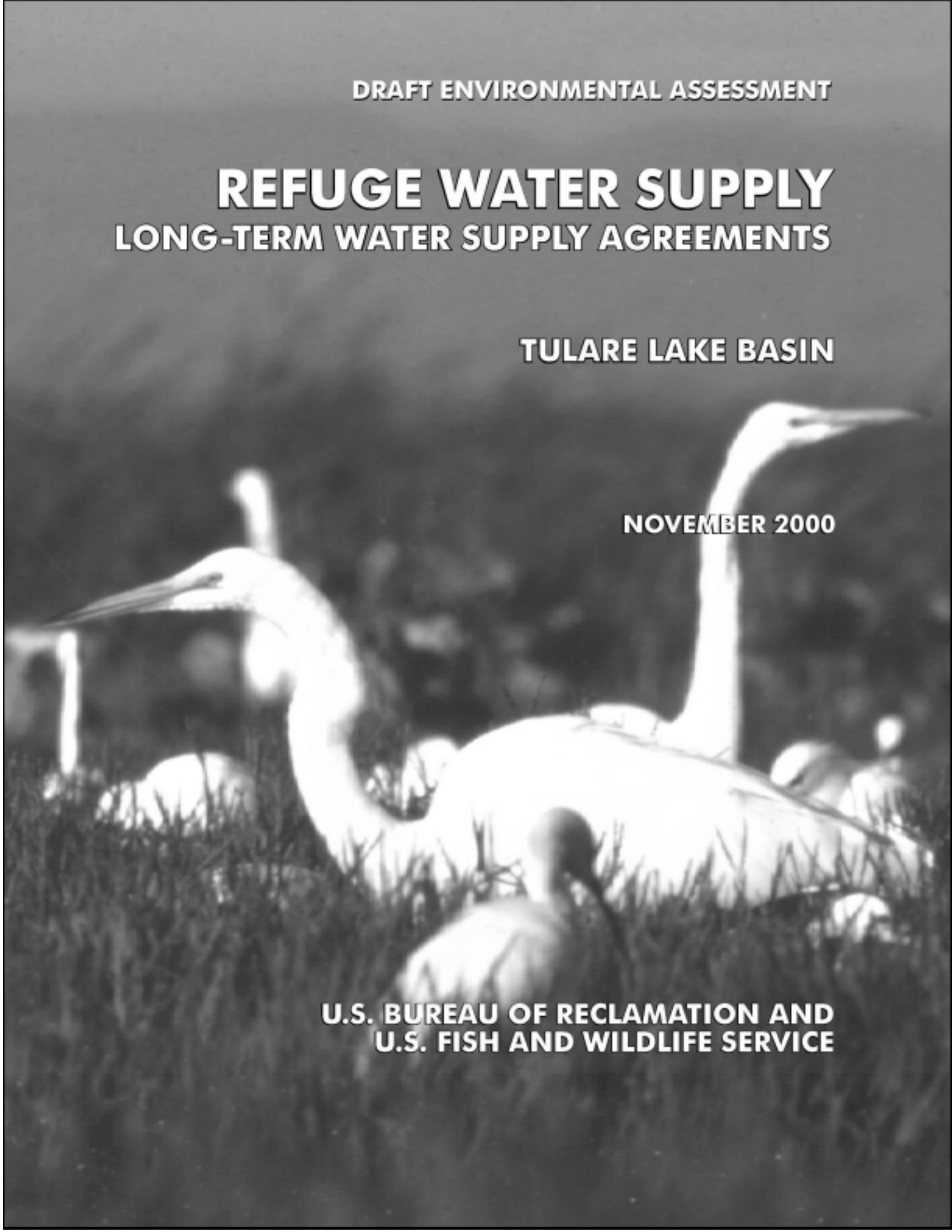
DRAFT ENVIRONMENTAL ASSESSMENT

REFUGE WATER SUPPLY
LONG-TERM WATER SUPPLY AGREEMENTS

TULARE LAKE BASIN



NOVEMBER 2000

U.S. BUREAU OF RECLAMATION AND
U.S. FISH AND WILDLIFE SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

MID-PACIFIC REGION

SACRAMENTO, CALIFORNIA

FINDING OF NO SIGNIFICANT IMPACT

REFUGE WATER SUPPLY – LONG-TERM AGREEMENTS

TULARE LAKE BASIN

Recommended: _____ _____
Planning Manager Date

Concur: _____ _____
Regional Environmental Officer Date

Approved: _____ _____
Regional Resource Manager Date

FONSI No. _____

FINDING OF NO SIGNIFICANT IMPACT

REFUGE WATER SUPPLY – LONG-TERM AGREEMENTS

TULARE LAKE BASIN

Lead Agency:

U.S. Bureau of Reclamation
2800 Cottage Way
Sacramento, California 95825-1898

BACKGROUND

The U.S. Department of the Interior Bureau of Reclamation (Reclamation) proposes to enter into long-term refuge water supply contracts/agreements with the U.S. Fish and Wildlife Service (Service) and the California Department of Fish and Game (CDFG), pursuant to Sections 3406(d)(1) and 3406(d)(2) of Title 34 of Public Law 102-575 of the Central Valley Project Improvement Act (CVPIA). These sections of the CVPIA require the provision of firm water supplies to specified National Wildlife Refuges (NWRs), State Wildlife Areas (WAs), and private wetlands in the Grassland Resource Conservation District (collectively referred to as "refuges"). Providing firm water supplies under this project would allow for optimum habitat management on the existing refuge lands. Reclamation is the federal Lead Agency for the preparation of this Environmental Assessment (EA) under the National Environmental Policy Act (NEPA). The proposed federal action is for the execution of the following water service agreement:

- A Memorandum of Understanding between Reclamation and the Service for delivery of water to the Kern and Pixley NWRs

An Environmental Assessment (EA), incorporated by reference, was prepared between January and November, 2000, to disclose any potential environmental impacts in accordance with the National Environmental Policy Act (NEPA).

FINDINGS

In accordance with NEPA and consistent with the EA, the Mid-Pacific Regional Office of Reclamation has found that implementing the proposed refuge water supply agreement is not a major federal action that would significantly affect the quality of the human environment, and that an Environmental Impact Statement is therefore not required.

The following discussion provides the rationale why the impacts of implementing the refuge water supply agreement will not be significant:

1) The expected changes to on-refuge habitats resulting from implementation of the refuge water supply agreement will not adversely affect special-status fish, wildlife, or plant species.

2) On-refuge water quality and the quality of waters downstream of the refuges will not be adversely affected by implementation of the refuge water supply agreement.

3) Conditions on adjacent farmlands will not change as a result of implementing the refuge water supply agreement.

4) Changes to on-refuge habitats resulting from implementing the refuge water supply agreement will not change the recreation opportunities provided by the refuges.

5) Regional economic conditions will not change as a result of implementing the refuge water supply agreement.

6) Social conditions in the general vicinity of the refuges will not change as a result of implementing the refuge water supply agreement.

7) Changes to on-refuge habitats resulting from implementing the refuge water supply agreement will not change the visual/aesthetic values provided by the refuges.

8) Cultural resource values of the refuges, or potentially found on the refuges, will not be affected by implementing the refuge water supply agreement.

9) Changes to the refuges resulting from implementing the refuge water supply agreement will not affect the use of power by the refuges.

10) Implementing the refuge water supply agreement will not affect Indian Trust Assets.

11) Implementing the refuge water supply agreement will not disproportionately affect minority or low-income populations and communities.

Contents

Attachments

Appendix

Tables

Figure

Section 1: Purpose and Need

SECTION 1

Purpose and Need

1.1 Introduction

The U.S. Department of the Interior, Bureau of Reclamation (Reclamation) proposes to enter into long-term water supply agreements with the U.S. Fish and Wildlife Service (Service) pursuant to Sections 3406(d)(1) and 3406(d)(2) of Title 34 of Public Law 102-575, the Central Valley Project Improvement Act (CVPIA). These sections of the CVPIA require the provision of firm water supplies to specified National Wildlife Refuges (NWRs), State Wildlife Areas (WAs), and private wetlands in the Grassland Resource Conservation District (RCD) (collectively referred to as "refuges"). Providing firm water supplies under this project would allow for optimum habitat management on the existing refuge lands. Reclamation is the federal Lead Agency for the preparation of this Environmental Assessment (EA) under the National Environmental Policy Act (NEPA).[1] The proposed federal action is for the execution of the following water service agreement:

- A Memorandum of Understanding between Reclamation and the Service for delivery of water to the Kern and Pixley NWRs.

Reclamation is also undertaking concurrent actions to enter into long-term water supply agreements per the CVPIA for refuges in the Sacramento River and San Joaquin River basins of the Central Valley. Separate environmental documents are being prepared for these two study areas.

1.2 History of Refuge Water Supply Planning

1.2.1 The Pacific Flyway and Central Valley Wetlands

The Central Valley lies at the southerly end of the Pacific Flyway migratory route. In pre-settlement times, it provided ideal wintering habitat and attracted large numbers of waterfowl. The Pacific Flyway is the westernmost of North America's four flyways, or migration routes, which are defined as definite geographic regions with breeding grounds in the north, wintering grounds in the south, and a system of migration routes in between. The Pacific Flyway encompasses territory in three countries: northern and western Canada, Alaska and all states west of the Rocky Mountains in the U.S., and western Mexico.

The Service ranks Central Valley wetland habitat as one of the top five habitats in the U.S. Historically, the Central Valley contained approximately 4 million acres of wetlands. Approximately 1.5 million acres located in the Sacramento/San Joaquin River Delta and the Tulare Basin were permanent marshes, while the remaining 2.5 million acres were seasonal wetlands created by winter rains and spring snow melt from the Sierra Nevada. Today, approximately 300,000 acres remain; 100,000 acres are publicly owned (federal and state

[1] This EA determines that the project would not cause a substantial change in the human environment and thus does not require preparation of an Environmental Impact Statement.

refuges) and 200,000 acres are privately owned (including private duck clubs). The remaining 300,000 acres provide wintering habitat for 60 percent of the Pacific Flyway's current waterfowl population and migration habitat for an additional 20 percent of the population. Altogether, nearly 10 to 12 million ducks and geese, along with millions of other water birds, winter in or pass through the Central Valley. However, the number of waterfowl using the Central Valley has declined 40 to 50 percent over the last 30 years. Maintaining the Pacific Flyway for waterfowl depends largely on maintaining critical wetland habitat in the Central Valley.

The Migratory Bird Conventions of 1916 and 1936 provided some of the first protection for waterfowl and other migratory birds. These Conventions are treaties between the U.S. and Canada and the U.S. and Mexico, respectively. The Conventions established protection for all species of migratory birds in North America except in regulated hunting seasons for game birds. The Conventions also provided the basic foundation for cooperative waterfowl management programs. In accordance with these treaties, and in recognizing the importance of waterfowl and wetlands and the need for international cooperation to help in the recovery of a shared resource, the Canadian and U.S. governments developed a strategy to restore waterfowl populations through habitat protection, restoration, and enhancement. The strategy was described in the North American Waterfowl Management Plan. The North American Waterfowl Management Plan was signed in 1986 by the Canadian Minister of the Environment and the U.S. Secretary of the Interior and was updated in 1994 to include the Republic of Mexico.

The goals of the North American Waterfowl Management Plan are accomplished through joint ventures composed of individuals, corporations, conservation organizations, and local, state, and federal agencies. There are currently 11 habitat joint ventures in the U.S. and three in Canada, including the Central Valley Habitat Joint Venture. The Central Valley Habitat Joint Venture established the following six broad goals:

- Enhance the natural resource values on the remaining existing wetland areas (approximately 300,000 acres)
- Enhance 443,000 acres of private agricultural lands for feeding and nesting waterfowl
- Protect 80,000 acres of existing wetlands through perpetual easement or fee title purchase
- Restore and protect 120,000 acres of former wetlands
- Secure 402,450 acre-feet of water for NWRs and WAs in the Central Valley and the Grassland RCD
- Secure Central Valley Project power for the NWRs, State WAs, the Grassland RCD, and other private and public lands dedicated to wetland management

1.2.2 Wetland Water Supply Planning

Securing a reliable water supply of sufficient quality has long been recognized as an important component for sustaining wetland habitats in the Central Valley and the waterfowl of the Pacific Flyway and other wildlife species that depend on wetland habitat. As early as 1950, state and federal resource agencies started investigating ways to maintain

wetland habitat, with a specific focus on providing reliable water supplies to wetland habitat areas. Numerous federal and state planning efforts regarding refuge water supplies followed. These include:

- Waterfowl Conservation in the Lower San Joaquin Valley (Reclamation, 1950)
- Fish and Wildlife Problems, Opportunities, and Solutions: Total Water Management Study for the Central Valley Basin, California (Reclamation, 1978)
- Water Availability Study for California Wetlands (Service, 1978a)
- Concept Plan for Waterfowl Wintering Habitat Preservation (Service, 1978b)
- A Plan for Protecting, Enhancing, and Increasing California's Wetlands for Waterfowl (California Department of Fish and Game, 1983)
- Central Valley Fish and Wildlife Habitat Management Study: New Waterfowl Habitat Potential within the Central Valley (Reclamation, 1986)
- Central Valley Habitat Joint Venture Implementation Plan (Service, 1990)

All of these documents describe Central Valley wetlands as having declined significantly; they submit that reliable water supplies have not been completely or consistently available. Two 1989 reports, described below, provided the basis for the water supply requirements prescribed by Sections 3406(d)(1) and 3406(d)(2) of the CVPIA.

Report on Refuge Water Supply Investigations

In the early 1980s, Reclamation initiated a refuge water supply study to investigate and identify potential sources and delivery systems for providing dependable water supplies to 14 Central Valley refuges. With assistance from the Service and California Department of Fish and Game (CDFG), this investigation was summarized in the *Report on Refuge Water Supply Investigations, Central Valley Hydrologic Basin, California* (Reclamation, 1989). The 1989 report identified the historic average annual water supplies and the water supplies required for optimal habitat management for each refuge. The CVPIA adopted, by reference, the dependable water supplies from the 1989 report as the specific quantities of water to be provided to the refuges.

Central Valley Refuges identified in the *Report on Refuge Water Supply Investigations*:

- Sacramento NWR
- Delevan NWR
- Colusa NWR
- Sutter NWR
- Gray Lodge WA
- San Luis NWR
- Kesterson NWR
- Merced NWR
- Los Banos WA
- Volta WA
- Grassland RCD
- Mendota WA
- Kern NWR*
- Pixley NWR*

*Considered in this EA.

San Joaquin Basin Action Plan/Kesterson Mitigation Plan

The 1989 *Report on Refuge Water Supply Investigations* identified the reliable water supplies needed for several refuges in the San Joaquin Valley. Reclamation (1989) also discussed several of the refuge areas in the *San Joaquin Basin Action Plan/Kesterson Mitigation Plan* (Action Plan). The Action Plan discussed wetland restoration on several biologically sensitive private lands adjacent to the state and federal refuges. The Action Plan was

prepared to implement the objectives of the Central Valley Habitat Joint Venture in the San Joaquin Valley (including providing reliable water supplies) and to meet the long-term mitigation requirements for the selenium-contaminated Kesterson Reservoir. Pursuant to the Action Plan, most of the private lands studied in the report have been acquired and integrated into the existing federal and state refuge system. The water supplies necessary for full habitat development and management on these acquired parcels were identified in the Action Plan and were adopted by reference into the CVPIA. The *San Joaquin Basin Action Plan/Kesterson Mitigation Plan* is discussed in more detail in the EA prepared for long-term refuge water service agreements in the San Joaquin River Basin.

1.3 Purpose and Need for the Proposed Action

The purpose of the Proposed Action is to execute long-term refuge water supply agreements, pursuant to the CVPIA, for the Kern and Pixley NWRs. These agreements will define the terms and conditions for annual water deliveries to the refuges. The need for the Proposed Action is to provide firm, reliable water supplies of suitable quality to the refuges to contribute to habitat maintenance and improvement efforts along the Pacific Flyway.

The purposes of the CVPIA are identified in Section 3402 of the CVPIA; they include the protection, restoration, and enhancement of fish, wildlife, and associated habitats in the Central Valley and the achievement of a reasonable balance among competing demands for use of Central Valley Project (CVP) water. CVPIA directives regarding wildlife refuges are found in Section 3406(d) of the Act, which begins as follows:

> *In support of the objectives of the Central Valley Habitat Joint Venture and in furtherance of the purposes of this title, the Secretary shall provide, either directly or through contractual agreements with other appropriate parties, firm water supplies of suitable quality to maintain and improve wetland habitat areas on units of the National Wildlife Refuge System in the Central Valley of California; on the Gray Lodge, Los Banos, Volta, North Grasslands, and Mendota state wildlife management areas; and on the Grassland Resource Conservation District in the Central Valley of California.*

The proposed long-term agreements will be implemented in accordance with Sections 3406(d)(1) and 3406(d)(2) of the CVPIA. Section 3406(d)(1) requires the Secretary of the Interior to immediately (that is, upon enactment of the CVPIA) provide specific quantities of water to the refuges. The CVPIA indicates that long-term contractual agreements should be developed for water provided under Section 3406(d)(1). For the refuges considered in this EA, the water supplies required pursuant to Section 3406(d)(1) are for "Level 2" supplies. These supplies were defined in the 1989 *Report of Refuge Water Supply Investigations* as the average annual water supplies delivered to the refuge boundaries from 1977 through 1984 (Table 1-1). The CVPIA requires delivery of this water in all year types except critically dry water year conditions, as determined by Reclamation. In the case of a critically dry water year, the Secretary of the Interior may reduce the Level 2 refuge water supplies by up to 25 percent.

Section 3406(d)(2) of the CVPIA refers to "Level 4" refuge water supplies, which is the amount of water required for optimal habitat management of the existing refuge lands identified in the 1989 *Report on Refuge Water Supply Investigations* (Table 1-1). The increment of water above Level 2 to meet Level 4 supplies must be acquired from voluntary sources

(e.g., willing sellers). Section 3406(d)(2) requires that, upon enactment of the CVPIA, Level 4 water be provided in 10 percent cumulative increments per year, with full Level 4 supplies provided after 10 years. Reclamation has been acquiring incremental amounts of Level 4 water on a short-term basis from willing sellers since 1992 and expects to acquire and provide full Level 4 supplies to the refuges by 2002. The long-term water service agreements would provide for the delivery of the total water supply required by Sections 3406(d)(1) and 3406(d)(2).

TABLE 1-1
Annual Level 2 and Level 4 Refuge Water Supplies for Tulare Lake Basin Refuges

	Water Supplies (acre-feet)		
Refuge	**Level 2[a]**	**Level 4 Increment[a]**	**Total**
Kern NWR	9,950	15,050	25,000
Pixley NWR	1,280	4,720	6,000

[a] Level 2 and 4 water supplies needed on the refuge per the *Report on Refuge Water Supply Investigations* (Reclamation, 1989). The amount of water diverted to meet these demands at the refuge boundaries will be greater because of the loss of water during conveyance.

1.4 Public Scoping

The three environmental documents for the Refuge Water Supply–Long-Term Agreement project were the subject of a scoping process held from November 30, 1999, through January 7, 2000. On November 30, 1999, Reclamation published a Notice of Intent in the Federal Register that notified the public of the proposal, announced the dates and locations of four public meetings, and solicited public comments. Public notification was also made through direct mailing of the Notice of Intent to approximately 80 stakeholders and by issuance of a press release. Interested parties were encouraged to attend the scoping meetings to provide verbal or written comments. Given the nature of the project and the large geographic area covered, scoping meetings were held in the general vicinity of the refuges (Willows and Los Banos) to attract local interest and in metropolitan areas (Oakland and Sacramento) to attract interest group and agency comments.

The comments provided during the scoping process and Reclamation's responses can be found in the Scoping Report prepared for the project (on file with Reclamation).

Section 2: Background

SECTION 2

Background

The two NWRs evaluated in this EA are the Kern and Pixley NWRs, located in Kern and Tulare counties, respectively, in the Tulare Lake Basin. The two refuges are managed collectively by the Service as the Kern NWR Complex (Figure 2-1). The Tulare Lake Basin is primarily agricultural and rural. At one time the study area supported vast wetland habitats for migrating waterfowl. Although much of this land has been converted to agricultural use, small areas of wetland habitat remain.

FIGURE 2-1
Tulare Lake Basin Refuges

The Kern and Pixley NWRs were created to provide habitat for migratory waterfowl. Because of its strategic location along the Pacific Flyway, the Kern NWR Complex serves as winter habitat for thousands of early migrant pintail ducks that once concentrated in the Tulare Lake Basin in August and September. It also serves as a major wintering area for green-winged teal and northern shovelers (Service, 1986a).

Regional and Pacific Flyway objectives for the Central Valley's waterfowl population are to restore waterfowl populations to the average level that occurred from September through

January in the years 1972 to 1977. Specific objectives for the southern San Joaquin Valley, including the Kern and Pixley NWRs, reflect these broader goals. Kern NWR has supported approximately 30 percent of the southern San Joaquin Valley wintering waterfowl population. However, with the loss of other wetland habitat in southern San Joaquin Valley, the Service estimates that Kern NWR must support closer to 40 percent of the future population to recover the waterfowl population to the 1972 through 1977 levels. For Pixley NWR, the Service has set the objective that the refuge should support approximately 5 percent of the southern San Joaquin Valley wintering waterfowl population (Service, 1986b).

2.1 Kern National Wildlife Refuge

The Kern NWR was created by the Migratory Bird Conservation Commission in 1961. The approximately 10,600-acre refuge is located 6 to 7 miles east of Interstate 5, 35 miles northwest of Bakersfield, and 19 miles west of Delano, in northern Kern County.

The Kern NWR was established to restore a part of the wetland habitat lost because of the drainage of Buena Vista, Kern, Goose, and Tulare lakes for agricultural use. Nearby land uses include wetlands, croplands, and uplands. Management of Kern NWR has four objectives (Service, 1986a):

- Provide wintering and migration habitat for waterfowl and water birds
- Preserve and improve habitats that support the endangered blunt-nosed leopard lizard, San Joaquin kit fox, and other endangered and sensitive species
- Maintain populations and habitats for native plants and animals
- Provide for public use that is compatible with the refuge's and Service's objectives and encourages visitors' environmental understanding

2.1.1 Pre-CVPIA Water Supplies

No appropriative or riparian water rights exist for Kern NWR. Before passage of the CVPIA, Kern NWR obtained water from Poso Creek and through annual contracts for State Water Project water from Kern County Water Agency. Groundwater was used to supplement these water supplies. Because of inconsistent availability, none of the water supplies available to Kern NWR was considered reliable.

In normal water years, water from surrounding streams and water delivery systems provided valley farmers with irrigation water. Excess water sometimes reached the refuge, although usually the refuge had to purchase water or pump groundwater from deep wells. In dry years, surface water had to be purchased or groundwater was pumped. During wet years, the refuge was naturally flooded by runoff from surrounding areas (Service, 1986a). Poso Creek, which terminates at the refuge, carries flood waters to the refuge (Reclamation, 1989). The Service has an agreement with the Pond-Poso Conservation District to receive all flood waters that reach the refuge via Poso Creek (Reclamation, 1989). These occasional flood flows were used on the refuge to create wetland habitat.

In the past, the refuge has purchased water from Reclamation and the Kern County Water Agency. Water purchased from the Kern County Water Agency was State Water Project

water delivered through the California Aqueduct to Buena Vista Water Storage District under annual contracts (Reclamation, 1992). Water purchased from the Kern County Water Agency constituted most of Kern NWR's water supply (Reclamation, 1989) and amounted to approximately 9,950 acre-feet per year.

Nine groundwater wells supplied water to the refuge until the early 1970s, when a receding water table, coupled with escalating energy costs, led to the discontinued use of three of the wells. The remaining six wells have been operated on an as-needed basis in conjunction with the purchase of State Water Project water (Service, 1986a).

Habitat management has been hindered by the unreliable and highly variable water supplies. As a result, the amount, duration of availability, and quality of wetland habitat on Kern NWR has varied dramatically from year to year, depending on water availability. Given the limited amount of water, water conservation methods, such as land-leveling and the use of contour dikes, have helped use limited water resources to create the greatest possible wetland habitat. The moist soil units on Kern NWR were leveled to increase the production of high-carbohydrate crops, such as swamp timothy and watergrass. Use of the leveled moist soil units has provided more habitat for less water than in unleveled seasonal marsh units. Summer water consisting of wetland flooded from fall through early summer provides nesting habitat for sensitive species. However, in most years, no summer water has been available on Kern NWR because of limited water availability. The quantity of available summer water has varied considerably from year to year, depending on the ability to run deep wells, the availability of agricultural drainage water, and drought conditions.

2.1.2 Existing Water Supplies

Existing water supplies consist of the pre-CVPIA supplies and water supplies provided for in the CVPIA. With passage of the CVPIA, Kern NWR has been receiving Level 2 water supplies. An increasing proportion of the Level 4 increment has also been delivered to Kern NWR. However, Kern NWR does not currently have the infrastructure to receive and distribute full Level 4 deliveries. As a result, Kern NWR has accepted 50 to 60 percent of full Level 4 deliveries for the last several years, because this is the maximum the refuge can use effectively with the existing infrastructure. Facilities modifications and upgrades needed to effectively and efficiently use full Level 4 water supplies were identified as part of the refuge's Master Plan and are currently being implemented.

2.1.3 Recent Water Acquisitions

During the 1999/2000 water-service period (March 1, 1999, to February 28, 2000), Kern NWR was entitled to receive 70 percent of Level 4 water supplies. Reclamation temporarily acquired 10,228 acre-feet of water from Semitropic Water Storage District. A portion of this water was used to meet Level 4 requirements at Kern NWR, while up to 3,478 acre-feet were allocated to meet Level 2 needs. By using some of the acquired water to meet Level 2 requirements at Kern NWR, an in-kind amount of CVP water was "backed up" as federal storage in the San Luis Reservoir to meet Level 4 requirements of other San Joaquin Valley wetland areas (Reclamation, 1999).

2.2 Pixley National Wildlife Refuge

The Pixley NWR was established in 1959 and consists of approximately 6,000 acres of grasslands and wetlands. The refuge is located in southwestern Tulare County, approximately 12 miles northeast of the Kern NWR and 5 miles southwest of the community of Pixley. Portions of the Pixley NWR lie within the historic Tulare Lake Bed.

Pixley NWR was established to restore and protect wetland habitat. In addition to providing wetland habitat, Pixley NWR currently serves an important role in supporting threatened and endangered species. Approximately 4,392 acres are set aside as habitat for three endangered species, the blunt-nosed leopard lizard, the San Joaquin kit fox, and the Tipton kangaroo rat. Wetlands, riparian habitat, and croplands make up the other primary land uses on Pixley NWR. Management of Pixley NWR has three primary objectives (Service, 1986b):

- Preserve and improve habitats that support the endangered blunt-nosed leopard lizard, San Joaquin kit fox, and other endangered and sensitive species
- Maintain adequate populations of native plants and animals
- Provide habitat for migratory waterfowl and water birds, when water is available

2.2.1 Pre-CVPIA Water Supplies

The refuge has no firm surface water supplies. Water supplies used by Pixley NWR before passage of the CVPIA consisted of surface water from Deer Creek and excess water from Pixley Irrigation District. Because of inconsistent availability, none of the water supplies available to Pixley NWR were considered reliable.

Deer Creek is an intermittent stream that passes through the southeast corner of the refuge (Service, 1986b). During extremely wet years, when flood flows occur in Deer Creek, the refuge could divert surface water from the creek at check structures along the southern boundary of the refuge. However, these conditions rarely have occurred and flood flows from Deer Creek were not considered a reliable water supply. In addition, for the purpose of groundwater recharge, Pixley Irrigation District has provided excess water to a limited area of the refuge.

