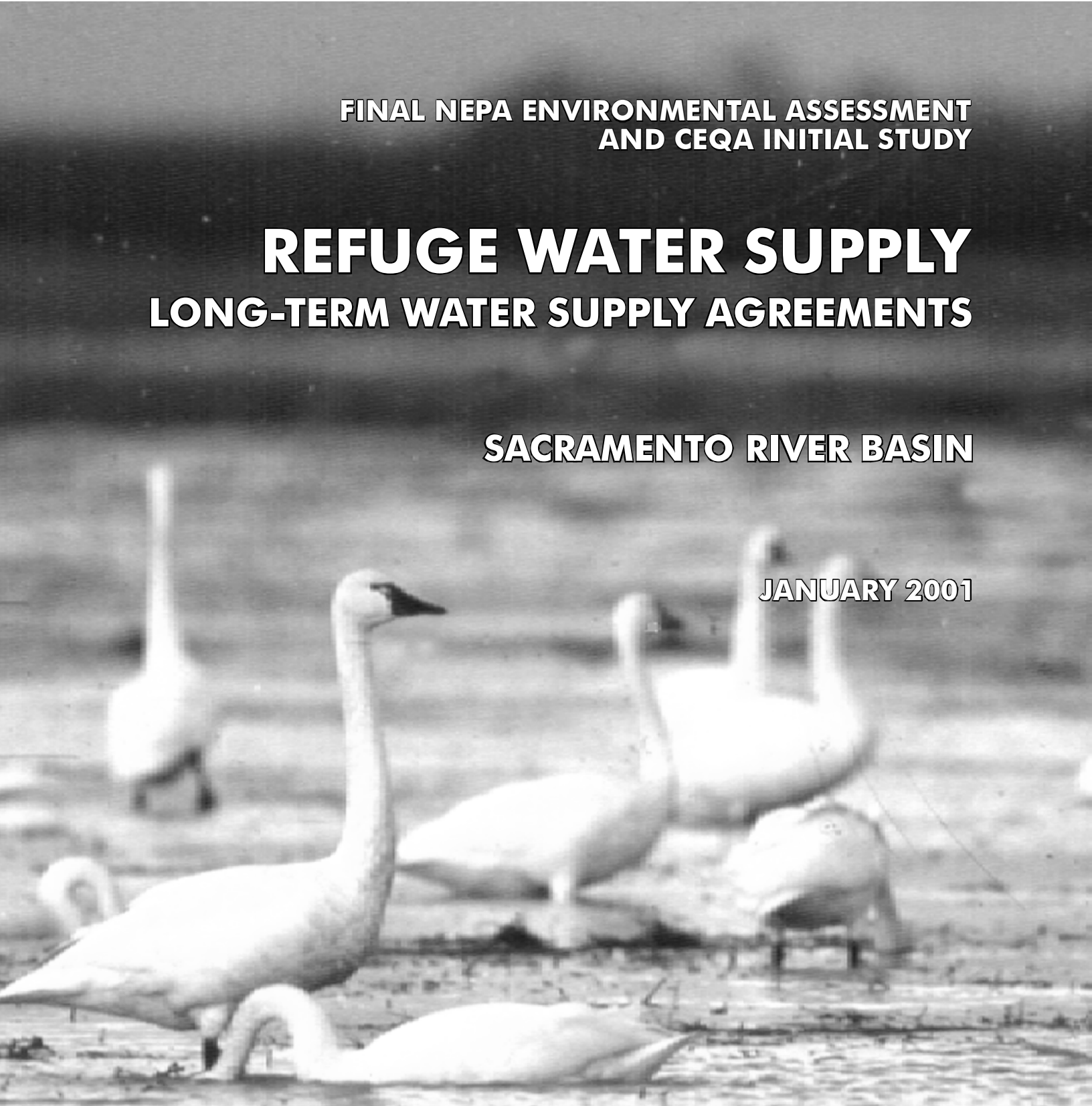
FINAL NEPA ENVIRONMENTAL ASSESSMENT
AND CEQA INITIAL STUDY

REFUGE WATER SUPPLY

LONG-TERM WATER SUPPLY AGREEMENTS

SACRAMENTO RIVER BASIN

JANUARY 2001



U.S. BUREAU OF RECLAMATION,
U.S. FISH AND WILDLIFE SERVICE, AND
CALIFORNIA DEPARTMENT OF FISH AND GAME

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

SACRAMENTO RIVER BASIN

Recommended: Alan R Candlish — 1/18/01
FOR Regional Planning Officer — Date

Concur: [signature] — 1/18/01
Regional Environmental Officer — Date

Approved: John F. Davis — 1/19/01
Regional Resources Manager — Date

FONSI No. 01-02-MP

FINDING OF NO SIGNIFICANT IMPACT

REFUGE WATER SUPPLY - LONG-TERM AGREEMENTS

SACRAMENTO RIVER BASIN

Lead Agency:

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

In accordance with the National Environmental Policy Act of 1969 (NEPA), as amended, and the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500 - 1508), the Mid-Pacific Regional Office of the U.S. Bureau of Reclamation has found that the proposed action would not significantly affect the quality of the human environment. Therefore, an Environmental Impact Statement is not required for entering into long-term refuge water supply contracts/agreements with the U.S. Fish and Wildlife Service and the California Department of Fish and Game for the Sacramento River Basin. Implementation of the preferred alternative may take place immediately.

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), the California Department of Fish and Game (CDFG), and the Grassland Water District 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 NEPA. CDFG is the lead state agency to ensure compliance with the California Environmental Quality Act (CEQA).

Proposed Action

The following is the proposed federal action for execution of the water service agreements:

- A Memorandum of Understanding between Reclamation and the Service for delivery of water to the Sacramento, Delevan, Colusa, and Sutter NWRs.

- A contract between Reclamation and CDFG for delivery of water to the Gray Lodge WA.

An Environmental Assessment and Initial Study (EA/IS), incorporated by reference, was prepared between January and November, 2000, to disclose any potential environmental impacts in accordance with NEPA and CEQA. This is a joint NEPA/CEQA document to allow simultaneous implementation of the water service agreements between Reclamation and the Service, and between Reclamation and CDFG.

Two alternatives were considered: the Proposed Action and a No-Action alternative. The Proposed Action is Reclamation's preferred alternative, and the two terms are used interchangeably within this document. The No-Action alternative was not selected because it would not comply with Section 3406 (d) of the CVPIA, which specifies increasing water supplies to each of the refuges listed above.

Environmental Impacts

The finding of no significant effect is based on the following:

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

2) There would be no significant effect on species listed pursuant to the Endangered Species Act. Reclamation has consulted with both the National Marine Fisheries Service and the Fish and Wildlife Service. NMFS concurred that the action will not likely adversely affect any listed species under their jurisdiction. The Fish and Wildlife Service issued two Biological Opinions; one dated April 28, 1999, programatically addresses management activities carried out on the Sacramento NWR Complex; the second, dated January 5, 2001, addresses the management of water supplies provided to CDFG on the Gray Lodge WA. Implementation of all requirements/commitments in these Biological Opinions will ensure species under their jurisdiction are not negatively impacted.

3) On-refuge water quality and the quality of waters downstream of the refuges would not change due to implementation of the Proposed Action.

4) Conditions on adjacent farmlands would not change as a result of implementing the refuge water supply agreements.

5) Changes to on-refuge habitats resulting from implementing the refuge water supply agreements would not change the recreation opportunities provided by the refuges.

6) Regional economic conditions would not change as a result of implementing the refuge water supply agreements.

7) Social conditions in the general vicinity of the refuges would not change as a result of implementing the refuge water supply agreements.

8) Cultural resources on the refuges, or potentially found on the refuges, would not be affected under the Proposed Action because the implementing the agreements would not disturb cultural resources.

9) The visual/aesthetic values provided by the refuges would increase slightly by implementing the Proposed Action due to the increased use of summer water/permanent wetlands. This is not significant because the amount of summer water/permanent wetlands would be small relative to the overall refuge area.

10) Implementing the refuge water supply agreements would not affect the use of power by the refuges because the refuges do not pump groundwater nor employ other power-intensive uses to a significant degree.

11) Implementing the refuge water supply agreements would not affect Indian Trust Assets because no Indian Trust Assets were identified within the project area.

12) Implementing the refuge water supply agreements would not disproportionately affect minority or low-income populations and communities because such populations do not occur in the refuge areas.

Finding

Reclamation has found that implementation of the preferred alternative would not have significant impacts on the quality of the human environment. This finding is based on analysis of environmental impacts using the best available information, through review of the comments received on the draft EA/IS, Endangered Species Act Section 7 consultation, coordination concerning Indian Trust Assets and environmental justice implications, and the environmental commitments listed in the final EA/IS.

State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

Amendment to the Negative Declaration for the Gray Lodge Wildlife Area

The Project. The Department of Fish and Game (CDFG) proposes to enter into a long-term refuge water supply contract with the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), for the Gray Lodge Wildlife Area. This action is proposed 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, State Wildlife Areas, 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. CDFG is the lead agency for the project under CEQA.

The Finding. This project, in conjunction with the implementation of the Gray Lodge Management Plan previously considered by CDFG, will not have a significant negative impact on the environment.

Mandatory Findings. Based on the information in the Initial Study (attached) in conjunction with the previously approved Negative Declaration for implementation of the Gray Lodge Management Plan, CDFG in its independent judgment finds:

- The project does not have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of California history or prehistory.

- The project does not have the potential to achieve short-term goals to the disadvantage of long-term environmental goals.

- The project does not have impacts which are individually limited, but cumulatively considerable.

- The project does not have environmental effects that will cause substantial adverse effects on humans, either directly or indirectly.

Basis for Finding. Based on the attached Initial Study and on the Initial Study prepared for implementation of the Gray Lodge Management Plan, no significant impact will occur as a result of this project.

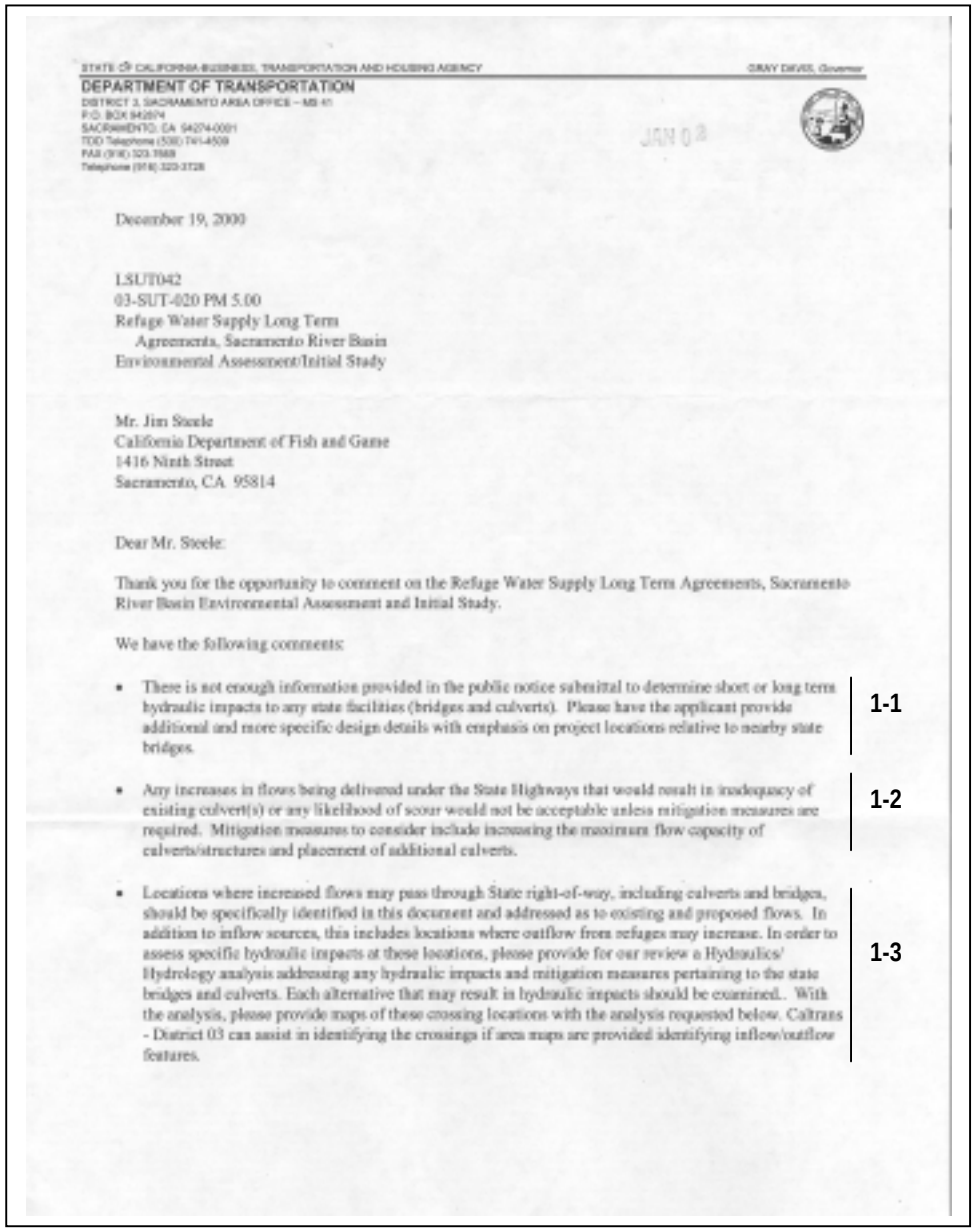
Therefore, this Negative Declaration is filed pursuant to Section 15072 of the Guidelines for Implementation of the California Environmental Quality Act.

All comments or questions should be directed to:

Mr. Jim Steele
California Department of Fish and Game
1516 Ninth Street
Sacramento, CA 95814
(916) 653-1485

L. Ryan Broddrick
Chief Deputy Director
California Department of Fish and Game

Date



STATE OF CALIFORNIA-BUSINESS, TRANSPORTATION AND HOUSING AGENCY GRAY DAVIS, Governor

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JAN 0 8

December 19, 2000

LSUT042
03-SUT-020 PM 5.00
Refuge Water Supply Long Term
Agreements, Sacramento River Basin
Environmental Assessment/Initial Study

Mr. Jim Steele
California Department of Fish and Game
1416 Ninth Street
Sacramento, CA 95814

Dear Mr. Steele:

Thank you for the opportunity to comment on the Refuge Water Supply Long Term Agreements, Sacramento River Basin Environmental Assessment and Initial Study.

We have the following comments:

- There is not enough information provided in the public notice submittal to determine short or long term hydraulic impacts to any state facilities (bridges and culverts). Please have the applicant provide additional and more specific design details with emphasis on project locations relative to nearby state bridges. **1-1**

- Any increases in flows being delivered under the State Highways that would result in inadequacy of existing culvert(s) or any likelihood of scour would not be acceptable unless mitigation measures are required. Mitigation measures to consider include increasing the maximum flow capacity of culverts/structures and placement of additional culverts. **1-2**

- Locations where increased flows may pass through State right-of-way, including culverts and bridges, should be specifically identified in this document and addressed as to existing and proposed flows. In addition to inflow sources, this includes locations where outflow from refuges may increase. In order to assess specific hydraulic impacts at these locations, please provide for our review a Hydraulics/ Hydrology analysis addressing any hydraulic impacts and mitigation measures pertaining to the state bridges and culverts. Each alternative that may result in hydraulic impacts should be examined.. With the analysis, please provide maps of these crossing locations with the analysis requested below. Caltrans - District 03 can assist in identifying the crossings if area maps are provided identifying inflow/outflow features. **1-3**

Caltrans Responses to Comments

Response 1-1

No facilities are proposed as part of this action.

Response 1-2

The refuges of the Sacramento NWR complex and the Gray Lodge WA are near Interstate 5 and State Routes 20, 45, and 162. However, these roads do not cross any of the refuge lands. Conveyance of water to the refuges was addressed in joint CEQA / NEPA documents that were adopted by Reclamation and DFG in 1998.

Response 1-3

See response 1-2 above.

Please provide our office with further actions regarding this project or its lands, as well as any drainage plans. If you have any questions regarding these comments, please contact Ronald Hall, Local Development Review Coordinator, at (916) 323-3728.

Sincerely,

JEFFREY PULVERMAN, Chief
Office of Regional Planning

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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 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 (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 document (EA) under the National Environmental Policy Act (NEPA).[1] The proposed federal action is for the execution of the following water service agreements:

- A Memorandum of Understanding between Reclamation and the Service for delivery of water to the Sacramento, Delevan, Colusa, and Sutter NWRs
- A contract between the Reclamation and the CDFG for delivery of water to the Gray Lodge WA

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

[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.

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 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, approximately 10 to 12 million ducks and geese, along with millions of other water birds, annually winter in or pass through the Central Valley each year. However, the number of waterfowl using the Central Valley has declined 40 to 50 percent over the last 30 years (Service, 1996). 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, or treaties between the U.S. and Canada, and the U.S. and Mexico, respectively, established protection for all species of migratory birds in North America, except during 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 for restoring waterfowl populations by protecting and restoring wetlands throughout North America. 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 3 in Canada, including the Central Valley Habitat Joint Venture, which 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 (CVP) 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, as well as providing for 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 of maintaining 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 and 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 (CDFG, 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, and 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 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 water supplies required for optimum 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. Several of the refuge areas were also discussed by Reclamation (1989) 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 Environmental Assessment 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 Sacramento, Delevan, Colusa, and Sutter NWRs (collectively referred to as the Sacramento NWR Complex) and the Gray Lodge WA.[2] 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.

In Section 3402 of the CVPIA, the purposes of the CVPIA are identified as protection, restoration, and enhancement of fish, wildlife, and associated habitats in the Central Valley, and 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

[2] The Sacramento NWR Complex also includes the Butte Basin NWR and the Sacramento River NWR. However, these refuges were not considered in the *Report on Refuge Water Supply Investigations*, so are not receiving water pursuant to the CVPIA.

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 for allocation of CVP water. 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 optimum 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 (such as 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 provision of full Level 4 supplies 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 supply contracts / agreements would provide for delivery of the total water supply, as required by Sections 3406(d)(1) and 3406(d)(2).

TABLE 1-1
Annual Level 2 and Level 4 Refuge Water Supplies for Sacramento River Basin Refuges

	Water Supplies (acre-feet)		
Refuge	**Level 2[a]**	**Level 4 Increment[a]**	**Total**
Sacramento NWR	46,400	3,600	50,000
Delevan NWR	20,950	9,050	30,000
Colusa NWR	25,000	- 0 -	25,000
Sutter NWR	23,500	6,500	30,000
Gray Lodge WA	35,400	8,600	44,000

[a] Levels 2 and 4 water supplies needed on the refuge per the Report on Refuge Water Supply Investigations (Reclamation, 1989). The amount of water diverted in order to meet these demands at the refuge boundaries will be greater as a result of 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 about 80 stakeholders, and by issuance of a press release. Interested parties were encouraged to attend the scoping meetings to provide verbal comments, or to provide 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).

1.5 Relationship to California Environmental Quality Act

The federal action of entering into long-term agreements with the Service and CDFG is subject to NEPA. This EA has been prepared pursuant to NEPA and determines that the Proposed Action would not cause a substantial change in the human environment, and thus does not require an Environmental Impact Statement.

Action by the CDFG to manage wildlife areas, which includes entering into water service contracts, is subject to the California Environmental Quality Act (CEQA). CDFG has prepared a Management Plan for the Gray Lodge WA. An Initial Study was performed under CEQA, and a Negative Declaration was adopted in 1989 stating that implementing the Management Plan would not have a significant effect on the environment. The resource management activities expected on the Gray Lodge WA with full Level 4 water supplies would be generally consistent with the existing Management Plan. However, in order to fully evaluate and disclose the potential impacts of CDFG's management activities in light of the proposed long-term contracts, and to consider such impacts in combination with the review of the long-term agreement between Reclamation and the Service, this document is being prepared as a joint NEPA EA and CEQA Initial Study. In support of this evaluation, a CEQA environmental checklist has been prepared (included in Appendix A).

Section 2: Background

SECTION 2

Background

The four NWRs evaluated in this Environmental Assessment / Initial Study (EA / IS) lie in the Sacramento River Basin, in Glenn, Colusa, and Sutter counties. These NWRs are managed collectively by the Service as the Sacramento NWR Complex (Figure 2-1). Also within the Sacramento River Basin, the CDFG manages Gray Lodge WA in Sutter and Butte counties. Gray Lodge WA was also identified in the CVPIA.

FIGURE 2-1
Sacramento River Basin Refuges

These five refuges were created to provide habitat for migratory waterfowl of the Pacific Flyway, and now serve a variety of wildlife and conservation objectives. The term "refuges" is used collectively to refer to both federal NWRs and state WAs. The Sacramento Valley supports approximately 44 percent of wintering waterfowl of the Pacific Flyway.

2.1 Sacramento National Wildlife Refuge

Sacramento NWR was created in 1937 and is located 5 miles south of the City of Willows. This refuge extends into both Glenn and Colusa counties and encompasses 10,783 acres. The refuge contains permanent ponds, seasonal wetlands, irrigated moist soil units, and uplands. The wetlands support watergrass and invertebrate populations that serve as a food

source for migratory waterfowl. Upland areas of the refuge support large concentrations of geese, upland birds, and other wildlife species (Reclamation, 1995).

