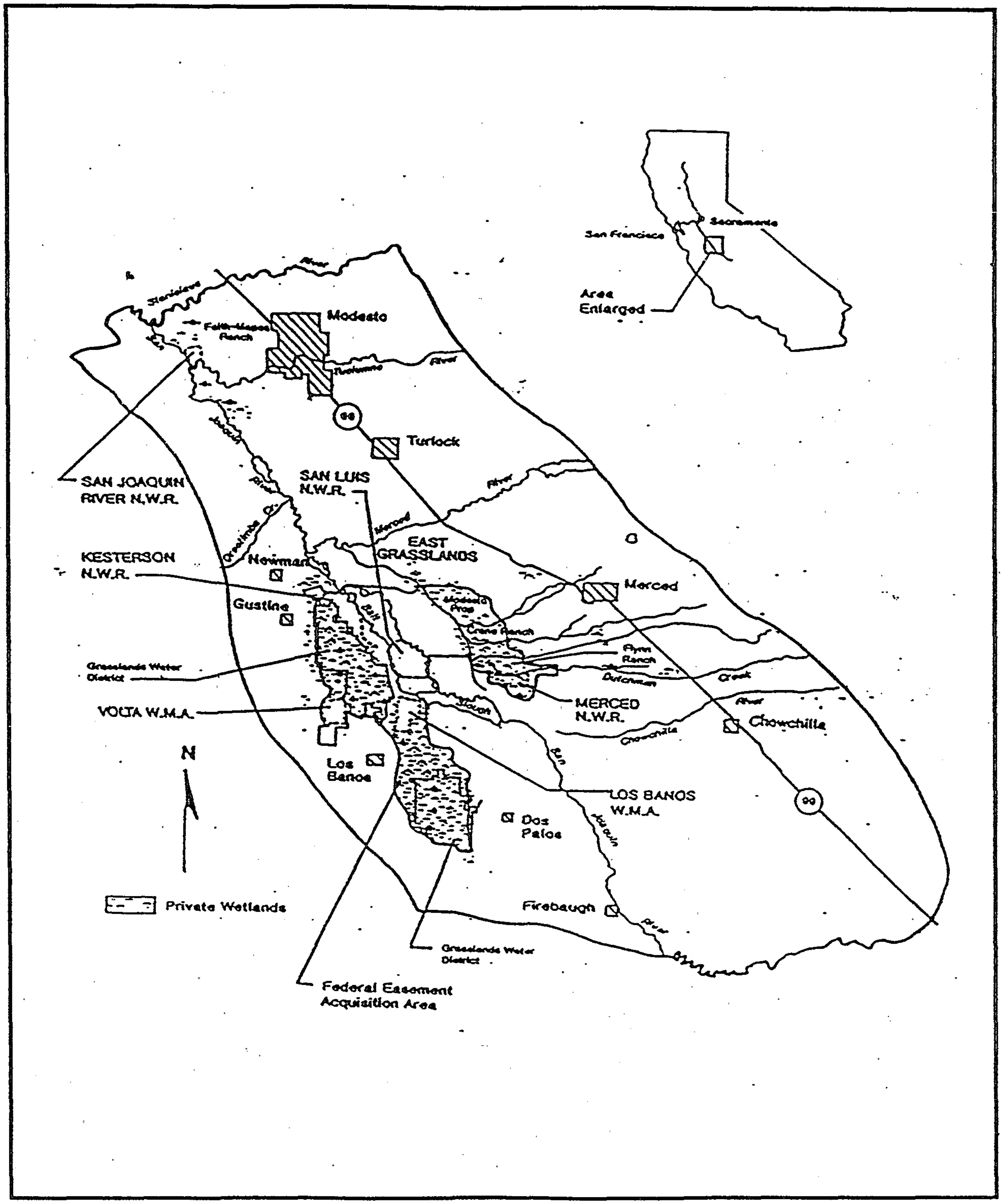


Figure 11. San Joaquin Basin



C-104562

C-104562

Many species of waterfowl such as the mallard, pintail, cinnamon teal, and American wigeon, frequent wetland habitat. Shorebirds and wading birds of wetlands areas include the great blue heron, great and snowy egrets, sandhill crane, American avocet, and black-necked stilt. Egret and heron rookeries are found at selected wetlands locations. Common raptors of the study area include the golden eagle, northern harrier, red-tailed hawk, short-eared and barn owls, and turkey vulture. Common passerine bird species within the study area include the Brewer's blackbird, scrub jay, red-shafted flicker, common crow, yellow-billed magpie, and tree, rough-winged, and cliff swallows.

Reptiles and amphibians of the area include the aquatic garter snake, common garter and gopher snakes, the western fence and California legless lizards, bullfrogs, and the Pacific pond turtle.

Fish

The San Joaquin Valley previously supported a productive fishery of both resident and anadromous fishes. Common resident fish included Sacramento and tule perch, Sacramento sucker, thick-tailed chub, Sacramento squawfish, hardhead, Sacramento blackfish, hitch, and Sacramento splittail; rainbow trout were also present in upstream reaches. Anadromous species, including white sturgeon, steelhead, and chinook salmon, were also present in the San Joaquin River and as far south as the Kings River and Tulare Lake.

Prior to major water developments, the San Joaquin River system supported both a fall-run and a spring-run of chinook salmon. A smaller population of winter-run salmon may have used the northern east-side tributaries to the San Joaquin. However, the spring-run population was the most abundant race of chinook salmon in the San Joaquin Valley. In total, runs exceeded 100,000 fish annually and probably exceeded 200,000 in peak years.

Today however, chinook salmon production in the San Joaquin River drainage has declined by over 85% since the 1940's. Spring-run chinook salmon in this drainage were essentially extirpated as a result of construction and operation of Friant Dam. Spring-runs on the other tributaries had been eliminated due to dam construction prior to and shortly after 1900. Due largely to artificial propagation, fall-run fish continue to exist in five major east-side tributaries to the San Joaquin River: the Merced, Tuolumne, Stanislaus, Mokelumne, and Cosumnes Rivers. Occasionally fall-run chinook salmon also ascend the Calaveras River. In addition, the Calaveras River has supported a small run of winter-run chinook salmon; however, the status of this population is currently unknown. Since the completion of Friant Dam, chinook salmon have appeared in the upper mainstem of the San Joaquin River only in extremely wet years, and have successfully spawned only once in the Kings River during the flood year of 1969. Estimated numbers of spawning adult salmon that returned to the major San Joaquin River tributaries from 1940 through 1989 are presented in Table 3.

Table 3. Chinook Salmon Escapement in the San Joaquin Basin

CHINOOK SALMON SPAWNING ESCAPEMENT ESTIMATES: - 1940-1989[a]

Year	San Joaquin River	Merced River	Tuolumne River	Stanislaus River	Mokelumne River	Cosumnes River
1940[b]	---	1,000[c]	122,000	3,000[c]	5,000[c]	---
1941	---	1,000[c]	27,000[c]	1,000[c]	12,000[c]	1,000[c]
1942	---	---	44,000	---	12,000[c]	---
1943	35,000	---	---	---	---	---
1944	5,000	---	130,000	---	---	---
1945	56,000	---	---	---	6,000	---
1946	30,000	---	61,000	---	---	---
1947	6,000	---	50,000	13,000	---	---
1948	2,000	---	40,000	15,000	<500	---
1949	---	---	30,000	8,000	1,000	---
1950	0	---	---	---	---	---
1951	0	---	3,000	4,000	2,000	---
1952	0	---	10,000	10,000	2,000	---
1953	0	<500	45,000	35,000	2,000	2,000
1954	0	4,000	40,000	22,000	4,000	5,000
1955	0	---	20,000	7,000	2,000	2,000
1956	0	0[d]	6,000	5,000	<500	1,000
1957	0	400[d]	8,000	4,000	2,000	1,000
1958	0	500[d]	32,000	6,000	7,000	1,000
1959	0	400[d]	46,000	4,000	2,000	0[d]
1960[d]	0	400	45,000	8,000	2,000	1,000
1961	0	50	500	2,000	100	---
1962	0	60	200	300	200	1,000
1963	0	20	100	200	500	1,000
1964[e]	0	40	2,000	4,000	2,000	2,000
1965	0	90	3,000	2,000	1,300	800
1966	0	40	5,000	3,000	700	600
1967	0	600	7,000	12,000	3,000	500
1968	0	500	9,000	6,000	1,700	1,500
1969	0	600	32,000	12,000	3,000	4,000
1970	0	5,000	18,000	9,000	5,000	600
1971	0	4,000	22,000	14,000	5,000	500
1972	0	3,000	5,000	4,000	1,100	1,600
1973	0	1,100	2,000	1,200	3,000	900
1974	0	2,000	1,100	800	1,400	300
1975	0	2,400	1,600	1,200	1,900	700
1976	0	1,900	1,700	600	500	0
1977	0	400	400	0	300	0
1978	0	600	1,300	50	1,100	100
1979	0	2,100	1,200	100	1,500	200
1980	0	2,800	500	100	3,200	200
1981	0	10,400	14,300	1,000	5,000	---
1982	0	3,000	7,000	---	9,000	---
1983	0	18,200	14,800	500	15,900	200
1984	0	34,000	13,700	12,000	6,000	1,000
1985	0	16,100	40,300	13,300	7,700	200
1986	0	6,200	7,300	5,900	5,000	---
1987	0	3,900	14,800	6,300	1,600	0
1988[f]	0	3,200	6,300	12,300	500	100
1989	0	200	1,600	1,400	200	100