Groundwater has been the only reliable water available to the refuge. The groundwater is of poor quality for agricultural irrigation, but is adequate for refuge uses. The Pixley NWR previously relied almost exclusively on a single groundwater well for regular water supply. The refuge is located in an area of groundwater overdraft with groundwater levels between 100 and 200 feet below the ground surface. Still, the well has yielded approximately 1,280 acre-feet of water per year of adequate quality (Reclamation and CDFG, 1997). Well capacity is minimally sufficient to meet Level 2 needs (Reclamation and CDFG, 1997).

Wetland habitat management on Pixley NWR has been similarly constrained by unreliable and limited water availability as it was for Kern NWR. Often, Pixley NWR did not have water to flood its wetland units. Only in wet winters when the refuge received floodwaters, was good wetland habitat supported (Service, 1986b).

2.2.2 Existing Water Supplies

Since passage of the CVPIA, Pixley NWR has relied on its existing well to provide Level 2 water supplies to the refuge. None of the Level 4 increment has been delivered to Pixley NWR because of inadequate facilities to convey the water to the refuge. Alternatives for conveying Level 4 water supplies to Pixley NWR are currently being evaluated (Reclamation, 1999).

2.2.3 Recent Water Acquisitions

None of Pixley NWR's Level 4 increment has been acquired because of inadequate facilities to deliver this water to the refuge.

Section 3: Summary of Previous Environmental Documentation

SECTION 3

Summary of Previous Environmental Documentation

3.1 Introduction

The purpose of this chapter is to summarize the results of the NEPA and CEQA documents that recently have been completed for providing reliable water supplies for refuges and for providing appropriate conveyance facilities for the water supplies. These documents presented the results of evaluation of the alternatives, identified benefits and impacts, identified mitigation measures, and determined that the impacts that could not be reasonably mitigated would be acceptable due to the benefits received by the project.

The two documents completed for the Tulare Lake region refuges include the *Programmatic Environmental Impact Statement (*PEIS) for the CVPIA and the *Conveyance of Refuge Water Supply Environmental Assessment* for the South San Joaquin Valley.

It should be recognized that under each of the descriptions presented in this chapter, references to "No Action Alternative" and other alternatives are specific to the reference documents not to the alternatives described in the remaining chapters of this Environmental Assessment.

3.2 Programmatic Environmental Impact Statement

3.2.1 Overview and Use of the Programmatic Environmental Impact Statement

On October 30, 1992, the President signed into law the Reclamation Projects Authorization and Adjustment Act of 1992 (Public Law 102-575) that included Title XXXIV, the Central Valley Project Improvement Act. The CVPIA amended the previous authorizations of the CVP to include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic uses and fish and wildlife enhancement as a project purpose equal to power generation. Through the CVPIA, Interior is developing policies and programs to improve environmental conditions that were affected by operations, management, and physical facilities of the CVP. The CVPIA also includes tools to facilitate larger efforts in California to improve environmental conditions in the Central Valley and the San Francisco Bay-Delta system. The PEIS addressed potential impacts and benefits of implementing provisions of the CVPIA. The PEIS was prepared under NEPA by Reclamation and the Service.

The analysis in the PEIS was intended to disclose the probable region-wide effects of implementing the CVPIA and provide a basis for selecting a decision among the alternatives. The PEIS was developed to allow subsequent environmental documents to incorporate PEIS analysis by reference and limit the need to re-evaluate the region-wide and cumulative impacts of the CVPIA. In some cases, worst-case assumptions were used to

maximize the utility of the analysis for tiering within the scope of the impacts analyzed in the PEIS.

As the project-specific actions are considered, the lead agencies must determine if the specific impacts were adequately analyzed in the PEIS. If the actions under consideration were previously evaluated and the impacts of such actions would not be greater than those analyzed in the PEIS or would not require additional mitigation measures, the actions could be considered part of the overall program previously approved in a Record of Decision. In such a case, an administrative decision could be made that no further environmental documentation would be necessary. If a tiered document is appropriate, the tiered document may be an EIS or an EA. The tiered documents can use the PEIS by reference to avoid duplication and focus more narrowly on the new alternatives or more detailed site-specific effects. Therefore, only changes from the alternatives considered in the PEIS would be addressed in detail in the tiered documents.

3.2.2 Use of the Programmatic Environmental Impact Statement for Environmental Documentation for Refuge Water Supply Agreements

As described in the PEIS, the nature of the mandate of Section 3406(d)(1) of the CVPIA does not require compliance with NEPA before implementation, as confirmed by the Ninth Circuit Court of Appeals. Westlands Water District v. Natural Resources Defense Council, 43 F.3d 457 (9 Cir. 1994). However, the PEIS did consider three methods for hydrologic shortages of CVP water. The alternative actions for refuge water supplies are incorporated into the PEIS alternatives as part of overall CVPIA implementation, as summarized below. The PEIS did not evaluate the impacts of individual provisions of CVPIA. The PEIS evaluated the impacts of implementing the overall CVPIA program under several methodologies.

3.2.3 Programmatic Environmental Impact Statement Alternatives

The CVPIA identified six general purposes for the CVPIA and over 60 actions that taken together would achieve these purposes. Individually, specific actions would not achieve the overall objectives of the CVPIA. Therefore, the PEIS alternatives were developed to evaluate a range of actions, or programs, to meet the purposes and implement provisions of the CVPIA.

The PEIS considered a No Action Alternative, 5 Main Alternatives, including a Preferred Alternative, and 15 Supplemental Analyses.

No Action Alternative

The PEIS No Action Alternative was used as a basis for comparison of alternatives. The No Action Alternative included projects and policies that would be impacted by the CVPIA. The No Action Alternative reflected conditions in the Year 2025 if the CVPIA had not been adopted. The No Action Alternative focused on the following issue areas that were identified through the scoping process as potentially being affected by implementation of the PEIS alternatives.

Water and Power Facilities and Operations

The PEIS No Action Alternative included existing facilities and operations and projected changes in operational policies which were being evaluated concurrently. The PEIS No Action Alternative included provisions in the Long-Term CVP Operations Criteria and Plan (CVP-OCAP), Reclamation's Mid-Pacific Region guidelines, the National Marine Fisheries Service (NMFS) biological opinion for winter-run chinook salmon, the Service's biological opinion for Delta smelt, the Bay-Delta Plan Accord, minimum instream Trinity River flows of 340,000 acre-feet / year, and opening of Red Bluff Diversion Dam gates from mid-September through mid-May. No new facilities were included in the PEIS No Action Alternative unless the facilities design, approvals, and construction funding approvals were in existence.

The PEIS No Action Alternative assumed that unless groundwater was not physically available due to hydrogeologic conditions, groundwater would be used with full diversion of surface water to fully meet water demands.

The PEIS No Action Alternative assumed that CVP facilities would be operated primarily to meet water rights, environmental requirements, and water supply requirements. Hydroelectric power generation at CVP reservoirs was assumed to be incidental in the PEIS analysis.

Biological Resources

The PEIS No Action Alternative assumed implementation of programs that provide benefits and impacts to the fisheries, including the Bay-Delta Plan Accord, biological opinions for winter-run chinook salmon and delta smelt, and construction of the Shasta Temperature Control Device. These programs were existing or being prepared prior to implementation of CVPIA.

The PEIS No Action Alternative assumed implementation of current environmental requirements as defined in adopted county general plans.

The PEIS No Action Alternative also included the CVP Conservation Program. This program was developed in 1991 during the Section 7 consultation between Reclamation and the Service for the renewal of the Friant Division water contracts. As part of this consultation and a subsequent consultation on interim renewal contracts, Reclamation agreed to address endangered species issues throughout the area affected by the CVP. The primary goal of the Conservation Program is to meet the needs, including habitat needs, of threatened, endangered and species of concern in the areas affected by the CVP. The Conservation Program, along with other initiatives such as Habitat Conservation Plans, would help ensure that the existing operation of the CVP would not jeopardize listed or proposed species or adversely affect designated or proposed critical habitat.

Agricultural and Urban Land Use Projections

The PEIS No Action Alternative included projections concerning future growth and land use changes based upon projections from California Department of Water Resources Bulletin 160-93, including 45,000 acres of land projected to be retired in accordance within the San Joaquin Valley Drainage Plan study area.

CVP Water Use and Pricing

The PEIS No Action Alternative assumed that all current long-term CVP contracts would be renewed by 2025. The total contract amount was assumed to be equal to existing contract amounts if that full contract amount had been diverted by the water user within the period of 1980 through 1993 or if environmental documentation was completed to evaluate use of full water contract amounts. If the full contract amount had not been diverted in that period or environmental documentation was not completed, the contract amount was assumed to be equal to the maximum amount diverted of CVP water during the period 1980 through 1993.

The price of CVP water was assumed to be equal to the 1992 rates in 1992 dollars. The pricing of CVP water for water service contracts would be at Contract Rate under the requirements of the Reclamation Reform Act.

Refuge Water Supplies

The PEIS No Action Alternative assumed that refuge water supplies are supplied from historical water suppliers, including the CVP, SWP, tailwater return flows from upstream water users, and water rights holders. The delivery amounts assumed in the PEIS No Action Alternative for the refuges and wetlands considered in the PEIS are shown in Table 3-1. The refuges and wetlands considered in the PEIS are limited to those identified in the CVPIA as the refuges addressed in the *1989 Report on Refuge Water Supply Investigation* and the *San Joaquin Basin Action Plan*.

PEIS Alternatives

The PEIS alternatives were developed with Core Programs and Multiple Options. The Core Programs included the actions addressed by separate concurrent programs and CVPIA programs that would probably be implemented in a single manner at a programmatic level but may require specific siting analyses. The Multiple Options included actions with several implementation methods that could be considered at a programmatic level.

Core Programs Included in All Alternatives

The following Core Programs are included in all of the PEIS alternatives.

- **Renew all CVP service, water rights, and exchange contracts** - up to existing amounts (same as No Action Alternative)
- **Implement water measurement and water conservation measures** - as described in Reclamation Reform Act with Best Management Practices with measurement at point of diversion and point of use (same conservation measures but without measurement in No Action Alternative)
- **Implement non-flow improvements** - as described in the preliminary Anadromous Fish Restoration Program (no improvements in No Action Alternative)
- **Implement (b)(1) "other" program** - as the next phase of the Conservation Program (base program in No Action Alternative)
- **Upgrade Tracy and Contra Costa pumping plants fish protection facilities** - (no improvements in No Action Alternative)

- **Construct Shasta Temperature Control Device -** same as No Action Alternative
- **Complete improvements to Coleman National Fish Hatchery -** no improvements in No Action Alternative

TABLE 3-1
Refuge Water Supply and Delivery Assumptions in the PEIS No Action Alternative

Refuge	Assumed Water Supply Source	Water Supplies at Refuge Boundary (acre feet per year)	Conveyance Loss (acre feet per year)	Water Diverted for Refuge Supplies (acre feet per year)
Sacramento NWR	CVP annual contract	34,800	11,600	46,400
Delevan NWR	CVP annual contract	15,713	5,238	20,950
Colusa NWR	CVP annual contract	18,750	6,250	25,000
Sutter NWR	Return flows and periodic purchases	23,500	0	23,500
Gray Lodge WA	Groundwater, water rights, and periodic purchases.	35,400	0	35,400
San Luis Unit	CVP contract per 1990 Agreement and 1954 Act	19,000	6,333	25,333
West Bear Creek	CVP contract per 1954 Act	10,810	0	10,810
Kesterson Unit	CVP contract per 1990 Agreement and 1954 Act	10,000	0	10,000
Freitas Unit	CVP contract per 1954 Act	5,290	0	5,290
Merced Unit	Merced ID per FERC agreement	15,000	5,000	20,000
East Bear Creek Unit	Not Applicable	0	0	0
Los Banos WA	CVP contract	16,670	0	16,670
Volta WA	CVP contract, and DFG Lease Agreement	13,000	0	13,000
China Island Unit	Not Applicable	0	0	0
Salt Slough Unit	CVP contract per 1954 Act	6,000	0	6,000
Mendota WA	CVP contract. NAA amount reduced from total contract amount because weirs not modified.	18,500	0	18,500
Grasslands Resource Conservation District	CVP contract	47,800	0	47,800
Kern NWR	SWP annual contracts	9,950	0	9,950
Pixley NWR	Not Applicable	0	0	0

- **Complete habitat improvements in Clear Creek** - as described in the preliminary Anadromous Fish Restoration Program (no improvements in No Action Alternative)
- **Implement non-flow stream restoration actions to replace gravels in Central Valley streams** - as described in the preliminary Anadromous Fish Restoration Program (no improvements in No Action Alternative)
- **Complete modifications to Anderson-Cottonwood Irrigation District and Glenn-Colusa Irrigation District diversion facilities for fish protection** - no improvements in No Action Alternative
- **Improve fish passage -** no improvements in No Action Alternative
- **Implement seasonal field flooding of up to 80,000 acres to enhance waterfowl habitat** - no improvements in No Action Alternative
- **Purchase up to 30,000 acres of retired land within San Joaquin Valley Drainage Plan study area** – this area selected for purposes of PEIS analysis only (in addition to 45,000 acres purchased under the No Action Alternative)

Multiple Options Included in Different Alternatives

The following multiple options were combined into four Alternatives, 15 Supplemental Analyses, and the Preferred Alternative.

- **Implement Fish and Wildlife Actions per Sections 3406(b)(2) and (3) of CVPIA**
  - **Preferred Alternative** assumed reoperation of the CVP supplies under Section 3406(b)(2) and acquisition of water from willing sellers under Section 3406(b)(3) for improvement of flows on tributaries to the Delta, to meet portions of the Bay-Delta Plan Accord, and Delta outflow. Approximately 50 percent of the acquired water could not be exported by CVP and SWP. Acquisition of water from willing sellers is constrained by existing funding limits.
  - **Alternative 1 and Supplemental Analyses 1b through 1i** assumed reoperation of the CVP supplies under Section 3406(b)(2) for improvement of flows on tributaries to the Delta and to meet portions of the Bay-Delta Plan Accord.
  - **Supplemental Analysis 1a** assumed reoperation of the CVP supplies under Section 3406(b)(2) for improvement of flows on tributaries to the Delta, to meet portions of the Bay-Delta Plan Accord, and Delta outflow.
  - **Alternative 2 and Supplemental Analyses 2a through 2d** assumed re-operation of the CVP supplies under Section 3406(b)(2) and acquisition of water from willing sellers under Section 3406(b)(3) to improve instream flows, to meet portions of the Bay-Delta Plan Accord, and Delta outflow. Acquired water could not be exported by the CVP and SWP. Acquisition of water from willing sellers is constrained by existing funding limits.
  - **Alternative 3 and Supplemental Analysis 3a** assumed reoperation of the CVP supplies under Section 3406(b)(2) and acquisition of water from willing sellers under Section 3406(b)(3) for improvement of flows on tributaries to the Delta and to meet portions of the Bay-Delta Plan Accord. Acquired water could be exported by the

CVP and SWP. Acquisition of water from willing sellers is not constrained by existing funding limits.

- **Alternative 4 and Supplemental Analysis 4a** assumed reoperation of the CVP supplies under Section 3406(b)(2) and acquisition of water from willing sellers under Section 3406(b)(3) for improvement of flows on tributaries to the Delta, to meet portions of the Bay-Delta Plan Accord, and Delta outflow. Acquired water could not be exported by the CVP and SWP. Acquisition of water from willing sellers is not constrained by existing funding limits.
- **No Action Alternative** assumed use of CVP water to meet portions of the Bay-Delta Plan Accord.

- **Implement Water Pricing Actions**
  - **Preferred Alternative**; **Alternatives 1, 2, 3, and 4**; **and Supplemental Analyses 1a, 1b, 1d through 1f, 1h, 1i, 2a through 2c, 3a, and 4a** assumed 80 percent of contract amount at Contract Rate, top 10 percent of contract amount at Full Cost Rate, and middle 10 percent of contract amount at blended rate assuming continuation of Ability-to-Pay policy.
  - **Supplemental Analyses 1c and 2d** assumed 80 percent of contract amount at Full Cost Rate, next 10 percent of contract amount at 110 percent of Full Cost Rate, and top 10 percent of contract amount at 120 percent of Full Cost Rate assuming continuation of Ability-to-Pay policy.
  - **Supplemental Analysis 1g** assumed 80 percent of contract amount at Contract Rate, top 10 percent of contract amount at Full Cost Rate, and middle 10 percent of contract amount at blended rate without Ability-to-Pay policy.
  - **No Action Alternative** assumed 100 percent of contract amount at Contract Rate assuming continuation of Ability-to-Pay policy.
- **Modify Red Bluff Diversion Dam**
  - **Preferred Alternative** indicated that this action would be determined following additional studies.
  - **Alternatives 1, 2, 3, and 4**; **Supplemental Analyses 1a through 1h, 2a through 2d, 3a, and 4a**; **and No Action Alternative** assumed gates open mid-September through mid-May.
  - **Supplemental Analysis 1i** assumed gates open all year with a new facility to deliver water.
- **Construct Delta Fish Barriers**
  - **Preferred Alternative** indicated that this action would be determined following additional studies.

  - **Alternatives 1, 2, 3, and 4**; **Supplemental Analyses 1a, 1c through 1e, 1g through 1i, 2b through 2d, 3a, and 4a**; **and No Action Alternative** assumed non-structural barriers at Old River and Georgiana Slough.

  - **Supplemental Analyses 1b and 2a** assumed structural barriers at Old River and Georgiana Slough.

- **Provide for Water Transfers**

  - **Preferred Alternative and Supplemental Analyses 1e, 2b, 3a, and 4a** assumed CVPIA water transfers with basic CVPIA transfer fees.

  - **Alternatives 1, 2, 3, and 4**; **Supplemental Analyses 1a through 1c, 1f through 1i, 2a, and 2d**; **and No Action Alternative** assumed only non-CVPIA water transfers.

  - **Supplemental Analyses** 1f and 2c assumed CVPIA water transfers with basic CVPIA transfer fees plus $50/acre-foot fee.

- **Revegetate up to 30,000 acres Retired Lands**

  - **Preferred Alternative and Supplemental Analysis 1h** assumed revegetation and restoration of retired lands without need for water supplies.

  - **Alternatives 1, 2, 3, and 4**; **Supplemental Analyses 1a through 1g, 1i, 2a through 2d, 3a, and 4a**; **and No Action Alternative** assumed no revegetation or restoration of retired lands.

- **Refuge Water Supplies**

  - **Preferred Alternative** assumed Level 2 and 4 water supplies as shown in Table 3-2 subject to hydrologic shortages described by the 40-30-30 Index with a maximum shortage of 25 percent of the total amount.

  - **Alternative 1 and Supplemental Analyses 1a through 1c and 1e through 1i** assumed Level 2 water supplies, as shown in Table 3-3 subject to hydrologic shortages described by the Shasta criteria with a maximum shortage of 25 percent of the total amount.

  - **Supplemental Analysis 1d** assumed Level 2 water supplies, as shown in Table 3-2 subject to no hydrologic shortages.

  - **Alternatives 2, 3, and 4 and Supplemental Analyses 2a through 2d, 3a, and 4a** assumed Level 2 and 4 water supplies as shown in Table 3-2 subject to hydrologic shortages described by the Shasta criteria with a maximum shortage of 25 percent of the total amount.

  - **No Action Alternative** assumed existing water supplies at the time of adoption of CVPIA as shown in Table 3-1 subject to hydrologic shortages described by the 40-30-30 Index with a maximum shortage of 25 percent of the total amount.

TABLE 3-2
Refuge Water Supply and Delivery Assumptions in the PEIS for Level 2 and Level 4 Water Supplies in Alternatives 2,3, and 4

Refuge	Assumed Water Supply Source	Water Supplies at Refuge Boundary (acre feet per year)	Conveyance Loss (acre feet per year)	Water Diverted for Refuge Supplies (acre feet per year)
Sacramento NWR	Level 2: CVP contract. Level 4: Purchase from Sacramento River Settlement Contractors	50,000	16,667	66,667
Delevan NWR	Level 2: CVP contract. Level 4: Purchase from Sacramento River Settlement Contractors	30,000	10,000	40,000
Colusa NWR	Level 2: CVP contract	25,000	8,333	33,333
Sutter NWR	Level 2: CVP contract. Level 4: Purchase from Sacramento River Settlement Contractors	30,000	3,333	33,333
Gray Lodge WA	Water rights. Remaining Level 2: CVP contract. Level 4: Purchase from Sacramento River Settlement Contractors	44,000	6,964	50,964
San Luis Unit	Level 2: CVP contract	19,000	6,333	25,333
West Bear Creek	Level 2: CVP contract	10,810	3,603	14,413
Kesterson Unit	Level 2: CVP contract	10,000	1,147	11,147
Freitas Unit	Level 2: CVP contract	5,290	1,763	7,053
Merced Unit	Level 2: Merced River water per FERC Agreement. Level 4: Purchase from water rights holders	16,000	5,333	21,333
East Bear Creek Unit	Level 2: CVP contract exchange with Merced River water rights holders. Level 4: Purchase from water rights holders	13,295	4,432	17,727
Los Banos WA	Level 2: CVP contract. Level 4: Purchase from San Joaquin River Exchange Contractors	25,496	5,129	30,625
Volta WA	Level 2: CVP contract. Level 4: Purchase from San Joaquin River Exchange Contractors	16,000	0	16,000
China Island Unit	Level 2: CVP contract. Level 4: Purchase from San Joaquin River Exchange Contractors	10,450	1,844	12,294
Salt Slough Unit	Level 2: CVP contract. Level 4: Purchase from San Joaquin River Exchange Contractors	10,020	1,768	11,788
Mendota WA	Level 2: CVP contract. Level 4: Purchase from water rights holders	29,650	0	29,650
Grasslands Resource Conservation District	Level 2: CVP contract. Level 4: Purchase from San Joaquin River Exchange Contractors	180,000	31,765	211,765
Kern NWR	Level 2: CVP contract. Level 4: Purchase from SWP Contractors	25,000	3,736	28,736
Pixley NWR	Level 2: CVP contract. Level 4: Purchase from SWP Contractors	6,000	833	6,833

TABLE 3-3
Refuge Water Supply and Delivery Assumptions in the PEIS for Level 2 Water Supplies in Alternative 1

Refuge	Assumed Water Supply Source	Water Supplies at Refuge Boundary (acre feet per year)	Conveyance Loss (acre feet per year)	Water Diverted for Refuge Supplies (acre feet per year)
Sacramento NWR	Level 2: CVP contract	46,400	15,467	61,867
Delevan NWR	Level 2: CVP contract	20,951	6,984	27,935
Colusa NWR	Level 2: CVP contract	25,000	8,333	33,333
Sutter NWR	Level 2: CVP contract	23,500	2,611	26,111
Gray Lodge WA	Water rights. Remaining Level 2: CVP contract	35,400	5,202	40,602
San Luis Unit	Level 2: CVP contract	19,000	6,333	25,333
West Bear Creek	Level 2: CVP contract	10,810	3,603	14,413
Kesterson Unit	Level 2: CVP contract	10,000	1,147	11,147
Freitas Unit	Level 2: CVP contract	5,290	1,763	7,053
Merced Unit	Merced River water per FERC Agreement	15,000	5,000	20,000
East Bear Creek Unit	CVP contract exchange with Merced River water rights holders	8,863	2,954	11,817
Los Banos WA	Level 2: CVP contract	16,670	2,783	19,453
Volta WA	Level 2: CVP contract	13,000	0	13,000
China Island Unit	Level 2: CVP contract	6,967	1,229	8,196
Salt Slough Unit	Level 2: CVP contract	6,680	1,179	7,859
Mendota WA	Level 2: CVP contract	27,594	0	27,594
Grasslands Resource Conservation District	Level 2: CVP contract	125,000	22,059	147,059
Kern NWR	Level 2: CVP contract	9,950	1,487	11,437
Pixley NWR	Level 2: CVP contract	1,280	0	1,280

Summary of Overall Analyses of PEIS Alternatives

The alternatives considered in the PEIS were analyzed to determine the potential for adverse and beneficial impacts associated with implementation of all actions as compared to continuation of the No Action Alternative conditions. The results of this analysis are summarized in Table 3-4. The most significant changes under the alternatives as compared to the No Action Alternative were related to surface water and groundwater facilities

operations and deliveries, power generation, fishery resources, agricultural land use and economics, and waterfowl habitat.

Given the integrated nature of the PEIS alternatives, it is not possible to determine if the impacts and benefits would occur due to a specific CVPIA provision or goal. The impacts and benefits of a PEIS alternative are due to the overall implementation of CVPIA as compared to conditions without implementation of CVPIA in the No Action Alternative.

The impacts and benefits presented below for Alternative 1 include changes due to implementation of Level 2 water supplies as well as allocation of CVP water to improve fisheries. Impacts and benefits presented for Alternative 2 include changes due to implementation of Level 4 water supplies and acquisition of water from non-CVP water service contractors to improve fisheries. Impacts and benefits for Alternatives 3 and 4 primarily include changes due to acquisition and use of water from non-CVP water service contractors to improve fisheries at higher levels than under Alternative 2.

TABLE 3-4
Summary of CVPIA PEIS Analysis

Issue Area	Impacts and Benefits
Surface Water	**CVP Water Deliveries.** Under the PEIS No Action Alternative, average annual deliveries from the CVP would be 5,700,000 acre-feet/year. CVP water deliveries would decrease under most alternatives, including the Preferred Alternative, by about 10% due to allocation of CVP water to Level 2 refuge water supplies, improved fish and wildlife habitat, and reduced Trinity River exports to the Central Valley. CVP water deliveries under Supplemental Analyses 1c and 2d would decrease about 20% because users could not afford some of the CVP water. **SWP Water Deliveries.** Under the PEIS No Action Alternative, average annual deliveries from the SWP would be 3,300,000 acre-feet/year. SWP water deliveries would increase under all alternatives, including the Preferred Alternative, by 1% to 2% due to increased Delta inflows that could be exported by SWP but not necessarily by CVP. Under Alternative 3 and Supplemental Analysis 3a, SWP water deliveries would be increased by 5% due to ability to export acquired water by both CVP and SWP. Changes in SWP deliveries would not be affected by implementation of Level 2 and Level 4 water supplies. **Delta Outflows.** Delta ouflows would increase under all alternatives because a portion of the CVP water was reallocated to improve instream flows during periods that CVP and SWP pumping plants could not export the flows. Delta outflows would also increase under Alternatives 2 and 4 and the Preferred Alternative due to acquisition of water to improve Delta outflows. Delta outflows would increase by 1% to 2% in Alternatives 1, 2, and 3 and the Preferred Alternative; and over 10% under Alternative 4. Changes in Delta outflows would not be affected by implementation of Level 2 and Level 4 water supplies. **Carryover Storage in CVP Reservoirs.** Average annual carryover storage would decrease in Shasta Lake and New Melones Reservoir under all alternatives. Carryover storage in Folsom Lake would decrease under Alternative 1, and would increase in all other alternatives. Operational flexibility of San Luis Reservoir would be decreased in all alternatives. A portion of these changes are caused by implementation of Level 2 and Level 4 water supplies, however, it is not possible to determine the specific impact. **Instream Flows.** Instream flows and/or pulse flows would increase in Clear Creek, Stanislaus River, and Trinity River under all alternatives. Instream flows and/or pulse flows would increase in Tuolumne, Merced, and San Joaquin rivers in Alternatives 2, 3, and 4 and the Preferred Alternative. Instream flows would increase in Mokelumne and Yuba rivers in Alternatives 3 and 4. Changes in instream flows would not be affected by implementation of Level 2 and Level 4 water supplies.