The management objectives for the NWRs of the Sacramento Valley are:

- Provide a diversity of wetland habitats for an abundance of migratory birds, particularly waterfowl and water birds
- Provide a natural habitat and management to restore and perpetuate endangered, threatened, and proposed species, as well as species of special concern
- Preserve a natural diversity and abundance of flora and fauna
- Alleviate crop depredation on private lands by providing sufficient alternative food sources for waterfowl on refuge property
- Provide opportunities for the understanding and appreciation of wildlife ecology and the human role in the environment
- Provide high-quality wildlife-dependent recreation, education, and research

These goals are achieved through an ecosystem management approach that strives to maintain a diversity of habitats that support and maintain a diversity of wildlife species.

2.1.1 Pre-CVPIA Water Supplies

Water is used to maintain ponds and seasonal marshes and to irrigate watergrass for waterfowl food on Sacramento NWR. Before passage of the CVPIA, habitat management on the Sacramento NWR was affected by unreliable water supplies. Both the timing and quantity delivered were extremely variable and were subject to annual water supply agreements. As a result, the types and amount of wetland area varied annually with the availability of water.

Before passage of the CVPIA, the refuge received CVP water from the Sacramento River through Glenn-Colusa Irrigation District (GCID) facilities. Under annual contracts with the Service, GCID conveyed a maximum of 50,000 acre-feet of CVP water to the refuge. These contracts specified that CVP water would be used to meet requirements of agricultural contracts before water was delivered to the refuge. In some years, all available water was allocated to agricultural users.

Additionally, GCID's facilities were dewatered for maintenance and cleaning during the late fall and winter months. As a result, the refuge received CVP water only from April through the end of November. With no deliveries in the winter, when water is needed on the refuge to maintain wintering waterfowl habitat, the refuge had to "stockpile" water. Stockpiling water consists of flooding wetland areas 2 to 3 feet deep and holding the water through the winter. This management strategy was necessary to ensure that habitat was available for waterfowl throughout the winter. However, stockpiling water resulted in wetland areas being flooded deeper than optimal levels for waterfowl feeding (that is, 1 foot or less). As a result, while wetland habitat was available for waterfowl, its quality was impaired because of the deep water that limited access to food sources (G. Mensik, pers. comm., December 13, 1999).

The Sacramento NWR also diverted agricultural return flows from Logan Creek under appropriative water rights. The refuge holds four appropriative water licenses to divert up to 60 cfs from Logan Creek to supply 4,575 acres of the refuge. Historically, the rights have been subject to depletion by other rights with higher priorities, so that they are not considered a dependable water supply. In addition, water was not always available from Logan Creek during July and August (Reclamation, 1989). Typically, the refuge exercised its water rights on Logan Creek only during the period when the GCID Main Canal was dewatered for winter maintenance and there was natural flow in the creek (Reclamation, 1992).

One groundwater well exists on the refuge, but this well has not been used because of the generally poor quality of groundwater due to high levels of arsenic and boron (G. Mensik, pers. comm., January 13, 2000). As a result of the CVPIA mandate that Interior provide firm water supplies of suitable quality, groundwater pumping is not a feasible alternative for meeting water supplies required under the CVPIA.

Because of inconsistent availability and/or poor quality, none of the refuge's water supplies were considered reliable and of suitable quality for wetland habitat management.

2.1.2 Existing Water Supplies

Existing water supplies consist of the refuge's appropriative water rights on Logan Creek and water supplies provided for in the CVPIA. Just as it did before passage of the CVPIA, GCID delivers CVP water to the refuge. With the completion of facilities modifications, starting in March 2000, GCID was able to deliver water to Sacramento NWR year-round. In previous years, GCID only delivered water to the refuge from April through November, after which the GCID Main Canal was not used because of maintenance activities. As a result, the refuge had to stockpile water as described above. Although the refuge has received more reliable and increased water supplies since passage of the CVPIA, wetland habitat management has not been optimal because water could not be delivered on a year-round basis.

2.1.3 Recent Water Acquisitions

In 1998, Reclamation acquired the permanent rights to 2,300 acre-feet of water from Corning Water District, 2,000 acre-feet of water from Proberta Water District, and 2,000 acre-feet from Thomes Creek Water District for a total of 6,300 acre-feet of water. This water is to be used to partially meet the annual Level 4 water supply requirements for the refuges of the Sacramento NWR Complex and Gray Lodge WA (Reclamation, 1998).

2.2 Delevan National Wildlife Refuge

Delevan NWR was authorized in 1962 under the Migratory Bird Conservation Commission, and it encompasses 5,794 acres. The refuge is located in Colusa County, midway between Sacramento NWR and Colusa NWR, approximately 4 miles east of the City of Maxwell. The Delevan NWR consists of permanent ponds, seasonal wetlands, watergrass fields, and uplands. The wetlands produce waterfowl food such as swamp timothy, watergrass, and invertebrate populations. The upland areas of the refuge provide habitat for geese, upland

birds, and other wildlife species. Refuge goals and objectives are the same as those for the Sacramento NWR.

2.2.1 Pre-CVPIA Water Supplies

Water is used to maintain ponds and seasonal marshes, and to irrigate moist soil units for waterfowl food on Delevan NWR. Before passage of the CVPIA, habitat management on the Delevan NWR was affected by unreliable water supplies. Both the timing and quantity of deliveries were extremely variable and subject to annual water supply agreements. As a result, the types and amount of wetland areas varied annually with the availability of water.

The refuge has no firm water supply and no groundwater supply. Previously, the refuge received water from Maxwell Irrigation District, but this water supply has not been used since 1979 because of poor water quality (Reclamation, 1989).

The Delevan NWR received CVP water from the Sacramento River through GCID facilities. Under annual contracts with the Service, GCID conveyed a maximum of 30,000 acre-feet of CVP water to the refuge. GCID also conveyed agricultural return flows to the refuge. Agricultural return flows delivered to the refuge are of poorer quality than are CVP supplies, but are of adequate quality for refuge uses. GCID delivered water to Delevan NWR only from April through November. As described for Sacramento NWR, this water delivery pattern impaired wetland habitat management. The lack of other water supplies from which to draw when GCID facilities were shut down further restricted habitat management on Delevan NWR.

Because of inconsistent availability, none of the refuge's water supplies were considered reliable for wetland habitat management.

2.2.2 Existing Water Supplies

Before passage of the CVPIA, Delevan NWR received CVP water via GCID facilities, as it does now. This water is conveyed by GCID facilities. With the completion of facilities modifications, starting in March 2000, GCID was able to deliver water to Delevan NWR year-round. In previous years, GCID delivered water to the refuge only from April through November, after which the GCID Main Canal was not used because of maintenance activities. As a result, the refuge had to stockpile water, as described above. Furthermore, because Delevan NWR could not receive water year-round, the refuge did not take all of the water (Level 2 plus the year-specific proportion of the Level 4 increment) it has been entitled to since passage of the CVPIA. As a result, wetland habitat management has not been optimal.

2.2.3 Recent Water Acquisitions

In 1998, Reclamation acquired the permanent right to 2,300 acre-feet of water from Corning Water District, 2,000 acre-feet of water from Proberta Water District, and 2,000 acre-feet from Thomes Creek Water District, for a total of 6,300 acre-feet of water. This water is to be used to partially meet the annual Level 4 water supply requirements at the refuges of the Sacramento NWR Complex and Gray Lodge WA (Reclamation, 1998). Some of this acquired water has been delivered to and used on Delevan NWR.

2.3 Colusa National Wildlife Refuge

Colusa NWR was established in 1944 and currently occupies 4,507 acres, approximately 2 miles southwest of the town of Colusa in Colusa County. The refuge recently acquired an additional 467 acres, which is reflected in the 4,507-acre total. This additional acreage was not considered in determining the refuge's water supply needs in the 1989 *Report on Refuge Water Supply Investigations* (Reclamation, 1989), so, this acreage was not included in the water supplies described in Sections 3406(d)(1) through (d)(5) of the CVPIA, and is not a part of this EA / IS. Colusa NWR provides wintering habitat and resting areas for ducks, geese, and shorebirds. The Colusa NWR consists of permanent ponds, seasonal wetlands, watergrass fields, and uplands. The wetlands produce waterfowl food such as millet, watergrass, and invertebrate populations. The upland areas of the refuge provide habitat for geese, upland birds, and other wildlife species. Refuge goals and objectives are the same as those for the Sacramento NWR.

2.3.1 Pre-CVPIA Water Supplies

Water is used to maintain ponds and seasonal marshes and to irrigate watergrass for waterfowl food on Colusa NWR. Before passage of the CVPIA, habitat management on the Colusa NWR was affected by unreliable water supplies. Both the timing and quantity delivered were extremely variable and subject to annual water supply agreements. As a result, the types and amount of wetlands area varied annually with the availability of water.

Colusa NWR has no firm water supply. Although the refuge has one groundwater well, it has not been used because of unacceptable water quality with high arsenic and boron levels, as well as high pumping costs (G. Mensik, pers. comm., January 13, 2000). Before passage of the CVPIA, the refuge obtained most of its water from Reclamation District (R.D.) 2047's Drain. Most of the water in R.D. 2047's Drain during the irrigation season is from agricultural return flows, which are of poorer quality than CVP water but are acceptable for refuge use. The refuge has one appropriative water right for diversion from R.D. 2047's Drain. However, given prior diversions, water was generally not available for the refuge during July and August. The refuge also received agricultural return flows from fields outside the refuge through the "J" Drain (Reclamation, 1989).

These water supplies were supplemented with CVP water conveyed through GCID facilities. Under annual contracts with the Service, GCID conveyed a maximum of 25,000 acre-feet of CVP water to the refuge. GCID's facilities are dewatered for maintenance and cleaning during the late fall and winter months. As described for Sacramento NWR, this water delivery pattern impaired wetland habitat management.

Given inconsistent availability and poor quality, none of the refuge's water supplies were considered reliable and of suitable quality for wetland habitat management.

2.3.2 Existing Water Supplies

Existing water supplies consist of the refuge's appropriative water rights on R.D. 2047's Drain, agricultural return flows, and water supplies provided for in the CVPIA. Level 2 water supplies have been met through a combination of existing water supplies and CVP water delivered by GCID. Level 4 supplies are the same as Level 2 water supplies. Because

this water is conveyed by GCID facilities, it has been subject to the same delivery constraints as described above. As a result, wetland habitat management has not been optimal. Modifications of GCID's conveyance facilities have been recently completed, so that starting in March 2000, GCID will be able to deliver water year-round to Colusa NWR.

2.3.3 Recent Water Acquisitions

Level 2 and Level 4 water supplies are the same at Colusa NWR, so no incremental Level 4 water supplies are required.

2.4 Sutter National Wildlife Refuge

Sutter NWR was established in 1944, and encompasses 2,591 acres in Sutter County, 8 miles southwest of Yuba City. Most of the refuge is located within the Sutter Bypass, north of its confluence with the Tisdale Weir. The refuge is the only publicly owned wetland habitat area in the Sutter Basin. Historically, flood flows from the Sacramento River, Butte Sink, and the Feather River inundated large portions of the Sutter Basin. However, most of this land has been protected from flooding by levees and has been developed for agricultural production. Water is used on the refuge to maintain ponds and seasonal wetlands. The wetlands support waterfowl food sources such as swamp timothy, millet, and invertebrate populations. Approximately 500 acres of the refuge provide habitat for geese, upland birds, and other wildlife species. Refuge goals and objectives are the same as those for the Sacramento NWR.

2.4.1 Pre-CVPIA Water Supplies

Water is used primarily to maintain ponds and seasonal marshes on Sutter NWR. Before passage of the CVPIA, habitat management on the Sutter NWR was affected by unreliable water supplies. Both timing and the quantities of deliveries were highly variable. As a result, the type and amount of wetland areas varied annually with the availability of water. Located in the Sutter Bypass, the refuge is also inundated by flood flows bypassed from the Sacramento River.

Before passage of the CVPIA, the Sutter NWR received surface-water supplies from two sources: the Sutter Extension Water District (SEWD) and the Sutter Bypass. The SEWD supplied the refuge lands located outside of the Sutter Bypass levees, approximately 450 acres at the southeast corner of the refuge, through the Sutter Extension Canal. The Service and SEWD had an annual agreement that allowed the Service to purchase water at the discretion of SEWD.

More than 85 percent of the water supply for the refuge has come from irrigation and return flows in the East and West Borrow Ditches of Sutter Bypass if, and when, they were available. Agricultural return flows provide the majority of the summer flows. Rainfall, runoff, and flood flows provide the majority of winter flows. Sutter NWR also has three appropriative water rights in the Sutter Bypass. License 4590 allocates 25 cfs from June 1 to October 30 to be diverted from the East Borrow Ditch for irrigation of 1,000 acres inside of the Bypass. License 3149 appropriates 5 cfs from April 15 to October 1 to be diverted from East Borrow Ditch for irrigation of 270 acres inside of the Bypass. License 6996 appropriates 10 cfs of water from the main drainage canal on the east side of the East Sutter Bypass levee

between October 1 and January 1 for irrigation of 450 acres. These water rights do not have high priority numbers, so reliable water supplies were not available to the refuge. Given the lack of available water during most of the year, these sources cannot be considered to be dependable water sources. The water right under License 6996 has not been used because of poor water quality and limited availability (Reclamation, 1995).

The refuge has five groundwater wells to supplement surface-water flows under a conjunctive use program. The groundwater has not been used because it contains high levels of arsenic, boron, and, possibly, mercury (Reclamation and CDFG, 1997).

Because of inconsistent availability and poor quality, none of the refuge's water supplies were considered reliable and of suitable quality for wetland habitat management.

2.4.2 Existing Water Supplies

Existing water supplies consist of the refuge's appropriative water rights, irrigation and return flows, flood flows, and water provided for in the CVPIA. In recent years, Sutter NWR has been inundated with flood flows from the Sacramento River given the wet hydrologic conditions, and has not accepted all of the water to be delivered under the CVPIA.

2.4.3 Recent Water Acquisitions

In 1998, Reclamation acquired the permanent rights to 2,300 acre-feet of water from Corning Water District, 2,000 acre-feet of water from Proberta Water District, and 2,000 acre-feet from Thomes Creek Water District for a total of 6,300 acre-feet of water. This water is used to partially meet the annual Level 4 water supply requirements at the refuges of the Sacramento NWR Complex (Reclamation, 1998).

2.5 Gray Lodge Wildlife Area

Gray Lodge WA was established in 1931 and encompasses 9,200 acres in Sutter and Butte counties near the City of Gridley. Only 8,400 acres of the refuge were considered in and covered in the 1989 *Report on Refuge Water Supply Investigations*. In 1997, the refuge added 800 acres consisting of 163 acres of rice field, with the remainder composed of irrigated pasture. Refuge water supply needs in the 1989 *Report on Refuge Water Supply Investigations* (Reclamation, 1989) only addressed water supplies for the 8,400 acres. Historically, the additional 800 acres were irrigated with surface water supplies under a junior water right. It is anticipated that this historical water supply will continue to be used on the 800 acres and the Level 2 and Level 4 will not be increased. However, Gray Lodge WA may use portions of Level 2 or Level 4 supplies on the 800 acres during some years to allow water management flexibility.

The WA is managed by CDFG. Gray Lodge WA is located adjacent to the Butte Sink, an overflow area of Butte Creek and the Sacramento River, and supports ponds, wetlands, crops, and pasture. Wetland areas support waterfowl food sources such as swamp timothy and invertebrate populations, while upland areas support habitat for geese, upland bird, and other wildlife species. According to CDFG (1998), Gray Lodge WA is managed in accordance with the following objectives:

- Provide optimal habitat for wintering waterfowl species

- Provide relief from depredation by waterfowl of agricultural crops
- Provide recreational opportunity

2.5.1 Pre-CVPIA Water Supplies

Water is used to maintain ponds and seasonal marshes and to irrigate moist soil units, crops, and pasture for waterfowl food, cover, and nesting. Before passage of the CVPIA, habitat management on Gray Lodge WA was affected by unreliable water supplies. Both timing and quantity delivered were variable. As a result, the types and amount of wetlands area varied annually with the availability of water.

Before passage of the CVPIA, Gray Lodge WA received water from a combination of surface water and groundwater sources, just as it does now. As a landholder within of the Biggs-West Gridley Water District (BWGWD), Gray Lodge has both primary and secondary surface water rights. Gray Lodge WA receives 8,000 acre-feet of dependable water from BWGWD and Reclamation Districts 833 and 2054. Approximately 2,600 acres of the refuge are within the BWGWD service area. The BWGWD has allocated 12,000 acre-feet of water per year to the refuge, but only 8,000 acre-feet are available during the irrigation season, from April to November. The refuge turnouts are located at the end of the BWGWD system and cannot receive water when the BWGWD canals are dewatered, from November to April (Reclamation, 1989).

The refuge has also diverted water from the R.D. 833's Drain and R.D. 2054's Drain. These canals convey agricultural return flows. The return flows are only available during the summer and early fall when the rice fields are drained. The R.D.s do not use or claim the agricultural return flows, which are diverted by the refuge under appropriative rights (Reclamation, 1989). Water may not be available in R.D. 833's Drain after rice fields are drained in the fall. Water is available from R.D. 2054's Drain from April to November (Reclamation, 1989). The amount of water available in these drains during the normal irrigation season has been decreasing as area farms improve irrigation efficiency and implement tailwater recycling programs. This is not considered a firm water supply for Gray Lodge WA.

Historically, groundwater has been used to supply a portion of the annual demand on the Gray Lodge WA. There are 21 deep groundwater wells used onsite, as necessary, to supplement surface-water deliveries and to supply water to portions of the Gray Lodge WA that cannot be reached by gravity flow from surface supplies. Other water supplies have occasionally been obtained by purchases from the State Water Project (SWP) via the Thermolito Afterbay.

Gray Lodge WA receives 8,000 acre-feet of dependable water from BWGWD. These 8,000 acre-feet are considered a firm reliable water supply.

2.5.2 Existing Water Supplies

Groundwater, in combination with the other water supplies, has been used to meet Level 2 water supplies and, in some years, groundwater has contributed to Level 4 water supplies. Future use of groundwater to meet Level 4 water supplies at Gray Lodge is undetermined at this time (Reclamation, 1998).

Gray Lodge WA has not taken any of its Level 4 increment in the past 2 years for two reasons. First, Gray Lodge WA does not currently have the infrastructure to use the additional water supply effectively and efficiently. Second, BWGWD does not currently have the facilities necessary to convey the water to Gray Lodge WA during all of the time periods when water is required by the WA.

With the firm water supply guaranteed by the CVPIA and increases in available water since implementation of the CVPIA, Gray Lodge WA has been able to implement significant improvements in the habitat management needed to manage the area at its optimum potential. Habitat improvements have consisted of increases in the amount of irrigated pasture and cereal grains and the amount of semi-permanent wetlands. The irrigated pastures and cereal grains provide food for wintering waterfowl and nesting cover. The semi-permanent wetlands and adjacent uplands provide nesting habitat and brood water.

2.5.3 Recent Water Acquisitions

In 1998, Reclamation acquired the permanent rights to 2,300 acre-feet of water from Corning Water District, 2,000 acre-feet of water from Proberta Water District, and 2,000 acre-feet from Thomes Creek Water District, for a total of 6,300 acre-feet of water. This water is used to partially meet the annual Level 4 water supply requirements at the refuges of the Sacramento NWR Complex and Gray Lodge WA (Reclamation, 1998).

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 Sacramento River region refuges include the *Programmatic Environmental Impact Statement* (PEIS) for the CVPIA and the *Conveyance of Refuge Water Supply* (EA / IS) documents for West Sacramento and East Sacramento valleys.

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 document.

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 the 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 Investigations 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

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 Unit	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

- **Construct Shasta Temperature Control Device** - same as No Action Alternative
- **Complete improvements to Coleman National Fish Hatchery** - no improvements in No Action Alternative
- **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 the 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 Unit	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 Unit	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	Level 2: CVP contract	6,967	1,229	8,196
Salt Slough	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.

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 per year. CVP water deliveries would decrease under most alternatives, including the Preferred Alternative, by about 10 percent, given the 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 by approximately 20 percent 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 3.3 million acre-feet per year. SWP water deliveries would increase under all alternatives, including the Preferred Alternative, by 1 to 2 percent given 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 percent as a result of the 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 when CVP and SWP pumping plants could not export the flows. Delta outflows would also increase under Alternatives 2 and 4 and the Preferred Alternative as a result of acquisition of water to improve Delta outflows. The Delta outflows would increase by 1 to 2 percent in Alternatives 1, 2, and 3 and the Preferred Alternative and by more than 10 percent 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 the Tuolumne, Merced, and San Joaquin rivers in Alternatives 2, 3, and 4 and the Preferred Alternative. Instream flows would increase in the 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. **Effects of CVPIA Refuge Water Supplies.** Under the PEIS No Action Alternative, average annual deliveries to refuges would be 335,000 acre-feet per year, primarily from CVP water supplies. Refuge water supplies from CVP would increase by 233,000 acre-feet per year of deliveries for Level 2 under all alternatives including 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 per 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 the 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 percent 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 percent in all regions under Alternatives 3 and 4 as a result of reduced recharge from fallowed lands.

TABLE 3-4
Summary of CVPIA PEIS Analysis

Issue Area	Impacts and Benefits
	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 given 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 per year. The average annual energy generation would be reduced by about 5 percent under all alternatives because of changes in releases from CVP reservoirs and reduced reservoir elevations in summer months because of 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 per hour per year. CVP Project Use would be reduced by about 10 percent under Alternatives 1, 2, and 4 and the Preferred Alternative as a result of reduced CVP exports from the Delta. CVP Project Use would be reduced only by 4 percent 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 the Sacramento, American, Stanislaus, and Trinity rivers under Alternative 1 given 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 because of 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 the Sacramento, Stanislaus, and Trinity rivers under Alternative 1 given stream flow improvements. Additional improvement would occur under Alternatives 2, 3, and 4 and the Preferred Alternative as a result of water acquired to increase spring and fall flows. Water temperatures would increase in summer months in the American River under all alternatives, which would adversely affect steelhead.
	Fish Passage and Habitat Quality. Fish passage and habitat quality would improve in all alternatives as a result of increased instream flows, as described above, and from 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 would improve Delta channel 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 from November through January in wetter years under Alternative 4 and the Preferred Alternative would improve outmigration of chinook salmon and steelhead. Additional benefits in the Sacramento River would occur under Supplemental Analysis 1i with 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 given the use of acquired water for increased Delta outflow.