[a] All fall-run fish. "---" indicates no data are or were available.
[b] Unless otherwise noted, data for 1940-1959 from: Fry, 1961.
[c] Escapement estimate based on incomplete count.
[d] Data for 1960-1963 and where noted from: Fry and Petrovich, 1970.
[e] Data for 1964-1987 from: Reavis, (in prep.).
[f] Data for 1988-1989 are preliminary counts from: pers. comm., Jul 15, 1990, T.H. Richardson, Fish and Wildlife Biologist, USFWS, Sacramento, CA.

The following are discussions of the issues on each of the major waterways in the basin.

Stanislaus River Fisheries. The anadromous fishery of the Stanislaus River has been severely depleted. The spring-run of chinook salmon has been totally eliminated and only a remnant fall-run remains. As recently as 1953, as many as 35,000 adult fall-run chinook salmon returned to spawn in the Stanislaus River. During the 1960's the average run size declined until, in the early 1980's no more than 1,000 to 3,000 fish returned to the Stanislaus. Only a major commitment by the Department of the Interior to modify the long term operating procedures of the Bureau of Reclamation's (Reclamation) New Melones Project offers any hope for significant restoration. The New Melones Project, as authorized by Public Law 87-874, includes provision for only 98,000 acre-feet of water for downstream fishery purposes in the Stanislaus River. This allocation amounts to less than 10 percent of the mean annual run-off of the Stanislaus Basin. With these releases, maintenance of the average pre-project salmon run at 11,000 fish, which was anticipated when New Melones was authorized, will not be achieved. The authorized fishery flow will do little more than preserve the existing remnant salmon population levels.

The New Melones Project water supply has not been fully committed. Initial recommendations by the Service for interim project operation which would increase fishery benefits were not approved and a Service recommendation that uncommitted water be released for fishery purposes was rejected by Reclamation. However, a 1986 agreement between Reclamation and the California Department of Fish and Game, which Reclamation agreed to only after it became apparent that the State would not issue any further water rights for New Melones water, has provided the opportunity for augmenting the Stanislaus River fishery flows. This agreement provides for Stanislaus River fishery releases of up to 302,000 acre-feet annually. The exact amount is determined based on a rather lengthy formula which takes into account reservoir storage, projected reservoir inflow, projected water demands (other than fishery needs), and prior instream flow releases. To date, however, because of dry year conditions, the amount of water available for Stanislaus River fishery flows, based on this formula, has not exceeded 98,000 acre-feet.

The Service, Reclamation, and California Department of Fish and Game, have developed a plan to study the measures necessary for the improvement of Stanislaus River chinook salmon runs. Among the study tasks are: (1) the identification of acceptable river flow regimes for fishery resources; (2) annual monitoring of spawning escapement; (3) the evaluation of available chinook salmon spawning habitat and its restoration, renovation, and maintenance; and, (4) the evaluation of various operating scenarios at New Melones and Tulloch Reservoirs, and Goodwin Dam. The study plan has been approved and limited funding provided by Reclamation for its implementation. The Service completed an instream flow assessment using the Instream Flow Incremental Methodology in 1992. A draft report is currently out for review. It is our position that the Stanislaus River fishery needs for water must be determined soon, while uncommitted water is still available.

Tuolumne River Fisheries. There are two water development projects on the Tuolumne River that are of concern to the Service: The Hetch Hetchy Water and Power System, and the Don Pedro Hydro Project (FERC No. 2299). The unusual natural values of the Tuolumne River were recognized in 1984 when 29 miles of the river were placed in the National Wild and Scenic River System. The designated wild and scenic reach extends upstream from Don Pedro Reservoir into Yosemite National Park.

The *Hetch Hetchy System* is operated by the City of San Francisco. In 1913, the Congress authorized San Francisco to construct certain reservoirs, diversion tunnels, powerhouses and other facilities on lands within Yosemite National Park and Stanislaus National Forest. Under that authorization, an expansion of facilities beyond those recorded in the originally approved plan must be endorsed by the Secretary of the Interior. In 1985, San Francisco requested the Secretary's approval to install a third generator in Kerckhoff Powerhouse which is located adjacent to the Tuolumne River 12 miles downstream from Hetch Hetchy Reservoir. Operation of the additional generator will mean the diversion of more water from Hetch Hetchy Reservoir, via Canyon Tunnel, to Kerckhoff Powerhouse, thus altering the flow regime in the river to the possible detriment of the trout fishery. Installation of the third generator was provisionally approved in November 1985 with the condition that San Francisco fund a 4-year study for the Service to determine if any change should be made in the prescribed schedule of minimum flow releases from the reservoir to the river. Construction of the third generator is completed and the final details of the Department of the Interior's approval were completed on March 10, 1987 and incorporated in a signed agreement with San Francisco. Representatives of San Francisco, U.S. Forest Service, California Department of Fish and Game, National Park Service, California Trout, Inc., and the Service worked together to develop a detailed fishery study. This study is currently being conducted by the Service's Sacramento Enhancement Field Office and is scheduled for completion in 1992.

The *Don Pedro Hydro Project*, operated under Federal Energy Regulatory Commission (FERC) license number 2299 by the Turlock and Modesto Irrigation Districts (Districts), is important to the Service because the project effectively controls Tuolumne River flow and hence habitat for the chinook salmon that spawn and rear downstream from La Grange Dam. Existing minimum instream flow release requirements are as low as 3 cfs which is known to be grossly inadequate. The FERC recently approved the Districts application for amended license with the condition that the Districts complete ongoing fishery studies and fund additional studies designed to assess the role of springtime flows in the life history of salmon. We believe that reservoir releases must be high in the spring when juvenile salmon are ready to begin their seaward migration if there is to be a large return of those salmon as adults 2 1/2 years later. For example, the high outflows in 1982-83 resulted in an adult return of 42,000 fish in 1985, the largest return since 1960. The fishery study also includes an instream flow study and addresses the effect of project-caused flow fluctuations on rearing habitat and water temperature. The flow study is currently being conducted by the Service's Sacramento Enhancement Field Office and should be completed in late 1992.

<u>Merced River Fisheries</u>. There are two major water development projects on the Merced River that impact anadromous fish resources, the Crocker-Huffman Dam near Snelling, and the New Exchequer Dam and Lake McClure further upstream. Only sparse and incomplete estimates of chinook salmon runs in this river were made prior to 1953. In 1940 and 1941 the runs were at least 1,000 fish, and

estimated at 4,000 fish in 1954. However, due to increased irrigation demands, the Merced River runs continued to decline until less than 100 were recorded in six consecutive years (1961-1966).