TABLE 3-4
Summary of CVPIA PEIS Analysis

Issue Area	Impacts and Benefits
	Effects of CVPIA Refuge Water Supplies. Under the PEIS No Action Alternative, average annual deliveries to refuges would be 335,000 acre-feet/year, primarily from CVP water supplies. Refuge water supplies from CVP would increase by 233,000 acre-feet/year of deliveries for Level 2 under all alternatives including Preferred Alternative. The incremental increase for Level 4 under Alternatives 2, 3, and 4 and the Preferred Alternative would be 140,000 acre-feet/year. Level 4 supplies were assumed for the purpose of the PEIS analysis to be provided by Sacramento River Settlement Contractors, San Joaquin River Exchange Contractors, and SWP contractors. Under Supplemental Analysis 1d, annual refuge water supply deliveries would be the same in all years, including critical dry years.
Groundwater	**Average Regional Groundwater Depths.** Average regional groundwater depths under No Action Alternative would be approximately 90 to 100 feet in the Sacramento and San Joaquin valleys and 200 to 300 feet in the Tulare Lake region. Groundwater levels would decline by 1% to 3% in all regions under Alternatives 1 and 2 and the Preferred Alternative due to allocation of CVP water to Level 2 refuge water supplies, improved fish and wildlife habitat, and reduced Trinity River exports to the Central Valley. Groundwater levels would decline by 1% to 5% in all regions under Alternatives 3 and 4 due to reduced recharge from fallowed lands.
	Subsidence. Under the No Action Alternative, subsidence would continue to increase in the Sacramento Valley near Davis-Zamora and in western San Joaquin Valley and Tulare Lake region. Additional subsidence would occur in the San Joaquin Valley and Tulare Lake region under all alternatives due to the decline in groundwater levels.
CVP Power Resources	**CVP Generation.** Under the No Action Alternative, average annual energy generation at CVP facilities would be 4,935 gigawatt-hours/year. The average annual energy generation would be reduced by about 5% under all alternatives due to changes in releases from CVP reservoirs and reduced reservoir elevations in summer months due to allocation of CVP water to Level 2 refuge water supplies, improved fish and wildlife habitat, and reduced Trinity River exports to the Central Valley.
	CVP Project Use. Under the No Action Alternative, average CVP Project Use would be 1,425 gigawatts-hour/year. CVP Project Use would be reduced by about 10% under Alternatives 1, 2, and 4 and the Preferred Alternative due to reduced CVP exports from the Delta. CVP Project Use would be reduced only by 4% in Alternative 3 because CVP exports are higher in these alternatives than other alternatives.
Fisheries Resources	**Stream Flows.** Stream flow improvements would occur in Clear Creek and Sacramento, American, Stanislaus, and Trinity rivers under Alternative 1given the allocation of CVP water to improved fish and wildlife habitat to increase spring and fall flows. Additional improvements in these streams and San Joaquin River tributaries would occur under Alternatives 2, 3, and 4 and the Preferred Alternative due to water acquisition for instream habitat. Release of water for Level 2 supplies under Alternative 1 and Level 4 supplies under Alternatives 2, 3, and 4 and the Preferred Alternative would increase stream flow patterns in fall and winter months in the Sacramento and Merced rivers.
	Stream Temperatures. Decreased stream temperatures would occur in Clear Creek and Sacramento, Stanislaus, and Trinity rivers under Alternative 1 due to stream flow improvements. Additional improvement would occur under Alternatives 2, 3, and 4 and the Preferred Alternative due to water acquired to increase spring and fall flows. Water temperatures would increase in summer months in the American River under all alternatives and this would adversely affect steelhead.
	Fish Passage and Habitat Quality. Fish passage and habitat quality would improve in all alternatives due to increased instream flows, as described above, and due to structural actions that would occur in all alternatives. Reduction in diversion of acquired water under Alternatives 2, 3, and 4 and the Preferred Alternative also would reduce losses at the diversions in the Sacramento and San Joaquin river systems and improve Delta channel

TABLE 3-4
Summary of CVPIA PEIS Analysis

Issue Area	Impacts and Benefits
	flows to increase movement of larval and juvenile striped bass, delta smelt, longfin smelt, and juvenile chinook salmon. Closure of the Delta Cross Channel gates in November through January in wetter years under Alternative 4 and Preferred Alternative would improve outmigration of chinook salmon and steelhead. Additional benefits in the Sacramento River would occur under Supplemental Analysis 1i due to the opening of Red Bluff Diversion Dam gates in the summer and restoration of the river reach currently affected by Lake Red Bluff. **Delta Outflow.** Reductions in Delta pumping and increases in Delta outflow in Supplemental Analysis 1a and Alternative 4 would reduce losses and improve species survival at the Delta export pumping plants. Delta outflow also would increase in Alternative 2 and the Preferred Alternative due to the use of acquired water for increased Delta outflow.
Vegetation and Wildlife Resources	**Retired and Fallowed Agricultural Lands.** The No Action Alternative assumes retirement of 45,000 acres of land identified in the San Joaquin Valley Drainage Plan as having drainage problems. An additional 30,000 acres would be retired under all alternatives including the Preferred Alternative. Additional habitat would occur due to fallowing of 0.3 to 3% of irrigated areas in the Central Valley under the alternatives including Preferred Alternative due to allocation of CVP water to Level 2 refuge water supplies, improved fish and wildlife habitat, reduced Trinity River exports to the Central Valley and water acquisitions for instream flows and Level 4 water supplies. **Riparian Restoration.** Riparian restoration would occur along the Sacramento and San Joaquin river systems due to habitat improvements under all alternatives. Additional restoration would occur under Alternatives 2, 3, and 4 and Preferred Alternative due to acquired water under increased instream flows. **Flooded Fields.** Up to 80,000 acres of agricultural fields would be flooded to provide additional habitat for waterfowl under Alternatives 1, 2, 3, and 4 through the implementation of Incentive Payments. The CVPIA stated that this program should be funded through the Restoration Fund only through 2002. The PEIS Alternatives 1, 2, 3, and 4 assumed continued funding through 2025. The Preferred Alternative assumed no funding through the Restoration Fund in 2025, but suggested that field flooding continue. **Refuge Water Supplies.** Habitat and waterfowl population would increase under Alternative 1 due to Level 2 water supplies. Additional increases would occur under Alternatives 2, 3, and 4 and Preferred Alternative due to Level 4 water supplies.
Recreation and Recreational Economics	**Opportunities at Reservoirs.** As a result of lower surface elevations at Shasta Lake and New Melones Reservoir due to allocation of CVP water to Level 2 refuge water supplies, improved fish and wildlife habitat, and reduced Trinity River exports to the Central Valley, boating opportunities would be reduced and boat ramps would need to be extended under all alternatives. Boating opportunities would be improved due to higher reservoir levels in Folsom Lake and Lake Oroville under all alternatives including the Preferred Alternative. **Opportunities at Rivers.** As a result of increased flows in the upper Sacramento River and Stanislaus River in peak season due to allocation of CVP water to Level 2 refuge water supplies, improved fish and wildlife habitat, and reduced Trinity River exports to the Central Valley, swimming opportunities would increase under all alternatives. Lower flows in peak season on the American River would decrease swimming opportunities under all alternatives including the Preferred Alternative. Flat-water recreational opportunities near Red Bluff would decline under Supplemental Analysis 1i. Boat access may be restricted near the physical barriers in Georgiana Slough and Old River under Supplemental Analyses 1b and 2a. Increased stream flows on the San Joaquin River tributaries and San Joaquin River under Alternatives 2, 3, and 4 and the Preferred Alternative and on the Sacramento River

TABLE 3-4
Summary of CVPIA PEIS Analysis

Issue Area	Impacts and Benefits
	tributaries under Alternatives 3 and 4 and the Preferred Alternative could increase recreational opportunities. **Opportunities on Refuges.** Recreational opportunities on the refuges would increase under Alternative 1 due to Level 2 water supplies. Additional increases would occur under Alternatives 2, 3, and 4 and Preferred Alternative due to Level 4 water supplies. **Economic Impacts and Benefits.** Recreation-related expenditures would increase about 3% at reservoirs and rivers under all alternatives. Recreation-related expenditures at refuges would increase about 25% under Alternative 1 due to Level 2 water supplies, and 70% under Alternatives 2, 3, and 4 and the Preferred Alternative due to Level 4 water supplies.
Cultural Resources	**Cultural Resources at Reservoirs.** Water surface elevations would be lowered more frequently than historically at New Melones Reservoir under all alternatives including the Preferred Alternative and at Folsom Lake and Shasta Lake under the Preferred Alternative due to allocation of CVP water to Level 2 refuge water supplies, improved fish and wildlife habitat, and reduced Trinity River exports to the Central Valley. Therefore, cultural resources would be exposed more frequently to vandalism potential under all alternatives including the Preferred Alternative. **Cultural Resources along Rivers.** Construction of habitat and fish passage improvements could increase the potential for disturbance of cultural resources in the riparian corridor under all alternatives including the Preferred Alternative. Increased instream flows during some months could increase visitor use, and therefore, increase the potential for vandalism, especially in the San Joaquin River system under all alternatives including the Preferred Alternative. **Cultural Resources in Agricultural Fields.** Agricultural lands would be fallowed under Alternative 1 due to allocation of CVP water to Level 2 refuge water supplies, improved fish and wildlife habitat, and reduced Trinity River exports to the Central Valley. Additional agricultural lands would be fallowed under Alternatives 2, 3, and 4 and the Preferred Alternative due to water acquisition programs. The fallowing of agricultural land could reduce the risk of disturbance and exposure of cultural resources. **Cultural Resources at the Refuges.** Increased water supplies at the refuges under all alternatives and the Preferred Alternative would increase visitor use and the risk of vandalism. Use of Level 2 and Level 4 water supplies also could flood or increase erosion potential for cultural resources at the refuges under all alternatives, including the Preferred Alternative.
Agricultural Economics	**Irrigated Acreage and Gross Revenue.** Under the No Action Alternative, 6.6 million acres of land would be irrigated in the Central Valley by all water supplies and in the San Felipe Division by CVP water supplies. This acreage would be reduced by 0.3 to 3% under all alternatives including the Preferred Alternative due to allocation of CVP water to Level 2 refuge water supplies, improved fish and wildlife habitat, and reduced Trinity River exports to the Central Valley. A portion of the reduced CVP water deliveries would be replaced by increased groundwater pumping. Reduction in surface water supplies and increased use of groundwater to replace reduction in CVP water supplies would reduce gross revenues from $10,245,000,000/year under the No Action Alternative by 0.7 to 1.5% in the alternatives including the Preferred Alternative.
Regional Economics	**Employment**. A total employment of 15.7 million was assumed in the No Action Alternative. Under the alternatives and the Preferred Alternative, employment would be reduced by 0.02 to 0.04%, primarily in the San Joaquin River region due to allocation of CVP water to Level 2 refuge water supplies, improved fish and wildlife habitat, reduced Trinity River exports to the Central Valley, and water acquisitions for increased instream flows and Level 4 water supplies.

Impacts and Benefits of Level 2 and Level 4 Refuge Water Supplies

Due to the integrated nature of the PEIS alternatives, it is not possible to determine if the impacts and benefits would occur due to a specific CVPIA provision or goal. The impacts and benefits of a PEIS alternative are due to the overall implementation of CVPIA as compared to conditions without implementation of CVPIA in the No Action Alternative. However, it is possible to compare the results of several alternatives to identify general impacts and benefits of increasing refuge water supplies.

Impacts on Surface Water Supplies

Under the PEIS No Action Alternative, average annual deliveries to refuges would be 335,000 acre-feet / year, primarily from CVP water supplies. Refuge water supplies from CVP would increase by 233,000 acre-feet / year to 568,000 acre-feet / year for Level 2 under all alternatives including Preferred Alternative. This would result in a decrease in CVP water deliveries, however the specific amount is difficult to determine due to the integrated implementation of CVPIA provisions. The PEIS alternatives assume that the water would be diverted under the monthly patterns described in the *1989 Report on Refuge Water Supply Investigation,* and all of the return flows would be discharged from the refuges in March. The PEIS also assumed allocation of the entire amount of Level 2 water supplies from CVP water. This may overestimate the impacts to CVP users if existing non-CVP water supplies continue to be used in the future.

Allocation of CVP water for Level 2 water supplies would reduce CVP water deliveries, especially south of the Delta because the refuges have a higher water supply reliability than the agricultural or municipal and industrial CVP water service contractors. Therefore, delivery of refuge water supplies may reduce the remaining capacity in the Tracy pumping plant or San Luis Reservoir in some months, especially in Below Normal or Dry water years. Allocation of CVP water for Level 2 water supplies also would reduce the amount of CVP water available for use by water service contractors. However, it is not possible to specify the impact only due to Level 2 refuge water supplies.

The overall impact of allocating CVP water towards meeting Section 3406(b)(2) of CVPIA requirements in Alternative 1 was to allocate up to 800,000 acre-feet / year as measured by a reduction in CVP water service contract deliveries. Following the determination of the "(b)(2) Water Management" component, the analysis of Alternative 1 continued with allocation of CVP water to Level 2 water supplies and reduction of CVP water supplies due to increased instream flows in the Trinity River. The overall impact of Alternative 1 (Revised Alternative 1 as presented in the Final PEIS) was to reduce water deliveries to CVP water users by 5 percent on an average annual basis and up to 8 percent in dry periods. The refuge water supplies were reduced by up to 25 percent in dry periods in accordance with the 40-30-30 Index in the No Action Alternative and Revised Alternative 1. The 40-30-30 Index is similar in frequency to the Shasta Index which is used to determine hydrologic deficiencies for deliveries to the Sacramento Settlement Contractors and Delta Mendota Exchange Contractors except that during the study period of 1922 – 1990, the 40-30-30 Index would identify dry year hydrologic conditions in one more year than the Shasta Index.

Under Supplemental Analysis 1d, refuge water supply deliveries would not be reduced in dry periods. This increased water supply reliability for the refuges would reduce CVP deliveries by an additional 0.5 percent in drier periods.

Impacts on CVP water service contractors under the Preferred Alternative would be higher than Revised Alternative 1 due to a different method to allocate water under "(b)(2) water management." Water deliveries to CVP water users would be reduced by 10 percent on an average annual basis and up to 13 percent in dry periods. The refuge water supplies were reduced by up to 25 percent in critically dry periods in accordance with the 40-30-30 Index in the No Action Alternative and the Preferred Alternative.

The incremental increase for Level 4 under Alternatives 2, 3, and 4 and the Preferred Alternative would be 140,000 acre-feet / year. Level 4 supplies were assumed for the purpose of the PEIS analysis to be provided by Sacramento River Settlement Contractors, San Joaquin River Exchange Contractors, and SWP contractors. It was assumed that acquisition of the Level 4 water supplies did not change the pattern of Delta diversions or annual storage amounts in CVP reservoirs. The acquisition amount was actually larger than the amount diverted by the refuges. The additional increment was used to restore instream flows that would have occurred due to return flows from the sellers during the irrigation season. The seller was required to release the increment of acquired water in excess of the Level 4 increment during the irrigation season to avoid third-party impacts. Therefore, there were no third-party impacts to surface water supplies due to Level 4 water supplies. Deficiencies during dry periods would be determined by the acquired water supplies. Therefore, deficiencies for refuges in the Sacramento River and San Joaquin River regions would be determined based on the Shasta Index. Deficiencies for refuges in the Tulare Lake region would be determined by the SWP deficiencies.

Impacts to Surface Water Quality

The primary concern about surface water quality related to refuge water supplies is based upon discharge of return flows from the San Joaquin River region refuges into the San Joaquin River. Salts in the return flows could increase salinity concentrations in the San Joaquin River to a level that could exceed current salinity standards in the river as measured at Vernalis. The PEIS analysis assumed a worst-case scenario of discharging all of the return flows during the month of March.

Changes in monthly water quality on the San Joaquin River at Vernalis during the irrigation (April - August) and non-irrigation (September -March) seasons were evaluated for the No Action Alternative and Alternative 1. During dry periods, water quality standards would not be met under the No Action Alternative. Adverse impacts of the PEIS alternatives were identified as an increase in frequency of violations of the standards, not the ability to meet the standard at all times. The analysis indicated that for both the irrigation and non-irrigation seasons, water quality standards would be exceeded more frequently in Alternative 1 than in the No Action Alternative. Under the Preferred Alternative, the combined contribution of acquired water released on the Merced, Tuolumne, and Stanislaus rivers (under the Vernalis Adaptive Management Program) would result in increased flow and improved water quality in the San Joaquin River at Vernalis during April and May, and decreased flow and reduced water quality in other months.

During the non-irrigation season, including March when refuges discharge return flows and agricultural users discharge return flows during pre-irrigation in the PEIS alternatives, the water quality standard would be exceeded in approximately 5 percent of the years under the Preferred Alternative as compared to 2 percent of the years under the No Action

Alternative. This increased frequency of violations is primarily due to reduced San Joaquin River flows in March of up to 3 to 10 percent, depending upon water year type.

It is important to note that the PEIS analysis assumes that the total salt loading during March includes contributions from both the refuge water supply return flows and irrigation return flows from pre-irrigation activities.

Impacts on Groundwater

Level 2 water supplies under all alternatives including Preferred Alternative would result in a decrease in CVP water deliveries which would increase reliance on groundwater in some areas of the Central Valley. In these areas, groundwater levels would decline. Groundwater level declines in the San Joaquin and Tulare Lake regions also would lead to increased subsidence. However the specific amount of groundwater decline and subsidence associated with Level 2 water supplies is difficult to determine due to the integrated implementation of CVPIA provisions.

The incremental increase for Level 4 under Alternatives 2, 3, and 4 and the Preferred Alternative would cause groundwater levels to decline based upon the assumptions in the PEIS for these water supplies. Level 4 supplies were assumed for the purpose of the PEIS analysis to be provided by Sacramento River Settlement Contractors, San Joaquin River Exchange Contractors, and SWP contractors through fallowing of land. Fallowing of land reduces groundwater recharge which leads to groundwater level declines.

Impacts on CVP Power Resources

Level 2 water supplies under all alternatives including Preferred Alternative would result in changes in release patterns from CVP reservoirs and reduced reservoir elevations in summer months and a reduced capability of using CVP hydropower facilities to meet peak summer demand for Western Area Power Administration preference power customers. However the specific impact on power supplies due to Level 2 water supplies is difficult to determine due to the integrated implementation of CVPIA provisions. Use of Level 2 water supplies is not anticipated to affect annual CVP Project Use, however, the pattern of CVP Project Use would be modified to provide increased fall and spring diversions to the refuges.

Level 4 supplies were assumed for the purpose of the PEIS analysis to be provided by Sacramento River Settlement Contractors, San Joaquin River Exchange Contractors, and SWP contractors. It was assumed that acquisition of the Level 4 water supplies would not change the pattern of Delta diversions or annual storage amounts in CVP reservoirs. However, release patterns could be modified, primarily at Shasta Lake and San Luis Reservoir, which could shift the pattern of CVP power generation and Project Use.

Impacts on and Benefits to Fisheries Resources

Level 2 and Level 4 water supplies under all alternatives including Preferred Alternative would result in increased instream flow patterns in the Sacramento and Merced rivers in the spring and fall months. These changes would be beneficial to fishery resources, including fall-run and spring-run chinook salmon, by increasing instream flows. Use of Level 2 and Level 4 water supplies would not impact temperature in critical summer months, fish passage and habitat, or Delta outflow. The increased frequency of violations of water temperature standards in the Sacramento River under all of the PEIS alternatives is probably

more associated with "(b)(2) water management" and increased instream flows on the Trinity River.

The PEIS did not evaluate fishery resources that occurred within the refuges.

Benefits to Vegetation and Wildlife Resources at Refuges in the Sacramento River Region

Under the No Action Alternative, water deliveries reflect the general conditions on the refuges prior to the implementation of the CVPIA in 1992. In 1992, approximately 2,450 acres of permanent ponds, 14,650 acres of seasonal marshes, and 1,900 acres of watergrass (millet) habitats were managed for migratory and breeding waterfowl and other wetland-dependent wildlife at refuges in the Sacramento River Region. Water supplies available to refuges under the No Action Alternative would limit the flexibility of refuge managers to use adaptive management techniques in adjusting the timing and locations of wetland habitats to maximize their benefits to wildlife. Large numbers of ducks, geese, and other water birds would continue to use the refuges in the Sacramento River Region under the No Action Alternative, but limited wetland acreages and short flooding cycles could reduce their use of refuge wetlands. Water supplies for refuges in the Sacramento River Region under the No Action Alternative could limit late-season wetland acreages and nesting opportunities for ducks, shorebirds, and wading birds that nest in the Central Valley. Lack of suitable late-season water supplies also could increase stagnation of waters in permanent ponds and seasonal marshes, and could increase the potential for outbreaks of waterfowl diseases such as botulism and avian cholera. Similarly, the limited summer and early fall water available to refuges under the No Action Alternative would not permit refuge managers to adapt their water use to prevent or eliminate waterfowl disease outbreaks in wetland habitats.

Level 2 water supplies to refuges in the Sacramento River Region would allow more effective management of existing wetlands to benefit migratory and breeding waterfowl and other water birds and wildlife. Under Level 2 water supplies, approximately 2,900 acres of permanent ponds, 17,300 acres of seasonal marshes, and 2,300 acres of watergrass habitats would be managed on refuges in the Sacramento River Region, an increase of 3,500 acres over the No Action Alternative acreage. Although these acreages would represent a substantial benefit to migratory waterfowl and other water birds, water supplies would be inadequate for optimal wetland management. Level 4 water supplies would permit optimal management of existing and new wetlands to benefit migratory and breeding waterfowl and other water birds and wildlife. Under Level 4 water supplies, approximately 3,000 acres of permanent ponds, 18,570 acres of seasonal marshes, and 2,700 acres of watergrass habitats would be managed on refuges in the Sacramento River Region. This is an increase of 5,300 acres over the No Action Alternative acreage. Reclamation and CDFG cite the following benefits of Level 4 water deliveries to refuges in the Sacramento River Region and the migratory waterfowl and other water birds that depend on them:

- Earlier fall flood-up schedule for seasonal marshes to allow increased wildlife use, while easing water conveyance capacity constraints due to timing
- Maintenance of additional acres of both summer water and permanent pond habitat types for both wildlife use and vegetation improvement

- Increased acreage of watergrass habitat and increased frequency of irrigation, if necessary, to provide a high-quality carbohydrate food source for waterfowl and other water birds, while easing potential waterfowl crop depredation problems on nearby agricultural lands
- Increased "flow-through" management in all wetland habitat units on the refuges to decrease the potential for disease outbreaks, especially botulism, among waterfowl and other water birds using these habitats
- Maintenance of water depths, using year-round water delivery, that provide optimum foraging conditions for the majority of avian species
- Control of undesirable vegetation species, such as cocklebur, using deep irrigation and maintenance for periods of two to four weeks during summer
- Development of an additional 400 to 500 wetland acres throughout the Sacramento NWR complex during the next several years

Each of these benefits is described in more detail in the specific master plans for individual refuges.

Existing wetland and upland habitats would not be affected by the conveyance or application of Level 4 water supplies on the refuges because most of the water would be applied to existing wetlands and recreated wetlands would be in historical wetland areas, such as swales, basins, or farmed wetlands. The overall objectives of refuge water management strategies anticipated under Level 4 water supplies would enable refuge managers to implement their master plans to optimize the foraging, resting, and breeding habitats for wetland-dependent wildlife.

The relative numbers of waterfowl and other water birds on the refuges, expressed in use-day indices (one use-day equals one bird present at a refuge for one day), reflect the potential use of Sacramento River Region refuge wetlands under the No Action Alternative. Use-day indices for the No Action Alternative were extrapolated from Level 2 estimates provided by Reclamation in 1992 for use in the PEIS. These values are included to provide an approximate basis for comparison with the other alternatives. Use days under the No Action Alternative for the Sacramento River region were 157,986,440 for ducks and geese and 6,186,440 for other water birds. It is anticipated that the use days for ducks and geese will increase 18 percent under Level 2 water supplies and 35 percent under Level 4 water supplies. Use days for other water birds would increase 18 percent under Level 2 water supplies and 35 percent for other water birds under Level 4 water supplies. Actual numbers of ducks and geese visiting the Sacramento River Region each year would vary with population trends in the Pacific Flyway and with the regional availability of suitable wetland habitats.

Benefits to Vegetation and Wildlife Resources at Refuges in the San Joaquin River Region

Under the No Action Alternative, refuges in the San Joaquin River Region and private wetlands would receive approximately 143,570 acre-feet of CVP water in normal and wet years. Under the No Action Alternative, wetlands available for breeding and migratory waterfowl on refuges in the San Joaquin River Region (excluding the San Joaquin Basin Action Plan lands) could include an estimated 2,000 acres of permanent ponds, 36,000 acres

of seasonal marshes, and 2,000 acres dedicated to growing waterfowl food plants such as watergrass and smartweed. The water supplies under the No Action Alternative would limit the flexibility of refuge managers to use adaptive management techniques to adjust the timing and locations of wetland habitats to maximize their benefits to wildlife. Large numbers of ducks, geese, and other water birds would continue to use refuges in the San Joaquin River Region under the No Action Alternative, but limited wetland acreages and short flooding cycles could limit the potential waterfowl use of refuge wetlands.

With Level 2 water supplies to these lands, refuges in the San Joaquin River Region (excluding the San Joaquin Basin Plan Action lands) could support approximately 3,400 acres of permanent ponds; 59,100 acres of seasonal wetlands; and 3,550 acres of waterfowl food plant habitat, such as watergrass and smartweed. Level 2 water supplies in the San Joaquin River Region would enable refuge managers to more effectively manage existing wetlands to benefit migratory and breeding waterfowl and other water birds and wildlife. However, although these acreages would substantially benefit migratory waterfowl and other water birds compared with acreages under the No Action Alternative, water supplies would be inadequate for optimal wetland management.

With Level 4 water supplies, approximately 6,240 acres of permanent ponds, 57,680 acres of seasonal marshes, and 7,700 acres of watergrass and smartweed habitats would be managed on refuges in the San Joaquin River Region, excluding the San Joaquin Basin Action Plan lands. This is an increase of 31,600 acres over the No Action Alternative acreage. Benefits of Level 4 water deliveries discussed above for the Sacramento River Region would also apply to refuges in the San Joaquin River Region. Increased water deliveries to San Joaquin River Region refuges would enable refuge managers to more effectively manage existing wetlands to benefit migratory and breeding waterfowl and other water birds and wildlife. Refuges and private wetlands in the San Joaquin River Region have benefited from firm water supplies during the past few years. The Grasslands RCD has increased waterfowl and other waterbird production habitat by approximately 400 percent since 1992, and increased wintering waterfowl food production by irrigating 14,600 acres in addition to those irrigated in 1994, resulting in an estimated 300 percent increase in food supplies. Five years of detailed research conducted by the Service, in cooperation with state and federal landowners, identified the importance of continuing to use high-quality, Level 4 CVP water supplies to reduce selenium concentrations at refuges. Based on studies conducted in 1986, 1987, 1988, 1989, and 1994, selenium concentrations in waterfowl and other water birds wintering in that vicinity declined significantly.

Use-day indices indicate that refuges in the San Joaquin River Region would support about half as many waterfowl but more than seven times as many shorebirds, wading birds, and other water birds as refuges in the Sacramento River Region under the No Action Alternative. Use days under the No Action Alternative for the San Joaquin River region were 76,002,420 for ducks and geese and 46,220,600 for other water birds. It is anticipated that the use days for ducks and geese will increase 65 percent under Level 2 water supplies and 113 percent under Level 4 water supplies. Use days for other water birds would increase 65 percent under Level 2 water supplies and 158 percent for other water birds under Level 4 water supplies. The actual number of water-dependent species using all these refuges and private wetlands each year would vary with population trends in the Pacific

Flyway and with regional availability of suitable wetland habitats in the San Joaquin River Region.

Benefits to Vegetation and Wildlife Resources at Refuges in the Tulare Lake Region

Under the No Action Alternative, water supplies available to refuges in the Tulare Lake Region (including Mendota WA) would limit the flexibility of refuge managers to use adaptive management techniques to adjust the timing and locations of wetland habitats to maximize their benefits to wildlife. With supplies available under the No Action Alternative, approximately 3,600 acres of seasonal wetlands could be managed at Mendota WA and at Kern NWR; and no permanent ponds or seasonal wetlands would be managed at Pixley NWR under this alternative.

