FINAL NEPA ENVIRONMENTAL ASSESSMENT
AND CEQA INITIAL STUDIES

REFUGE WATER SUPPLY

LONG-TERM WATER SUPPLY AGREEMENTS

SAN JOAQUIN RIVER BASIN

JANUARY 2001

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

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

SAN JOAQUIN 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 T. Davis — 1/19/01
Regional Resources Manager — Date

FONSI No. 01-03-MP

FINDING OF NO SIGNIFICANT IMPACT

REFUGE WATER SUPPLY - LONG-TERM AGREEMENTS

SAN JOAQUIN 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, the California Department of Fish and Game, and the Grassland Water District for the San Joaquin 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 and GWD are the lead state agencies 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 San Luis National Wildlife Refuge Complex, including the San Luis, West Bear Creek, Kesterson, Freitas, Merced, and East Bear Creek Units.

- A contract between Reclamation and CDFG for delivery of water to the Los Banos WA, Volta WA, portions of the North Grasslands WA (China Island and Salt Slough Units), and the Mendota WA.

- A contract between Reclamation and GWD for delivery of water to private lands within the Grassland Resource Conservation District.

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, between Reclamation and CDFG, and between Reclamation and GWD.

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 a Biological Opinion dated January 16, 2001, addressing management on refuges in the San Joaquin River Basin. Implementation of all requirements/commitments in this Biological Opinion 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) Changes to the refuges resulting from implementing the refuge water supply agreements would not affect the use of power by the refuges because groundwater pumping and other power-intensive uses are not expected to change relative to the No Action Alternative.

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 Declarations for the Los Banos, North Grasslands, and Mendota Wildlife Areas

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 Los Banos, North Grasslands, and Mendota Wildlife Areas. 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 Management Plans for the Los Banos, North Grasslands, and Mendota Wildlife Areas 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 Declarations for implementation of the Management Plans for the Los Banos, North Grasslands, and Mendota Wildlife Areas, 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 Studies prepared for implementation of the Los Banos, North Grasslands, and Mendota Management Plans, 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

GRASSLAND WATER DISTRICT
DRAFT
NEGATIVE DECLARATION

The following proposed project has been reviewed by the Grassland Water District pursuant to Section 2100 et. seq. of the California Public Resources Code. A Negative Declaration is proposed for the project.

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

2. **Location and Description:** Private lands within the Grassland Resource Conservation District in western Merced County.

Under the proposed project, the Grassland Water District (GWD) would enter into long-term contracts 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 the water supplies were provided as described in Reclamation's Report on *Refuge Water Supply Investigations*. Pursuant to this report, Reclamation would ensure that GWD is provided with a firm, reliable water supply of 125,000 acre-feet per year (afa), subject to deficiencies. In addition, Reclamation would see to supply GWD with up to an additional increment of 55,000 afa if that water can be acquired from willing sellers through its Water Acquisition Program. This water (up to a total of 180,000 afa under the proposed contract) would be used by GWD to support the efficient use of existing wetland habitats on private lands within the Grassland Resource Conservation District (GRCD).

3. **Project Sponsor:** Grassland Water District
22759 S. Mercy Springs Road
Los Banos, CA 93635
Tel: (209) 826-5188

4. **Finding:**

Based on the attached *Environmental Assessment/Initial Study: Refuge Water Supply – Long Term Agreements*, including Appendix B, *CEQA Initial Study Checklist,* and without a public hearing, it is my judgment that:

(X) The project COULD NOT have a significant effect on the environment.

( ) The potentially significant effects of the project noted in the EA/IS attached have been mitigated by modifications to the project so that the potential adverse effects are reduced to a point where no significant effects would occur.

[DRAFT] Date: _____
Don Marciochi
Grassland Water District

5. Mitigation Measures

No potential adverse impacts were identified; therefore, no mitigation measures are required.

6. Preparation and Public Review

This Negative Declaration was prepared by the Grassland Water District. Copies of the Negative Declaration, the *Environmental Assessment/Initial Study*, and the public record of the project are available for review and may be obtained at the address listed below, Monday through Friday from 9:00 a.m. to 4:00 p.m.:

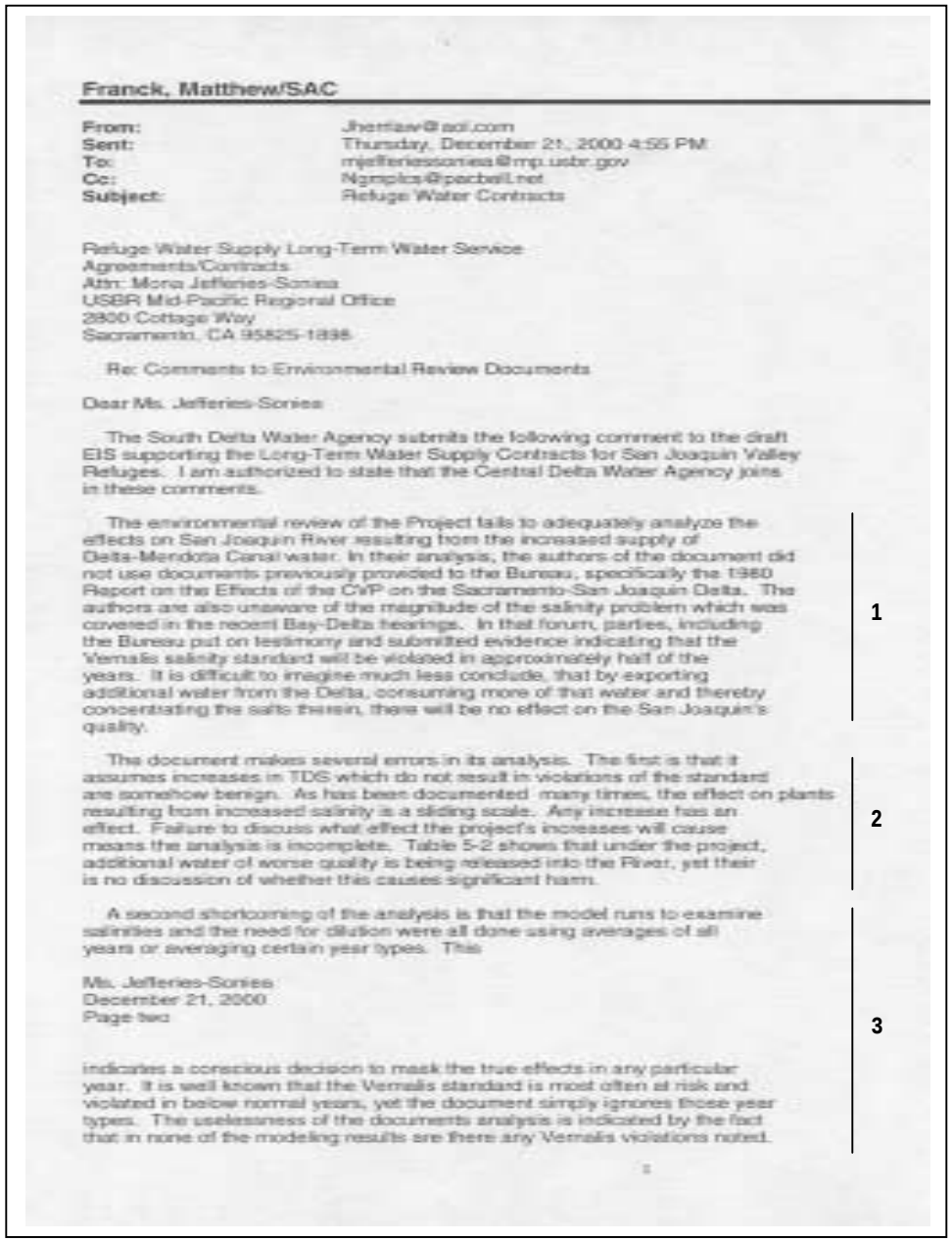
Grassland Water District
22759 S. Mercy Springs Road
Los Banos, CA 93635
Tel: (209) 826-5188

A 30-day public review and comment period will open on November 22, 2000, and will close on December 21, 2000.

Any comments as to whether this Draft Negative Declaration should become final, or whether an Environmental Impact Report should be prepared for the project, must be received by the Grassland Water District prior to the close of the public comment period.

Comments may be addressed to:

Don Marciochi
Grassland Water District
22759 S. Mercy Springs Road
Los Banos, CA 93635
Tel: (209) 826-5188
Fax: (209) 826-4984



Franck, Matthew/SAC

From: Jherlaw@aol.com
Sent: Thursday, December 21, 2000 4:55 PM
To: mjefferiessonies@mp.usbr.gov
Cc: Ngmplcs@pacbell.net
Subject: Refuge Water Contracts

Refuge Water Supply Long-Term Water Service
Agreements/Contracts
Attn: Mona Jefferies-Sonies
USBR Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, CA 95825-1898

Re: Comments to Environmental Review Documents

Dear Ms. Jefferies-Sonies

The South Delta Water Agency submits the following comment to the draft EIS supporting the Long-Term Water Supply Contracts for San Joaquin Valley Refuges. I am authorized to state that the Central Delta Water Agency joins in these comments.

The environmental review of the Project fails to adequately analyze the effects on San Joaquin River resulting from the increased supply of Delta-Mendota Canal water. In their analysis, the authors of the document did not use documents previously provided to the Bureau, specifically the 1980 Report on the Effects of the CVP on the Sacramento-San Joaquin Delta. The authors are also unaware of the magnitude of the salinity problem which was covered in the recent Bay-Delta hearings. In that forum, parties, including the Bureau put on testimony and submitted evidence indicating that the Vernalis salinity standard will be violated in approximately half of the years. It is difficult to imagine much less conclude, that by exporting additional water from the Delta, consuming more of that water and thereby concentrating the salts therein, there will be no effect on the San Joaquin's quality. 1

The document makes several errors in its analysis. The first is that it assumes increases in TDS which do not result in violations of the standard are somehow benign. As has been documented many times, the effect on plants resulting from increased salinity is a sliding scale. Any increase has an effect. Failure to discuss what effect the project's increases will cause means the analysis is incomplete. Table 5-2 shows that under the project, additional water of worse quality is being released into the River, yet their is no discussion of whether this causes significant harm. 2

A second shortcoming of the analysis is that the model runs to examine salinities and the need for dilution were all done using averages of all years or averaging certain year types. This 3

Ms. Jefferies-Sonies
December 21, 2000
Page two

indicates a conscious decision to mask the true effects in any particular year. It is well known that the Vernalis standard is most often at risk and violated in below normal years, yet the document simply ignores those year types. The uselessness of the documents analysis is indicated by the fact that in none of the modeling results are there any Vernalis violations noted.

Responses to Comments

Response 1

This comment raises a concern regarding potential impacts on San Joaquin River water quality from increased water diversions from the Delta to provide the mandated refuge water supplies south of the Delta. This issue was addressed in the PEIS, however, and the Project considered in this EA does not involve any increases in the total amount of water diverted from the Delta. The analysis presented in this EA compares conditions under the No Action Alternative (equivalent to the PEIS Preferred Alternative at the Year 2025) with the Proposed Action. Both alternative include delivery of Level 2 and Level 4 refuge water supplies at the same annual delivery amount.

The historical reduction in flows on the San Joaquin River and increased salinity in the river near Vernalis are discussed in Chapter II of the Surface Water Supplies and Facilities Operations Technical Appendix and Attachment B of the Fisheries Technical Appendix of the PEIS, including information presented in the 1980 draft report and subsequent reports. The water quality and quantities available under pre-CVPIA operations with projected land use for the Year 2025 were defined in the PEIS No Action Alternative and used as a basis for comparison for PEIS alternatives. The assumptions for the PEIS No Action Alternative included delivery of a supply that was equal to the Level 2 water supplies because the definition of Level 2 water volume delivered between 1977 and 1984. The description of water quality presented for the PEIS No Action Alternative states that water quality standards are not met in drier year types when water is limited following delivery of water rights and environmental requirements. The frequency of months in which the Vernalis water quality standard is exceeded will be greater and the salinity will be higher in the dry years under the PEIS Preferred Alternative as

compared to the PEIS No Action Alternative. The PEIS recognizes that methods to increase compliance with water quality standards are being considered in other Reclamation projects, including the continued evaluation of the Vernalis Adaptive Management Plan and San Joaquin River Agreement programs and the Grasslands Bypass project.

As described previously, the analysis of overall CVP operations presented in this EA was based upon the comparison of the Proposed Action to the No Action Alternative which was defined as conditions in the Year 2025 with implementation of CVPIA as defined by the PEIS Preferred Alternative. While both of these alternatives include delivery of Level 2 and Level 4 refuge water supplies at the same annual delivery amount, one of the primary differences in operations between these two alternatives is the pattern of delivery (and therefore of releases into the San Joaquin River) and the use of the water on the refuges. Therefore, this EA focuses on an analysis of the water quality changes that would occur due to the change in diversion pattern, use of the water, and associated release patterns. There would not be an overall change in the amount of water diverted from the Delta for the refuges under the alternatives considered in this EA as compared to the No Action Alternative.

Response 2

The information presented in Tables 5-2 and 5-3 are presented as background information related to the description of the No Action Alternative. This information was developed based upon analyses in the PEIS and the San Joaquin Basin Action Plan and North Grasslands Area Conveyance Facilities Final Environmental Assessment/Initial Study. As discussed in Response to Comment 1, the PEIS did indicate that implementation of all CVPIA actions in the PEIS Preferred Alternative, including

Level 4 refuge water supplies, would result in increased salinity in the San Joaquin River at Vernalis. Reclamation is continuing to evaluate methods to reduce the frequency of events when the Vernalis water quality standard is violated. Information presented in Tables 5-2 and 5-3 indicate that for the No Action Alternative, increases in salinity due to the delivery of Level 4 refuge water supplies as compared to Level 2 refuge water supplies alone would not cause an increase in the frequency of violations of the Vernalis water quality standard.

Response 3

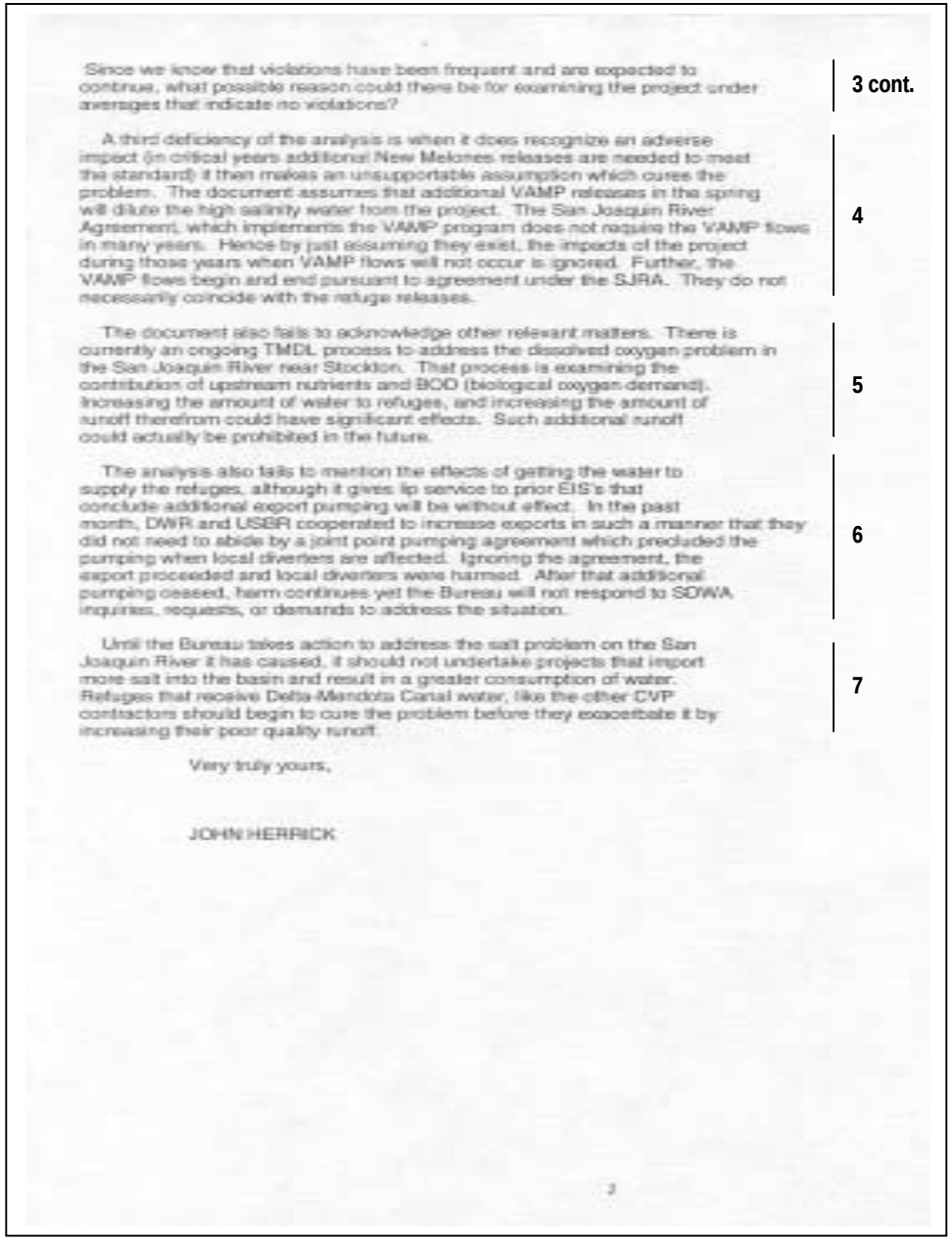
The EA includes an analysis of the Proposed Action conditions as compared to the No Action Alternative in critically dry years in Tables 5-8 and 5-9.

The volume assumptions for annual deliveries of refuge water supplies are identical in the No Action Alternative and the Proposed Action. The only issue that changes for this analysis is how the water is used. Under the Proposed Action, more water is used in drier years for flows through wetlands than under the No Action Alternative. Therefore, the amount of water discharged into the San Joaquin River increases under the Proposed Action as compared to the No Action Alternative.

The analysis summarized in these tables indicates that under critically dry conditions, the change in operation of refuge water management will increase the amount of salts discharged into the San Joaquin River as compared to the No Action Alternative. The analysis presented in Tables 5-8 and 5-9 also indicates that this increase would require dilution water to reduce the salinity concentration below the Vernalis water quality standard, and the dilution water could be provided by the Vernalis Adaptive Management Plan (VAMP). The No Action Alternative includes the

assumption that VAMP or a similar program will be continued into the Year 2025. The inclusion of VAMP allows the VAMP water releases to eliminate the need for additional releases of water from New Melones Reservoir to dilute salinity discharged from the refuges.

This analysis is incremental in nature and includes the analysis of the PEIS Preferred Alternative. That analysis indicated that in the irrigation season from April through August that both the frequency and the total concentration of salinity would increase in the PEIS Preferred Alternative as compared to the PEIS No Action Alternative. Therefore, if the increases in salinity in a drier year corresponded with a period of time that adequate dilution water was not available from New Melones Reservoir, the overall salinity in the San Joaquin River would not meet the Vernalis water quality standard. If this event occurred in April, as indicated in Tables 5-8 and 5-9, the monthly frequency of violations would not be greater under the Proposed Action as compared to the No Action Alternative.



Since we know that violations have been frequent and are expected to continue, what possible reason could there be for examining the project under averages that indicate no violations?

3 cont.

A third deficiency of the analysis is when it does recognize an adverse impact (in critical years additional New Melones releases are needed to meet the standard) it then makes an unsupportable assumption which cures the problem. The document assumes that additional VAMP releases in the spring will dilute the high salinity water from the project. The San Joaquin River Agreement, which implements the VAMP program does not require the VAMP flows in many years. Hence by just assuming they exist, the impacts of the project during those years when VAMP flows will not occur is ignored. Further, the VAMP flows begin and end pursuant to agreement under the SJRA. They do not necessarily coincide with the refuge releases.

4

The document also fails to acknowledge other relevant matters. There is currently an ongoing TMDL process to address the dissolved oxygen problem in the San Joaquin River near Stockton. That process is examining the contribution of upstream nutrients and BOD (biological oxygen demand). Increasing the amount of water to refuges, and increasing the amount of runoff therefrom could have significant effects. Such additional runoff could actually be prohibited in the future.

5

The analysis also fails to mention the effects of getting the water to supply the refuges, although it gives lip service to prior EIS's that conclude additional export pumping will be without effect. In the past month, DWR and USBR cooperated to increase exports in such a manner that they did not need to abide by a joint point pumping agreement which precluded the pumping when local diverters are affected. Ignoring the agreement, the export proceeded and local diverters were harmed. After that additional pumping ceased, harm continues yet the Bureau will not respond to SDWA inquiries, requests, or demands to address the situation.

6

Until the Bureau takes action to address the salt problem on the San Joaquin River it has caused, it should not undertake projects that import more salt into the basin and result in a greater consumption of water. Refuges that receive Delta-Mendota Canal water, like the other CVP contractors should begin to cure the problem before they exacerbate it by increasing their poor quality runoff.

7

Very truly yours,

JOHN HERRICK

3

Response 4

The No Action Alternative is based upon the assumption that the PEIS Preferred Alternative is implemented. The No Action Alternative includes the assumption that VAMP or a similar program will be continued into the Years 2025. This assumption is not affected by the actions in the Proposed Action, therefore, the Proposed Action also assumes that VAMP or a similar program will be continued into the Year 2025.

The assumptions for VAMP releases were developed by Reclamation for the initial VAMP environmental documentation. One of the primary purposes of the VAMP was to develop pulse flows in April and May, including in critical dry years. These pulse flows coincide to the period that the refuges are predicting releases of large amounts of water under dry year operations. Therefore, the VAMP flows would reduce the salinity in the San Joaquin River at that time.

Response 5

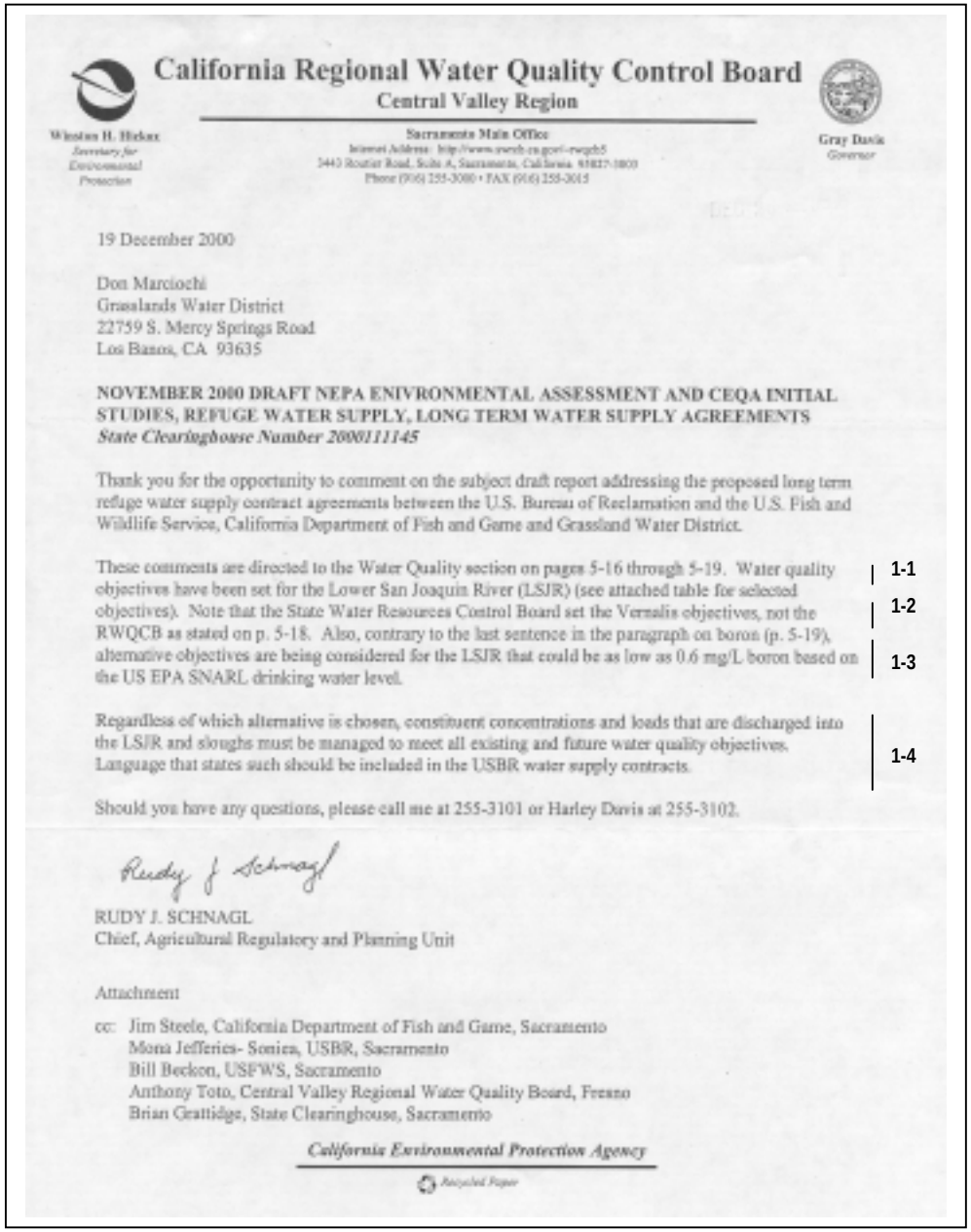
As described in Response to Comment 1, the Proposed Action does not increase the amount of water to the refuges, but rather modifies the diversion and discharge patterns in accordance with existing standards. Programs to modify discharge requirements for the San Joaquin River are referred to in Chapter 5. As these programs proceed, evaluations under those programs would consider the need to revise water quality standards and discharge requirements. If the discharge requirements for the refuges are modified in the future, the refuge managers would need to comply with these standards in accordance with the water supply agreements.

Response 6

The analysis in the EA assumes that refuge water supplies would be delivered in the same manner in both the No Action Alternative and the Proposed Action. This assumption, based upon the analysis presented in the PEIS for the PEIS Preferred Alternative does not include the assumption of the joint point pumping agreement. The analysis assumes that refuge water supplies to be delivered from the Delta would be delivered by the CVP either directly from the Delta or from water stored in San Luis Reservoir. The PEIS indicates that these deliveries would reduce water deliveries to CVP water service contractors located South of the Delta and the mitigation would be participation in programs identified by CALFED. As those programs are implemented on a long-tern basis, additional environmental documentation will be completed to identify the potential for adverse impacts to all water users.

Response 7

Reclamation is working through several programs to reduce the salinity problems in the San Joaquin River, including the Grasslands Bypass program and VAMP. These programs or similar programs are assumed to continue through the Year 2025 in the alternatives considered in this EA in order to reduce the salinity problems.



California Regional Water Quality Control Board
Central Valley Region

Winston H. Hickox
Secretary for
Environmental
Protection

Sacramento Main Office
Internet Address: http://www.swrcb.ca.gov/~rwqcb5
3443 Routier Road, Suite A, Sacramento, California 95827-3003
Phone (916) 255-3000 • FAX (916) 255-3015

Gray Davis
Governor

19 December 2000

Don Marciochi
Grasslands Water District
22759 S. Mercy Springs Road
Los Banos, CA 93635

NOVEMBER 2000 DRAFT NEPA ENIVRONMENTAL ASSESSMENT AND CEQA INITIAL STUDIES, REFUGE WATER SUPPLY, LONG TERM WATER SUPPLY AGREEMENTS
State Clearinghouse Number 2000111145

Thank you for the opportunity to comment on the subject draft report addressing the proposed long term refuge water supply contract agreements between the U.S. Bureau of Reclamation and the U.S. Fish and Wildlife Service, California Department of Fish and Game and Grassland Water District.

These comments are directed to the Water Quality section on pages 5-16 through 5-19. Water quality objectives have been set for the Lower San Joaquin River (LSJR) (see attached table for selected objectives). Note that the State Water Resources Control Board set the Vernalis objectives, not the RWQCB as stated on p. 5-18. Also, contrary to the last sentence in the paragraph on boron (p. 5-19), alternative objectives are being considered for the LSJR that could be as low as 0.6 mg/L boron based on the US EPA SNARL drinking water level. 1-1 1-2 1-3

Regardless of which alternative is chosen, constituent concentrations and loads that are discharged into the LSJR and sloughs must be managed to meet all existing and future water quality objectives. Language that states such should be included in the USBR water supply contracts. 1-4

Should you have any questions, please call me at 255-3101 or Harley Davis at 255-3102.

Rudy J. Schnagl

RUDY J. SCHNAGL
Chief, Agricultural Regulatory and Planning Unit

Attachment

cc: Jim Steele, California Department of Fish and Game, Sacramento
Mona Jefferies- Sonies, USBR, Sacramento
Bill Beckon, USFWS, Sacramento
Anthony Toto, Central Valley Regional Water Quality Board, Fresno
Brian Grattidge, State Clearinghouse, Sacramento

California Environmental Protection Agency

Recycled Paper

Regional Board Responses to Comments

Response 1-1

Current water quality objectives are referenced in the document.

Response 1-2

The text will be modified to reflect that the State Water Resources Control Board set the Vernals objectives.

Response1-3

The text will be modified to reflect that the boron objectives for drinking water for the lower San Joaquin River could be as low as 0.6 mg/L.

Response 1-4

This comment references the proposed refuge water supply contracts/agreements. A requirement that water quality objectives must be met is included in the draft contracts/agreements.

SUMMARY OF SELECTED WATER QUALITY OBJECTIVES FOR THE LOWER SAN JOAQUIN RIVER BASIN

	CONSTITUENT			
Location	Salinity (µmhos/cm)	Selenium[1,2] (µg/L)	Boron[2] (mg/L)	Molybdenum[2] (µg/L)
Vernalis	*MAXIMUM 30-DAY RUNNING AVERAGE* *1 April - 31 Aug.* **700 µmhos/cm** *1 Sept. - 31 March* **1,000 µmhos/cm**			
Mouth of Merced River to Vernalis		*MAXIMUM* **13 µg/L** *4-Day AVERAGE* **5 µg/L**	*MAXIMUM* *15 March - 15 Sept.* **2.0 mg/L** *16 Sept. -14 March* **2.6 mg/L** *MONTHLY MEAN* *15 March - 15 Sept.* **0.8 mg/L** *16 Sept. -14 March* **1.0 mg/L** *Critical WY* **1.3 mg/L**	*MAXIMUM* **15 µg/L** *MONTHLY MEAN* **10 µg/L**
Sack Dam to Mouth of Merced River		*MAXIMUM* **20 µg/L** *4-Day AVERAGE* **5 µg/L**	*MAXIMUM* **5.8 mg/L** *MONTHLY MEAN* *15 March - 15 Sept.* **2.0 mg/L**	*MAXIMUM* **50 µg/L** *MONTHLY MEAN* **19 µg/L**
Salt Slough		*MAXIMUM* **20 µg/L** *MONTHLY MEAN* **2 µg/L**	*MAXIMUM* **5.8 mg/L** *MONTHLY MEAN* *15 March - 15 Sept.* **2.0 mg/L**	*MAXIMUM* **50 µg/L** *MONTHLY MEAN* **19 µg/L**
Mud Slough (north)		*MAXIMUM* **20 µg/L** *4-Day AVERAGE* **5 µg/L**	*MAXIMUM* **5.8 mg/L** *MONTHLY MEAN* *15 March - 15 Sept.* **2.0 mg/L**	*MAXIMUM* **50 µg/L** *MONTHLY MEAN* **19 µg/L**

1. Selenium has a compliance schedule that is in the Regional Board's Basin Plan.
2. Selenium, boron and molybdenum are total concentrations.