TABLE 3-4
Summary of CVPIA PEIS Analysis

Issue Area	Impacts and Benefits
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 as a result of fallowing of 0.3 to 3 percent of irrigated acres in the Central Valley under the alternatives including Preferred Alternative because of 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 as a result of 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 as a result of Level 2 water supplies. Additional increases would occur under Alternatives 2, 3, and 4 and the Preferred Alternative because of Level 4 water supplies.
Recreation and Recreational Economics	**Opportunities at Reservoirs.** Given the lower surface elevations at Shasta Lake and New Melones Reservoir from 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 as a result of higher reservoir levels in Folsom Lake and Lake Oroville under all alternatives including the Preferred Alternative. **Opportunities at Rivers.** Because of increased flows in the upper Sacramento River and Stanislaus River in peak season from 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 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 given the Level 2 water supplies. Additional increases would occur under Alternatives 2, 3, and 4 and the Preferred Alternative as a result of Level 4 water supplies. **Economic Impacts and Benefits.** Recreation-related expenditures would increase about 3 percent at reservoirs and rivers under all alternatives. Recreation-related expenditures at refuges would increase about 25 percent under Alternative 1 given Level 2 water supplies, and 70 percent under Alternatives 2, 3, and 4 and the Preferred Alternative given Level 4 water supplies.

TABLE 3-4
Summary of CVPIA PEIS Analysis

Issue Area	Impacts and Benefits
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 because of the 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, would 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 as a result of 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 as a result of 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 percent under all alternatives, including the Preferred Alternative, because of 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 billion per year under the No Action Alternative by 0.7 to 1.5 percent 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 percent, primarily in the San Joaquin River region because of the 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.

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.

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 Investigations* 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 on 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 water bird 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 water bird 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 water bird 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 as a result of 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 per year under No Action Alternative to $145,322,000 per year with Level 2 water supplies and $146,680,000 per 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 per year under No Action Alternative to $85,156,000 per year with Level 2 water supplies and $86,041,000 per 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 per year under No Action Alternative to $193,000 per year 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 owing to increased wetlands, including refuge wetlands, could be mitigated by increased abatement activities.
- Reductions in swimming opportunities in the American River resulting from 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 as a result of 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 owing to Restoration Fund charges
- Adverse impacts to fish owing to increased water temperatures in some streams
- Adverse impacts to fish owing 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 West and East Sacramento Study Areas

3.3.1 Overview of the NEPA/CEQA Documentation for Conveyance of Refuge Water Supplies for West and East Sacramento Study Areas

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 CDFG, which was the lead state agency for CEQA. The purpose of these documents was to evaluate the environmental impacts of implementing alternative means of conveying water supplies to the Sacramento, Delevan, and Colusa NWRs within the West Sacramento Valley area and Sutter NWR and Gray Lodge WA in East Sacramento 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 discussed 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/ISs focused on the environmental compliance phase of the project and addressed anticipated effects of constructing and/or improving existing conveyance facilities to the refuges. Reclamation, in cooperation with the Service and CDFG, is currently implementing projects to provide and/or improve existing conveyance facilities to deliver those quantities of water required for full habitat development on the refuges located in West and East Sacramento Valley study areas.

The purposes of the conveyance projects 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 resulted from capacity constraints and/or maintenance requirements in the delivery systems. Historically, water supplies were conveyed on an as-available basis, which was 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, were precluded from year-round delivery capability. Facility capacities must be able to support scheduled maximum peak flows under Level 4 water supplies.

The EA/IS for the West Sacramento Valley study area and the associated Finding of No Significant Impact was adopted by Reclamation in March 1998. The EA/IS for the East Sacramento Valley study area and the associated Finding of No Significant Impact also was adopted by Reclamation in August 1998.

3.3.2 Current Conveyance Facilities

The Sacramento NWR currently receives approximately 90 percent of its water between March 15 and November 30 through Glenn Colusa Irrigation District (GCID) Lateral 26-2 and Logan Creek. This lateral delivers water from GCID's Main Canal to the northwest corner of the refuge. Once Lateral 26-2 enters the refuge, it splits and delivers water along the northern and western boundaries of the refuge. A series of checks along Lateral 26-2 provides the necessary water height for diversion onto the refuge lands. This system does not deliver an adequate quantity of water to the northeast corner of the refuge because of site topography. GCID Lateral 35-1C also delivers water to the middle of the refuge's western boundary, primarily during September and October. Because of site topography, water delivered at this point can only be delivered by gravity flow to the southern half of the refuge.

No water is available from GCID facilities from December 1 through mid-March, when the GCID Main Canal is shut down and dewatered. During this period, the refuge relies on seasonal precipitation and natural flow in North Fork Logan Creek which passes through the refuge lands. Water from North Fork Logan Creek is diverted inside the refuge using Weirs DM-1 and DM-2 that back up water for distribution within the refuge.

The Delevan NWR currently receives water that flows from the GCID Main Canal through Willits Slough, through Hunters Creek, and is then diverted into Lateral HC-2. Lateral HC-2 runs from Hunters Creek to the northwest corner of the refuge. No water is generally available from GCID facilities from December 1 through mid-March when the GCID Main Canal is shut down and dewatered. The check structure on Hunters Creek is removed during this time to allow passage of winter flood flows. During this period, the refuge relies solely on seasonal precipitation.

The Colusa NWR currently receives water from the GCID Main Canal through Laterals 64-2A and 64-1C, and from the 2047 Drain. Lateral 64-2A serves the central portion of the refuge south of the 2047 Drain via the refuge's West Main Lateral, which parallels the western boundary of the refuge. A lift pump transfers water from Lateral 64-2A to the West Main Lateral. Lateral 64-1C serves the southern portion of the refuge, which cannot be served by the West Main Lateral. Both laterals provide water only from mid-March through November 30 while the GCID Main Canal is in operation. During peak irrigation demand periods, these laterals do not have sufficient capacity to meet refuge demands.

During the winter shutdown of the GCID Main Canal, the 2047 Drain is the primary source of water for the refuge. In 1994, the Service installed a rubber dam and rehabilitated a pump station on the 2047 Drain that has increased both the amount of water and the time periods during which the refuge can pump from the drain. The pooled water from the dam can be pumped in the summer to supplement the GCID lateral supplies. Two pump stations (24-cubic-feet-per-second [cfs] highway pump and 24-cfs main pump) that draw from the 2047 Drain can provide flows to the northeast and central portions of the refuge, but cannot provide flows to the southern portion. Precipitation is the only source of water for the southern portion of the refuge from December 1 to mid-March.

The Sutter NWR receives surface-water supplies from two sources: the Sutter Extension Water District (SEWD) and the Sutter Bypass. SEWD supplies the refuge lands located outside of the Sutter Bypass levees, approximately 450 acres at the southeast corner of the refuge, through the Sutter Extension Canal. The Service and SEWD have an annual agreement that allows the Service to purchase water at the discretion of SEWD; however, there is no contracted amount of water that must be delivered to Sutter NWR.

Gray Lodge WA currently receives water from a combination of surface-water and ground water sources. As a customer of the Biggs-West Gridley Water District (BWGWD), Gray Lodge WA has both primary and secondary surface-water rights, which are supplied from the Thermalito Afterbay, through the A-Joint Canal and BWGWD's Belding Lateral, to four delivery points at the Gray Lodge WA boundary via the Rising River, Schwind, Jakey, and Cassidy laterals. Additional water purchased through the SWP is also conveyed from the Thermalito Afterbay through these same facilities, when necessary, to augment other supplies. BWGWD facilities are shut down from mid-January to mid-April for maintenance.

Gray Lodge WA also has appropriative water rights supplied from diversions on the RD 833 Drain and the RD 2054 Drain, where these drains cross the WA boundary. The water in these drains is a combination of agriculture and natural runoff, depending on the time of year. The amount of water available in these drains during the normal irrigation season has been decreasing as area farms improve irrigation efficiency and implement drainage capture and reuse programs. This is not considered a firm water supply by Gray Lodge WA.

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.

Three alternatives were considered for the Sacramento NWR:

- New pipeline from the Tehama Colusa Canal to refuge
- New pipeline from GCID Main Canal to refuge; improvements to GCID Main Canal including Stony Creek siphon
- Use of existing GCID laterals 26-2 and 25-1; improvements to GCID Main Canal including Stony Creek siphon

The alternative that uses existing laterals 26-2 and 25-1 and improves GCID Main Canal was selected as the recommended alternative because of the low capital cost and limited environmental impacts.

Three alternatives were considered for the Delevan NWR:

- Use GCID Logan Creek conveyance
- Upgrade existing conveyance channel and install new canal segments in GCID Main Canal
- Upgrade existing GCID facilities

Upgrade the existing conveyance channel and install new canal segments in GCID Main Canal was selected as the recommended alternative primarily because of its integration with the selected alternative for the Sacramento NWR and the relatively lower cost of this alternative.

Two alternatives were considered for the Colusa NWR:

- Drain and modify existing pump station
- Enlarge GCID Laterals 64-2A and use Lateral 64-1C and 2047 Drain in the winter

Enlargement of GCID Laterals 64-2A and use Lateral 64-1C and 2047 Drain in the winter was selected as the recommended alternative primarily because of water supply reliability and water quality issues.

Three alternatives were considered for the Sutter NWR:

- Use existing canals from Thermalito Afterbay; construct new pipeline from Sutter Extension Canal
- Use existing canals from Thermalito Afterbay; construct new pressure pipeline from Sutter Extension Canal
- Use existing canals; enlarge Farrington Lateral; modify existing siphons

Use existing canals, enlarge Farrington Lateral, modify existing siphons was selected as the recommended alternative primarily because of its relatively low capital cost, limited

environmental impacts associated with the smallest construction impacts, and relatively minor implementation and engineering issues.

Four alternatives were considered for the Gray Lodge WA:

- Construct new pipeline from Thermalito Afterbay
- Construct new canal from Thermalito Afterbay
- Use BWGWD facilities with improvements
- Use Butte Water District facilities with improvements

Use BWGWD facilities with improvements was selected as the recommended alternative primarily because of its relatively low capital cost, limited environmental impacts associated with the smallest construction impacts, and relatively minor implementation and engineering issues.

3.3.4 Summary of Analyses of Alternatives

Impacts identified by the EA / ISs related primarily to construction impacts. Mitigation measures were also identified to reduce the impacts to a level of less than significant. The results of the impact analyses 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 historic sites near Sacramento and Sutter NWRs and Gray Lodge WA.

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. If necessary, boring under streams and ditches would be considered to avoid impacting flows.

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/ISs for Conveyance of Refuge Water Supplies and the associated Findings of No Significant Impact were adopted by Reclamation in December 1997. The current status of the conveyance facilities for the refuges in the Sacramento Valley 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 Management Plan and associated CEQA documentation for the Gray Lodge WA was adopted by CDFG in 1989. The purpose of the Management Plan was to define CDFG's goals and objectives for managing the 8,400-acre refuge. The plan focused on providing optimal habitat for wildlife while ensuring the continued public use of the refuge for waterfowl hunting and other recreation uses.

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. Also described are alternatives considered but not carried forward for detailed analysis.

4.2 Water Supply Agreements

4.2.1 No Action Alternative

The Preferred Alternative of the CVPIA PEIS assumed that Reclamation would enter into a 25-year water supply agreement with the Service, and a 25-year water service contract with CDFG to provide Level 2 water supplies from CVP yield to the refuges of the Sacramento NWR Complex and Gray Lodge WA, respectively. 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 service agreement with the Service and CDFG to provide Level 2 water supplies from CVP yield to the refuges, and that the long-term water service agreements 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 service 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).

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 for 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, Interior, represented by Reclamation, the Service, CDFG, and the Grassland WD assembled a Task Force for this purpose.

TABLE 4-1
Quantities of Water to Be Provided to the Refuges of the Sacramento NWR Complex and Gray Lodge WA under the No Action Alternative

Refuge	Level 2 (acre-feet)	Level 2 +Level 4 Increment (acre-feet)
Sacramento NWR	46,400	50,000
Delevan NWR	20,951	30,000
Colusa NWR	25,000	25,000
Sutter NWR	23,500	30,000
Gray Lodge WA	35,400	44,000

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

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 goal of the ICP, as overseen by the Task Force, was 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 service agreements between Reclamation and the Service, and CDFG 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

Under the Proposed Action, Reclamation would enter into 25-year water service agreements with the Service and CDFG to ensure provision of Level 2 water supplies to the refuges. The long-term water service agreements 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 service agreements are summarized in Table 4-2.

Water Management Planning

The Water Service Agreement proposed between Reclamation and the Service includes the requirement that Water Use Plans be prepared for the refuges of the Sacramento NWR Complex. Similarly, CDFG would have to prepare a Water Use Plan for Gray Lodge WA within one year of execution of the water service contract. The ICP Report described for the No Action Alternative fills a short-term need, if necessary, to ensure and improve water-use efficiency on the refuges. The Sacramento NWR Complex is scheduled to begin preparation in 2001 of a Comprehensive Conservation Plan (CCP), as required by the National Wildlife Refuge System Improvement Act of 1997, with completion expected by 2005. Development of the CCP is expected to include a Water Use Plan to fulfill the requirements of the Water Service Agreement.

4.3 On-Refuge Management

4.3.1 Sacramento National Wildlife Refuge Complex

Management goals of the Sacramento NWR Complex are based on refuge purposes defined in the United States Code and executive orders. The goals include:

- Provide a diversity if wetland habitats for an abundance of migratory birds, particularly waterfowl and water birds

TABLE 4-2
Summary of the Proposed Water Service Memorandum of Understanding with the U.S. Fish and Wildlife Service, and the Proposed Refuge Water Supply Contract with the California Department of Fish and Game.

Article	Discussion
Quantities of Water	Refuge water supplies will be provided both from the CVP and from other sources, as described below. The USFWS and CDFG 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.
Sacramento NWR	Reclamation will provide the full Level 2 supply of 46,400 acre-feet per year, and will seek to acquire the Level 4 increment of 3,600 acre-feet per year through voluntary measures for a total potential water delivery of 50,000 acre-feet per year.
Delevan NWR	Reclamation will provide the full Level 2 supply of 20,950 acre-feet per year, and will seek to acquire the Level 4 increment of 9,050 acre-feet per year through voluntary measures for a total potential water delivery of 30,000 acre-feet per year.
Colusa NWR	Reclamation will provide the full Level 2 supply of 25,000 acre-feet per year. No Level 4 deliveries are necessary.
Sutter NWR	Reclamation considers 3,000 acre-feet per year to be a firm, reliable water supply of sufficient quality to continue serving refuge needs. Reclamation will provide the remaining Level 2 increment of 20,500 acre-feet per year, and will seek to acquire the Level 4 increment of 6,500 acre-feet per year through voluntary measures for a total potential water delivery of 30,000 acre-feet per year (21,000 acre-feet per year by Reclamation).
Gray Lodge WA	Reclamation considers 28,000 acre-feet per year to be a firm, reliable water supply of sufficient quality to continue serving refuge needs. Reclamation will provide the remaining Level 2 increment of 7,400 acre-feet per year, and will seek to acquire the Level 4 increment of 8,600 acre-feet per year through voluntary measures for a total potential water delivery of 44,000 acre-feet per year (16,000 acre-feet per year by Reclamation).
Term of Agreements	25 years
Water Delivery Schedule	On or before to March 1 of each year, the refuges will submit a requested monthly schedule of water deliveries to Reclamation.
Measurement	The refuges shall provide measurement readings to Reclamation from the authorized Point of Delivery.
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.
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.

TABLE 4-2
Summary of the Proposed Water Service Memorandum of Understanding with the U.S. Fish and Wildlife Service, and the Proposed Refuge Water Supply Contract with the California Department of Fish and Game.

Article	Discussion
Exchanges	With the approval of Reclamation, CVP water made available under these agreements 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 establishment of criteria by the Interagency Refuge 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.
The following applies only to the proposed contract with the California Department of Fish and Game (not applicable for MOUs between federal agencies).	
Standard Articles for Contracting	• Rules and Regulations • Water and Air Pollution Control • Equal Opportunity • Compliance with Civil Rights Laws and Regulations • Contingent Upon Appropriation or Allotment of Funds • Books, Records, and Reports • Assignment Limited – Successors and Assigns Obligated • Liability • Officials Not to Benefit • Confirmation of Contract • Certification of Nonsegregated Facilities • Notices

- Provide a natural habitat and management to restore and perpetuate endangered, threatened and proposed species, and species of special concern
- Preserve a natural diversity and abundance of flora and fauna
- Alleviate crop depredation on private lands by providing sufficient alternative food sources for waterfowl on refuge property
- Provide opportunities for the understanding and appreciation of wildlife ecology and the human role in the environment
- Provide high-quality wildlife-dependent recreation, education and research

The three main habitat types on the refuges of the Sacramento NWR Complex include managed wetlands and waterways, vernal pool-alkali meadow-annual grassland complex, and riparian woodlands. On each refuge, managed wetlands are composed of seasonal wetlands (flooded from August or September to April), moist soil impoundments (flooded from August through May and irrigated once in June; sometimes referred to as "watergrass

units"), summer water (flooded September through mid-July), and permanent wetlands (flooded year-round) (G. Mensik, 2000). The amount of each of these managed wetland types varies from year to year, based on habitat management treatments, maintenance requirements, and water availability. Management of these habitats, including management priorities in critically dry years, would be similar for the two alternatives and is described below. 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.

Seasonal wetlands are inundated fields or ponds that are managed primarily to grow seed and produce invertebrates for migratory waterfowl, shorebirds, and other wetland-dependent wildlife. They are the most abundant and diverse habitat type on the Sacramento NWR Complex. These units are typically flooded from early September through mid-April. Seed-producing plants germinate and grow to maturity on the moist pond bottoms during the spring and early summer. Wetland flooding in the fall makes this food available to migrant waterfowl and other water birds. Optimal management of seasonal marsh requires an average of 5 to 6.3 acre-feet of water per acre, the lowest amount of the habitat types.

Moist soil impoundments on the Sacramento NWR Complex are managed to produce watergrass, sprangletop, and smartweed. Moist soil impoundments are usually flooded from late August through early May, and are irrigated in mid-June to bring watergrass, sprangletop and smartweed to maturity. Optimal management of moist soil impoundments requires 7.3 to 8.5 acre-feet of water per acre on average.

During the summer growing season, water is often used to encourage growth in certain sparsely vegetated units. Two water management strategies are employed in these summer water units. In some units, water removal does not take place until late July; in others, the normal drawdown in April is done, scheduled work is completed, and then the unit is flooded for the remainder of the year. Both practices promote vegetation growth while providing habitat for resident wildlife during the hot summer months. Optimal management of summer water requires 8.3 to 9 acre-feet of water per acre on average.

Permanent ponds remain flooded throughout the year. Characterized by both emergent and submergent aquatic plants, these units provide brood and molting areas for waterfowl, secure roosting and nesting sites for wading birds and other over-water nesters, and feeding areas for some species. These units are drawn down every 4 to 5 years to recycle nutrients to increase their productivity and to discourage undesirable fish populations. Optimal management of permanent pond habitat requires 13.3 to 13.6 acre-feet of water per acre on average.

On the Sacramento NWR Complex, an additional 5 percent of the quantities of water used in the wetland units is necessary to account for evaporation/seepage from the delivery ditches (Forest et al., 1996). This water is considered essential for current and planned riparian habitat along the refuge waterways. Some water may be delivered specifically to irrigate these riparian areas and provide habitat for special status species.

The previous discussion describes optimum management of wetland habitats, which 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 critically 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 would be restricted. Less water would be available to irrigate seasonal wetlands during the summer, which would affect the types and quality of forage production. Swamp timothy requires the least amount of water of the primary forage plants, and 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. Permanent ponds, semi-permanent wetlands, and 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.

No Action Alternative

Habitat Management

Under the No Action Alternative, on-refuge management at the Sacramento NWR Complex would be in accordance with the assumptions of the CVPIA PEIS Preferred Alternative, as defined in the Record of Decision. The CVPIA 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). Table 4-3 shows the acres of each habitat type that would be managed using firm Level 2 water supplies, as well as the Level 4 increment, based on the assumptions for the No Action Alternative.

Mosquito Abatement

Under the No Action Alternative, mosquito-monitoring and -control programs would follow existing practices. The local Mosquito and Vector Control Districts are responsible for monitoring and control programs on public and private lands, including the NWRs. Active programs occur on Sacramento, Colusa, and Sutter NWRs. Program objectives include preventing populations of adult mosquitoes from reaching levels that could pose a public health risk or significant nuisance. Mosquito and Vector Control District activities are conducted in accordance with approved Pesticide Use Proposals and special use permits, which are prepared and submitted annually. The Sacramento NWR Complex has a Draft Integrated Pest Management Plan for mosquito abatement that will eventually be approved by the Regional Office. Control actions may occur on none to all of the NWRs, depending on the mosquito populations, the detected presence of viral disease in mosquito populations or birds, and environmental conditions (such as ambient temperature, wind speed / direction). Typically, Colusa and Sutter NWRs have received the greatest control efforts.