The enlargement of Exchequer Dam and increased water storage capacity in the early 1960's provided the opportunity to obtain improved fish flow releases for the Merced River. Fish flow releases identified in the FERC license for the New Exchequer Project (FERC No. 2179) issued in 1964 were:

Period	Normal Year (cfs)	Dry Year (cfs)
Jun 1 - Oct 15	25	15
Oct 16 - Oct 31	75	60
Nov 1 - Dec 31	100	75
Jan 1 - May 31	75	60

These flows were initiated in 1967. Also, a salmon spawning channel and a rearing pond were completed at the base of Crocker-Huffman Dam. As a result of these improvements, and screening of irrigation diversions on the Merced River, salmon runs responded favorably. However, despite these measures, salmon populations have fluctuated extensively, primarily because of highly variable spring outflows. In 1983, 1984, and 1985 the Merced River spawning escapements were estimated at 18,000, 25,000, and 16,000 fish, respectively following high spring outflow in 1982-83. In more recent years, severe drawdowns of Lake McClure due to drought conditions have resulted in inadequate flow releases to attract salmon into the system. The returns to the Merced River in 1990 and 1991 were estimated at only 75 and 50 fall-run chinook salmon, respectively.

Clearly, the limiting factor for salmon production in the Merced River is still the lack of adequate instream flow regimes. Hatchery production has failed to achieve the anticipated salmon returns to this river. Since the FERC license for the New Exchequer Project does not expire until 2014, special action to reopen the license will probably be necessary to implement changes in instream flow releases. Such action usually requires in-depth instream flow and habitat studies such as those recently conducted for the Yuba and Mokelumne Rivers. The California Department of Fish and Game will initiate an instream flow study in 1993.

<u>Lower Mokelumne River Fisheries</u>. Four anadromous fishes are present in the lower Mokelumne River: fall-run chinook salmon, steelhead trout, American shad, and striped bass.

Presently, the majority of chinook salmon spawning takes place in the 5 miles below Camanche Dam. The run has averaged 3,200 spawners during the 27 years since the construction of Camanche Dam. The State-operated Mokelumne River Fish Hatchery (MRFH) is located on the river. High water temperatures, low flows, poor water quality, and poor passage during critical life stages limit salmon production on this river.

The present natural production of steelhead in the Mokelumne River is thought to be very low. The Department of Fish and Game estimates that the runs are probably less than 200 fish per year. Steelhead are managed as "catchable trout" in the river with rearing taking place at the MRFH. Efforts to create a self-sustaining run of steelhead have been unsuccessful to date.

Striped bass and American shad utilize the lower portion of the river which is in the Sacramento-San Joaquin Delta.

Cosumnes River Fisheries. The Cosumnes River is a tributary to the Mokelumne River and joins it from the north near the town of Thornton. The headwaters are lower in elevation than the Mokelumne River system, and most of the runoff is rainfall. Flows in the lower Cosumnes River are not regulated by a dam and the river generally has no flow during summer months. Annual spawner escapement of fall-run chinook salmon in the Cosumnes River has averaged 200 fish during the 1980's.

Mainstem San Joaquin River Fisheries. There presently is no minimum instream flow requirement for the mainstem San Joaquin River below Friant Dam. Reclamation does release some water to meet the demands of downstream water rights holders, but the river is essentially dry (except for agricultural return flow) until it receives tributary inflow from the Merced River some 90 miles downstream. Consequently, the mainstem above the mouth of the Merced no longer supports a fishery. The mainstem below the Merced, however, remains an essential migratory corridor for salmon and steelhead adults moving into the tributaries to spawn in the fall and for juveniles moving out in the spring. So while there is no mainstem fishery per se, the issue of instream flows is a crucial one. In addition, the question of restoration of the mainstem fishery remains a point of contention between the fish and wildlife interests and the water development community. No instream flow studies on the mainstem San Joaquin River are underway or planned in the immediate future.

In general, the San Joaquin River within the project area is dominated by warmwater fish species. Common species include green sunfish, bluegill, redear sunfish, largemouth bass, black crappie, threadfin shad, common carp, Sacramento blackfish, white catfish, black bullhead, brown bullhead, and mosquitofish. A list of fish known to occur in the San Joaquin River system within the project area is presented within Appendix A.

Endangered Species

The following discussion of federally-listed threatened and endangered species should be regarded as preliminary information, which we are providing only to assist you in preparation of a Biological Assessment, should one be deemed necessary.

A list of proposed and listed endangered and threatened species was provided to the Corps by letter dated May 15, 1992 (1-1-92-SP-705). A copy of this letter is contained in Enclosure 1. In summary, there are 10 federally-listed threatened and endangered species that may be found in the project area. These are the endangered blunt-nosed leopard lizard, bald eagle, Aleutian Canada goose, San Joaquin kit fox, Fresno kangaroo rat, California jewelflower, and palmate-bracted bird's-beak; and the threatened valley elderberry longhorn beetle, and Hoover's wooly-star. There are also two proposed species for listing which may be found in the project area: the giant garter snake and western snowy plover (coastal population).

In addition, there are 48 candidate species that may be present in the project area. These species are currently being reviewed by the Service and are under consideration for possible listing as endangered or threatened.

Enclosure 1 also provides a summary of a Federal agency's responsibilities under Section 7(a) and (c) of the Endangered Species Act of 1973, as amended (Act). We recommend that the Corps review its requirements, published in 50 CFR 402, for compliance with the Act. The Service has consultation responsibility for the federally-listed species that may be affected by the project, and the Sacramento Field Office should be contacted regarding further consultation requirements.

Since the latest list of federally-listed endangered and threatened species is more than 90-days-old, the Corps should also verify the accuracy of the list with this office prior to preparation of any Biological Assessment for this project.

MITIGATION

The Service's Mitigation Policy (Federal Register 46:15; January 23, 1981) provides internal guidance to us for establishing appropriate mitigation recommendations for projects under our purview. Under the mitigation policy, fish and wildlife resources are divided into four categories to assure that recommended mitigation is consistent with the fish and wildlife habitat values involved. These four resource categories cover a range of habitat values from those considered to be unique and irreplaceable to those believed to be of relatively low value to fish and wildlife. Corresponding mitigation planning goals range from "no loss of existing habitat value" (Resource Category 1) to "minimize loss of habitat value" (Resource Category 4). The mitigation policy does not apply to federally-listed threatened or endangered species.

Resource category determinations are based on the importance of the habitat type to the selected evaluation species, and on the relative scarcity of the habitat type on a regional or National basis. Selection of evaluation species can be based on several criteria, including (1) species known to be sensitive to specific land and water uses, (2) species that play a key role in nutrient cycling or energy flow, (3) species that utilize a common environmental resource, and (4) species such as anadromous fish and migratory birds that are associated with Important Resource Problems as designed by the Director or Regional Directors of the Fish and Wildlife Service.

In addition to Resource Categories as defined by the Mitigation Policy, the mitigation goal of Region 1 of the Fish and Wildlife Service is for no net loss of wetlands acreage. Freshwater emergent wetlands, and any other wetlands in the project area, are subject to this goal.

In the project area, the following general habitat areas could be impacted by the proposed project: (1) the San Joaquin River upstream of Friant Dam, (2) the San Joaquin River downstream of Friant Dam, (3) San Joaquin River tributaries (Stanislaus, Tuolumne, Merced, Fresno, Chowchilla rivers) up- and downstream of their first major dam, (4) freshwater marshes adjacent the rivers in the study area and in the area known as the Grasslands, (5) riparian forests, and (6) agricultural lands. If consideration of the project continues in the future and further, more detailed analyses of impacts are required, we will likely further subdivide these general habitat areas into more specific habitat types (e.g., specific occurrences of SRA Cover, and the various riparian forest types) for quantitative analysis. For planning purposes now, however, the lack of project specificity dictates only a general, qualitative treatment of habitat areas.

As discussed in our draft planning aid letter on Friant Dam/Millerton Lake Flood Control Operation Investigation, Millerton Lake contains the only known reproductive population of landlocked American shad; the only spawning habitat for these shad is in the San Joaquin River between Millerton Lake and the Kerckhoff powerhouses. American shad are suitable evaluation species because of (1) the high scientific interest in the only freshwater population of a normally-anadromous fish, and (2) their high importance as sportfish. Based on these considerations, and the scarcity of such areas, we have tentatively placed the reach of the San Joaquin River between Millerton Lake and Kerckhoff Dam in Resource Category 2; our associated general mitigation planning goal is for no net loss of in-kind habitat value. As defined in the Service's Mitigation Policy, "in-kind replacement" means providing or managing substitute resources to replace the habitat value of the resources lost, where such substitute resources are physically and biologically the same or closely approximate those lost.