Contents

Attachments

Appendices

Tables

Figures

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

- A Memorandum of Understanding between Reclamation and the Service for delivery of water to the San Luis National Wildlife Refuge Complex, including the San Luis, West Bear Creek, Kesterson, Freitas, Merced, and East Bear Creek Units
- A contract between Reclamation and the CDFG for delivery of water to the Los Banos WA, Volta WA, portions of the North Grasslands WA (China Island and Salt Slough Units), and the Mendota WA
- A contract between Reclamation and the Grassland WD for delivery of water to private lands within the Grassland RCD

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

1.2 History of Refuge Water Supply Planning

1.2.1 The Pacific Flyway and Central Valley Wetlands

The Central Valley lies at the southerly end of the Pacific Flyway migratory route. In pre-settlement times it provided ideal wintering habitat and attracted large numbers of waterfowl. The Pacific Flyway is the westernmost of North America's four flyways, or migration routes, which are defined as definite geographic regions with breeding grounds in the north, wintering grounds in the south, and a system of migration routes in between.

[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.

The Pacific Flyway encompasses territory in three countries: northern and western Canada, Alaska and all states west of the Rocky Mountains in the U.S., and western Mexico.

The Service ranks Central Valley wetland habitat as one of the top five habitats in the U.S. Historically, the Central Valley contained approximately 4 million acres of wetlands. Approximately 1.5 million acres located in the Sacramento/San Joaquin River Delta and the Tulare Basin were permanent marshes, while the remaining 2.5 million acres were seasonal wetlands created by winter rains and spring snow melt from the Sierra Nevada. Today, approximately 300,000 acres remain, 100,000 acres are publicly owned (federal and state refuges) and 200,000 acres in private ownership, including private duck clubs. The remaining 300,000 acres provide wintering habitat for 60 percent of the Pacific Flyway's current waterfowl population, and migration habitat for an additional 20 percent of the population. Altogether, nearly 10 to 12 million ducks and geese, along with millions of other water birds, annually winter in or pass through the Central Valley. However, the number of waterfowl using the Central Valley has declined 40 to 50 percent over the last 30 years (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 are treaties between the U.S. and Canada, and the U.S. and Mexico, respectively. The conventions established protection for all species of migratory birds in North America, except 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; it was updated in 1994 to include the Republic of Mexico.

The goals of the North American Waterfowl Management Plan are accomplished through joint ventures that include individuals, corporations, conservation organizations, and local, state, and federal agencies. There are currently 11 habitat joint ventures in the U.S. and three in Canada, including the Central Valley Habitat Joint Venture, 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 power for the NWRs, State WAs, the Grassland RCD, and other private and public lands dedicated to wetland management

1.2.2 Wetland Water Supply Planning

Securing a reliable water supply of sufficient quality has long been recognized as an important component for sustaining wetland habitats in the Central Valley, and the waterfowl of the Pacific Flyway, as well as providing for 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, 1978a)
- Water Availability Study for California Wetlands (Reclamation, 1978b)
- 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, as well as the water supplies required for optimum habitat management for

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.

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.

San Joaquin Basin Action Plan/Kesterson Mitigation Plan

The San Joaquin Action Plan/Kesterson Mitigation Plan report (Action Plan) was prepared by Reclamation, the Service, and CDFG in 1989. The Action Plan was developed to contribute to meeting multiple objectives. The habitat acquisition and enhancement described in the Action Plan are intended to meet both the requirements of long-term mitigation for Kesterson Reservoir, as well as implementation of the objectives of the Central Valley Habitat Joint Venture in support of the North American Waterfowl Management Plan. Implementation of the Action Plan was initiated on October 9, 1990, by a cooperative agreement among Reclamation, the Service, and CDFG. The primary goals of the Action Plan include:

- Ensure permanent habitat preservation of lands of vital importance to Pacific Flyway ducks and geese, other migratory birds, state and federally listed threatened and endangered species, and resident species
- Create wetlands for migratory birds and other wetland-dependent species on agricultural lands suitable for conversion
- Protect and enhance riparian habitat and fishery resources in the San Joaquin River and its tributaries
- Increase opportunities for public use based on wildlife and wildlife habitats when compatible with other objectives
- Provide adequate sanctuary to encourage wider distribution of migratory birds and to provide adequate protection from disturbance for other birds, as well as state and federally listed threatened and endangered species
- Identify and protect cultural resources sites
- Protect and enhance existing natural biological communities

Action Plan lands to be provided with water under the proposed long-term agreements:

- Freitas Ranch
- China Island (aka Freitas-McPike)
- Salt Slough (aka San Luis Ranch)
- West Bear Creek (aka West Gallo)
- East Bear Creek (aka East Gallo)

The Action Plan provides a framework within which several contiguous state and federal refuges can be developed and managed in a coordinated manner. The existing state and federal refuges included in the Action Plan are Kesterson NWR, San Luis NWR, Merced NWR, and Los Banos WA. The Action Plan identified actions to improve the reliability, availability, and quality of the water supplies for these wetlands to enhance wetland habitat. In addition, the Action Plan identified approximately 23,500 acres of private lands within the northern San Joaquin River Basin that were historic wetlands or would be suitable for management as wildlife habitat. These lands were not fully developed as wetland habitats and were used for grazing or other agricultural purposes. The Action Plan identified wetland and riparian restoration for each of the lands to be acquired. The water supplies necessary for full habitat development of the Action Plan lands were also identified, and were adopted by reference into the CVPIA. At this time, most of the

Action Plan lands have been acquired and have been integrated into the existing federal and state refuge system.

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 San Luis NWR Complex; the Los Banos, Volta, North Grasslands, and Mendota WAs; and the Grassland RCD.[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.

The purposes of the CVPIA are identified in Section 3402 of the CVPIA to include protection, restoration, and enhancement of fish, wildlife, and associated habitats in the Central Valley, and to achieve 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). The water supplies required pursuant to Section 3406(d)(1) are for "Level 2" supplies, which 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. Section 3406(d)(1) also states that two-thirds of the water supplies necessary for full habitat development on the Action Plan lands are also required. (For convenience, this amount is also referred to as Level 2.) The water supplies identified from the *Report on Refuge Water Supply Investigations* and the Action Plan are summarized in 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 year, the Secretary of the Interior may reduce 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

[2] The San Luis NWR Complex also includes the San Joaquin River NWR and the Arena Plains Unit of the Merced NWR. However, these refuge units were not considered in the *Report on Refuge Water Supply Investigations*, so are not receiving water pursuant to the CVPIA. The Blue Goose Unit of the San Luis NWR Complex and the Gadwall Unit of the North Grasslands WA were private refuges in the Grassland RCD at the time of the *Report on Refuge Water Supply Investigations* and will, therefore, receive water under the CVPIA from the Grassland WD.

identified in the 1989 *Report on Refuge Water Supply Investigations*. Section 3406(d)(2) also refers to the amount of water required for full habitat development on the Action Plan lands. (For convenience, this amount is also referred to as Level 4.) The increment of water above Level 2 amounts must be acquired from voluntary sources (e.g., willing sellers). Section 3406(d)(2) states that upon enactment of the CVPIA, this increment of water must be provided in 10 percent cumulative increments per year, with full supplies provided after 10 years. Reclamation has been acquiring incremental amounts of Level 4 water on a short-term basis from willing sellers since 1992 and expects to acquire and provide full supplies to the refuges by 2002. The long-term water supply contracts/agreements would provide for delivery of the total Level 4 water supply by 2002, as required by Sections 3406(d)(1) and 3406(d)(2).

TABLE 1-1
Annual Water Supplies for San Joaquin River Basin Refuges

	Water Supplies (acre-feet)		
Refuge	**Level 2[a]**	**Level 4 Increment[b]**	**Total**
San Luis NWR Complex:			
San Luis Unit	13,350	5,650	19,000
West Bear Creek Unit	7,207	3,603	10,810
Kesterson Unit	3,500	6,500	10,000
Freitas Unit	3,527	1,763	5,290
Merced Unit	13,500	2,500	16,000
East Bear Creek Unit[c]	8,863	4,432	13,295
Los Banos Wildlife Area	16,670	8,330	25,000
Volta Wildlife Area	10,000	6,000	16,000
North Grassland WA:			
China Island Unit	6,967	3,483	10,450
Salt Slough Unit	6,680	3,340	10,020
Mendota Wildlife Area	18,500	11,150	29,650
Grassland RCD	125,000	55,000	180,000

[a] Level 2 water supplies include those specifically identified as Level 2 in the *Report on Refuge Water Supply Investigations* (Reclamation, 1989), and two-thirds of the amount needed for full habitat development per the *San Joaquin Basin Action Plan/Kesterson Mitigation Plan* (Reclamation, et al., 1989). The amount of water diverted in order to meet these demands at the refuge boundaries will be greater because of loss of water during conveyance.

[b] Level 4 water supplies include those specifically identified as Level 4 in the *Report on Refuge Water Supply Investigations* (Reclamation, 1989), and the incremental amount needed to provide full habitat development per the *San Joaquin Basin Action Plan/Kesterson Mitigation Plan* (Reclamation, et al., 1989). The amount of water diverted in order to meet these demands at the refuge boundaries will be greater because of loss of water during conveyance.

[c] Numbers for the East Bear Creek Unit correspond to the portion of the entire East Bear Creek Unit identified in the Action Plan that is currently under federal ownership.

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, CDFG, and the Grassland WD 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 Management Plans for the Los Banos, North Grasslands, and Mendota WAs. Initial Studies were performed under CEQA, and Negative Declarations were adopted stating that implementing the Management Plans would not have a significant effect on the environment. The resource management activities expected on these state WAs under the full water supplies specified in the proposed long-term contract (Level 4 amounts) would be consistent with the existing Management Plans. However, 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 agreements with the Service and Grassland WD, this document is being prepared as a joint NEPA EA and CEQA Initial Study (IS). In support of this evaluation, a CEQA environmental checklist has been prepared (Appendix A).

In addition, CDFG is in the process of completing its Management Plan for the Volta WA, and is considering adoption of a Negative Declaration for the plan. Because a prior Negative Declaration has not been adopted for the Volta WA, this joint EA/IS considers the effects of the Proposed Action on the existing refuge conditions.

The Grassland Water District's action to enter into a contract with Reclamation is subject to CEQA. No prior CEQA analysis has been specifically prepared for use of Level 4 water on private lands within the Grassland RCD. Accordingly, this joint EA/IS also describes the potential environmental effects of the proposed long-term contract with the Grassland Water District, which would supply water to the private lands within the Grassland RCD. In support of this evaluation, a second CEQA environmental checklist has been prepared (Appendix B).

Section 2: Background

SECTION 2

Background

This Environmental Assessment/Initial Study (EA/IS) addresses state and federal refuges and private wetland areas of the San Joaquin River Basin (Figure 2-1). Included in this EA/IS are three NWRs (San Luis NWR, Kesterson NWR, and Merced NWR), four state WAs (Los Banos WA, Volta WA, Mendota WA, and North Grasslands WA), three units of the San Joaquin Basin Action Plan managed by the Service (East Bear Creek, West Bear Creek, and Freitas), and private wetland areas within the Grassland RCD. The North Grasslands WA includes three units: Salt Slough, China Island, and Gadwall. Salt Slough and China Island are part of the San Joaquin Basin Action Plan and are evaluated in the EA.

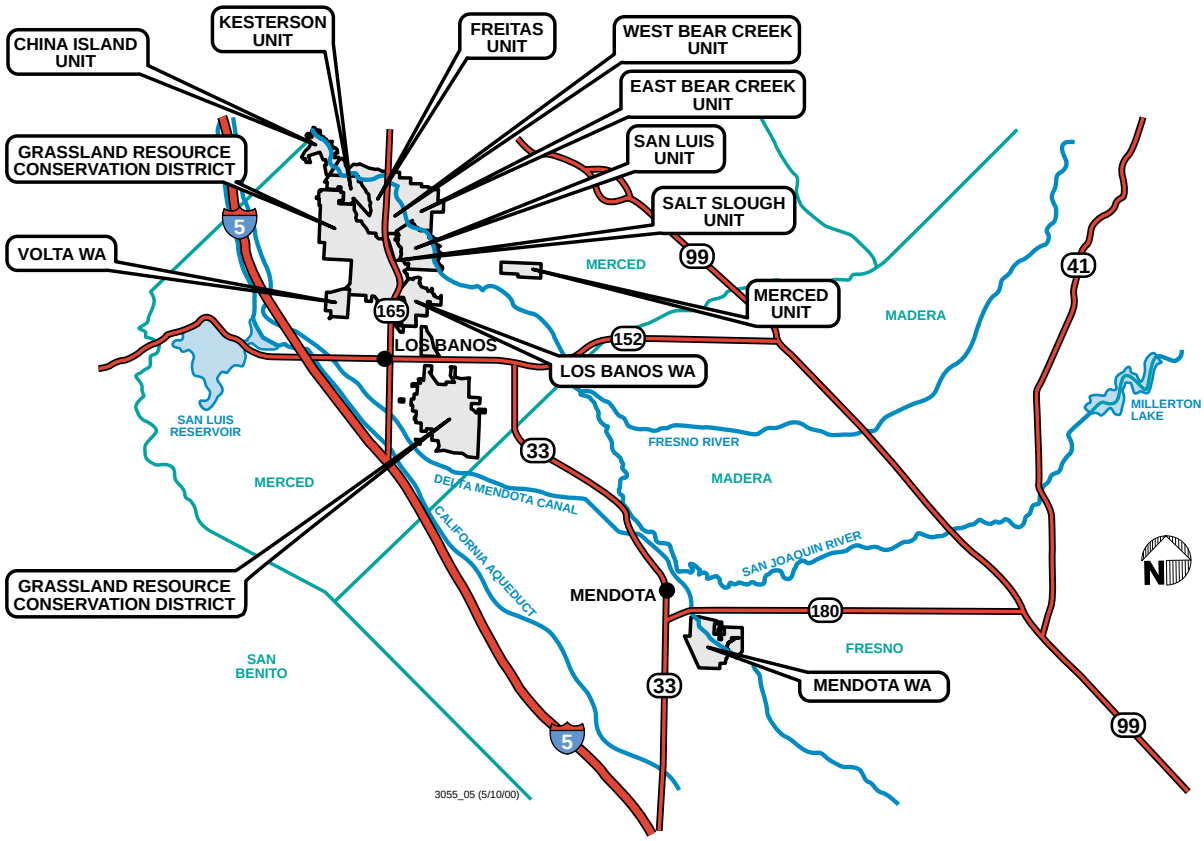


FIGURE 2-1
San Joaquin River Basin Refuges

With the exception of Merced NWR, Volta WA, Mendota WA, and the private lands of the Grassland RCD, the refuges covered in this EA/IS are part of the Action Plan. Implementation of the Action Plan included acquiring several tracts of land, specifically the West Bear Creek, East Bear Creek, Freitas, Salt Slough, and China Island units. The Salt Slough and China Island units were acquired by the State and are being managed collectively as part of the North Grassland WA. The remaining three units, West Bear Creek, East Bear Creek, and Freitas, were acquired by the federal government and are being

managed as part of the San Luis NWR Complex. The other state and federal refuges covered in this document (Volta WA, Mendota WA, and Merced NWR) were originally established to provide habitat for wintering waterfowl, but now serve a variety of wildlife and conservation objectives. Similarly, the private wetland areas within the Grassland RCD originally were managed primarily to attract waterfowl during the fall and winter to support recreational hunting on private duck clubs, but today are managed to meet the needs of a wide array of wetland-dependent wildlife.

2.1 National Wildlife Refuges

The San Luis NWR Complex has been reorganized since the 1989 *Report on Refuge Water Supply Investigations* and the 1989 *San Joaquin Basin Action Plan/Kesterson Mitigation Plan*. As a result of implementation of the Action Plan, acquisition of the West Bear Creek and Freitas Units of the Action Plan lands resulted in a contiguous land base among the San Luis and Kesterson NWRs and the two Action Plan units. Therefore, the Service has redesignated the two NWRs and Action Plan units as the San Luis NWR Complex, with each of the former NWRs and Action Plan units designated as management units within the San Luis NWR Complex. In addition, the San Luis NWR Complex includes the Merced Unit, which includes the East Bear Creek Unit of the Action Plan. Because all of these lands are managed collectively as the San Luis NWR Complex, they are addressed together in this section.

The management objectives for the San Luis NWR Complex are to:

- Provide feeding and resting habitat for wintering waterfowl
- Provide habitat and manage for endangered, threatened, and sensitive species of concern
- Protect and provide habitat for neotropical migratory landbirds
- Preserve a natural diversity and abundance of flora and fauna
- Provide for compatible, management-oriented research
- Alleviate crop depredation
- Provide public use activities, such as wildlife observation, photography, environmental education, and hunting
- Further the goals of the NWR system

In addition to these primary objectives, the San Luis NWR Complex is managed to contribute to attaining the specific goals of the Central Valley Habitat Joint Venture for the San Joaquin Valley, which are to:

- Protect 53,000 acres of existing wetlands through fee or perpetual easement acquisition
- Increase wetland area by 20,000 acres through conversion of agricultural lands to wetlands
- Enhance the 121,000 acres of existing wetlands that are under public and private ownership

To achieve these goals, the San Luis NWR complex is managed to provide seasonal wetland habitat for migratory waterfowl, as well as to maintain various wetland and riparian habitats to support a diversity of wildlife species.

In the past, the lack of firm, adequate-quality water has limited the variety of wetland habitat, species diversity, and management flexibility of the NWRs in the San Joaquin Valley. Permanent water, which is required by many Central Valley listed species and species of special concern, was usually absent on the San Luis NWR Complex. Water for riparian habitat was also absent, resulting in reduced habitat quality and availability for neotropical migratory birds and warmwater fish. Seasonal wetland quality for waterfowl was also limited by water availability, because sufficient water was not available to maximize production of moist soil food plants for wintering waterfowl.

2.1.1 San Luis Unit

The 7,430-acre San Luis Unit was established in 1966 under the Migratory Bird Conservation Act. The refuge is 12 miles northwest of the city of Los Banos. It is located on an interior island in the San Joaquin River floodplain, flanked by riparian zones along Salt Slough on the west and the San Joaquin River on the east. The refuge is managed to provide nesting, migration and wintering habitat for waterfowl and other migratory birds, endangered species, and resident wildlife. San Luis Unit also supports natural grasslands.

Pre-CVPIA Water Supplies

Water is used on the San Luis Unit to support permanent and seasonal wetlands. The refuge holds 19,910 acre-feet of surface water rights on Salt Slough. Salt Slough is a permanent stream that flows along the western refuge boundary and eventually into the San Joaquin River. Most of the water in Salt Slough originates from either operational spills or from return flow from the Grassland WD, San Luis Canal Company, and Central California Irrigation District. In the San Joaquin Valley, agricultural return flows typically have contained selenium concentrations above the two parts per billion objective deemed safe for wetland and wildlife management. As a result, the Service generally has not used Salt Slough water for wetland management since 1986.

Because of the unacceptable quality of Salt Slough water, the Service entered into a long-term (40-year) Grant of Easement in 1989 with San Luis Canal Company regarding water deliveries to the refuge. Under the terms of the agreement, the San Luis Canal Company delivers up to 25,125 acre-feet of CVP water to the refuge, keeping up to 25 percent to compensate for seepage losses. Accounting for the 25 percent conveyance loss, San Luis Unit typically receives approximately 19,000 acre-feet of water. Reclamation has made this water available under the 1954 Central Valley Project Reauthorization Act (1954 Act), as implemented through a 1990 Agreement, under which Reclamation provides this water for mitigation for Kesterson Reservoir. The 1954 Act also provided 40,000 acre-feet per year for a proposed 12,000-acre federal waterfowl management area from other than existing project sources.

The Service also has an agreement, through deed encumbrances, to accept surface return flows directly from agricultural lands serviced by the San Luis Canal Company. This source is not dependable and has varied between 135 and 1,700 acre-feet per year.

Existing Water Supplies

The San Luis Unit currently receives 19,000 acre-feet of CVP water as provided for by the 1954 Act and the 1990 Agreement. The *Report on Refuge Water Supply Investigations* identified Level 2 supplies for San Luis NWR as 13,350 acre-feet per year and the total Level 4 amount as 19,000 acre-feet per year. Thus, current water supplies for the San Luis Unit constitute full Level 2 and Level 4 water supplies.

Recent Water Acquisitions

Because the San Luis Unit has been receiving full Level 4 supplies through the 1990 Agreement and 1954 Act, no acquired water has been used at San Luis NWR.

2.1.2 West Bear Creek Unit

The West Bear Creek Unit was acquired by the federal government as part of the implementation of the Action Plan. This 3,892-acre tract is located adjacent to and north of San Luis Unit. The San Joaquin River forms the east boundary and Salt Slough and Highway 165 form the west boundary. It is managed as part of the San Luis NWR Complex.

Before its acquisition, the unit was managed as a cattle ranch. Habitats on the unit consisted of irrigated pasture with areas of native grasslands/vernal pool complex, riparian habitat, and seasonal wetland basins. The Service recently completed the habitat restoration and enhancement work identified in the Action Plan. The restoration focused on restoring the floodplain of the San Joaquin River and Salt Slough by restoring the area's natural hydrology. The unit now supports a mix of riparian habitat, seasonal wetlands, and native uplands.

Pre-CVPIA Water Supplies

Although the West Bear Creek Unit is bounded on two sides by Salt Slough and the San Joaquin River, the unit does not have water rights for either of these watercourses. When managed as a cattle ranch, the unit's water source was 10 groundwater wells. Three of those wells are currently operational. However, high salinity of the groundwater has precluded its use as a sole source of water for managed wetlands.

After the unit was acquired, the Service entered into a long-term contract with the San Luis Canal Company to deliver 6,225 acre-feet of CVP water to the unit. This water has been made available through annual contracts with Reclamation. Reclamation supplies the CVP water under the authority of the 1954 Act (Reclamation, et al., 1989).

Existing Water Supplies

Wetland enhancement and restoration efforts were recently completed on the West Bear Creek Unit. Existing water supplies consist of the water allocated to the unit under the CVPIA. The unit began taking Level 2 water supplies and the year-specific Level 4 increment in 1999 (J. Miller, 2000a). The Level 2 water supply is 7,207 acre-feet, and the full Level 4 supply is 10,810 acre-feet.

Recent Water Acquisitions

Reclamation temporarily acquired 20,000 acre-feet of water from the San Joaquin River Exchange Contractors Water Authority during the period from April 1999 to February 2000. This water was delivered to San Joaquin Valley wetland habitat areas to partially meet the 1999/2000 Level 4 water requirements. Some of this acquired water was used to meet the West Bear Creek Unit's 1999/2000 Level 4 increment of 2,523 acre-feet (Reclamation, 1999).

2.1.3 Kesterson Unit

The Kesterson Unit was purchased by Reclamation in 1969 as part of the San Luis Drain Project. The refuge is located 4 miles east of Gustine, in Merced County. The refuge consists of wetlands and grassland/vernal pool habitat. Wetlands are managed to provide habitat for migratory waterfowl, as well as for resident wildlife. Grassland/vernal pool habitat is protected to provide habitat for federal- and state-listed species.

Pre-CVPIA Water Supplies

Water is used on the Kesterson Unit to maintain seasonal wetlands and to irrigate moist soil units to produce food sources for wintering waterfowl. Before implementation of the CVPIA, the Kesterson Unit received CVP water from Reclamation under the requirements of 1954 Act. Through the 1954 Act, the Kesterson Unit receives 3,500 acre-feet of firm CVP water each year (between September 15 and November 15) through Grassland WD. This amount can be reduced in drought years. Reclamation has also provided up to 7,000 acre-feet of CVP water from the 40,000 acre-feet per year authorized under the 1954 Act.

Existing Water Supplies

Existing water supplies at the Kesterson Unit consist of 3,500 acre-feet of CVP water provided under the 1954 Act and up to 7,000 acre-feet of CVP water provided through annual contracts also authorized under the 1954 Act. The *Report on Refuge Water Supply Investigations* identified Level 2 water supplies for the Kesterson Unit as 3,500 acre-feet and the total Level 4 amount as 10,000 acre-feet. Thus, the Kesterson Unit is currently receiving full Level 2 water supplies and the Level 4 increment.

Recent Water Acquisitions

Because the Kesterson Unit has been receiving full Level 4 supplies through the 1954 Act and the 1990 Agreement, no acquired water has been used at the Kesterson Unit.

2.1.4 Freitas Unit

The Freitas Unit is part of the lands acquired pursuant to the Action Plan. This 5,600-acre tract lies east of, and immediately adjacent to, the former Kesterson Reservoir site and is bordered by the Great Valley Grasslands State Park on the east and north. The Freitas Unit is managed as part of the San Luis NWR Complex. The unit consists of native grassland, seasonal wetlands, slough, and oxbows. Before acquisition, it was managed as a cattle ranch.

Pre-CVPIA Water Supplies

The Freitas Unit has no water rights to divert water from either the San Joaquin River or Salt Slough. Before acquisition, the unit's water supply consisted only of floodwater from the

San Joaquin River and Salt Slough, and groundwater. Once acquired, the Freitas Unit became eligible to receive water under the 1954 Act. Reclamation has made 5,290 acre-feet of CVP water available to the Freitas Unit since 1990. A production groundwater well was also developed adjacent to the San Luis Canal on the southern boundary of the tract and is intended to be used to maintain permanent wetland habitat during drought periods.

Existing Water Supplies

The Level 2 water supply for the Freitas Unit is 3,527 acre-feet and the full Level 4 amount is 5,290 acre-feet. Existing water supplies consist of the 5,290 acre-feet of CVP water provided by Reclamation under the 1954 Act. This quantity of water fulfills both Level 2 water supplies and the Level 4 increment for the Freitas Unit.

Recent Water Acquisitions

Because the Freitas Unit has been receiving full Level 4 supplies through the 1954 Act, no acquired water has been used at the Freitas Unit.

2.1.5 Merced Unit

The Merced Unit is located approximately 9 miles southwest of the City of Merced. The refuge was established to alleviate crop depredation and to provide habitat for migratory and wintering waterfowl. The refuge is one of the most important wintering areas in California for snow and Ross' geese, and lesser sandhill cranes (Reclamation, 1992). The refuge provides seasonal and permanent wetland habitats; grain and forage crops are grown on the refuge as wildlife food crops. Water is used to irrigate seasonal marshes and croplands and to maintain permanent wetlands.

At the time of the *Report on Refuge Water Supply Investigations*, the Merced Unit was 2,562 acres in size. In 1990, 636 acres were added to the refuge bringing the total current acreage to 3,198 acres. Acquisition at the Merced Unit has continued and at present the refuge encompasses 4,400 acres. This additional acreage was not considered when determining the refuge's water supply needs in the *Report on Refuge Water Supply Investigations*. Therefore, this acreage was not included in the water supplies described in Section 3406(d)(1) through (d)(5) of the CVPIA and is not a part of this EA/IS.

Pre-CVPIA Water Supplies

Article 45 of the Federal Energy Regulatory Commission (FERC) license for the New Exchequer Project requires that 15,000 acre-feet of CVP water be conveyed to the Merced Unit annually. In 1989, FERC issued orders requiring Merced Irrigation District to comply with Article 45. However, at the time, there were no facilities to deliver the water to the Merced Unit (Reclamation, 1992), and this water supply was not available to the refuge.

Before passage of the CVPIA, groundwater made up much of the refuge's water supply. The refuge has 21 groundwater wells. Groundwater is typically used during the winter when Merced Irrigation District's dewatered its delivery system (Reclamation, 1992).

The Merced Unit also diverted water from Deadman Creek and the East Side Bypass on an as-available basis. In 1985, the refuge obtained rights to divert 3,000 acre-feet annually from Deadman Creek, between December 15 and May 31. Under the conditions of the water

rights, the refuge cannot divert water from this stream except during high flow periods. As a result, this water right was not considered a firm supply. Water from the East Side Bypass was also diverted on an as-available basis.

Existing Water Supplies

Since passage of the CVPIA, the Merced Unit has relied, to a large degree, on groundwater for Level 2 water supplies and the Level 4 increment because there were no facilities capable of supplying CVP water to the refuge. Under an agreement between Reclamation and the Service, Reclamation has paid for the cost of pumping groundwater. Water is also diverted from Deadman Creek under the refuge's water right, when available. Conveyance facilities capable of delivering water from Merced Irrigation District have been completed recently (D. Woolington, 1999). As a result, Merced Irrigation District has been delivering the 15,000 acre-feet of CVP water required under Article 45 (D. Woolington, 1999). For the Merced Unit, the Report on Refuge Water Supply Investigation identified the Level 2 water supply as 13,500 acre-feet. Thus, the Refuge is currently receiving the Level 2 water supply and most of the Level 4 increment. However, water provided by the Merced Irrigation District is only available during the irrigation season, and the refuge relies on groundwater during the winter (December through March).

Recent Water Acquisitions

No acquired water has been used on the Merced Unit.

2.1.6 East Bear Creek Unit

The San Joaquin Action Plan identified the East Bear Creek and Kelly tracts for acquisition by the federal government. The federal government purchased 4,000 acres of the East Bear Creek tract from the Gallo family in 1993. This purchase currently constitutes the East Bear Creek Unit. The Gallo family also sold a perpetual, non-development easement to the Service for 2,132 acres of land north of Bear Creek. Further acquisition efforts on the Kelly tract are currently deferred, pending the initiation of negotiations with the property owner. The federal government will also attempt to purchase a 158-acre parcel contiguous to the north end of the Kelly tract. This parcel was not recognized as a separate ownership in the Action Plan (Reclamation and CDFG, 1995).

The East Bear Creek Unit lies east of the San Joaquin River, adjacent to the San Luis NWR. The Service manages the unit as part of the San Luis NWR. The unit includes 3 miles of Bear Creek and contains natural grasslands, vernal pools, riparian floodplain habitat, irrigated pasture and small-grain production lands (Reclamation and CDFG, 1995; Reclamation, et al., 1989). Before its acquisition, the land was managed as a cattle ranch, and consisted primarily of irrigated pasture. The habitat restoration actions identified in the Action Plan have not been completed yet. The restoration proposed for the unit focuses on restoring the floodplain of the San Joaquin River and Salt Slough by restoring the area's natural hydrology. When completed, the unit will support a mix of riparian habitat, native uplands, and seasonal wetlands. A small amount of irrigated pasture and crops will be retained to provide forage for cranes and geese, as well as nesting cover for waterfowl and resident wildlife.