TABLE 4-3
Acres of Habitat Expected on Sacramento NWR Complex Refuges under the No Action Alternative and Proposed Action[a]

	No Action Alternative		Proposed Action[b]
Habitat	**Level 2**	**Level 4**	**Level 4**
Sacramento NWR			
Permanent pond	155	155	379 to 1,137
Seasonal marsh	6,180	6,180	4,925 to 6,819
Moist soil impoundment	565	565	379 to 1,515
Rice	287	287	-
Total managed wetland	**7,187**	**7,187**	**7,577**
Delevan NWR			
Permanent pond	53	86	221 to 665
Seasonal marsh	3,407	4,000	2,880 to 3,988
Moist soil impoundment	316	450	221 to 886
Rice	204	204	-
Total managed wetland	**3,980**	**4,740**	**4,431**
Colusa NWR			
Permanent pond	455	455	160 to 481
Seasonal marsh	2,280	2,280	2,083 to 2,885
Moist soil impoundment	535	535	160 to 641
Rice	86	86	-
Total managed wetland	**3,356**	**3,356**	**3,205**
Sutter NWR			
Permanent pond	73	85	101 to 303
Seasonal marsh	1,047	1,250	1,312 to 1,817
Moist soil impoundment	865	1,100	101 to 404
Rice	-	-	-
Total managed wetland	**1,985**	**2,435**	**2,019**

[a] Acres of habitat for the Proposed Action assumes full Level 4 water supplies. Habitat acreages for the Proposed Action are refinements of prior assumptions and are discussed in detail later in this section.
[b] Of the managed wetland acres, the refuges of the Sacramento NWR Complex are expected to contain 5 to 15 percent permanent wetlands and summer water, 5 to 20 percent moist soil impoundments, and 65 to 90 percent seasonal marsh with full Level 4 water supplies (G. Mensik, pers. comm., January 3, 2000). As a result, a range is shown for each habitat type. Total managed wetland indicates the total acreage of wetland habitat is composed of permanent pond/summer water, seasonal marsh, and moist soil impoundment. The actual composition of the managed wetland acres would vary from year to year within the percentages noted.

Mosquito control would follow an ordered succession, using nonchemcial treatments first (water control strategies, mosquitofish, *Bacillus thuringiensis israeli*, etc.), resorting to chemical treatment only when necessary, as determined through standard mosquito-

monitoring procedures. Whenever possible, mosquito production areas would be treated with mosquitofish or nonchemical treatments before larvacides or adulticides are applied. Wetlands that have produced large mosquito populations in the past would be flooded as quickly as possible to minimize multiple emergences that may cause a need for adulticiding.

Listed Species Management

The Sacramento NWR Complex completed consultation with the Service's Ecological Services Division pursuant to the federal ESA for the following listed species that occur on the refuges of the Sacramento NWR Complex:

- Giant garter snake (*Thamnophis gigas*)
- Aleutian Canada goose (*Branta canadensis leucopareia*)
- Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)
- Conservancy fairy shrimp (*Branchinecta conservatio*)
- Vernal pool fairy shrimp (*Branchinecta lynchi*)
- Vernal pool tadpole shrimp (*Lepidurus packardi*)
- Palmate-bracted bird's beak (*Cordylanthus palmatus*)
- Hairy orcutt grass (*Orcuttia pilosa*)
- Green's tuctoria (*Tuctoria greenei*)
- Hoover's spurge (*Chamaesyce hooveri*)

In addition to these species, the Service determined that activities covered under the Biological Opinion were not likely to adversely affect bald eagle (*Haliaeetus leucocephalus*) and Sacramento splittail (*Pogonichthys macrolepidotus*); these species were not considered in the Biological Opinion. The Service prepared a Biological Opinion (April 28, 1999) on the effects of routine projects, activities, and programs undertaken on the refuges of the Sacramento NWR Complex on listed species. Activities addressed in the Biological Opinion are:

- Fire management
- Herbicide / pesticide use
- Mosquito abatement
- Public use
- Routine maintenance (includes levee repair; ditch / canal cleaning and excavation; vegetation control; clearing of tree and shrub limbs crossing roadway and utility easements; maintenance and replacement of water-control structures; road maintenance, grading, and clearing; construction; and trail maintenance)
- Special use permits
- Biological surveys
- Habitat restoration and enhancement activities
- Water-management activities
- Prescribed livestock grazing
- Animal damage control
- Water conveyance

While the Biological Opinion focused on routine management activities, provisions were included to address additional projects or programs not covered by the programmatic Biological Opinion. Most importantly, the Biological Opinion covered habitat conditions expected with full use of Level 4 water supplies.

Management practices on the Sacramento NWR Complex include measures to conserve and protect listed species. In addition to the conservation measures routinely practiced by the Sacramento NWR Complex, the Service required additional terms and conditions to protect listed species. With implementation of all of the measures for listed species, the Service determined that the level of anticipated take on the Sacramento NWR Complex was not likely to result in jeopardy to any listed species or result in the destruction or adverse modification of critical habitat. These management practices for the protection of listed species would continue under the No Action Alternative.

Proposed Action

Since 1993, following passage of the CVPIA, refuges of the Sacramento NWR Complex have been receiving Level 2 water supplies, except in drought years, and an increasing amount of the Level 4 increment. This firm reliable water will provide the refuge managers with an opportunity to refine habitat management to provide the greatest benefit to wildlife on the refuge. As a result, the habitat management objectives with full Level 4 water supplies have been updated from those predicted when the CVPIA PEIS was prepared. Of the managed wetland acres, the refuges of the Sacramento NWR Complex are expected to contain 5 to 15 percent permanent wetlands and summer water, 5 to 20 percent moist soil impoundments and 65 to 90 percent seasonal marsh with full Level 4 water supplies (G. Mensik, pers. comm., January 3, 2000). The Proposed Action includes these revised management objectives. Table 4-3 shows the expected habitat conditions on each of the refuges of the Sacramento NWR Complex with Level 4 supplies.

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 those described for the No Action Alternative.

4.3.2 Gray Lodge Wildlife Area

Gray Lodge Wildlife Area is managed to achieve the following three primary objectives:

1. Provide optimal habitat for wintering waterfowl
2. Provide relief from depredation by waterfowl of agricultural crops
3. Provide recreational opportunity

Habitats on Gray Lodge WA include permanent pond, seasonal wetlands, agricultural fields managed for cereal grains, and other uplands.

Seasonal wetlands are managed to provide food and cover for wintering waterfowl, shorebirds, and other wildlife. Food plants grown at Gray Lodge in seasonal wetlands include alkali bulrush (*Scirpus robustus*), swamp timothy (*Heleochloa schoenoides*),

pricklegrass (*Crypsis niliaca*), jointgrass (*Paspalum distichum*), watergrass (*Echinochloa crusgalli*), smartweed (*Polygonum lapthifolium*), spikerush, and sago pondweed (*Potamogeton pectinatus*). Management of seasonal wetlands and permanent ponds is similar to that described for the Sacramento NWR Complex. However, if water is available, Gray Lodge WA irrigates moist soil impoundments several times during the summer. In addition, Gray Lodge WA grows a variety of crops to provide food and nesting cover for waterfowl. Irrigated crops include cereal grains and pasture, and require approximately 3.5 acre-feet of water per year. Actual water requirements in any given year would vary, depending on weather conditions. Management of these habitats on Gray Lodge WA would be similar under the No Action Alternative and the Proposed Action.

No Action Alternative

Under the No Action Alternative, on-refuge management at Gray Lodge WA would be in accordance with the assumptions of the CVPIA PEIS Preferred Alternative, as defined in the Record of Decision. The CVPIA assumed that provision of Level 2 water supplies and the Level 4 increment would result in the acres of habitat identified in *Report on Refuge Water Supply Investigations* (Reclamation, 1989). Table 4-4 shows the acres of each habitat type that would be managed using firm Level 2 water supplies and the Level 4 increment.

TABLE 4-4
Acres of Habitat Expected on the Gray Lodge WA under the No Action Alternative and Proposed Action[a]

	No Action Alternative		Proposed Action
Habitat	**Level 2**	**Level 4**	**Level 4**
Permanent pond	2,200	2,700	400 to 600
Seasonal wetland	3,800	3,800	5,356 to 5,556
Irrigated upland (pasture and cereal grains)	2,000	1,500	1,955
Total managed wetland and irrigated upland	**8,000**	**8,000**	**7,911**

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

Mosquito Abatement

The Butte and Yuba-Sutter Mosquito Districts are responsible for control of mosquitoes on Gray Lodge WA. Gray Lodge WA has a contract with these districts whereby, Gray Lodge WA pays the Mosquito District for any control efforts the district undertake. The Mosquito Districts determine when control is necessary and what measures to employ with the restriction that CDFG regulates the use of toxic chemicals on the wildlife area.

Mosquito-control methods on Gray Lodge WA include a variety of biological controls such as introduction of mosquito-eating *Gambusia* fish, or the larvicide bacteria *Bacillus thuringiensis israeli*, to the more traditional aerial application of toxic chemicals. Given the negative impacts known to result from the bioaccumulation of certain classes of toxic chemicals in the food chain, Gray Lodge WA and the CDFG strongly discourage the use of toxic chemicals for mosquito abatement on the wildlife area when alternative biological controls can be used. Extreme care is taken to minimize mosquito production on the wildlife

area by closely coordinating irrigation and fall flooding activities with the Butte and Yuba-Sutter Mosquito Districts.

Listed-Species Management

Gray Lodge WA provides habitat for a number of state-listed and federally listed species. It is CDFG's goal to preserve existing populations of all threatened and endangered species, and to improve the overall conditions and status of those species, where possible. It is also CDFG's policy, as well as state law, to not conduct any type of "project" on wildlife areas without first holding internal consultation with the CDFG's Environmental Services Division. Management of Gray Lodge WA underwent consultation as required by the California Endangered Species Act (CESA) regarding the effects of implementing the Gray Lodge Management Plan on listed species (CDFG, 1989). Furthermore, because Gray Lodge WA receives federal funding, consultation with the Service was held to evaluate the effects of the management on federally listed species.

The species addressed in the federal consultation were Aleutian Canada goose and valley elderberry longhorn beetle. Giant garter snakes were state-listed at the time and were also included in the CESA consultation. However, because the giant garter snake was not federally listed at the time, the Service's concurrence did not extend to this species. Bald eagles, federally listed as threatened, only occasionally use the area during winter, and no impacts to bald eagles were identified as a result of implementing the Management Plan (CDFG, 1989).

The Management Plan includes measures to protect listed species on the WA and the CDFG consultation concluded that the Management Plan would not jeopardize the continued existence of these species. The Service concurred with these findings. Under the No Action Alternative, management activities on Gray Lodge WA would continue to be in accordance with the conservation measures specified in the Gray Lodge Management Plan for the listed species identified above.

Proposed Action

Under the Proposed Action, Gray Lodge WA would use Level 4 water supplies to achieve the habitat acreages shown in Table 4-4. Gray Lodge WA would increase the acreage of irrigated upland. About 80 percent of the managed upland areas would be irrigated. Seasonal wetlands, which include moist soil management units, would be the primary wetland habitat.

In the CVPIA PEIS, Gray Lodge WA was projected to have 2,700 acres of permanent pond habitat with Level 4 water supplies. Current management objectives for Gray Lodge WA focus on providing seasonal marsh habitats. This current management objective reflects the focus of Gray Lodge WA as providing waterfowl habitat, as well as habitat for upland game birds. While permanent ponds were previously considered to provide the best habitat quality for wildlife, more recently, seasonal marshes have been found to provide better insect and seed food sources. As a result, Gray Lodge WA's current and expected management direction focuses more on seasonal wetlands than projected in the 1989 Report. Still, Gray Lodge WA would provide 400 to 600 acres of permanent wetland and pond habitat.

Mosquito Abatement

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

Listed-Species Management

Under the Proposed Action, Gray Lodge WA would implement conservation and take avoidance measures for the giant garter snake, which was federally listed as threatened after preparation of the Gray Lodge WA Management Plan and CESA Biological Opinion. In addition, Gray Lodge WA would implement revised conservation and take avoidance measures for valley elderberry longhorn beetles, Aleutian Canada geese, and bald eagles. The revised measures for these species are necessary for consistency with the Biological Opinion being prepared for implementation of the CVPIA. Measures that Gray Lodge WA would implement for giant garter snakes include:

- Earth-moving activities would be restricted to May through October, during the majority of the giant garter snake's active period. During the giant garter snake's inactive period (November 1 through April 1), some small-scale emergency levee repair could occur.
- The majority of earth-moving activities would occur within wetlands that have been drained. Drained areas would be dry for 2 weeks before earth-moving activities. Drained areas would also be checked for ponded areas that could concentrate prey and attract giant garter snakes.
- To the extent possible, the majority of canal cleaning and excavation would be performed only from May 1 to October 1. If it is necessary for water conveyance canals to be cleaned prior to or after the giant garter snake's active period (May 1 through October 30), cleaning shall only occur below the highest water line as evidenced on the sides of the canal as high water marks.
- Excavation would typically occur from only one side of the canal during a given year. When possible, one side of the canal would be left undisturbed indefinitely.
- Excavation above the high-flow watermark would be avoided whenever possible to minimize disturbance to burrows and retreat sites.
- Vegetation on the tops and sides of canals would be left as undisturbed as possible.
- Roads adjacent to giant garter snake habitat would: (a) not be mowed unless necessary for regular access; (b) be mowed between March 1 and October 31; (c) be mowed with mowers adjusted to leave no less than 6 inches of standing vegetation.
- Burning would be conducted during the spring, summer, and fall months on thoroughly dried wetlands or uplands. Where possible, only one bank of vegetation would be subject to prescribed burns. Vegetation along canal banks would be left undisturbed as much as possible, and bank vegetation passed over by the fire would not be reignited. Any giant garter snakes observed within the prescribed burn areas would be captured and relocated or attempts would be made to flush them away from areas where the fire is likely to travel.

- Discing would be conducted in dried wetlands or in uplands. Winter discing and planting for spring production of wildlife forage would be restricted to upland areas. Discing activities would be avoided directly adjacent to waterways and summer wetlands unless they have been allowed to dry.

- Implement the Service's *Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake (Thamnophis gigas) Habitat*.

- No Construction or activities that destroy or modify giant garter snake habitat shall take place between October 1 through April 30.

- If a giant garter snake is encountered during maintenance or construction activities, the activity should temporarily halt in the vicinity of the snake until it can be determined the snake will not be harmed. The snake should be observed and monitored to determine if it leaves the area or retreats into burrows or other areas. If possible, all activity in the vicinity should cease and the areas should be fenced or flagged and avoided to allow the snake to move away from the area on its own. Capture or handling of giant garter snakes will be avoided unless impending harm to the snake is apparent. If it is necessary to relocate a snake out of harm's way, the snake should be moved to the nearest available suitable habitat; doing so will maximize the probability that the giant garter snake will be familiar with available retreat sites and cover and minimize the risk that the snake will attempt to cross roads and/or construction areas to return to a familiar area. Any encounters with giant garter snakes shall be reported to the Service and CDFG. The report will include date(s), location(s), habitat description, and any corrective measures taken to protect the giant garter snake(s) found.

These measures are the same as those required under the Biological Opinion for the Sacramento NWR Complex.

For valley elderberry longhorn beetle, Gray Lodge WA would implement the following conservation and take avoidance measures:

- A qualified biologist would survey proposed project sites within the range of the valley elderberry longhorn beetle for the presence of the beetle and its elderberry host plant.

- A core avoidance area would be established around elderberry plants. The core avoidance area includes all area within 20 feet of the dripline of any elderberry plant with a stem measuring 1 inch or greater in diameter at ground level. Core avoidance areas should not be disturbed during or after construction, or during operation of the project. The buffer-avoidance area includes all area within 100 feet of any elderberry plant with a stem measuring 1 inch or greater in diameter at ground level. Firebreaks may not be included in the buffer zone. In buffer areas construction-related disturbance should be minimized, and any damaged area should be promptly restored following construction.

- All areas to be avoided would be fenced and flagged, and a minimum setback of at least 20 feet from the dripline of each elderberry plant shall be provided. Contractors shall be briefed on the need to avoid damaging the elderberry plants and the possible penalties for not complying with these requirements. Work crews shall be instructed as to the status of the beetle and the need to protect its elderberry host plant.

- Signs shall be erected every 50 feet along the edge of the avoidance area; these signs should state: "This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment." The signs should be clearly readable from a distance of 20 feet, and must be maintained for the duration of construction.
- Any damage done to the buffer area (area within 100 feet of elderberry plants) during construction shall be restored to its original conditions, erosion control shall be provided, and the area shall be revegetated with appropriate native plants.
- Both core and buffer avoidance areas must continue to be protected after construction from adverse effects of the project. Measures, such as fencing, signs, weeding, and trash removal, are usually appropriate.
- No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant would be used in core and buffer avoidance areas, or within 100 feet of any elderberry plant with one or more stems measuring 1 inch or greater in diameter at ground level.
- Mowing of grasses / groundcover may occur from July through April to reduce fire hazard. No mowing should occur within 5 feet of elderberry shrub stems. Mowing would be performed in a manner that avoids damaging shrubs (stripping away bark through careless use of mowing / trimming equipment).
- In the event that take cannot be avoided, CDFG would contact the Service for information before starting the action.

For Aleutian Canada geese, CDFG would implement the following take avoidance and conservation measures at the Gray Lodge WA:

- Agricultural lands would not be converted to other uses. In the event that agricultural land is proposed for conversion to another use, CDFG would consult with the Service.
- To the extent practicable, construction activities in areas used by Aleutian Canada geese for wintering would be restricted to the period between May 15 and September 30.
- To the extent practicable, disturbance to flocks and foraging geese would be avoided during the first and last two hours of daylight.
- In the 3vent that take cannot be avoided, CDFG would contact the Service before starting the action.

For bald eagles, CDFG would implement the following take avoidance and conservation measures at the Gray Lodge WA.

- If construction activities would occur near areas with suitable nesting sites (i.e., snags or trees over 20 inches in diameter at breast height), the area would be surveyed for eagle activity prior to construction.
- Construction activities would not occur within 0.5 mile of an active nest site between January 1 and August 31.

- Construction activities would not occur within 0.5 mile of an active roost site between November 15 and March 15.
- Removal of large, mature trees or snags over 22 inches in diameter at breast height along watercourses, lakes, and reservoirs would be avoided.
- CDFG would take actions to maintain and protect the local fish population from sedimentation and other disturbance.
- If nest surveys are conducted, surveys would be initiated after mid-April.
- In the event that take cannot be avoided, CDFG would contact the Service before starting the action.

4.4 Alternatives Considered But Not Analyzed in Detail

The Proposed Action was selected and the No Action Alternative was developed following consideration of a broader range of possible alternatives. This section describes other alternatives that were considered but 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 and CDFG 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, donations, or similar activities). 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 fulfill the objectives of the CVPIA, it was not carried forward for detailed consideration.

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 refuges in the Sacramento River basin, 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 (such as CVP-wide issues such as surface water and groundwater), or were not likely to be affected under the Proposed Action (such as mineral resources, 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 CVPIA PEIS Preferred Alternative. For both alternatives, the impact analysis considers conditions that would occur with full Level 4 water supplies.

This document is being prepared as a joint Environmental Assessment/Initial Study (EA/IS). As described in Section 1.5, additional CEQA analysis is necessary in order to supplement the Negative Declaration prepared for the Gray Lodge Management Plan. In order for the analysis in this section to meet CEQA requirements, the effects of the Proposed Action on the Gray Lodge WA are compared to existing conditions in addition to being compared to the No Action Alternative. The information described in the Existing Conditions assessment will be used in the preparation of an Addendum to the Negative Declaration for the Gray Lodge Management Plan.

5.2 Biological Resources

This section describes the biological resources present on the refuges and adjacent agricultural lands, and how these resources may be affected as a result of the Proposed Action.

5.2.1 Affected Environment

The affected environment for biological resources includes four refuges of the Sacramento NWR Complex (Sacramento NWR, Delevan NWR, Colusa NWR, and Sutter NWR) and the Gray Lodge WA. The refuges of the Sacramento NWR Complex are owned and managed by the Service; Gray Lodge WA is a state wildlife area and is managed by CDFG. All of these refuges are in the Sacramento River Basin.

The Sacramento River Basin forms the northern portion of the Central Valley. Historically, the Central Valley supported three major landscape types: wetlands, grassland-prairies, and riparian woodlands. These habitats were hydrologically and biologically linked to the river systems. Prior to their containment by the construction of dams and levees, the major rivers meandered, forming oxbows and riparian habitat. Winter floods would inundate and scour areas along these rivers, creating marshes and early-succession riparian scrub. Expanses of seasonal wetlands were also created by winter flooding. These seasonal wetlands formed important habitat for overwintering and migrating waterfowl.

Habitat areas such as wetlands are now intensively managed to support large numbers of birds and other wildlife within small and fragmented areas. Remnant wetlands and agricultural lands in the Central Valley support approximately 60 percent of the waterfowl wintering in the Pacific Flyway region. In addition, another 20 percent of the Pacific Flyway population passes through the Central Valley, using the wetlands for foraging and resting on their migratory passage through the region. The Sacramento Valley alone winters 44 percent of the Pacific Flyway waterfowl. The wetland and associated habitat are also important to several federally listed and proposed species, and other special-status species such as the American peregrine falcon (*Falco peregrinus*), bald eagle (*Haliaeetus leucocephalus*), Aleutian Canada goose (*Branta canadensis leucopareia*), giant garter snake (*Thamnophis gigas*), and California tiger salamander (*Ambystoma californiense*).