The San Joaquin River downstream of Friant Dam, Kings River North and other sloughs and channels are of high to medium value to warmwater game fish; this type of habitat remains relatively abundant on a national basis. Warmwater game fish are appropriate evaluation species because of human consumptive uses. As a result, we have designated these areas as Resource Category 3; our associated general mitigation planning goal is for no net loss of habitat value while minimizing loss of in-kind habitat value.

Most occurrences of Shaded Riverine Aquatic (SRA) cover in the project area are of high value for cover, rearing areas, and food resources to juvenile salmon. SRA Cover is defined as the nearshore aquatic area occurring at the interface between the river and adjacent woody riparian habitat. The principle attributes of this valuable cover-type include (a) the adjacent bank being composed of natural, eroding substrates supporting riparian vegetation that either overhangs or protrudes into the water, and (b) the water containing variable amounts of woody debris, such as leaves, logs, branches and roots, as well as variable depths, velocities and currents. These attributes provide high-value feeding areas, burrowing substrates, escape cover, and reproductive cover for numerous species. We have made a preliminary designation of these areas as Resource Category 2, with the associated mitigation planning goal of no net loss of in-kind habitat value or acreage. However, depending on the specific project features proposed, and whether SRA Cover would be replaceable in association with those features, certain occurrences or geographical areas of SRA Cover could be designated as Resource Category 1. If so, our mitigation planning goal for these areas would be to achieve no loss of *existing* habitat values.

The Merced, Tuolumne and Stanislaus rivers downstream of their first major dam are of high to medium value for anadromous salmonid spawning and rearing. Anadromous salmonid fishes are suitable evaluation species because of (1) the current scarcity of anadromous salmonids in the San Joaquin River system compared to historical populations, and (2) their high importance as commercial and sport fish. As a result, we have tentatively placed these river reaches in Resource Category 2, with the associated mitigation planning goal of no net loss of in-kind habitat value.

Freshwater wetlands in the study area are of high value to numerous aquatic birds, which are suitable evaluation species because of both their importance to nonconsumptive human activities (e.g., birdwatching) and Service Migratory Bird Treaty Act responsibilities. Freshwater wetlands habitat is scarce and continues to be lost on a national basis; within the San Joaquin Valley it has become very scarce. Thus, we have placed any project area freshwater wetlands in Resource Category 2, with the associated mitigation planning goal of no net loss of in-kind habitat value or acreage.

Riparian forests have also become relatively scarce in California's Central Valley and what little remains is generally of high value to resident and migratory birds and other fish and wildlife. We have chosen raptors as evaluation species because, as predators, they play a key role in the community ecology of the study area; in addition, they have important human nonconsumptive benefits (e.g., birdwatching). We have placed project-area riparian forests in Resource Category 2, which has the associated mitigation planning goal of no net loss of in-kind habitat value. For any riparian forest areas that also meet the Service's definition of a wetland, our associated goal would be no loss of acreage.

Uplands in the project area provide habitat valuable for wildlife, especially during flood events. Upland habitat adjacent the river is generally converted to agricultural uses or heavily grazed. We have chosen small mammals as evaluation species because of their importance to raptors and larger mammals as prey species. We have placed project-area uplands in Resource Category 3; our planning goal would be for no net loss of habitat value while minimizing loss of in-kind habitat value.

Agricultural lands vary considerably in the project areas, ranging from medium to low value for wildlife, depending on cropping practices and location. We have initially chosen small mammals as evaluation species because of their importance to raptors and larger mammals as prey species. We have tentatively placed most project-area agricultural lands in Resource Category 4, which has the associated mitigation planning goal of minimizing loss of habitat value. However, once site-specific project data becomes available, the Service, in consultation with the Department of Fish and Game, may find that some of the impacted agricultural lands should be designated as Resource Category 3 or 2, with their attendant mitigation planning goals.

The preliminary Evaluation Species, Resource Categories, and mitigation

C-104571

planning goals for the general habitat areas found in the San Joaquin River Mainstem Reconnaissance Study area are summarized in Table 4.

Table 4. Evaluation Species, Resource Categories, and Mitigation Planning Goals for the general habitat areas found within the San Joaquin River Mainstem Reconnaissance Study Area.

HABITAT TYPE	EVALUATION SPECIES	RESOURCE CATEGORY	MITIGATION GOAL
San Joaquin River Upstream Dam	American shad	2	No net loss of acreage or in-kind habitat value
San Joaquin River Downstream Dam	warmwater game fish	3	No loss of habitat value while minimizing loss of in-kind habitat value
Tributary River Downstream Dam	anadromous salmonid spawning/rearing	2	No net loss of acreage or in-kind habitat value
Shaded Aquatic Cover	juvenile salmon	2,1	Variable: From no loss of existing habitat values to no net loss of acreage or in-kind habitat value
Freshwater Wetland	aquatic birds	2	No net loss of acreage or in-kind habitat value
Riparian Forest	raptors	2	No net loss of acreage or in-kind habitat value
Agricultural Lands	small mammals	4,3,2	Variable: From minimize loss of habitat value to No net loss if in-kind habitat value
Uplands	small mammals	3	No loss of habitat value while minimizing loss of in-kind habitat value

As stated, these resource category designations should be regarded as provisional; we may revise them later based on more definitive project information and/or further consultations with the National Marine Fisheries Service, California Department of Fish and Game, and other entities. Also, we may delineate more specific cover types for our impacts analyses. The information being provided now is as detailed as allowable at this early stage of your planning process.

DISCUSSION

The study area's existing fish and wildlife resources are especially important because of the history of severe losses of fish and wildlife habitat in the San Joaquin Valley. Much of the existing land area was converted to agricultural, municipal and industrial use many years ago. More recently, the conversion of agricultural land to municipal and industrial use has accelerated. Even though much of the agricultural land currently has marginal value for wildlife it has substantially more value than municipal lands, and this conversion generally eliminates future possibilities for fish and wildlife habitat restoration efforts.

Any vegetation removal along the waterways as part of the project could have significant effects on fish, wildlife and their habitats. The exact locations proposed for such work will be a major factor in determining the degree of impact on fish and wildlife resources.

Any sediment removal directly from the mainstem San Joaquin River also has the potential to adversely impact fish, wildlife and their habitats. Riparian vegetation could be destroyed by construction of access roads and work areas adjacent to the river, nesting birds could be impacted by noise and disturbance if work is near nest sites, and fish could be directly or indirectly impacted by habitat modifications, turbidity, or other water quality changes. Proper planning and regulation of sediment removal could reduce these impacts. Implementation of on-farm measures to prevent sediments from entering the river could have minimal impacts to fish and wildlife resources, and properly designed, could be an enhancement measure.

The concept of diversion of a portion of peak flood flows onto State and federally owned wetlands adjacent the San Joaquin River has been received favorably by the managers of these lands. Minimal adverse impacts to fish and wildlife habitat could occur at locations where diversion structures would be constructed. However, such impacts could be mostly avoided, by selecting non-woody vegetated areas to place the structures. We anticipate there would be certain benefits for fish and wildlife on the wetlands receiving these waters, but additional construction and operation details are needed to better assess their range and magnitude.

Structural alternatives such as constructing raised levees, toe drains, berms, impermeable walls within levees, off-set levees, and various combinations of the above would all adversely effect fish, wildlife and their habitats. The degree of impacts would vary, depending on the river location in its relation to riparian habitat, whether construction focused on the landside or waterside of the levee, and whether the structural alternatives might help protect or enhance fish and wildlife resources.

The proposed changes to the emergency spillway release diagrams for various reservoirs in the San Joaquin Valley could have a significant impact on the fish, wildlife, and habitats of the project area, including additional conversions of wildlife habitats to lower valued or non-habitat areas. Information provided to us to date by the Corps, on the proposed new Friant Dam release diagram, however, indicates that the direct impacts of the project on fish and wildlife resources would likely be minimal. This tentative conclusion is based on the Corps' assertions that (a) the changes to the emergency spillway release diagram would only affect releases to the San Joaquin River during rare (75-year or greater) flood events, and (b) the total volume of water released to the San Joaquin River during these events would not change despite the revisions to the emergency spillway release diagram.