Pre-CVPIA Water Supplies

Before passage of the CVPIA, the water sources for the East Bear Creek Unit were a combination of agricultural return flows, irrigation operational spill, and winter runoff flows from Bear Creek, and the San Joaquin River. The tracts of the entire East Bear Creek Unit previously identified for acquisition have an annual appropriative water right of 27,627 acre-feet on an if-and-when-available basis. The water right entitlement on Bear Creek is 38 cfs, with no maximum acre-feet amount. However, water can only be diverted from Bear Creek on an if-and-when-available basis and only from March 1 to October 31. Water availability during this time period was historically good (Reclamation, et al., 1989). In addition to the surface water sources, there are four groundwater wells on the property.

Existing Water Supplies

Wetland habitat restoration and enhancement plans are currently being developed for the East Bear Creek Unit. As such, the unit has not accepted delivery of full Level 2 water supplies or the Level 4 increment. However, the unit has taken up to 4,800 acre-feet of water each year since 1996 to maintain oxbows and small wetlands along the San Joaquin River (J. Miller, 2000b).

The 1989 Action Plan identified the water supply required for full management of the original 7,600-acre tract as 25,260 acre-feet. However, not all of the lands originally identified have been acquired. Due to the reduction of lands acquired in fee title, the Service has proportionately decreased its water requirement. The revised water requirement for full habitat management of the current East Bear Creek Unit acreage is 13,295 acre-feet. The two-thirds supply (Level 2) for this amount of water is 8,863 acre-feet.

Recent Water Acquisitions

Because restoration actions have not yet been implemented on the East Bear Creek Unit, no acquired water has been used.

2.2 State Wildlife Areas

Five state WAs covered by the CVPIA lie in the San Joaquin Valley. CDFG manages the WAs in accordance with the following departmental guidelines (CDFG, 1998):

- Supply suitable habitat and living space for the preservation of native species, including nongame and endangered plants and animals
- Protect surrounding agricultural lands from depredating waterfowl by providing feeding and resting areas for waterfowl
- Furnish access to public lands for hunting and fishing opportunities
- Provide for multiple use of the area when this use will not unduly interfere with the primary use of the land

Habitat management on the state WAs has been impaired by unreliable and poor-quality water supplies in a similar manner as on the federal refuges. The lack of firm, adequate-quality water has limited the diversity of wetland habitat, species diversity, and

management flexibility. Permanent water, which is required by many Central Valley listed species and species of special concern, could not be supported in years of low water availability. Seasonal wetland quality for waterfowl was also limited by water availability, because sufficient water was not available to maximize production of moist soil food plants for wintering waterfowl. Water availability similarly limited irrigation of upland pasture and crops for forage and nesting cover.

2.2.1 Los Banos Wildlife Area

The 5,586-acre Los Banos WA is located in the San Joaquin River floodplain, approximately 4 miles northeast of Los Banos. Los Banos WA is dominated by seasonal wetlands. Permanent and semi-permanent wetlands are also present as are areas of riparian habitat. The WA also supports natural and non-native grasslands. Irrigated pasture and croplands are maintained to provide food, resting, and nesting habitat for waterfowl and other wildlife.

Pre-CVPIA Water Supplies

Water is available to Los Banos WA from a number of water rights, licenses, and contracts, but use of much of this water has been limited because of unacceptable water quality. The Grassland WD delivers 2,200 acre-feet of water, and the San Luis Canal Company delivers an additional 4,000 acre-feet through an exchange contract for water rights lost from the San Joaquin River. Although a firm water supply, Los Banos WA could not obtain CVP via the San Luis Canal Company during the winter because the San Luis Canal Company dewaters its canals during this time period for maintenance (CDFG, 1988). Selenium contamination in drainage water that was carried by the San Luis Canal (a Grassland WD facility) and a CDFG directive prohibiting use of selenium-tainted water further complicated and restricted water deliveries via the San Luis Canal prior to construction of the Grassland Bypass. Uncontaminated water was only available through this canal during short delivery periods (CDFG, 1988).

In addition to firm CVP water, the Los Banos WA could obtain up to 4,000 acre-feet of agricultural return flows when available from the Boundary Drain. Water from the Boundary Drain is of poorer quality than CVP supplies because of high total dissolved solids. The WA also has 2,000 acre-feet of riparian rights on Mud Slough (south), which joins the Boundary Drain near the center of the Refuge. However, use of this water has been limited because of unacceptable selenium concentrations (Reclamation, 1992).

The Refuge has a water contract with the San Luis Canal Company for 15 cfs of water spilled to Salt Slough, which is estimated to provide approximately 4,000 acre-feet per year. Water rights amounting to 15,130 acre-feet per year on Salt Slough downstream of the confluence with Mud Slough (south) are also subject to acceptable selenium concentrations and diversions by others with senior rights (Reclamation, 1992).

Historically, the refuge used five groundwater wells. Well cave-ins and poor water quality caused the groundwater system to be largely abandoned (Reclamation, 1989). Three wells are still operable, but are intended for emergency use during a drought rather than as a regular water source.

Existing Water Supplies

Existing water supplies consist of the pre-CVPIA water supplies described above and water supplies provided for in the CVPIA. Since passage of the CVPIA, Level 2 water supplies have been met through a combination of pre-CVPIA water supplies and CVP water. The refuge's Level 4 increment has been met by Reclamation through the Water Acquisition Program (discussed below). The Level 2 water supply is 16,670 acre-feet and the full Level 4 amount is 25,000 acre-feet.

Recent Water Acquisitions

Reclamation temporarily acquired 20,000 acre-feet of water from the San Joaquin River Exchange Contractors Water Authority during the period from April 1999 to February 2000. This water was delivered to San Joaquin Valley wetland habitat areas to partially meet the 1999/2000 Level 4 water requirements. Some of this acquired water was used to meet Los Banos WA's 1999/2000 Level 4 increment of 5,836 acre-feet (Reclamation, 1999).

Reclamation also temporarily acquired 10,228 acre-feet of water from Semitropic Water Storage District during 1999/2000. This water was also used to meet the Level 4 incremental needs of Kern NWR. Up to 3,478 acre-feet of this water was used to meet Level 2 water needs at Kern NWR. By using this water to contribute to meeting Level 2 water requirements, an in-kind amount of CVP water was "backed up" in San Luis Reservoir. This stored water was used to meet Level 4 incremental requirements at San Joaquin Valley wetland areas.

2.2.2 Volta Wildlife Area

Volta WA is leased from Reclamation and has been managed by CDFG since 1952. The refuge consists of approximately 3,000 acres located 6 miles northwest of Los Banos, and is in the Grassland RCD. The WA supports permanent and seasonal wetlands for waterfowl and resident wildlife. Irrigated pasture and crops are grown to provide food for migratory waterfowl, as well as nesting cover.

Pre-CVPIA Water Supplies

Volta WA has an agreement with Reclamation for 13,000 acre-feet of firm CVP water (Reclamation, 1992). CVP water is delivered to Volta WA from the San Luis Reservoir and O'Neill Forebay via the Delta-Mendota Canal or the Volta Wasteway (Reclamation, 1989). The refuge also often obtained water through special contracts to supplement the firm CVP supply. Groundwater has not been used on the refuge (Reclamation, 1989).

Existing Water Supplies

Existing water supplies consist of 13,000 acre-feet of firm CVP water provided through the agreement with Reclamation. This supply is adequate to meet Level 2 water supplies for the refuge. In addition, in the 1999/2000 water service year, Volta WA was eligible to receive 70 percent of the Level 4 increment which amounts to 4,200 acre-feet. Volta WA's agreement for 13,000 acre-feet fulfilled both the refuge's Level 2 water supply (10,000 acre-feet) and much of the Level 4 increment. The Full Level 4 water supply for Volta WA is 16,000 acre-feet.

Recent Water Acquisitions

No acquired water has been used at Volta WA.

2.2.3 North Grasslands WA–China Island Unit

The China Island Unit, along with the Salt Slough Unit, was a part of the initial purchase of new lands to implement the Action Plan. The State of California acquired both of these units in 1990 and managed them collectively as the North Grasslands WA. The 3,315-acre China Island Unit borders the San Joaquin River southwest of the confluence with the Merced River. The unit consists mainly of irrigated pasture and natural grasslands (Reclamation and CDFG, 1995), but it also contains Valley oak woodland / riparian habitat that provides important habitat for a variety of wildlife. The pastures provide habitat for geese, including the federally listed Aleutian Canada goose, and sandhill cranes (Reclamation, et al., 1995). Before its acquisition, the unit was managed as a cattle ranch. Restoration and enhancement actions have focused on increasing seasonal wetlands, permanent and semi-permanent wetlands, and riparian habitat on the unit (Reclamation and CDFG, 1995).

Pre-CVPIA Water Supplies

The China Island Unit does not have any water rights even though the San Joaquin River and Mud Slough North flow through or adjacent to the unit. Before acquisition of the property, water to irrigate pasture was derived from five groundwater wells (Reclamation, et al., 1989).

Existing Water Supplies

Existing water supplies consist of groundwater and water supplies provided for through CVPIA. With passage of the CVPIA, Level 2 water supplies from CVP yield have been delivered to the unit. The unit has not accepted delivery of the Level 4 increment because conveyance facilities have not been developed to deliver the water to the unit and to use it efficiently on the unit. The Level 2 water supply is 6,967 acre-feet and the full Level 4 amount is 10,450 acre-feet.

Groundwater has continued to be an important water supply for the China Island Unit, particularly in drought years. Groundwater has been used to meet a small portion of the water needed for optimum management of the unit. However, the current well system cannot fulfill the water needs for full restoration of the China Island unit, nor is it desirable to increase groundwater pumping because of potential groundwater overdrafting and poor water quality (CDFG, 1998).

Recent Water Acquisitions

CDFG is in the process of developing internal conveyance facilities to be able to fully use Level 4 water supplies. As a consequence, no acquired water has been used to date on the unit.

2.2.4 North Grasslands WA–Salt Slough Unit

The 2,241-acre Salt Slough Unit is located on the west side of Salt Slough, adjacent to San Luis NWR and Los Banos WA. As described for the China Island Unit, the Salt Slough Unit was one of the initial lands purchased in implementing the San Joaquin Basin Action

Plan/Kesterson Mitigation Plan. CDFG manages the unit as part of the North Grasslands WA, along with the China Island Unit.

Before its acquisition, the unit consisted mainly of irrigated pasture and was managed as a cattle ranch (Reclamation and CDFG, 1995). The pasture provides important late-winter and early-spring habitat for geese, including the federally listed Aleutian Canada goose. The unit also contains riparian habitat and some seasonal wetlands. CDFG has developed plans to restore and enhance seasonal, permanent, and semi-permanent wetlands on the unit (Reclamation and CDFG, 1995; CDFG, 1998).

Pre-CVPIA Water Supplies

The Salt Slough unit has an appropriative water right of 8,891 acre-feet from Salt Slough. Most of the water in Salt Slough originates from operational spills and return flow from the Grassland WD, San Luis Canal Company, and Central California Irrigation District. In the San Joaquin Valley, agricultural return flows typically have contained selenium concentrations above the two parts per billion objective deemed safe for wetland and wildlife management. Given the high levels of selenium water from Salt Slough could rarely be used for wetland management.

Existing Water Supplies

Existing water supplies consist of the appropriative water right on Salt Slough, one groundwater well, and CVP water provided by the CVPIA. The unit's water requirements are currently being met primarily by CVP water delivered by Grassland WD. Habitat restoration on the unit has been completed and the unit has been receiving Level 2 water supplies and the year-specific Level 4 increment. The Level 2 water supply is 6,680 acre-feet and the full Level 4 amount is 10,020 acre-feet.

Groundwater and surface water from Salt Slough are used periodically to supplement the unit's water needs. Use of water from Salt Slough has been limited because of unacceptable water quality. Although water quality in Salt Slough has improved with the reopening of the San Luis Drain in 1996, water quality must still be monitored to determine usability (CDFG, 1998).

Recent Water Acquisitions

Reclamation temporarily acquired 20,000 acre-feet of water from the San Joaquin River Exchange Contractors Water Authority during the period April 1999 to February 2000. This water was delivered to San Joaquin Valley wetland habitat areas to partially meet the 1999/2000 Level 4 water requirements. Some of this acquired water was used to meet Salt Slough Unit's 1999/2000 Level 4 increment of 2,335 acre-feet (Reclamation, 1999).

Reclamation also temporarily acquired 10,228 acre-feet of water from Semitropic Water Storage District during 1999/2000. This water was used to meet the Level 4 incremental needs of Kern NWR. Up to 3,478 acre-feet of this water was also used to meet Level 2 water needs at Kern NWR. By using some of the acquired water to meet Level 2 water requirements, an in kind amount of CVP water was "backed up" in San Luis Reservoir. This stored water was used to meet Level 4 incremental requirements at San Joaquin Valley wetland areas.

2.2.5 Mendota Wildlife Area

Mendota WA is located in western Fresno County, approximately 4 miles southeast of the town of Mendota. The 12,425-acre WA was purchased by the California State Wildlife Conservation Board between 1954 and 1966 and is managed by CDFG. Throughout its recent history the WA has been managed primarily to provide seasonal wetland habitat (CDFG, 1994). Water is used to irrigate natural food crops, such as swamp timothy, alkali bulrush, smartweed, and millet, and to flood seasonal and semipermanent wetlands. Small grains, corn, and pasture are also irrigated in the upland areas (Reclamation and CDFG, 1999).

Pre-CVPIA Water Supplies

Fresno Slough is a natural drainage that bisects Mendota WA. The slough receives water from Mendota Pool, located a few miles northwest of the WA. Gates and pumps divert water from the slough to Mendota WA (Reclamation and CDFG 1999). Water from Mendota Pool has been the refuge's main water supply.

Mendota WA has existing contracts with Reclamation for a total of 29,650 acre-feet of water. The contract with Reclamation includes 8,143 acre-feet of Section 2 water, 12,000 acre-feet of Section 6 water, 4,000 acre-feet of mitigation water and 1,320 acre-feet of firm water rights. Section 2 water is provided free of charge from the Mendota Pool. No more than 5,800 acre-feet of the Section 2 water can be delivered after June 30 of each year because of the limited capacity of conveyance facilities. Section 6 water must be purchased by the State of California and is available from September 1 through November 30. The 4,000 acre-feet of mitigation water is available from March 15 through May 31 (Reclamation and CDFG, 1999). In addition, the refuge holds 3,120 acre-feet of supplemental water rights, but that water is not always available (Reclamation, 1989).

Although the refuge has a contract with Reclamation for 29,650 acre-feet, the refuge only received an average of 18,500 acre-feet per year (Reclamation, 1989). The difference between the amount of water currently contracted and the amount actually delivered is related to the following (Reclamation and CDFG, 1999):

- Dewatering of Mendota Pool for safety of dams inspections and dam and pool maintenance during the winter
- Periodic dewatering of canals and ponds on Mendota WA to control cattails
- Maintenance and construction of ditches and levees on the WA that require periodic dewatering of canals
- Occurrence of drought when most water supplies are reduced

Dewatering Mendota Pool effectively terminates water deliveries to Mendota WA. This interruption in the water supply reduced waterfowl habitat in two ways. First, to compensate for the loss of water supply, fields on Mendota WA had to be flooded deeper than is desirable to ensure that adequate water remained throughout the waterfowl hunting/winter season. Second, the interruption of water supply allowed ponds to dry up, eliminating waterfowl habitat (Reclamation and CDFG, 1999). Thus, although the refuge has a substantial amount of guaranteed water, the water has not always been available or may

not have been available at the time of year when it was needed for optimum habitat management.

Existing Water Supplies

The Level 2 water supply for Mendota WA is 18,500 acre-feet and the full Level 4 amount is 29,650 acre-feet. Existing water supplies consist of Mendota WA's existing contracts with Reclamation for 29,650 acre-feet of CVP water. While this water supply is adequate to meet Level 2 water supplies and the Level 4 increment, the availability of this water has been subject to the same constraints as described above. Modifications to Mendota Dam to allow year-round delivery of water to Mendota WA are currently being developed and evaluated (Reclamation and CDFG, 1999). When completed, these modifications will alleviate problems in water availability at Mendota WA from operation and maintenance activities of Mendota Dam.

Recent Water Acquisitions

Because Mendota WA's existing contracts with Reclamation fulfill Level 2 water supplies, and the Level 4 increment, no acquired water has been used on the refuge.

2.3 Grassland Resource Conservation District

The Grassland RCD contains approximately 75,000 acres and comprises private hunting clubs and other privately owned wetland areas, as well as all or portions of several state and federal refuges (such as the Kesterson Unit, Volta WA, Los Banos WA, Freitas Unit, Salt Slough Unit, Blue Goose Unit, and Gadwall Unit). The area is the largest contiguous block of wetlands remaining in the Central Valley and is a major wintering ground for migratory waterfowl and shorebirds of the Pacific Flyway. Up to 30 percent of the Central Valley wintering population of ducks use this area. The Service ranks the habitat provided by the Grassland RCD as the most important complex of wetlands in the San Joaquin Valley. Wetlands of the Grassland RCD are a component of the Western Hemisphere Shorebird Reserve Network and is now internationally recognized for its importance to shorebirds (Reclamation, 1992).

Lands within the Grassland RCD are primarily managed for waterfowl habitat. The Grassland WD has a Water Management Plan that guides water use on nearly all lands within the Grassland RCD. In addition, the management objectives of the Grassland RCD include an active program to encourage natural food plant production (such as swamp timothy, smartweed, and wildlife millet) and habitat protection. Land uses include seasonally flooded wetlands, moist soil impoundments, permanent wetland, irrigated pasture, and croplands.

The Grassland RCD contains most of the 51,530 acre Grassland WD. The Grassland WD is a legal entity that was established to receive and distribute CVP water. The Grassland WD delivers CVP water to the wetland areas within its boundaries. The Grassland WD contains approximately 165 separate ownerships, most of which are hunting or duck clubs. Perpetual easements have been purchased by the Service to help preserve wetland-dependent migratory bird habitat on approximately 31,000 acres serviced by the Grassland WD. These

easements authorize the Service to restrict land uses that would diminish wetland habitat values.

2.3.1 Pre-CVPIA Water Supplies

Lands serviced by GWD were originally part of the Miller and Lux estate. Beginning in 1926, the Miller and Lux Corporation began selling what amounted to more than 98,000 acres to ranchers and wildlife enthusiasts. Water supplies at that time were obtained directly from the San Joaquin River, but after Friant Dam was constructed upstream, most river water supplies were replaced with CVP water conveyed by the Delta-Mendota Canal. In 1953, as a final settlement of water right claims by area interests, 50,000 acre-feet of CVP water from the Delta-Mendota Canal was made available on a permanent basis for wildlife use. The Grassland WD was formed at this time to provide a legal entity to contract for the CVP water and to assume responsibility for the distribution of water and maintenance of facilities within the district. The contract limits delivery of this water to between September 15 and November 30 (Reclamation, 1989 and 1992).

Before passage of the CVPIA, the fresh water supply to the Grassland WD from Reclamation was limited and unreliable. The September 1972 "Mendota-Gustine Study" prepared by the USDA Soil Conservation Service, proposed using drainwater for WAs. Until 1985, the Grassland WD used a mixture of CVP fresh water and agricultural return flows (Stoddard & Associates, 1998). Lands within the Grassland RCD became largely dependent on using return flows. As a result, return flows constituted 50 to 70 percent of the 125,000 to 150,000 acre-feet of historical annual water supply (Reclamation, 1992). However, this drainwater was found to have elevated concentrations of selenium that could have toxic effects on waterfowl. In 1985, the Grassland WD ceased using agricultural return flows that contained drainage water (Stodddard & Associates, 1998). Most of the drainwater is considered contaminated and is no longer used on wetland habitat. As a result, the Grassland RCD could no longer meet its objective of flooding all wetlands in the fall. Attainment of all other management objectives, such as maintaining permanent wetlands, was not possible (Reclamation, 1992).

In addition to CVP water, the Grassland WD has a water right agreement with Reclamation that recognizes the right of the Grassland WD to flows in Los Banos Creek and San Luis Creek. The agreement provides 3,500 acre-feet of water except in critically dry years, in which the Grassland WD may only divert up to 1,750 acre-feet. The agreement is considered a water rights settlement contract. This water is currently delivered to the Kesterson Unit.

Garzas and Los Banos creeks are intermittent streams that flow through the Grassland RCD. Flow in these streams is substantial only after heavy storms. Natural flow occurs mainly in winter, after fall flooding. In addition, the area available to receive the flow is only about 20 percent of the Grassland RCD. These factors make this water supply of limited value in meeting water requirements in the Grassland RCD (Stoddard & Associates, 1998).

Groundwater pumping facilities exist on approximately 15 of the 165 hunting clubs in GWD. High pumping costs and the generally poor quality of shallow groundwater preclude use of these wells as more than a supplemental supply (Reclamation, 1992).

With the limited and unreliable pre-CVPIA water supplies, semi-permanent and permanent wetland habitat was scarce in areas serviced by the Grassland WD. In addition, wetland

managers had to employ management techniques to conserve water, but these techniques were deleterious to waterfowl. Wetland managers previously "stockpiled" water to depths of several feet early in the season to ensure that water was available throughout the winter for waterfowl. This management strategy resulted in wetland areas being flooded deeper than optimal for waterfowl feeding (which is 1 foot or less). In addition, disease outbreaks, especially avian botulism and cholera, were more prevalent with this management strategy (Stoddard & Associates, 1998).

2.3.2 Existing Water Supplies

The two sources of surface water supply in the Grassland RCD are CVP water delivered pursuant to the 1954 Act and provided for under the CVPIA, and local runoff from seasonal creeks passing through the Grassland RCD. The majority of agricultural drainage water from upstream agricultural activities is diverted around the Grassland RCD and cannot be used for wetland management because of its poor quality (Stoddard & Associates, 1998)

Since passage of the CVPIA, Level 2 water supplies and an increasing percentage of the Level 4 increment have been available to wetland areas in the Grassland RCD. The Level 2 water supply for Grassland RCD is 125,000 acre-feet and the full Level 4 amount is 180,000 acre-feet. The existing CVP contract for 50,000 acre-feet, water rights on Garzas Creek, and a CVP contract for substitute water for Los Banos Creek and San Luis Creek natural flows that were no longer available to the Grassland WD as a result of the construction of dams and storage of water in Los Banos Creek Detention Reservoir and the San Luis Reservoir, have been used to meet a portion of Level 2 water supplies. Delivery of CVP water provided for by the CVPIA did not actually start until the 1993/1994 water year. Other sources of water prior to this water year included water provided on a temporary basis as mitigation for Kesterson Reservoir, as well as operational spills (Stoddard & Associates, 1998).

The increased amount and reliability of water supplies provided under the CVPIA has supported substantial improvements in wetland habitats in the Grassland RCD and has allowed wetland managers to manage wetlands not only for wintering waterfowl, but to manage wetlands to meet the needs of a diversity of wetland-dependent wildlife. The most apparent accomplishments of using CVPIA water to manage Grassland RCD wetlands have been improvement in wetland habitat quality, increase in summer water acreage, and irrigation for moist-soil plants. The year-round availability of high-quality water has also allowed for an earlier flooding schedule of wetlands that provides habitat for early arriving migratory birds, as well as for resident wildlife (Stoddard & Associates, 1998).

2.3.3 Recent Water Acquisitions

Reclamation temporarily acquired 20,000 acre-feet of water from the San Joaquin River Exchange Contractors Water Authority during the period from April 1999 to February 2000. This water was delivered to San Joaquin Valley wetland habitat areas to partially meet the 1999/2000 Level 4 water requirements. Some of this acquired water was used to meet the Grassland RCD's 1999/2000 Level 4 increment of 38,500 acre-feet (Reclamation, 1999).

Reclamation also temporarily acquired 10,228 acre-feet of water from Semitropic Water Storage District during 1999/2000. This water was used to meet the Level 4 incremental

needs of Kern NWR. Up to 3,478 acre-feet of this water was used to meet Level 2 water needs at Kern NWR. By using this water to contribute to meeting Level 2 water requirements, an in-kind amount of CVP water was "backed up" in San Luis Reservoir. This stored water was used to meet Level 4 incremental requirements at San Joaquin Valley wetland areas.

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 given the benefits received by the project.

The two documents completed for the San Joaquin River Basin refuges include the Programmatic Environmental Impact Statement (PEIS) for the CVPIA and the Conveyance of Refuge Water Supply EA/IS.

It should be recognized that under each of the descriptions presented in this section, references to "No Action Alternative" and other alternatives are specific to the reference documents, not to the alternatives described in the remaining sections 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), which included Title XXXIV, the CVPIA. The CVPIA amended the previous authorizations of the CVP to include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic uses, and fish and wildlife enhancement as a project purpose equal to power generation. Through the CVPIA, Interior is developing policies and programs to improve environmental conditions that were affected by operations, management, and physical facilities of the CVP. The CVPIA also includes tools to facilitate larger efforts in California to improve environmental conditions in the Central Valley and the San Francisco Bay-Delta system. The PEIS addressed potential impacts and benefits of implementing provisions of the CVPIA. The PEIS was prepared under NEPA by Reclamation and the Service.

The analysis in the PEIS was intended to disclose the probable regionwide effects of implementing the CVPIA and to 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 to limit the need to reevaluate the regionwide 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 whether 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 document can use the PEIS by reference to avoid duplication and to 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 in 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 more than 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 to 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 several issue areas (discussed below) 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 that 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 per year, and the 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 as a result of 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 before 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, which 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 and endangered species, 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, nor would it 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 on 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 from 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)
- **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)

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 Irrigation District 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 RCD	CVP contract	47,800	0	47,800
Kern NWR	SWP annual contracts	9,950	0	9,950
Pixley NWR	Not Applicable	0	0	0

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

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

- **Implement Water Pricing Actions**
  - **Preferred Alternative**; **Alternatives 1, 2, 3, and 4**; **and Supplemental Analyses 1a, 1b, 1d through 1f, 1h, 1i, 2a through 2c, 3a, and 4a** assumed 80 percent of contract amount at Contract Rate, top 10 percent of contract amount at Full Cost Rate, and middle 10 percent of contract amount at blended rate assuming continuation of Ability-to-Pay policy.
  - **Supplemental Analyses 1c and 2d** assumed 80 percent of contract amount at Full Cost Rate, next 10 percent of contract amount at 110 percent of Full Cost Rate, and top 10 percent of contract amount at 120 percent of Full Cost Rate assuming continuation of Ability-to-Pay policy.
  - **Supplemental Analysis 1g** assumed 80 percent of contract amount at Contract Rate, top 10 percent of contract amount at Full Cost Rate, and middle 10 percent of contract amount at blended rate without Ability-to-Pay policy.
  - **No Action Alternative** assumed 100 percent of contract amount at Contract Rate assuming continuation of Ability-to-Pay policy.

- **Modify Red Bluff Diversion Dam**
  - **Preferred Alternative** indicated that this action would be determined following additional studies.
  - **Alternatives 1, 2, 3, and 4**; **Supplemental Analyses 1a through 1h, 2a through 2d, 3a, and 4a**; **and No Action Alternative** assumed gates open mid-September through mid-May.
  - **Supplemental Analysis 1i** assumed gates open all year with a new facility to deliver water.

- **Construct Delta Fish Barriers**
  - **Preferred Alternative** indicated that this action would be determined following additional studies.
  - **Alternatives 1, 2, 3, and 4**; **Supplemental Analyses 1a, 1c through 1e, 1g through 1i, 2b through 2d, 3a, and 4a**; **and No Action Alternative** assumed non-structural barriers at Old River and Georgiana Slough.

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

- **Provide for Water Transfers**
  - **Preferred Alternative and Supplemental Analyses 1e, 2b, 3a, and 4a** assumed CVPIA water transfers with basic CVPIA transfer fees.
  - **Alternatives 1, 2, 3, and 4**; **Supplemental Analyses 1a through 1c, 1f through 1i, 2a, and 2d; and No Action Alternative** assumed only non-CVPIA water transfers.
  - **Supplemental Analyses 1f and 2c** assumed CVPIA water transfers with basic CVPIA transfer fees plus $50 per 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.

3.2.4 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 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 3-2
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 Water rights.	30,000	3,333	33,333
Gray Lodge WA	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 RCD	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 NWR	Level 2: CVP contract	10,000	1,147	11,147
Freitas Unit	Level 2: CVP contract	5,290	1,763	7,053
Merced Unit	Merced River water per FERC Agreement	15,000	5,000	20,000
East Bear Creek Unit	CVP contract exchange with Merced River water rights holders	8,863	2,954	11,817
Los Banos WA	Level 2: CVP contract	16,670	2,783	19,453
Volta WA	Level 2: CVP contract	13,000	0	13,000
China Island Unit	Level 2: CVP contract	6,967	1,229	8,196
Salt Slough Unit	Level 2: CVP contract	6,680	1,179	7,859
Mendota WA	Level 2: CVP contract	27,594	0	27,594
Grasslands RCD	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

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 5.7 million 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 about 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 because 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 because of the

TABLE 3-4
Summary of CVPIA PEIS Analysis

Issue Area	Impacts and Benefits
	acquisition of water to improve Delta outflows. 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, but it is not possible to determine the specific impact. **Instream Flows.** Instream flows and/or pulse flows would increase in Clear Creek, Stanislaus River, and Trinity River under all alternatives. Instream flows and/or pulse flows would increase in Tuolumne, Merced, and San Joaquin rivers in Alternatives 2, 3, and 4 and the Preferred Alternative. Instream flows would increase in Mokelumne and Yuba rivers in Alternatives 3 and 4. Changes in instream flows would not be affected by implementation of Level 2 and Level 4 water supplies. **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 will decline by 1 to 3 percent in all regions under Alternatives 1 and 2 and the Preferred Alternative, 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. Groundwater levels would decline by 1 to 5 percent in all regions under Alternatives 3 and 4, given reduced recharge from fallowed lands. **Subsidence.** Under the No Action Alternative, subsidence would continue to increase in the Sacramento Valley near Davis-Zamora and in the 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 approximately 5 percent under all alternatives as a result of changes in releases from CVP reservoirs and reduced reservoir elevations in summer months 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. **CVP Project Use.** Under the No Action Alternative, average CVP Project Use would be 1,425 gigawatts-hour per year. CVP Project Use would be reduced by approximately 10 percent under Alternatives 1, 2, and 4, and the Preferred Alternative, given the 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 because of 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

TABLE 3-4
Summary of CVPIA PEIS Analysis

Issue Area	Impacts and Benefits
	would occur under Alternatives 2, 3, and 4, and the Preferred Alternative, as a result 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 as a result of stream flow improvements. Additional improvement would occur under Alternatives 2, 3, and 4, and the Preferred Alternative as a result of the 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 because of 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 because of the use of acquired water for increased Delta outflow.
Vegetation and Wildlife Resources	**Retired and Fallowed Agricultural Lands.** The No Action Alternative assumes retirement of 45,000 acres of land identified in the San Joaquin Valley Drainage Plan as having drainage problems. An additional 30,000 acres would be retired under all alternatives including the Preferred Alternative. Additional habitat would occur from fallowing of 0.3 to 3 percent of irrigated acres in the Central Valley under the alternatives, including the 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 as a result of 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 as a result of Level 4 water supplies.