The refuges of the Sacramento NWR Complex contain permanent ponds, seasonal wetlands, irrigated moist soil impoundments, and uplands. The wetlands support watergrass, swamp timothy, and sprangletop, as well as invertebrate populations that serve as a food source for migrating and overwintering waterfowl. Upland areas of the refuge support large

concentrations of geese, upland birds, and other wildlife species (Reclamation, 1995). The management objectives for the NWRs of the Sacramento Valley are:

- Provide a diversity of wetland habitats for an abundance of migratory birds, particularly waterfowl and water birds
- Provide natural habitat and manage to restore and perpetuate endangered, threatened and proposed species, and species of special concern
- Preserve a natural diversity and abundance of flora and fauna
- Alleviate crop depredation on private lands by providing sufficient alternative food sources for waterfowl on refuge property
- Provide opportunities for the understanding and appreciation of wildlife ecology and the human role in the environment
- Provide high-quality wildlife-dependent recreation, education and research

These goals are achieved through an ecosystem management approach that strives to maintain a diversity of habitats that support a diversity of wildlife species.

The Gray Lodge WA supports permanent and seasonal wetlands, crops, and pasture. Wetland areas support waterfowl plant food sources and invertebrate populations; managed upland areas provide habitat for geese, upland birds, and other wildlife species. Gray Lodge WA is managed in accordance with the following objectives (CDFG, 1989):

- Provide optimal habitat for wintering waterfowl species
- Provide relief from depredation of agricultural crops by waterfowl
- Provide recreational opportunity

Vegetation and Wildlife

Management of the Sacramento NWR Complex and Gray Lodge WA focuses on providing wetland habitats. Small grain crops and pasture are also managed on Gray Lodge WA. The vegetation and associated wildlife communities of the Sacramento NWR Complex and Gray Lodge WA can be divided into four general types:

- Upland habitats
- Wetland habitats
- Riparian habitats
- Irrigated pasture and crops

Upland habitats consist of annual and perennial grasslands, alkali meadows, and vernal pool complexes. All of these habitats occur on the refuges of the Sacramento NWR Complex. Gray Lodge WA has been intensively managed for waterfowl and upland game bird production since its establishment. As a result, native upland habitats do not occur on the refuge. 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 and crops) active water management is necessary to produce and maintain good-quality wildlife habitat. Therefore, these habitats have the potential to be affected by the proposed

water service agreements. The affected environment discussion and environmental consequences focuses on these habitat types.

Wetland Habitats

Wetland habitats consist of seasonally flooded marshes, including moist soil impoundments, and permanent ponds/summer water. The characteristics and wildlife species associated with each of the wetland types are described below.

Seasonally flooded marsh is by far the most numerous and diverse of the wetland habitat types on the state and federal refuges of the Sacramento River Basin. Wetland units managed as seasonally flooded marsh are typically flooded from early September through mid-April. Their diversity is the product of a variety of water depths that result in an array of vegetative species that, in combination, provide habitat for the greatest number of wildlife species throughout the course of a year. Through the fall and winter, seasonally flooded marshes are used by large concentrations of waterfowl and smaller numbers of egrets, herons, ibis, and grebes, to name a few. In addition, a full complement of raptors take advantage of the water bird prey base. Water is removed in the spring, so large concentrations of shorebirds use the shallow depth and exposed mudflats on their northern migration. Seed-producing plants germinate and grow to maturity on the moist pond bottoms during the spring and early summer. Wetland flooding in the fall makes this food available to early migrant waterfowl and other waterfowl.

Moist soil impoundments are similar to seasonally flooded marshes except that they are irrigated in summer to improve production of watergrass, sprangletop, and swamp timothy, the primary food species for waterfowl. Moist soil impoundments are typically irrigated during the summer to bolster plant growth and to enhance seed production. An irrigation is usually performed in mid-June to increase plant biomass and seed production of watergrass, sprangletop, and smartweed plants. During these irrigation periods, these units are often used by locally nesting colonial water birds (egrets, herons). Though not as diverse, once flooded, these units provide an abundant food source for waterfowl at an important (potential crop depredation) time of the year. In addition, a number of wading birds species frequent them throughout the year.

Permanent ponds and summer water provide wetland habitat for year-round and summer resident species. Permanent ponds remain flooded throughout the year, while units managed for summer water are flooded through June or July. Characterized by both emergent and submergent aquatic plants, permanent ponds and summer water units provide brood and molting areas for waterfowl, secure roosting and nesting sites for wading birds and other over-water nesters, and feeding areas for species like cormorants and pelicans. Permanent wetland habitats are also important to a number of special-status species, such as the giant garter snake (*Thamnophis gigas*), white-faced ibis (*Plegadis chihi*), and tricolored blackbird (*Agelaius tricolor*).

Riparian Habitat

Valley-foothill riparian habitats are found along low- to mid-elevation streams and waterways. On the refuges, riparian vegetation is supported by seepage along canals. Where riparian trees and shrubs are planted to restore or enhance riparian habitat, water may be used to irrigate the plantings until they are established. Riparian habitats provide nesting, roosting, and feeding areas for passerines, raptors, herons, egrets, waterfowl, and small

mammals. These areas also provide important corridors for local and migratory wildlife. Riparian woodland habitats are characterized by even-aged, broad-leafed, deciduous trees with open canopies that reflect flood-mediated episodic events. Cottonwoods (*Populus* sp.), willows (*Salix* spp.), alders (*Alnus* spp.), and oaks (*Quercus* spp.) are common trees found in riparian woodlands. Riparian scrub habitats are described as streamside thickets dominated by one or more willow species, as well as other fast-growing shrubs and vines (California Native Plant Society, 1994).

Irrigated Pasture and Crops

Agricultural land use within refuges includes irrigated small-grain crops as a food source for migrating ducks, geese, and sandhill cranes (*Grus canadensis*) and irrigated pasture for nesting cover for waterfowl and upland game birds. Only Gray Lodge WA manages irrigated pasture and small grain crops. Cropland and pastures consist of corn, vetch, milo, mixed grasses, and safflower.

Fish

With many miles of irrigation ditches and canals available as aquatic habitat, the refuges support resident fish species. The most common species include largemouth bass (*Micropterus salmoides*), channel catfish (*Ictalurus punctatus*), sunfish, and carp. These species are adapted to the warm, murky waters of the area, and their only special habitat requirement is year-round permanent water. Maintenance of permanent water in most of the ditches is complementary to the primary goal of maintaining wintering waterfowl habitat. On Gray Lodge WA, a popular warmwater fishery is supported and provides recreational opportunities for anglers. Fishing is not permitted on the Sacramento NWR Complex.

With the exception of Sutter NWR, anadromous salmonids and the federally listed Sacramento splittail (*Pogonichthys macrolepidotus*) do not occur on the refuges. Anadromous salmonids and Sacramento splittail can occur on Sutter NWR when flood flows are bypassed from the Sacramento River into the Sutter Bypass. Juvenile and adult anadromous salmonids can enter the refuge with floodwaters. When the bypass is flooded, splittail spawn in the Sutter Bypass and could occur on Sutter NWR.

Special-Status Species

Table 5-1 lists special-status species known to or potentially occurring on the Sacramento NWR Complex and Gray Lodge WA and their habitat associations. These species were identified on a list provided to Reclamation by the Service in a March 20, 2000, letter. 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:

- Gray Lodge Wildlife Area Management Plan (CDFG, 1989)
- Biological Opinion on Management, Operations and Maintenance of the Sacramento National Wildlife Refuge Complex, Willows, California (Service, 1999)
- CVPIA PEIS and associated Draft Biological Opinion (Service, 2000)
- EA/IS for Conveyance of Refuge Water Supply Project East Sacramento Valley Study Area (Reclamation and CDFG, 1997a)

- EA / IS for Conveyance of Refuge Water Supply Project West Sacramento Valley Study Area (Reclamation and CDFG, 1997)

TABLE 5-1
Special-Status Species Known to Occur or Potentially Occurring on or Downstream of Refuges of the Sacramento River Basin

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)
Antioch Dunes anthicid beetle *Anthicus antiochensis*	Federal – SC State- none	Sandy deposits along rivers and sloughs
Sacramento anthicid beetle *Anthicus sacramento*	Federal – SC State – none	Sandy deposits along rivers and sloughs
California linderiella *Linderiella occidentalis*	Federal – SC State – none	Vernal pools
Molestan blister beetle *Lytta molesta*	Federal – SC State – none	Vernal pools; grassland habitat
Sacramento Valley tiger beetle *Cicindela hirticollis abrupta*	Federal – SC State – none	Riparian habitat
Fish		
Sacramento splittail *Pogonichthys macrolepidotus*	Federal – T State – CSC	Bay-Delta estuary; rivers
Central Valley steelhead *Oncorhynchus mykiss*	Federal – T State – none	Rivers and streams
Sacramento River winter-run chinook salmon *O. tshawytscha*	Federal – T State – E	Rivers and streams
Sacramento River winter-run chinook salmon critical habitat	Federal – NA State – NA	Rivers and streams
Central Valley fall-run/late-fall-run chinook salmon *O. tshawytscha*	Federal – C State - CSC	Rivers and streams
Central Valley spring-run chinook salmon *O. tshawytscha*	Federal – T State – T	Rivers and streams
Central Valley spring-run chinook proposed critical habitat	Federal – NA State – NA	Rivers and streams

TABLE 5-1
Special-Status Species Known to Occur or Potentially Occurring on or Downstream of Refuges of the Sacramento River Basin

Common Name Scientific Name	Status	General Habitat Association
Green sturgeon *Acipenser medriostris*	Federal – SC State – CSC	Rivers
River lamprey *Lampetra ayresi*	Federal – SC State – CSC	Rivers and streams
Pacific lamprey *Lampetra tridentata*	Federal – SC State – none	Rivers and streams
Amphibians		
Western spadefoot toad *Scaphiopus hammondii*	Federal – SC State – CSC	Vernal pools
California red-legged frog *Rana aurora draytonni*	Federal – T State – CSC	Wetland and aquatic habitat
Foothill yellow-legged frog *Rana boylii*	Federal – SC State – CSC	Rivers and streams
Reptiles		
Western pond turtle *Clemmys marmorata*	Federal – SC State – CSC	Wetland and riparian habitats
Giant garter snake *Thamnophis gigas*	Federal – T State – T	Wetland habitat
Birds		
White-faced ibis *Plegadis chihi*	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
Cooper'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
Ferruginous hawk *Buteo regalis*	Federal – SC State – CSC	Grassland and scrub habitat; 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 habitat
Osprey *Pandion haliaetus*	Federal – none State – CSC	Riparian habitat

TABLE 5-1
Special-Status Species Known to Occur or Potentially Occurring on or Downstream of Refuges of the Sacramento River Basin

Common Name Scientific Name	Status	General Habitat Association
Merlin *Falco columbarius*	Federal – none State – CSC	Wetland habitat
Prairie falcon *Falco mexicanus*	Federal – none State – CSC	Grassland and scrub habitat
American peregrine falcon *Falco peregrinus anatum*	Federal – none State – E	Wetland and grassland habitat
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 habitat
Long-billed curlew *Numenius americanus*	Federal – none State – CSC	Grassland habitat
Short-eared owl *Asio flammeus*	Federal – none State – CSC	Grassland and wetland habitat
Burrowing owl *Athene cunicularia*	Federal – SC State – CSC	Grassland habitat
Willow flycatcher *Empidonax traillii*	Federal – none State – E	Wetland and riparian habitat
Purple martin *Progne subis*	Federal – none State - CSC	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
Yellow-breasted chat *Icteria virens*	Federal – none State – CSC	Wetland and riparian habitats
Mammals		
Pallid bat *Antrozous pallidus*	Federal – none State – CSC	Grassland habitat
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

TABLE 5-1
Special-Status Species Known to Occur or Potentially Occurring on or Downstream of Refuges of the Sacramento River Basin

Common Name Scientific Name	Status	General Habitat Association
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
Western 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
Pale western big-eared bat *Plecotus townsendii pallescens*	Federal – SC State – CSC	Riparian habitat
Marysville Heermann's kangaroo rat *Dipodomys californicus eximius*	Federal – SC State – CSC	Grassland habitat
San Joaquin pocket mouse *Perognathus inornatus inornatus*	Federal – SC State - none	Grassland habitat
Plants		
Henderson's bent grass *Agrostis hendersonii*	Federal – SC State – none	Grassland habitat
Ferris's milk-vetch *Astragalus rattanii* var. *ferrisiae*	Federal – SC State – none	Grassland habitat
Heartscale *Atriplex cordulata*	Federal – SC State – none	Grassland and scrub habitats
Valleyspearscale *Atriplex joaquiniana*	Federal – SC State – none	Grassland and scrub habitats
Vernal pool saltbrush *Atriplex persistens*	Federal – SC State – none	Vernal pools; grassland habitat
Hoover's spurge *Chamaesyce hooveri*	Federal – PT State – none	Vernal pools
Palmate-bracted bird's beak *Cordylanthus palmatus*	Federal – E State – E	Grassland and scrub habitats
Recurved larkspur *Delphinium recurvatum*	Federal – SC State – none	Grassland and scrub habitats
Diamond-petaled California poppy *Eschscholzia rhombipetala*	Federal – SC State – none	Grassland habitat
Adobe lily *Fritillaria pluriflora*	Federal – SC State – none	Grassland habitat
Rose mallow *Hibiscus lasiocarpus*	Federal – SC State – none	Wetland habitat
Ahart's dwarf rush *Juncus leiospermus* var. *ahartii*	Federal – SC State – none	Grassland habitat

TABLE 5-1
Special-Status Species Known to Occur or Potentially Occurring on or Downstream of Refuges of the Sacramento River Basin

Common Name Scientific Name	Status	General Habitat Association
Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus*	Federal –SC State – none	Grassland habitat
Butte County meadowfoam *Limnanthes flocossa* ssp. *californica*	Federal – E State – E	Vernal pools; grassland habitat
Wooly meadowfoam *Limnanthes flocossa* ssp. *flocossa*	Federal – SC State – none	Grassland habitat
Red-fllowered lotus *Lotus rubriflorus*	Federal – SC State – none	Grassland habitat
Little mousetail *Myosurus minimus* ssp. *apus*	Federal – SC State – none	Vernal pools
Colusa grass *Neostapfia colusana*	Federal – T State – E	Vernal pools
Hairy orcutt grass *Orcuttia pilosa*	Federal – E State – E	Vernal pools
Ahart's paronychia *Paronychia ahartii*	Federal – SC State – none	Vernal pools; grassland habitat
Hartweg's golden sunburst *Psuedobahia bahiifolia*	Federal – E State – E	Grassland habitat
Sanford's arrowhead *Sagittaria sanfordii*	Federal – SC State – none	Wetland habitat
Caper-fruited tropidocarpum *Tropidocarpum capparideum*	Federal – SC State – none	Grassland habitat
Green's tuctoria *Tuctoria greenei*	Federal – E State – Rare	Vernal pools

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.
PE = 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.
NA = Not applicable.

5.2.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to provide Level 2 water supplies and up to the full Level 4 increment to the refuges of the Sacramento NWR Complex (the Sacramento, Delevan, Colusa, and Sutter NWRs) and the Gray Lodge WA. The impacts of providing this water have been evaluated programmatically in the CVPIA PEIS, as described in Section 3 of this EA/IS. 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.

Sacramento NWR Complex

No Action Alternative

Under the No Action Alternative, Reclamation would continue to provide Level 2 water supplies and up to the full Level 4 increment to the refuges of the Sacramento NWR Complex. In recent years, the refuges have been receiving Level 2 water supplies and a portion of the Level 4 increment. However, until recently, habitat management has been restricted because GCID's conveyance facilities that are used to deliver water to Sacramento, Colusa, and Delevan NWRs were dewatered in the fall and winter, and water could not be delivered to refuges during these months. With no deliveries in the winter when water is needed on the refuge to maintain wintering waterfowl habitat, the refuge had to "stockpile" water. Stockpiling water consists of flooding wetland areas 2 to 3 feet deep and holding the water through the winter. This management strategy was necessary to ensure that habitat was available for waterfowl throughout the winter. However, stockpiling water resulted in wetland areas being flooded deeper than optimal levels for waterfowl feeding (1 foot or less). As a result, while wetland habitat was available for waterfowl, its quality was impaired because of the deep water that limited access to food sources (G. Mensik, pers. comm., December 13, 1999). With the completion of conveyance facilities improvements, the increase in reliable water supplies to full Level 4 under the No Action Alternative would allow for optimal management of refuge habitats. Under the No Action Alternative, the refuges of the Sacramento NWR Complex would support the acreages of habitats shown in Table 4-3.

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 resulting from increased, year-round water supplies. Expected improvements in habitat management include:

- Earlier, expanded, and prolonged 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 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
- Use of flow-through management rather than stockpiling water to improve water quality, reduce disease outbeaks, and maintain optimal water depths for waterfowl foraging
- Control of undesirable vegetation species using deep irrigation and maintenance for periods of two to four weeks during the summer

As these improved management capabilities continue to develop, optimal habitat conditions can 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 provide water for spring/summer irrigation. Level 4 water would also allow early flooding of seasonal wetlands and increase the extent of seasonal wetlands in the fall and winter. The availability of permanent ponds and summer water would also increase. Overall, higher-quality wetland habitat would be available for a longer period of time each year.

Improved habitat quality and availability of seasonal wetlands would continue to benefit migratory waterfowl. The *Report on Refuge Water Supply Investigations* (Reclamation, 1989) projected 150 million bird-use-days for waterfowl, geese, and other migratory shorebirds on refuges of the Sacramento NWR Complex each year under habitat 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 and stability provided under optimal habitat management of wetland units. These species include the tricolored blackbird, white-faced ibis, and giant garter snakes. Golden and bald eagles, and the American peregrine falcon could indirectly benefit from an increase in their seasonal food supply of wintering waterfowl. In addition, the Sacramento NWR Complex conducts management and operational activities in accordance with its Biological Opinion, which specifies conservation and avoidance measures to protect federally listed species. These conservation measures, in combination with the habitat improvements expected with full Level 4 water supplies under the No Action Alternative, would protect and potentially enhance recovery of listed species.

An additional benefit of maximizing waterfowl retention on the refuges is control of avian diseases that are potentially transmittable to domestic fowl. Potential benefits to the refuges under the No Action Alternative are two-fold: (1) increased on-refuge retention of waterfowl would reduce potential exposure of domestic fowl to migratory waterfowl, and (2) increased ability for refuge managers to effectively manage water supplies would help reduce outbreaks of avian cholera, botulism, and other bird diseases. Because these effects are expected as the availability of Level 4 water increases under the No Action Alternative, there would be a continuing beneficial effect associated with limiting the spread of avian diseases.

Increased water supplies would augment 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. Return-flow water from the Sacramento NWR leaves the refuge via Logan Creek and eventually flows into the Sacramento River. Return flows from both the Delevan and Colusa NWRs flow through the R.D. 2047 drain to the Sacramento River. While the volume of return flows would continue to increase under the No Action Alternative, the increase would not adversely impact water quality or anadromous salmonids in downstream areas because: (1) the quality of the water that would be delivered to the refuge would be similar to or better than what is currently used, and (2) reliable year-round water supplies would allow flow-through management that will improve water quality.

On Sutter NWR, anadromous salmonids and splittail currently can enter the refuge with rising floodwaters during flood events in the bypass. The fish that enter the refuge lands could become stranded when the floodwaters recede and the refuge lands dry. This is a naturally occurring phenomenon that is not related to water management practices on the refuge. Potential concerns relate to changes in the water conveyance system or the topography on the refuge that could alter the potential for fish to become stranded on the refuge. Use of Level 2 and up to Level 4 water supplies to optimally manage existing habitat would not include changes in the conveyance facilities or topography of the refuge. Therefore, no impacts to anadromous salmonids or splittail are expected. This assessment is consistent with the 1997 Biological Opinion that concluded that maintenance and operational activities on the refuges of the Sacramento NWR Complex would not adversely affect splittail.

Proposed Action

The Proposed Action would have the same benefits to wetland habitats and associated wildlife species, including special-status species, as described for the No Action Alternative. Habitat conditions under the Proposed Action would be similar to those for the No Action Alternative. The Proposed Action primarily differs from the No Action Alternative in providing greater flexibility in the delivery schedule of Level 2 water supplies and the Level 4 increment, and in a slightly greater emphasis on summer water on Sacramento and Delevan NWRs (Table 4-3). 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 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.

The greater emphasis on permanent wetlands under the Proposed Action would extend the benefits of increased water supplies to resident species and summer migrants. Permanent wetlands and summer water provide habitat for nesting birds and a diversity of resident wildlife species. Permanent wetland habitats are also important to a number of special-status species, such as the giant garter snake, white-faced ibis, and tricolored blackbird.

Under the Proposed Action, the Sacramento NWR Complex would continue to conduct management and operational activities in accordance with the 1997 Biological Opinion. As a result, the Proposed Action would have similar benefits to federally listed species as would the No Action Alternative. As under the No Action Alternative, no adverse impacts to anadromous salmonids or splittail are expected with implementation of the Proposed Action.

Gray Lodge Wildlife Area

No Action Alternative

Under the No Action Alternative, Reclamation would continue to ensure that Gray Lodge WA receives Level 2 water supplies and up to the full Level 4 increment. The increase in reliable water supplies to full Level 4 under the No Action Alternative would allow optimal management of on-refuge habitats. Currently, Gray Lodge WA supports 455 acres of permanent wetland and aquatic habitat, and 5,501 acres of seasonal wetlands (A. Atkinson,

pers. comm., January 5, 2000). The remainder of the WA is managed upland, consisting of cereal grains and pasture, and riparian habitat. Based on the habitat expectations detailed in the *Refuge Water Supply Investigations*, the No Action Alternative assumes that with full Level 4 water supplies, Gray Lodge WA would support approximately 2,700 acres of permanent wetland habitat, 3,800 acres of seasonal wetland habitat, and 1,500 acres of irrigated upland. The difference in the level of permanent wetlands between the No Action Alternative and existing conditions reflects an increased understanding of wetland and waterfowl ecology. Permanent ponds were previously considered to provide the best habitat quality for wildlife, but, more recently, seasonal wetlands have been found to provide better insect and seed food sources. The current habitat composition of Gray Lodge WA reflects this understanding developed since preparation of the *Report on Refuge Water Supply Investigations*.