Wetland and riparian habitat restoration at the North Grasslands Wildlife Area, China Island Unit, Grassland Water District lands, and Arena Plains NWR would provide important additional habitat for migratory and resident waterfowl, shorebirds, raptors, other passerine birds, and various mammals, reptiles and amphibians. Construction of low earthen levees and other water control and delivery structures would temporarily impact uplands and possibly some wetlands during the construction periods. However, upland habitat values would be expected to recover soon after construction is completed if disturbed areas were reseeded. Any losses of existing wetland or riparian habitat values or acreages would likely be small and would be expected to be more than offset by habitat value gains due to the restoration efforts. Diversion of flood flows onto these lands would be beneficial by assisting in leaching salts accumulated in the soils of the area, and providing an increment of downstream flood protection benefits.

Restoration of riparian habitat (including SRA cover) along the mainstem San Joaquin River could provide a significant step toward re-establishment of an unbroken riparian corridor along the river. Most categories of fish and wildlife could potentially benefit. Fish species in particular would benefit with the eventual development of SRA Cover. The restored habitats could also provide some bank protection and erosion control benefits. However, bank protection measures included in this alternative to control erosion would adversely impact fish and wildlife if rock were used rather than vegetated berms or other methods.

To better quantify the extent and magnitude of both the beneficial and negative fish and wildlife resource impacts of the proposed flood protection and environmental restoration alternatives, including indirect and cumulative impacts, we would need at least the following information: (1) detailed maps or, recent large-scale (i.e., 1:≤6,000) aerial photographs showing the extent of the vegetation and cover types at each proposed worksite in relation to the construction area (with accompanying detailed description of the work proposed at the construction area); (2) detailed data about the present and projected future patterns of inundation of these areas during various flood events; (3) detailed data showing how these patterns would change if the proposed project is implemented; (4) maps showing the extent of the 100-year floodplain or other appropriate floodplain intervals) relative to existing wildlife habitats; (5) projections on the floodplain maps of any changes in the floodplains that would be associated with project implementation; (6) a description of the relationships between the proposed project and any other on-going or proposed projects that may affect flows in the San Joaquin River, and (7) adequate funding to analyze direct, indirect, and cumulative impacts of specific project proposals on fish, wildlife, and their habitat and prepare a Section 2(b) report as provided for in the Fish and Wildlife Coordination Act (Stat. 401, as amended, 16 U.S.C. 661 et seq.).

We anticipate that there would be some adverse impacts to fish and wildlife that would necessitate development of a compensation site(s) for losses of habitat values. Such site(s) should be selected based on evaluation of the soil condition, surface hydrology, groundwater depth, and the absence of salinity, alkalinity, or other chemical peculiarities.

Once areas have been selected, site-specific revegetation plans would need to be developed. These plans should address at a minimum: (1) types of plantings and soil preparation proposed, (2) irrigation methods and duration, (3) success monitoring details, and (4) actions to be taken if the effort is unsuccessful.

Plantings should include native plant species to the extent possible.

Cuttings, acorns, and seeds for propagation from plants in the vicinity of the compensation site should be used. If large quantities of rooted plants were needed it would be desireable to contract for growing specific plants at least 18 months in advance. Costs for developing such compensation sites vary. For planning purposes $25,000-$35,000/acre can be used. This does not include land acquisition, irrigation water, extensive earth moving, or predevelopment studies such as site hydrology.

Flood, sprinkler, or drip irrigation systems may be used, depending on the site size and location, its soils, and type of plantings proposed. All plantings would need to be watered and maintained until they were fully self-sustaining.

RECOMMENDATIONS

We have relatively limited recommendations regarding the proposed project at this time due to the lack of specific project proposals. We will fully develop our specific recommendations as the project is further developed in accordance with the Service's mitigation policy and National Environmental Policy Act regulations. Our recommendations will be directed at avoiding, minimizing, rectifying and reducing any impacts first, and at compensating for the impacts secondly.

Recommendations we have at this time are that:

1. An additional alternative be included which develops a comprehensive aquatic and riparian habitat restoration and protection plan for the mainstem San Joaquin River, Old River to Friant Dam.

   This alternative would have a Feasibility Report which develops a comprehensive aquatic and riparian habitat restoration and protection plan for the lands along the mainstem San Joaquin River and tributaries. It would be a consensus document detailing what measures are needed, how they will be implemented, and where they will be located. Examples of measures include riparian revegetation, removal of exotic plant species such as false bamboo, erosion control, and limited sediment removal. This plan would address floodway and levee maintenance issues, levee rehabilitation, and the possibility of setback levees.

   The Corps would be the lead agency in the development of this plan, with local cost-sharing sponsors providing in-kind services, other assistance, and general guidance. Decisions and implementable measures would be arrived at through consensus of all participants. The focus of this planning effort would be on the long-term improvement of the natural resources of the San Joaquin River corridor in a manner as compatible with flood protection and agriculture as is possible. This alternative has the potential to provide a framework for solving many current and future problems associated with the San Joaquin River corridor.

2. Any reports of the Corps of Engineers on this project seek the inclusion of conservation and enhancement of fish and wildlife resources among the purposes for which the project is to be authorized.

3. The Corps provide funds to the Fish and Wildlife Service to develop a detailed report on the impacts of this project as called for under Section 2(b) of the Fish and Wildlife Coordination Act.

4. A 20-year monitoring plan be developed and implemented to determine the success of efforts implemented as part of this project to reduce flood control problems and restore the natural environment (including any mitigation efforts identified). Monitoring and reporting should occur every year for the first 5 years of the 20-year period, and every 5 years thereafter. The report of monitoring would be submitted by the local project sponsor to the Corps of Engineers, Fish and Wildlife Service, and California Department of Fish and Game.

5. Construction activities within 1/2 mile of nesting raptors be confined to non-nesting periods, roughly from July 15 to March 1 to avoid possible adverse disturbances on reproduction.

6. Construction activities within the main watercourses be confined to the periods which will avoid possible adverse impacts on adult salmon migrating upstream to spawn, and juvenile salmon rearing and outmigration, as follows:

San Joaquin River	Dec. 1 - Sept. 30
Mokelumne River	May 1 - Sept. 30
Cosumnes River	May 1 - Sept. 30
Stanislaus River	May 1 - Sept. 30
Tuolumne River	May 1 - Sept. 30
Merced River	May 1 - Sept. 30

7. Funds be provided for the Fish and Wildlife Service and California Department of Fish and Game staff to mark sensitive habitat areas to be avoided near construction sites. Contractors should be given oral and written instruction to avoid these areas and made aware of the value and significance of these habitats.

<u>Additional Study Needs</u> (based on current project information)

8. Swainson's hawk surveys be conducted during March 1 - August 15 within all proposed worksites. Estimated cost range is $75,000-150,000. Total cost will be affected by number of worksites, their proximity to each other, skill and difficulty of observer(s) in locating nests, access to survey areas, and other factors. Costs can be better estimated once worksites are identified.

9. A Habitat Evaluation Procedures (HEP) for aquatic and terrestrial resources for each alternative selected for feasibility study be completed. The estimated cost, which can be refined once feasibility level alternatives are identified, is about $100,000.

10. An aerial atlas be developed by the Corps for the San Joaquin River and tributaries using the latest aerial photography (1992). Pertinent information, such as designated critical habitats, sensitive species

ranges, etc., to be included on the atlas should be coordinated with the Service, Department of Fish and Game, and San Joaquin River Management Program.

11. An inventory report be completed on the presence of SRA Cover along the San Joaquin River and its major tributaries. Preliminary estimated total cost is $105,800, with a breakdown as follows:

San Joaquin River (~225 miles)	$25,875
Stanislaus River (~35 miles)	$12,650
Tuolumne River (~48 miles)	$12,650
Fresno River (~58 miles)	$12,650
Calaveras River (~55 miles)	$12,650
Chowchilla River (~44 miles)	$12,650
Merced River (~62 miles)	$12,650
Kings River North (~35 miles)	$ 4,025

This inventory would be based on the new aerial photography completed in 1992 and extensive ground-truthing by boat, by swimming or wading, and on foot. The inventory would serve as the baseline condition source for this important cover-type for this proposed project and any other projects.

REFERENCES

California Department of Fish and Game. 1992. San Joaquin Valley Mid-Winter Waterfowl Counts, 1980-1989. File data from CDFG, Sacramento, California. 1 pp.

_________________. 1991. Lower Mokelumne River Fisheries Management Plan. CDFG, Streamflow Requirements Program. Sacramento, California. 239 pp.

_________________. 1990. Central Valley Salmon and Steelhead Restoration and Enhancement Plan. CDFG, Inland Fisheries Division. Sacramento, California. 115 pp.