TABLE 3-4
Summary of CVPIA PEIS Analysis

Issue Area	Impacts and Benefits
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 the higher reservoir levels in Folsom Lake and Lake Oroville under all alternatives including the Preferred Alternative. **Opportunities at Rivers.** Given increased flows in the upper Sacramento River and Stanislaus River in peak season 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, swimming opportunities would increase under all alternatives. Lower flows in peak season on the American River led to decreased 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 because 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. **Economic Impacts and Benefits.** Recreation-related expenditures would increase by approximately 3 percent at reservoirs and rivers under all alternatives. Recreation-related expenditures at refuges would increase approximately 25 percent under Alternative 1 as a result of Level 2 water supplies, and 70 percent under Alternatives 2, 3, and 4 and the Preferred Alternative as a result of Level 4 water supplies.
Cultural Resources	**Cultural Resources at Reservoirs.** Water surface elevations would be lowered more frequently than historically at New Melones Reservoir under all alternatives, including the Preferred Alternative and at Folsom Lake and Shasta Lake under the Preferred Alternative as a result 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, coned 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 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. Additional agricultural lands would be fallowed under Alternatives 2, 3, and 4, and the Preferred Alternative, because 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

TABLE 3-4
Summary of CVPIA PEIS Analysis

Issue Area	Impacts and Benefits
	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, 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. 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 as a result 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 whether the impacts and benefits would occur as a result of a specific CVPIA provision or goal. The impacts and benefits of a PEIS alternative are the result of the overall implementation of CVPIA, compared to conditions without implementation of CVPIA in the No Action Alternative.

The impacts and benefits presented below for Alternative 1 include changes as a result of 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 resulting from 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 from acquisition and use of water from non-CVP water service contractors to improve fisheries at higher levels than under Alternative 2.

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

Given the integrated nature of the PEIS alternatives, it is not possible to determine whether the impacts and benefits would occur from a specific CVPIA provision or goal. The impacts and benefits of a PEIS alternative are the results of the overall implementation of CVPIA, 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 to Surface 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 to 568,000 acre-feet per year for Level 2 under all alternatives, including the Preferred Alternative. This would result in a decrease in CVP water deliveries, but the specific amount is difficult to determine given 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 from 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 per 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 from 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 during dry periods. The refuge water supplies were reduced by up to 25 percent during 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 through 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 during drier periods.

Impacts CVP water service contractors under the Preferred Alternative would be higher than Revised Alternative 1 because of 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 by up to 13 percent during dry periods. The refuge water supplies were reduced by up to 25 percent during 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 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. 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 as a result of 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 from Level 4 water supplies. Deficiencies during dry periods would be determined by the acquired water supplies. Therefore, deficiencies for refuges in the Sacramento River and San Joaquin River regions would be determined based on the Shasta Index. Deficiencies for refuges in the Tulare Lake region would be determined by the SWP deficiencies.

Impacts to Surface Water Quality

The primary concern about surface water quality related to refuge water supplies is based on 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 through August) and non-irrigation (September through 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, compared to 2 percent of the years under the No Action Alternative. This increased frequency of violations is primarily a result of reduced San Joaquin River flows of up to 3 to 10 percent in March, depending on 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 to Groundwater

Level 2 water supplies under all alternatives, including the 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, given 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 on 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 to CVP Power Resources

Level 2 water supplies under all alternatives, including the 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 from Level 2 water supplies is difficult to determine, given 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 and Benefits to Fisheries Resources

Level 2 and Level 4 water supplies under all alternatives, including the 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 before 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 follow-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. The Service conducted 5 years of detailed research, in cooperation with state and federal landowners, which 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 approximately one-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 due to Level 4 water supplies.

Under the No Action Alternative, hunting, fishing, and non-consumptive visitor use was 101,200 at the Sacramento River region refuges, 72,900 at the San Joaquin River region refuges, and 4,400 at the Tulare Lake River region refuges (as described above). Under Level 2 water supplies, visitor use would increase to 125,700 at the Sacramento River region refuges and 93,200 at the San Joaquin River region refuges. No change would occur at Tulare Lake River region refuges. The majority of the increased use would be the result of 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 the 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 the No Action Alternative to $193,000/year with Level 4 water supplies. No change would occur under Level 2 water supplies.

Impacts to 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 to 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, given 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 to 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.

3.2.6 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 along with their 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 from increased summer water temperatures in the American River could be mitigated by temperature-control devices on Folsom Dam.
- More potential for mosquito abundance from increased wetlands, including refuge wetlands, could be mitigated by increased abatement activities.
- Reductions in swimming opportunities in the American River 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 constructing or extending 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 from 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 from Restoration Fund charges
- Adverse impacts to fish from increased water temperatures in some streams
- Adverse impacts to fish from 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.

3.2.7 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 decisionmaker may determine that additional analysis is needed to reach a decision on how to implement any of 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 in 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 the San Joaquin River Basin

3.3.1 Overview of the NEPA/CEQA Documentation for Conveyance of Refuge Water Supplies for the San Joaquin River Basin

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 acted as the state lead agency for CEQA. The purpose of this document was to evaluate the environmental impacts of implementing alternative means of conveying water supplies to the San Luis NWR Complex; the Los Banos, Volta, and Mendota WAs; and Grasslands RCD.

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 Conveyance of Refuge Water Supply for San Joaquin Basin Action Plan and North Grasslands Area EA / IS was completed in December 1997 and focused on the environmental compliance phase of the project and addressed anticipated effects of constructing and / or improving existing conveyance facilities in the project area. Reclamation, in cooperation with the Service, CDFG, and local water districts, has been working in recent years to develop conveyance facilities to deliver those quantities of water required for full habitat development.

The Conveyance of Refuge Water Supply for Mendota WA EA / IS was completed in February 1998 and focused on the environmental compliance phase of the project and addressed anticipated effects of constructing and / or improving existing conveyance facilities for Mendota WA. Reclamation, in cooperation with the Service and CDFG, is in the process of providing and / or improving existing conveyance facilities to deliver those quantities of water required for full habitat development.

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 Projects was a result of capacity constraints and/or maintenance requirements in existing delivery systems. Water supplies were historically conveyed on an as-available basis, which was not consistent with refuge needs. Conveyance facilities were not designed to convey peak daily refuge requirements in addition to existing customer demands or were 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.

3.3.2 Current Conveyance Facilities

Water for the Merced Unit is delivered from Deadman Creek and the Eastside Bypass, and from the Merced River through the Merced Irrigation District facilities. Improvements to conveyance facilities for delivery of water to the Merced Unit were completed in 1995/96. Modifications to these conveyance facilities to deliver water to the East Bear Creek Unit are currently being evaluated.

The Kesterson, Salt Slough, and Freitas Units receive CVP water through the Grassland WD canals. The San Luis Unit and the Los Banos WA receive CVP water through San Luis Canal Company and Central California Irrigation District canals. The West Bear Creek Unit receives CVP water via San Luis Canal Company canals. Water is delivered to Volta WA from San Luis Reservoir or O'Neill Forebay via the Delta-Mendota Canal or the Volta Wasteway. The Grassland RCD, China Island Unit, and Salt Slough Unit receive CVP water through Grassland WD and from the Delta-Mendota Canal. These facilities do not have adequate capacity to provide Level 4 water supplies. No additional conveyance facilities are needed to deliver water to the Freitas Unit.

Mendota WA receives water from the Mendota Pool via Fresno Slough. The water supply is interrupted periodically due to dewatering of Mendota Pool for safety of dams inspection at Mendota Dam, Mendota Pool and canal maintenance, and maintenance of ditches and levees within the refuge. Therefore, full water supplies cannot be delivered to the refuge.

3.3.3 Conveyance for Refuge Water Supply Alternatives for Kesterson and San Luis Units, Los Banos and Volta WAs, Grassland RCD, China Island Unit, Freitas Unit, West Bear Creek Unit, and Salt Slough Unit

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

Two alternatives were considered for this refuge complex. The Dependent System Alternative would use agricultural water district facilities. The China Island Unit would be serviced from the Central California Irrigation District Main Canal through the new Newman Wasteway Canal and J Lateral. Portions of the Grassland RCD would be served from the Main Canal through a new pipeline along Cottonwood Road. Volta WA and portions of Grassland RCD would be served from the Delta-Mendota Canal via the San Luis

Wasteway. Mosquito Ditch and Spillway Ditch would need to be improved by raising canal embankments. A portion of the Santa Fe canal would be improved through silt removal and channel modification. New turnouts from the Delta Mendota Canal and the Orleans Canal, enlargement of O'Banion Bypass and the Main Canal, and capacity improvements to the San Luis Canal would be required for a portion of Grassland RCD, Kesterson Unit, Los Banos WA, Freitas Unit, and Salt Slough Unit. The San Luis Canal Company would continue to serve Los Banos WA and San Luis Unit. The West Bear Creek Unit would be served by the Island C Extension. This alternative would require negotiations with Central California Irrigation District, San Luis Canal Company, and Grassland WD.

The second alternative, the Independent System Alternative, would provide year-round supplies directly from the Delta-Mendota Canal through an independent system to meet peak demands. A new turnout from the Delta Mendota Canal would divert CVP water to the Newman Wasteway Canal and the J Lateral. A second new turnout would divert water to a new Cambria Canal and third new turnout would divert water to the Charleston Lateral to serve the southern portion of the refuges. The Helm Canal and San Luis Canal would be enlarged and extended. Smaller laterals (Southside Ditch, Wolfsen Canal, and Northside Canal) would be constructed to serve the Los Banos WA and San Luis Unit. This alternative would require negotiations with Grassland WD.

The Dependent System Alternative was preferred because of less disruption to the soil, biological, and cultural resources than the Independent System Alternative. However, the Dependent Alternative provides less flexibility due to the interaction with irrigation districts that operate portions of the canals as compared to the Independent System Alternative.

Summary of Analyses of Alternatives

Impacts identified by the EA/IS were primarily related to soil, water, biological, and cultural resources impacts. Mitigation measures were also identified to reduce the impacts to a level of less than significant. The results of the impact analysis are summarized below.

Soils

Construction could temporarily impact agricultural production, cause wind erosion from disturbed soils, increase the potential for weed growth in disturbed soils, and increase the potential for exposure to toxic materials that may be present in the soil mantle. These impacts would be mitigated by watering disturbed areas to reduce soil blowing; and by minimizing the extent of disturbed soils by minimizing new facilities construction to reduce the potential for exposure of weedy species seeds and soils that may contain toxic materials that could be exposed to runoff.

Water Resources

Evaluation of the water resource impacts was focused on impacts due to refuge operations, as described in Section 4 of this report. No other impacts were identified.

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 3 years following construction.

Cultural Resources

Specific field surveys would be completed before construction along specific routes. If resources are discovered, a certified archeologist would develop a plan to protect appropriate resources, in accordance with the requirements of the State Historic Preservation Officer, Advisory Council on Historic Preservation, and Section 106 of the National Historic Preservation Act.

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

3.3.4 Conveyance for Refuge Water Supply Alternatives for Mendota WA

The No Action Alternative would involve continued use of existing conveyance systems that would limit refuge water supplies to less than Level 2. The dam must be dewatered frequently for dam inspection and repairs.

Two alternatives were considered for the Mendota WA. The first alternative, Facilities Reoperation, would modify operation of Mendota Dam and Pool to reduce the maintenance period from Thanksgiving to January 15 to a period between Thanksgiving and December 15. No new facilities would be required. High seepage from the dam would continue to occur which results in losses for the Central California Irrigation District. This alternative could lead to more frequent dam inspections and reduced operations over the long-term period.

The second alternative, Dam Replacement, would involve replacing the dam with a facility that would eliminate seepage problems and increase the capacity of the Mendota Pool from 3,000 acre-feet to 3,013 acre-feet. The new dam would include fish passage facilities.

The Dam Replacement Alternative was preferred because it provided the most flexibility and benefits to habitat on the refuge. In addition, it improved operation of Mendota Dam and Pool.

Summary of Analyses of Alternatives

Impacts identified by the EA/IS were primarily related to soil, water resources, biological resources, and cultural resources impacts. Mitigation measures were also identified to

reduce the impacts to a level of less than significant. The results of the impact analysis are summarized below.

Soils

Construction could temporarily cause wind erosion from disturbed soils. These impacts would be mitigated by watering disturbed areas to reduce soil blowing. In addition, spill prevention plans and contingency plans would be developed by the construction contractor.

Water Resources

Evaluation of the water resources impacts focused on impacts resulting from refuge operations, as described in Section 4 of this report. No other impacts were identified.

Biological Resources

Impacts would continue to the refuge habitat under the Facilities Operation Alternative. These impacts would be eliminated under the Dam Replacement Alternative:

- Approximately 2.77 acres of riparian woodland and 1.20 acres of upland habitat would be acquired near the new dam site to replace habitat loss under the Dam Replacement Alternative.
- The new dam, under the Dam Replacement Alternative, would be retrofitted with a fish passageway that would be designed to minimize predation.
- 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

Specific field surveys would be completed prior to construction along specific routes. If resources are discovered, a certified archeologist would develop a plan to protect appropriate resources, in accordance with the requirements of the State Historic Preservation Officer, Advisory Council on Historic Preservation, and Section 106 of the National Historic Preservation Act.

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

3.3.5 Implementation of Conveyance Facilities for Refuge Water Supplies

The EA / IS documents for Conveyance of Refuge Water Supplies and the associated Finding of No Significant Impact were completed by Reclamation. 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 which are the subject of this document.

3.4 Management of Wildlife Areas

A Mitigated Negative Declaration was completed in April 1998 for the North Grasslands WA (China Island Unit, Salt Slough Unit, and Gadwall Unit, which is not discussed in detail in this document) by CDFG. The project was to enhance, restore, and manage 6,335 acres of wildlife habitat. This plan included restoration and development of the water conveyance facilities, restoration of habitat, and administration of the lands for regulated public use. The only identified adverse impacts were related to potential impacts to Delta button celery, an endangered species. To mitigate these impacts, water conveyance pipeline routes were selected to minimize disturbance, pipe material was specified for reinforced concrete to minimize the extent of disturbed soils, topsoil removed during construction was stockpiled and replaced, construction was limited to periods following maturity of this annual plant, water was not distributed to areas with potential Delta button celery habitat during the summer months, water was distributed to areas with potential Delta button celery habitat during the winter months only if these areas had been subjected to historical flooding, and a monitoring program was established to protect Delta button celery during and following construction. An experimental technique to recolonize Delta button celery will be attempted.

A Mitigated Negative Declaration was completed in March 1994 for the Mendota WA by CDFG. The project was to manage 12,425 acres of wildlife habitat. This plan included restoration of wetland and riparian habitat, production of food and cover crops, and administration of the lands for regulated public use. The major action considered under this CEQA document was continued and improved management of refuge lands. The only identified adverse impacts related to water resources focused on impacts from refuge operations, as described in Section 4 of this report.

A Mitigated Negative Declaration was completed in October 1988 for the Los Banos WA by CDFG. The project was to enhance, restore, and manage 2,378 acres of acquired land wildlife habitat. This plan included enhancement and restoration of habitat and administration of the lands for regulated public use. The major action considered under this CEQA document was the conversion of alkali meadows, irrigated pasture, and permanent pasture to wetlands, marsh, water, and grain crops. The only identified adverse impacts were related to potential impacts to soils and loss of habitat due to expansion of the parking lot at the visitor center. To mitigate these impacts, construction disruption would be minimized to reduce erosion potential. The increased habitat value of the refuge would provide compensation for the loss of habitat at the parking lot.

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, which addresses how the Level 2 and Level 4 water supplies would be used on the refuges to achieve the purposes of the CVPIA. This section also provides a description of alternatives considered but not carried forward for detailed analysis.

4.2 Water Service Agreement

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, a 25-year water supply contract with CDFG, and a 25-year water supply contract with Grassland WD to provide Level 2 water supplies from CVP yield to the refuges of the San Luis NWR Complex, the State WAs, and private wetlands in the Grassland RCD, 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 25-year water supply agreements/contracts with the Service, CDFG, and Grassland WD to provide Level 2 water supplies from CVP yield to the refuges, and that the long-term water supply 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 supply agreement of the No Action Alternative are shown in Table 4-1. Level 2 and Level 4 water supplies would be delivered on the estimated monthly patterns identified in the *Report on Refuge Water Supply Investigations* (Reclamation, 1989).

Water Management Planning on State and Federal Refuges

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 in the San Joaquin River Basin under the No Action Alternative

Refuge	Level 2 (acre-feet)	Level 2 + Level 4 Increment (acre-feet)
National Wildlife Refuges		
San Luis Unit	13,350	19,000
West Bear Creek Unit	7,207	10,810
Kesterson Unit	3,500	10,000
Freitas Unit	3,527	5,290
Merced Unit	13,500	16,000
East Bear Creek Unit	8,863	13,295
State Wildlife Areas		
Los Banos WA	16,670	25,000
Volta WA	10,000	16,000
North Grasslands WA		
China Island Unit	6,967	10,450
Salt Slough Unit	6,680	10,020
Mendota WA	18,500	29,650
Grassland Resource Conservation District		
Grassland RCD	125,000	180,000

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 ICP's goals, as overseen by the Task Force, were to:

- Provide background information on optimum management scenarios for refuge water supplies
- Identify methods of effective use of wetland water supplies
- Assure that a process is in place for public input that can be applied consistently to assist in refuge management decisions
- 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. Task Force members generally agreed 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 the 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, the Service, CDFG, and Grassland WD would be implemented. Therefore, the No Action Alternative also assumes preparation and implementation of a Water Use Plan for each refuge.

Water Management Planning on Lands Serviced by the Grassland Water District

The Grassland WD has prepared a Water Management Plan (Stoddard & Associates, 1998), which is a comprehensive water management plan that will increase water-use efficiency on Grassland RCD lands, while providing optimum wetland habitat as a priority. The Water Management Plan addresses the following issues:

- The various sources of water available to the Grassland WD and the extent of beneficial uses of the water
- The specific water needs to provide optimum wetland habitat
- An inventory of ongoing water management activities on lands served by the Grassland WD, aimed at improving wetland habitat

- Development of Water Management Units (WMUs) within the Grassland WD for the purposes of inflow and outflow measurements and quantifying beneficial use in the WMUs
- Best management practices that can be implemented to improve overall water use efficiency on Grassland RCD lands served by the Grassland WD
- Schedules, budgets, and expected project results of implementing various best management practices

If accepted by Reclamation, Grassland WD's Water Management Plan will fulfill the requirement to prepare a Water Management Plan specified in the water service contract between Reclamation and the Grassland WD.

4.2.2 Proposed Action

Under the Proposed Action, Reclamation would enter into long-term water service agreements/contracts with the Service, CDFG, and Grassland WD to provide 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 water service agreements would be in effect for 25 years. The major provisions of the water service agreements are summarized in Table 4-2.

TABLE 4-2
Summary of the Proposed Water Service Memorandum of Understanding with the U.S. Fish and Wildlife Service, and the Proposed Refuge Water Supply Contracts with the California Department of Fish and Game and the Grassland Water District.[a]

Article	Discussion
Quantities of Water:	Refuge water supplies will be provided both from the CVP and from other sources, as described below. The USFWS, CDFG, and Grassland WD 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.
San Luis Unit	Reclamation will provide the full Level 2 supply of 13,350 acre-feet per year, and will seek to acquire the Level 4 increment of 5,660 acre-feet per year through voluntary measures for a total potential water delivery of 19,000 acre-feet per year.
West Bear Creek Unit	Reclamation will provide the full Level 2 supply of 7,207 acre-feet per year, and will seek to acquire the Level 4 increment of 3,603 acre-feet per year through voluntary measures for a total potential water delivery of 10,810 acre-feet per year.
Kesterson Unit	Reclamation will provide the full Level 2 supply of 3,500 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 10,000 acre-feet per year.
Freitas Unit	Reclamation will provide the full Level 2 supply of 3,527 acre-feet per year, and will seek to acquire the Level 4 increment of 1,763 acre-feet per year through voluntary measures for a total potential water delivery 5,290 acre-feet per year.
Merced Unit	Reclamation will supplement deliveries by the Merced Irrigation District to the extent necessary, by reimbursing the Service for groundwater pumping costs and/or acquiring additional water supplies up to the full Level 2 and Level 4 amounts.
East Bear Creek Unit	Reclamation will provide the Level 2 supply of 8,863 acre-feet per year (corresponding to the percentage of the East Bear Creek Unit in federal ownership), and will seek to acquire the Level 4 increment of 4,432 acre-feet per year through voluntary measures for a total potential water delivery of 13,295 acre-feet per year.

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 Contracts with the California Department of Fish and Game and the Grassland Water District.[a]

Article	Discussion
Los Banos WA	Reclamation considers 6,200 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 10,470 acre-feet per year, and will seek to acquire the Level 4 increment of 8,330 acre-feet per year through voluntary measures for a total potential water delivery of 25,000 acre-feet per year (19,800 acre-feet per year by Reclamation).
Volta WA	Pursuant to its management agreement with CDFG, Reclamation will provide up to 13,000 acre-feet per year to the Volta WA (3,000 acre-feet per year more than Volta's Level 2 amount). Reclamation will also seek to acquire the remaining portion of the Level 4 increment (3,000 acre-feet per year) through voluntary measures for a total potential water delivery of 16,000 acre-feet per year.
China Island Unit	Reclamation will provide the full Level 2 supply of 6,967 acre-feet per year, and will seek to acquire the Level 4 increment of 3,483 acre-feet per year through voluntary measures for a total potential water delivery 10,450 acre-feet per year.
Salt Slough Unit	Reclamation will provide the full Level 2 supply of 6,680 acre-feet per year, and will seek to acquire the Level 4 increment of 3,340 acre-feet per year through voluntary measures for a total potential water delivery 10,020 acre-feet per year.
Mendota WA	Reclamation considers CDFG's existing water contracts for 27,594 acre-feet per year to be firm, reliable water supplies of suitable quality that provide Level 2 and a portion of Level 4 demands. Reclamation will seek to provide 2,056 acre-feet per year through voluntary measures for a total potential water delivery of 29,650 acre-feet per year.
Grassland RCD	Reclamation will provide the full Level 2 supply of 125,000 acre-feet per year, and will seek to provide 55,000 acre feet per year through voluntary measures for a total potential water delivery of 180,000 acre-feet per year.
Term of Agreements	25 years
Water Delivery Schedule	On or before 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 priority or priorities that applied to such water prior to its acquisition for Level 4 supplies.

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 Contracts with the California Department of Fish and Game and the Grassland Water District.[a]

Article	Discussion
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 in project operations and contractors.
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 Water Management Team, each refuge shall prepare a Water Management Plan to address the effective and efficient use of water on the refuge, following the general guidelines of the *Interagency Coordinated Program Task Force* report. Implementation of the plans would be monitored in annual reports submitted to Reclamation, and the plans would be updated on a five-year schedule for the term of each agreement. Any identified water savings may be reallocated to other wetland, wildlife or fishery needs under the direction of an Interagency Refuge Water Management Team and subject to Reclamation's determination regarding impacts in project operations and contractors
The following applies only to the proposed contracts with the California Department of Fish and Game and the Grassland Water District (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

[a] The provisions applicable to the San Luis NWR Complex are part of a joint MOU with the Service including the Kern and Pixley NWRs in the Tulare Lake Basin.

Water Management Planning

The Water Service Agreements include the requirement that Water Use Plans be prepared for the refuges. 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.

4.3 On-Refuge Management

Habitat management on refuges within the San Joaquin River Basin focuses on providing wetland habitats for migratory waterfowl. Crops and pasture are also grown on some wildlife areas to provide foraging and loafing habitat for sandhill cranes and geese during winter. In addition, several of the state and federal refuges support native upland habitat, which is managed and protected to provide habitat for federally and state-listed species.

The major habitat types occurring on state, federal, and private wetlands in the San Joaquin Basin are:

- Seasonal wetlands / moist soil impoundments
- Semi-permanent wetlands
- Permanent wetlands
- Cropland, including irrigated pasture, grain, or corn
- Riparian habitat
- Uplands, primarily natural grasslands

Water is actively managed to maintain the first four habitat types. Water management practices are discussed below for each of the habitat types. These practices would be the same for the No Action Alternative and the Proposed Action. It is important to note that the water requirements described below are averages. More or less water may be required in any given year, depending on precipitation patterns.

4.3.1 Habitat Management

Seasonal Wetlands

Seasonal wetlands are inundated fields or ponds that are managed primarily to grow seed and to produce invertebrates for migratory waterfowl, shorebirds, and other wetland-dependent wildlife. These wetlands are usually flooded from October through March, and are dry for the rest of the year, except for summer irrigation. Some seasonal wetlands are inundated by early August, depending on the habitat required for early-arriving waterfowl, and some seasonal wetlands may be kept inundated through April to provide habitat for migrants that do not depart to northern breeding habitats until that time (Reclamation, et al., 1995).

Primary food production plants in seasonal wetlands are watergrass, smartweed, swamp timothy, and alkali bulrush. Seasonal wetlands are typically irrigated during the summer to produce large quantities of these food plants. Water requirements differ among the plant species. Swamp timothy requires the fewest irrigations and, consequently, the least amount of water to produce. Watergrass can require several irrigations during the summer and has the highest water requirements of the moist soil plants (Reclamation, et al., 1995). Watergrass is considered one of the most productive and important waterfowl foods in California (Reclamation, et al., 1998).

Production of food plants and management of seasonal wetlands typically have the following water management pattern (Reclamation, et al., 1995). Drawdown (draining of winter floodwater and drying of the soils) would occur in the spring. For swamp timothy, drawdown is usually accomplished from last 2 weeks of March through the first 2 weeks of

April, while in units managed for watergrass the drawdown is later, occurring from early April through early May. The soils dry and warm to allow germination of seeds and initial vegetation growth. Depending on weather patterns and soil composition, a first irrigation is applied in the last 2 weeks of April through the first 2 weeks in May for swamp timothy, or from late May to early June for watergrass. A second irrigation to ensure heavy seed production and vegetative structure is applied during the last 2 weeks of May through the first 2 weeks of June for swamp timothy, or for watergrass during late June to July. Depending on soil composition and weather conditions, swamp timothy may not require a second irrigation (Reclamation, et al., 1998). Swamp timothy is then left dry to let the plants mature and the seeds cure before fall. Watergrass may receive a third irrigation before fall (Reclamation, et al., 1998). Fall flooding is initiated in September or October, although some units may be flooded in August to provide habitat for early-arriving waterfowl.

Water requirements for seasonal wetlands will vary from year to year and among locations, depending on weather conditions, soil composition, topography of wetland units, and target food plants. Average water requirements for seasonal wetlands range from approximately 4.1 acre-feet per acre on units managed for swamp timothy to 8.5 acre-feet on units managed for watergrass (Reclamation, et al., 1998; Reclamation, et al., 1995). In dry years, more water may be necessary, while in wet years less water would be adequate.

Semi-Permanent Wetlands

Semi-permanent wetlands are kept flooded for 8 months or more of the year, and are managed to provide wetland habitat during the summer when the expanses of seasonal wetlands are not flooded. Water is maintained at greater depths in semi-permanent wetlands than in seasonal wetlands. Semi-permanent wetlands provide production habitat for many species of resident water birds, and foraging habitat for other wetland-dependent wildlife. Water requirements for semi-permanent wetlands are greater than those required for seasonal wetlands of a comparable size because they are flooded for a longer period of time and are maintained through the hottest, driest times of the year. (Reclamation, et al., 1995)

Water requirements for semi-permanent wetlands vary with the length and timing of inundation, as well as weather conditions and soil composition, which affect water loss through seepage and evaporation. Some semi-permanent wetland units are allowed to go dry as early as August as seasonal wetlands are flooded, while other semi-permanent wetlands will require water from February through November (Reclamation, et al., 1995). Water requirements for semi-permanent wetlands range from approximately 7.4 acre-feet per acre to 9.5 acre-feet per acre (Reclamation and CDFG, 1995; Service, 1996; Reclamation, et al., 1998). These amounts vary from wetland to wetland and from year to year.

Permanent Wetlands

Permanent wetlands 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 3 to 4 years (Service, 1996). Water depths in permanent wetlands are deeper than they are in seasonal wetlands, but are still relatively shallow. When properly situated, permanent wetlands can act as reservoirs for

water supply to other habitats. They can also be maintained through runoff from other habitats. Water requirements for permanent wetlands are greater than they are for semi-permanent wetlands, because water is maintained in the units year round. Water requirements for permanent wetlands range from approximately 10 acre-feet per acre to 13.6 acre-feet per acre (Reclamation and CDFG, 1995; Service, 1996; Reclamation, et al., 1998). These amounts vary from wetland to wetland and from year to year.

Irrigated Pasture and Croplands

Croplands are fields that are managed to produce food and cover crops that do not occur naturally and that require more intensive farming to maintain than the food and cover produced in wetland habitats. Three distinct subtypes of croplands are managed on the WAs: irrigated pasture, corn production, and small grain production.

Irrigated pasture is primarily managed to create nesting cover, but may also be managed later in the year to produce short, green, grazing and loafing habitat for sandhill cranes and geese during the winter. Vegetation within irrigated pasture may consist of Dallas grass, perennial fescue, ryegrass, clovers, vetch, and trefoil. This vegetation will typically require periodic irrigation through the summer to remain vigorous. Estimated water requirements for irrigated pasture range from 3 acre-feet per acre to 4.24 acre-feet per acre (Reclamation, et al., 1998; Service, 1996).

Corn production is labor-intensive and requires considerable water. However, corn produces large quantities of high-energy food used by all seed-eating wildlife. Corn is grown primarily to feed sandhill cranes and geese during the winter. The average annual water requirement for corn is 4.5 acre-feet of water per acre (Reclamation, et al., 1995).

Small grain production croplands are used to produce food and cover. The primary crops grown are barley, wheat, safflower, and vetch. All of these crops are planted in the fall or winter, and produce good crops of high-energy food using little water. These crops also provide nesting and escape cover in the spring and summer. The advantage of the small grains is that they provide fall green feed and diversity, and can be produced with a minimum of water during a typical mild winter. The average annual water requirement for small grain production is 1.75 acre-feet per acre (Reclamation, et al., 1995).

Dry Year Management

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

In critically dry years, when water availability would be reduced, the diversity, acreage, and duration of availability of wetland habitats would be reduced. Refuge management objectives would shift to emphasize habitats with the lowest water requirements. Seasonal wetlands require the least amount of water. As a result, 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. Table 4-3 displays Grassland RCD's priority ranking of water uses during periods of limited water availability.

TABLE 4-3
Dry Year Management Priorities for Wetland Habitat Management in the Grassland RCD

Priority	Water Use Practice	Comments
1	Fall habitat and associated maintenance	Important for providing wintering habitat for migratory waterfowl
2	Early fall habitat	Important for early migratory waterfowl and resident wildlife
3	Summer water management	Important for locally breeding waterfowl and resident wetland-dependent wildlife
4	Spring irrigation	Important for moist-soil plant management and late-migrating birds
5	Summer irrigation	Important for enhanced moist-soil management and wintering waterfowl forage
6	Spring maintenance	Important for maintaining habitat for wintering and resident waterfowl, shorebirds, and moist-soil management
7	Salt balance management	Important for improving soil conditions, and the quality of wetland habitat

Source: Reclamation, et al., 1998.