Level 2 water supplies to refuges in the Tulare Lake Region would enable more effective management of existing wetlands to benefit migratory and breeding waterfowl and other water birds and wildlife. Under Alternative 1, approximately 4,800 acres of seasonal marshes would be managed on refuges in the Tulare Lake Region, an increase of 1,200 acres over the No Action Alternative acreage. Although these acreages would represent a substantial benefit to migratory waterfowl and other water birds, water supplies under this alternative would be inadequate for optimal wetland management.

Under Level 4 water supplies, approximately 12,000 acres of seasonal marshes and 4,000 acres of watergrass and smartweed habitats would be managed on refuges in the Tulare Lake Region. This is an increase of 12,400 acres over the No Action Alternative acreage. Benefits of Level 4 water deliveries discussed above for the Sacramento River Region also would apply to refuges in the Tulare Lake Region. The increased water deliveries to Tulare Lake Region refuges would enable refuge managers to more effectively manage existing wetlands, to benefit migratory and breeding waterfowl and other water birds and wildlife. Refuges and private wetlands in the Tulare Lake Region have benefited from firm water supplies during the past few years. For example, seasonal wetland habitats at the Kern NWR complex in 1994 peaked at 4,000 acres, compared with 1,900 in 1992, representing a 52 percent increase. An increase of 20 percent in waterfowl and 30 percent in other waterbird use was documented at the Kern NWR complex during this same period.

The number of ducks, geese, and other water birds using seasonal marshes at refuges in the Tulare Lake Region probably would represent less than 10 percent of the birds using refuges in the San Joaquin River Region or Sacramento River Region under the No Action Alternative. Use days under the No Action Alternative for the Tulare Lake region were 6,583,820 for ducks and geese and 986,030 for other water birds. It is anticipated that the use days for ducks and geese will increase 36 percent under Level 2 water supplies and 314 percent under Level 4 water supplies. Use days for other water birds would increase 36 percent under Level 2 water supplies and 326 percent for other water birds under Level 4 water supplies. Limited wetland acreages and short flooding cycles could limit waterbird use of refuge wetlands. The actual number of water-dependent species using refuges in the Tulare Lake Region each year would vary with population trends in the Pacific Flyway and the regional availability of suitable wetland habitats.

Benefits to Recreation and Recreational Economics at the Refuges

Recreational opportunities on the refuges increased under Alternative 1 due to Level 2 water supplies. Additional increases occurred under Alternatives 2, 3, and 4 and Preferred Alternative due to Level 4 water supplies.

Under the No Action Alternative, hunting, fishing, and non-consumptive visitor use was 101,200 at the Sacramento River region refuges, 72,900 at the San Joaquin River region refuges, and 4,400 at the Tulare Lake River region refuges (as described above). Under Level 2 water supplies, visitor use would increase to 125,700 at the Sacramento River region refuges and 93,200 at the San Joaquin River region refuges. No change would occur at Tulare Lake River region refuges. The majority of the increased use would be due to hunting. Under Level 4 water supplies, visitor use would increase to 164,500 at the Sacramento River region refuges, 121,000 at the San Joaquin River region refuges, and 11,000 at the Tulare Lake River region refuges.

In the Sacramento River region refuges, the increased visitor use would increase recreation trip-related expenditures from $144,474,000 / year under No Action Alternative to $145,322,000 / year with Level 2 water supplies and $146,680,000 / year with Level 4 water supplies. In the San Joaquin River region refuges, the increased visitor use would increase recreation trip-related expenditures from $84,494,000 / year under No Action Alternative to $85,156,000 / year with Level 2 water supplies and $86,041,000 / year with Level 4 water supplies. In the Tulare Lake region refuges, the increased visitor use would increase recreation trip-related expenditures from $77,000 / year under No Action Alternative to $193,000 with Level 4 water supplies. No change would occur under Level 2 water supplies.

Impacts on Cultural Resources

Increased water supplies at the refuges under all alternatives and the Preferred Alternative would increase visitor use and the risk of vandalism. Use of Level 2 and Level 4 water supplies also could flood or increase erosion potential for cultural resources at the refuges under all alternatives, including the Preferred Alternative.

Impacts on Agricultural Economics

As described above under Impacts to Surface Water Resources, implementation of CVPIA including providing CVP water for Level 2 water supplies, would result in a decrease in CVP water deliveries to water service contractors. However the specific amount is difficult to determine due to the integrated implementation of CVPIA provisions. These actions would reduce water supply reliability, reduce irrigated acreage, and increase groundwater use. All of these actions would reduce gross revenues by 0.7 to 1.5 percent. The PEIS assumed allocation of the entire amount of Level 2 water supplies from CVP water. This may overestimate the impacts to CVP users if existing non-CVP water supplies are continued to be used in the future.

Level 4 supplies were assumed for the purpose of the PEIS analysis to be provided by Sacramento River Settlement Contractors, San Joaquin River Exchange Contractors, and SWP contractors. Gross revenues for the agricultural sector would increase due to sales of water.

Impacts on Regional Economics

Employment and income would increase for recreational sectors with Level 2 and Level 4 water supplies as compared to the No Action Alternative. However, loss of employment and net revenues would decrease for the agricultural sector at a greater amount. Therefore, the total change in regional economics would be negative under implementation of CVPIA.

Summary of Impacts and Benefits Described in the PEIS

The Final PEIS recognizes that there are adverse impacts that would occur due to implementation of the Preferred Alternative. Some of these impacts can be mitigated. The following impacts under the Preferred Alternative were identified with the associated mitigation measures.

- Reduction in CVP water service contract deliveries and reduction in groundwater levels could be mitigated by implementation of methods to increase CVP yield including recommendations under Section 3408(j).
- Adverse impacts due to increased summer water temperatures in the American River could be mitigated by temperature control devices on Folsom Dam.
- Increase potential for mosquito abundance due to increased wetlands, including refuge wetlands, could be mitigated by increased abatement activities.
- Reductions in swimming opportunities in the American River due to high flows could be mitigated by development of other swimming opportunities.
- Increased potential for disturbance to cultural resources could be mitigated by increased activities in accordance with Section 106 consultation.
- Periodic reductions in boating and shoreline use opportunities at CVP reservoirs could be mitigated by construction or extension of boat ramps and facilities for beach use.
- Adverse impacts to employment could be mitigated by job training opportunities.
- Adverse impacts to orchards along the Stanislaus River banks due to high groundwater during high flow conditions could be mitigated by flood easements.

For other impacts, there are no reasonable mitigations for many of these impacts. The following impacts do not have reasonable mitigation measures.

- Adverse impacts due to Restoration Fund charges
- Adverse impacts to fish due to increased water temperatures in some streams
- Adverse impacts to fish due to reduced instream flows in some streams.
- Adverse impacts to reduction in CVP power generation and shift of generation

However, the impacts are necessary to realize the benefits to fish and wildlife resources.

3.2.4 Implementation of CVPIA Refuge Water Supplies

The PEIS was intended to provide the basis for a decision on whether to implement most of the CVPIA provisions. However, the decision-maker may determine that additional analysis is needed to reach a decision on how to implement any the provisions. A Record of Decision based on the PEIS would not include a decision about whether to provide CVP water

supplies to refuges as described in 3406(d)(1), because the nature of the 3406(d)(1) mandate does not require compliance with NEPA before implementation, as confirmed by the Ninth Circuit Court of Appeals. Westlands Water District v. Natural Resources Defense Council, 43 F.3d 457 (9 Cir. 1994). However, a Record of Decision based on the PEIS would likely include a decision about how to describe hydrologic shortages to which refuge water supplies would be subject. A Record of Decision based on the PEIS would likely include a decision about whether to proceed at the programmatic level with water acquisition to provide increased refuge water supplies, as described in 3406(d)(2).

The PEIS assumed that subsequent NEPA documentation for refuge water supplies would include evaluation of improvements to conveyance and methods used to acquire the increment for Level 4 water supply. In addition, the PEIS assumed that future NEPA documentation would evaluate use of Level 2 and Level 4 water supplies at the refuges under new water management plans that were different than those identified in 1989. The PEIS also assumed that future NEPA documentation would include an updated list and analysis of special status species on the refuges.

3.3 Conveyance of Refuge Water Supply for South San Joaquin Study Area

3.3.1 Overview of the NEPA/CEQA Documentation for Conveyance of Refuge Water Supplies for South San Joaquin Study Area

The Conveyance of Refuge Water Supply Project was implemented pursuant to Section 3406 (d)(5) of CVPIA. Reclamation was the lead federal agency for NEPA in cooperation with the Service and the CDFG. CDFG is acting as the lead state agency for CEQA. The purpose of this document was to evaluate the environmental impacts of implementing alternative means of conveying water supplies to the Pixley and Kern NWRs within the South San Joaquin Valley area of the Central Valley.

The environmental compliance portion of the action began with the 1995 publication of the *Report of Recommended Alternatives, Refuge Water Supply and San Joaquin Basin Action Plan Lands (Decision Document).* This document described the alternatives identified during technical investigations and public involvement meetings in 1994. The *Decision Document* also discusses the initial screening of the alternatives, based on environmental, technical, and economic factors, as a result of project scoping / screening efforts. The potential feasibility of alternatives identified in the *Decision Document* was verified in June 1995 through public involvement workshops, stakeholder meetings, and field investigations. The *Refuge Water Supply Conveyance Alternatives Refinement Memorandum* published in May 1995 summarized the results of alternative refinement activities presented in the *Decision Document* for the Sacramento, Delevan, Colusa, Sutter, Gray Lodge, Kern, and Pixley refuges.

The Conveyance of Refuge Water Supply EA / IS focused on the environmental compliance phase of the project and addresses anticipated effects of constructing and / or improving existing conveyance facilities to the Pixley NWR and Kern NWR. Reclamation, in cooperation with the Service and the CDFG, is proposing to provide and / or improve

existing conveyance facilities to deliver those quantities of water required for full habitat development on Pixley and Kern NWRs located in the South San Joaquin Valley.

The purposes of this conveyance project are to:

- Provide or upgrade facilities to support peak flow and year-round delivery of water supply requirements
- Minimize any adverse impacts on the environment resulting from the implementation of the selected conveyance alternative

The need for the Conveyance of Refuge Water Supply Project was a result of capacity constraints and/or maintenance requirements in existing delivery systems. Currently, water supplies are conveyed on an as-available basis, which is not consistent with refuge needs. Existing facilities were not designed to convey peak daily refuge requirements in addition to existing customer demands or are dewatered for maintenance purposes, and therefore, are precluded from year-round delivery capability. Facility capacities must be able to support scheduled maximum peak flows under Level 4 water supplies.

3.3.2 Current Conveyance Facilities

The Kern NWR currently receives Level 2 water supplies via the California Aqueduct to Buena Vista Water Storage District (BVWSD) facilities. Water is diverted at BVWSD Turnout 1B and conveyed through a pipeline to either the West Side Canal or the Main Drain Canal, which in turn convey the water to the Goose Lake Canal. Although available capacity in the West Side and/or Main Drain Canals varies, one or the other is sufficiently below capacity at any given time to accommodate the diverted refuge flows. The Goose Lake Canal conveys the water to the southern boundary of the Kern NWR, where it is diverted into the refuge's internal distribution system. Both the West Side Canal and the Main Drain Canal have capacity limitations during peak demand periods. The Goose Lake Canal is normally shut down for 2 to 3 weeks in late September or early October and again in March for seasonal maintenance. In wet years, Kern NWR takes flood waters from Poso Creek.

The Pixley NWR currently relies almost exclusively on a single groundwater well for regular water supply. The well was installed in 1993 near the southern boundary of the refuge. The well draws from the deep aquifer beneath the Corcoran clay layer and produces approximately 1,500 gallons per minute (gpm), or 3.3 cubic feet per second (cfs), of good quality water. The well is 1,200 feet deep and has a 150-horsepower (hp) pump motor. Well capacity is minimally sufficient to meet Level 2 needs. During extremely wet years when flood flows occur in Deer Creek, surface-water diversions from the creek can be made at check structures along the southern boundary of the refuge. This occurred only twice since the early 1980s and is not considered a reliable water supply.

3.3.3 Conveyance for Refuge Water Supply Alternatives

The No Action Alternative would involve continued use of existing conveyance systems that would limit refuge water supplies to Level 2 amounts or less during some months.

Two alternatives were considered for the Kern NWR:

- Use existing Buena Vista Water Storage District facilities, enlarge Main Drain, and use existing West Side Canal when Main Drain capacity is exceeded.
- Use existing Lost Hills Irrigation District facilities and clean Burhan Canal to reduce water losses.

The alternative that uses existing Buena Vista Water Storage District facilities, enlarges the Main Drain, and uses existing West Side Canal when Main Drain capacity is exceeded was selected as the recommended alternative because of the greater potential for interaction with agricultural return flows.

Four alternatives were considered for the Pixley NWR:

- New pipeline from Friant-Kern Canal to refuge
- Shared Delano-Earlimart Irrigation District facilities plus new pipeline to refuge
- Conjunctive use program with on-refuge ground water wells, in lieu recharge with Pixley Irrigation District
- New pipeline from Friant-Kern Canal to refuge and portions of Pixley Irrigation District

The new pipeline from Friant-Kern Canal to the refuge was selected as the recommended alternative primarily because of its high water supply reliability and water quality ranking as a result of the direct pipeline from the Friant-Kern Canal.

3.3.4 Summary of Analyses of Alternatives

Impacts identified by the EA/IS were primarily related to construction impacts. Mitigation measures were also identified to reduce the impacts to a level of less than significant. The results of the impact analysis are summarized below.

- **Land Use.** Construction could temporarily impact agricultural production. However, these impacts would be mitigated by scheduling construction during non-crop seasons, minimizing construction easements, and compensating landowners for loss of crops.

  Residential structures, other structures, and powerlines could be permanently impacted due to proposed routes. These impacts would be mitigated by selecting routes that avoid existing structures and powerlines. If necessary, landowners would be compensated for loss of use of property.

- **Biological Resources.** Impacts to special-status species would be avoided based upon the findings of pre-construction surveys and mitigation measures to avoid impacts or provide acceptable compensation.

  Permanently eliminated riparian habitat would be replaced at a 2:1 ratio. Erosion and sediment controls would be included in the project to reduce impacts during and following construction.

  Wetlands delineations would be conducted and measures to avoid jurisdictional wetlands would be developed. Post-construction surveys would be conducted to

determine actual impacts. Eliminated wetlands would be replaced at a 2:1 ratio.

Revegetation plans would be developed to restore construction sites.

A monitoring plan would be instituted to confirm the implementation of the mitigation measures. The monitoring program would continue for at least three years following construction.

- **Cultural Resources.** Construction activities would be restricted to alignments that would not impact prehistoric sites near Kern NWR and historic residences near Pixley and Kern NWRs.
- **Surface Water Resources.** Construction would be scheduled during the dry season to minimize erosion and damage to streambeds and streambanks. An erosion control plan would be implemented to minimize impacts during and following construction.

No long-term impacts were identified in the EA/IS. The benefits of implementing the conveyance facilities were similar to those described in the PEIS for providing Level 4 water supplies to the refuges.

3.3.5 Implementation of Conveyance Facilities for Refuge Water Supplies

The EA/IS for Conveyance of Refuge Water Supplies and the associated Finding of No Significant Impact will be adopted by Reclamation following completion of CVPIA PEIS. The current status of the conveyance facilities for the Kern and Pixley NWRs is discussed in other sections of this document. Delivery of Level 2 and Level 4 water supplies could be initiated under CVPIA on a temporary basis when the conveyance facilities are completed. Long-term deliveries could be initiated following adoption of the long-term water supply agreements that are the subject of this document.

3.4 Management of Wildlife Areas

A Master Plan and associated NEPA documentation were approved in 1986 for the Kern NWR by the Service. The Master Plan was adopted to guide the maintenance and enhancement of wildlife habitat on the refuge, including both the needs of migratory waterfowl and special-status species. The environmental evaluation concluded that minor negative impacts would occur on air quality, soils, and economics, as well as potential impacts on adjacent landowners due to reduced capacity to accommodate flood waters on the refuge. Beneficial effects of the Master Plan would occur for vegetation, wildlife, cultural resources, land use, and aesthetics.

A Master Plan and associated NEPA documentation were approved in 1886 for the Pixley NWR by the Service. The Master Plan was adopted to guide the maintenance and enhancement of wildlife habitat, and focused on the acquisition of private lands within the Approved Refuge Boundary. For the Pixley NWR, a key consideration was the production of special-status species and enhancement of native plant and animal communities. The environmental evaluation concluded that minor negative impacts on soils, air quality, and hydrology would occur, but that substantial beneficial effects would occur for vegetation, wildlife, cultural resources, and aesthetics.

Section 4: Description of Alternatives

SECTION 4

Description of Alternatives

4.1 Introduction

Two alternatives were identified for this project: the No Action Alternative and the Proposed Action. The alternatives consist of two parts: the water supply agreement and on-refuge management. On-refuge management addresses how Level 2 water supplies and the Level 4 increment would be used on the refuges to achieve the purposes of the CVPIA. In addition, alternatives considered but not carried forward for detailed analysis are described.

4.2 Water Service Agreement

4.2.1 No Action Alternative

Introduction

The Preferred Alternative of the CVPIA PEIS assumed that Reclamation would enter into a 25-year water supply agreement with the Service to provide Level 2 water supplies to Kern and Pixley NWRs from CVP yield. In addition, the Preferred Alternative assumed that Reclamation would provide the Level 4 increment as acquired through the Water Acquisition Program. Therefore, the No Action Alternative assumes that Reclamation would enter into a 25-year water supply agreement with the Service to provide Level 2 water supplies from CVP yield to Kern and Pixley NWRs, and that the long-term water supply agreement would provide for delivery of up to the Level 4 increment, as acquired. The quantities of CVP water that would be provided under the long-term water supply agreement of the No Action Alternative are shown in Table 4-1. Level 2 and Level 4 water supplies would be delivered on the estimated monthly patterns identified in the *Report on Refuge Water Supply Investigations* (Reclamation, 1989).

TABLE 4-1
Quantities of Water to Be Provided to the Kern and Pixley NWRs under the No Action Alternative

Refuge	Level 2 (acre-feet)	Level 2 + Level 4 Increment (acre-feet)
Kern NWR	9,950	25,000
Pixley NWR	1,280	6,000

Note: Level 2 water supplies would be provided from CVP yield. The Level 4 increment would be provided as acquired through voluntary measures.

Water Management Planning

Section 210 of the Reclamation Reform Act of 1982 requires water districts with certain types of contracts with Reclamation to prepare and submit Water Conservation Plans with

appropriate goals, measures, timetables, and plans to ensure that water is being efficiently applied to beneficial uses. The plans are to be updated every 5 years. After passage of the CVPIA, a number of parties recognized the need for the development of Best Management Practices / Efficient Use Plans for the refuges to ensure that the refuge water supplies were being efficiently used in keeping with the Reclamation Reform Act. In 1996, Interior responded by directing that an Interagency Coordinated Program (ICP) be instituted to provide a common methodology for water use planning for all wetlands areas receiving water authorized by the CVPIA. In 1997, the U.S. Department of the Interior, represented by Reclamation, the Service, CDFG, and the Grassland WD assembled a Task Force for this purpose.

The Task Force provided guidance and advice in the development of the report *An Interagency Coordinated Program for Wetland Water Use Planning, Central Valley, California* (ICP Report) (Reclamation, et al., 1998) that examined water use on wetland areas and provided a process for identification of effective water regimes for wetlands. The goals of the ICP, as overseen by the Task Force, were to: (1) provide background information on optimum management scenarios for refuge water supplies; (2) identify methods of effective use of wetland water supplies; (3) assure that a process is in place for public input that can be applied consistently to assist in refuge management decisions; and (4) provide a common methodology for analysis of effective water use.

In the ICP Report, the Task Force proposed a common methodology for water use planning on the refuges. There was general agreement within the Task Force that a number of water management practices could be used to improve water use in some situations on the refuges. The common methodology recommended by the Task Force was to systematize these practices and to create a procedure by which all state, federal, and Grassland WD managers are periodically asked whether they have considered efficient use practices on their wetland operations. The ICP Report presented a partial list of practices that could contribute to increasing water use efficiency on the refuges. Furthermore, the ICP Report identified a number of measures that wetland managers should consider when planning operations. The intent of the proposed measures was to encourage refuge managers to consider the suggested practices during each planning cycle and to adopt those that are technically feasible, financially affordable, and consistent with achieving the refuge's goals. The common methodology promoted the most effective water regimes for refuges while preserving local flexibility for wetland managers.

Finally, the Task Force proposed that implementation of the common methodology described in the ICP Report should require all refuges to prepare an *Effective Water Use Plan*. In many cases, existing documents provide a strong foundation for preparing these plans. These documents include:

- *A Guide to Wetland Habitat Management in the Central Valley* (a Cooperative effort of CDFG and the California Waterfowl Association, last revised in 1995)
- *Water Management Strategy for the National Wildlife Refuges for the Central Valley of California* (K.M. Forrest and S. Baird, in draft)
- *Water Management Plan for Grassland Water District* (Stoddard & Associates, 1998)

These documents describe water management practices and water requirements for wetland habitats and croplands managed for waterfowl. They also discuss the justification for the water management practices and the benefits to waterfowl habitat. These documents may be functional equivalents of Effective Water Use Plans, but to make the format and accountability consistent with plans prepared by CVP water users, and to incorporate the Water Use Effectiveness Practices developed by the Task Force, the Task Force recommended that each refuge prepare a separate document.

The CVPIA PEIS Preferred Alternative assumed that the long-term water supply agreement between Reclamation and the Service would be implemented. Therefore, the No Action Alternative also assumes preparation and implementation of a Water Use Plan for each refuge.

4.2.2 Proposed Action

Introduction

Under this alternative, Reclamation would enter into a 25-year water supply agreement with the Service to ensure provision of Level 2 water supplies to Kern and Pixley NWRs. The long-term water supply agreement would also include provisions for delivery of the Level 4 increment when this additional water is acquired by Reclamation. The major provisions of the water supply agreement are summarized in Table 4-2.

TABLE 4-2
Summary of the proposed water service Memorandum of Understanding with the U.S. Fish and Wildlife Service.[a]

Article	Discussion
Quantities of Water:	Refuge water supplies will be provided both from the CVP and from other sources, as described below. The USFWS will continue to use non-CVP sources of Level 2 water provided that these other supplies remain available and of suitable quality. If this non-CVP water becomes unavailable or unsuitable in quality, then Reclamation will provide substitute water such that adequate Level 2 water is delivered to the refuges pursuant to the CVPIA.
Kern NWR	Reclamation will provide the full Level 2 supply of 9,950 afa, and will seek to acquire the Level 4 increment of 15,050 afa through voluntary measures for a total potential water delivery of 25,000 afa.
Pixley NWR	Reclamation will reimburse the Service for the power costs of pumping the full Level 2 supply of 1,280 afa from groundwater, and will seek to acquire the Level 4 increment of 4,720 afa through voluntary measures for a total potential water delivery of 6,000 afa.
Term of Agreements	25 years
Water Delivery Schedule	On or before March 1 of each year, the refuges will submit a schedule of water deliveries to Reclamation.
Measurement	The refuges shall provide measurement readings to Reclamation from the authorized Point of Delivery. Prior to March 1 of each year, the refuges will submit a requested monthly schedule of water deliveries to Relcamation.
Water Quality	Reclamation will provide water of sufficient quality to maintain or improve wetland habitat areas and comparable to that provided other CVP contractors in the same geographic region. If the Level 2 or Level 4 water supplies are not of sufficient quality, Reclamation and the affected refuges will meet within 48 hours to determine appropriate actions necessary to identify and address the source of the water quality problems. Reclamation is under no obligation to construct or furnish water treatment facilities to maintain or improve the quality of water furnished under these agreements.
Endangered Species	Use of water provided by this agreement will be in compliance with any applicable Biological Opinions.

TABLE 4-2
Summary of the proposed water service Memorandum of Understanding with the U.S. Fish and Wildlife Service.[a]

Article	Discussion
Deficiencies	Reductions in deliveries will be based on the critically dry water year classifications whenever reductions due to hydrologic circumstances are imposed upon agricultural deliveries of CVP water, subject to the 25 percent cap on refuge water supply reductions for Level 2 water supplies. Reductions in Level 2 supplies not provided by Reclamation in excess of 25 percent will be compensated by Reclamation so that the maximum deficiency does not exceed 25 percent. For Level 4 supplies, reductions will be imposed in accordance with the priority or priorities that applied to such water prior to its acquisition for Level 4 supplies.
Rescheduling	With the approval of Reclamation, a portion of Level 2 water supplies and/or a portion of the Level 4 water supplies may be rescheduled for use within the refuge's boundary during the subsequent year, in accordance with applicable rescheduling guidelines and policies.
Pooling	Whenever deficiencies are imposed on Level 2 water supplies and the Level 4 increment, the remaining water supplies may be pooled for use on other refuges at the direction of the Interagency Refuge Water Management Team and subject to Reclamation's determination regarding impacts on project operations and contractors..
Exchanges	With the approval of Reclamation, CVP water made available under this agreement may be exchanged for water made available to other refuges, provided that the exchange is authorized by applicable Federal and California State laws and applicable guidelines or regulations.
Water Use Efficiency	Within one year following the establishment of criteria by the Interagency Refuge Water Management Team, each refuge shall prepare a Water Management Plan to address the effective and efficient use of water on the refuge, following the general guidelines of the *Interagency Coordinated Program Task Force* report. Implementation of the plans would be monitored in annual reports submitted to Reclamation, and the plans would be updated on a five-year schedule for the term of each agreement. Any identified water savings may be reallocated to other wetland, wildlife, or fishery needs under the direction of an Interagency Refuge Water Management Team and subject to Reclamation's determination regarding impacts on project operations and contractors..

[a] These provisions are part of a joint MOU with the Service including the refuges of the San Luis NWR Complex in the San Joaquin River basin.

Water Management Planning

The MOU proposed between Reclamation and the Service includes the requirement that Water Use Plans be prepared for Kern and Pixley NWRs. The ICP Report that has been described for the No Action Alternative fills a short-term need to ensure and improve, if necessary, water use efficiency on the refuges. Kern and Pixley NWRs have recently initiated preparation of Comprehensive Conservation Plans, as required by the National Wildlife Refuge System Improvement Act of 1997. Development of a Water Use Plan is anticipated as part of this process to fulfill the requirements of the MOU.

4.3 On-Refuge Management

Habitat management on the Kern NWR Complex focuses on providing wetland and native upland habitats. Crops and pasture are also grown on Pixley NWR to provide winter foraging and loafing habitat for sandhill cranes and geese.

All habitats on the Kern NWR Complex except native uplands, require active water management to produce and maintain high-quality habitat. Water management practices are discussed below for each of the habitat types, including management priorities in critically dry years. These practices would be the same for the No Action Alternative and the Proposed

Action. It is important to note that the water requirements described below are averages. More or less water may be required in any given year, depending on precipitation patterns.

4.3.1 Seasonal Wetland

Wetland habitats on Kern and Pixley NWRs are grouped into three major categories: seasonally flooded marsh, moist soil impoundments, and summer water. These categories are addressed collectively as seasonal wetlands for this assessment.

Seasonally flooded marshes are inundated fields or ponds that are managed primarily to grow seed and to produce invertebrates for migratory waterfowl, shorebirds, and other wetland-dependent wildlife. (Reclamation and CDFG, 1995). Primary food production plant species found within this habitat type on Kern and Pixley NWRs are watergrass (or wild millet) and swamp timothy. Water levels are managed to provide appropriate water depths for wintering waterfowl and shorebirds. At Kern and Pixley NWRs, seasonal marsh is flooded from October through February, although some units may be flooded as early as August or September if water is available to provide habitat for early arriving migratory waterfowl such as northern pintails. Optimal management of seasonally flooded marsh on the Kern NWR Complex requires approximately 2.5 to 3.4 acre-feet of water per acre (D. Hardt, 2000).