Counties of Madera and Fresno and City of Fresno. 1986. San Joaquin River Area Reconnaissance Study, Appendices, Volume II.

Brinson, Mark M., B. Swift, R. Plantico, and J. Barclay. 1981. Riparian Ecosystems: Their Ecology and Status. Eastern Energy and Land Use Team, National Water Resources Analysis Group, U.S. Fish and Wildlife Service. Kearnyville, West Virginia. 154 pp.

Central Valley Habitat Joint Ventures Implementation Plan. 1990. California Department of Fish and Game, California Waterfowl Association, Ducks Unlimited, U.S. Fish and Wildlife Service. Sacramento, California. 102 pp.

Corps of Engineers. 1992. San Joaquin River Mainstem Reconnaissance Report and Environmental Assessment (draft). Sacramento District Corps of Engineers, Sacramento, California. 80 pp.

_________________. 1992. Comments on USFWS draft Planning Aid Letter. Sacramento District Corps of Engineers, Sacramento, California.

_________________. 1992. Preliminary Draft Environmental Restoration Alternatives, San Joaquin River Mainstem Reconnaissance Study. Sacramento District Corps of Engineers, Sacramento, California. 4 pp. + maps.

_________________. 1984. San Joaquin River Aerial Atlas (Stockton to Friant Dam). Sacramento District Water Resources Planning Branch Investigations, Section C. Sacramento, California. 147 Plates.

_________________. 1984. Plan of Action, Channel Clearing, Lower San Joaquin River and Tributaries, California. Sacramento District Corps of Engineers, Sacramento, California. 12 pp. + maps.

_________________. 1983. Kings River North (Fresno Slough) Aerial Atlas (San Joaquin River to Stinson Weir). Sacramento District Water Resources Planning Branch Investigations. Sacramento, California. 27 Plates.

Hubbard, D.H. 1941. The vertebrate animals of Friant reservoir basin with special reference to the possible effects upon them of Friant Dam. California Department of Fish and Game 27:198-215.

Miller, J.S. 1992. Personnel Communication. USFWS Easement Program Biologist. San Luis NWR Complex, Los Banos, California

Moore, S.B., J. Winkel, S.J. Detwiler, S.A. Klasing, P.A. Gau, N.R. Kanim, B.E. Kesser, A.B. DeBevee, K. Beardsley, and L.K. Puckett. 1990. Fish and Wildlife Resources and Agricultural Drainage in the San Joaquin Valley, California. San Joaquin Valley Drainage Program, Sacramento.

Moyle, P.B. 1976. Inland Fishes of California. University of California Press, Berkeley.

Saiki, M.K. 1984. Environmental Conditions and Fish Faunas in Low Elevation Rivers on the Irrigated San Joaquin Valley Floor, California. Reprint from California Fish and Game 70(3):145-157.

Soil Conservation Service. 1992. West Stanislaus Sediment Reduction Plan, Stanislaus County, California. USDA, SCS, Davis, California. 250 pp.

U.S. Fish and Wildlife Service. 1992. Draft Planning Aid Letter. Friant Dam/Millerton Lake Flood Control Operation Investigation. Fish and Wildlife Enhancement, Sacramento, California. 26 pp.

______________________. 1992 Draft Planning Aid Letter. Friant Dam /Millerton Lake Flood Control Operation Investigation. Fish and Wildlife Enhancement, Sacramento, California. 26 pp.

______________________. 1989. Waterfowl Population Data, California. Memorandum dated September 15, 1989 from Migratory Bird Coordinator, Region 1. USFWS, Portland, Oregon. 20 pp.

______________________. 1986. Draft Fish and Wildlife Coordination Act Report, Lower San Joaquin River and Tributaries Clearing and Snagging Project, California. Fish and Wildlife Enhancement, Sacramento, California. 82 pp. + appendices.

______________________. 1981. U.S. Fish and Wildlife Service Mitigation Policy. Federal Register 46:15; January 23, 1981. 7744-7763.

APPENDIX A

FISH and WILDLIFE SPECIES LISTS

C-104580

Eared grebe, *Podiceps caspicus*
Western grebe, *Aechmophorus occidentalis*
Pied-billed grebe, *Podilymbus podiceps*
Great blue heron, *Ardea herodias*
Black-crowned night heron, *Nycticorax nycticorax*
Green heron, *Butorides virescens*
Great egret, *Casmerodius albus*
Snowy egret, *Leucophoyx thula*
Least bittern, *Ixobrychus exilis*
American bittern, *Botarus lentiginosus*
Whistling swan, *Olor columbianus*
Canada goose, *Branta canadensis*
White-fronted goose, *Anser albifrons*
Snow goose, *Chen caerulescens*
Ross's goose, *Chen rossii*
Mallard, *Anas platyrhynchos*
Gadwall, *Anas strepera*
Pintail, *Anas acuta*
Green-winged teal, *Anas crecca*
Cinnamon teal, *Anas cyanoptera*
American widgeon, *Mareca americana*
Shoveler, *Spatula clypeata*
Ruddy duck, *Oxyura jamaicensis*
California quail, *Iophortyx californicus*
Ring-necked pheasant, *Phasianus colchicus*
Sora, *Porzana carolina*
Common gallinule, *Gallinula chloropus*
American coot, *Fulica americana*
Killdeer, *Charadrius vociferus*
Black-bellied plover, *Pluvialus squatarola*
Common snipe, *Gallinago gallinago*
Long-billed curlew, *Numenius americanus*
Whimbrel, *Numenius phaeopus*
Spotted sandpiper, *Actitis macularia*
Greater yellowlegs, *Totanus melanoleucus*
Dunlin, *Calidris alpina*
Least sandpiper, *Calidris minutilla*
Long-billed dowitcher, *Limnodromus scolopaceus*
Western sandpiper, *Erunetes mauri*
American avocet, *Recurvirostra americana*
Black-necked stilt, *Himantopus mexicana*
Wilson's phalarope, *Phalaropus tricolor*
Red-necked phalarope, *Phalaropus lobatus*
California gull, *Larus californicus*
Forster's tern, *Sterna forsteri*
Turkey vulture, *Cathartes aura*
Sharpshinned hawk, *Accipiter striatus*
Cooper's hawk, *Accipiter cooperii*
Red-tailed hawk, *Buteo jamaicensis*
Red-shouldered hawk, *Buteo lineatuo*
Rough-legged hawk, *Buteo lagopus*
Ferruginous hawk, *Buteo regalis*
Golden eagle, *Aquila chrysaetos*
Bald eagle, *Haliaeectus leucephalus*
Northern harrier, *Circus cvaneus*
Osprey, *Pandion haliaetus*
Prairie falcon, *Falco mexicanus*
Peregrine falcon, *Falco perigrinus anatum*
American kestrel, *Falco sparvarius*
Black-shouldered kite, *Elanus caerulus*
Barn owl, *Tyto albo*
Screech owl, *Otus asio*
Great horned owl, *Bubo virginianus*
Burrowing owl, *Athene cunicularia*
Long-eared owl, *Asio otus*
Short-eared owl, *Asio flammeus*
Purple martin, *Progne subis*
Scrub jay, *Aphelocoma coerulescens*
Yellow-billed magpie, *Pica nuttalli*
Common raven, *Corvus corax*
Common crow, *Corvus brachyrhynchos*
Plain titmouse, *Parus inornatus*
Common bushtit, *Psaltriparus minimus*
White-breasted nuthatch, *Sitta carolinensis*
Red-breasted nuthatch, *Sitta canadensis*
Brown creeper, *Certhia americana*
Wrentit, *Chamaea fasciata*
House wren, *Troglodytes aedon*
Bewick's wren, *Thryomanes bewickii*
Long-billed marsh wren, *Telmatodytes palustris*
Mockingbird, *Mimus polyglottos*
California thrasher, *Toxostoma redivivum*
American robin, *Turdus migratorius*
Varied thrush, *Ixoreus naevius*
Hermit thrush, *Hylocichla guttata*
Swainson's thrush, *Hylocichla ustulata*
Western bluebird, *Sialia mexicana*
Mountain bluebird, *Sialia currocoides*
Townsend's solitaire, *Myadestes townsendi*
Blue-gray gnatcatcher, *Polioptilia caerulea*
Golden-crowned kinglet, *Regulus satrapa*
Ruby-crowned kinglet, *Regulus calendula*
Water pipit, *Anthus spinoletta*
Cedar waxwing, *Bombycilla caororum*
Phainopepla, *Phainopepla nitens*
Loggerhead shrike, *Lanius ludovicianus*
Starling, *Sturnus vulgaris*