4.3.2 San Luis National Wildlife Refuge Complex

The San Luis NWR Complex is managed for a diversity of habitats to achieve the goals for the NWR system. In addition, the former Action Plan units and the Kesterson and San Luis Units are managed to provide long-term mitigation for Kesterson Reservoir. The San Luis NWR Complex is managed primarily to provide seasonal wetlands for migratory waterfowl. Permanent and semi-permanent wetlands are maintained on the units to provide habitat for year-round and summer resident wildlife. Irrigated pasture and corn are also managed for on the Merced Unit and planned for on the East Bear Creek Unit to provide upland foraging opportunities for geese and sandhill cranes. In addition to providing foraging opportunities, irrigated pasture provides nesting cover for breeding waterfowl and other birds.

No Action Alternative

Habitat Management

Under the No Action Alternative, on-refuge management at the San Luis NWR Complex would be in accordance with the assumptions of the CVPIA PEIS Preferred Alternative. 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) and the *San Joaquin Basin Action Plan/Kesterson Mitigation Plan* (Reclamation, et al., 1989). The acres of each habitat type that would be managed using firm Level 2 water supplies and the Level 4 increment are shown in Table 4-4.

TABLE 4-4
Acres of Habitat Expected on the San Luis NWR Complex under the No Action and Proposed Action[a] that Would Be Managed Using Water Provided under the CVPIA

	No Action		Proposed Action
Habitat	**Level 2**	**Level 4**	**Level 4**
San Luis Unit			
Semi-permanent/permanent wetland	80	150	293
Seasonal wetland	2,950	3,400	2,166
Riparian habitat	-	-	1,160
Total managed wetland	**3,030**	**3,550**	**3,619**
West Bear Creek Unit			
Semi-permanent/permanent wetland	156	156	111
Seasonal wetland	1,321	1,321	1,168
Riparian habitat	-	-	72
Total managed wetland	**1,477**	**1,477**	**1,351**
Kesterson Unit/Freitas Unit[b]			
Semi-permanent/permanent wetland	375	535	516
Seasonal wetland	686	1,456	1,490
Riparian habitat	-	-	18
Total managed wetland	**1,061**	**1,991**	**2,024**
Merced Unit			
Semi-permanent/permanent wetland	20	60	82
Seasonal wetland	680	1,140	1,122
Riparian habitat			43

TABLE 4-4
Acres of Habitat Expected on the San Luis NWR Complex under the No Action and Proposed Action[a] that Would Be Managed Using Water Provided under the CVPIA

	No Action		Proposed Action
Habitat	**Level 2**	**Level 4**	**Level 4**
Irrigated upland (pasture and cereal grains)	-	-	615
Total managed wetland and irrigated upland	**700**	**1,200**	**1,862**
East Bear Creek Unit			
Semi-permanent/permanent wetland	342	342	80
Seasonal wetland	2,341	2,341	675
Riparian habitat	-	-	100
Irrigated upland (pasture and cereal grains)	1,072	1,072	310
Total managed wetland and irrigated upland	**3,755**	**3,755**	**1,165**

[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]The Freitas Unit has been incorporated into the former Kesterson NWR.

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 controlling mosquito populations on the refuges. However, the refuges of the San Luis NWR Complex are relatively removed from towns, and the Mosquito and Vector Control Districts have not conducted control activities on the refuges in recent years. Given the lack of control efforts needed on the refuges, the Service does not have an agreement with the local Mosquito Districts for control activities. If control activities were necessary in the future, the refuge would develop agreements with the local Mosquito and Vector Control Districts, as necessary to allow control programs to proceed in a manner consistent with the refuge's purposes.

Listed Species Management

The refuges of the San Luis NWR Complex are managed to achieve multiple objectives related to wildlife and wildlife-dependent recreation. One of the management objectives for the refuges is to provide habitat and to manage for endangered, threatened, and sensitive species. As a federal agency, the Service has an obligation under the ESA to ensure that its activities in managing the refuges do not adversely affect federally listed species or designated critical habitat. Therefore, management actions, biological surveys, and research programs on the San Luis NWR Complex are conducted and coordinated in consideration of the needs of listed species. Such consideration of listed species in conducting management activities on the refuges would continue under the No Action.

Proposed Action

Habitat Management

Since preparation of the 1989 Reports, refuge managers have refined habitat management objectives to provide the greatest benefit to wildlife on the refuges. In addition, site-specific restoration plans have been developed for the Action Plan lands. As a result, habitat conditions expected with full Level 4 water supplies have been refined from those predicted when the CVPIA PEIS was prepared. The Proposed Action includes these revised habitat projections (Table 4-4).

The acreages in Table 4-4 reflect the types of habitat that each management unit primarily provides. However, management of a unit may be modified in a given year in response to water availability and management needs. In addition, management objectives for the refuges may be refined over time, resulting in changes in the types of habitats emphasized. For these reasons, the habitat composition on each unit would fluctuate around the values presented in Table 4-4.

Mosquito Abatement

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

Listed Species Management

Under the Proposed Action, the Service would implement conservation and take-avoidance measures to protect federally listed and state-listed species, as well as other special-status species, from impacts that could occur on the San Luis NWR Complex as a result of on-refuge management activities. Although the Service currently considers the needs of listed species in conducting its management activities, under the Proposed Action, action necessary to protect listed species would be formally specified in and required by a Biological Opinion. Species-specific measures would be implemented for the species listed in Table 4-5. The conservation and take avoidance measures vary among the species. In general, the measures consist of:

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

In addition to these measures, the Service's Endangered Species Division is to be contacted in the event that take of one of the special-status species cannot be avoided in order to develop circumstance-specific mitigation measures. Conservation and take-avoidance measures that would be implemented for each species are provided in Table C-1 of Appendix C. These measures are consistent with requirements of the Biological Opinion for implementation of the CVPIA.

TABLE 4-5
Special-Status Species for which the Service Would Implement Conservation and Take-Avoidance Measures under the Proposed Action

Bald eagle (*Haliaeetus leucocephalus*)	Giant garter snake (*Thamnophis gigas*)
Aleutian Canada goose (*Branta canadensis leucopareia)*	Blunt-nosed leopard lizard (*Gambelia sila*))
Conservancy fairy shrimp (*Branchinecta conservatio*)	Fresno kangaroo rat (*Dipodomys nitratoides exilis*)
Longhorn fairy shrimp (*Branchinecta longiantenna*)	Giant kangaroo rat (*Dipodomys ingens*)
Vernal pool fairy shrimp (*Branchinecta lynchi*)	San Joaquin kit fox *(Vulpes macrotis mutica)*
Vernal pool tadpole shrimp (*Lepidurus packardi*)	Colusa grass (*Neostapfia colusana*)
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	

4.3.3 California Department of Fish and Game Wildlife Areas

CDFG manages four WAs in the San Joaquin Valley that are covered by this EA/IS: Los Banos WA, Volta WA, North Grasslands WA, and Mendota WA. The WAs are managed primarily to provide seasonal wetlands for migratory waterfowl. Permanent and semi-permanent wetlands are also maintained on the units to provide habitat for year-round and summer-resident wildlife. Small grains and irrigated pasture are also managed on the WAs to provide upland foraging opportunities for geese and sandhill cranes, and nesting cover for breeding waterfowl and other birds.

No Action Alternative

Habitat Management

Under the No Action Alternative, on-refuge management at the State WAs would be in accordance with the assumptions of the CVPIA PEIS Preferred Alternative. 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) and the *San Joaquin Basin Action Plan/Kesterson Mitigation Plan* (Reclamation, et al., 1989). The acres of each habitat type that would be managed using firm Level 2 water supplies and the Level 4 increment are shown in Table 4-6.

Mosquito Abatement

The local Mosquito and Vector Control Districts are responsible for control of mosquitoes on the State WAs. For each of the WA's, CDFG has a contract with the local district whereby the WA pays the Mosquito District for any control efforts that the district undertakes. The Mosquito and Vector Control Districts determine when control is necessary and what measures to employ, except that CDFG regulates the use of toxic chemicals on the WA.

Mosquito control efforts on the WAs range from 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, the WA managers and the CDFG strongly discourage the use of toxic chemicals for mosquito abatement on the WA when alternative biological controls can be used.

TABLE 4-6
Acres of Habitat Expected on the CDFG's WAs in the San Joaquin River Basin under the No Action and Proposed Action[a] that Would Be Managed with Water Provided under the CVPIA

	No Action		Proposed Action
Habitat	**Level 2**	**Level 4**	**Level 4**
Los Banos WA			
Semi-permanent/permanent wetland	484	900	650
Seasonal wetland	1,500	1,000	2,340[b]
Moist soil impoundment	500	850	
Irrigated upland (pasture and cereal grains)	724	458	855
Total managed wetland and irrigated upland	**3,208**	**3,208**	**3,845**
Volta WA			
Semi-permanent/permanent wetland	350	500	500
Seasonal wetland	50	850	2,350[b]
Moist soil impoundment	2,250	1,500	
Irrigated pasture (pasture and cereal grains)	350	150	150
Total managed wetland and irrigated upland	**3,000**	**3,000**	**3,000**
North Grasslands WA – China Island Unit			
Semi-permanent/permanent wetland	118	118	185
Seasonal wetland	1,002	1,002	995[b]
Moist soil impoundment	430	430	
Irrigated upland (pasture and cereal grains)	-	-	630
Total managed wetland and irrigated upland	**1,550**	**1,550**	**1,810**
North Grasslands WA – Salt Slough Unit			
Semi-permanent/permanent wetland	151	151	125
Seasonal wetland	955	955	918[b]
Moist soil impoundment	-	-	
Irrigated upland (pasture and cereal grains)	602	602	720
Total managed wetland and irrigated upland	**1,708**	**1,708**	**1,763**
Mendota WA			
Semi-permanent/permanent wetland	-	-	-
Seasonal wetland	2,072	4,026	7,400[b]
Moist soil impoundment	-	3,374	
Irrigated upland (pasture and cereal grains)	1,940	1,940	1,940
Total managed wetland and irrigated upland	**4,012**	**9,340**	**9,430**

[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]Portions of the seasonal wetlands are managed as moist soil impoundments. The amount varies from year to year.

Extreme care is taken to minimize mosquito production on the WA by closely coordinating irrigation and fall flood-up activities with the local mosquito districts. The CDFG takes various management actions to minimize mosquito production on the area, such as eliminating shallow, standing water, to the extent possible, in order to reduce the financial impact mosquito abatement has on the operating budgets for the WAs.

Listed Species Management

The WAs provide habitat for a number of federally and state-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 WAs without first holding internal consultation with the CDFG's Environmental Services Division. Each of the Management Plans for the State WAs have undergone consultation, as required by the California ESA, regarding the effects of implementing the management plan on listed species. Measures specified in the California ESA Biological Opinions to be implemented to avoid jeopardy to listed species are summarized for each refuge in Table C-2 of Appendix C. In addition to these measures, listed species on each of the WAs benefit greatly through habitat management and enhancement on the WAs.

Proposed Action

Habitat Management

Since 1993, following passage of the CVPIA, the State WAs have been receiving Level 2 water supplies (except in drought years) and an increasing amount of the Level 4 increment. This firm reliable water has provided the refuge managers with an opportunity to refine habitat management objectives to provide the greatest benefit to wildlife on the refuge. As a result, the habitat conditions that are expected with full Level 4 water supplies have been refined from those predicted when the CVPIA PEIS was prepared. The Proposed Action includes these revised habitat expectations (Table 4-6).

The acreages in Table 4-6 were derived based on the habitat that each wetland unit primarily provides. However, management of a unit may be modified in a given year in response to water availability and management needs. In addition, management objectives for the refuges may be refined over time resulting in changes in the habitats emphasized. For these reasons, the habitat composition on each unit would fluctuate around the values presented in Table 4-6.

Mosquito Abatement

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

Listed Species Management

Under the Proposed Action, CDFG would continue to manage listed and special-status species in accordance with the California ESA Biological Opinions for each of the State WAs. CDFG would also implement additional conservation and take-avoidance measures for federally listed species and other special-status species. Species-specific measures would be implemented for the species listed in Table 4-7 on the refuges where they occur. The revised measures are necessary for consistency with the Biological Opinion being prepared for implementation of the CVPIA.

The conservation and take-avoidance measures vary among the species. In general, the measures consist of:

- Avoiding disturbance to nesting or denning individuals
- Surveying for species before conducting earth-moving activities

TABLE 4-7
Special-Status Species for which CDFG Would Implement Conservation and Take-Avoidance Measures under the Proposed Action

Bald eagle - All (*Haliaeetus leucocephalus*)	San Joaquin kit fox – Mendota only *(Vulpes macrotis mutica)*
Aleutian Canada goose - All (*Branta canadensis leucopareia*	Palmate-bracted birds-beak – Mendota only (*Cordylanthus palmatus*)
Valley elderberry longhorn beetle - All (*Desmoserus californicus dimorphus*)	Hoover's errastrum – Mendota only (*Erastrum hooverii)*
California red-legged frog – Los Banos only (*Rana aurora draytonnii*)	San Joaquin wooley-threads – Mendota only (*Lembertia congdonii*)
Giant garter snake -All (*Thamnophis gigas*)	Vernal pool fairy shrimp – Los Banos & Mendota only *(Branchinecta lynchi)*
Blunt-nosed leopard lizard – Mendota only (*Gambelia sila*)	Longhorn fairy shrimp – Los Banos & Mendota only *(Branchinecta longiantenna)*
California Red-Legged Frog – All *(Rana aurora draytonii)*	Conservancy fairy shrimp – Los Banos & Mendota only *(Branchinecta conservatio)*
Fresno kangaroo rat - All (*Dipodomys nitratoides exilis*)	Vernal pool tadpole shrimp – Los Banos & Mendota only *(Lepidurus packardi)*
Giant kangaroo rat - All (*Dipodomys ingens*)	

- Confining surface disturbance to areas without indicators of habitation by special-status species, and at least 200 feet from potential habitat
- Conducting construction activities during daylight hours
- Restricting vehicle speeds to 25 mile per hour or less

In addition to these measures, the Service's Endangered Species Division is to be contacted in the event that take of one of the special-status species cannot be avoided in order to develop circumstance-specific mitigation measures. Conservation and take-avoidance measures that would be implemented for each species are provided in Table C-3 of Appendix C.

4.3.4 Grassland Resource Conservation District

Lands within Grassland RCD are managed to provide habitat for waterfowl and other wetland-dependent species. Water delivered by the Grassland WD would be used in managing for wetland habitat for waterfowl. The management objectives of the Grassland WD include an active program to encourage natural food-plant production, (e.g., swamp timothy, smartweed, wildlife millet) and habitat protection. Wetland habitats consist primarily of seasonal flooded wetlands, moist soil impoundments, and permanent/semi-permanent wetlands.

No Action Alternative

Habitat Management

Under the No Action Alternative, management of privately owned wetland areas serviced by the Grassland WD is assumed to be in accordance with the assumptions of the CVPIA PEIS Preferred Alternative. The CVPIA assumed that providing 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). The acres of each habitat type that would be managed using firm Level 2 water supplies and the Level 4 increment are shown in Table 4-8.

TABLE 4-8
Acres of Habitat Expected on Private Lands within the Grassland RCD under the No Action and Proposed Action[a] that Would Be Managed with Water Provided under the CVPIA

	No Action		Proposed Action
Habitat	**Level 2**	**Level 4**	**Level 4**
Semi-permanent/permanent wetland	2,000	4,000	6,917
Seasonal wetland/moist soil impoundment and associated uplands	54,000	52,000	47,887[b]
Irrigated upland (pasture)	-	-	1,000
Total managed wetland and irrigated upland	**56,000**	**56,000**	**55,804**

[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] Includes 3,325 acres of agricultural lands that would be eligible for CVPIA water if converted to wetland habitat.

Mosquito Abatement

Mosquito monitoring and control programs covering lands within the Grassland RCD are conducted by the local Mosquito and Vector Control Districts. The local districts are responsible for monitoring mosquito populations and implementing appropriate control strategies.

Listed-Species Management

The Grassland WD currently implements a number of take-avoidance measures to protect the federally listed giant garter snakes that use water delivery channels maintained by Grassland WD. The following standard avoidance and minimization measures for giant garter snake habitat measures are practiced:

- Construction activities within 200 feet from the banks of giant garter snake habitat are avoided.
- Heavy equipment is confined to existing roadways to minimize habitat disturbance.
- Construction activity within habitat is conducted between May 1 and October 1. This is the active period for giant garter snakes, and direct mortality is lessened because snakes are expected to actively move and avoid danger.
- Clearing is confined to the minimal area necessary to facilitate construction activities.
- Maintenance of water conveyance facilities (e.g., clearing of vegetation) is limited to one side of the ditch during a given year to reserve giant garter snake habitat.
- Construction personnel receive Service-approved worker environmental awareness training. This training instructs workers to recognize giant garter snakes and their habitat(s).

- The project area is surveyed for giant garter snakes 24 hours before construction activities. The survey of the project is repeated if a lapse in construction activity of 2 weeks or more occurs. If a snake is encountered during construction, activities are ceased until appropriate corrective actions are completed, or it is determined that the snake will not be harmed.
- Dewatered habitat is kept dry for at least 15 consecutive days after April 15 and before excavating or filling dewatered habitat.
- After completion of construction activities, any temporary fill and construction debris is removed and disturbed areas are restored to pre-project conditions, where feasible.

Proposed Action

Habitat Management

Since 1993, following passage of the CVPIA, the Grassland WD has been receiving Level 2 water supplies (except in drought years) and an increasing amount of the Level 4 increment, and distributing this water to private wetland areas within its service area. This firm reliable water has provided the wetland managers with an opportunity to refine and implement the most effective water management practices for providing high-quality habitat for waterfowl.

The Grassland WD has identified various water needs related to wetland management strategies that encourage the production of waterfowl food and habitat. These strategies include spring maintenance, moist-soil plant irrigations, summer water management, early habitat management, fall habitat management, shallow water maintenance, salt balance, and irrigated pasture. While these water management strategies would not change the total wetland acreage, the quality of the habitat and the duration that the habitat is available would increase. For example, earlier flooding of seasonal wetlands would not result in an increase in the acreage of seasonal wetlands with a given area, but would increase the availability of this habitat by providing seasonal wetlands during a period of time (early fall) when wetlands were previously scarce. Table 4-9 shows the acres that would be benefited under the Proposed Action with full Level 4 water supplies.

TABLE 4-9
Acres Benefited in the Grassland RCD under Each Water Management Activity

Management Activity	Acres Benefited with Full Level 4 Water Supplies
Spring maintenance	21,500
Moist-soil plant irrigations	18,000
Summer water management	4,500
Early fall habitat	3,000
Fall habitat	33,000
Shallow water maintenance	29,500
Salt balance management	3,000
Irrigated pasture	1,000

Source: Stoddard & Associates, 1998.

The water management strategies that would be supported with full Level 4 water supplies would roughly translate into the acres of wetland habitat types listed in Table 4-8. However, the Grassland WD does not dictate how wetland habitats are managed on individual properties. Water supplied by the Grassland WD would be used to support wetland habitats or irrigated uplands that provide habitat for geese and sandhill cranes. However, the exact composition of wetland habitat types on lands within the Grassland RCD that would be supported with water provided by the CVPIA cannot be predicted.

As indicated in Table 4-8, 3,325 acres of agricultural land occurs within the Grassland WD service area. These areas are not currently eligible for CVPIA water because CVPIA water can only be used for wetland habitat management. However, if these agricultural lands were converted to wetland habitat, they would be eligible for water from Grassland WD. The water needs identified for private lands in the Grassland RCD and provided by the CVPIA considered future water deliveries to these areas.

Mosquito Abatement

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

Listed Species Management

Under the Proposed Action, Grassland WD would implement conservation and take-avoidance measures for state and federally listed species and other special-status species. Species-specific measures would be implemented for the species listed in Table 4-10. These measures are consistent with the Biological Opinion being prepared for implementation of the CVPIA.

TABLE 4-10
Special-Status Species for which the Grassland WD Would Implement Conservation and Take-Avoidance Measures under the Proposed Action

Aleutian Canada goose (*Branta canadensis leucopareia)*	Giant kangaroo rat (*Dipodomys ingens)*
Bald eagle (*Haliaeetus leucocephalus*)	San Joaquin kit fox *(Vulpes macrotis mutica)*
Fresno kangaroo rat (*Dipodomys nitratoides exilis*)	Giant garter snake (*Thamnophis gigas*

The conservation and take-avoidance measures vary among the species. In general, the measures consist of:

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

In addition to these measures, the Service's Endangered Species Division or California Department of Fish and Game, as appropriate, is to be contacted in the event that take of one of the special-status species cannot be avoided in order to develop circumstance-specific mitigation measures. Conservation and take-avoidance measures that would be implemented for each species are provided in Table C-4 of Appendix C.

4.4 Alternatives Considered But Not Analyzed in Detail

The selection of the Proposed Action and the development of a No Action Alternative came following consideration of a broader range of possible alternatives. This section describes other alternatives that were considered, but were not carried forward for detailed analysis.

4.4.1 Annual Agreements

Under an alternative based on annual water service agreements, Reclamation would negotiate annual agreements with the Service, CDFG, and the Grassland WD for Level 2 supplies and the available Level 4 increment. Such an alternative would provide maximum flexibility in Reclamation's water supply planning, but this alternative was not selected for detailed analysis because of several disadvantages. Primary among these disadvantages was that annual contracts did not appear to meet the intent of the CVPIA.

Bolstering Central Valley wetland habitats by providing reliable refuge water supplies is a long-term proposition, and year-to-year contracts would not provide enough certainty to promote effective management of on-refuge habitats. However, flexibility has been built into the proposed long-term agreements in a manner consistent with CVPIA directives. In addition to the inherent flexibility provided by Reclamation's Water Acquisition Program, Level 2 supplies can be reduced in dry years, and pooling of water supplies between refuges can occur in dry years under the direction of a refuge water management team. Because annual contracts do not appear to meet CVPIA directives, and because some flexibility is obtained through long-term agreements, an alternative involving annual agreements was not carried forward for detailed consideration.

4.4.2 Long-Term Level 2 Agreements

Another potential alternative is to enter into long-term agreements for Level 2 supplies only. The Level 4 increment would be provided under annual interim agreements subject to availability of water from the Water Acquisition Program. This alternative was not selected for detailed analysis because it did not offer any clear advantages over the Proposed Action and may not be consistent with the CVPIA. Reclamation's commitment to provide Level 2 supplies would remain the same under this alternative as under the Proposed Action. Reclamation's obligation to provide the Level 4 increment would also not differ between the two alternatives. In both cases, the Level 4 increment would be provided through voluntary measures (e.g., water conservation, conjunctive use, purchase, lease, donation, or other similar activities). If the Level 4 increments 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 San Joaquin River basin, and describes potential environmental consequences with regard to the following 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 (e.g., CVP-wide issues such as surface water and groundwater), or were not likely to be affected under the Proposed Action (e.g., mineral resources and noise). The PEIS provides an appropriate cumulative impacts analysis for this document, and additional cumulative impacts are not considered.

As a NEPA document, the effects of the alternatives are considered at an equal level of detail, and the primary focus is on how the Proposed Action would impact the environment relative to the No Action Alternative. In other words, environmental consequences would occur if the Proposed Action were not implemented, and the focus of the environmental analysis is to identify 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 EA / IS. As described in Section 1.5, additional CEQA analysis is necessary in order to supplement the Negative Declarations prepared for the Los Banos, North Grasslands, and Mendota WA Management Plans, and to assess the impacts of the Proposed Action on the Grassland RCD. In order for the analysis in this section to meet CEQA requirements, the effects of the Proposed Action 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 appropriate CEQA documentation for the state WAs and the Grassland RCD.

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 San Joaquin River Basin forms the southern 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. Before 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 wetlands 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*).

National Wildlife Refuges

The refuges of the San Luis NWR Complex contain permanent ponds, seasonal wetlands, irrigated moist soil impoundments, riparian habitats, 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. Riparian habitats have been substantially reduced in the Central Valley and the refuges provide critical habitat for riparian associated species. Upland areas consist of native grasslands, as well as small areas of cropland and pasture. These uplands support large concentrations of geese, upland birds, and other wildlife species, including special-status species.

State Wildlife Areas

The state WAs in the San Joaquin River Basin support permanent and seasonal wetlands, crops, pasture, and some native uplands. Wetland areas support waterfowl plant food sources and invertebrate populations; managed upland areas provide habitat for geese, upland birds, and other wildlife species.

Grassland Resource Conservation District

Private wetland areas in the Grassland RCD consist of 165 separate ownerships. These lands are managed primarily as waterfowl habitat, but provide a wide variety of wildlife benefits. Specific land uses include seasonally flooded wetlands, moist soil impoundments, permanent wetlands, and irrigated pasture and croplands. Perpetual easements have been purchased by the Service on about 31,000 acres serviced by the Grassland WD to help preserve wetland-dependent migratory bird habitat. These easements authorize the Service to restrict land uses that would diminish wetland habitat values.

Vegetation and Wildlife

Management of the refuges of the San Joaquin River Basin refuges focuses on providing wetland habitats. Small grain crops and pasture are also managed on the WAs and, to a lesser extent, on some of the federal refuges and private wetlands. The vegetation and associated wildlife communities of the refuges of the San Joaquin River Basin 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 scrub, and vernal pool complexes. 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 and private wetland areas of the San Joaquin River Basin. Seasonal wetlands are inundated fields or ponds that are managed primarily to grow seed and to produce invertebrates for migratory waterfowl, shorebirds, and other wetland-dependent wildlife. These wetlands are usually flooded from October through March, and are dry for the rest of the year except for summer irrigation. Some seasonal wetlands are inundated by early August, depending on the habitat required for early-arriving waterfowl, and some seasonal wetlands may be kept inundated through April to provide habitat for

migrants that do not depart to northern breeding habitats until that time (Reclamation and CDFG, 1995).

The diversity of seasonal wetlands 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 (millet), sprangletop, and smartweed. During these irrigation periods, these units are often used by locally nesting colonial water birds (egrets, herons). Although 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.

Semi-permanent / permanent wetlands provide wetland habitat for year-round and summer resident species. Semi-permanent wetlands are flooded for 8 or more months of the year, while permanent wetlands remain flooded throughout the year. Characterized by both emergent and submergent aquatic plants, semi-permanent / permanent wetlands provide brood and molting areas for waterfowl, secure roosting and nesting sites for wading birds and other over-water nesters, and provide feeding areas for species like cormorants and pelicans. Semi-permanent / 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*), as well as irrigated pasture for nesting cover for waterfowl and upland game birds. Cropland and pastures include corn, vetch, milo, mixed grasses, and safflower.

Fish Resources

With many miles of irrigation ditches and canals available as aquatic habitat, the refuges support resident fish species. Rivers, streams, and sloughs that flow through or adjacent to the refuge lands also support resident fish populations. Common species of the water conveyance ditches and canals include spotted bass (*Micropterus punctulatus*), largemouth bass (*M. salmoides*), channel catfish (*Ictalurus punctatus*), sunfish (*Lepomis* sp.), brown bullhead (*Ameiurus nebulosus*), and common carp (*Cyprinus carpio*). 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 complements the primary goal of maintaining wintering waterfowl habitat.

All of the refuges of the San Joaquin River Basin eventually drain into the San Joaquin River. This river supports the anadromous salmonids: fall-run chinook salmon (*Oncorhynchus tshawytscha*) and Central Valley steelhead (*O. mykiss*). The federally listed Sacramento splittail (*Pogonichthys macrolepidotus*) occurs in the lower reaches of the San Joaquin River, but has never been documented to occur as far upstream as the refuges (Reclamation and CDFG, 1997. Since 1992, a fish barrier was installed in the San Joaquin River, just upstream of the confluence of the Merced River. The barrier precludes migration of fish farther upstream in the San Joaquin River. As all of the refuges are upstream of the Merced River confluence, no anadromous salmonids occur on the refuges.