As with the refuges of the Sacramento NWR Complex, expansion of wetland habitats to nonwetland areas would not occur on Gray Lodge WA. Rather, increased and reliable water supplies would enable more effective management of existing habitats. 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 the Sacramento NWR Complex. The *Report on Refuge Water Supply Investigations* (Reclamation, 1989) projected 72 million bird-use-days for waterfowl, geese, and other migratory shorebirds on Gray Lodge WA each year under optimal habitat management. As for the Sacramento NWR Complex, the potential for outbreaks of avian diseases and transmission of diseases to domestic fowl would be reduced with optimal management of wetland habitats. Special-status species associated with wetland habitats would similarly benefit from improved quality and availability of wetland habitats.

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, including special-status species, 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.

Return flows from Gray Lodge WA reach the Sacramento River through various drains and channels. The volume of return flows from Gray Lodge WA is expected to increase with the additional Level 4 increment of water provided to the refuge. This increase in return flows is not expected to adversely impact water quality or anadromous salmonids in downstream watercourses. In addition, the improved water quality from increased water supplies and management flexibility could have a beneficial effect for downstream uses.

Proposed Action

Habitat conditions under the Proposed Action would be similar to existing conditions, but would differ from the assumptions of the No Action Alternative primarily with respect to permanent wetlands. As under the No Action Alternative, seasonal wetlands would be the predominant wetland type on the refuge. However, while the No Action Alternative assumed that full Level 4 water supplies would be used to support approximately 2,700 acres of permanent wetland and aquatic habitat, the Proposed Action would provide 400 to 600 acres of permanent wetland and aquatic habitat. The emphasis on seasonal wetlands reflects the current understanding that seasonal wetland can be managed to provide better habitat quality for migratory waterfowl than can permanent wetlands. In

addition, permanent wetlands have never been the predominant wetland type on Gray Lodge WA. Thus, the difference in the acreage of permanent wetlands between the Proposed Action and No Action Alternative does not reflect an actual physical difference that would occur on the refuge under each of the alternatives.

The benefits to wetland habitat quality through improved management capabilities identified under the No Action Alternative would also be realized under the Proposed Action. Furthermore, the Proposed Action could result in somewhat better habitat quality than would the No Action Alternative, given an increased flexibility in the delivery schedule of Level 2 water supplies and the Level 4 increment. 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 year-to-year adjustments in the delivery pattern. This difference would further enhance the refuge managers' ability to optimally manage wetland riparian and upland (crops) habitats, thereby benefiting a diversity of wildlife species (including special-status species).

Under the Proposed Action, Gray Lodge WA would implement additional conservation measures to avoid and minimize potential impacts to special-status species, particularly giant garter snakes, from a wide range habitat management activities and operational regimes. These conservation measures would improve protection of special-status species relative to the No Action Alternative. In combination, the improvements in habitat quality and availability, and the additional conservation measures of the Proposed Action would provide greater benefit to special-status species than would the No Action Alternative. As under the No Action Alternative, no adverse effects to anadromous salmonids would occur under the Proposed Action.

5.3 Water Quality

This section describes the water quality conditions that exist on the Sacramento NWR Complex and the Gray Lodge WA, and how these conditions may change as a result of the Proposed Action.

5.3.1 Affected Environment

Sacramento National Wildlife Refuge

Before passage of the CVPIA, the Sacramento NWR received CVP water from the Sacramento River through GCID. Under contracts with the Service, GCID conveyed a maximum of 50,000 acre-feet of CVP water to the refuge. The Sacramento NWR has continued to receive CVP water through GCID facilities to meet Level 2 water supplies and the annual Level 4 increment.

The quality of surface water from the Sacramento River is adequate for refuge and agricultural uses (Reclamation, 1994). In general, levels of salinity, organic and inorganic contaminants, and pathogens are low. For example, this surface water is widely used for drinking water after disinfection, and supports special-status anadromous fish and other fish species of management concern. The GCID Main Canal and associated conveyance

canals receive some agricultural return flow, but water quality remains adequate for refuge and agricultural uses, as demonstrated by its current, successful use for irrigation of agricultural fields and wildlife habitat.

Until recently, GCID's facilities were dewatered for maintenance and cleaning during the late fall and winter months. As a result, the refuge received CVP water only from April through the end of November. With no deliveries in the winter when water is needed to maintain waterfowl habitat, the refuge has had to "stockpile" water. Stockpiling water consists of flooding wetland areas 2 to 3 feet deep and holding the water through the winter. This management strategy was necessary to ensure that habitat was available for waterfowl throughout the winter. However, in the absence of fresh water inflows, poor water quality conditions resulted from this management strategy, which, in turn, may have contributed to disease losses. In some years, more than 14,000 birds died on the Sacramento NWR Complex as a result of these diseases (Dileanis, et al., 1992).

The Sacramento NWR also diverts agricultural return flows from Logan Creek under appropriative water rights. The refuge holds four appropriative water licenses to divert up to 60 cfs from Logan Creek to supply 4,575 acres of the refuge. Typically, the refuge exercised its water rights on Logan Creek during the period when the GCID Main Canal was dewatered for winter maintenance and there was natural flow in the creek (Reclamation, 1992). Water from the GCID canals is considered to be of higher quality and is preferred over Logan Creek water (Dileanis, et al., 1992). Water quality of the water currently diverted from Logan Creek is unknown, but samples collected in 1988 did not indicate any water quality parameters of concern, and this water has been successfully used for irrigation of agricultural fields and wildlife habitat. Currently, two wells exist on the Sacramento NWR. These wells are not used for water supply because of groundwater quality concerns.

Delevan National Wildlife Refuge

The Delevan NWR has no firm water supply and no groundwater supply. Before passage of the CVPIA, the refuge received up to 30,000 acre-feet of CVP water from the Sacramento River through annual contracts between the Service and GCID. The Delevan NWR continues to receive CVP water via GCID facilities to meet Level 2 water supplies, and the annual Level 4 increment.

As described for the Sacramento NWR, the quality of surface water from the Sacramento River is adequate for refuge and agricultural uses (Reclamation, 1994). In addition to CVP water, GCID conveys agricultural return flows to the refuge. Agricultural return flows are of poorer quality than CVP supplies, but are of adequate quality for refuge uses.

Until recently, GCID only delivered water to Delevan NWR from April through November. As described for Sacramento NWR, wetland habitat management practices resulting from this water delivery pattern could contribute to poor water-quality conditions and subsequent disease outbreaks. The lack of other water supplies to draw on when GCID facilities were shut down further restricted wetland management options on Delevan NWR. Outbreaks of avian cholera and botulism have occurred on Delevan NWR, although not to the degree as on the Sacramento NWR.

Colusa National Wildlife Refuge

Colusa NWR has no firm water supply. Before passage of the CVPIA, the refuge obtained most of its water from the R.D. 2047 Drain. Most of the water in the R.D. 2047 Drain during the irrigation season is from agricultural return flows, which are of poorer quality than CVP water but are acceptable for refuge use. The refuge has one appropriative water right for diversion from the R.D. 2047 Drain. However, because of prior appropriations, water was generally not available for the refuge during July and August. The refuge also received agricultural return flows from fields outside of the refuge through the "J" Drain (Reclamation, 1989).

These water supplies were supplemented with CVP water conveyed through GCID's facilities. At times, a significant part of the water in GCID's canal has been agricultural return flows. Agricultural return flows delivered to the refuge are of poorer quality than CVP supplies, but are of adequate quality for refuge uses. Currently, the Colusa NWR has been receiving CVP water via GCID facilities to meet Level 2 and Level 4 water supplies.

GCID's facilities are dewatered for maintenance and cleaning during the late fall and winter months. As at Sacramento and Delevan NWRs, water was stockpiled at Colusa NWR because water was generally not available during the late fall and winter. Water quality and avian disease concerns were the same as those described for Sacramento and Delevan NWRs. However, outbreaks of avian cholera and botulism have occurred less frequently at Colusa NWR than at other refuges of the Sacramento NWR Complex (Dileanis, et al., 1992).

Sutter National Wildlife Refuge

The Sutter NWR receives surface-water supplies from two sources: the Sutter Extension Water District and the Sutter Bypass. More than 85 percent of the water supply for the refuge has come from irrigation and return flows in the East and West Borrow Ditches of Sutter Bypass, if and when they have been available. Agricultural return flows provide the majority of the summer flows. The quality of agricultural return flows is suitable for refuge uses. Because rainfall, runoff, and flood flows provide the majority of winter flows, the refuge has not had to stockpile water, as has been done at the other refuges of the Sacramento NWR Complex. Still, outbreaks of avian cholera and botulism have occurred at Sutter NWR, although not to the extent as at the other refuges of the Sacramento NWR, Complex (Dileanis, et al., 1992). The refuge has five groundwater wells, but groundwater has not been used because it contains high levels of arsenic, boron, and, possibly, mercury (Reclamation, 1995).

Gray Lodge Wildlife Area

Before passage of the CVPIA, as well as now, Gray Lodge WA received water from a combination of surface water and groundwater sources. Gray Lodge WA is served by the Biggs-West Gridley Water District, which diverts SWP water from Thermalito Afterbay. Gray Lodge WA receives 8,000 acre-feet of dependable water from Biggs-West Gridley Water District and R.D. 833 and 2054. The quality of water from Thermolito Afterbay is adequate for agricultural, urban, and wildlife habitat management uses.

The refuge has also diverted water from the R.D. 833 Drain and the R.D. 2054 Drain. These canals convey agricultural return flows. The return flows are only available during the

summer and early fall, when the rice fields are drained. This water has been of adequate quality for refuge uses.

Groundwater has been used to supply a portion of the annual demand on the Gray Lodge WA. There are 21 deep groundwater wells used onsite, as necessary, to supplement surface-water deliveries and to supply water to portions of the Gray Lodge WA that cannot be reached by gravity flow from surface supplies. No water-quality concerns have been identified regarding the use of groundwater for wetland habitat management at Gray Lodge WA.

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 Sacramento NWR complex (the Sacramento, Delevan, Colusa, and Sutter NWRs) and Gray Lodge WA. The impacts of providing this water have been evaluated in the CVPIA PEIS, as described in Section 3 of this EA/IS. However, additional site-specific analysis is warranted. This section focuses on the site-specific water-quality impacts that may occur with increased water supply.

Sacramento NWR Complex

No Action Alternative

Under the No Action Alternative, on-refuge management at the Sacramento NWR Complex would be in accordance with the assumptions of the CVPIA PEIS Preferred Alternative. Under the No Action Alternative, Reclamation would continue to provide Level 2 water to the refuges from CVP yield and the Level 4 increment, as acquired through the Water Acquisition Program. The Level 2 and Level 4 water supplies for the refuges of the Sacramento NWR Complex were identified previously in Section 4.3.1.

Refuges in the Sacramento NWR Complex rely solely on surface water for refuge management. Most of the surface water used on the refuges is diverted from the Sacramento River. Water from the Sacramento River would continue to make up most of the refuge's water supply. Water quality of the additional water conveyed to the refuges would be similar to what is currently being delivered.

As described above, the refuges had to "stockpile" water for use during the winter. This management resulted in extended ponding of water that, at times, contributed to poor water quality on the refuges and subsequent disease outbreaks. With more reliable and year-round water supplies under the No Action Alternative, management of wildlife habitat would not require "stockpiling" of water. Rather, a flow-through management strategy would be followed. With flow-through management, water levels are maintained at a constant level by adding fresh water and draining water that was previously applied to the wetland units. This management results in a continuous supply of fresh water to the wetland units and decreases the potential for poor water-quality conditions to develop. Because of improved water quality, flow-through management is expected to decrease the potential for disease outbreaks among wintering waterfowl, which would be a beneficial water-quality effect both on the refuge and for downstream uses.

Drainage from the Sacramento NWR Complex eventually reaches the Sacramento River through Logan Creek (Sacramento NWR), the R.D. 2047 Drain (Delevan and Colusa NWRs), or the Sutter Bypass (Sutter NWR). Delivery of up to Level 4 water under the No Action Alternative would increase return flows from these areas. Table 5-2 presents the estimated increase in return flows from delivery of full Level 4 water. This increase in drainage is not expected to impact water quality, because on-refuge levels of trace elements and pesticides are generally within established guidelines and criteria (Dileanis et al., 1992). In addition, no concerns regarding water quality of return flows coming off the refuges have been identified (G. Mensik, pers. comm., January 13, 2000). Continued improvement in water quality as a result of flow-through management would be expected to have a beneficial effect with respect to downstream uses.

TABLE 5-2
Estimated Increase in Drainage from Individual Refuges with Delivery of Level 4 Water

Refuge Area	Receiving Water	Drainage (ac-ft)	Increased Drainage (ac-ft)	Total Drainage (ac-ft)
Sacramento NWR	Logan Creek	6,000 to 8,000	4,600	10,600 to 12,600
Delevan NWR	2047 Drain	2,500 to 3,500	450	2,950 to 3,950
Colusa NWR	2047 Drain	2,000 to 3,000	0	2,000 to 3,000
Sutter NWR	Sutter Bypass	2,820 to 6,345	1,500	4,320 to 7,845

Proposed Action

Under the Proposed Action, Reclamation would ensure that Level 2 water supplies are delivered, as well as the Level 4 increment as acquired through the Water Acquisition Program. This water would be used to manage wetland habitats on the Sacramento NWR Complex in accordance with revised management objectives. The acreage of permanent ponds and summer water would generally be greater at the Sacramento NWR Complex than was assumed under the No Action Alternative. Acres of the other wetland habitat types (moist soil impoundments and seasonal wetlands) would be similar to the No Action Alternative.

Although an increased acreage of permanent and summer water would be available on the Sacramento NWR Complex, management of wetland habitats would be similar to the No Action Alternative. The availability of reliable, year-round water supplies would allow flow-through management of wetland habitats, which would result in similar water-quality benefits as those described for the No Action Alternative.

Gray Lodge Wildlife Area

No Action Alternative

Under the No Action Alternative, Reclamation would continue to provide Level 2 water to Gray Lodge WA from CVP yield, and would provide the Level 4 increment, as available through the Water Acquisition Program. The Level 2 and Level 4 water supplies for Gray Lodge WA were identified earlier in Section 4.3.2. Gray Lodge WA would receive surface water from Reclamation throughout the year. It is expected that Gray Lodge WA would

continue to use groundwater to supplement surface water, primarily in drought years when water deliveries to the refuge would be reduced. Both sources of water would be of suitable quality for wetland management.

The availability of reliable, year-round water supplies would increase management flexibility at Gray Lodge WA. Stockpiling water has not been necessary to the same extent as on the federal refuges of the Sacramento NWR Complex. Nonetheless, providing Level 2 water supplies and up to the Level 4 increment would result in greater flexibility and certainty that a flow-through management strategy could be followed. This would act to improve water-quality conditions on the refuge and would decrease the potential for disease outbreaks, as described for the refuges of the Sacramento NWR Complex.

Drainage flows at Gray Lodge WA would continue to increase as a result of the additional Level 4 increment of approximately 8,600 acre-feet of water applied to the refuge. This increase in drainage is not expected to impact water quality, as on-refuge levels of trace elements and pesticides are within acceptable levels from established criteria. In addition, the improved water quality from increased water supplies and management flexibility would have a beneficial effect on downstream uses.

Proposed Action

As under the No Action Alternative, the availability of reliable, year-round water under the Proposed Action would provide greater flexibility and certainty such that a flow-through management strategy could be followed. Because the quantity and quality of water available to Gray Lodge WA under the Proposed Action would be similar to the No Action Alternative, the same water quality conditions identified under the No Action Alternative would be expected under this alternative. Likewise, the quality of return flows would be similar to the No Action Alternative.

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

Sacramento National Wildlife Refuge

The Sacramento NWR is located in rural Glenn and Colusa Counties in the northern Sacramento Valley. The lands surrounding the refuge are primarily agricultural with large acreages of rice as the predominant crop. Several duck clubs are also present in the surrounding area. Interstate 5 abuts the refuge's western boundary.

The Sacramento NWR is designated as "Open Space/Public Lands" in the Glenn County General Plan, whereas surrounding farmlands are designated as "Intensive Agriculture." In addition, surrounding lands in Glenn County have a special overlay designation of "Restorable Wetlands," which facilitates the use of designated farmlands for wildlife conservation purposes. All refuge lands within Colusa County are designated "Resource Conservation" in the Colusa County General Plan, whereas surrounding land uses are considered "General Agriculture." Land use policies in both of the two county General

Plans support measures to ensure the compatibility of farmlands and wetland / wildlife areas. For example, policy CO-20 of the Colusa County General Plan states:

> *Protection of Resource Conservation areas may at times conflict with agricultural and recreation practices on adjacent lands. Such conflicts should be resolved on a case-by-case basis in a manner which recognizes the public interests in both habitat resource protection and the sound management of agriculture and recreation resources.*

No equivalent policy exists in the Glenn County General Plan.

Delevan National Wildlife Refuge

The Delevan NWR is located entirely within Colusa County. The refuge area is surrounded by rice farms, and the refuge itself was formerly used for rice farming. The Delevan NWR is designated as "Resource Conservation" by the Colusa County General Plan. Adjacent lands are designated as "General Agriculture," and the immediate eastern boundary is designated as a "Drainage Facility" (the R.D. 2047 Drain). Policy CO-20 of the Colusa County General Plan, described above, also applies to the Delevan NWR and surrounding lands.

Colusa National Wildlife Refuge

The Colusa NWR is located entirely within Colusa County. The refuge area is surrounded by rice farms, and portions of the refuge were previously used for rice farming. The Colusa NWR is designated as "Resource Conservation" by the Colusa County General Plan. Adjacent lands are designated as "General Agriculture," with the northeastern border of the refuge abutting the City of Colusa planning area. Land use designations within this portion of the City of Colusa planning area are industrial and public (the City's sewer ponds). Policy CO-20 of the Colusa County General Plan, described above, also applies to the Colusa NWR and surrounding lands.

Sutter National Wildlife Refuge

The Sutter NWR is located entirely within rural Sutter County, and most of its land area is contained within the Sutter Bypass, a major flood overflow channel from the Sacramento River. Lands to the east and west of the bypass levees are in rice production, and other lands within the bypass to the north and south of the refuge are under cultivation. The refuge is designated as "Key Wildlife Area" in the Sutter County General Plan, and surrounding land uses are considered "Intensive Agriculture." The General Plan does not identify specific policies relating to the interface between farmlands and public wetland / wildlife areas.

Gray Lodge Wildlife Area

The Gray Lodge WA is located in rural Butte and Sutter counties. Adjacent lands to the north, south, and east are primarily agricultural, most of which are rice fields with some limited pasture and orchards. Some of this surrounding farmland is flooded in winter for private waterfowl hunting. Lands to the west are primarily unfarmed wetlands of the Butte Sink, most of which is preserved as waterfowl habitat in private hunting clubs.

The Gray Lodge WA is designated as "Public" in the Butte County General Plan, whereas surrounding farmlands are designated as "Orchard and Field Crop." All lands of the Gray Lodge WA in Sutter County are considered "Key Wildlife Areas" in the Sutter County General Plan, whereas surrounding land uses are considered "Intensive Agriculture."

Neither of the two county General Plans identifies specific policies relating to the interface between farmlands and public wetland / wildlife areas.

Two contractual arrangements exist with property owners. One property owner has a right of access to his property, which is surrounded on three sides by the Gray Lodge WA. The Tule Goose Hunting Club has a contractual right to all drainage water from the refuge on demand. The Gray Lodge WA may acquire additional lands in the future, as parcels come up for sale. The Gray Lodge Management Plan (CDFG, 1989) identifies six adjacent properties that Gray Lodge will consider purchasing if the opportunity presents itself.

5.4.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the refuges of the Sacramento NWR complex (the Sacramento, Delevan, Colusa, and Sutter NWRs) and the Gray Lodge WA. The impacts of providing this water have been evaluated in the CVPIA PEIS, as described in Section 3 of this EA / IS. However, 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 refuges include economic impacts (primarily from crop depredation by waterfowl and spread of avian diseases) and refuge expansion. Other land use and nuisance issues are considered minor and would not change under the Proposed Action (such as weed control and beaver and muskrat damage). The issue of mosquito control was addressed in Section 4.

In order to understand how changing water supplies on the refuges may impact adjacent agricultural lands, available refuge management information was 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.

Sacramento NWR Complex

No Action Alternative

The objectives of the Sacramento NWR Complex include alleviating the problem of depredation of agricultural crops by wintering waterfowl, and this 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), improvements to on-refuge habitats are expected to occur under the No Action Alternative. Continuing to provide Level 2 and Level 4 water would result in substantial improvements to the ability of the Service to manage waterfowl habitat on the refuge. The improvements expected do not include expansion of wetland habitats to nonwetland 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 increased ability to produce waterfowl forage on the refuge. The ability to more effectively grow food items is expected to help maintain waterfowl on the refuge and, therefore, reduce the potential for depredation on surrounding farmland. Accordingly, a beneficial land use effect is expected under the No Action Alternative.

An additional benefit of maximizing waterfowl retention on the refuges is control of avian diseases that are potentially transmittable to domestic fowl. Potential benefits to the refuges

under the No Action Alternative are two-fold: (1) increased on-refuge retention of waterfowl would reduce potential exposure of domestic fowl to migratory waterfowl, and (2) increased ability for refuge managers to effectively manage water supplies would help reduce outbreaks of avian cholera, botulism, and other bird diseases. Because these benefits are expected to increase as the availability of refuge water supplies increases under the No Action Alternative, there would be a beneficial effect associated with limiting the spread of avian diseases.