Moist soil impoundments are similar to seasonal wetlands, except that they are irrigated in summer to improve production of watergrass and swamp timothy, the primary food producing species. Moist soil impoundments are typically irrigated during the summer to produce large quantities of these food plants. Water requirements differ among the plant species. Swamp timothy requires the least irrigation and, consequently, the least amount of water to produce. Watergrass can require several irrigations during the summer and has the highest water requirements of the moist soil plants (Reclamation and CDFG, 1995). Watergrass is considered to be one of the most productive and important waterfowl foods in California (Reclamation, et al., 1998)

Production of food plants and management of seasonal wetlands typically has the following water management pattern (Reclamation and CDFG, 1995). Drawdown (draining of winter floodwater and drying of the soils) would occur in the spring. For swamp timothy, drawdown is usually accomplished in the last 2 weeks of March through the first 2 weeks of April. For units managed for watergrass, the drawdown is later, occurring from early April through early May. The soils dry and warm to allow germination of seeds and initial vegetation growth. Depending on weather patterns and soil composition, a first irrigation is applied during the last 2 weeks of April through the first 2 weeks in May for swamp timothy, or from late May to early June for watergrass. A second irrigation to ensure heavy seed production and vegetative structure is applied during the last 2 weeks of May through the first 2 weeks of June for swamp timothy, or from late June to July for watergrass. Depending on soil composition and weather conditions, swamp timothy may not require a second irrigation (Reclamation, et al., 1998). Swamp timothy is then left dry to let the plants mature and the seed cure before fall. Watergrass may receive a third irrigation before fall (Reclamation, et al., 1998). Fall flooding is initiated in September or October, although some units may be flooded in August to provide habitat for early arriving waterfowl.

Water requirements for moist soil impoundments vary from year to year, and among locations, depending on weather conditions, soil composition, topography of wetland units, and target food plants, as described above. On the Kern NWR Complex, the water requirements for moist soil impoundments range from 4 acre-feet per acre to 7.4 acre-feet, depending on the target food plant and local site conditions (D. Hardt, 2000). In dry years, more water may be necessary, while in wet years less water would be adequate.

Summer water consists of wetlands that are flooded from fall through early summer and maintained flooded through June or July for sensitive species nesting habitat. Provision of summer water at Kern NWR requires about 3.1 to 3.5 ac-ft of water per acre during May, June and July (D. Hardt, 2000).

4.3.2 Irrigated Pasture and Cropland

Irrigated pasture is primarily managed to create nesting cover, but may also be managed later in the year to produce short green grazing and loafing habitat during the winter for sandhill cranes and geese. Small grain production croplands are used to produce food and cover. The primary small grain crops grown on Pixley NWR are barley, wheat, safflower, and vetch. No crops are grown on Kern NWR. These crops produce high-energy food using little water, and also provide nesting and escape cover in the spring and summer. The advantage of the small grains is that they provide fall green feed and diversity, and can be produced with a minimum of water during a typical mild winter. Water is required in the fall as a pre-irrigation to germinate the seed and to start growth. The plants then grow using naturally occurring winter moisture until spring irrigation is applied to ensure heavy seed production. Optimum management of small grain production fields and irrigated pasture on Pixley NWR requires approximately 3.4 to 3.8 acre-feet of water (D. Hardt, 2000).

4.3.3 Riparian Habitat

Managed riparian habitat consists of natural slough channels that receive water drained from managed wetland units. Managed riparian habitat also includes areas where trees and shrubs have been planted, and delivered water is used to irrigate and help establish new plantings. On Pixley NWR, it is estimated that management of riparian habitat areas requires 2.6 to 3 acre-feet of water per acre during November and December to help establish new plantings.

4.3.4 Dry Year Management

The previous discussion of on-refuge management described optimum management of wetland habitats. Optimum management can only be practiced with adequate water supplies. In critically dry years, water availability is reduced. Under the CVPIA, Level 2 water supplies may be reduced up to 25 percent in critically dry years. Level 4 water supplies are also expected to be reduced. The degree to which Level 4 water supplies would be reduced depends on the dry-year provisions associated with acquired water, and cannot currently be determined. Nonetheless, the water available for refuge management activities in dry years would be reduced.

In critically dry years when water availability would be reduced, the diversity, acreage and duration of availability of wetland habitats would be reduced. Refuge management objectives would shift to emphasize habitats with the lowest water requirements. Seasonal

wetlands require the least amount of water, so in critically dry years, this habitat type would be emphasized. However, early fall flooding of seasonal wetlands in August or September could be restricted. Less water would be available to irrigate seasonal wetlands, pasture, and crops, which would affect the types and quality of forage production. Swamp timothy requires the least amount of water of the primary forage plants, so units managed for swamp timothy would be expected to increase in critically dry years. Because swamp timothy does not produce as much or as nutritious a food source as other forage plants (such as watergrass), the quality of seasonal wetlands for migratory waterfowl the following fall would be reduced. Summer water habitats require the most water and also require application of water during the summer months when water availability can be the most restricted. As a result, in critically dry years, the amount and duration of availability of semi-permanent wetlands and summer water would be reduced.

4.3.5 Kern National Wildlife Refuge

No Action Alternative

Habitat Management

Under the No Action Alternative, on-refuge management at Kern NWR would be in accordance with the assumptions of the CVPIA Preferred Alternative. The CVPIA PEIS assumed that provision of Level 2 water supplies and the Level 4 increment would result in the acres of habitat identified in the *Report on Refuge Water Supply Investigations* (Reclamation 1989).

Level 2 water supplies would support approximately 2,800 acres of seasonal wetland, of which 1,200 acres would be moist soil impoundments (Reclamation, 1989). The moist soil impoundments would be irrigated in the summer, but no summer water habitat would be provided (Table 4-3).

TABLE 4-3
Acres of Habitat Expected on Kern and Pixley NWRs under the No Action Alternative and Proposed Action[a]

	No Action Alternative		Proposed Action
Habitat	**Level 2**	**Level 4**	**Level 4**
Kern NWR			
Summer water	-	-	200
Seasonal marsh	1,600	4,300	4,250
Moist soil impoundment	1,200	2,700	2,250
Total managed wetland	**2,800**	**7,000**	**6,700**
Pixley NWR			
Summer water	-	-	-
Seasonal marsh	-	550	238
Moist soil impoundment	310	400	517
Small grain/irrigated pasture	-	650	545
Total managed wetland and irrigated upland	**310**	**1,600**	**1,300**

[a]Amount of habitat acreage for the Proposed Action assumes full Level 4 water supplies. Habitat acreage for the Proposed Action are refinements of prior assumptions and are discussed in detail later in this section.

With the increased water associated with Level 4 water supplies, Kern NWR would provide 7,000 acres of seasonal wetland habitat, of which approximately 2,700 acres would be moist soil impoundments. The increase to the Level 4 water supply would expand the availability of wetland habitat and provide water for spring/summer irrigation. Level 4 water would also allow for early flooding of seasonal wetlands and would increase the extent of seasonal wetlands in the fall and winter.

Mosquito Abatement

Under the No Action Alternative, mosquito monitoring and control programs would follow existing practices. The Kern County's Mosquito and Vector Control District is responsible for monitoring and control programs on public and private lands, including the Kern NWR. Control activities on Kern NWR undertaken by the Kern County Mosquito and Vector Control District are conducted in accordance with approved Pesticide Use Proposals and special use permits from the Service. Control actions depend on the mosquito populations, the detected presence of viral disease in mosquito populations or birds, and environmental conditions (such as ambient temperature, or wind speed/direction). Mosquito control typically relies on chemical methods, primarily growth inhibitors. The Mosquito and Vector Control District obtains approval from the refuge before flying and spraying for mosquito control.

Listed Species Management

Under the No Action Alternative, management and conservation actions for federally listed species would be in accordance with the 1997 Biological Opinion on *Wetland/Riparian Enhancement and Endangered Species Management Actions, Within Refuge Master Plans, on Kern and Pixley National Wildlife Refuges, Kern and Tulare Counties, California* (Service, 1997). The Kern NWR Complex consulted with the Service's Ecological Services Division pursuant to the federal ESA on the effects of wetland and riparian habitat restoration and enhancement, and endangered species management actions on the Kern and Pixley NWRs, as described in the Master Plans for the two refuges (Service 1986a and 1986b). While the Master Plans include use of full Level 4 water supplies, the consultation focused on the specific effects of the proposed habitat restoration and enhancement actions.

The consultation and ensuing Biological Opinion addressed the following listed species:

- San Joaquin kit fox (*Vulpes macrotis mutica*)
- Blunt-nosed leopard lizard (*Gambelia sila*)
- Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*)
- Vernal pool fairy shrimp (*Branchinecta lynchi*)

The conservation and avoidance measures required under the Biological Opinion generally consisted of conducting surveys for San Joaquin kit fox, blunt-nosed leopard lizard, and Tipton kangaroo rat before construction activities, educating construction workers on the occurrence and identification of listed species, and flagging and/or fencing areas potentially inhabited by listed species to prevent intrusion by construction equipment or personnel, or by the visiting public. With implementation of all of the measures for listed species, the Service determined that the level of anticipated take resulting from habitat restoration and enhancement activities on Kern and Pixley NWRs was not likely to result in jeopardy to any listed species nor would it result in the destruction or adverse modification of critical habitat.

Proposed Action

Habitat Management

Management objectives on Kern NWR with full Level 4 water supplies have been refined since preparation of the *Report on Refuge Water Supply Investigations* (Reclamation, 1989) on which the management assumptions for the No Action Alternative were based. Under these revised management objectives, Kern NWR would support 6,700 acres of seasonal wetland, of which approximately 200 acres would be managed for summer water, and 2,000 acres would be managed as moist soil impoundments. The remaining 4,500 acres of wetland would be seasonally flooded only during the fall and winter to provide habitat for wintering waterfowl (Table 4-3). These revised management objectives are assumed for the Proposed Action.

The apparent reduction in the acres of managed wetland under the Proposed Action results from a refinement in habitat classification on the Refuge. In the *Report on Refuge Water Supply Investigations*, riparian habitat was not specifically identified. The original seasonal marsh acreage (7,000 acres) included 300 acres of riparian habitat. This habitat was not individually identified. An additional 150 acres of riparian habitat has also been added as a result of reclassification of habitats. Only the 6,700 acres of seasonal marsh would be actively managed with Level 4 water supplies. Riparian habitat would benefit from Level 2 and Level 4 water supplies, and available water supplies would be used, as necessary, to help establish new plantings of riparian trees and shrubs as a part of restoration and enhancement actions.

Mosquito Abatement

Mosquito abatement practices would be the same as those described for the No Action Alternative.

Listed Species Management

Under the Proposed Action, the Service would implement conservation and take avoidance measures to protect federally listed and state-listed species, as well as other special-status species, from impacts that could occur on Kern NWR as a result of on-refuge management activities. Species-specific measures would be implemented for the species listed in Table 4-4. The conservation and take avoidance measures vary among the species. In general, the measures consist of:

- Avoiding disturbance to nesting or denning individuals
- Surveying for species before earth-moving activities
- Confining surface disturbance to areas without indicators of habitation by special-status species and at least 200 feet from potential habitat
- Conducting construction activities during daylight hours
- Restricting vehicle speeds to 25 mile per hour or less

In addition to these measures, the Service's Endangered Species Division is to be contacted in the event that take of one of the special-status species cannot be avoided in order to develop circumstance-specific mitigation measures. Management measures for San Joaquin kit fox, blunt-nosed leopard lizard, Tipton kangaroo rat, and vernal pool fairy shrimp would be in

addition to those specified in the 1997 Biological Opinion. Conservation and take avoidance measures that would be implemented for each species are provided in Appendix A.

4.3.6 Pixley National Wildlife Refuge

No Action Alternative

Habitat Management

Under the No Action Alternative, on-refuge management at Pixley NWR is assumed to be in accordance with the assumptions of the preferred alternative resulting from the CVPIA PEIS. The acres of each habitat that would be managed using firm Level 2 water supplies and the Level 4 increment are shown in Table 4-3.

Management using Level 2 water would consist of winter flooding of seasonal wetlands for wintering and migrating waterfowl. Existing wetland impoundments allow for a total of 950 wetland acres. However, Level 2 water could only support approximately 310 acres of seasonal wetland. No crops or irrigated pasture would be supported.

The increase to Level 4 water supplies would increase wetland habitat availability in the fall and winter. In addition, more water would be available to irrigate moist soil impoundments and cropland. Irrigated uplands would consist of small grains and pasture, and would provide food resource for geese, sandhill cranes, and waterfowl.

Mosquito Abatement

Mosquito-control activities have not been necessary on Pixley NWR in the past. If control actions were necessary in the future they would be the same as those described for Kern NWR.

Listed-Species Management

Listed species management would be the same as that described for the No Action Alternative for Kern NWR.

Proposed Action

Habitat Management

Management objectives with full use of Level 4 water under the Proposed Action would emphasize moist soil impoundments to a greater degree than the No Action Alternative and would reduce the acreage maintained as unirrigated seasonal marsh. Current habitat objectives using full Level 4 deliveries are shown in Table 4-3. The change in the habitat acreages from those predicted in the *Report on Refuge Water Supply Investigations* results from recalculations of acreages within the units on the Refuge (D. Hardt, 2000)

Mosquito Abatement

Mosquito-abatement practices would be the same as those described for the No Action Alternative.

Listed-Species Management

Listed species management would be the same as that described for Kern NWR under the Proposed Action.

TABLE 4-4
Special-Status Species for which the Service Will Implement Conservation and Take Avoidance Measures under the Proposed Action

Bald eagle (*Haliaeetus leucocephalus*)	Southern grasshopper mouse (*Onychomys torridus ramona*)
Blunt-nosed leopard lizard *(Gambelia sila)*	Tipton kangaroo rat *(Dipodomys nitratoides nitratoides)*
Ferruginous hawk (*Buteo regalis*)	Vernal pool fairy shrimp *(Branchinecta lynchi)*
Giant kangaroo rat (*Dipodomys ingens*)	Western burrowing owl (*Athene cunicularia hypugea*)
Northwestern and southwestern pond turtle (*Clemmys marmorata marmorata* and *C. m. pallida*)	Mountain plover (*Charadrius montanus*)
San Joaquin coachwhip (*Masticophis flagellum ruddocki*)	Pacific (=Townsend's) western big-eared bat (*Corynorhinus townsendii townsendii*)
San Joaquin kit fox *(Vulpes macrotis mutica)*	California mastiff bat (*Eumops perotis californicus*)
Swainson's hawk (*Buteo swainsonii*)	Small-footed myotis bat (*Myotis ciliolabrum*)
Tricolored blackbird (*Agelaius tricolor*)	Long-eared myotis bat (*Myotis evotis*)
White-faced ibis (*Plegadis chihi*)	Fringed myotis bat (*Myotis thysanodes*)
Western spadefoot toad (*Scaphiopus hammondii*)	Long-legged myotis bat (*Myotis volans*)
Buena Vista Lake shrew (*Sorex ornatus relictus*)	Yuma myotis bat (*Myotis yumanensis*)
California horned lizard (*Phrynosoma coronatum frontale*)	Kern mallow (*Eremalche kernensis*)
Giant garter snake (*Thamnophis gigas*)	Lost Hills crownscale (*Atriplex vallicola*)
Little willow flycatcher (*Empidonax traillii brewsteri*)	Slough thistle (*Cirsium crassicaule*)
San Joaquin (=Nelson's) antelope squirrel (*Ammospermophilus nelsoni*)	Recurved larkspur (*Delphinium recurvatum*)
San Joaquin pocket mouse (*Perognathus inornatus*)	

4.4 Alternative Considered But Not Analyzed in Detail

The selection of the Proposed Action and the development of a No Action Alternative came following consideration of a broader range of possible alternatives.

This section describes other alternatives that were considered, but were not carried forward for detailed analysis. All of the alternatives considered included full Level 2 and Level 4 water deliveries per CVPIA directives.

4.4.1 Annual Agreements

Under an alternative based on annual water service agreements, Reclamation would negotiate annual agreements with the Service for Level 2 supplies and the available Level 4 increment. Such an alternative would provide maximum flexibility in Reclamation's water supply planning, but this alternative was not selected for detailed analysis because of several disadvantages. Primary among these disadvantages was that annual contracts did not appear to meet the intent of the CVPIA. Bolstering Central Valley wetland habitats by providing reliable refuge water supplies is a long-term proposition, and year-to-year contracts would not provide enough certainty to promote effective management of on-refuge habitats. However, flexibility has been built into the proposed long-term agreements in a manner consistent with CVPIA directives. In addition to the inherent flexibility provided by Reclamation's Water Acquisition Program, Level 2 supplies can be reduced in dry years, and pooling of water supplies between refuges can occur in dry years under the direction of a refuge water management team. Because annual contracts do not appear to meet CVPIA directives, and because some flexibility is obtained through long-term agreements, an alternative involving annual agreements was not carried forward for detailed consideration.

4.4.2 Long-Term Level 2 Agreements

Another potential alternative is to enter into long-term agreements for Level 2 supplies only. The Level 4 increment would be provided under annual interim agreements, subject to availability of water from the Water Acquisition Program. This alternative was not selected for detailed analysis because it did not offer any clear advantages over the Proposed Action and may not be consistent with the CVPIA. Reclamation's commitment to provide Level 2 supplies would remain the same under this alternative as under the Proposed Action. Reclamation's obligation to provide the Level 4 increment would also not differ between the two alternatives. In both cases, the Level 4 increment would be provided through voluntary measures (e.g., water conservation, conjunctive use, purchase, lease, donation, or other similar activities)[2]. If the Level 4 increment were not available, then it would not be provided to the refuges. Because an alternative to only enter into long-term agreements for Level 2 supplies would not fulfil the objectives of the CVPIA, it was not carried forward for detailed consideration.

[2] These measures do not require involuntary reallocations of CVP yield.

Section 5: Affected Environment and Environmental Consequences

SECTION 5

Affected Environment and Environmental Consequences

5.1 Introduction

This section describes the environmental setting of the Kern and Pixley NWRs, and describes potential environmental consequences regarding the following resource categories:

- Biological Resources
- Water Quality
- Agricultural Land Use
- Recreation
- Regional Economics
- Social Conditions
- Cultural Resources
- Visual Resources
- Power

Other resources were either fully covered in the CVPIA PEIS (for example, CVP-wide issues such as surface water and groundwater), or were not likely to be affected under the Proposed Action (such as mineral resources and noise). The PEIS provides an appropriate cumulative impacts analysis for this document, and additional cumulative impacts are not considered.

As a NEPA document, the effects of the alternatives are considered at an equal level of detail, and the primary focus is on how the Proposed Action would impact the environment relative to the No Action Alternative. In other words, environmental consequences would occur if the Proposed Action was not implemented, and the focus of the environmental analysis is identifying how the environment would be affected with the project versus how it would be affected without the project. As described in Section 4, the No Action Alternative has two primary components:

- Reclamation would continue to provide Level 2 water supplies and the Level 4 increment under long-term agreements of unspecified duration.

- On-refuge use of the water would be in accordance with the assumptions of the CVPIA PEIS.

The analysis of the impacts of the Proposed Action considers how on-refuge habitat conditions would differ between the current management objectives assumed under the Proposed Action and the habitat conditions assumed in the PEIS. For both alternatives, the impact analysis considers conditions that would occur with full Level 4 water supplies.

5.2 Biological Resources

This section describes the biological resources present on the refuges within the Tulare Lake Basin, and how these resources may be affected as a result of the Proposed Action.

5.2.1 Affected Environment

The Kern NWR Complex is located in the Tulare Lake Basin at the southern portion of the Central Valley and comprises two individual refuges (Kern and Pixley NWRs) owned and managed by the Service. Historically, seasonal flooding of Tulare Lake and four other smaller lakes created an interconnected patchwork of aquatic, wetland, riparian forest, and valley oak savannah habitats. The vast wetland habitats were an important overwintering and migratory stopover for waterfowl. Although much of the historic Tulare Lake Basin has been converted to agricultural use, small areas of wetland habitat remain.

The 10,600-acre Kern NWR was established to restore a portion of the wetland habitat lost through drainage of Buena Vista, Kern, Goose, and Tulare lakes for agricultural use. Management of Kern NWR has four objectives (Service, 1986a):

- Provide wintering and migration habitat for waterfowl and water birds
- Preserve and improve habitats that support the endangered blunt-nosed leopard lizard, San Joaquin kit fox, and other endangered and sensitive species
- Maintain populations and habitats for native plants and animals
- Provide for public use that is compatible with the refuge's and Service objectives, and encourage environmental understanding for visitors

Pixley NWR was also established to restore and protect wetland habitat. However, in addition to providing wetland habitat, Pixley NWR currently fills an important role in supporting threatened and endangered species. Approximately 4,392 acres of the refuge are set aside as habitat for three endangered species—the blunt-nosed leopard lizard, the San Joaquin kit fox, and the Tipton kangaroo rat. Management of Pixley NWR has three primary objectives (Service, 1986b):

- Preserve and improve habitats that support the endangered blunt-nosed leopard lizard, San Joaquin kit fox, and Tipton kangaroo rat, as well as other endangered and sensitive species
- Maintain adequate populations of native plants and animals
- Provide habitat for migratory waterfowl and water birds, when water is available

Vegetation and Wildlife

Management of the Kern NWR Complex focuses on providing wetland and native upland habitats. Small grain crops and pasture are also maintained on Pixley NWR as winter loafing habitat for sandhill cranes and geese. The vegetation and associated wildlife communities of Kern and Pixley NWRs can be divided into four general types:

- Upland habitats
- Wetland habitats

- Riparian habitats
- Irrigated pasture and crops

Upland Habitats

Native upland habitats consist of annual and perennial grasslands, alkali scrub / alkali playa, and vernal pool complexes. Approximately 2,330 acres of Kern NWR and 5,045 acres of Pixley NWR are native upland habitats managed for endangered species. Water is not used to manage the upland habitats, and would not be affected by the Proposed Action. For the remaining habitat types (wetland, riparian, and irrigated pasture), active water management is necessary to produce and maintain good-quality wildlife habitat. Therefore, these habitats could potentially be affected by the proposed water service agreement. The affected environment discussion and environmental consequences focus on these habitat types.

Wetland Habitats

Wetland habitats consist of seasonally flooded marshes (including moist soil impoundments, and summer water / permanent ponds). Seasonally flooded wetlands are primarily managed to provide habitat for migratory waterfowl, while the summer water / permanent pond types are managed to provide habitat for resident wildlife and summer migrants. Through the fall and winter, large concentrations of waterfowl and smaller numbers of egrets, herons, ibis, and grebes (as well as many other types of water birds and shorebirds) use the seasonally flooded marshes. In addition, a full complement of raptors preys on the numerous water birds. Approximately 6,700 acres of Kern NWR are designated for management as wetlands; on Pixley NWR, approximately 1,300 acres are designated for management as wetlands.

Seasonally flooded marshes are inundated fields or ponds managed primarily to grow seed and produce invertebrates as food for migratory waterfowl, shorebirds, and other wetland-dependent wildlife. (Reclamation and CDFG, 1995). Plant species include watergrass (*Echniochloa crusgalli*), smartweed (*Polygonum sp.*), swamp timothy (*Crypsis schoenoides*), sprangletop (*Leptochloa sp.*), loosestrife (*Ammannia sp.*), burhead (*Echinodorus sp.*), beggarticks (*Bidens sp.*), annual saltbush (*Atriplex sp.*), goosefoot (*Chenopodium* sp.), and brass buttons (*Cotula coronopifolia*). Water levels are managed to provide the appropriate foraging water depths for various wintering waterfowl and shorebirds. Generally, seasonal marshes are flooded from October through February, although some units are flooded as early as August or September to provide habitat for early-arriving migratory waterfowl such as northern pintails. The seasonal wetland units are drained in the spring. As water is removed, shorebirds use the shallow depth and exposed mudflats.

Moist soil impoundments are similar to seasonally flooded wetlands, except that they are irrigated in summer to improve production of watergrass and swamp timothy, the primary food species for waterfowl. Moist soil impoundments are typically irrigated during the summer to increase plant biomass and to enhance seed production. Water requirements differ among plant species. Swamp timothy requires the fewest irrigations and, consequently, requires less water to produce. Watergrass can require several irrigations during the summer and has the highest water requirements of the moist-soil plants (Reclamation and CDFG, 1995). Watergrass is considered one of the most productive and important waterfowl food plants in California (Reclamation, et al., 1998). With adaptive management techniques, the acreage for each target food source changes based on water

availability; less watergrass can be managed in dry years, while less swamp timothy is produced in wet years.

Summer water habitat consists of wetlands that are flooded in the fall and remain flooded through June or July. This habitat provides nesting and brooding habitats for waterfowl, as well as breeding habitat for sensitive species such as tri-colored blackbirds and white-faced ibis. Summer water is only provided on Kern NWR.

Riparian Habitat

Managed riparian habitat consists of natural slough channels that receive water drained from managed wetland units. Managed riparian habitat also includes areas where trees and shrubs were planted. Water is delivered to these areas in November and December to help establish new plantings. Riparian habitats provide important nesting and foraging habitat as well as migratory / dispersal corridors for a variety of migratory and resident wildlife species. Willows and cottonwoods provide nesting, roosting, and feeding habitat for migratory songbirds and raptors, and shelter and screening for waterfowl. Deer, small mammals, and duck broods use riparian areas during the summer when many marsh units are dry.

Irrigated Pasture and Crops

Irrigated pasture and cultivated crops are only provided on Pixley NWR. Irrigated pasture creates nesting cover for upland game birds and other species, and may also be managed later in the year to produce short green grazing and loafing habitat during the winter for sandhill cranes and geese. Small grain crops include barley, wheat, safflower, and vetch. These crops produce high-energy food, requiring little water, and also provide nesting and escape cover in the spring and summer.