Special-Status Species

Table 5-1 lists special-status species known to occur or potentially occur on the San Luis NWR Complex, the State WAs, and the Grassland RCD and their habitat associations. These species were identified on a list provided to Reclamation by the Service in a letter dated March 20, 2000. 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:

- EA / IS for Conveyance Facilities for San Joaquin Basin Action Plan and North Grasslands Area (Reclamation and CDFG, 1997)
- Los Banos Wildlife Area Management Plan (CDFG, 1988)
- North Grasslands Wildlife Area Management Plan (CDFG, 1998)
- Mendota Wildlife Area Management Plan (CDFG, 1994)
- Final Draft Volta Wildlife Area Management Plan (CDFG, 2000)

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

Common Name *Scientific Name*	Status[a]	General Habitat Association
Invertebrates		
Longhorn fairy shrimp *Branchinecta longiantenna*	Federal – E State – none	Vernal pools
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)
California linderiella *Linderiella occidentalis*	Federal – SC State – none	Vernal pools
Molestan blister beetle *Lytta molesta*	Federal – SC State – none	Vernal pools; grassland 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
Central Valley fall-run/late fall-run chinook salmon *Oncorhynchus tshawytscha*	Federal – C State – CSC	Rivers and streams
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
Kern brook lamprey *Lampetra hubbsi*	Federal – SC State – CSC	Rivers and streams
Amphibians		
California tiger salamander *Ambystoma californiense*	Federal – C State – CSC	Vernal pools
California red-legged frog *Rana aurora draytonii*	Federal – T State – CSC	Wetland and aquatic habitat
Foothill yellow-legged frog *Rana boylii*	Federal – SC State – CSC	Rivers and streams
Western spadefoot toad *Scaphiopus hammondii*	Federal – SC State – CSC	Vernal pools

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

Common Name ***Scientific Name***	**Status**[a]	**General Habitat Association**
Reptiles		
Western pond turtle *Clemmys marmorata*	Federal – SC State – CSC	Wetland and riparian habitats
Blunt-nosed leopard lizard *Gambelia sila*	Federal – E State – E	Grassland and scrub habitats
California horned lizard *Phrynosoma coronatum frontale*	Federal – SC State – CSC	Grassland and riparian habitats
Silvery legless lizard *Anniella pulchra pulchra*	Federal – SC State – CSC	Grassland habitat
Giant garter snake *Thamnophis gigas*	Federal – T State – CSC	Wetland habitat
San Joaquin coachwhip *Masticophis flagellum ruddocki*	Federal – SC State – CSC	Grassland and scrub habitats
Birds		
American white pelican *Pelecanus erythrorhynchos*	Federal – none State – CSC	Wetland and aquatic habitats
Double-crested cormorant *Phalacrocorax auritas*	Federal – none State – CSC	Aquatic habitats
White-faced ibis *Plegadis chihi*	Federal – SC State – CSC	Wetland habitat, irrigated pasture and croplands
Fulvous whistling-duck *Dendrocygna bicolor*	Federal – SC State – CSC	Wetland habitat, irrigated pasture and croplands
Aleutian Canada goose *Branta canadensis leucopareia*	Federal – T State – none	Wetland habitat; irrigated pasture and croplands
Cooper's hawk *Accipiter cooperii*	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 habitats; irrigated pasture
Swainson's hawk *Buteo swainsoni*	Federal – none State – T	Grassland habitat; irrigated pasture
Northern harrier *Circus cyaneus*	Federal – none State – CSC	Grassland and wetland habitats
Bald eagle *Haliaeetus leucocephalus*	Federal – T State – E	Wetland and riparian habitats
Osprey *Pandion haliaetus*	Federal – none State – CSC	Riparian habitat
Merlin *Falco columbarius*	Federal – none State – CSC	Wetland habitat

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

Common Name ***Scientific Name***	**Status**[a]	**General Habitat Association**
Prairie falcon *Falco mexicanus*	Federal – none State – CSC	Grassland and scrub habitats
American peregrine falcon *Falco peregrinus anatum*	Federal – none State – E	Wetland and grassland habitats
Greater sandhill crane *Grus canadensis tabida*	Federal – none State – T	Irrigated pasture and croplands
Least bittern *Ixobrychus exilis*	Federal – none State – SC	Wetland habitat
Mountain plover *Charadrius montanus*	Federal – PT State – CSC	Grassland and scrub habitats
Western snowy plover *Charadrius alexandrinus nivosus*	Federal – none State – CSC	Grassland and wetland habitats
Long-billed curlew *Numenius americanus*	Federal – none State – CSC	Grassland habitat
Black tern *Chlidonias niger*	Federal – SC State – CSC	Wetland habitat
California gull *Larus californicus*	Federal – none State – CSC	Wetland habitat
Short-eared owl *Asio flammeus*	Federal – none State – CSC	Grassland and wetland habitats
Long-eared owl *Asio otus*	Federal – none State – CSC	Riparian habitat
Western burrowing owl *Athene cunicularia hypugea*	Federal – SC State – CSC	Grassland habitat
Little willow flycatcher *Empidonax traillii brewsteri*	Federal – none State – E	Wetland and riparian habitats
Bank swallow *Riparia riparia*	Federal – none State – T	Riparian habitat
Loggerhead shrike *Lanius ludovicianus*	Federal – SC State – CSC	Grassland habitat and irrigated pasture
California horned lark *Eremophila alpestris actia*	Federal – none State – CSC	Grassland habitat
Tricolored blackbird *Agelaius tricolor*	Federal – SC State – CSC	Wetland habitat
Yellow-breasted chat *Icteria virens*	Federal – none State – CSC	Wetland and riparian habitats
Yellow warbler *Dendroica petechia brewsteri*	Federal – none State – CSC	Wetland and riparian habitats
Mammals		
Pallid bat *Antrozous pallidus*	Federal – none State – CSC	Grassland and scrub habitats

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

Common Name ***Scientific Name***	**Status**[a]	**General Habitat Association**
Spotted bat *Euderma maculatum*	Federal – SC State – CSC	Riparian wetland and grassland habitats
Yuma myotis *Myotis yumanensis*	Federal – SC State – none	Riparian habitat
Long-eared myotis *Myotis evotis*	Federal – SC State – none	Riparian habitat
Fringed myotis *Myotis thysanodes*	Federal – SC State – none	Riparian habitat
Long-legged myotis *Myotis volans*	Federal – SC State – none	Riparian habitat
Small-footed myotis *Myotis cilolabrum*	Federal – SC State – none	Scrub habitat
Pacific western big-eared bat *Plecotus townsendii townsendii*	Federal – SC State – CSC	Riparian habitat
Greater western mastiff bat *Eumops perotis californicus*	Federal – SC State – CSC	Grassland and scrub habitats
San Joaquin antelope squirrel *Ammosphermophilus nelsoni*	Federal – SC State – T	Grassland and scrub habitats
Fresno kangaroo rat *Dipodomys nitratoides exilis*	Federal – E State – E	Grassland and scrub habitats
Fresno kangaroo rat critical habitat	Federal – NA State – NA	
Short-nosed kangaroo rat *Dipodomys nitratoides brevinasus*	Federal – SC State – CSC	Grassland habitat
Merced kangaroo rat *Dipodomys heermanni dixoni*	Federal – SC State	Grassland habitat
San Joaquin pocket mouse *Perognathus inornatus*	Federal – SC State – none	Grassland and scrub habitats
San Joaquin Valley woodrat *Neotoma fuscipes riparia*	Federal – PE State – CSC	Riparian habitat
Riparian brush rabbit *Sylvilagus bachmani riparius*	Federal – PE State – E	Riparian habitat
San Joaquin kit fox *Vulpes macrotis mutica*	Federal – E State – T	Grassland and scrub habitats
Plants		
Heartscale *Atriplex cordulata*	Federal – SC State – none	Grassland and scrub habitats
Brittlescale *Artiplex depressa*	Federal – SC State – none	Grassland and scrub habitats
Alkali milk-vetch *Astragalus tener* var. *tener*	Federal – SC State – none	Vernal pools

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

Common Name ***Scientific Name***	**Status**[a]	**General Habitat Association**
San Joaquin saltbush *Atriplex joaquiniana*	Federal – SC State – none	Grassland and scrub habitats
Lesser saltscale *Atriplex minuscula*	Federal – SC State – none	Grassland and scrub habitats
Lost Hills crownscale *Atriplex vallicola*	Federal – SC State – none	Grassland and scrub habitats
Hispid bird's beak *Cordylanthus mollis* ssp. *hispidus*	Federal – SC State – none	Grassland habitat
Palmate-bracted bird's-beak *Cordylanthus palmatus*	Federal – E State – E	Grassland and scrub habitats
Hoover's eriastrum *Eriastrum hooverii*	Federal – T State – none	Grassland and scrub habitats
Delta button celery *Eryngium racemosum*	Federal – none State – E	Riparian habitat
San Joaquin woolythreads *Lembertia congdonii*	Federal – E State – none	Grassland and scrub habitats
Colusa grass *Neostapfia colusana*	Federal – T State – E	Vernal pools
Hairy orcutt grass *Orcuttia pilosa*	Federal – E State – E	Vernal pools
Sanford's arrowhead *Sagittaria sanfordii*	Federal – SC State – none	Wetland habitat
Green's tuctoria *Tuctoria greenei*	Federal – E State – Rare	Vernal pools

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

5.2.2 Environmental Consequences

The project would implement the CVPIA requirements to provide Level 2 water supplies and up to the full Level 4 increment to the federal and state refuges, and private wetland areas in the Grassland RCD within the San Joaquin River Basin. 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.

San Luis 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 San Luis NWR Complex. The refuges of the San Luis NWR Complex would support the acreages of habitats shown in Table 4-4 under the No Action Alternative.

Currently, most of the refuges receive Level 2 water supplies, and some or all of the Level 4 increment. The San Luis, Kesterson, and Freitas units of the San Luis NWR Complex were receiving full Level 2 water supplies and the full Level 4 increment before the passage of the CVPIA through the 1954 Act and 1990 Agreement. The Merced Unit receives full Level 2 water supplies and almost all of the Level 4 increment through Merced Irrigation District, as required by the FERC license for the New Exchequer Project. Habitat restoration on the West Bear Creek Unit was recently completed and this Unit has been accepting its full Level 2 allotment, as well as the year-specific Level 4 increment. Habitat restoration plans for East Bear Creek Unit are still being finalized; the Unit will begin taking its full Level 2 water supplies and the Level 4 increment upon completion of the restoration activities.

With the exception of the East Bear Creek Unit, the habitat conditions on the refuges under the No Action Alternative would be similar to existing conditions. When the wetland and riparian habitat restoration on the East Bear Creek Unit is completed, the water provided under the No Action Alternative would support an increased acreage of wetland and riparian habitats relative to existing conditions. The portions of the East Bear Creek Unit that will be restored consist of former wetland and riparian areas that were previously converted to agricultural uses, primarily grazing lands. No native upland habitats would be affected by the restoration (D. Woolington, 2000).

The Level 2 water supplies and Level 4 increment provided under the No Action Alternative would not be used to create new wetland habitat. Rather, improvements in wetland habitat quality would result from the ability and flexibility to more effectively manage existing wetland units with reliable, year-round water supplies of acceptable quality. Habitat management under the No Action Alternative includes:

- Earlier and expanded fall flooding of seasonal wetlands to allow increased wildlife use
- Additional maintenance of summer water, wetland / moist soil, riparian, and irrigated pasture habitat types for wildlife use and vegetation improvement
- Increased management of moist soil impoundments through more frequent irrigations, 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 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, optimal habitat conditions could be maintained under drought conditions and during flood/storm conditions to provide suitable and stable habitat conditions for resident and migratory wildlife. Reliable full Level 4 water supplies would ensure that wetland habitat units could be flooded throughout the fall and winter and water levels could be maintained at optimal depths for waterfowl foraging. In addition, water would be available for spring/summer irrigation and maintenance of semi-permanent/permanent wetlands through the summer months. Overall, high-quality wetland habitat would be available at the appropriate times of the year to benefit resident and migratory waterfowl.

Improved habitat quality and availability of seasonal wetlands would continue to benefit migratory waterfowl under the No Action Alternative. Improvements in wetland habitat quality and availability would also 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 benefit from the habitat diversity and stability provided under optimal habitat management of wetland units (Table 5-1). 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.

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.

Before passage of the CVPIA, many of the refuges and private wetland areas in the San Joaquin River Basin relied on return flows from upstream agricultural areas to meet water requirements for wetland habitat management. In the mid-1980s, agricultural drainage water in the San Joaquin Basin was found to be contaminated with selenium that could have deleterious effects on waterfowl and other wildlife. As a result of this finding and recommendations by the state and federal resources agencies, agricultural drainage water that contained selenium concentrations greater than 2 parts per billion (ppb) was no longer used for wetland habitat management. With this restriction, the amount of water available for wetland habitat management was substantially reduced, which impaired wetland habitat management. The refuges currently have access to water of suitable quality for wetland habitat management. The water provided to the refuges under the No Action Alternative would continue to be of adequate quality and quantity for optimal wetland habitat management to avoid any potential adverse effects to waterfowl from selenium-contaminated water.

Return flows from the federal refuges would increase slightly under the No Action Alternative relative to existing conditions. This increase could seasonally increase the availability of water in conveyance channels on the refuge and could beneficially affect riparian vegetation and associated wildlife.

While the volume of return flows would increase under the No Action relative to existing conditions, 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 would improve water quality. Potential effects to anadromous salmonids in the San Joaquin River were fully evaluated in the CVPIA PEIS, as summarized in Section 3.

Proposed Action

The Proposed Action would have the same benefits to wetland habitats and associated wildlife species (including special-status species) as those described for the No Action Alternative. Habitat conditions under the Proposed Action would be similar to those for the No Action Alternative (Table 4-4). 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 the Proposed Action would provide greater certainty and predictability. Under the No Action Alternative, Level 2 water supplies and the Level 4 increment, would be delivered on the monthly pattern identified in the *Report on Refuge Water Supplies Investigations* (Reclamation, 1989). In contrast, the water service agreement for the Proposed Action would provide greater flexibility and would allow year-to-year adjustments in the delivery pattern. This difference would further enhance the refuge managers' abilities to optimally manage wetland habitats, as managers could better adjust the water delivery schedule in response to habitat management needs and wildlife use. The acres of habitat that would be provided on each of the refuges under the Proposed Action are shown in Table 4-4.

The Proposed Action would have similar benefits to habitats for federally listed species as would the No Action Alternative. However, the Proposed Action would ensure greater protection to special-status species than would the No Action Alternative. The Proposed Action includes conservation measures to avoid and minimize potential impacts to special-status species from a wide range of habitat management activities and operational regimes. 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 are likely to occur under the Proposed Action.

State Wildlife Areas

No Action Alternative

Under the No Action Alternative, Reclamation would continue to ensure that state WAs receive Level 2 water supplies and up to the full Level 4 increment. This water would be used to support the habitat acreages shown in Table 4-6. With the exception of China Island, Level 2 water supplies and the year-specific Level 4 increment have been available to the state WAs. For China Island, the internal conveyance facilities currently are not adequate to effectively and efficiently use more than Level 2 water supplies, and none of the Level 4

increment has been provided to this Unit. The increase in reliable water supplies to full Level 4 water supplies under the No Action would allow optimal management of on-refuge habitats. However, because the refuges have been receiving most of the water required by the CVPIA, the habitat conditions would not change substantially under the No Action Alternative relative to existing conditions.

As with the refuges of the San Luis NWR Complex, expansion of wetland habitats to non-wetland areas would not occur on the state WAs. 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 San Luis NWR Complex, including avoidance of potential adverse effects to waterfowl from use of selenium-contaminated water. As for the San Luis 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 continue to support 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 the state WAs reach the San Joaquin River through various sloughs, drains, and channels. The volume of return flows would be expected to increase relative to existing conditions, with the additional Level 4 increment of water provided to the refuge. As described in Sections 3 and 5.3.3, this increase in return flows is not expected to significantly adversely impact water quality or anadromous salmonids in downstream watercourses. The effects of increased return flows from the refuges on anadromous salmonids were evaluated in the CVPIA PEIS and are being considered in the Biological Opinion for the CVPIA. 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 and the No Action Alternative (Table 4-6). As under the No Action Alternative, seasonal wetlands would be the predominant wetland type on the refuge units.

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 contract for the Proposed Action would provide greater flexibility and year-to-year adjustments in the delivery pattern. This difference would

further enhance the refuge managers' ability to optimally manage habitats, thereby benefiting a diversity of wildlife species (including special-status species).

Under the Proposed Action, additional conservation measures would be implemented on the state WAs to avoid and minimize potential impacts to special-status species from a wide range of 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 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.

Grassland Resource Conservation District

No Action Alternative

Grassland WD delivers water to private wetland areas. Before passage of the CVPIA, wetland habitat could not be optimally managed on the areas given limited supplies of suitable quality water. With the limited and unreliable pre-CVPIA water supplies, semi-permanent and permanent wetland habitat was scarce in areas serviced by the Grassland WD. In addition, wetland managers had to employ management techniques to conserve water, but that were deleterious to waterfowl. Wetland managers previously stockpiled water to depths of several feet early in the season to ensure that water was available for waterfowl throughout the winter. This management strategy resulted in wetland areas being flooded deeper than optimal for waterfowl feeding (1 foot or less). In addition, flow through management may reduce the incidence of avian cholera.

Since passage of the CVPIA, the Grassland WD has been receiving Level 2 water supplies and an increasing proportion of the Level 4 increment. Currently, the Grassland WD is receiving almost all of the water supplies required under the CVPIA. Under the No Action Alternative, the amount of water provided to Grassland WD would increase slightly to the full Level 4 amount. The increased amount and reliability of water supplies relative to existing conditions would enhance wetland habitat management, as described for the San Luis NWR Complex. The amount of wetland habitat would not increase under the No Action Alternative. Rather, the duration of availability of wetland habitats would increase, as would the quality wetland habitat. 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 San Luis NWR Complex, including avoidance of potential adverse effects to waterfowl from use of selenium-contaminated water. Special-status species associated with wetland habitats would similarly benefit from improved quality and availability of wetland habitats. As described for the refuges of the San Luis NWR Complex and the state WAs, no adverse effects to anadromous salmonids would occur under the No Action Alternative.

Proposed Action

Habitat conditions under the Proposed Action would be similar to existing conditions and the No Action Alternative (Table 4-8). 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 Supply 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 wetland managers' ability to optimally manage wetland habitats, thereby benefiting wetland-associated species (including special-status species).

Under the Proposed Action, Grassland WD would implement additional conservation measures to avoid and minimize potential impacts to special-status species from a wide range of management activities. 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 would provide greater benefit to special-status species than would the No Action Alternative. As described for the refuges of the San Luis NWR Complex and the state WAs, no adverse effects to anadromous salmonids would occur under the Proposed Action.

5.3 Water Quality

5.3.1 Affected Environment

Overview of San Joaquin River Water Quality

Water quality in the San Joaquin River has degraded significantly since the late 1940s when reservoirs were constructed in the upper watershed and the irrigated acreage increased along tributaries to the river. Surface water quality in the San Joaquin River Basin is affected by several factors, including natural runoff, agricultural return flows, biostimulation, construction, grazing, operations of flow regulating facilities, urbanization, and recreation.

The upper reaches of the San Joaquin River Basin originate in large drainage areas high on the west side of the Sierra Nevada. The water in these rivers is generally soft with low mineral concentrations. As these streams flow from the Sierra Nevada foothills across the eastern valley floor, their mineral concentration steadily increases. This increase in concentration is fairly uniform for each of the east side streams. In the western part of the San Joaquin Valley, soils are derived mainly from the marine sediments that make up the Coast Range and are high in salts and trace elements such as selenium, molybdenum, arsenic, and boron. As the San Joaquin Valley has undergone extensive land development, erosion and drainage patterns have been altered, thereby accelerating the rate at which these trace elements have been dissolved from the soil to accumulate in shallow groundwater, streams, and the San Joaquin River. The term "shallow groundwater" refers to as the highest zone of saturation down to a depth of approximately 20 feet below ground surface.

The primary area of subsurface drainage problems extend along the western side of the San Joaquin Valley from the Delta to south of Bakersfield. Shallow semi-impermeable clay layers lie beneath the land surface, preventing adequate drainage of irrigation water. This impediment to downward flow has resulted in high groundwater levels in the shallow groundwater zone and requires subsurface drainage of low lying fields to prevent

waterlogging and salt buildup in the root zone. The subsurface drainage water is characterized by high salt concentrations and elevated levels of trace elements.

Wildlife refuges and private wetlands also affect water quality in the San Joaquin River. The refuges begin flooding operations in the fall to maintain habitat for migratory waterfowl, primarily with water delivered from the Delta via the Delta-Mendota Canal. Prior to receiving increased water supplies under CVPIA, salinity of the water in the ponds would increase during the fall due to evaporation and following winter seasons with low precipitation, often contributing poor quality water to the San Joaquin River when the ponds are drained in the spring. Increased water supplies under CVPIA have allowed many refuges to irrigate or maintain flooded conditions on wetland units during spring and summer months as well as during the fall months. This has allowed the drainage flows to occur over a longer period time with lower concentrations of constituents.

Water quality in the San Joaquin River varies considerably along the stream's length. Above Millerton Lake and downstream towards Mendota Pool, water quality is generally excellent. The reach from Gravelly Ford to Mendota Pool (about 17 miles) is frequently dry except during extreme wet weather conditions because most of the water released from Millerton Lake is diverted upstream to satisfy water rights agreements, or percolates to groundwater. Recent pilot studies have released additional water from Millerton Lake to maintain flows in the San Joaquin River between Gravelly Ford and Mendota Pool. Ongoing studies are evaluating the potential to maintain year-round flows to improve fisheries and riparian habitat.

When the reach between Gravelly Ford and Mendota Pool is dry, water in the Mendota Pool is primarily imported from the Delta. The imported water generally has higher concentrations of total dissolved solids (TDS), salinity, and boron than San Joaquin River water. Most of the water released from the Mendota Pool to the San Joaquin River is diverted at or above Sack Dam for agricultural uses. Therefore, the San Joaquin River is often dry between Sack Dam and Salt Slough except during wet weather conditions. Releases from Millerton Lake for the San Joaquin River pilot study also will maintain flows in this reach.

From Salt Slough to Fremont Ford, most of the flow in the San Joaquin River is from surface irrigation return flows and subsurface drainage flows from Salt and Mud sloughs. This reach is also affected by seepage from groundwater that is characterized by high salinity and trace element concentrations.

Downstream from Fremont Ford, the majority of flows in the San Joaquin River are provided from the major tributaries: Merced, Tuolumne, and Stanislaus rivers. The water quality of the tributaries is similar to that of the upper San Joaquin River. However due to irrigation return flows, drainage flows, and effluent from industrial and municipal wastewater treatment plants that enter the lower San Joaquin River, mineral and salinity concentrations are high in the San Joaquin River downstream of Fremont Ford. Water quality in the San Joaquin River is monitored at Vernalis because of potential adverse impacts of high salinity to agricultural and municipal uses and south Delta fish resources.

Total dissolved solids is monitored as Electric Conductivity (EC) and reported in microsiemens per centimeter ($\mu s/cm$). Values for EC in the San Joaquin River near Vernalis

have historically ranged from 50 mg/l during high flows to over 1,400 mg/l during the 1977 – 1978 drought period. The annual average EC in the San Joaquin River near Vernalis has increased from slightly more than 200 µs/cm before Millerton Lake was constructed to almost 600 µs/cm in 1997. In 1991, the SWRCB adopted EC standards for the San Joaquin River at Vernalis of 700 µs/cm for irrigation months (April through August) and 1000 µs/cm for non-irrigation months (September through March). These standards are frequently referred to as the "Vernalis Standards."

In the late 1960s, the SWRCB evaluated the potential concerns about increased salinity in the San Joaquin River. The evaluation indicated that there were many causes for increased salinity, but one of the reasons was construction of Friant Dam and Millerton Lake by Reclamation and the associated importation of water from the Delta to serve existing water rights holders. Therefore, when Reclamation applied for an operating permit for New Melones Reservoir on the Stanislaus River in 1972, the SWRCB included a provision in Decision 1422 and SWRCB Order 83-3, issued in 1983 (hereinafter collectively referred to as D-1422), that Reclamation maintain average monthly concentrations of salinity in the San Joaquin River at Vernalis as a condition of the operating permit for New Melones Reservoir. Therefore, Reclamation releases water from New Melones Reservoir, to the extent possible, to reduce salinity concentrations to levels below the Vernalis Standards. It is difficult to meet the standards during drier years when salinity is high due to a lack of flow in the San Joaquin River tributaries, high salinity concentrations in the irrigation water and the subsequent drainage flows, and limited amounts of water available for release from New Melones Reservoir. The RWQCB compared 30-day running average of EC concentrations in the San Joaquin River at Vernalis with the standard from 1986 through 1998. In this 13 year period, the standard was exceeded at Vernalis for 11% of the days in non-irrigation months (September through March) and 49% of the days in irrigation months (April through August). The monthly EC concentrations in the river at Crows Landing (upstream of the confluences with the Tuolumne and Stanislaus rivers, but downstream of the Merced River and Salt and Mud sloughs) were compared to the Vernalis Standards. In the same 13 year period, the standard was exceeded 67% of the months in non-irrigation months and 78% of the months in irrigation months at Crows Landing. A similar pattern of exceedances occurred at Lander Avenue upstream of Salt and Mud sloughs. However, immediately downstream of Salt and Mud sloughs, at Hills Ferry, the standard was exceed almost 95% of the time.

The RWQCB also reviewed the sources of salinity in the river at Vernalis. According to the RWQCB, the primary sources and their contributions of salinity in the river at Vernalis for a 10-year period from 1985 through 1994 showed:

- 2% from municipal and industrial sources
- 8% from wetlands, including refuges
- 16% from the upper tributaries
- 17% from subsurface return flows from irrigated acreage
- 29% from surface return flows from irrigated acreage
- 28% from groundwater seepage from irrigated acreage

This evaluation led to consideration of a new salinity standard for the lower San Joaquin River from Mendota Pool to Vernalis. The potential standards included limitations such as 700 µs/cm to protect irrigated agriculture, 900 µs/cm to protect drinking water, and 5000 µs/cm to protect aquatic life in the delta.

Boron also is monitored in the San Joaquin River. The existing water quality standards from Mendota Pool to the confluence with Merced River is 2 mg/l from March 15 to September 15. Downstream of Merced River, the boron water quality standard in the San Joaquin River is 0.8 mg/l from March 15 to September 15 and 1.0 mg/l from September 16 to March 14. The standard increases to 1.3 mg/l in a critically dry year. The major source of boron into the San Joaquin River is from subsurface return flows that are discharged into the river near Mud Slough and Salt Slough. Boron standards in the river have consistently been exceeded between the confluences of Mud Slough and the Merced River. The RWQCB compared 30-day running average of boron concentrations in the San Joaquin River at Vernalis with the standard from 1986 through 1998. In this 13 year period, the standard was only exceeded in three months. The monthly boron concentrations in the river at Crows Landing (upstream of the confluences with the Tuolumne and Stanislaus rivers, but downstream of the Merced River and Salt and Mud sloughs) in the same 13 year period, the standard was exceeded primarily in the drier years. At Lander Avenue upstream of Salt and Mud sloughs, the boron standard was only exceeded in one year. However, immediately downstream of Salt and Mud sloughs, at Hills Ferry, the standard was exceed almost 95% of the time. The source of boron is primarily from groundwater that leaches boron from the soil. The boron enters the San Joaquin River primarily from subsurface irrigation return flows. The RWQCB is also considering changing standards for boron in the San Joaquin River. The range of standards being considered included limitations such as 0.7 mg/l to protect irrigated agriculture, and 0.6 mg/l to protect drinking water and aquatic life.

D-1422 also requires that Reclamation release water from New Melones Reservoir to maintain dissolved oxygen (DO) concentrations in the lower Stanislaus River. The 1975 revision to the RWQCB Water Quality Control Plan established a minimum DO concentration of 7 mg/l, as measured on the Stanislaus River near Ripon.

Refuge Water Supply Quality

Historically, water quality in the wetland areas in the San Joaquin River Basin was dependent upon water supplies, including a combination of CVP fresh water and agricultural return flows. Much of the agricultural return flow was conveyed through Mud Slough and Salt Slough. In 1985, selenium in the subsurface drainage water was recognized as a potential threat to waterfowl and other animals, having resulted in waterfowl deformities at Kesterson Reservoir. At that time, to avoid delivering agricultural drainage water to the refuges, two canals (Camp 13 and Agatha Canal) within Grassland RCD were alternately used to transport drainage water and freshwater. When one channel was conveying drainage water, the other channel conveyed freshwater to wetland areas along that channel. Subsequently, the system would be switched, to deliver freshwater to wetland areas along the other channel. This “flip-flop” system alleviated problems of agricultural return flows being used on the refuges. In addition a bypass canal to Salt Slough was constructed to divert agricultural return flows from the northern portion of the Grassland RCD and the state and federal refuges. However, these bypass systems were inefficient and

resulted in many instances when wetlands could not receive otherwise available water supplies. For example, when the capacity of the bypass to Salt Slough was exceeded, drainage water entered the Santa Fe and San Luis Canal system, and State, Federal, and private wetlands could not take delivery of water from this system due to water quality concerns.

As part of a pilot program, Reclamation initiated the Grasslands Bypass Project in 1996. Under this project, subsurface agricultural drainage water is collected in the San Luis Drain upstream from areas serviced by the Grasslands Water District and the state and federal wildlife areas. The San Luis Drain is a concrete-lined channel that conveys the drainage water to the confluence of the drain with Mud Slough North. Mud Slough North conveys the water to the San Joaquin River. Discharges from Mud Slough to the San Joaquin River are subject to Waste Discharge Requirements from the RWQCB. By collecting and transporting drainage water in the San Luis Drain, the channels that flow into and through the wildlife areas only convey co-mingled CVP water, withdrawn groundwater, and agricultural surface return flows. The separation of this higher quality co-mingled water and subsurface drainage water has allowed for better water management, improved water quality in return flows from the refuges, and reduced potential for selenium contamination in the wildlife areas.

Historically, agricultural return flows were discharged to the San Joaquin River primarily through Mud Slough and Salt Slough. Implementation of the Grassland Bypass Project has directed most agricultural subsurface return water around the Grasslands Water District via the San Luis Drain into Mud Slough North where it discharges into the San Joaquin River. Diversion of agricultural subsurface drainage water through the San Luis drain into Mud Slough has resulted in an increase in the frequency of exceeding objectives in Mud Slough. However, this reduction in water quality has been offset by a corresponding decrease in the frequency of exceeding objectives in Salt Slough and there has been no significant difference in the attainment of objectives in the San Joaquin River.

National Wildlife Refuges

Water supplies to the refuges of the San Luis NWR Complex (the San Luis, West Bear Creek, Kesterson, Freitas, Merced, and East Bear Creek units) consist of groundwater, flood flows, surface return flows, surface water rights and licenses, and CVP water supplied under the 1954 Act and the CVPIA. Water quality of these water supplies varies. San Joaquin River water above Salt Slough is generally considered usable for wetland management; however, none of the refuges have riparian rights to use San Joaquin River water. Prior to implementation of the Grasslands Bypass Project, the quality of Mud Slough South and Salt Slough was unusable for wetland management due to high levels of selenium.

The San Luis Unit has appropriative water rights on Salt Slough, but generally has not used Salt Slough water for wetland management after 1986 due to concerns about selenium concentrations. The East Bear Creek Unit has appropriative water rights associated with Bear Creek and the San Joaquin River on an if-and-when-available basis. Prior to the CVPIA, groundwater provided the majority of water supplied to the Merced NWR. Groundwater is also available for use on the Bear Creek units and the Freitas unit. However, elevated salinity has precluded the use of groundwater as the sole source of water for managed wetlands on the West Bear Creek Unit.

Prior to the CVPIA, water supplies to refuge areas were limited due to timing of delivery of CVP water and the presence of co-mingled subsurface and surface agricultural drainage water of poor quality in area canals. The water supply system could not prevent co-mingling of fresh water and selenium contaminated drainage. Presence of agricultural drainage in sloughs and channels complicated, and at times prevented, the delivery of otherwise available water supplies. Implementation of the Grasslands Bypass Project in 1996 alleviated many of the problems regarding salinity concentrations in Salt Slough and other area channels. With delivery of the water supplies required under the CVPIA and implementation of the Grassland Bypass Project, wetland management and water quality on the refuges has improved.

State Wildlife Areas

Five state wildlife areas included the CVPIA lie within the San Joaquin River Basin. Historic water supplies to the wildlife areas consist of groundwater, flood flows, surface return flows, surface water rights and licenses, and CVP water supplied under the 1954 Act and the CVPIA. Water quality of these water supplies varies. Habitat management on the wildlife areas has been impaired by unreliable and poor quality water supplies in a similar manner as on the federal refuges and Grassland RCD. The lack of firm water supplies of adequate quality has limited management flexibility and the diversity of wetland habitat and species.

Since the passage of the CVPIA, very little Level 2 water supplies from CVP yield have been delivered to the China Island Unit of the North Grassland WA due to a lack of conveyance facilities. Facilities are currently under construction as part of San Joaquin Basin Action Plan, and once completed will allow for the deliveries of all Level 2 and 4 supplies. Groundwater has continued to be an important water supply for the China Island Unit, particularly in drought years. Groundwater has been used to meet a small portion of the water needed for management of the unit pending completion of the conveyance facilities for CVP supplies. However, poor quality and the potential for groundwater overdraft limit the use of groundwater for wetland habitat management (CDFG, 1998).

The Salt Slough Unit has an appropriative license from Salt Slough if and when available. Use of water from Salt Slough has been limited due to unsuitable quality and availability. Although water quality in Salt Slough has improved with implementation of the Grasslands Bypass Project, water quality must still be monitored to determine usability (CDFG, 1998). Since 1993, the Salt Slough Unit has received CVPIA water (approximately 8,000 af per year), which is conveyed through the Grassland WD canal system.