No additional refuge lands would be acquired under the No Action Alternative. The amount of water provided to the refuge under interim water service agreements is intended for optimum management of current refuge lands per the *Report on Refuge Water Supply Investigations*. The Service currently owns all lands of the four refuges of the Complex, and no expansion of the refuges is planned.

Proposed Action

Habitat conditions under the Proposed Action would be similar to the No Action Alternative, with the primary difference being a slight increase in permanent wetlands on the Sacramento and Delevan NWRs. This increase in permanent wetlands 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, so 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 under the Proposed Action.

Gray Lodge Wildlife Area

No Action Alternative

One of the primary objectives of the Gray Lodge WA is to provide relief from depredation of agricultural crops by waterfowl (CDFG, 1989). This objective would continue to be supported under the No Action Alternative. As described in Section 5.2 (Biological Resources), improvements to on-refuge habitats are expected to occur under the No Action Alternative. Continuing to provide Level 2 supplies, and eventually expanding conveyance infrastructure to fully use up to Level 4 supplies, would result in substantial improvements to the ability of CDFG to manage waterfowl habitat on the refuge. As with the Sacramento NWR Complex, expansion of wetland habitats to nonwetland areas is not planned, but CDFG would have the ability to more effectively manage existing habitats. With the reliable water supply under the No Action Alternative, the ability to more effectively grow food items is expected to help maintain waterfowl on the refuge, thereby reducing the potential for depredation on surrounding farmland. Accordingly, a beneficial land use effect is expected under the No Action Alternative.

An additional benefit of maximizing waterfowl retention on the refuges is control of avian diseases, which are potentially transmittable to domestic fowl. For the Gray Lodge WA, beneficial impacts with regard to controlling avian diseases would be the same as those described for the Sacramento NWR Complex.

No additional refuge lands would be acquired under the No Action Alternative. The amount of water provided to the refuge under the No Action Alternative is intended for optimum management of refuge lands per the *Report on Refuge Water Supply Investigations*.

Proposed Action

Habitat conditions under the Proposed Action would be similar to the No Action Alternative, with the primary difference being a slight increase in permanent wetlands. This increase in permanent wetlands 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 was described above. As is the case under the No Action Alternative, no additional refuge lands would be acquired as part of the Proposed Action.

The potential land use impacts of the Proposed Action relative to existing conditions would be similar to the beneficial effects described above under the No Action Alternative. Part of the benefit described above has been realized as a result of delivery of Level 2 water supplies to the Gray Lodge WA, with additional benefits having occurred in those years in which Level 4 water supplies were available on the refuge. Additional benefits would occur relative to existing conditions until full Level 2 and Level 4 water is available on the Gray Lodge WA.

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 Proposed Action to affect consumptive (hunting and fishing) and nonconsumptive (bird watching) recreation uses on the refuges.

5.5.1 Affected Environment

Sacramento NWR Complex

The goals and objectives for the Sacramento, Delevan, Colusa, and Sutter NWRs support public recreation activities. Consumptive recreation activities on the four refuges are limited to waterfowl and pheasant hunting programs administered by the refuges in cooperation with CDFG. Fishing is not allowed at the Sacramento NWR Complex refuges. Nonconsumptive recreation activities have expanded at the refuges, and now support more visitor-use days than hunting. Table 5-3 shows current recreation use at the four refuges.

As indicated on Table 5-3, recreation use at the complex, especially nonconsumptive use, is focused around the Sacramento NWR. The Sacramento NWR is the headquarters of the complex and contains a visitor center and other developed public uses, including a six-mile auto tour route and a walking trail. The presence of the visitor center and interpretive staff at the Sacramento NWR makes the refuge a focus of local environmental education activities. The Colusa NWR has an auto tour route and walking trail, but the Delevan and Sutter NWRs are not developed for nonconsumptive recreation use.

TABLE 5-3
Recreation Use on the Sacramento NWR Complex

Refuge	Consumptive (visitor-use days)	Nonconsumptive (visitor-use days)	Total (visitor-use days)
Sacramento NWR	7,950	55,000	62,950
Delevan NWR	7,000	0	7,000
Colusa NWR	3,800	35,000	38,800
Sutter NWR	4,500	0	4,500
Total for all Refuges:	23,250	90,000	113,250

Gray Lodge Wildlife Area

The Gray Lodge WA has traditionally supported numerous recreation activities including waterfowl and pheasant hunting, angling, and nonconsumptive uses, such as bird watching, photography, and hiking. Although CDFG's primary consideration is the needs of wildlife (CDFG, 1989), public recreation opportunity is one of the three primary missions of the refuge. As stated in its management plan, CDFG's future goals for the Gray Lodge WA include continuation of hunting, expansion of fishing, and development of new interpretive programs for nonconsumptive users.

Hunting has been the traditional recreation use at the Gray Lodge WA. The original Gray Lodge area was a gun club before its acquisition by the State of California, and many of the additions to the refuge came with the stipulation to allow public hunting. Today, the Gray Lodge WA is one of the most popular public waterfowl and pheasant hunting areas in California, and supports approximately 16,000 hunter-days per year (CDFG, 1989). CDFG's intent is to continue to provide the maximum public hunting opportunity as is practical and consistent with sound ecological practices (CDFG, 1989).

Approximately 50 miles of ditches on the Gray Lodge WA are open to public fishing outside of the waterfowl hunting season. The fishery consists primarily of black bass, bullhead, and several other warmwater game fish. Several of CDFG's goals in its management plan include maintaining permanent water in ditches and ponds to support the warmwater fishery on the refuge. Maintenance of permanent water is considered complementary to the CDFG's primary goals, but maintenance of the fishery must not interfere with waterfowl habitat and production. It is estimated that the Gray Lodge WA supports approximately 15,000 angler-days per year.

In recent years, the nonconsumptive uses of wildlife have become increasingly significant and, with an estimated 168,000 visitor-days per year, are now the primary recreation use at the Gray Lodge WA. The bulk of nonconsumptive users are bird watchers. Hunters and bird watchers are separated into hunting areas and nonhunting areas; during hunting season, bird watchers are restricted to nonhunting areas even on nonshoot days, but in nonhunting season, bird watchers can use most of the refuge.

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 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 significantly, 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).

Sacramento NWR Complex

No Action Alternative

As described in Section 5.2, habitat conditions are expected to continue to improve on the refuges of the Sacramento NWR Complex. Expected improvements include an increased ability to manage for year-round habitat conditions and to irrigate for waterfowl forage crops. As a result of these continued improvements, waterfowl populations are expected to increase. Accordingly, recreation use is expected to increase along with waterfowl populations.

Overall recreation conditions are expected to improve, reflecting the expectation that almost every type of recreation use is expected to benefit from the delivery of Level 2 and Level 4 water supplies. In addition to the recreation benefits that are directly related to increased waterfowl populations (waterfowl hunting, bird watching), other benefits are expected. For example, increased forage crop production would benefit pheasant populations and, as a result, pheasant hunting.

Proposed Action

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

Gray Lodge Wildlife Area

No Action Alternative

As described in Section 5.2, habitat conditions are expected to continue to improve on the Gray Lodge WA. Similar to the above discussion for the Sacramento NWR Complex, improved habitat conditions are expected to result in improved conditions for recreation users. As described above, recreation improvements include an increase in waterfowl hunting and bird-watching potential, as well as increased pheasant hunting. In addition, increased water in internal conveyance ditches and increased year-round water would benefit warmwater fish populations and, therefore, would benefit angling.

Proposed Action

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

In addition, recreation benefits are expected to occur relative to existing conditions. As described in Section 2, water supplies available for use on the Gray Lodge WA have been equivalent to Level 4 amounts in recent years, but additional conveyance infrastructure is needed to ensure that up to Level 4 supplies are provided in a reliable manner. Completion of these infrastructure improvements in the near future would allow for continued improvement to habitat conditions on the Gray Lodge WA, which is expected to benefit recreation users relative to existing conditions. Accordingly, entering into the proposed long-term water supply contract would result in a beneficial impact to recreation.

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. This 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 wetland-based recreation activities, both public and private. Nationwide, it is estimated that $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 few studies have been specifically performed regarding the economic benefits of wildlife refuges in the Sacramento Valley.

Economic benefits associated with wetland-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 (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 these trips. 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 (Willows, Williams, Colusa, Yuba City, Gridley). These communities are likely to 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 refuges of the Sacramento NWR complex and the Gray Lodge WA. 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 specific refuges, and focuses primarily on trip-related expenses captured by local communities.

As described by Southwick Associates (1995), annual hunting depends, at least in part, on the population of waterfowl available for hunters to target. Similarly, birdwatching trips are likely to 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.

All Refuges

No Action Alternative

Under the No Action Alternative, Level 2 and up to full Level 4 water supplies would continue to be provided to the Sacramento NWR Complex and to the Gray Lodge WA, with the amount of water gradually increasing on most refuges until full Level 4 supplies are provided. As described in Section 5.2 (Biological Resources), reliable 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. The positive economic benefits would be experienced by local communities (such as through increased travel-related expenditures) and to other economic sectors. Benefits to local communities would likely be a dispersed benefit to the service sector (gas stations, restaurants). 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 northern Sacramento Valley region in a site-specific manner. However, changes are expected to be beneficial.

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 somewhat different than under the No Action Alternative, primarily in terms of additional summer water / permanent ponds on several of the refuges. As described in Section 5.5 (Recreation), these differences in habitat are not expected to result in significant, if any, changes to onsite recreation use, either relative to the No Action Alternative or to existing conditions. Accordingly, no changes to regional economic benefits are expected under the Proposed Action.

5.7 Social Conditions

This section describes how the refuges contribute to local and regional social conditions and the potential changes in these conditions resulting from implementation of the long-term refuge water service agreements. This section focuses 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 (hunting, 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 (California Waterfowl Association, 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 (on-refuge staffing, construction of facilities).

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 refuges of the Sacramento NWR Complex and the Gray Lodge WA. 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 Sacramento Valley 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).

All Refuges

No Action Alternative

Under the No Action Alternative, Level 2 and Level 4 water supplies would continue to be provided to the Sacramento NWR Complex and to the Gray Lodge WA, with the amount of CVPIA water continuing to increase on most refuges. As described in Section 5.4 (Recreation), hunter and birdwatcher use would 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 have 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 (gas stations, restaurants), also considered a beneficial social effect to local businesses 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 refuges may expand staffing levels in response to increased recreation demand, which may be especially true for the Gray Lodge WA because full implementation of its Management Plan (including staffing levels) depends on providing a reliable water supply. Economic and employment factors all contribute to a positive social benefit resulting from continuing to provide refuge water supplies pursuant to the No Action Alternative.

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 slightly different than those under the No Action Alternative, but these differences are not expected to result in any changes to social conditions relative to the No Action Alternative.

The Proposed Action is expected to result in minor differences in social conditions relative to existing conditions on the Gray Lodge WA. As described in Section 2, an increasing amount of the full Level 4 water supplies has been provided to the Gray Lodge WA in

recent years, so most of the social benefits potentially associated with this expanded water supply have already been realized.

5.8 Cultural Resources

This section describes the historical and prehistoric conditions in the refuge areas, and describes known cultural resources on each refuge. The evaluation focuses on how the proposed action may impact known and unknown cultural resources.

5.8.1 Affected Environment

General Overview of Prehistoric Resources

The study area lies in a boundary zone between the ethnographically known territories of three different Native American groups. The Konkow to the north and the Nisenan to the south spoke closely related languages of the Maiduan language family. The Patwin, located primarily west of the Sacramento River, but controlling part of the east bank, spoke a more divergent language. All three languages belong to the Penutian superstock (Shipley, 1978). The refuges generally lie between the highly productive areas near the river and the interior valleys of the surrounding foothills. Both areas were more heavily used in recent prehistory than were the grassy plains in the middle. It is probable that the area was used by foraging parties from the people based along the river. No matter which group controlled the plains between the Sacramento and the lower Feather at any given time, the way of life was similar.

The pattern of "village communities" (Kroeber, 1925) constituted the only political organization. A community was composed of several geographically related villages with one maintaining a large semisubterranean ceremonial lodge (Riddell, 1978). This larger lodge may also have been the dwelling of the headman, who was the more authoritative person in the community. The headman acted only as a spokesman and advisor to the people and, apparently, lacked magisterial powers. Each village community held a known territory in which all community members had hunting and fishing rights (Kroeber, 1925; Riddell, 1978). All three groups practiced hunting, gathering, and fishing subsistence strategies. Their intimate knowledge of the flora and fauna ensured an efficient exploitation of their environs. The largest game animal that was hunted for its meat was the deer. Fishing produced salmon, trout, steelhead, eels, and other fish, and freshwater clams and mussels were obtained from the main rivers (Wilson, 1978).

Sacramento National Wildlife Refuge

The lands of the Sacramento NWR are flat, with some natural slough courses. Much of the area that became the Sacramento NWR in 1937 was designated as "Swamp and Overflow Land" by the early surveyors for the General Land Office. Because the area lies along the course of the Southern Pacific Line, alternating sections of the land were granted to the railroad very early, forcing settlers either to purchase the land from the railroad or to select other lands for their farms or ranches. The remainder of the area was purchased from the government in the late 1860s to mid-1870s. Farms and ranches were quite scattered, suggesting that a large tract of land was necessary for economic success in this region.

The Northeast Information Center indicated that there has been no previous cultural resources surveys within the Sacramento NWR. The Northeast Information Center did point out that the Lookout Tower and Refuge Headquarters within the refuge boundary are listed as historic properties in the Office of Historic Preservation's Historic Property Data File.

Delevan National Wildlife Refuge

At the Delevan NWR, the pattern of land acquisition is much the same as for the Sacramento NWR, suggesting some possibility for early settlement. The Northwest Information Center indicated that there have been four previous cultural resources surveys within the Delevan NWR. One of the studies described the R.D. 2047 Drain as a historic structure (Neuenschwander, 1997). The R.D. 2047 Drain, which runs for about 75 miles through the Colusa Basin, was constructed in 1919 to provide a channel for floodwaters, and also serves as an irrigation canal. No other historical structures or archaeological sites were identified in the other three studies, and review of historical literature and maps by the Northwest Information Center gave no indication of archaeological sites or other historic structures in the project area.

Colusa National Wildlife Refuge

At the Colusa NWR, the pattern of land acquisition is much the same as for the Sacramento NWR. Examination of historic maps did not reveal the presence of old structures within the survey areas. The Northwest Information Center indicated that there has only been one previous survey on the Colusa NWR; this survey was conducted for the Tract 15 project just north of Abel Road. No archaeological sites or historic structures were identified in this study, nor are they indicated in other reports or maps on file with the Northwest Information Center. However, the R.D. 2047 Drain, as described under the Delevan NWR, has been recorded as a historical resource.

Sutter National Wildlife Refuge

The Sutter NWR is near the boundaries of three Mexican grants – New Helvetia, Boga, and Honcut. The Boga plat map shows a number of historic period features along the early road from Marysville to Hamilton, including houses, fences, fields, a tavern, farms, and barns, some of which lie near the alignment. Also shown on the Boga Rancho plat are several "Indian Rancherias," one of which was the village of "Boga," the source of the rancho's name and, apparently, occupied at the time of contact. The land was fairly rich not only in the bottomlands along the various drainages, but throughout the study area, and there was a plentiful water supply. Outside of what is now the Sutter Bypass, shown as "Swamp and Overflow Land," early survey maps of the southern portion of the study area show a number of structures, fences, and roads in the area in the 1860s and 1870s. Most of the land outside the ranchos was taken up as homesteads or purchased as cash entry patents in the 1860s.

The Northeast Information Center indicated that there have been three previous surveys on the Sutter NWR, two in the Hughes Road area (for the Hughes Road Bridge project and the Greenleaf Power pipeline project) and one in the southeastern corner of the refuge (for the Depco pipeline project). No archaeological sites or historic structures were identified in these studies, nor are they indicated in other reports or maps on file with the Northeast Information Center.

Gray Lodge Wildlife Area

Along the western and southern ends of the Gray Lodge WA, much of the study area was taken up in smaller parcels (40 and 80 acres), with alternating sections granted to the Southern Pacific Railroad. The remainder of the area was also in a "checkerboard" pattern, with alternating sections acquired by the railroad, and 160-acre parcels acquired by settlers in the 1860s to 1870s. The Sacramento Northern Railroad also crosses the study area, as well as several early water-conveyance features.

The Northeast Information Center indicated that there has only been one previous survey on the Gray Lodge WA; this survey was conducted for the Wild Goose Gas Storage Project pipeline along the northern refuge boundary. No archaeological sites or historic structures were identified in this study, nor are they indicated in other reports or maps on file with the Northeast Information Center.

5.8.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the refuges of the Sacramento NWR Complex (the Sacramento, Delevan, Colusa, and Sutter NWRs) and the state Gray Lodge WA. The impacts of providing this water have been evaluated in the CVPIA PEIS, as described in Section 3 of this EA/IS. 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.

Sacramento NWR Complex

No Action Alternative

Under the No Action Alternative, Reclamation would continue to provide Level 2 and Level 4 water to the refuges of the Sacramento NWR Complex. The effect of this water delivery would be to allow more efficient management of existing wetlands on the refuges (allow for year-round management), and would not result in the conversion of existing uplands to wetland habitat. Activities that cause disturbance below the ground surface (conveyance improvements, habitat conversion) may affect unknown cultural resources, but such activities would not occur on the refuges because of delivery of water under the No Action Alternative. Therefore, the increase in water supplies to allow the efficient management of existing wetland areas would not affect cultural resources. In order to assess the potential effects 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.[3] The agreement covers all Service lands in California, including Sacramento NWR Complex. The purpose of the Programmatic Agreement is to establish procedures for cultural resources review for routing 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 Sacramento NWR Complex are consistent with the terms of the Programmatic Agreement. Accordingly, full compliance with Section 106 is expected without separate SHPO consultation.

[3] 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.

Proposed Action

Management activities on the Sacramento NWR Complex under the Proposed Action would be similar to management activities under the No Action Alternative; differences would consist only of minor changes in how some wetland habitats are managed. Accordingly, the potential to impact cultural resources is the same as that under the No Action Alternative (no impact). Any potential for adverse effects would be minimized by full compliance with the requirements of the Programmatic Agreement, which would remain in effect under the Proposed Action.

Gray Lodge Wildlife Area

No Action Alternative

Under the No Action Alternative, Reclamation would continue to provide Level 2 water to the Gray Lodge WA, and would provide the additional Level 4 increment pending completion of conveyance improvements. The effect of this water delivery would be to allow more efficient management of existing wetlands on the refuge (allow for year-round management), and would not result in the conversion of existing uplands to wetland habitat. These changes in management practices do not have the potential to disturb cultural resources.

In its Management Plan for the Gray Lodge WA, CDFG states that pursuant to CEQA, a CDFG archaeologist or consultant would conduct a preconstruction archaeological survey in the area of a certain project (e.g., projects that require subsurface excavation). This standard process, which would happen at the time specific improvements are proposed, is considered appropriate mitigation to minimize any potential cultural resources impacts that may occur as part of routine management activities.

Proposed Action

Similar management activities would occur under the Proposed Action as under the No Action Alternative, and CDFG would undertake the same cultural resources review process as described above. Because no changes in potential management activities would occur relative to the No Action Alternative, the Proposed Action is not likely to adversely affect cultural resources. As with the No Action Alternative, no cultural resources impacts are expected to occur as a result of using Level 2 and Level 4 water supplies provided under the Proposed Action.

Potential effects on cultural resources relative to existing conditions would be the same as would occur under the No Action Alternative and the Proposed Action. Accordingly, potential cultural resources impacts relative to existing conditions would be less-than-significant.

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/IS 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.

5.9.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the refuges of the Sacramento NWR Complex and the Gray Lodge WA. At a broad scale, the visual resource 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 site-specific visual resource impacts.

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

All Refuges

No Action Alternative

Under the No Action Alternative, Level 2 water supplies would continue to be delivered to the refuges, and Level 4 deliveries would continue to increase. Refuge management practices would not change in any noticeable manner with the primary difference being an increase in permanent pond/summer water habitat on the Gray Lodge WA with the delivery of full Level 4 supplies. An increase in permanent wetlands would continue to improve visual conditions in the summer by providing a natural contrast between the Gray Lodge WA and the surrounding lands.

Section 5.2 (Biological Resources) describes how the No Action Alternative would continue to contribute to improved habitat conditions on the refuges, and how these changes in habitat would help improve waterfowl populations. Increases in the size and health of the waterfowl population would translate into a positive scenic effect for refuge visitors.

Proposed Action

Similar visual 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 slightly different than that under the No Action Alternative (additional summer water/permanent ponds on the Sacramento and Delevan NWRs). However, these changes are minor and would not result in a substantial change to the scenic environment in these refuge areas. Visual resources under the Proposed Action are expected to be similar to those for the No Action Alternative.

Visual resources on the Gray Lodge WA with full Level 4 water supplies would be similar to existing conditions. The habitat types expected under the No Action Alternative have not been developed, and the current habitat distribution is closer to that expected under the Proposed Action (emphasis on seasonal wetlands and irrigated uplands). Because few, if any, changes would occur to lands on the refuge, there would be a less-than-significant visual impact as a result of implementing the Proposed Action.

5.10 Power

This section describes power use by the refuges, and how power use for refuge management may change as a result of implementing the long-term refuge water supply agreements.