Special-Status Species

Table 5-1 lists the special-status species known to occur, or potentially occurring, on the Kern and Pixley NWRs and their habitat associations. These species were identified in a March 20, 2000, letter from the Service to Reclamation. In addition to the list from the Service, the following documents were reviewed to identify any additional special-status species potentially occurring at the refuges:

- Master Plans for Kern and Pixley NWRs (Service, 1986a and 1986b)
- *Biological Opinion on Wetland /Riparian Enhancement and Endangered Species Management Actions Within Refuge Master Plans on Kern and Pixley National Wildlife Refuges, Kern and Tulare Counties, California* (Service, 1997)
- CVPIA PEIS and associated Draft Biological Opinion
- *Programmatic Biological Opinion on National Wildlife Refuge and Wildlife Area Water Conveyance Projects within Tulare, Kern, Fresno, Madera, and Merced Counties, California* (Service, 1999)
- Draft EA / IS for Conveyance of Refuge Water Supply Project South San Joaquin Valley Study Area (Reclamation and CDFG, 1997)

TABLE 5-1
Special-Status Species Known to Occur or Potentially Occurring on Kern and Pixley NWRs

Common Name Scientific Name	Status	General Habitat Association
Invertebrates		
Conservancy fairy shrimp *Branchinecta conservatio*	Federal – E State – none	Vernal pools
Vernal pool fairy shrimp *Branchinecta lynchi*	Federal – T State – none	Vernal pools
Vernal pool tadpole shrimp *Lepidurus packardi*	Federal – E State – none	Vernal pools
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	Federal – T State - none	Riparian habitat (elderberry bushes)
Amphibians		
Western spadefoot toad *Scaphiopus hammondii*	Federal – SC State – CSC	Vernal pools
Reptiles		
Western pond turtle *Clemmys marmorata*	Federal – SC State – CSC	Wetland and riparian habitats
Blunt-nosed leopard lizard *Gambelia sila*	Federal – E State – E	Grassland and scrub habitats
California horned lizard *Phrynosoma coronatum frontale*	Federal – SC State – CSC	Grassland and riparian habitats
Giant garter snake *Thamnophis gigas*	Federal – T State – CSC	Wetland habitat
San Joaquin coachwhip *Masticophis flagellum ruddocki*	Federal – SC State – CSC	Grassland and scrub habitats
Birds		
American white pelican *Pelicanus erythrorhynchos*	Federal – none State – CSC	Wetland and aquatic habitats
White-faced ibis *Plegadis chihi*	Federal – SC State – CSC	Wetland habitat, irrigated pasture and croplands
Fulvous whistling duck *Dendrocygna bicolor*	Federal – SC State – CSC	Wetland habitat, irrigated pasture and croplands
Aleutian Canada goose *Branta canadensis leucopareia*	Federal – T State – none	Wetland habitat; irrigated pasture and croplands
Copper's hawk *Accipiter cooperi*	Federal – none State – CSC	Riparian habitat
Sharp-shinned hawk *Accipiter striatus*	Federal – none State – CSC	Riparian habitat
Golden eagle *Aquila chrysaetos*	Federal – none State – CSC	Grassland, scrub, and wetland habitats; irrigated pasture

TABLE 5-1
Special-Status Species Known to Occur or Potentially Occurring on Kern and Pixley NWRs

Common Name Scientific Name	Status	General Habitat Association
Ferruginous hawk *Buteo regalis*	Federal – SC State – CSC	Grassland and scrub habitats; irrigated pasture
Swainson's hawk *Buteo swainsoni*	Federal – none State – T	Grassland habitat; irrigated pasture
Northern harrier *Circus cyaneus*	Federal – none State – CSC	Grassland and wetland habitats
Bald eagle *Haliaeetus leucocephalus*	Federal – T State – E	Wetland and riparian habitats
Osprey *Pandion haliaetus*	Federal – none State – CSC	Riparian habitat
Merlin *Falco columbarius*	Federal – none State – CSC	Wetland habitat
Prairie falcon *Falco mexicanus*	Federal – none State – CSC	Grassland and scrub habitats
American peregrine falcon *Falco peregrinus anatum*	Federal – none State – E	Wetland and grassland habitats
Greater sandhill crane *Grus canadensis tabida*	Federal – none State – T	Irrigated pasture and croplands
Mountain plover *Charadrius montanus*	Federal – PT State – CSC	Grassland and scrub habitats
Long-billed curlew *Numenius americanus*	Federal – none State – CSC	Grassland habitat
Black tern *Chlidonias niger*	Federal – SC State – CSC	Wetland habitat
California gull *Larus californicus*	Federal – none State – CSC	Wetland habitat
Short-eared owl *Asio flammeus*	Federal – none State – CSC	Grassland and wetland habitats
Western burrowing owl *Athene cunicularia hypugea*	Federal – SC State – CSC	Grassland habitat
Little willow flycatcher *Empidonax traillii brewsteri*	Federal – none State – E	Wetland and riparian habitats
Bank swallow *Riparia riparia*	Federal – none State – T	Riparian habitat
Loggerhead shrike *Lanius ludovicianus*	Federal – SC State – CSC	Grassland habitat and irrigated pasture
Tricolored blackbird *Agelaius tricolor*	Federal – SC State – CSC	Wetland habitat
Yellow warbler *Dendroica petechia brewsteri*	Federal – none State – CSC	Wetland and riparian habitats

TABLE 5-1
Special-Status Species Known to Occur or Potentially Occurring on Kern and Pixley NWRs

Common Name Scientific Name	Status	General Habitat Association
Mammals		
Buena Vista Lake shrew *Sorex ornatus relictus*	Federal – C State – CSC	Wetland and riparian habitats
Pallid bat *Antrozous pallidus*	Federal – none State – CSC	Grassland and scrub habitats
Spotted bat *Euderma maculatum*	Federal – SC State – CSC	Riparian wetland and grassland habitats
Occult little brown myotis *Myotis lucifugus occultus*	Federal – SC State – CSC	Riparian and wetland habitats
Yuma myotis *Myotis yumanensis*	Federal – SC State – none	Riparian habitat
Long-eared myotis *Myotis evotis*	Federal – SC State – none	Riparian habitat
Fringed myotis *Myotis thysanodes*	Federal – SC State – none	Riparian habitat
Long-legged myotis *Myotis volans*	Federal – SC State – none	Riparian habitat
Small-footed myotis *Myotis cilolabrum*	Federal – SC State – none	Scrub habitat
Pacific western big-eared bat *Plecotus townsendii townsendii*	Federal – SC State – CSC	Riparian habitat
Greater western mastiff bat *Eumops perotis californicus*	Federal – SC State – CSC	Grassland and scrub habitats
San Joaquin antelope squirrel *Ammosphermophilis nelsoni*	Federal – SC State – T	Grassland and scrub habitats
Fresno kangaroo rat *Dipodomys nitratoides exilis*	Federal – E State – E	Grassland and scrub habitats
Tipton kangaroo rat *Dipodomys nitratoides nitratoides*	Federal – E State – E	Grassland and scrub habitats
Giant kangaroo rat *Dipodomys ingens*	Federal – E State – E	Grassland habitat
Short-nosed kangaroo rat *Dipodomys nitratoides brevinasus*	Federal – SC State – CSC	Grassland habitat
San Joaquin pocket mouse *Perognathus inornatus*	Federal – SC State – none	Grassland and scrub habitats
Southern grasshopper mouse *Onychomys torridus ramona*	Federal – SC State – CSC	Scrub and riparian habitats
Tulare grasshopper mouse *Onychomys torridus tularensis*	Federal – SC State – CSC	Scrub and riparian habitats

TABLE 5-1
Special-Status Species Known to Occur or Potentially Occurring on Kern and Pixley NWRs

Common Name Scientific Name	Status	General Habitat Association
San Joaquin kit fox *Vulpes macrotis mutica*	Federal – E State – T	Grassland and scrub habitats
Plants		
Forked fiddleneck *Amsinokia vernicosa*	Federal – SC State – none	Grassland habitat
Heartscale *Atriplex cordulata*	Federal – SC State – none	Grassland and scrub habitats
Brittlescale *Artiplex depressa*	Federal – SC State – none	Grassland and scrub habitats
San Joaquin saltbush *Atriplex joaquiniana*	Federal – SC State – none	Grassland and scrub habitats
Bakersfield smallscale *Atriplex tularensis*	Federal – SC State – E	Scrub habitat
Lost Hills crownscale *Atriplex vallicola*	Federal – SC State – none	Grassland and scrub habitats
Akali mariposa lily *Calochortus striatus*	Federal – SC State – none	Grassland and scrub habitats
California jewelflower *Caulanthus californicus*	Federal – E State – E	Grassland and scrub habitats
Hoover's spurge *Chamaesyce hooveri*	Federal – PT State – none	Vernal pools
Slough thistle *Cirsium crassicaule*	Federal – SC State – none	Riparian, scrub, and grassland habitats
Hispid bird's beak *Cordylanthus mollis* ssp. *hispidus*	Federal – SC State – none	Grassland habitat
Recurved larkspur *Delphinium recurvatum*	Federal – SC State – none	Grassland and scrub habitats
Kern mallow *Eremalche kernensis*	Federal – E State – none	Grassland and scrub habitats
Hoover's eriastrum *Eriastrum hooveri*	Federal – T State – none	Grassland and scrub habitats
Temblor buckwheat *Eriogonum tembrense*	Federal – SC State – none	Grassland habitat
Comanche Point layia *Layia leucopappa*	Federal – SC State – none	Grassland and scrub habitats
San Joaquin woolythreads *Lembertia congdonii*	Federal – E State – none	Grassland and scrub habitats
Little mousetail *Myosurus minimus*	Federal – SC State – none	Vernal pools
San Joaquin orcutt grass *Orcuttia inaequalis*	Federal – PE State – E	Vernal pools

TABLE 5-1
Special-Status Species Known to Occur or Potentially Occurring on Kern and Pixley NWRs

Common Name Scientific Name	Status	General Habitat Association
Gairdner's yampah *Perideridia gairdneri*	Federal – SC State – none	Vernal pools; grassland habitat
Sanford's arrowhead *Sagittaria sanfordii*	Federal – SC State – none	Wetland habitat
Oil neststraw *Stylocline citroleum*	Federal – SC State – none	Scrub habitat
Mason neststraw *Stylocline masonii*	Federal – SC State – none	Scrub habitat
Green's tuctoria *Tuctoria greenei*	Federal – E State – Rare	Vernal pools

[a]Status Definitions:
E = Listed as Endangered by the state or federal government.
T = Listed as Threatened by the state or federal government.
PE = Proposed to list as Endangered by the state or federal government.
PT = Proposed to list as Threatened by the state or federal government.
SC = Federal Species of Concern.
CSC = California Species of Special Concern.
Rare = Designated as rare by the State of California.

5.2.2 Environmental Consequences

The proposed project would implement the provisions of the CVPIA to provide firm Level 2 water supplies and up to the full Level 4 increment to Kern and Pixley NWRs. The impacts of providing this water have been evaluated programmatically in the CVPIA PEIS, as described in Section 3 of this EA. However, additional site-specific analysis on the effects of using the water on the refuges is warranted. This section focuses on the site-specific effects that may occur to biological resources within these areas.

Kern NWR

No Action Alternative

Under the No Action Alternative, Reclamation would provide Level 2 water supplies and up to the full Level 4 increment. In recent years, Kern NWR has received full Level 2 water supplies and 50 to 60 percent of the Level 4 increment. The increase in reliable water supplies to full Level 4 under the No Action would allow optimal management of refuge habitats. Under the No Action Alternative, Kern NWR would support 7,000 acres of managed wetlands, of which 4,300 acres would be seasonally flooded marsh, and 2,700 acres would be moist soil impoundments.

The habitat improvements expected under the No Action Alternative do not include expansion of wetland habitats, but, rather, result from the ability and flexibility to more effectively manage existing wetland units as a result of increased year-round water supplies. Continued habitat improvements are expected to result from:

- Earlier and expanded fall flooding of seasonal wetlands to allow increased wildlife use
- Additional maintenance of summer water, wetland / moist soil, riparian, and irrigated pasture habitat types for wildlife use and vegetation improvement

- Increased management of moist soil impoundments and through more frequent irrigation to provide a high-quality carbohydrate food source for waterfowl and other water birds, while easing potential waterfowl crop depredation problems on nearby agricultural lands
- Maintenance of water depths, using year-round water delivery, that provide optimum foraging conditions for the majority of avian species
- Control of undesirable vegetation species using deep irrigation and maintenance for periods from 2 to 4 weeks during the summer

With these improved management capabilities resulting from increased and more-reliable water supplies, optimal habitat conditions could be maintained under drought conditions and during flood/storm conditions to provide suitable and stable habitat conditions for resident and migratory wildlife. In particular, full Level 4 water supplies would increase the availability of wetland habitat and would provide water for spring/summer irrigation. Level 4 water would also allow early flooding of seasonal wetlands and would increase the extent of seasonal wetlands in the fall and winter. Overall, higher-quality wetland habitat would be available for a longer period of time each year.

An additional benefit of the No Action Alternative would include reduction of the potential for waterfowl to transmit avian diseases to domestic fowl. Potential benefits are two-fold: (1) increased on-refuge retention of waterfowl as a result of improved habitat availability and quality would reduce potential exposure of domestic fowl to migratory waterfowl, and (2) increased ability for refuge managers to employ flow-through management techniques would minimize outbreaks of avian cholera, botulism, and other bird diseases on the refuges.

Continuing improvements in habitat quality and availability of seasonal wetlands would benefit migratory waterfowl. The *Report on Refuge Water Supply Investigations* (Reclamation, 1989) projected more than 16 million bird-use-days for waterfowl, geese, and other migratory shorebirds on the Kern NWR each year under management with full Level 4 water supplies. Improvements in wetland habitat quality and availability would have beneficial effects for other wetland-associated wildlife, including a variety of invertebrates, reptiles, amphibians, mammals, and shorebirds, by providing foraging and resting areas. A number of special-status species would also benefit from the increased habitat diversity provided under optimal habitat management of wetland units. These species include the tricolored blackbird, white-faced ibis, Buena Vista Lake shrew, slough thistle, and recurved larkspur. Golden and bald eagles, and the American peregrine falcon could indirectly benefit from an increase in their seasonal food supply of wintering waterfowl.

The increased water supplies would increase return flows from the refuge. This increase could seasonally increase the availability of water in conveyance channels on the refuge and beneficially affect riparian vegetation and associated wildlife. However, Kern NWR may not be able to release return flows to adjacent agricultural lands. If water is not released from managed wetland units, it could overflow into upland habitats and could temporarily inundate habitat for special-status species associated with native upland habitats, such as San Joaquin kit fox, Tipton kangaroo rat, giant kangaroo rat, and blunt-nosed leopard lizard.

The refuge is currently working with the Solicitor's Office of the Department of the Interior to develop a legal mechanism for protecting listed species under these conditions.

Proposed Action

The Proposed Action would provide the same benefits to wetland habitats as those described for the No Action Alternative. The Proposed Action primarily differs from the No Action Alternative in providing greater flexibility of the delivery schedule of Level 2 water supplies and the Level 4 increment and in a greater emphasis on summer water. Under the No Action Alternative, Level 2 water supplies and the Level 4 increment would be delivered on the monthly pattern identified in the *Report on Refuge Water Supplies Investigations* (Reclamation, 1989). In contrast, the water service agreement for the Proposed Action would provide greater flexibility and would allow year-to-year adjustments in the delivery pattern. This difference would further enhance the refuge managers' ability to optimally manage wetland habitats, as managers could better adjust the water delivery schedule in response to habitat management needs and wildlife use.

Management of on-refuge habitats under the Proposed Action would focus on seasonal wetland habitats, just as under the No Action Alternative. The Proposed Action is expected to support 6,700 acres of managed wetlands of which 4,250 acres would be seasonal marsh, 2,250 acres would be moist soil impoundments, and 200 acres would be summer water. In addition, approximately 450 acres of riparian habitat would be supported on Kern NWR. The difference in acreage of managed wetlands between the Proposed Action and the No Action Alternative reflects a reclassification of habitats on the refuge rather than an expected physical difference.

The Proposed Action includes provision of 200 acres of summer water that was not projected to occur under the No Action Alternative. By maintaining wetland habitats into the summer months, the benefits of increased water supplies would extend to resident species and summer migrants. Summer water provides habitat for nesting birds such as tricolored blackbirds and waterfowl, and resident species.

Development and maintenance of riparian habitat would benefit raptors, songbirds, raccoons, opossums, and some reptiles and amphibians. Increases in aquatic invertebrates should also be proportional to increases in aquatic acreage. An existing riparian area on the refuge is managed for a heron rookery; water is kept on the area at depths sufficient to protect nesting birds from predators. With implementation of the Proposed Action, riparian habitat would be managed for optimal rookery habitat. Special-status species, such as the western pond turtle and the little willow flycatcher, may benefit from the additional acres and better-quality riparian habitat supported under the Proposed Action.

The Proposed Action includes conservation measures for protecting special-status species that avoid and minimize potential impacts to special-status species from a wide range of habitat management activities and operational regimes that may be influenced by the approval of the Proposed Action. These conservation measures would improve protection of special-status species relative to the No Action Alternative. Implementation of the conservation measures would ensure protection of special-status species and their habitats, and could contribute to the recovery of listed species. Thus, relative to the No Action Alternative, the Proposed Action would provide greater benefit to special-status species.

Pixley NWR

No Action Alternative

Under the No Action Alternative, Reclamation would provide Level 2 water supplies and up to the full Level 4 increment to Pixley NWR. Since passage of the CVPIA in 1992, Pixley NWR has only had access to Level 2 water supplies from the one groundwater well on the refuge. The continuing availability of Level 2 water supplies, and eventual expansion of the conveyance infrastructure to reliably provide up to the full Level 4 increment, would result in substantial improvements in the ability to manage waterfowl habitat on the refuge. The increase in reliable water supplies to full Level 4 under the No Action Alternative would allow optimal management of on-refuge habitats. Under the No Action Alternative, Pixley NWR would support 950 acres of managed wetlands, of which approximately 550 acres would be seasonally flooded marsh, while 400 acres would be moist soil impoundments. In addition, 650 acres would be managed as irrigated pasture and cultivated crops.

As with Kern NWR, expansion of wetland habitats to non-wetland areas would not occur. Rather, increased and reliable water supplies would enable more effective management of existing habitats. Continued improvements in management capabilities and the subsequent benefits to wetland habitat quality and availability and wetland-associated species would be the same as those described for Kern NWR. The *Report on Refuge Water Supply Investigations* (Reclamation, 1989) projected nearly 3 million bird-use-days for waterfowl, geese, and other migratory each year under optimal habitat management.

Full Level 4 water supplies would also support an increase in irrigated pasture and croplands. This increase would benefit sandhill cranes, geese, raptors, and other birds and mammals that forage on small grains and/or insects and small mammals found in these habitats. Pasture could also provide habitat for grassland birds, such as sparrows, pheasants, and northern harriers.

An additional benefit of the No Action Alternative would include reduction of the potential for waterfowl to transmit avian diseases to domestic fowl. Beneficial effects with regard to controlling avian diseases would be the same as those described for the Kern NWR.

Proposed Action

The effects of the Proposed Action on habitat quality and availability on Pixley NWR would be largely the same as for the No Action Alternative. Under the Proposed Action, Pixley NWR would support approximately 755 acres of managed wetlands, with 238 acres managed as seasonally flooded marsh and 545 acres managed as moist soil impoundments. Approximately 545 acres would be irrigated pasture and cultivated crops. The acreage differences from the No Action Alternative reflect a reclassification of habitats on the refuge rather than an expected physical difference. The Proposed Action could result in somewhat better habitat quality than the No Action Alternative because of increased flexibility in the delivery schedule of Level 2 water supplies and the Level 4 increment. Under the No Action, Level 2 water supplies and the Level 4 increment would be delivered on the monthly pattern identified in the *Report on Refuge Water Supplies Investigations* (Reclamation, 1989). In contrast, the water service agreement for the Proposed Action would provide greater flexibility and year-to-year adjustments in the delivery pattern. This difference would further enhance the refuge managers' ability to optimally manage habitats on the refuge, thereby benefiting a diversity of wildlife species (including special-status species).

As on Kern NWR, conservation measures to protect special-status species would be implemented under the Proposed Action. These measures, in combination with improved habitat management capabilities, would further benefit special-status species relative to the No Action.

5.3 Water Quality

This section describes the water quality conditions that exist on the Kern NWR Complex (Kern NWR and Pixley NWR) and how these conditions may change as a result of the Proposed Action.

5.3.1 Affected Environment

Kern National Wildlife Refuge

Water supplies for Kern NWR consist of surface water from the CVP and SWP, and groundwater. The Kern NWR is primarily served by the Buena Vista Water Storage District, which obtains surplus SWP water from the Kern County Water Agency through the California Aqueduct. In addition, Kern NWR occasionally receives water from Reclamation through the Friant-Kern Canal and, subsequently, through Poso Creek. The quality of surface water from the CVP and SWP is adequate for refuge uses and is widely used for irrigation and drinking water (Reclamation, 1994). Runoff from surrounding farms and flood flows supply additional surface water. The quality of this water has also been adequate for refuge uses. Studies conducted by the U.S. Geological Survey on the refuge detected few pesticides, and those detected were far below levels at which adverse effects would occur. Trace element concentrations were also found to be low and to pose little threat to wildlife.

Nine groundwater wells were used to supply water to the refuge until the early 1970s when a receding water table, coupled with escalating energy costs, led to the discontinued use of three of the wells. The remaining six wells have been operated on an as-needed basis, in conjunction with the purchase of SWP water (Service, 1986a). No water quality concerns regarding the use of groundwater on the refuge have been identified.

There are no return flows from the Kern NWR except in extremely wet years. The refuge area sits within the Tulare Lake Bed. The historic hydrology has been greatly altered, with the majority of flow that at one time reached the lake bed now controlled through dams, reservoirs, and irrigation features. The primary drainage features within the study area are Deer Creek, Poso Creek, the Goose Creek Canal, and the Kern River channel. The Kern NWR accepts floodwater from Poso Creek on an as-needed basis.

Pixley National Wildlife Refuge

Pixley NWR's primary source of water has been groundwater; limited surface water supplies have been available in the past. Deer Creek, which passes through the southeast corner of the refuge, is an intermittent stream (Service, 1986b). During extremely wet years when flood flows occur in Deer Creek, surface water could be diverted from the creek at check structures along the southern boundary of the refuge. This water is of suitable quality for wetland habitat management. Studies conducted by the USGS on the refuge detected few

pesticides, and those detected were far below levels at which adverse effects would occur. Trace element concentrations were also found to be low and to pose little threat to wildlife.

Pixley NWR has also received surface water from the Pixley Irrigation District when surplus flows have been available. The Pixley Irrigation District obtains water from the Friant-Kern Canal at Millerton Lake. Surface water quality in Millerton Lake, the San Joaquin River at and upstream of the PID diversion, and in subsequent canals and systems is adequate for refuge and agricultural uses (Reclamation, 1994). This water is widely used for irrigation and drinking water after disinfection.

Groundwater has been the only reliable water available to the refuge. The groundwater is of poor quality for agricultural irrigation, but has been adequate for refuge uses. The Pixley NWR has relied almost exclusively on a single groundwater well for regular water supply.

There are no return flows from Pixley NWR except in extremely wet years. The refuge area sits within the Tulare Lake Bed. While the vast majority of this lakebed is under cultivation, the area still has been inundated as recently as 1983. The historic hydrology has been greatly altered, with the majority of flow that at one time reached the lake bed now controlled through dams, reservoirs, and irrigation features. The primary drainage features within the study area are Deer Creek, Poso Creek, the Goose Creek Canal, and the Kern River channel.

5.3.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the refuges of the Kern NWR complex. The impacts of providing this water have been evaluated in the CVPIA PEIS, as described in Section 3 of this EA. However, additional site-specific analysis is warranted. This section focuses on the site-specific water-quality impacts that may occur with increased water supply.

Kern NWR Complex

No Action Alternative

Under the No Action Alternative, on-refuge management at the Kern NWR Complex would be in accordance with the assumptions of the CVPIA Preferred Alternative. Under the No Action Alternative, Reclamation would provide Level 2 water to the Kern NWR Complex from CVP yield and the Level 4 increment as acquired through the Water Acquisition Program.

Water provided to Kern NWR and Pixley NWR would continue to improve water quality conditions on the refuges. First, the availability of reliable, year-round water supplies would allow managers to optimally manage wetland habitat, which includes maintaining good water quality in the wetland units to avoid outbreaks of avian diseases. Second, the quality of the water provided to the refuges would be of similar or better quality. The quality the groundwater used on Pixley NWR is poor. With provision of Level 2 and up to Level 4 water supplies, the quality of the water used for wetland habitat management would continue to improve.

There are no return flows from either the Kern or Pixley NWRs except in extremely wet years, so providing Level 2 and up to Level 4 water supplies would not affect the quality or quantity of return flows.

Proposed Action

As under the No Action Alternative, Reclamation would deliver Level 2 water supplies from CVP yield and the Level 4 increment as acquired through the Water Acquisition Program to Kern NWR. This water would be used to manage wetland habitats on Kern NWR in a manner similar to the No Action Alternative. The quality and quantity of the water delivered to and used on the refuges would be the same as under the No Action Alternative. As a result, no adverse impacts to water quality would occur from use of the water on Kern NWR.

On Pixley NWR under the Proposed Action, groundwater would continue to be used to meet Level 2 water supplies. The one well on Pixley NWR has provided water of sufficient quality for wetland habitat management, although it is generally of poorer quality than CVP water. Reclamation would provide the Level 4 increment to Pixley NWR as acquired through the Water Acquisition Project. Because Level 2 water and the Level 4 increment would be of sufficient quality for wetland habitat management and there are no return flows from Pixley NWR, no adverse effects to water quality would occur. In the event that groundwater becomes unsuitable for wetland habitat management, Reclamation would provide Level 2 water from other sources of sufficient quality.

5.4 Agricultural Land Use

This section describes the interaction between the refuges and adjacent agricultural lands, and how these conditions may change as a result of the Proposed Action.

5.4.1 Affected Environment

Kern National Wildlife Refuge

The Kern NWR is on the lower margins of the historic Tulare Lake, and the surrounding area contains large remnants of native habitats, as well as lands converted to agricultural use. Native uplands are located primarily to the south and east of the refuge, and are also found to a lesser extent north of the refuge. Portions of the lands south of the refuge contain wetland and riparian habitats. Several duck clubs are located south and east of the refuge. Developed farmlands are located primarily to the west and northeast of the refuge.

Because of its federal ownership, the refuge is considered “Non-Jurisdictional” lands in the Kern County General Plan. Surrounding land uses are designated as a combination of “Intensive Agricultural,” “Resource Reserve,” and “Extensive Agriculture,” with all three land uses applying to surrounding parcels. The Kern NWR Master Plan states that justifications for creating the refuge included preserving lower San Joaquin Valley waterfowl habitat, providing local hunting opportunities, and protecting nearby crops from depredation. The Master Plan does not address compatibility with adjacent farmlands, and refuge/farmland compatibility is not addressed in the Kern County General Plan.

Pixley National Wildlife Refuge

The Pixley NWR is on the eastern margins of historic Tulare Lake and contains large remnants of native grassland habitats and marshes. Most of the surrounding lands have been converted to agricultural use, with a few pockets of native habitats occurring outside of the refuge boundaries. The Pixley NWR is unique among Central Valley refuges in that it

is composed of several isolated parcels rather than one contiguous tract. As a result of recent land acquisitions, the Service currently owns the entire refuge boundary.

The Pixley NWR and surrounding areas are designated as "Agriculture" by the Tulare County General Plan. Justification for creating the refuge included protecting nearby crops from depredation, but the Pixley NWR Master Plan does not address compatibility with adjacent farmlands, and refuge/farmland compatibility is not addressed in the Tulare County General Plan.

5.4.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the Kern and Pixley NWRs. The impacts of providing this water have been evaluated in the CVPIA PEIS, as described in Section 3 of this EA, but additional site-specific analysis is warranted. This section focuses on the site-specific land use conflicts that may occur with surrounding agricultural land uses. Key issues of concern to farm owners surrounding the Kern and Pixley NWRs include economic impacts (primarily as a result of crop depredation by waterfowl and spread of avian diseases) and refuge expansion. Other land use and nuisance issues are considered minor (such as weed control, and beaver and muskrat damage) and would not change under the proposed project. The quality of refuge runoff water was addressed in Section 5.3, and mosquito control was addressed in Section 4.

In order to understand how changing water supplies on the refuges may impact adjacent agricultural lands, the individual refuge management plans were reviewed. The purpose of this reconnaissance was to understand current refuge management practices and how these practices affect surrounding land uses. A similar process was undertaken to evaluate how the Proposed Action may affect these current practices.

Kern National Wildlife Refuge

No Action Alternative

The objectives of the Kern NWR include alleviating depredation of agricultural crops by wintering waterfowl, which continues to be a part of the refuges' primary mission. This objective would continue to be supported under the No Action Alternative. As described in Section 5.2 (Biological Resources), on-refuge habitats would continue to improve under the No Action Alternative. Continuing to provide Level 2 water, and eventually expanding to full Level 4 supplies, would improve the Service's ability to manage waterfowl habitat on the refuge. The improvements expected under the water service agreements do not include expansion of wetland habitats to non-wetland areas, but rather provide the ability to more effectively manage existing habitats.

One of the benefits of effectively managing wetland habitats with a reliable water supply is the ability to improve production of waterfowl forage on the refuge (such as moist soil impoundments for improved watergrass production) rather than focusing only on providing flooded areas. The ability to more effectively grow food items on the refuge is expected to help maintain waterfowl on the refuge, thereby reducing the potential for depredation on surrounding farmlands. Additionally, effectively managing existing habitat is expected to result in a reduced potential for waterfowl diseases to occur, as described in Section 5.2. Reduction in disease potential, coupled with a decrease in off-refuge depredation impacts, is expected to result in a decreased incidence of spreading avian

diseases to domestic fowl (and also should reduce spread of avian diseases from domestic fowl to waterfowl), resulting in an overall beneficial effect to surrounding land uses.