Water is available to the Los Banos WA from a number a number of water rights, licenses, and CVP contracts. Historically (prior to CVPIA and State Water Resources Control Board's water quality objectives being set), use of much of this water had been limited due to unacceptable water quality. Selenium contamination in drainage water historically conveyed through Grassland WD via the San Luis Canal and a CDFG directive prohibiting the use of selenium-tainted water further complicated and restricted water deliveries to the Los Banos WA via the San Luis Canal. During this period, uncontaminated CVP water was only available through this canal during short delivery periods. (CDFG, 1998). The majority of agricultural drainage water from upstream agricultural activities is now diverted around via the Grasslands Bypass Project.

CVP water deliveries via the San Luis Canal Company (SLCC) prior to CVPIA was also limited in that during the winter (December to February) SLCC dewatered its canals for maintenance. The Los Banos WA can obtain agricultural return flows when available from the Boundary Drain. Water from the Boundary Drain is of poorer quality than CVP supplies because of high total dissolved solids. The Los Banos WA also has a 5 cfs riparian right (if and when available) from Mud Slough South, which joins the Boundary Drain near the center of the refuge. However, use of this water has been limited due to unacceptable selenium concentration (Reclamation, 1992).

The Mendota and Volta WAs have relied on CVP water delivered the Mendota Pool and Delta Mendota Canal via San Luis Wasteway, respectively. Water from the Mendota Pool has been Mendota WA's main water supply. The quality of water from the Mendota Pool and San Luis Wasteway is adequate for agricultural, urban, and wildlife habitat management uses.

Grassland Resource Conservation District

Prior to passage of the CVPIA, the fresh water supply to private wetlands in the Grassland RCD was limited and unreliable. Until 1985, Grassland Water District delivered a combination of CVP fresh water and co-mingled agricultural return flows (Stoddard & Associates 1998). However, the subsurface drainwater was found to have elevated concentrations of selenium that could have toxic effects on waterfowl. The majority of agricultural drainage water from upstream agricultural activities is now diverted around the Grassland RCD and cannot be used for wetland management due to its poor quality unless it is co-mingled with higher quality water from other sources (Stoddard & Associates 1998).

With implementation of Grasslands Bypass Project and the passage of the CVPIA, which enabled delivery of CVP water on a more predictable basis, management and water quality on private wetland areas has improved. Wetland managers no longer need to stockpile water in anticipation of limited water supplies. Rather, flow-through management is feasible and has resulted in improved water quality.

Water Quality Effects of Refuge Water Supplies on the San Joaquin River

The previously described wetland areas drain into the San Joaquin River through tributaries. Flows from the refuges contribute salts that are present in the source water, including CVP water, and concentrate in the flows following evaporation and evapotranspiration from the wetland areas. If the source water into the refuges has selenium and/or boron or biostimulatory substances, the return flows also will include these constituents. The CVP water does not contain high selenium or boron concentrations or high biostimulatory substances concentrations. Therefore, in the recent years following implementation of CVPIA, contributions from the refuges have been primarily characterized by high salinity which is present in the source water and concentrates through refuge practices.

The RWQCB historic records indicated that flows from the wetland areas contributed about 8% of the annual total salt load and less than 5% of the total annual flow in the San Joaquin River at Vernalis. However, the impact of these flows is dependent upon when the flows are released from the wetland areas. Historically, the wetland areas stored water in the fall

months. If adequate water was available, the stored water was released in the winter months during wet weather periods when replacement water was available to refill the wetland areas. The winter water was released in the early spring months, primarily in March and April. High volumes of water were not released during irrigation season. Release of most of the water from the wetland areas in winter and early spring months in general did not cause EC at Vernalis to exceed standards. As discussed in Chapter 3, analysis in the PEIS indicated that increased flows from wetland areas due to application of Level 4 water supplies as compared to historical Level 2 water supplies did not increase the potential for exceeding the Vernalis Standards. This analysis was based upon the assumption that water releases under Level 4 water supplies would continue to occur in winter and early spring months.

Since the implementation of CVPIA, the refuge managers have modified the historic water management practices. Water supplies are provided throughout the year which has allowed for flow-through water management and salt management. These changes in operations have improved water quality on the wetlands and in the return flows. In addition, it has reduced the massive loads into the river which had historically occurred in a short-time period. The "San Joaquin Basin Action Plan and North Grasslands Area Conveyance Facilities Final Environmental Assessment / Initial Study" (December 1997) developed a refuge water and salt mass balance model to evaluate the impact of refuge water supplies on water quality in the San Joaquin River. The model considers the monthly patterns of water delivery to the refuges, precipitation, storage, evapotranspiration, percolation to shallow groundwater, and return flows to the San Joaquin River. The analysis assumes that the refuges were provided water from the Delta Mendota Canal. The analysis considers delivery of water to three habitat types: seasonal wetlands, permanent wetlands, and croplands. Application rates were considered to provide flooding of seasonal wetlands from fall through spring months. The permanent wetlands were flooded in all months in the model. Crops were assumed to be grain crops used for waterfowl feeding. The mass balance model calculates the monthly runoff as the difference between applied water, losses to evapotranspiration and evaporation, and storage capacity in ponds and in the soil. A salt loading is calculated on a monthly basis. The 1997 study compared the differences in salt loadings between conditions with Level 2 and Level 4 water supplies to determine if additional water would need to be released from New Melones Reservoir to maintain the same level of compliance as under Level 2 water supplies. The 1997 study only considered an "average" hydrologic year type and did not consider the dilution factor due to flows in the San Joaquin River. In addition, the 1997 study assumed less acreage and less water under Level 4 conditions than were considered in the PEIS.

For this Environmental Assessment, an evaluation was completed of the Level 2 and Level 4 water supplies with the flows and application rates assumed in the PEIS using the water balance model to determine the effects of changes in refuge water supplies. The results, shown in Table 5-2 in accordance with the 1997 report methodology, indicate that implementation of Level 4 in the PEIS alternatives would not increase the frequency of non-compliance of the Vernalis Standards as compared to Level 2 conditions in the PEIS alternatives and therefore would not require additional water releases from New Melones Reservoir. Salinity concentrations also were calculated for the San Joaquin River at Vernalis to reflect dilution factors that would occur under the Vernalis Adaptive Management Program pilot project in which increased April flows are released on the San Joaquin River

TABLE 5-2
Additional Need to Release Water from New Melones Reservoir to Meet Vernalis Standards Without Consideration for Dilution of Water in San Joaquin River on an Average Annual Basis for Level II and Level IV Water Supplies as Described in the Programmatic EIS

	EC Std. (us/cm)	TDS Std. (mg/L)	Discharge Level II Volume (acre-feet)	Discharge Level II TDS (tons)	Discharge Level IV Volume (acre-feet)	Discharge Level IV TDS (tons)	Discharge Volume Increase (acre-feet)	Discharge TDS Increase (tons)	Need for Additional Water to be Released from New Melones Reservoir to meet Standards (acre-feet)
OCT	1000	640	0	0	0	0	0	0	0
NOV	1000	640	0	0	0	0	0	0	0
DEC	1000	640	0	0	1859	951	1859	951	0
JAN	1000	640	345	148	2141	1022	1796	874	0
FEB	1000	640	1269	458	23751	10222	22482	9764	0
MAR	1000	640	2450	956	29759	13189	27309	12233	0
APR	700	448	27752	13932	28538	15681	786	1749	0
MAY	700	448	0	0	0	0	0	0	0
JUN	700	448	0	0	0	0	0	0	0
JUL	700	448	0	0	0	0	0	0	0
AUG	700	448	0	0	0	0	0	0	0
SEP	1000	640	0	0	0	0	0	0	0

tributaries to improve fisheries conditions. The results, reported in Table 5-3, indicate that there was no need to increase releases from New Melones Reservoir to meet salinity standards due to changes in refuge water supplies from Level 2 to Level 4 on an average annual basis. This is consistent with the results presented in the Final PEIS.

Historically, the standards have been primarily exceeded in critical dry years. Therefore, for this Environmental Assessment, an evaluation also was prepared for critical dry years. The results, shown in Table 5-4, indicates that during critical dry years under implementation of Level 4 water supplies, additional water would need to be released from New Melones Reservoir in April without the Vernalis Adaptive Management Program flows. However, with the Vernalis Adaptive Management Program flows, there would be no need to increase releases from New Melones Reservoir to meet salinity standards due to changes in refuge water supplies from Level 2 to Level 4 in critical dry years in PEIS alternatives, as shown in Table 5-5. This is consistent with the results presented in the Final PEIS.

5.3.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the San Luis NWR Complex; the Los Banos, Volta, North Grasslands, and Mendota WAs, and the Grassland RCD. The impacts of providing this water have been evaluated in the PEIS as described in Section 3 of this report. The impacts also have been evaluated as part of the San Joaquin Basin Action Plan and North Grasslands Area Conveyance Facilities Final EA/IS.

No Action Alternative

The analyses in the PEIS indicated that increasing deliveries up to Level 4 water supplies would increase return flows to the San Joaquin River and associated TDS concentrations. The Programmatic EIS analysis assumed that all of the return flows from these refuges would enter the San Joaquin River in the spring months prior to April when the EC standard is 1000 µs/cm. However, implementation of the Preferred Alternative also would lead to increased water releases from the San Joaquin River tributaries under the Vernalis Adaptive Management Plan. This would reduce the TDS concentrations in the San Joaquin River as compared to the pre-CVPIA conditions (PEIS No-Action Alternative) which included Level 2 water supplies to most refuges.

As part of the San Joaquin Basin Action Plan and North Grasslands Area Conveyance Facilities Final EA/IS, a detailed analysis was completed to evaluate water quality in the San Joaquin River, as described above. That analysis indicated that TDS would increase with implementation of Level 4, as shown in the Programmatic EIS evaluation, but there would not be an increase in the frequency of water quality violations in the San Joaquin River at Vernalis. Results of a more recent application of this model, prepared for this Environmental Assessment under average conditions and critical dry conditions with refuge water supplies consistent with the PEIS assumptions, also indicated that there would not be an increase in the frequency of water quality violations in the San Joaquin River at Vernalis.

Proposed Action

Habitat conditions under the Proposed Action would be very similar to the No Action Alternative, with the primary difference being a slight increase in permanent wetlands on some of the refuge units and a change in release patterns. The primary difference between

TABLE 5-3
Additional Need to Release Water from New Melones Reservoir to Meet Vernalis Standards With Consideration for Dilution of Water in San Joaquin River on an Average Annual Basis for Level II and Level IV Water Supplies as Described in the Programmatic EIS

	EC Std. (us/cm)	TDS Std. (mg/L)	San Joaquin River Flows at Vernalis (acre-feet)	Discharge Level II Volume (acre-feet)	Discharge Level II TDS (tons)	Discharge Level IV Volume (acre-feet)	Discharge Level IV TDS (tons)	Level II TDS in the San Joaquin River at Vernallis (mg/L)	Level IV TDS in the San Joaquin Riverat Vernallis (mg/L)	Need for Additional Water to be Released from New Melones Reservoir to meet Standards (acre-feet)
OCT	1000	640	122975	0	529	0	444	238	238	0
NOV	1000	640	119008	0	404	0	403	342	342	0
DEC	1000	640	184463	0	356	1859	376	526	530	0
JAN	1000	640	276694	345	315	2141	351	592	594	0
FEB	1000	640	360992	1269	265	23751	316	365	385	0
MAR	1000	640	399669	2450	287	29759	326	138	160	0
APR	700	448	386777	27752	369	28538	404	152	155	0
MAY	700	448	368926	0	1416	0	1035	203	203	0
JUN	700	448	208264	0	2793	0	1915	189	189	0
JUL	700	448	153719	0	7266	0	4035	355	355	0
AUG	700	448	122975	0	0	0	0	345	345	0
SEP	1000	640	119008	0	0	0	0	268	268	0

TABLE 5-4
Additional Need to Release Water from New Melones Reservoir to Meet Vernalis Standards Without Consideration for Dilution of Water in San Joaquin River in Critical Dry Years for Level II and Level IV Water Supplies as Described in the Programmatic EIS

	EC Std. (us/cm)	TDS Std. (mg/L)	Discharge Level II Volume (acre-feet)	Discharge Level II TDS (tons)	Discharge Level IV Volume (acre-feet)	Discharge Level IV TDS (tons)	Discharge Volume Increase (acre-feet)	Discharge TDS Increase (tons)	Need for Additional Water to be Released from New Melones Reservoir to meet Standards (acre-feet)
OCT	1000	640	0	0	0	0	0	0	0
NOV	1000	640	0	0	0	0	0	0	0
DEC	1000	640	0	0	0	0	0	0	0
JAN	1000	640	0	0	169	110	169	110	0
FEB	1000	640	0	0	1070	667	1070	667	0
MAR	1000	640	0	0	845	527	845	527	0
APR	700	448	0	0	845	813	845	813	2740
MAY	700	448	0	0	0	0	0	0	0
JUN	700	448	0	0	0	0	0	0	0
JUL	700	448	0	0	0	0	0	0	0
AUG	700	448	0	0	0	0	0	0	0
SEP	1000	640	0	0	0	0	0	0	0

TABLE 5-5
Additional Need to Release Water from New Melones Reservoir to Meet Vernalis Standards With Consideration for Dilution of Water in San Joaquin River in Critical Dry Years for Level II and Level IV Water Supplies as Described in the Programmatic EIS

	EC Std. (us/cm)	TDS Std. (mg/L)	San Joaquin River Flows at Vernalis (acre-feet)	Discharge Level II Volume (acre-feet)	Discharge Level II TDS (tons)	Discharge Level IV Volume (acre-feet)	Discharge Level IV TDS (tons)	Level II TDS in the San Joaquin River at Vernallis (mg/L)	Level IV TDS in the San Joaquin River at Vernallis (mg/L)	Need for Additional Water to be Released from New Melones Reservoir to meet Standards (acre-feet)
OCT	1000	640	92231	0	559	0	513	370	370	0
NOV	1000	640	89256	0	531	0	511	560	560	0
DEC	1000	640	92231	0	663	0	529	625	625	0
JAN	1000	640	122975	0	476	169	477	863	863	0
FEB	1000	640	138843	0	412	1070	458	544	548	0
MAR	1000	640	122975	0	436	845	458	168	171	0
APR	700	448	119008	0	831	845	707	111	116	0
MAY	700	448	153719	0	1954	0	1779	188	188	0
JUN	700	448	89256	0	7329	0	4758	231	231	0
JUL	700	448	61488	0	0	0	0	395	395	0
AUG	700	448	61488	0	0	0	0	345	345	0
SEP	1000	640	59504	0	0	0	0	268	268	0

the No Action Alternative and the Proposed Action is that the Proposed Action allows for improved water management methods, such as flow-through methods, that improve water quality on the refuges and in the return flows. In the No Action Alternative, it was assumed that all of the return flows from the refuges were released in March. In the Proposed Action, the water management methods allow for return flows throughout the year.

The mass balance model described above was used to evaluate the application of refuge water supplies under the Proposed Action as compared to Level 4 water supplies under the No Action Alternative. Initially, the analysis only considered changes in runoff without consideration for dilution in the San Joaquin River. Under those assumptions, the runoff from the refuges would increase the need for additional releases from New Melones Reservoir in December through April under average conditions and in January, February, and April under critical dry conditions, as shown in Tables 5-6 and 5-8. However, dilution can be considered in evaluating the impacts on compliance with the Vernalis Standards, and due to the flows in the San Joaquin River there would not be a need for additional releases from New Melones Reservoir to meet the standards (Tables 5-7 and 5-9). Therefore, the level of impact from the Proposed Action as compared to the No Action Alternative would be similar.

5.4 Agricultural Land Use

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

5.4.1 Affected Environment

Adjacent Land Uses

The refuges in the San Joaquin River basin are located predominantly in Merced County in the central San Joaquin Valley. The refuges are generally located between State Route (SR) 140 to the north, and SR 152 to the south. SR 165 divides the area from north to south. The largest town in the general vicinity is Los Banos, with the smaller communities of Gustine and Volta located nearby. The majority of the refuges are located adjacent to one another in wetland areas along the San Joaquin River, Salt Slough, Mud Slough, and portions of Bear, Los Banos, and San Luis Creeks. Several of the San Joaquin Valley refuges, including the Kesterson Unit, the Freitas Unit, the West Bear Creek Unit, and the Salt Slough Unit, are surrounded entirely by other refuges. However, a majority of the refuges are surrounded by privately owned agricultural lands, made up of pasture, row crops, and orchards.

Lands surrounding the refuges are generally designated as Agricultural according to the Merced County General Plan. The refuges themselves are recognized as highly valuable wetland areas and wildlife habitat within the General Plan. The refuges land uses are compatible with the Land Use, Open Space, and Agricultural Land Use goals of the Merced County General Plan.

The Merced NWR and the Mendota WA are unique among the San Joaquin Valley refuges because they are situated independently from the other refuges. Merced NWR is the most easterly of the refuges in the San Luis NWR Complex, located approximately 9 miles

TABLE 5-6
Additional Need to Release Water from New Melones Reservoir to Meet Vernalis Standards Without Consideration for Dilution of Water in San Joaquin River on an Average Annual Basis for Level II and Level IV Under No Action Alternative and Proposed Action

	EC Std. (us/cm)	TDS Std. (mg/L)	Discharge No Action Alt Volume (acre-feet)	Discharge No Action Alt TDS (tons)	Discharge Proposed Action Volume (acre-feet)	Discharge Proposed Action TDS (tons)	Discharge Volume Increase (acre-feet)	Discharge TDS Increase (tons)	Need for Additional Water to be Released from New Melones Reservoir to meet Standards (acre-feet)
OCT	1000	640	0	0	0	0	0	0	0
NOV	1000	640	0	0	0	0	0	0	0
DEC	1000	640	1859	951	0	0	-1859	-951	0
JAN	1000	640	2141	1022	2897	2007	756	985	0
FEB	1000	640	23751	10222	16642	10035	-7109	-187	0
MAR	1000	640	29759	13189	13590	8198	-16169	-4991	0
APR	700	448	28538	15681	31752	19849	3213	4168	4606
MAY	700	448	0	0	0	0	0	0	0
JUN	700	448	0	0	0	0	0	0	0
JUL	700	448	0	0	0	0	0	0	0
AUG	700	448	0	0	0	0	0	0	0
SEP	1000	640	0	0	0	0	0	0	0

TABLE 5-7
Additional Need to Release Water from New Melones Reservoir to Meet Vernalis Standards With Consideration for Dilution of Water in San Joaquin River on an Average Annual Basis for Level IV Under No Action Alternative and Proposed Action

	EC Std. (us/cm)	TDS Std. (mg/L)	San Joaquin River Flows at Vernalis (acre-feet)	Discharge No Action Alt Volume (acre-feet)	Discharge No Action Alt TDS (tons)	Discharge Proposed Action Volume (acre-feet)	Discharge Proposed Action TDS (tons)	No Action Alt TDS in the San Joaquin River at Vernallis (mg/L)	Proposed Action TDS in the San Joaquin River at Vernallis (mg/L)	Need for Additional Water to be Released from New Melones Reservoir to meet Standards (acre-feet)
OCT	1000	640	122975	0	444	0	828	238	238	0
NOV	1000	640	119008	0	403	0	691	342	342	0
DEC	1000	640	184463	1859	376	0	584	530	526	0
JAN	1000	640	276694	2141	351	2897	509	594	597	0
FEB	1000	640	360992	23751	316	16642	443	385	385	0
MAR	1000	640	399669	29759	326	13590	444	160	151	0
APR	700	448	386777	28538	404	31752	460	155	163	0
MAY	700	448	368926	0	1035	0	670	203	203	0
JUN	700	448	208264	0	1915	0	1249	189	189	0
JUL	700	448	153719	0	4035	0	1337	355	355	0
AUG	700	448	122975	0	0	0	0	345	345	0
SEP	1000	640	119008	0	0	0	0	268	268	0

TABLE 5-8
Additional Need to Release Water from New Melones Reservoir to Meet Vernalis Standards Without Consideration for Dilution of Water in San Joaquin River in Critical Dry Years for Level IV Under No Action Alternative and Proposed Action

	EC Std. (us/cm)	TDS Std. (mg/L)	Discharge No Action Alt Volume (acre-feet)	Discharge No Action Alt TDS (tons)	Discharge Proposed Action Volume (acre-feet)	Discharge Proposed Action TDS (tons)	Discharge Volume Increase (acre-feet)	Discharge TDS Increase (tons)	Need for Additional Water to be Released from New Melones Reservoir to meet Standards (acre-feet)
OCT	1000	640	0	0	0	0	0	0	0
NOV	1000	640	0	0	0	0	0	0	0
DEC	1000	640	0	0	0	0	0	0	0
JAN	1000	640	169	110	0	0	-169	-110	0
FEB	1000	640	1070	667	0	0	-1070	-667	0
MAR	1000	640	845	527	966	618	121	91	0
APR	700	448	845	813	24617	17184	23772	16371	17324
MAY	700	448	0	0	0	0	0	0	0
JUN	700	448	0	0	0	0	0	0	0
JUL	700	448	0	0	0	0	0	0	0
AUG	700	448	0	0	0	0	0	0	0
SEP	1000	640	0	0	0	0	0	0	0

TABLE 5-9
Additional Need to Release Water from New Melones Reservoir to Meet Vernalis Standards With Consideration for Dilution of Water in San Joaquin River in Critical Dry Years for Level IV Under No Action Alternative and Proposed Action

	EC Std. (us/cm)	TDS Std. (mg/L)	San Joaquin River Flows at Vernalis (acre-feet)	Discharge No Action Alt Volume (acre-feet)	Discharge No Action Alt TDS (tons)	Discharge Proposed Action Volume (acre-feet)	Discharge Proposed Action TDS (tons)	No Action Alt TDS in the San Joaquin River at Vernallis (mg/L)	Proposed Action TDS in the San Joaquin River at Vernallis (mg/L)	Need for Additional Water to be Released from New Melones Reservoir to meet Standards (acre-feet)
OCT	1000	640	92231	0	513	0	568	370	370	0
NOV	1000	640	89256	0	511	0	568	560	560	0
DEC	1000	640	92231	0	529	0	559	625	625	0
JAN	1000	640	122975	169	477	0	491	863	863	0
FEB	1000	640	138843	1070	458	0	471	548	544	0
MAR	1000	640	122975	845	458	966	470	171	172	0
APR	700	448	119008	845	707	24617	513	116	217	0
MAY	700	448	153719	0	1779	0	988	188	188	0
JUN	700	448	89256	0	4758	0	1723	231	231	0
JUL	700	448	61488	0	0	0	3272	395	395	0
AUG	700	448	61488	0	0	0	0	345	345	0
SEP	1000	640	59504	0	0	0	0	268	268	0

southwest of the City of Merced in central Merced County. The Merced NWR is completely surrounded by agricultural lands. The Mendota WA is located in Fresno County, 3 miles southeast of the town of Mendota adjacent to Fresno Slough. The Mendota WA is situated adjacent to SR 180 (Whitesbridge Road), immediately west of CDFG's Alkali Sink Ecological Reserve (a 932-acre tract of land managed for threatened and endangered species and habitat values). The refuge is bounded by the San Luis Drain to the west, and is surrounded almost entirely by agricultural lands to the west, north, and south. The refuge is designated as Open Space in the Fresno County General Plan, and the surrounding lands are designated as Agriculture. The lands surrounding the Mendota WA are managed almost exclusively for agriculture; crops include cotton, alfalfa, seed, small grains, and sugar beets. Horse and sheep graze on some adjacent fields. Some nearby lands are managed as private waterfowl hunting clubs, and several small privately owned inholdings within the Mendota WA are also managed as private waterfowl hunting clubs. The Fresno County General Plan encourages the County to support state and federal programs to acquire significant fish and wildlife habitat areas for permanent protection and / or public recreation use (Fresno County, 1980).

Management Objectives

The Service manages the San Luis NWR Complex pursuant to several objectives, including: (1) to provide feeding and resting habitat for wintering waterfowl; (2) to provide habitat to manage endangered, threatened, and sensitive species of concern; and (3) to alleviate crop depredation. In addition to these primary objectives, the San Luis NWR Complex is also managed to attain the specific goals of the Central Valley Habitat Joint Venture for the San Joaquin Valley, including providing seasonal wetland habitat for migratory waterfowl and maintaining a diversity of wetland and riparian habitats to support a diversity of wildlife species. CDFG manages the WAs in accordance with several departmental land use management guidelines, including providing suitable habitat and living space for the preservation of native species and protecting surrounding agricultural lands from depredation by waterfowl. The main objectives of the Grassland WD are to efficiently deliver water supplies to wetlands within the Grassland RCD, conserve wetlands and wildlife habitat, provide landowners with information on the use of water to manage wetland habitat, and assist landowners in producing optimum habitat for migratory waterfowl and shorebird populations.

5.4.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the San Luis NWR Complex; the Los Banos, Volta, North Grasslands, and Mendota WAs; and the Grassland RCD. The impacts of providing this water have been evaluated in the CVPIA PEIS, as described in Section 3 of this report, but additional site-specific analysis is warranted. This section focuses on the site-specific land-use conflicts that may occur with surrounding agricultural land uses. Key issues of concern to farm owners surrounding the refuges include economic impacts (primarily from crop depredation by waterfowl and the 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, or 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.

5.4.2.1 San Luis NWR Complex

No Action Alternative

One objective of the San Luis NWR Complex includes alleviating the problem of depredation of agricultural crops by wintering waterfowl, which continues to be a part of the refuges' primary mission. This objective would be supported under the No Action Alternative. As described in Section 5.2 (Biological Resources), improvements to on-refuge habitats will continue to occur under the No Action Alternative. One of the benefits of effectively managing wetland habitats with a reliable water supply is the increased ability to produce waterfowl forage on the refuges. The ability to more effectively grow food items has helped maintain waterfowl on the refuge, thereby reducing the potential for depredation on surrounding farmland. This benefit would continue to occur under the No Action Alternative, and additional benefits are expected as full Level 4 supplies are delivered. In addition, relative to existing conditions, additional waterfowl habitat would be supported on the East Bear Creek Unit when restoration actions are completed, which is expected to provide additional benefits in terms of holding waterfowl on the refuge areas. Because of these factors, land use effects would be beneficial 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. 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 refuge water supply increases under the No Action Alternative, there would be a beneficial effect associated with limiting the spread of avian diseases.

Water provided to the refuge is intended for optimum management of refuge lands per the *Report on Refuge Water Supply Investigations* and the *San Joaquin Basin Action Plan/Kesterson Mitigation Plan*. The Service currently owns most of the lands in the Complex; however, per the Action Plan, additional lands may be acquired in the East Bear Creek Unit and the adjacent Kelly property. Per the CVPIA, refuge water supplies are available to these units and would likely be provided under the No Action Alternative, should these additional lands be acquired. Other than these lands that were identified in the Action Plan, no additional refuge expansion is anticipated under the No Action Alternative.

Proposed Action

Habitat conditions under the Proposed Action would be similar to the No Action Alternative. The 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, including potential acquisition of new refuge lands, would be about the same as described above.

5.4.2.2 State Wildlife Areas

No Action Alternative

One of the primary objectives of the state WAs in the San Joaquin River basin is to provide relief from depredation by waterfowl of agricultural crops. 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 would continue to occur under the No Action Alternative. With the reliable water supply under the No Action Alternative, the ability to more effectively manage habitat, including growing waterfowl food items, has helped maintain waterfowl on the refuge, thereby reducing the potential for depredation on surrounding farmland. This beneficial land use effect would continue to occur under the No Action Alternative, and additional benefits are expected as full Level 4 supplies are delivered. In addition, relative to existing conditions, additional waterfowl habitat would be supported on the China Island Unit when infrastructure improvements are completed and Level 4 water supplies are delivered.

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

No refuge expansion is planned under the No Action Alternative. The amount of water provided to the state refuges is intended for optimum management of current refuge lands.

Proposed Action

Habitat conditions under the Proposed Action would be similar to the No Action Alternative. Minor habitat changes under the Proposed Action would not result in a different level of impact to adjacent farmlands relative to the No Action Alternative. 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. Many of the benefits described above are currently being realized as a result of delivery of Level 2 water supplies to the state refuge units, and some refuge units have received up to Level 4 water supplies. The primary difference would be with regard to the China Island Unit, which is still undergoing conveyance improvements to fully use Level 4 water supplies. Accordingly, the potential benefits to farmlands adjacent to the China Island Unit (such as decreased crop depredation or decreased spread of avian diseases) would increase over time, as habitat improvements associated with Level 4 deliveries occur on the China Island Unit.

5.4.2.3 Grassland Resource Conservation District

No Action Alternative

As described in Section 5.2 (Biological Resources), improvements to Grassland RCD waterfowl habitat would continue to occur under the No Action Alternative. With the

reliable water supply under the No Action Alternative, the ability to more effectively manage waterfowl habitat, including growing food items, has helped maintain waterfowl on the Grassland RCD, thereby reducing the potential for depredation on surrounding farmland. This beneficial land use effect would continue to occur under the No Action Alternative, and additional benefits are expected as full Level 4 supplies are delivered.

An additional benefit of maximizing waterfowl retention on the Grassland RCD is control of avian diseases, which are potentially transmittable to domestic fowl. For the Grassland RCD, beneficial impacts with regard to controlling avian diseases would be the same as those described above for the San Luis NWR Complex.

Providing reliable refuge water supplies to the Grassland RCD does not involve the conversion of upland habitats to wetland use; rather, the amount of water provided to the Grassland RCD is intended for optimum management of current waterfowl habitat per the *Report on Refuge Water Supply Investigations*. However, conversion of existing agricultural areas to wetlands remains an option for agricultural property owners within the Grassland RCD. If such a conversion occurs, then the Grassland WD would be obligated to provide water to these new wetland areas. However, the decision by private landowners to create new wetland habitats is not expected to be affected by Grassland WD actions under the No Action Alternative.

Proposed Action

Habitat conditions under the Proposed Action would be similar to the No Action Alternative, and any minor changes in habitat 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 those described above. 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. Most of the benefits have been realized given recent deliveries of most of the Level 4 increment, but some additional benefits relative to existing conditions would be realized through increasing Level 4 deliveries.

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 hunting, fishing, and non-consumptive recreation uses on the refuges.

5.5.1 Affected Environment

The San Joaquin Valley refuges provide many consumptive and non-consumptive recreational opportunities, including hunting, fishing, birdwatching, and nature study. A majority of recreational opportunities on the refuges is associated with waterfowl, and includes non-consumptive uses (such as wildlife observation) and consumptive uses (such as waterfowl hunting). Visitation to the refuges is highest in winter (October through January), when waterfowl are present. NWRs, by policy, allow public use activities that are deemed compatible with the primary purpose of individual refuges. Except for the cooperative hunting programs, no access fees are charged to the general public.

Consumptive use includes all recreational use that allows publicly owned wildlife to become private property (hunting, fishing, etc.). A non-consumptive use is an activity that does not consume a natural resource, such as photography or nature study. Many of the refuges are designed to protect wildlife populations from overuse and to provide for equitable distribution of resources taken by the public. In addition, regulations limit consumptive user numbers, season of use, and location of use. These regulations are designed to provide adequate protection of wildlife and habitats from damage through overuse.