Solitary vireo, *Vireo solitarius*
Warbling vireo, *Vireo gilvus*
Western meadowlark, *Sturnella neglecta*
Yellow-headed blackbird, *Xanthocephalus xanthocephalus*
Redwinged blackbird, *Agelaius phoeniceus*
Tricolored blackbird, *Agelaius tricolor*
Hooded oriole, *Icterus cucullatus*
Northern oriole, *Icterus galbula*
Brewer's blackbird, *Euphagus cyanocephalus*
Brown-headed cowbird, *Molothrus ater*
Western tanager, *Piranga ludoviciana*
Black-headed grosbeak, *Pheucticus melanocephalus*
Blue grosbeak, *Guiraca caerulea*
Lazuli bunting, *Passerina amoena*
Evening grosbeak, *Hesperiphona vespertina*
Purple finch, *Carpodacus purpureus*
House finch, *Carpodacus mexicanus*
American goldfinch, *Spinus tristis*
Lesser goldfinch, *Spinus psaltria*
Lawrence's goldfinch, *Spinus lawrencei*
Rufous-sided towhee, *Pipilo ernthrophthalmus*
Brown towhee, *Pipilo fuscus*
Savannah sparrow, *Passerculus sandwichensis*
Grasshopper sparrow, *Ammodramus savannarum*
Vesper sparrow, *Pooecetes gramineus*
Lark sparrow, *Chondests grammacus*
Dark-eyed junco, *Junco hyemalis*
Chipping sparrow, *Spizella passerina*
Brewer's sparrow, *Spizella breweri*
White-crowned sparrow, *Zonotrichia leucophry*
Golden-crowned sparrow, *Zonotrichia atricapilla*
White-throated sparrow, *Zonotrichia albicollis*
Fox sparrow, *Passerella iliacs*
Belted kingfisher, *Ceryle alcyon*
Lincoln's sparrow, *Melospiza lincolnii*
Song sparrow, *Melospiza melodia*
Band-tailed pigeon, *Columba fasciata*
Mourning dove, *Zenaidura macroura*
Common nighthawk, *Chordeiles minor*
Lesser nighthawk, *Chordeiles acutipennis*
White-throated swift, *Aeronautes saxatalis*
Black-chinned hummingbird, *Archilochus alexandri*
Anna's hummingbird, *Calypte anna*
Rufous hummingbird, *Selasphorus rufus*
Allen's hummingbird, *Selasphorus sasin*
Calliope hummingbird, *Stellula calliope*
Northern flicker, *Colaptes auratus*
Acorn woodpecker, *Melanerpes formicivorus*
Lewis' woodpecker, *Melanerpes lewis*
Red-naped sapsucker, *Sphyrapicus nuchalis*
Red-breasted sapsucker, *Sphyrapicus ruber*
Downy woodpecker, *Picoides pubescens*
Nuttall's woodpecker, *Picoides nuttallii*
Western kingbird, *Tyrannus verticalis*
Ash-throated flycatcher, *Myiarchus cinerascens*
Black phoebe, *Sayornis nigricans*
Say's phoebe, *Sayornis saya*
Willow flycatcher, *Empidonax traillii*
Hammond's flycatcher, *Empidonax hammondii*
Dusky flycatcher, *Empidonax oberholseri*
Western flycatcher, *Empidonax difficilis*
Western wood-pewee, *Contopus sordidulus*
Olive-sided flycatcher, *Contopus borealis*
Horned lark, *Eremophila alpestris*
Violet-green swallow, *Tachycineta thalassina*
Tree swallow, *Tachycineta bicolor*
Bank swallow, *Riparia riparia*
Rough-winged swallow, *Stelgidopteryx serripennis*
Barn swallow, *Hirundo rustica*
Cliff swallow, *Hirundo pyrrhonota*
Orange-crowned warbler, *Vermivora celata*
Nashville warbler, *Vermivora ruficapilla*
MacGillivray's warbler, *Oporornis tolmiei*
Common yellowthroat, *Geothlypis trichas*
Yellow-breasted chat, *Icteria virens*
Yellow warbler, *Dendroica petechia*
Yellow-rumped warbler, *Dendroica coronata*
Black-throated gray warbler, *Dencroica nigrescens*
Hermit warbler, *Dencroica occidentalis*
Wilson's warbler, *Wilsonia pusilla*
House sparrow, *Passer domesticus*

SOURCE: Counties of Madera and Fresno and City of Fresno 1986

Sacramento sucker, *Catostomus occidentalis*
green sunfish, *Lepomis cyanellus*
warmouth, *Lepomis gulosus*
bluegill sunfish, *Lepomis macrochirus*
redear sunfish, *Lepomis microlophus*
smallmouth bass, *Micropterus dolomieui*
largemouth bass, *Micropterus salmoides*
white crappie, *Pomoxis annularis*
black crappie, *Pomoxis nigromaculatus*
threadfin shad, *Dorosoma petenense*
sculpin, *Cottus* sp.
goldfish, *Carassius auratus*
common carp, *Cyprinus carpio*
hitch, *Lavina exilicauda*
hardhead, *Mylophardon chrysoleucas*
golden shiner, *Notemigonus crysoleucas*
red shiner, *Notropis lutrensis*
fathead minnow, *Pimephales promelas*
Sacramento splittail, *Pogonichthys macrolepidotus*
Sacramento squawfish, *Ptychocheilus grandis*
Sacramento blackfish, *Orthodon microlepidotus*
tule perch, *Hysterocarpus traski*
threespine stickleback, *Gasterosteus aculeatus*
white catfish, *Ictaluras catus*
black bullhead, *Ictaluras melas*
brown bullhead, *Ictaluras nebulosus*
channel catfish, *Ictaluras punctatus*
striped bass, *Morone saxatilis*
bigscale logperch, *Percina macrolepida*
lamprey, *Lampetra* sp.
mosquitofish, *Gambusia affinus*
chinook salmon, *Oncorhynchus tshawytscha*
rainbow trout, *Oncorhynchus mykiss*
white sturgon, *Acipenser transmontanus*
American shad, *Alosa sapidissima*

SOURCE: Saiki 1984; Moyle 1976

SAN JOAQUIN RIVER BASIN MAMMALS (partial list)

mule deer, *Odocoileus hemionus*
coyote, *Canis latrans*
mountain lion, *Felis concolor*
bobcat, *Lynx rufus*
gray fox, *Urocyon cinereoargenteus*
Virginia opossum, *Didelphus virginiana*
raccoon, *Procyon lotor*
badger, *Taxidea taxus*
striped skunk, *Mephites mephites*
spotted skunk, *Spilogale putorius*
long-tailed weasel, *Mustela frenata*
muskrat, *Ondatra zibethicus*
beaver, *Castor canadensis*
ringtail cat, *Bassaricus astutus*
Audubon cottontail, *Sylvilagus audubonii*
California ground squirrel, *Spermophilus beecheyi*
western gray squirrel, *Sciurus griseus*
Botta's pocket gopher, *Thomomys bottae*
broad-banded mole, *Scapanus latimanus*
ornate shrew, *Sorex ornatus*
California bat, *Myotis thysanodes*
fringed bat, *Myotis californicus*
small-footed bat, *Myotis leibii*
Yuma bat, *Myotis yumanensis*
hoary bat, *Myotis cinereus*
red bat, *Lasiurus borealis*
big brown bat, *Eptesicus fuscus*
Brazilian free-tailed bat, *Tadarida brasiliensis*
Heermann kangaroo rat, *Dipodomys heermani*
harvest mouse, *Reithrodontomys megalotus*
parasitic mouse, *Peromyscus californicus*
deer mouse, *Peromyscus maniculatus*
brush mouse, *Peromyscus boylii*
pinon mouse, *Peromyscus truei*
San Joaquin pocket mouse, *Perognathus inornatus*
dusky-footed wood rat, *Neotoma fuscipes*

SOURCES: Counties of Madera et al. 1986; Hubbard 1941

SAN JOAQUIN RIVER BASIN REPTILES AND AMPHIBIANS (partial list)