No additional refuge lands would be acquired. The amount of water provided to the refuge by Reclamation would allow for optimum management of current refuge lands per the *Report on Refuge Water Supply Investigations*. The Service currently owns the entire refuge, and no expansion of the refuge is planned.

Proposed Action

Habitat conditions under the Proposed Action would be similar to the No Action Alternative, the primary difference being an increase in summer water (approximately an additional 200 acres relative to the No Action Alternative). This increase in summer water and other minor changes in habitat under the Proposed Action would not substantially change potential impacts to adjacent farmlands relative to the No Action Alternative. Therefore, the level of impact would be about the same as described above. As is the case under the No Action Alternative, no additional refuge lands would be acquired as part of the Proposed Action.

Pixley National Wildlife Refuge

No Action Alternative

The objectives of the Pixley NWR include alleviating depredation of agricultural crops by wintering waterfowl, which continues to be a part of the refuges' primary mission. This objective would continue to be supported under the No Action Alternative. Similar to the previous discussion of impacts on the Kern NWR, continued improvements to Pixley NWR habitat conditions are expected to occur under the No Action Alternative. Continuing to provide Level 2 water, and eventually up to Level 4 supplies, would result in substantial improvements to the ability of the Service to manage waterfowl habitat on the refuge. The improvements expected under the water service agreements do not include expansion of wetland habitats to non-wetland areas but, rather, provide the ability to more effectively manage existing habitats. As on the Kern NWR, providing additional water supplies would help improve on-refuge production of waterfowl forage crops, which is expected to help maintain waterfowl on the refuge and to reduce the potential for depredation on surrounding farmlands. Additionally, effectively managing existing habitat is expected to result in a reduced potential for waterfowl diseases to occur, as described above for the Kern NWR. A reduction in disease potential, coupled with a decrease in off-refuge depredation impacts, is expected to result in decreased spreading of avian diseases to domestic fowl (and also would reduce spreading avian diseases from domestic fowl to waterfowl).

No additional refuge lands would be acquired under the No Action Alternative. The amount of water provided to the Pixley NWR would allow for optimum management of current refuge lands per the *Report on Refuge Water Supply Investigations*. At this time, no additional expansion of the refuge is planned.

Proposed Action

Habitat conditions under the Proposed Action would be similar to the No Action Alternative. Accordingly, potential impacts to adjacent farmlands would be similar to those described above. As is the case under the No Action Alternative, no additional refuge lands would be acquired as part of the Proposed Action.

5.5 Recreation

The quality of on-refuge habitats, both for waterfowl and other species, affects recreation opportunities and experiences. This section describes the potential for habitat changes associated with the project to affect consumptive and non-consumptive recreation uses on the refuges.

5.5.1 Affected Environment

Kern National Wildlife Refuge

Both consumptive and non-consumptive recreation uses occur at the Kern NWR. Public hunting is consistent with federal objectives for the refuge, and occurs in cooperation with CDFG. The primary emphasis is on waterfowl hunting but, to a lesser extent, pheasant hunting also occurs. The current master plan for the Kern NWR calls for an increase in waterfowl hunters from levels in the mid-1980s of an estimated 2,600 hunters per year to approximately 3,300 hunters per year. Pheasant hunter levels are expected to remain at approximately 20 hunters per year. Other consumptive recreation opportunities (such as fishing or dove hunting) are not currently permitted on the Kern NWR.

Non-consumptive recreation use (such as bird watching) has historically been low, but is planned to increase. In the mid-1980s, it was estimated that approximately 500 visitors per year took part in nonconsumptive recreation activities on the Kern NWR. These numbers are expected to increase to more than 2,000 visitors, in part a result of new development commitments on the refuge to expand nonconsumptive recreation opportunities. Such commitments include developing auto tour routes and footpaths, and providing interpretive exhibits describing refuge wildlife and habitats. The Kern NWR Master Plan states that some recreational development is contingent on securing a long-term, reliable water supply.

Pixley National Wildlife Refuge

Public recreation use is not emphasized on the Pixley NWR. No hunting or fishing is currently allowed or planned. Nonconsumptive recreation use is currently allowed subject to permit, and minor recreation development is planned, including interpretive and wildlife observation facilities and two small foot trails. The recreation objective for the Pixley NWR is approximately 1,000 nonconsumptive recreation visitors per year. The Pixley NWR Master Plan states that the recreation development is contingent on securing a long-term, reliable water supply.

5.5.2 Environmental Consequences

Entering into the proposed long-term refuge water supply agreements may affect recreation uses in several ways. This section focuses on the on-refuge habitat changes that may contribute to changes in recreation use. Other potential recreation effects have been evaluated in the CVPIA PEIS, as summarized in Section 3.

Policies affecting on-refuge recreation uses are not expected to change, so any changes to habitats on the refuges are expected to directly correspond to changes in recreation use. The conclusions of Section 5.2 (Biological Resources) have been carried forward to this section

(for example, benefits to waterfowl habitat will improve recreation opportunities for hunters and bird watchers).

Kern NWR

No Action Alternative

Under the No Action Alternative, habitat conditions are expected to continue to improve in a manner that supports the recreation goals described in the Kern NWR Management Plan. As described above, recreation use on the Kern NWR is expected to increase from 3,100 visitor-use days per year (mid-1980s levels) to more than 5,300 visitor-use days per year as the Management Plan is implemented. This expected recreation benefit is attributable to the habitat improvements under firm Level 2 supplies and the Level 4 increment.

Proposed Action

Recreation benefits under the Proposed Action are expected to be similar to those of the No Action Alternative. Although minor habitat changes are expected (such as increased permanent wetlands), these changes are not expected to result in substantially different recreation benefits than those described above under the No Action Alternative. Accordingly, there would be no impact to recreation use under the Proposed Action relative to the No Action Alternative.

Pixley NWR

No Action Alternative

Under the No Action Alternative, habitat conditions are expected to continue to improve over current conditions in a manner that supports the recreation goals described in the Pixley NWR Management Plan. As described above, recreation use on the Pixley NWR is expected to increase to approximately 1,000 visitor-use days per year as the Management Plan is implemented. This expected recreation benefit is attributable to opening the refuge to non-consumptive recreation uses, which would be made possible, in part, because of habitat improvements under firm Level 2 water supplies and the Level 4 increment.

Proposed Action

Recreation benefits under the Proposed Action are expected to be identical to the No Action Alternative. Accordingly, there would be no impact to recreation use under the Proposed Action relative to the No Action Alternative.

5.6 Regional Economics

This section describes how the refuges contribute to regional economic conditions and the potential changes in these conditions from implementing the long-term refuge water supply agreements. The section focuses on economic benefits associated with public use of the refuges. Effects associated with employment are discussed in Section 5.7 (Social Conditions). Effects on adjacent agricultural operations associated with providing full Level 2 and Level 4 water supplies to the refuges are discussed in Section 5.4 (Agricultural Land Use).

5.6.1 Affected Environment

Significant economic benefits have resulted from waterfowl-based recreation activities, both public and private. Nationwide, it is estimated that approximately $3.3 billion is spent annually on nonconsumptive uses of migratory waterfowl, and another $0.5 billion is spent annually on migratory waterfowl hunting (Southwick Associates, 1995). California is considered the largest state consumer of migratory waterfowl-related recreation spending (Southwick Associates, 1995), but no studies have been specifically performed regarding the economic benefits of wildlife refuges in the Tulare Lake basin.

Economic benefits associated with waterfowl-based recreation activities are dispersed (there is a "non-point" economic benefit), so changes to economic outputs would occur across market sectors and communities. According to Southwick Associates (1995), travel-related costs are the most significant economic outputs, because a majority of consumers travel long distances (such as from urban areas) to the refuges. Travel-related costs include gas, food, and lodging; these expenses can be entirely attributed to the refuges because waterfowl-based recreation is the primary purpose of the trip. In contrast, the economic benefits of waterfowl-based recreation by local residents is difficult to estimate because items such as fuel and refreshments may not be directly related to on-refuge recreation activities. Other economic benefits associated with waterfowl-based recreation uses include employment and wages (discussed in more detail in Section 5.7), revenues to state and federal governments from permits and licenses, and the purchase of sporting equipment such as guns and ammunition.

The affected environment for regional economic impacts is primarily the local communities in the vicinity of the refuges. These communities may capture a portion of the trip-related expenses associated with refuge-based recreation. Expenditures tend to be highest during the fall and winter in conjunction with the primary hunting and birdwatching seasons.

5.6.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the Kern and Pixley NWRs. At a broad scale, the economic impacts of implementing the CVPIA have been evaluated in the CVPIA PEIS, as summarized in Section 3. However, additional site-specific analysis is warranted. This section focuses on potential economic impacts resulting from changes in water deliveries to the Kern and Pixley NWRs, and is focused primarily on trip-related expenses captured by local communities.

As described by Southwick Associates (1995), annual hunting depends, at least partially, on the population of waterfowl available for hunters to target. Similarly, birdwatching trips depend on waterfowl (and other bird) populations to some degree. For the purposes of this analysis, it is assumed that demand for hunting and birdwatching is positively correlated with waterfowl populations. In other words, recreation use will increase or decrease in relation to waterfowl populations. Therefore, in order to assess potential economic impacts, Sections 5.2 (Biological Resources) and 5.5 (Recreation) were reviewed to determine how changes in refuge habitats may affect waterfowl populations and recreation use.

Kern National Wildlife Refuge

No Action Alternative

Under the No Action Alternative, Level 2 water supplies would continue to be provided to the Kern NWR, and increasing amounts of Level 4 water would be provided. As described in Section 5.2 (Biological Resources), increased water supplies, together with other post-CVPIA actions (such as improvements to conveyance facilities), would continue to result in improvements to on-refuge habitats and to waterfowl (and other bird) populations. As wildlife populations continue to increase, hunter and birdwatcher use is expected to respond in a similar manner. In addition, as is expected for wildlife populations, drastic changes in recreation are not expected to occur; rather, modest increases over time are more likely. Positive economic benefits would be experienced by local communities (through increased travel-related expenditures) and to other economic sectors. Benefits to local communities would likely be a dispersed benefit to the service sector (such as gas stations or restaurants) as the reliability of a positive recreation experience is bolstered by the water service agreements. Because of limited data regarding the economic effects of waterfowl-based recreation, it is not possible to quantify the specific benefits to the economy of the Tulare Lake basin in a site-specific manner. However, changes relative to existing conditions are expected to be beneficial and long term.

Proposed Action

Similar economic benefits are expected to occur under the Proposed Action as under the No Action Alternative. Refuge management under the assumptions for the Proposed Action would be about the same as those under the No Action Alternative, with the addition of approximately 200 acres of summer water habitat. As described in Section 5.5 (Recreation), habitat changes under the Proposed Action are not expected to result in significant, if any, changes to onsite recreation use relative to the No Action Alternative. Accordingly, no changes to regional economic benefits are expected under the Proposed Action relative to the No Action Alternative.

Pixley National Wildlife Refuge

No Action Alternative

Under the No Action Alternative, Level 2 water supplies would continue to be provided to the Pixley NWR. Level 4 water supplies would be provided in the future, pending completion of conveyance infrastructure and acquisition of the water by Reclamation. As described in Section 5.2 (Biological Resources), providing up to full Level 4 supplies would allow the expansion of on-refuge waterfowl habitat and result in improvements to waterfowl (and other bird) populations. This improvement in waterfowl habitat is expected to help support the refuge's objective of expanding nonconsumptive recreation use.[3] As wildlife populations continue to increase, a modest increase in birdwatcher use over time is expected (a maximum of 1,000 visitors per year according to the Management Plan). Because of limited data regarding the economic effects of waterfowl-based recreation, it is not possible to quantify the specific benefits to the economy of the Tulare Lake basin in a site-specific manner. However, changes relative to existing conditions are expected to be beneficial and long term.

[3] As described in Section 5.5, consumptive recreation use (such as hunting) is not currently allowed and is not proposed to be allowed on the Pixley NWR.

Proposed Action

Refuge management under the habitat assumptions for the Proposed Action would be the same as those under the No Action Alternative. Because of the limited economic benefits described above, habitat changes under the Proposed Action are not expected to result in changes to regional economic benefits relative to the No Action Alternative.

5.7 Social Conditions

This section describes how the refuges contribute to local and regional social conditions and the potential changes in these conditions as a result of implementation of the long-term refuge water supply agreements. The focus of this section is on the indicators of social well being (such as employment) that affect key social groups.

5.7.1 Affected Environment

Providing Level 2 and Level 4 refuge water supplies would affect some individuals to a greater degree than others. In order to simplify the analysis, the effects of the refuge water supply project are considered in the context of three broad social groups: (1) individuals who participate in refuge-dependent recreation activities (such as hunting and birdwatching), (2) local communities that benefit from the refuges being located nearby, and (3) neighboring farmers.

As described in the CVPIA PEIS, waterfowl hunters are primarily concerned with the preservation of habitat and refuge lands. The organizations representing waterfowl hunters (such as the California Waterfowl Association and Ducks Unlimited) support efforts to restore or improve waterfowl habitats. Birdwatchers share the same goals as waterfowl hunters, but place a higher value on other aspects of the natural environment. For example, birdwatchers generally support restoration of riparian areas and permanent ponds to a similar degree as seasonal wetlands. Members of both groups generally believe that environmental considerations should play a larger role in water resources decisionmaking.

The key indicators of social well-being for local communities are business income and employment potential. Local services businesses are primarily concerned with how changes in on-refuge management affect their customer base. In general, local businesses are assumed to support changes in refuge management that improve recreation use, because increased recreation use would translate into an increased customer base and higher business income. Employment potential could also be affected as business staffing needs change. Other potential employment opportunities for local residents could result from changes in refuge management (such as on-refuge staffing, construction of facilities, etc.).

In general, changes in refuge management are not of concern to neighboring farmers unless the changes result in decreased crop revenues (from depredation by migratory waterfowl) or a decrease in water supply reliability. Because one of the primary goals of wildlife refuges is to reduce depredation by waterfowl, farmers are generally supportive of the refuges. However, individual nuisance problems may occur where the two different land uses abut.

5.7.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the Kern and Pixley NWRs. At a broad scale, changes in social conditions resulting from implementation of the CVPIA have been evaluated in the CVPIA PEIS, as summarized in Section 3. This section focuses on potential impacts to the indicators of social well-being for refuge-dependent recreation users and local business owners resulting from changes in water deliveries to the Tulare Lake basin refuges.

Potential benefits to recreation users and local communities are closely related to waterfowl populations and recreation use. Therefore, in order to assess impacts to social conditions, Sections 5.2 (Biological Resources) and 5.5 (Recreation) were reviewed to determine how changes in refuge habitats might affect waterfowl populations and recreation use. Potential impacts to surrounding farmlands were evaluated in Section 5.4 (Agricultural Land Use).

Kern NWR

No Action Alternative

Under the No Action Alternative, Level 2 water supplies would continue to be provided to the Kern NWR, and increasing amounts of Level 4 water would be provided over time. As described in Section 5.4 (Recreation), hunter and birdwatcher use is expected to continue to increase in response to improved waterfowl conditions and increased numbers of birds. This is a beneficial social effect as well. The recreation user group is expected to have a more satisfying recreation experience as a result of improved conditions on the refuges.

As described in Section 5.6 (Regional Economics), local communities would continue to realize positive economic benefits through increased travel-related expenditures by recreation users. Benefits to local businesses would likely be a dispersed benefit to the service sector (such as gas stations and restaurants). Local businesses would also realize a beneficial social effect, because revenues would increase. Employment opportunities are expected to increase, because economic benefits to local service businesses (increased revenues) may result in job growth in the affected businesses. In addition, the refuge expects to expand staffing levels in response to increased recreation demand. Economic and employment factors all contribute to a positive social benefit resulting from refuge water supplies provided under the No Action Alternative.

Proposed Action

Similar social benefits are expected to occur under the Proposed Action as occur under the No Action Alternative. Refuge management under the assumptions for the Proposed Action would be slightly different from those under the No Action Alternative, but these differences are not expected to result in changes to social conditions relative to the No Action Alternative.

Pixley NWR

No Action Alternative

Under the No Action Alternative, Level 2 water supplies and the Level 4 increment would be provided to the Pixley NWR. As described in Section 5.4 (Recreation), birdwatcher use is expected to increase in response to continuing improvements to waterfowl conditions and increased numbers of birds. As with the Kern NWR, this would provide a beneficial social

effect as well. Economic and employment factors would benefit as described previously for the Kern NWR.

Proposed Action

Similar social benefits are expected to occur under the Proposed Action as under the No Action Alternative. Refuge management under the assumptions for the Proposed Action would be the same as under the No Action Alternative, so no changes to social conditions are expected to occur relative to the No Action Alternative.

5.8 Cultural Resources

This section describes the historic and prehistoric conditions in the refuge area, and describes known cultural resources on each refuge. The focus of the evaluation is how the project may impact known and unknown cultural resources.

5.8.1 Affected Environment

General Overview of Prehistoric Resources

Studies of the southern San Joaquin Valley region define an elaborate culture complex for the late prehistoric period. This complex can be ascribed probably to the Yokuts and their direct ancestors. The material culture of this late temporal period complex included steatite vessels and beads, finely made projectile points, pottery, shaped stone mortars, Tivela disc beads, use of asphaltum, and the presence of metates and manos. Flexed burials were the predominant interment mode. Earlier mortuary practices included extended, rather than flexed burial position, a situation analogous to that of the northern valley (Gifford and Schenck, 1926; Lillard, et al., 1939; Moratto, 1972).

The Southern Valley Yokuts were members of the Penutian language family that occupied all of the Central Valley, San Francisco Bay Area, and the Pacific Coast from Marin County to near Point Sur. The Yokuts differed from other California Indians in that they had true tribal divisions with group names. Each tribe spoke an individual dialect of seemingly one parent language (Kroeber, 1925). The tribe controlling the Pixley study area at the time of Euro-American contact was the Wowol, who controlled the southern shores of Tulare Lake. Their principal village, Sukwutnu, was some distance south of the lake, 15 miles west of Delano (Latta, 1949). The lower Kern River, incorporating the Kern project area, was the homeland of the Chuxoxi (Wallace, 1978). Settlements were oriented along the waterways, with their village sites normally placed adjacent to these features for their nearby water and food resources. House structures varied in size and shape (Latta, 1949; Kroeber, 1925). Housepit depressions ranged from 3 to 18 meters in diameter.

Trade was well developed, with a mutually beneficial interchange of needed or desired goods. Obsidian, rare in the San Joaquin Valley, was obtained by trade with Paiute and Shoshoni groups on the eastern side of the Sierra Nevada, where numerous sources of this material are located, and to some extent from the Napa Valley to the north. Shell beads (obtained by the Yokuts from coastal people) and acorns (rare in the Great Basin) were among many items exported to the east by Yokuts traders (Davis, 1961).

The rivers, streams, and sloughs that formed a maze within the valley provided abundant food resources such as fish, shellfish, and turtles. Game, wild fowl, and small mammals were trapped and hunted to provide protein augmentation of the diet. In general, the eastern portion of the San Joaquin Valley provided a lush environment of varied food resources, with the estimated large population centers reflecting this abundance (Cook, 1955; Baumhoff, 1963).

Kern National Wildlife Refuge

The Kern NWR lies in the swampy remnant of sloughs associated with Tulare Lake. Before reclamation efforts, the land had little value for agriculture. Consequently, there were few early settlers in the study area. There were some attempts to homestead the land in the decades between 1880 and 1920, but many of the homesteads were relinquished once or twice before they were finally taken up between 1920 and 1940. One of the main land uses in the 1920s appears to have been the establishment of gun clubs for waterfowl hunting.

According to the South San Joaquin Valley Information Center, nine cultural resources surveys have been prepared for specific projects within the Kern NWR. Although no comprehensive surveys or studies have been performed for the Kern NWR, the area encompassed by the nine surveys covers a substantial portion of the refuge area. There have been 32 sites recorded within the Kern NWR. Most of these sites are prehistoric in nature, and are mostly lithic scatters consisting of artifacts such as milling equipment and chert, basalt, and obsidian flakes. Remants of Native American burial sites were observed (such as mineralized human bone fragments). Three historic habitation sites and two historic trash dumps are also known to be located on the Kern NWR.

Pixley National Wildlife Refuge

Most of the Pixley NWR study area lies in an area of checkerboard land grants to the railroad. Portions of the study area were swamps and overflow lands that could not be worked for agriculture until reclamation had taken place. Early settlers in the sections open to settlement tried to homestead the land in the 1870s and 1880s, but were not successful and a number of claims were cancelled in the 1880s. Topographic maps from the 1920s show a number of small rectangular ponds, as well as a system of ditches, apparently part of the irrigation system for the region.

As described by the South San Joaquin Valley Information Center, there have been four previous cultural resources surveys within Pixley NWR, one of which was a comprehensive study of the refuge area (Varner and Cursi, 1981). Three prehistoric and three historic sites were recorded during these surveys. The three prehistoric sites are lithic scatters, but all appear to have been displaced by farm leveling and drainage work. The site or sites producing these artifacts may have been located along streams that flowed into Tulare Lake. In addition to these lithic scatters, a burial ground was previously reported near one of the sites surveyed. The historic sites described in the surveys are three homesite remnants related to early settlement in the late 1800s.

5.8.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the Kern and Pixley NWRs. The impacts of providing this water have been

evaluated in the Programmatic EIS for the CVPIA, as described in Section 3 of this report; however, additional site-specific analysis is warranted. This section focuses on the site-specific cultural resources impacts that may occur as a result of implementing the Proposed Action.

Kern NWR

No Action Alternative

Under the No Action Alternative, Reclamation would continue to ensure that Level 2 water is provided to the Kern NWR, and would provide up to Level 4 water supplies, when infrastructure is available to support such deliveries and as this water is acquired. Since the passage of the CVPIA, the increased availability of reliable water supplies has affected, and will continue to affect, habitat management practices on the refuge. Specifically, this water has supported the efficient use of seasonal wetland habitat on the Kern NWR, and would support further improvements, pending delivery of Level 4 water supplies. These changes in management practices do not have the potential to disturb cultural resources.

In order to address potential affects of on-refuge management activities on cultural resources, the Service has entered into a Programmatic Agreement with the State Historic Preservation Officer (SHPO) under Section 106 of the National Historic Preservation Act.[4] The agreement covers all Service lands in California, including the Kern and Pixley NWRs. The purpose of the Programmatic Agreement is to establish procedures for cultural resources review for routine undertakings on the refuges, without each individual undertaking requiring SHPO consultation. The result is full compliance with Section 106 requirements in a streamlined manner. Activities on the Kern NWR under the No Action Alternative are consistent with the terms of the Programmatic Agreement. Accordingly, full compliance with Section 106 is expected without separate SHPO consultation.

Proposed Action

Management activities on the Kern NWR under the Proposed Action would be similar to management activities under the No Action Alternative; differences would consist only of minor differences in habitat acreage. Accordingly, the potential to impact cultural resources is the same as under the No Action Alternative. Any potential for adverse effects would be minimized by full compliance with the requirements of the Programmatic Agreement, which will remain in effect under the Proposed Action.

Pixley NWR

No Action Alternative

Under the No Action Alternative, Reclamation would provide Level 2 water supplies and the Level 4 increment to the Pixley NWR. Under the No Action Alternative, refuge managers would have the ability to appropriately manage the increased water supply. These changes in management practices do not have the potential to disturb cultural resources.

As described for the Kern NWR, the Service also follows the Programmatic Agreement with SHPO for the Pixley NWR. The activities occurring on the Pixley NWR under the No Action

[4] Section 106 of the National Historic Preservation Act requires consideration of the effects of federal actions on resources listed, or eligible for listing, on the National Register of Historic Places. The determination of effect is made by the SHPO in the state Office of Historic Preservation.

Alternative would occur with compliance with the Programmatic Agreement. Compliance with the Programmatic Agreement would minimize the potential for adverse cultural resource impacts under the No Action Alternative.

Proposed Action

The Proposed Action would not result in management activities substantially different from those expected under the No Action Alternative; differences would consist only in minor changes to habitat types. Accordingly, the potential for Service actions on the Pixley NWR to impact cultural resources is the same as that under the No Action Alternative. As described above, the potential for adverse effects would be minimized by full compliance with the requirements of the Programmatic Agreement, which will remain in effect under the Proposed Action.

5.9 Visual Resources

This section describes the visual quality of the refuges and potential changes in visual quality resulting from implementing the long-term refuge water supply agreements.

5.9.1 Affected Environment

All wildlife refuges considered in this EA are located within agricultural viewsheds in the Central Valley. The refuges provide visual contrast with surrounding agricultural lands, primarily because of their natural vegetation and water. Scenic quality is also enhanced by the large numbers and variety of waterfowl, which increases visual sensitivity.

5.9.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the Kern and Pixley NWRs. At a broad scale, the visual resource impacts of implementing the CVPIA have been evaluated in the Programmatic EIS, as summarized in Section 3; however, additional site-specific analysis is warranted. This section focuses on potential site-specific visual resource impacts.

Kern NWR Complex

As mentioned above, scenic quality of the refuges is related to the visual contrast between the refuge lands and surrounding farmlands, and waterfowl populations. In order to assess visual resource impacts, Sections 5.2 (Biological Resources) was reviewed to determine how changes in refuge habitats may affect scenic quality.

No Action Alternative

Under the No Action Alternative, continued improvements to habitats on the Kern and Pixley NWRs are expected. The total amount of water, including the Level 4 increment ,is a substantial increase above historical water supplies, so the delivery of the full refuge water supplies is expected to improve on-refuge habitat. Although new wetlands would not be developed, existing wetlands would be managed more effectively, and would provide more frequent reliable habitat benefits. Accordingly, continuing to provide Level 2 water supplies and delivery of the Level 4 increment under the No Action Alternative would continue to improve visual resources.

Proposed Action

On-refuge habitat conditions under the Proposed Action would be similar to conditions under the No Action Alternative. Therefore, no substantial difference would occur in potential visual resource benefits relative to the No Action Alternative.

5.10 Power

This section describes power use by the Kern and Pixley NWRs, and how power use for refuge management may change as a result of implementing the project.

5.10.1 Affected Environment

Kern NWR

Power is supplied to the Kern NWR by Pacific Gas and Electric (PG&E). Groundwater pumping has historically been used to supplement other water sources for the Kern NWR, but has not provided a significant percentage of its total water supply. Although the well system provides valuable security for the maintenance of on-refuge habitats, groundwater pumping costs are high.

Pixley NWR

Power is supplied to the Pixley NWR by PG&E. Since the recent construction of a well, groundwater pumping has provided the only reliable water supply to the Pixley NWR. Groundwater pumping costs are high, but the Service has received CVP Project Use Power for use on the Pixley NWR since 1993.

5.10.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the Kern and Pixley NWRs. The power impacts of providing this water have been evaluated in the CVPIA PEIS, as summarized in Section 3. However, site-specific impacts on the refuges (such as power use and cost) were not described in the PEIS. Accordingly, this analysis focuses on the changes in on-refuge power use and costs associated with the proposed water service agreement. Because groundwater pumping is typically the most significant power use on the refuges, the amount of water expected to be provided from groundwater under the Proposed Action was compared to the amount of groundwater pumping under the No Action Alternative.

Kern NWR

No Action Alternative

Level 2 water supplies would continue to be provided under the No Action Alternative, and delivery of the Level 4 increment would increase as conveyance facilities are expanded. Accordingly, groundwater use would continue to decrease in favor of surface water deliveries. Because groundwater pumping and its associated power use would continue to decrease, the No Action Alternative would have a beneficial effect on power resources.

Proposed Action

Implementing the Proposed Action would provide firm Level 2 water supplies and the Level 4 increment, which would reduce the need for groundwater pumping on the Kern NWR, except in dry years when Level 2 deliveries are reduced. The average annual need for groundwater pumping would be identical to the No Action Alternative. Therefore, the Proposed Action would not impact power resources relative to the No Action Alternative.