5.10.1 Affected Environment

Sacramento NWR Complex

Pacific Gas and Electric (PG&E) supplies power to the Sacramento NWR Complex refuges, but power use is not significant at any of the refuges. Groundwater pumping, usually the most significant refuge power cost, does not occur because of unacceptable groundwater quality.

Gray Lodge Wildlife Area

PG&E supplies power to the Gray Lodge WA. Groundwater pumping has historically been a significant component of the Gray Lodge WA's water supply, providing up to 40 percent of its total water supply in below-normal water years. Although the well system provides valuable security for the maintenance of on-refuge habitats, groundwater pumping costs are significant and, in the past, has consumed an average of 75 percent of the refuge's operations budget (CDFG, 1989). An objective of the Gray Lodge WA Management Plan is to increase reliance on surface water in order to unencumber operations funds currently spent on groundwater pumping costs.

5.10.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the refuges of the Sacramento NWR Complex and the Gray Lodge WA. 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 (power use and cost) were not described. Accordingly, this analysis focuses on the changes in on-refuge power use and costs associated with the proposed long-term water supply agreements. 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.

Sacramento NWR Complex

No Action Alternative

Because groundwater pumping and its associated power use is not a significant activity at the Sacramento NWR Complex refuges, the No Action Alternative would have little effect on refuge power use.

Proposed Action

Implementing the proposed long-term agreement with the Service would have little effect on refuge power use relative to the No Action Alternative, primarily because groundwater pumping does not occur on the Sacramento NWR Complex.

Gray Lodge Wildlife Area

No Action Alternative

As described in Section 2, groundwater pumping, in combination with the other water supplies, has been used to meet the water demands of the Gray Lodge WA. Under the No Action Alternative, it is assumed that Reclamation would deliver up to full Level 4 supplies from surface water, so no groundwater pumping would be necessary. It is expected, however, that the Gray Lodge WA would continue to use groundwater to supplement surface water in drought years, when water deliveries to the refuge would be reduced, or during times when conveyance facilities are not available to deliver water to the WA.

Since the passage of the CVPIA and initiation of Reclamation's refuge water supply program, power use and costs on the Gray Lodge WA have been reduced as a result of reduced groundwater pumping.[4] This situation is expected to continue as Level 4 water becomes available through the water acquisition program. Accordingly, water deliveries under the No Action Alternative would maintain this beneficial effect to power (reduction in power use relative to pre-CVPIA conditions).

Proposed Action

Under the Proposed Action, Gray Lodge WA would continue to pump groundwater to meet some of the Level 2 water supply. Groundwater is currently used to meet much of the refuge's water needs. Thus, the Proposed Action would not result in increased power needs for groundwater pumping. The Level 4 increment is expected to be provided from surface water and power costs to convey this water would be minor.

Power costs are paid to PG&E from CDFG's operations budget for the Gray Lodge WA. Discussions have occurred for providing CVP Project Use Power to wildlife refuges, which would result in significant cost savings for the Gray Lodge WA and other refuges that rely on groundwater. However, at this time, no commitment has been made to make CVP Project Use Power available to the Gray Lodge WA.

[4] In 1996, groundwater pumping was necessary because of problems with delivering the required Level 2 water. Because Level 2 supplies are required under the CVPIA, Reclamation reimbursed CDFG for the costs of pumping groundwater.

Section 6: Consultation and Coordination

SECTION 6

Consultation and Coordination

This EA/IS has been prepared to comply with the environmental review and consultation requirements of NEPA and CEQA. Compliance 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 reports, 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 Coordination 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

Compliance efforts under the federal ESA for the Sacramento NWR Complex, including refuge management with Level 2 water supplies and the Level 4 increment, were completed in 1999 with the issuance of a Biological Opinion. Management of the Complex under the Proposed Action would continue to follow this Biological Opinion, and no additional ESA compliance actions with the Service are necessary.

CDFG has received a state Biological Opinion under the CESA for management of the Gray Lodge WA, but federal consultation has been limited to Service concurrence on the state Biological Opinion for Aleutian Canada goose and valley elderberry longhorn beetle. Reclamation conducted formal consultation with the Service to address potential effects of the Proposed Action on giant garter snakes. The consultation was completed with issuance of a biological opinion on December 27, 2000.

Reclamation also conducted informal consultation with the National Marine Fisheries Service (NMFS) to address the effects of the Proposed Action on anadromous salmonids in the Sacramento River basin. NMFS concurred that the Proposed Action is not likely to adversely affect anadromous salmonids.

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) 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 and CDFG have identified conservation measures to be implemented for the Gray Lodge WA pursuant to the Service's December 27, 2000, Biological Opinion, for the following species:

- Aleutian Canada goose
- bald eagle
- giant garter snake
- valley elderberry longhorn beetle

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List of Preparers

U.S. Bureau of Reclamation

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Gwen Buchholz	CVPIA Consistency

Appendix A:
CEQA Initial Study Checklist

APPENDIX A

CEQA Initial Study Checklist

1. Project Title: Refuge Water Supply – Long-Term Contract with U.S. Bureau of Reclamation

2. Lead Agency: Department of Fish and Game

3. Contact Person: Mr. Jim Steele
Environmental Specialist
1516 Ninth Street
Sacramento, CA 95814
(916) 653-1485

4. Project Location: Gray Lodge Wildlife Area in Butte and Sutter Counties

5. Project Sponsor: Department of Fish and Game

6. General Plan Designation: Public (Butte County General Plan)
Key Wildlife Area (Sutter County General Plan)

7. Zoning: Varies

8. Description of Project:

Under the proposed project, the Department of Fish and Game (CDFG) would enter into a long-term contract with the U.S. Bureau of Reclamation (Reclamation) to provide water supplies pursuant to the Central Valley Project Improvement Act (CVPIA). The proposed contract would ensure that water supplies are provided as described in Reclamation's *Report on Refuge Water Supply Investigations*. Pursuant to this report, Reclamation would ensure that the Gray Lodge Wildlife Area (WA) is provided with a firm, reliable water supply of 35,400 acre-feet per year (afa), subject to deficiencies. In addition, Reclamation would seek to supply the Gray Lodge WA with up to an additional increment of 8,600 afa if that water can be acquired through its Water Acquisition Program. This water (up to a total of 44,000 afa under the proposed contract) would be used by CDFG to support the efficient use of existing wetland habitats on the Gray Lodge WA.

CDFG's water demands for the Gray Lodge WA have been met in recent years through water delivery from various sources, including on-refuge groundwater pumping. However, this situation will not be the case in all water years unless additional actions are taken. Part of Reclamation's actions to ensure that sufficient water is provided to the Gray Lodge WA has been to undertake a program to improve local conveyance facilities. Under this program, the proposed conveyance improvements will provide sufficient capacity to deliver the needed water supplies to the Gray Lodge WA. Reclamation and CDFG completed review of the refuge water conveyance project under CEQA and the National Environmental Policy Act (NEPA) in 1997. Construction of these facilities would remove a

key barrier to ensuring that up to 44,000 afa is provided to the Gray Lodge WA. In order to fully use a water supply of 44,000 afa, additional on-refuge conveyance improvements will probably be necessary. These improvements will likely consist of minor alterations to existing on-refuge surface water delivery canals and appurtenant structures, but specific improvement projects have not been defined at this time. On-refuge conveyance improvement projects will be constructed, as necessary, in the future as part of ongoing implementation of the Gray Lodge Management Plan.[1]

9. Surrounding Land Uses and Setting:

Adjacent lands to the north, south, and east of the Gray Lodge WA are primarily agricultural, mostly rice fields with some limited pasture and orchards. Some of this surrounding farmland is flooded in winter for private waterfowl hunting. Lands to the west are primarily unfarmed wetlands of the Butte Sink, most preserved as waterfowl habitat in private hunting clubs.

10. Other agencies whose approval is required:

None.

11. References:

This Initial Study Checklist augments the Environmental Assessment/Initial Study (EA/IS) prepared for the project, and is intended to be an attachment to the main EA/IS document. A detailed list of references in support of the findings of this Initial Study Checklist can be found in the attached EA/IS.

12. List of Preparers:

The individuals primarily responsible for preparing this Initial Study are:

Mike Womack, Manager, Gray Lodge WA
Sandra Taylor, Biologist, CH2M HILL
Matt Franck, CEQA Compliance, CH2M HILL

Additional assistance has been provided by the Refuge Water Supply environmental review team, consisting of staff of the U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, and the California Department of Fish and Game.

[1] Minor on-refuge improvements of the sort envisioned for the Gray Lodge WA are typically "Categorically Exempt" under the CEQA Guidelines, meaning that project-specific environmental review is not required.

Determination

On the basis of this initial evaluation:

☑ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature _____ Date _____

Title _____

Environmental Factors Potentially Affected

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology /Soils
☐ Hazards & Hazardous Materials	☐ Hydrology / Water Quality	☐ Land Use / Planning
☐ Mineral Resources	☐ Noise	☐ Population / Housing
☐ Public Services	☐ Recreation	☐ Transportation/Traffic
☐ Utilities / Service Systems	☐ Mandatory Findings of Significance	

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
I. AESTHETICS. Would the project:				
(a) Have a substantial adverse effect on a scenic vista?	☐	☐	☑	☐
(b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☑	☐
(c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☑	☐

Comment: The Gray Lodge WA has a high degree of visual intactness including wetland, upland, and riparian areas with views of the Sutter Buttes. Implementing the proposed project would allow existing wetland areas to be managed more effectively, including the use of permanent wetlands. Providing for year-round use of wetlands will slightly increase visual quality, so this impact is considered to be beneficial.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☑

Comment: The proposed project will provide water for the more effective management of existing wetlands, and would not result in any new light or glare sources.

II. AGRICULTURE RESOURCES. In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:

(a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☑

Comment: Because the proposed project is for increased delivery of water to existing wetland areas, no farmland would be converted to non-farm uses.

(b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☑

Comment: Continued use of Gray Lodge WA for waterfowl and other wildlife habitat purposes is consistent with the policies of the Butte and Sutter County General Plans.

(c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☑

Comment: No aspect of the proposed project would converted farmland to non-farm use.

III. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:

(a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☑
(c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☑
(d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☑

Comment: The proposed project would provide additional water supplies to existing wetlands to improve management of wetland habitats, and would therefore have no potential to substantially degrade air quality in the northern Sacramento Valley.

IV. BIOLOGICAL RESOURCES. Would the project:

(a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☑	☐

Comment: A detailed description of the Biological Resources-affected environment can be found in the NEPA documentation prepared for Refuge Water Supply – Long-Term Agreements project. The reader is referred to this analysis for an understanding of the habitat and associated plant and animal resources of the Gray Lodge WA.

The proposed increase in reliable water supplies would allow for the optimal management of on-refuge habitats. Currently, Gray Lodge WA supports approximately 555 acres of permanent wetland and aquatic habitat, 469 acres of semi-permanent wetlands, and 5,779 acres of seasonal wetlands. The remainder of the WA is managed upland, consisting of cereal grains and pasture, and riparian habitat. Under the proposed project, the Gray Lodge WA is expected to support 400 to 600 acres of permanent wetland and aquatic habitat. The amount of semi-permanent and permanent wetlands would remain about the same as under existing conditions.

Expansion of wetland habitats to non-wetland areas would not occur on Gray Lodge WA. Rather, increased and reliable water supplies would enable more effective management of existing habitats. Expected improvements in habitat management include:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact

- Earlier and expanded fall flooding of seasonal wetlands to allow increased wildlife use
- Maintenance of additional acres of summer water, wetland / moist soil, riparian, and irrigated pasture habitat types for wildlife use and vegetation improvement
- Increased acreage of moist soil impoundments and increased frequency of irrigations, if necessary, to provide a high-quality carbohydrate food source for waterfowl and other waterbirds, 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
- Use of flow-through management rather than stockpiling water to improve water quality, reduce disease outbreaks, and maintain optimal water depths for waterfowl foraging
- Control of undesirable vegetation species using deep irrigation and maintenance for periods of 2 to 4 weeks during the summer

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

Approximately 72 million bird-use-days for waterfowl, geese, and migratory shorebirds are expected to occur on the Gray Lodge WA each year under optimal habitat management. Special-status species associated with wetland habitats would similarly benefit from improved quality and availability of wetland habitats.

The additional 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 (including special-status species) 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 maximizing waterfowl retention on the refuges is control of avian diseases that are potentially transmittable to domestic fowl. Potential benefits are two-fold: (1) increased on-refuge retention of waterfowl would reduce potential exposure of domestic fowl to migratory waterfowl, and (2) increased ability for the refuge manager to effectively manage water supplies would help reduce outbreaks of avian cholera, botulism, and other bird diseases. Because these effects are expected as the availability of water increases under the proposed project, there would be a beneficial effect associated with limiting the spread of avian diseases.

Return flows from the Gray Lodge WA reach the Sacramento River through various drains and channels. The volume of return flows from the Gray Lodge WA is expected to increase as a result of the additional water provided to the refuge. This increase in return flows is not expected to adversely impact water quality or anadromous salmonids in downstream watercourses. In

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
addition, the improved water quality from increased water supplies and management flexibility could have a beneficial effect for downstream uses.				
(b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☑	☐
Comment: Habitat types found on the Gray Lodge WA are considered sensitive, but the proposed project is intended to improve habitat management activities on the Gray Lodge WA.				
(c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☑	☐
Comment: The proposed project would allow for the efficient management of existing wetland areas. No filling of wetlands is proposed that would require notification under Section 404 of the Clean Water Act.				
(d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☑	☐
Comment: Changes in management practices under the proposed project would not affect the amount of wetlands, only the use of water on these wetlands (such as increased permanent wetland habitat). The extent of these habitat changes is not expected to adversely affect wildlife movement and dispersal.				
(e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☑	☐
Comment: The project is consistent with the policies of the Butte and Sutter County General Plans. In addition, the project facilitates the implementation of Gray Lodge WA Management Plan.				

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☑

Comment: No HCPs or NCCPs have been adopted for the project area.

V. CULTURAL RESOURCES. Would the project:

(a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☐	☐	☐	☑
(b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☐	☐	☑
(c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☑
(d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☑

Comment: Based on information obtained from the Northeast Information Center, the Gray Lodge WA has a low to moderate potential for prehistoric cultural resources. Standard CDFG processes for protection of cultural resources call for preconstruction surveys where subsurface excavation is planned, and consultation with the Office of Historic Preservation where appropriate. However, changes in water management under the proposed project would have no effect on cultural resources.

VI. GEOLOGY AND SOILS. Would the project:

(a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
(i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(ii) Strong seismic ground shaking?	☐	☐	☐	☑
(iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☑
(iv) Landslides?	☐	☐	☐	☑

Comment: The proposed project does not involve any structural improvements that would potentially be affected by, or expose people to, seismic or other geologic hazards.

(b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☑
(c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☑
(d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☑

Comment: The proposed project does not involve any structural improvements that would potentially be affected by, or expose people to, soils-related hazards.

(e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☑

Comment: The use of septic tanks or other wastewater disposal systems is not a component of the proposed project.

VII. HAZARDS AND HAZARDOUS MATERIALS. Would the project:

(a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☑
(c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☑
(d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☑

Comment: The proposed project involves the increased delivery of water supplies to the Gray Lodge WA, and would not involve the use of or expose people to hazardous materials.

(e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☑
(f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☑

Comment: No airstrips are located on or near the Gray Lodge WA.

(g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☑

Comment: No emergency response or evacuation plans exist for the project area. Delivering increased water supplies to the Gray Lodge WA would have no effect on emergency response or evacuation.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☑

Comment: The risk of damage from wildfires at the Gray Lodge WA is extremely low, and would not be affected by changes in water deliveries under the proposed project.

VIII. HYDROLOGY AND WATER QUALITY. Would the project:

(a) Violate any water quality standards or waste discharge requirements?	☐	☐	☑	☐

Comment: A detailed description of the affected environment with regard to water resources and water quality can be found in the NEPA documentation prepared for the Refuge Water Supply project. The reader is referred to this analysis for an understanding of the water resources on and near the Gray Lodge WA.

The availability of reliable, year-round water supplies would increase management flexibility on the Gray Lodge WA and would provide certainty that a flow-through management strategy could be followed. Flow-through management would help improve water-quality conditions on the refuge and decrease the potential for disease outbreaks, as described above under Biological Resources.

Drainage flows at the Gray Lodge WA are expected to increase with flow-through management of the refuge. This increase in drainage is not expected to impact water quality, because on-refuge levels of trace elements and pesticides are within acceptable levels from established criteria. In addition, the improved water quality from increased water supplies and management flexibility would have a beneficial effect for downstream uses.

(b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☑	☐

Comment: The delivery of additional water supplies to the Gray Lodge WA is expected to have a beneficial effect on the local aquifer by allowing for additional recharge.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☑

Comment: Changes in water management on the Gray Lodge WA under the proposed project would not affect onsite drainage patterns.

(d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☑	☐
(e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☑	☐

Comment: Additional water would be applied to existing wetlands on the Gray Lodge WA. Accordingly, the quantity of discharge water would increase. As described above, this increase in drainage is not expected to impact water quality, because on-refuge levels of trace elements and pesticides are within acceptable levels from established criteria.

(f) Otherwise substantially degrade water quality?	☐	☐	☑	☐

Comment: All potential water quality effects of the proposed project are described in the above sections.

(g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☑

Comment: No housing units would be constructed under the proposed project.

(h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
Comment: No structures would be constructed under the proposed project.				
(i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☑
Comment: No changes to natural flood hydrology would occur as a result of the proposed project.				
(j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☑
Comment: The Gray Lodge WA is not subject to the effects of seiches, tsunamis, or mudflows.				
IX. LAND USE AND PLANNING: Would the project:				
(a) Physically divide an established community?	☐	☐	☐	☑
Comment: There are no established communities within the Gray Lodge WA.				
(b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☑	☐
Comment: The project is consistent with several plans that relate to the Gray Lodge WA, including the Central Valley Project Improvement Act, the North American Waterfowl Management Plan (including the management plan of the Central Valley Habitat Joint Venture), the Gray Lodge Management Plan, and the Butte and Sutter County General Plans.				
(c) Conflict with any applicable Habitat Conservation Plan or Natural Community Conservation Plan?	☐	☐	☐	☑
Comment: No HCPs or NCCPs have been adopted for the project area.				
X. MINERAL RESOURCES: Would the project:				
(a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(a) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☑

Comment: The proposed project does not involve paving or constructing structures on the Gray Lodge WA in a manner that would preclude the extraction of mineral resources.

XI. NOISE: Would the project result in:

(a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☑
(b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☑
(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☑
(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☑

Comment: The proposed project would result in changes to the management of existing wetland areas. This would not expose people to significant noise sources.

(e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☑
(f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☑

Comment: No airstrips are located on or near the Gray Lodge WA.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
XII. POPULATION AND HOUSING: Would the project:				
(a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☑

Comment: The proposed project would likely result in modest economic gains in the region from enhanced recreational opportunities. The extent of these benefits, however, is not expected to translate into noticeable population or housing growth.

(b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☑

Comment: No housing units would be displaced by the proposed project.

(c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☑

Comment: No individuals would be relocated under the proposed project.

XIII. PUBLIC SERVICES: Would the project:				
(a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
(i) Fire protection?	☐	☐	☐	☑
(ii) Police protection?	☐	☐	☐	☑

Comment: Public use of the Gray Lodge WA is primarily for recreational duck hunting and bird watching. Recreational use may increase as a result of the more effective management of the existing wetlands, but this is not expected to translate into an increased need for public services such as police and fire protection.

		Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(iii)	Schools?	☐	☐	☐	☑
(iv)	Parks?	☐	☐	☐	☑
(v)	Other public facilities?	☐	☐	☐	☑

Comment: No aspect of the proposed project would affect local schools and parks.

XIV. RECREATION. Would the project:

(a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☑

Comment: The proposed project is expected to generate additional recreational use of the Gray Lodge WA, which could lead to overall recreation benefits. However, public neighborhood and regional park facilities would not be affected.

(b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☑

Comment: No additional recreation facilities would be constructed under the proposed project.

XV. TRANSPORTATION/TRAFFIC. Would the project:

(a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	☑
(b) Exceed, either individually or cumulatively, a level of service standard established by the County congestion management agency for designated roads or highways?	☐	☐	☐	☑
(c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☑
(e) Result in inadequate emergency access?	☐	☐	☐	☑
(f) Result in inadequate parking capacity?	☐	☐	☐	☑
(g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☑

Comment: Although positive recreation benefits are expected to occur from improvement of on-refuge habitats (resulting in improved duck populations), this is not expected to translate into a noticeable difference in terms of traffic (from hunters and bird watchers traveling to the Gray Lodge WA). Accordingly, traffic-related impacts (such as congestion, safety, parking) would not be affected by the proposed project.

XVI. UTILITIES AND SERVICE SYSTEMS. Would the project:

(a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☑

Comment: There are no wastewater treatment requirements applicable to the Gray Lodge WA. Water quality is addressed in Section XIII(a) above.

(b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☑

Comment: No new water or wastewater treatment facilities would be required from implementation of the proposed project.

(c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☑	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
Comment: The amount of water discharged off the refuges is expected to increase, but this discharge would occur into natural conveyance channels and would not affect storm drainage facilities.				
(d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☑	☐
Comment: The proposed project is to supply the Gray Lodge WA with sufficient water to effectively manage wetland habitats per Reclamation's *Report on Refuge Water Supply Investigations* and the Gray Lodge Management Plan.				
(e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☑
Comment: Wetland use on the Gray Lodge WA is not supported by a wastewater treatment facility.				
(f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☑
(g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☑
Comment: Delivering water to the Gray Lodge WA would not generate solid waste.				
XVII. MANDATORY FINDINGS OF SIGNIFICANCE:				
(a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☑	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☑	☐
(c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☑