California newt, *Taricha torosa*
California slender salamander, *Batrachoseps attenuatus*
western toad, *Bufo boreas*
Pacific tree frog, *hyla regilla*
red-legged frog, *Rana aurora*
bullfrog, *Rana catesbeiana*
foothill yellow-legged frog, *Rana boylei*
western pond turtle, *Clemmys marmorata*
California whiptailed lizard, *Cnemidophorus tigris*
western fence lizard, *Sceloporus occidentalis*
side-blotched lizard, *Uta stansburiana*
Gilbert's skink, *Eumeces gilberti*
southern alligator lizard, *Gerrhonotus multicarinatus*
northern alligator lizard, *Gerrhonotus coeruleus*
giant garter snake, *Thamnophis gigas*
sharp-tailed snake, *Cotia tenuis*
California night snake, *Typsiglena torquata*
racer, *Coluber constrictor*
gopher snake, *Pituophis melanoleucus*
California king snake, *Lampropeltis getulus*
garter snake, *Thamnophis sirtalis*
red racer, *Masticophus* sp.
western rattlesnake, *Crotalus viridis*

SOURCES: County of Madera et al. 1986; Hubbard 1941

C-104585

ATTACHMENT 2

FWS ENDANGERED SPECIES LETTER

ENCLOSURE A

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CANDIDATE SPECIES THAT MAY OCCUR IN THE AREA OF THE PROPOSED SAN JOAQUIN RIVER MAINSTEM AND TRIBUTARIES STUDY
(1-1-92-SP-705, MAY 15, 1992)

Listed Species

Reptiles
blunt-nosed leopard lizard, *Gambelia silus* (E)

Birds
bald eagle, *Haliaeetus leucocephalus* (E)
American peregrine falcon, *Falco peregrinus anatum* (E)
Aleutian Canada goose, *Branta canadensis leucopareia* (E)

Mammals
San Joaquin kit fox, *Vulpes macrotis mutica* (E)
Fresno kangaroo rat, *Dipodomys nitratoides exilis* (E)

Invertebrates
valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Plants
California jewelflower, *Caulanthus californicus* (E)
Hoover's wooly-star, *Eriastrum hooveri* (T)
palmate-bracted bird's-beak, *Cordylanthus palmatus* (E)

Proposed Species

Reptiles
giant garter snake, *Thamnophis couchi* (PE)

Birds
western snowy plover, coastal population, *Charadrius alexandrinus nivosus* (PT)

Candidate Species

Amphibians
California tiger salamander, *Ambystoma californiense* (2)
California red-legged frog, *Rana aurora draytonii* (1•)
western spadefoot toad, *Scaphiopus hammondi hammondi* (2R)

Reptiles
western pond turtle, *Clemmys marmorata marmorata* (2)

Birds

tricolored blackbird, *Agelaius tricolor* (2)
ferruginous hawk, *Buteo regalis* (2)
white-faced ibis, *Plegadis chihi* (2)
mountain plover, *Charadrius montanus* (2)
loggerhead shrike, *Lanius ludovicianus* (2)
California horned lark, *Eremophila alpestris actia* (2)

Mammals

Pacific western big-eared bat, *Plecotus townsendii townsendii* (2)
Nelson's antelope ground squirrel, *Ammospermophilus nelsoni* (2)
San Joaquin Valley woodrat, *Neotoma fuscipes riparia* (2)
riparian brush rabbit, *Sylvilagus bachmani riparius* (1)

Invertebrates

vernal pool branchinecta, *Branchinecta lynchi* (1•)
California linderiella, *Linderiella occidentalis* (1•)
Conservancy fairy shrimp, *Branchinecta conservatio* (1)
Ciervo aegialian scarab beetle, *Aegialia concinna* (1)
San Joaquin dune beetle, *Coelus gracilis* (1)

Plants

forked fiddleneck, *Amsinckia furcata* (2)
heartscale, *Atriplex cordulata* (2)
valley spearscale, *Atriplex joaquiniana* (2)
Lost Hills saltbush, *Atriplex vallicola* (2)
Hoover's rosinweed, *Calycadenia hooveri* (2)
Mt. Hamilton harebell, *Campanula sharsmithiae* (2)
slough thistle, *Cirsium crassicaule* (2)
beaked clarkia, *Clarkia rostrata* (2)
hispid bird's-beak, *Cordylanthus mollis* ssp. *hispidus* (2)
Mt. Hamilton coreopsis, *Coreopsis hamiltonii* (2)
recurved larkspur, *Delphinium recurvatum* (2)
delta coyote-thistle, *Eryngium racemosum* (2)
spiny-sepaled coyote-thistle, *Eryngium spinosepalum* (2)
diamond-petaled poppy, *Eschscholzia rhombipetala* (2)
talus fritillary, *Fritillaria falcata* (2)
legenere, *Legenere limosa* (2)
red-flowered lotus, *Lotus rubriflorus* (2)
Merced monardella, *Monardella leucocephala* (1*)
Colusa grass, *Neostapfia colusana* (1)
San Joaquin orcutt grass, *Orcuttia inaequalis* (1)
pilose orcutt grass, *Orcuttia pilosa* (1)
fleshy owl's-clover, *Orthocarpus campestris* var. *succulentus* (2)
Merced phacelia, *Phacelia ciliata* var. *opaca* (2)
Mt. Diablo phacelia, *Phacelia phacelioides* (2)
hairless allocarya, *Plagiobothrys glaber* (2)
Mt. Hamilton jewelflower, *Streptanthus callistus* (2)
Arburua Ranch jewelflower, *Streptanthus insignis* ssp. *lyonii* (2)
caper-fruited tropidocarpum, *Tropidocarpum capparideum* (2*)
Greene's orcutt grass, *Tuctoria greenei* (1)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Fish and Wildlife Enhancement
Sacramento Field Office
2800 Cottage Way, Room E-1803
Sacramento, California 95825-1846

TAKE PRIDE IN AMERICA

In Reply Refer To:
1-1-92-SP-705

May 15, 1992

Mr. Walter Yep
Chief, Planning Division
U.S. Army Corps of Engineers, Sacramento
1325 J Street
Sacramento, California 95814-2922

Subject: Species List for the Proposed San Joaquin River Mainstem and Tributaries Study

Dear ~~Mr. Yep~~ Walter:

As requested by letter from your agency dated April 13, 1992, you will find enclosed a list of the proposed and listed endangered and threatened species that may be present in the subject project area. (See Enclosure A.) This list fulfills the requirement of the Fish and Wildlife Service to provide a species list pursuant to Section 7(c) of the Endangered Species Act, as amended.

Some pertinent information concerning the distribution, life history, habitat requirements, and published references for the listed species is also attached. This information may be helpful in preparing the biological assessment for this project, if one is required. Please see Enclosure B for a discussion of the responsibilities Federal agencies have under Section 7(c) of the Act and the conditions under which a biological assessment must be prepared by the lead Federal agency or its designated non-Federal representative.

Formal consultation, pursuant to 50 CFR § 402.14, should be initiated if you determine that a listed species may be affected by the proposed project. If you determine that a proposed species may be adversely affected, you should consider requesting a conference with our office pursuant to 50 CFR § 402.10. Informal consultation may be utilized prior to a written request for formal consultation to exchange information and resolve conflicts with respect to a listed species. If a biological assessment is required, and it is not initiated within 90 days of your receipt of this letter, you should informally verify the accuracy of this list with our office.

Also, for your consideration, we have included a list of the candidate species that may be present in the project area. (See Enclosure A.) These species are currently being reviewed by our Service and are under consideration for possible listing as endangered or threatened. Candidate species have no protection under the Endangered Species Act, but are included for your

C-104589

consideration as it is possible that one or more of these candidates could be proposed and listed before the subject project is completed. Should the biological assessment reveal that candidate species may be adversely affected, you may wish to contact our office for technical assistance. One of the potential benefits from such technical assistance is that by exploring alternatives early in the planning process, it may be possible to avoid conflicts that could otherwise develop, should a candidate species become listed before the project is completed.

Please contact Peggie Kohl of this office at (916) 978-4866 if you have any questions regarding the enclosed list or your responsibilities under the Endangered Species Act.

Sincerely,

Wayne S. White
Field Supervisor

Enclosures

cc: FWS-SFO (Federal Projects), Sacramento, CA