Pixley NWR

No Action Alternative

Level 2 water supplies would be provided under the No Action Alternative. This would obviate the need to pump groundwater to provide Level 2 supplies, and, therefore, power use would decrease. Conveyance of the Level 4 increment is currently being planned; power costs associated with conveying Level 4 supplies are expected to be low.

Proposed Action

Under the Proposed Action, Level 2 water supplies would be provided from groundwater pumping on the Pixley NWR, rather than from conveyance of CVP water through new conveyance facilities. The power use associated with this use of groundwater is, however, not expected to exceed the amount of power required to convey surface water through CVP facilities. However, this does not represent a real impact because groundwater pumping, and its associated cost, is currently being used on the Pixley NWR. Accordingly, power use on the Pixley NWR would remain the same as under existing conditions. Changes to power use associated with providing the Level 4 increment would not change relative to the No Action Alternative.

Section 6: Consultation and Coordination

SECTION 6

Consultation and Coordination

This EA has been prepared to comply with the environmental review and consultation requirements of NEPA. Compliance efforts with specific environmental review and consultation requirements to implement the Proposed Action are identified below.

6.1 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act requires Reclamation to consult with the Service before undertaking projects that control or modify surface water. This consultation is intended both to promote the conservation of wildlife resources by preventing loss of or damage to wildlife resources, and to provide for the development and improvement of wildlife resources in connection with water projects. Federal agencies undertaking water projects are required to include the Service's recommendations in their project report, give full consideration to these recommendations, and include justifiable means and measures for wildlife purposes in their project plans.

Reclamation contacted the Service about the need for a formal Coordination Act Report for the project, and the Service determined that a formal report is not required for the project. The Service, as a project participant, reviewer, and commentor, ensures that the intent of the Coordinations Act is fully addressed as part of the project formulation and ongoing cooperative efforts. Technical memoranda to the official project files have served the purpose of information tracking. Reclamation and the Service are closely coordinating several ongoing activities associated with the CVPIA.

6.2 Endangered Species Act

Reclamation has consulted with the Service to ensure compliance with the federal Endangered Species Act (ESA). The existing *Biological Opinion on Wetland/Riparian Enhancement and Endangered Species Management Actions Within Refuge Master Plans on Kern and Pixley National Wildlife Refuges, Kern and Tulare Counties, California* (Service, 1997) addressed the effects of refuge management actions on San Joaquin kit fox, blunt-nosed leopard lizard, Tipton kangaroo rat, and vernal pool fairy shrimp. Conservation and take avoidance measures were required by the Service. Management of the refuges under the Proposed Action would continue in accordance with this Biological Opinion.

The consultation with the Service for the Proposed Action included management changes specifically attributable to the Proposed Action and addressed additional species that were not covered in the existing Biological Opinion. Also, several new avoidance and conservation measures have been proposed in the draft Biological Opinion for the CVPIA that were not included in the 1997 Biological Opinion. These additional measures would be implemented under the Proposed Action. Based on a review of the effects of the Proposed

Action, the Service concluded that the Proposed Action was not likely to adversely affect listed species.

Reclamation also has initiated informal consultation with the National Marine Fisheries Service (NMFS) to address potential effects of the Proposed Action on anadromous salmonids in the San Joaquin Valley. The informal consultation process with NMFS will be executed before completion of this EA.

6.3 Cultural Resources Coordination

This project has been reviewed in accordance with the requirements of the National Historic Preservation Act. Notification of and information about the project has been provided by Reclamation to tribes for which the project area may have historical or cultural significance; no concerns have been raised. The assessment of project effects on cultural resources (Section 5.8) concludes that the potential for impacts is low due to the nature of the project (i.e., change in water management on the refuges), and, therefore, Reclamation has concluded that additional compliance activity under the National Historic Preservation Act is not necessary.

6.4 Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests in property or rights held in trust by the U.S. for Indian Tribes or individuals. Trust status originates from rights imparted by treaties, statutes, or Executive Orders. These rights are reserved for or granted to tribes. A defining characteristic of an ITA is that such assets cannot be sold, leased, or otherwise alienated without federal approval. Indian reservations, rancherias, and allotments are common ITAs. Allotments can occur both within and outside of reservation boundaries and are parcels of land where title is held in trust for specific individuals. Additionally, ITAs include the right to access certain traditional use areas and to perform certain traditional activities.

Reclamation's ITA database was searched for this project, and it was determined that no ITAs are located within the refuge areas (Welch, 2000). Therefore, implementation of the Proposed Action will not affect ITAs.

6.5 Environmental Justice

Executive Order 12898 requires each federal agency to achieve environmental justice as part of its mission, by identifying and addressing disproportionately high and adverse human health or environmental effects (including social and economic effects) of its programs, policies, and activities on minority populations and low-income populations of the U.S. Reclamation has determined that entering into long-term water supply agreements with the refuges would not disproportionately impact minority or low-income populations. The social and economic impacts identified in Section 5 are generally anticipated to be beneficial, in addition to being shared across income levels.

6.6 Farmlands Policy

Council on Environmental Quality (CEQ) memorandums to heads of agencies, dated August 30, 1976, and August 11, 1980, and the Farmlands Protection Policy Act of 1981 require agencies to prepare farmlands assessments designed to minimize adverse impacts on prime and unique farmlands. As described in Section 5.4 ("Agricultural Land Use"), the Proposed Action would have no adverse impacts on adjacent farmlands.

Attachments

Environmental Commitments

Significant impacts have not been identified for the Proposed Action. However, the Service has committed to implement additional conservation measures for various special-status plant and animal species, as follows.

- Conservation measures from the Service's 1997 Biological Opinion for San Joaquin kit fox, blunt-nosed leopard lizard, Tipton kangaroo rat, and vernal pool fairy shrimp will be updated to be consistent with the Biological Opinion for the CVPIA.
- New conservation measures will be added for the following species:
  - bald eagle
  - Buena Vista Lake Shrew
  - California horned lizard
  - ferruginous hawk
  - giant garter snake
  - giant kangaroo rat
  - little willow flycatcher
  - northwestern and southwestern pond turtle
  - San Joaquin antelope squirrel
  - San Joaquin coachwhip
  - San Joaquin pocket mouse
  - southern grasshopper mouse
  - Swainson's hawk
  - tricolored blackbird
  - white-faced ibis

References

Baumhoff, M. A. 1963. *Ecological Determinants of Aboriginal California Populations*. University of California Publications in American Archaeology and Ethnology 49(2):155-236. Berkeley.

California Department of Fish and Game (CDFG). 1983. "A Plan for Protecting, Enhancing, and Increasing California's Wetlands for Waterfowl." Sacramento, California.

Cook, S.F. 1995. *The Aboriginial Populations of the San Joaquin Valley, California*. University of California Press Anthropological Records 16(2). Berkeley.

Gifford, E.W. and W.E. Schenck. 1926. *Archaeology of the Southern San Joaquin Valley, California.* University of California Publications in American Archaeology and Ethnology, Vol. 23, No. 1. Berkeley.

Hardt, D. 2000. Telephone conversation between Dave Hardt, USFWS Kern NWR, Refuge Manager, and Sandy Taylor, CH2M HILL Project Manager. January 24, 2000.

Kroeber, A. L. 1925. *Handbook of the Indians of California*. Bureau of American Ethnology Bulletin 78. Washington, D.C.

Latta, F. F. 1949. *Handbook of the Yokurs Indians*. Bear State Books, Oildale, California.

Lillard, J. B., R. F. Heizer, and F. Fenenga. 1939. *An Introduction to the Archaeology of Central California*. Sacramento Junior College, Department of Anthropology Bulletin 2. Sacramento.

Moratto, Michael J. 1984. *California Archaeology*. Academic Press, Inc., New York.

Stoddard & Associates. 1998. *Water Management Plan for Grassland Water District*. Stoddard & Associates Civil Engineers, Los Banos, California.

U.S. Bureau of Reclamation (Reclamation). 1950. "Waterfowl Conservation in the Lower San Joaquin Valley." Sacramento, California.

U.S. Bureau of Reclamation (Reclamation). 1978a. "Water Availability Study for California Wetlands." Prepared by CH2M HILL Hill.

U.S. Bureau of Reclamation (Reclamation). 1978b. "Fish and Wildlife Problems, Opportunities, and Solutions." Working document No. 12, USBR, Sacramento, California.

U.S. Bureau of Reclamation (Reclamation). 1986. "Central Valley Fish and Wildlife Management Study: New Waterfowl Habitat Potential Within the Central Valley, California." Special Report, September 1986.

U.S. Bureau of Reclamation (Reclamation). 1989. "Report on Refuge Water Supply Investigations: Central Valley Hydrologic Basin, California." Mid Pacific Region.

U.S. Bureau of Reclamation (Reclamation). 1992. "Refuge Water Supply Study, Plan Coordination Team Interim Report." Mid-Pacific Region, Sacramento, California.

U.S. Bureau of Reclamation (Reclamation). 1999. “Final Environmental Assessment and Finding of No Significant Impact. The Temporary Acquisition of Water from Semitropic Water Storage District for San Joaquin Valley Wetland Habitat Areas.” Mid-Pacific Region, Sacramento, California.

U.S. Bureau of Reclamation (Reclamation) and California Department of Fish and Game (CDFG). 1995. “San Joaquin Basin Action Plan: Wetlands Development and Management Plan in the North Grasslands Area.” Merced County, California.

U.S. Bureau of Reclamation (Reclamation) and California Department of Fish and Game (CDFG). 1997. “Draft Environmental Assessment / Initial Study, Proposed FONSI / Negative Declaration.” Conveyance of refuge water supply project, South San Joaquin Valley Study Area.

U.S. Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service, California Department of Fish and Game, Grassland Resource Conservation District. 1998. “Final Task Force Report: An Interagency Coordinated Program for Wetland Water Use Planning, Central Valley, California.” Prepared by Tetra Tech, Environmental Science Associates, and CONCUR.

U.S. Fish and Wildlife Service (Service). 1978. “Concept Plan for Waterfowl Wintering Habitat Preservation.” Region 1, Portland, Oregon.

U.S. Fish and Wildlife Service (Service). 1986a. “Kern National Wildlife Refuge Master Plan.” Region One.

U.S. Fish and Wildlife Service (Service). 1986b. “Pixley National Wildlife Refuge Master Plan.” Region One.

U.S. Fish and Wildlife Service (Service). 1990. “Central Valley Habitat Joint Venture Implementation Plan.” Portland, Oregon.

U.S. Fish and Wildlife Service (Service). 1997. “Intra-Service Biological Opinion on Wetland/Riparian Enhancement and Endangered Species Management Actions Within Refuge Master Plans on Kern and Pixley National Wildlife Refuges, Kern and Tulare Counties, California.” Sacramento Field Office, Sacramento, California.

U.S. Fish and Wildlife Service (Service). 1999. “Programmatic Biological Opinion on National Wildlife Refuge and Wildlife Area Water Conveyance Projects Within Tulare, Kern, Fresno, Madera, and Merced Counties, California.” Sacramento Fish and Wildlife Office, Sacramento, California.

Wallace, W. J. 1978. *Southern Valley Yokuts: California*, pp. 448-461, edited by R. F. Heizer. *Handbook of North American Indians, Vol. 8*, William G. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

List of Preparers

U.S. Bureau of Reclamation

Mona Jefferies-Soniea	Project Manager
Stan Yarbrough	CVPIA Negotiations Specialist
Jim West	Archaeologist

U.S. Fish and Wildlife Service

Joel Miller	Refuge Wildlife Program Specialist
Jill Wright	Fish and Wildlife Biologist
Mirriam Morrill	Fish and Wildlife Biologist

CH2M HILL

Sandy Taylor	Project Manager
Matt Franck	NEPA Compliance
Beth Doolittle	NEPA Compliance
Laurel Karren	NEPA Compliance
Gwen Buchholz	CVPIA Consistency

Appendix A:
Terms and Conditions of Biological Opinion

APPENDIX A

Terms and Conditions of Biological Opinion

TABLE A-1
Measures to Avoid Take of Special-Status Species on the Kern and Pixley NWRs under the Proposed Action

Species	Avoidance Measures
Bald eagle	If construction activities are going to occur near areas with suitable nesting sites (snags or large trees more than 20 inches in diameter), survey for eagle activity before construction. Construction activities must not occur within 0.5 mile of a nest site from January 1 through August 31. Construction activities must not occur within 0.5 mile of a roost site from November 15 through March 15. Avoid removing large, mature trees or snags more than 20 inches in diameter at breast height (DBH) along watercourses, lakes, or reservoirs. Maintain and protect local fish populations from sedimentation and other habitat disturbance. If nest surveys are conducted, begin after mid-April. In the event that take cannot be avoided, contact the Service for information before starting the action.
Buena Vista Lake shrew	Before any ground-disturbing activities, have a Service-approved biologist survey for the presence of the wetland plant associations considered habitat for the Buena Vista Lake shrew. Avoid areas in, or adjacent to, the Kern Lake Preserve. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. In the event that take cannot be avoided, contact the Service for information before starting the action.

TABLE A-1
Measures to Avoid Take of Special-Status Species on the Kern and Pixley NWRs under the Proposed Action

Species	Avoidance Measures
Blunt-nosed leopard lizard	Before staging and construction, have a Service-approved biologist survey for the presence of the habitat types used by this species and signs of leopard lizards, such as burrows. The protocol developed by the California Department of Fish and Game (CDFG) shall be used to survey for this species. During the blunt-nosed leopard lizard's hibernation time, surveys are unreliable and cannot be used to determine absence of this species. Notice will be given to the CDFGame and the Service 30 days before beginning construction to determine whether capture is desired. For projects from 5 to 10 acres in size (or 5 to 10 linear miles), within suitable habitat, should schedule surface disturbance activities during the active season (approximately April 15 to October 15). A Service-approved biologist will survey any trenches in the morning and late afternoon to remove lizards that fall into the trench. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the habitat types and sign listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. In the event that take cannot be avoided, contact the Service for information before starting the action.
California horned lizard	Before staging and construction, have a Service-approved biologist survey for the presence of the habitat types used by this species and signs of California horned lizards, such as burrows. During the California horned lizard's hibernation time, surveys are unreliable and cannot be used to determine absence of this species. Notice will be given to CDFG and the Service 30 days before beginning construction to determine whether capture is desired. If presence is determined within the project area, the Service will be consulted to establish appropriate mitigation. Seasonal restrictions on project activities may be appropriate.
Ferruginous hawk	Site surveys will be conducted to identify suitable foraging and roosting habitat and species presence. If located within 0.5 mile of the project site with a direct line of sight to the activity, the Service and/or the CDFG will be consulted to establish appropriate mitigation. Seasonal restrictions on project activities may be appropriate.

TABLE A-1
Measures to Avoid Take of Special-Status Species on the Kern and Pixley NWRs under the Proposed Action

Species	Avoidance Measures
Giant garter snake	Avoid construction activities within 200 feet from the banks of giant garter snake aquatic habitat. Confine movement of heavy equipment to existing roadways to minimize habitat disturbance. Construction activity within habitat should be conducted between May 1 and October 1. This is the active period for giant garter snakes and direct mortality is lessened, because snakes are expected to actively move and avoid danger. Between October 2 and April 30 contact the Service's Sacramento Fish and Wildlife Office to determine whether additional measures are necessary to minimize and avoid take. Confine clearing to the minimal area necessary to facilitate construction activities. Flag and designate avoided giant garter snake habitat within or adjacent to the project area as Environmentally Sensitive Areas. This area should be avoided by all construction personnel. Construction personnel should receive a Service-approved worker environmental awareness training. This training instructs workers to recognize giant garter snake and its habitat(s). The project area should be surveyed for giant garter snakes 24 hours before construction activities. Survey of the project area should be repeated if a lapse in construction activity of 2 weeks or greater has occurred. If a snake is encountered during construction, activities shall cease until appropriate corrective measures have been completed or it has been determined that the snake will not be harmed. Report any sightings and any incidental take to the Service immediately by telephone at (916) 979-2725. Any dewatered habitat should remain dry for at least 15 consecutive days after April 15 and before excavating or filling of the dewatered habitat. After completion of construction activities, remove any temporary fill and construction debris and, wherever feasible, restore disturbed areas to pre-project conditions. Restoration work may include replanting species removed from banks or with emergent vegetation in the active channel. In the event that take cannot be avoided, contact the Service for information before starting the action.

TABLE A-1
Measures to Avoid Take of Special-Status Species on the Kern and Pixley NWRs under the Proposed Action

Species	Avoidance Measures
Giant kangaroo rat	Before any ground-disturbing activities, have a Service-approved biologist survey for the presence of the plant associations considered habitat for the giant kangaroo rat. The Service-approved biologist must survey for the presence of giant kangaroo rat sign, such as burrow systems (precincts), haystacks, and areas of clipped vegetation. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed weekly. In the event that take cannot be avoided, contact the Service for information before starting the action.
Little willow flycatcher	Site surveys will be conducted to identify suitable nesting habitat and species presence. If located nesting within project area, the Service and/or the CDFG will be consulted to establish appropriate mitigation. Seasonal restrictions on project activities may be appropriate.

TABLE A-1
Measures to Avoid Take of Special-Status Species on the Kern and Pixley NWRs under the Proposed Action

Species	Avoidance Measures
Northwestern pond turtle Southwestern pond turtle	A Service-approved biologist shall survey the work site 2 weeks before the onset of activities. If pond turtles cannot be relocated within 1/4 mile of the work site within the same drainage, then the Service-approved biologist shall contact the appropriate Service office before work activities begin. Before any construction activities begin on any project, a Service-approved biologist shall conduct a training session for all construction personnel about the pond turtle, its habitat, and the necessary measures to protect or avoid it onsite. During project activities, all trash that may attract predators shall be properly contained, removed from the work site and disposed of regularly. Following construction, all trash and construction debris shall be removed from work areas. On unposted roads vehicle speeds shall not exceed 25 miles per hour. All fueling and maintenance of vehicles and other equipment and staging areas shall occur at least 20 meters from any riparian habitat or water body. All workers shall be informed of the importance of preventing spills and of the appropriate measures to take, should a spill occur. The spread or introduction of invasive exotic plant species shall be avoided to the maximum extent possible. Project sites shall be revegetated with an appropriate assemblage of grasses, riparian, or wetland vegetation suitable for the area. A species list and restoration plan shall be included with the project proposal for review by the Service. To the maximum extent possible, stream contours shall be returned to their original condition at the end of project activities. The number of access routes, number and size of staging areas, and the total area of the activity shall be limited to the minimum necessary to achieve the project goal. Routes and boundaries shall be clearly demarcated. Only Service-approved biologists shall participate in activities associated with the capture, handling, and monitoring of the pond turtle. Best management practices to control erosion during and after project implementation shall be implemented. If a work site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh not larger than 5 millimeters (mm) to prevent juvenile turtles from entering the pump system. Water shall be released or pumped downstream at an appropriate rate to maintain downstream flows during construction. Upon completion of construction activities, any barriers to flow shall be removed in a manner that will allow flow to resume with the least disturbance to the substrate. Any individuals of exotic species, such as bullfrogs, crayfish, and centrarchid fishes that are captured onsite shall be permanently removed from the wild. Additional or modified measures to reduce the adverse effects of actions may be identified during the project review by the Service. In the event that take cannot be avoided, contact the Service for information before starting the action.

TABLE A-1
Measures to Avoid Take of Special-Status Species on the Kern and Pixley NWRs under the Proposed Action

Species	Avoidance Measures
San Joaquin antelope squirrel	Protect existing suitable habitat on Pixley NWR (Allensworth Natural Area) and inventory potential habitat areas within refuge boundaries. Determine habitat management prescriptions for the San Joaquin antelope squirrel and coordinate species baseline information with the Service's Endangered Species Division. Before any ground-disturbing activities, have a Service-approved biologist survey for the presence of the plant associations considered habitat for the San Joaquin antelope squirrel. The Service-approved biologist must survey for the presence of San Joaquin antelope squirrel sign, such as burrow systems (precincts), haystacks, and areas of clipped vegetation. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less that 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed weekly. In the event that take cannot be avoided, contact the Service for information before starting the action.
San Joaquin coachwhip	Before staging and construction, have a Service-approved biologist survey for the presence of the habitat types used by this species and signs of the San Joaquin coachwhip, such as burrows. During hibernation time, surveys are unreliable and cannot be used to determine absence of this species. If present within project area, the Service and/or CDFG will be consulted to establish appropriate mitigation. Seasonal restrictions on project activities may be appropriate.
San Joaquin pocket mouse	Before any ground-disturbing activities, have a Service-approved biologist survey for the presence of the plant associations considered habitat. The Service-approved biologist must survey for the presence of San Joaquin pocket mouse sign, such as burrow systems, haystacks, and areas of clipped vegetation. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. If present within project area, the Service and/or CDFG will be consulted to establish appropriate mitigation. Seasonal restrictions on project activities may be appropriate.

TABLE A-1
Measures to Avoid Take of Special-Status Species on the Kern and Pixley NWRs under the Proposed Action

Species	Avoidance Measures
San Joaquin kit fox	Before staging and construction, have a Service-approved biologist survey for dens and other kit fox sign, such as scat, prey remains, and tracks. The biologist shall follow the Service's Standard Recommendations For Avoidance of The San Joaquin Kit Fox (1997). If any evidence of kit fox activity is found, contact the Service's Sacramento Fish and Wildlife Office to initiate consultation. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the habitat types and sign listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. To avoid inadvertent entrapment of animals in holes during construction, all excavated, steep-walled holes or trenches more than 2 feet deep should be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. All construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods should be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. Restrict the use of rodenticides and herbicides to prevent secondary poisoning. In the event that take cannot be avoided, contact the Service for information before starting the action.
Southern grasshopper mouse	Before any ground-disturbing activities, have a Service-approved biologist survey for the presence of the plant associations considered habitat. The Service-approved biologist must survey for the presence of southern grasshopper mouse sign, such as burrows. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed weekly. In the event that take cannot be avoided, contact the Service for information before starting the action.

TABLE A-1
Measures to Avoid Take of Special-Status Species on the Kern and Pixley NWRs under the Proposed Action

Species	Avoidance Measures
Swainson's hawk	Site surveys will be conducted to identify nesting activity in suitable nesting habitat. If nests are located within 0.5 mile of the project site with a direct line of sight to the activity, CDFG will be consulted to establish appropriate mitigation. Seasonal restrictions on project activities may be appropriate.
Tipton kangaroo rat	Before any ground-disturbing activities, have a Service-approved biologist survey for the presence of the plant associations considered habitat for the giant kangaroo rat. The Service-approved biologist must survey for the presence of Tipton kangaroo rat sign, such as burrow systems, haystacks, and areas of clipped vegetation. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within one-half mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers. In the event that take cannot be avoided, contact the Service for information before starting the action.
Tricolored blackbird	Site surveys will be conducted to identify suitable nesting habitat and species presence. If located nesting within project area, the Service will be consulted to establish appropriate mitigation. Seasonal restrictions on project activities may be appropriate.

TABLE A-1
Measures to Avoid Take of Special-Status Species on the Kern and Pixley NWRs under the Proposed Action

Species	Avoidance Measures
Vernal pool fairy shrimp	Stay at least 250 feet from the margin of the pool/swale edge. When conducting activities beyond 250 feet from habitat, be careful to avoid activities that will eventually result in effects to the pool/swale through changes in hydrology, sedimentation, or contamination of the habitat. Adequate fencing will be placed and maintained around any avoided (preserved) vernal pool habitat to prevent impacts from vehicles. If habitat is avoided (preserved) onsite, then a Service-approved biologist (monitor) will inspect any construction-related activities at the proposed project site to ensure that no unnecessary take of listed species or destruction of their habitat occurs. The biologist will have the authority to stop all activities that may result in such take or destruction until appropriate corrective measures have been completed. The biologist also will be required to report immediately any unauthorized impacts to the Service and the CDFG. All onsite construction personnel will receive instruction regarding the presence of listed species and the importance of avoiding impacts to these species and their habitat. The applicant will ensure that activities that are inconsistent with the maintenance of the suitability of remaining habitat and associated onsite watershed are prohibited. This includes, but is not limited to (i) alteration of existing topography or any other alteration or uses for any purposes, including the exploration for or development of mineral extraction; (ii) placement of any new structures on these parcels; (iii) dumping, burning, and/or burying of rubbish, garbage, or any other wastes or fill materials; (iv) building of any new roads or trails; (v) killing, removal, alteration, or replacement of any existing native vegetation; (vi) placement of stormwater drains; (vii) fire protection activities not required to protect existing structures at the project site; and (viii) use of pesticides or other toxic chemicals. In the event that take cannot be avoided, contact the Service for information before starting the action.
White-faced ibis	Site surveys will be conducted to identify suitable nesting habitat and species presence. If located nesting within project area, the Service and/or CDFG will be consulted to establish appropriate mitigation. Seasonal restrictions on project activities may be appropriate. The U.S. Fish and Wildlife Service (1985) suggests management guidelines for ibis that include: (1) managing water to maintain stable breeding vegetation in wet and dry year; (2) providing shallow water [less than 15 centimeter (5.9 inches) deep] in feeding areas, especially during the fledgling stage; (3) reducing or eliminating cattle grazing in ibis breeding colony areas; (4) including ibis nesting requirements in marsh/grassland/fire management; (5) providing at least a 4:1 ratio of breeding vegetation size to colony size at state and federal wildlife areas; (6) acquiring in fee or easement, ibis colonies that are threatened on private land; (7) providing technical assistance and educational materials to private land owners; and (8) monitoring ibis nesting annually.

TABLE A-1
Measures to Avoid Take of Special-Status Species on the Kern and Pixley NWRs under the Proposed Action

Species	Avoidance Measures
Western burrowing owl	Site surveys will be conducted to identify suitable habitat and species occupancy. Occupancy of suitable habitat can be verified at a site by detecting a burrowing owl, its molted feathers, cast pellets, prey remains, eggshell fragments, or excrement at or near a burrow entrance. Burrowing owls exhibit site fidelity, reusing burrows year after year. A site should be assumed occupied if at least one burrowing owl has been observed occupying a burrow there within the last 3 years. If presence is determined, CDFG should be contacted for the appropriate mitigation measures to minimize impacts to burrowing owls, their burrows and foraging habitat.
Western spadefoot toad	Before staging and construction, have a Service-approved biologist survey for the signs of presence and the habitat types used by this species. If present within the project area the Service will be contacted for further consultation and avoidance measures.
Mountain plover	If suitable habitat is found within the project area, and surveys indicate species presence, project activities should halt until the Service is contacted for further consultation.
Pacific western big-eared bat Greater western mastiff-bat Small-footed myotis bat Long-eared myotis bat Fringed myotis bat Long-legged myotis bat Yuma myotis bat	Before any ground-disturbing activities, have a Service-approved biologist survey for the presence of associated habitat types for the bat species of concern. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for these species. If bats are present, suitable avoidance and conservation measures should be implemented. Avoid disturbance of roosts in May, June, and July during late pregnancy and while young are non-volant.
Kern mallow Lost Hills saltbush Slough thistle Recurved larkspur	Before any ground-disturbing activities, have a Service-approved botanist survey for the presence of the soils and plant associations considered habitat for these species. Avoid known occupied habitat by at least 300 feet. Be careful not to directly or indirectly affect the habitat through changes in hydrology, sedimentation, or contamination of the habitat or the surrounding area. Temporarily fence the plant or plants to be avoided so that it is obvious that it/they are not to be disturbed (such as bright orange construction fencing). Take appropriate measures to avoid and minimize adverse effects such as the temporary construction of berms or drains to protect the area. After the work is completed, restore the surrounding areas to their original condition. If seeding is necessary when restoring to previous condition, use locally native, non-invasive species that will not compete with the listed plants. If repair activities must come within 300 feet of the habitat, initiate formal consultation with the Service before starting the project.