San Luis NWR Complex

The recreation management objectives for the San Luis NWR Complex provide for both consumptive and non-consumptive use on the refuges. The primary consumptive use is waterfowl and pheasant hunting, and the primary non-consumptive use is wildlife observation.

San Luis Unit

The San Luis Unit offers a multitude of well-established consumptive and non-consumptive use programs. Public-use estimates have recently been updated for the refuge, and include an estimated 7,000 consumptive use days, and 36,000 non-consumptive use days. As indicated by these estimates, non-consumptive activities are the primary focus of recreation use on the refuge.

Non-consumptive use at the San Luis Unit focuses primarily on interpretive waterfowl and wildlife observation programs, as well as hiking. The refuge has two auto tour routes and several foot trails open year-round for sightseeing, nature study, and wildlife viewing. Waterfowl and other wildlife can be viewed from the 10-mile Waterfowl Tour Route. The Tule Elk Tour Route encircles a 760-acre fenced enclosure where a small herd is maintained. This tour route, including interpretive signs and an observation tower equipped with a scope, are the products of a challenge grant from the Rocky Mountain Elk Foundation and other contributions by local landowners. Foot traffic is permitted along the auto tour routes, as well as several adjacent trails, including the Chester Marsh Trail and the Winton Marsh Trail. The Winton Marsh Trail includes an observation platform with benches overlooking the Winton Marsh. The 1-mile Chester Marsh Trail leads to the San Joaquin River and offers opportunities to explore the marsh and woodland habitat of the refuge. Bicycles are also allowed on the San Luis Unit tour routes.

Consumptive use programs on the refuge focus primarily on waterfowl and pheasant hunting, and to a lesser extent, on fishing. The waterfowl hunting program is available 3 days per week during the hunting season, and approximately 40 percent of the refuge is available for hunting at this time. Public hunting of ducks, geese, snipe, moorhens, coots, and pheasants is allowed by special permit. The waterfowl hunting program is operated under a cooperative agreement between the Service and CDFG. Fishing is permitted in season along the Salt Slough portion of the refuge. The main species caught are channel catfish, bullheads, striped bass, carp and black bass.

West Bear Creek Unit

Because the West Bear Creek Unit is a relatively new unit of the San Luis NWR complex, recreation use is not currently well established. Recent public use estimates for the refuge

include an estimated 528 consumptive use days, and 800 non-consumptive use days. The West Bear Creek Unit is open to waterfowl hunting 3 days a week during the hunting season. Major interpretive and recreational expansion opportunities exist on the West Bear Creek Unit, including future tour routes, walking trails, and increased waterfowl hunting opportunities.

Kesterson Unit

Both consumptive and non-consumptive recreation uses occur at the Kesterson Unit. Waterfowl hunting is the primary consumptive use, and hunting blinds have been installed in recent years. Fishing, a popular consumptive use on the surrounding refuges, is not permitted at the Kesterson Unit. Wildlife observation is the primary non-consumptive recreation use on the refuge. Other non-consumptive uses on the refuge includes hiking and biking, organized tours, and outdoor education. Public use estimates have recently been updated for the refuge, and include estimates of 2,600 consumptive use days and 2,200 non-consumptive use days on the refuge.

The Kesterson Unit is open from dawn until dusk. The public access point is located 2 miles east of Gustine on Highway 140. A portion of the Kesterson Unit is open to the general public by foot or bicycle throughout the year, except during the waterfowl hunting season or when restrictions are in place to protect nesting bird colonies from disturbance.

Freitas Unit

Similar to the West Bear Creek Unit, the Freitas Unit is a relatively new unit of the San Luis NWR Complex, so recreation use is not currently well established. Waterfowl hunting is the primary consumptive use on the refuge, and recent public use is estimated at 1,600 consumptive use-days. The Freitas Unit is open to waterfowl hunting seven days a week during the hunting season. The primary waterfowl hunting areas on the refuge are accessible by boat only. Non-consumptive use of the refuge is limited.

Merced Unit

Both consumptive and non-consumptive recreation use occurs on the Merced Unit. Recent public use estimates include an estimated 1,100 consumptive use days, and 12,000 non-consumptive use days. As indicated by these estimates, non-consumptive activities are the primary focus of recreation use on the Merced Unit.

Similar to the San Luis Unit, non-consumptive use opportunities on the refuge include a self-guided auto tour route and hiking trails for wildlife observation, nature study, and photography. In response to increased demand for wildlife observation opportunities, public use facilities (such as observation platforms and interpretive panels) have been installed.

Consumptive use on Merced NWR focuses primarily on waterfowl hunting. Fishing is not permitted on the refuge. Seasonal waterfowl hunting is allowed by permit on designated days in selected areas of the refuge. The hunting area has been expanded following the delivery and management of new water supplies.

East Bear Creek Unit

Prior to its acquisition in 1993, the East Bear Creek Unit was managed as a cattle ranch, and consisted primarily of irrigated pasture. Because the habitat restoration actions identified in the Action Plan have not yet been completed, the East Bear Creek Unit remains primarily

pasture, and does not offer recreational opportunities at this time. The proposed restoration focuses on restoring the natural floodplain of the San Joaquin River and Salt Slough. Once this restoration is complete, consumptive and non-consumptive recreation opportunities will most likely be established on the refuge.

State Wildlife Areas

The state WAs encompassed by the CVPIA are located in the San Joaquin Valley. CDFG manages the WAs in accordance with departmental recreation use guidelines, to provide access to public lands for hunting and fishing opportunities and to provide for multiple use of the area when this use will not unduly interfere with the primary use of the land (CDFG, 1998). This multiple-use policy permits all wildlife-oriented recreation activities to take place on the refuges, as long as these activities are compatible with the primary objectives of the area.

The WAs are open to the general public 24 hours a day, 7 days a week from the middle of January (the first day following the close of waterfowl hunting season) through September 15. Waterfowl may be hunted on Saturdays, Sundays, and Wednesdays from mid-October through mid-January. Pheasant hunting is permitted during the season on Saturdays, Sundays, and Wednesdays, in combination with waterfowl hunting. Pheasant hunting occurs on the first Monday, Tuesday, Thursday, and Friday of the season. Pheasant season runs from early November through early December. Waterfowl hunting can conflict with most other types of recreation use. However, conflict can be avoided by not allowing other recreational activities to occur in the same area as waterfowl hunting on the refuges.

Los Banos WA

Los Banos WA supports both consumptive and non-consumptive recreation uses. Public use for the refuge is estimated at 4,200 consumptive use days, and 35,000 non-consumptive use days (Reclamation, 1989). As indicated by these estimates, the majority of recreation use on the Los Banos WA is non-consumptive in nature.

Non-consumptive recreation opportunities on Los Banos WA include camping, sightseeing, hiking, dog training, and waterfowl observation during the spring and summer months. The refuge has a demonstration marsh for educational purposes, and a self-guided auto tour. The Los Banos WA staff are also available to give custom tours of the refuge to interested groups. These tours are free of charge and are available throughout the year.

Consumptive use on Los Banos WA is oriented toward seasonal waterfowl and pheasant hunting. Dove, rabbit and raccoon hunting are also permitted during the waterfowl and pheasant hunting seasons. Game fish species caught by anglers on the refuge include striper, catfish, bullhead, largemouth bass, crappie, and bluegill. Most angling for game fish on the refuge is concentrated around Buttonwillow Lakes, Ruth Lakes, Mud Slough, and the Boundary Drain. Anglers fish these waters from the shore, as well as from boats.

Volta WA

One of the original objectives for the creation of Volta WA was to provide public waterfowl hunting opportunities. According to the Volta WA Draft Management Plan, this original objective still carries significant importance today. Volta WA has been, and will continue to be, managed with a major emphasis on providing public hunting opportunity for waterfowl and any other game species that can reasonably be hunted without significantly impacting

that or any other species (e.g., pheasant, dove, rabbit, raccoon). Another important management goal for Volta WA is to continue to provide sportfishing opportunities. A third management objective for the refuge is to continue to provide guided tours for non-consumptive users, as needed.

Public use for Volta WA is estimated at 7,400 consumptive use days, and 5,600 non-consumptive use days. Non-consumptive use includes limited nature study and waterfowl observation. Volta WA staff are available for guided tours of the refuge upon request.

North Grasslands WA – China Island Unit & Salt Slough Units

The China Island Unit and the Salt Slough Unit were purchased by the State in 1990, and do not have highly developed recreation programs at this time. Specific information regarding the number of recreation visitors to each refuge and the type of recreation use is not currently available.

Both the China Island and Salt Slough Units are open to visitors, on a walk-in basis only. Consumptive recreational activities are similar to other refuges in the area, and include waterfowl hunting, as well as hunting for raccoons, rabbits, doves, and pheasants. Fishing is also popular. Non-consumptive uses include nature study, birdwatching, and sightseeing.

Mendota Wildlife Area

Mendota WA provides for a wide variety of consumptive and non-consumptive recreational opportunities. Fishing and waterfowl hunting comprise the primary emphasis of the consumptive activities. Camping and nature study comprise the primary emphasis of the non-consumptive activities.

Mendota WA is open to the public 24 hours a day, 7 days a week from the middle of January (the first day following the close of waterfowl hunting season) through September 15. Between 1980 and 1995 there were an estimated 33,389 recreational visits to Mendota WA per year. Of these visits, 52 percent were for fishing, 32 percent for waterfowl hunting, 5 percent for camping, 3 percent for dog-training/field trials, and less than 1 percent each for a combination of consumptive and non-consumptive uses including nature study, birding, picknicking, rabbit hunting, raccoon hunting, and frogging.

An average of 17,534 anglers visit Mendota WA annually. Anglers fish for a variety of species, including black bass, crappie, catfish, bluegill, and striped bass. While fishing occurs throughout the year, much less occurs from mid-October to mid-January, when a majority of the refuge is closed 3 days a week for waterfowl hunting. Additionally, when the Mendota Pool is dewatered every other year, the number of anglers dwindles for a month or two until the pool level and fish populations recover. Waterfowl hunting, the second most popular consumptive use on the refuge, accounts for 10,809 hunters annually. Among the waterfowl hunted are ducks, geese, coots, moorhens, and snipe. Pheasant hunting, a much less popular activity on the refuge, is permitted in combination with waterfowl hunting. An average of 486 pheasant hunters use Mendota WA annually. Dove hunting averages another 483 visits annually. In recent years, however, the number of dove hunters has increased dramatically as hunting opportunities on Mendota WA have become better known in the region. Rabbit hunting accounts for 291 visits annually and occurs year round. Raccoon hunting averages 116 visits annually, and the hunting season extends from late winter into the fall.

As mentioned above, camping is the most popular non-consumptive use, and accounts for 1,544 campers annually. The heaviest use occurs in the summer months. Sightseeing accounts for 3 percent of the recreational use on the refuge. An average of 1,093 sightseers visit Mendota WA annually. Most sightseeing occurs in the spring and early summer months (during the bird nesting season). Dog training and field trials account for an average 362 participants annually. Much of this use is in organized groups and typically precedes and follows the waterfowl hunting season. Nature study accounts for 322 visits annually and participants range from organized groups of local elementary school students to college students. Birding averages 180 visits annually, and picnicking averages 89 visits annually.

Grassland Resource Conservation District

The Grasslands area also provides recreational benefits to sportsmen and visitors attracted by waterfowl hunting and waterfowl viewing opportunities. Public use is estimated at 80,000 consumptive users, and 56,000 non-consumptive users per year.

5.5.2 Environmental Consequences

Entering into the proposed long-term refuge water supply agreements may affect recreation uses in several ways. The focus of this section is 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).

San Luis NWR Complex

No Action Alternative

As described in Section 5.2, habitat conditions would continue to improve on the refuges of the San Luis NWR Complex, in part as a result of an increased ability to manage for year-round habitat conditions and to irrigate for waterfowl forage crops. As a result of these improvements, waterfowl populations would continue to increase. Recreation use is expected to increase along with waterfowl populations. Although the specific number of user-days has not been estimated, the greatest increase in the number of user-days is expected to occur on the Action Plan lands considering that the West Bear Creek and Freitas Units have not supported public recreation use until recently, and the East Bear Creek Unit will not support recreation use until habitat restoration is complete.

In addition to the recreation benefits that are directly related to waterfowl populations (such as waterfowl hunting or bird watching), other benefits are expected as well. For example, increased water in internal conveyance ditches and increased year-round water would benefit warm-water fish populations, and thereby benefit a variety of fish-eating birds and associated wildlife observation and photography.

Proposed Action

Recreation benefits under the Proposed Action are expected to be similar to the No Action Alternative. Although some habitat changes are expected, these changes are not likely to result in substantially different recreation benefits than those described above under the No Action Alternative. Accordingly, there would be no impact to recreation use under the Proposed Action relative to the No Action Alternative.

State Wildlife Areas

No Action Alternative

As described in Section 5.2, habitat conditions are expected to improve on State WAs in the San Joaquin River Basin. Similar to the above discussion for the San Luis NWR Complex, improved habitat conditions are expected to result in improved conditions for recreation users, and would be greatest on the Action Plan lands (i.e., the Salt Slough and China Island Units) that have not supported public recreation until recently. As described above, recreation improvements include an increase in waterfowl hunting and bird watching potential. In addition, increased water in internal conveyance ditches and increased year-round water would benefit warm-water fish populations, thereby benefiting angling.

Proposed Action

Because habitat conditions would be similar between the No Action Alternative and the Proposed Action, recreation benefits would be similar, too. 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, habitat improvements have only been recently completed on the China Island and Salt Slough Units. Because these two refuge units are just now opening to the public, they have the greatest potential for recreation benefits relative to existing conditions. Beneficial effects relative to existing conditions would also occur on the Los Banos, Volta, and Mendota WAs, but the incremental benefit would not be as great as it would be on the two Action Plan units.

Grassland RCD

No Action Alternative

Private recreation use on the Grassland RCD would continue to benefit from the additional water supplied under the No Action Alternative. Similar to the previous discussion for developed public refuges, providing up to full Level 4 water supplies to the Grassland RCD would continue to allow refuge managers to manage for year-round habitat conditions and to irrigate for waterfowl forage crops. As described in Section 5.2, this ability to more effectively manage wetland areas in the Grassland RCD would increase waterfowl populations on the Grassland RCD and would bolster the existing private recreation opportunities in this refuge area.

Proposed Action

Recreation benefits under the Proposed Action are expected to be similar to the No Action Alternative. Although minor habitat changes are expected, 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. Because existing recreation

conditions are not likely to have developed to a level commensurate with the No Action Alternative, beneficial recreation effects would occur under the Proposed Action relative to existing conditions.

5.6 Regional Economics

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

5.6.1 Affected Environment

Significant economic benefits have resulted from waterfowl-based recreation activities, both public and private. Nationwide, it is estimated that approximately $3.3 billion is spent annually on non-consumptive 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); however, few studies have been specifically performed regarding the economic benefits of wildlife refuges in the San Joaquin River basin.

Because economic benefits associated with waterfowl-based recreation activities are dispersed (there is a “non-point” economic benefit), 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 the trip. In contrast, the economic benefits of waterfowl-based recreation by local residents is difficult to estimate because items such as fuel and refreshments may not be directly related to on-refuge recreation activities. Other economic benefits associated with waterfowl-based recreation uses include employment and wages (discussed in more detail in Section 5.7), revenues to state and federal governments from permits and licenses, and the purchase of sporting equipment such as guns and ammunition.

The affected environment for regional economic impacts is primarily the local communities in the vicinity of the refuges (Los Banos, Santa Nella). 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 considered in this analysis. At a broad scale, the economic impacts of implementing the CVPIA have been evaluated in the CVPIA PEIS, as summarized in Section 3, but additional site-specific analysis is warranted. This section focuses on potential

economic impacts resulting from changes in water deliveries to the specific refuges, primarily on trip-related expenses captured by local communities.

As described by Southwick Associates (1995), annual hunting at least partially depends on the population of waterfowl available for hunters to target. Similarly, birdwatching trips likely 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. As a result, 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 refuges. As described in Section 5.2 (Biological Resources), continuing to provide a reliable water supply, 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. In addition, continuing restoration of wetlands on the Action Plan lands would have a substantial wildlife benefit. As wildlife populations continue to increase, hunter and birdwatcher use is expected to respond in a similar manner, and may likely increase to a greater extent as a result of expanding public recreation uses to the Action Plan lands. As is expected for wildlife populations, drastic changes in recreation are not expected to occur; rather, modest increases over time are more likely. Positive economic benefits would be experienced by local communities (through increased travel-related expenditures) and to other economic sectors (permit fees). 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 San Joaquin River basin 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 similar to the No Action Alternative. As described in Section 5.5 (Recreation), onsite recreation use is not expected to change substantially. Accordingly, no changes to regional economic benefits are expected under the Proposed Action relative to the No Action Alternative.

The Proposed Action is expected to result in minor differences to regional economic conditions relative to existing conditions. As described in Section 2, most San Joaquin River Basin refuges have been receiving water deliveries, pursuant to the CVPIA. Many refuges are receiving most of their total Level 4 water supplies. Relative to existing conditions, habitat changes on refuges that are currently receiving most, or all, of their Level 4 water supplies would be minor, so regional economic conditions are not likely to change in a significant manner. The increase to full Level 4 deliveries at China Island and East Bear

Creek would further improve waterfowl habitat relative to existing conditions. Similar to the No Action Alternative described above, these improvements in waterfowl habitats would result in beneficial effects to regional economic conditions (such as increased local business revenue).

5.7 Social Conditions

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

5.7.1 Affected Environment

Providing Level 2 and Level 4 refuge water supplies would affect some individuals to a greater degree than others. In order to simplify the analysis, the effects of the refuge water supply project are considered in the context of three broad social groups: (1) individuals who participate in refuge-dependent recreation activities (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 (such as California Waterfowl Association, or 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 resource decision making.

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 (for example, 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 in the San Joaquin River Basin. On 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 recreationists and local business owners resulting from changes in water deliveries to the San Joaquin River Basin refuges.

Potential benefits to recreation users and local communities are closely related to waterfowl populations and recreation use. Therefore, in order to assess impacts to social conditions, Sections 5.2 (Biological Resources) and 5.5 (Recreation) were reviewed to determine how changes in refuge habitats may 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 San Joaquin River Basin refuges. As described in Section 5.4 (Recreation), hunter and birder use is expected to increase in response to improved waterfowl conditions, increased numbers of birds, and the expansion of recreation uses to the Action Plan lands. This could provide 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 and access to 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), and also could be 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, especially considering the need to provide staffing for the Action Plan lands. 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 similar to those under the No Action Alternative for most of the refuges, and are not expected to result in any changes to social conditions relative to the No Action Alternative.

As described in Section 2, the San Joaquin River basin refuges have been receiving water supply deliveries under interim contracts, pursuant to the CVPIA. Many refuges are receiving most of their total Level 4 water supplies. Relative to existing conditions, habitat changes on refuges that are currently receiving most or all of their Level 4 water supplies would be minor. Therefore, the secondary effects associated with habitat changes (recreation

and socioeconomic changes) would likewise be minor. With regard to the refuges that expect habitat values to change as full Level 4 supplies are fully used (China Island Unit, East Bear Creek Unit), the increased water deliveries are expected to bring about an improvement in waterfowl habitat. These improvements in waterfowl habitats would result in beneficial social effects (such as local employment and on-refuge employment).

5.8 Cultural Resources

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

5.8.1 Affected Environment

General Overview of Prehistoric Resources

Studies of the Southern Central Valley region define an elaborate culture complex for the late prehistoric period. This complex most likely can be ascribed to the Yokuts and their direct ancestors. The material culture of this late temporal period complex included steatite vessels and beads, finely made projectile points, pottery, shaped stone mortars, Tivela disc beads, use of asphaltum, and the presence of metates and manos. Flexed burials were the predominant interment mode. Earlier mortuary practices included extended, rather than flexed, burial position, a situation analogous to that of the northern valley (Gifford and Schenck, 1926; Lillard, et al., 1939; Moratto, 1984).

The Southern Valley Yokuts were members of the Penutian language family, which occupied all of the Central Valley, San Francisco Bay Area, and the Pacific Coast from Marin County to near Point Sur. The Yokuts differed from other California Indians in that they had true tribal divisions with group names. Each tribe spoke an individual dialect of seemingly one parent language (Kroeber, 1925). Trade was well developed, with a mutually beneficial interchange of needed or desired goods. Obsidian, rare in the San Joaquin Valley, was obtained by trade with Paiute and Shoshoni groups on the eastern side of the Sierra Nevada, where numerous sources of this material are located, and to some extent from the Napa Valley, to the north. Shell beads, obtained by the Yokuts from coastal people, and acorns (rare in the Great Basin) were among many items exported to the east by Yokuts traders (Davis, 1961).

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

San Luis NWR Complex

San Luis Unit

The San Luis Unit was the subject of a comprehensive cultural resources survey by Pope (1976) and an overview survey by Haversat and Breschini (1985). Pope's survey identified more than 20 sites on the refuge unit with artifacts thought to be of Native American origin

(such as house pits, lithic scatters, burial areas). In addition to these sites, a historic ferry structure was recorded along San Joaquin River on the eastern border of the refuge.

West Bear Creek Unit

The San Joaquin Basin Action Plan states that cultural resource values are expected to be high in the area of the West Bear Creek Unit because of historic use by Native Americans, especially along Salt Slough and the San Joaquin River and in native grasslands. However, no comprehensive or site-specific surveys of the West Bear Creek Unit have been performed.

Kesterson Unit

Several cultural resources surveys have been performed on the Kesterson Unit, including surveys by ESCA-Tech (1980, for areas in and around Kesterson Reservoir), True, et al. (1981, for the San Luis Drain), West and Welch (1995, for on-refuge improvements), and Haversat and Breschini (1985, an overview survey). There are approximately 15 known sites within the Kesterson Unit that appear to be of Native American origin, including a large area along SR 140. This site, which crosses SR 140 into the China Island Unit of the North Grasslands WA, may be eligible for inclusion on the National Register.

Freitas Unit

The San Joaquin Basin Action Plan states that cultural resources in the area of the Freitas Unit are expected to be high because of the extensive historical use of the Salt Slough and San Joaquin River areas by Native Americans. No comprehensive surveys have been performed on the Freitas Unit. A site-specific survey of a monitoring well field (for the nearby Kesterson Reservoir site) was performed by West (1990). This survey discovered one site containing artifacts thought to be of Native American origin. An additional survey along the eastern boundary of the refuge conducted for the Grasslands State Park (Woodward, 1993) also discovered several sites of Native American origin.

Merced Unit

Several surveys of the Merced Unit have been performed, including a general overview of cultural resources on the refuge property (Haversat and Breschini, 1985). Site-specific surveys were conducted by Shapiro (1997a and 1997b) and Dietz (1998), both for Corps of Engineers levee improvements. Artifacts thought to be of Native American origin were found near the refuge headquarters.

East Bear Creek Unit

The San Joaquin Basin Action Plan states that native grasslands in the area and San Joaquin River/Bear Creek riparian areas are likely to have Native American archaeological sites. No comprehensive surveys have been performed on the East Bear Creek Unit. A survey was performed on 5 acres in the northern portion of the refuge (Parks, 1999), but no cultural resources were found.

State Wildlife Areas

Los Banos Wildlife Area

No comprehensive or site-specific cultural resources surveys have been performed on the Los Banos WA. However, artifacts and human bones have been found by CDFG staff at various sites on the refuge. Five residential structures on the project site are more than 45 years old, so could potentially be classified as historic resources.

Volta Wildlife Area

No cultural resources surveys have been performed on the Volta WA.

North Grasslands Wildlife Area (China Island and Salt Slough Units)

No comprehensive surveys for cultural resources have been performed on either the China Island or Salt Slough Units of the North Grasslands WA. The San Joaquin Basin Action Plan, however, states that Native American archaeological sites are likely to occur within these areas, primarily in riparian areas and native grasslands. Several site-specific surveys were performed on the China Island Unit, including True, et al. (1981, for the San Luis Drain), Welch and West (1996, for the J-lateral pipeline and associated borrow areas), and Adams (1988). As described above for the Kesterson Unit, the site straddling SR 140 may be eligible for listing on the National Register of Historic Places.

No site-specific surveys have been performed for the Salt Slough Unit. However, a small adobe building on the eastern edge of the refuge, the San Luis Camp Adobe, was evaluated for its National Register eligibility. The San Luis Camp Adobe was determined to not be eligible for listing on the National Register, but a placard has been placed to identify the building as a State Historical Landmark.

Mendota Wildlife Area

A records search performed by the South San Joaquin Information Center indicates that five surveys have been conducted for the Mendota WA. Six prehistoric sites have been identified on the Mendota WA, all containing lithic scatters (obsidian flakes, shell and bone fragments), projectile points, and other similar artifacts.

Grassland Resource Conservation District

No comprehensive cultural resources surveys of the Grassland RCD have been performed, but approximately 40 surveys have been performed for various projects in the Grassland RCD. These surveys were usually performed for small levee and road improvements on individual duck clubs, and do not cover a large portion of the RCD. Most of the surveys were undertaken by Service archaeologists in conjunction with federal grant funding (such as Partners for Wildlife). Five sites, all within the South Unit of the Grassland RCD (mostly south of SR 152) were identified as showing evidence of Native American activity. In addition, the Santa Fe Grade Road, which transverses most of the Grassland RCD, has been identified as a historic resource.

5.8.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the San Luis NWR Complex; the Los Banos, Volta, North Grasslands, and Mendota WAs; and the Grassland RCD. The impacts of providing this water have been evaluated in the CVPIA PEIS, as described in Section 3 of this report, but 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.

San Luis NWR Complex

No Action Alternative

Under the No Action Alternative, Reclamation would continue to ensure that Level 2 water is provided to the refuges of the San Luis NWR Complex and that up to full Level 4 water is eventually provided. The effect of this water delivery would be to allow more efficient management of existing wetlands on the refuges, and would not result in the conversion of existing uplands to wetland habitat except as provided in the Action Plan. These changes in management practices do not have the potential to disturb cultural resources.

In order to address potential effects of such 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.[1] The agreement covers all Service lands in California, including the refuges of the San Luis NWR Complex. The Programmatic Agreement establishes procedures for cultural resources review for routine undertakings on the refuges, without each individual undertaking requiring SHPO consultation. The result is full compliance with Section 106 requirements in a streamlined manner. Under the No Action Alternative, habitat management activities are consistent with the terms of the Programmatic Agreement. Accordingly, full compliance with Section 106 is expected without separate SHPO consultation.

Proposed Action

Management activities on the San Luis 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 habitat acreage that do not, in themselves, have the potential to affect cultural resources. Accordingly, the potential to impact cultural resources is the same as that discussed under the No Action Alternative. As described above, 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.

State Wildlife Areas

No Action Alternative

Under the No Action Alternative, Reclamation would provide Level 2 and Level 4 water to state WAs. The effect of this water delivery would be to allow more efficient management of existing wetlands on the refuges, and would not result in the conversion of existing uplands to wetland habitat except as provided in the Action Plan. These changes in management practices do not have the potential to disturb cultural resources.

CDFG procedures require that, pursuant to CEQA, a CDFG archaeologist or consultant conduct a preconstruction archaeological survey in the area of any management activity that requires 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.

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

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 only minor changes in potential management activities would occur relative to the No Action Alternative, the Proposed Action would not adversely affect cultural resources. Potential effects on cultural resources relative to existing conditions would be similar to those described under the No Action Alternative.

Grassland Resource Conservation District

No Action Alternative

Under the No Action Alternative, Reclamation would continue to provide Level 2 and Level 4 water to the Grassland RCD. Since the passage of the CVPIA, the availability of reliable water supplies has affected, and will continue to affect habitat management practices on the individual refuges of the Grassland RCD. The expected changes in habitat management practices with delivery of up to full Level 4 water supplies are primarily changes to management of existing wetlands (more summer water, earlier fall flood-up); no new habitat development activities would occur. This change in water management of existing wetland areas would have no impact on cultural resources.

Proposed Action

Changes in habitat conditions under the Proposed Action relative to the No Action Alternative are primarily an increase in the delivery of summer water to existing wetland areas. As described above under the No Action Alternative, no new habitat development activities would occur, and the change in water management activities of existing wetland areas would have no impact on cultural resources. Relative to existing conditions, potential impacts on cultural resources would be the same as described under the No Action Alternative (no impact).

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

The San Joaquin River basin refuges 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 refuges in the San Joaquin River basin. On a broad scale, the visual resource impacts of implementing the CVPIA have been evaluated in the CVPIA PEIS, as summarized in Section 3, but 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. In order to assess visual resource impacts, Sections 5.2 (Biological Resources) was reviewed to determine how changes in refuge habitats may affect scenic quality.

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. Key changes would result from the continued improvement of seasonal and permanent wetland habitats on the Action Plan lands. This is expected to result in a beneficial effect to visual resources on the Action Plan lands by providing an increased visual contrast to surrounding uplands.

Section 5.2 (Biological Resources) describes how the No Action Alternative would improve habitat on all of the refuges in the San Joaquin River Basin, 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. Accordingly, a beneficial visual resource effect would occur on all refuges.

Proposed Action

Because habitat conditions would be similar, visual effects are expected under the Proposed Action as under the No Action Alternative. In comparison to existing conditions, the most substantial visual resource benefits would occur on the East Bear Creek Unit for which restoration activities are still planned. Although habitat restoration activities have been completed on the China Island Unit, the full benefits of these activities (including aesthetic benefits) are still being realized. Accordingly, relative to existing conditions, there would either be a beneficial impact or no noticeable change to visual resources, and the potential impacts of the Proposed Action would be less than significant.

5.10 Power

This section describes power use by the refuges in the San Joaquin River Basin, and how power use for refuge management may change as a result of the Proposed Action.

5.10.1 Affected Environment

The Pacific Gas and Electric Company (PG&E) supplies electrical power to each of the refuges in the San Joaquin River basin. The amount of power used on each refuge generally depends on whether groundwater is pumped. Power costs have become a major budgetary item for those refuges that pump large quantities of groundwater. In some cases, the cost of electrical power has increased to such an extent that groundwater pumping has been reduced to meet budget constraints (Reclamation, 1989). In addition, lower groundwater levels in some areas of the San Joaquin Valley have raised pumping costs. Because other power use requirements (such as low-lift surface-water pumps) do not contribute significantly to overall power demands, this section focuses primarily on groundwater pumping.

Several of the San Joaquin River Basin refuges have minimal groundwater pumping demands, including the San Luis Unit, West Bear Creek Unit, Freitas Unit, Los Banos WA, and the Salt Slough Unit. Three groundwater wells on the San Luis Unit are used to supplement CVP water. Three groundwater wells, powered by portable diesel generators, are used to supplement CVP water on the West Bear Creek Unit. The Freitas Unit also has one production groundwater well. This individual well is used to maintain permanent wetland habitat during drought periods. Although five groundwater wells were historically used on Los Banos WA, a portion of the system was abandoned as a result of well cave-ins and poor groundwater quality. Three wells are still operable on the refuge, but are intended for use during drought periods only. Groundwater pumping is also used minimally on the Salt Slough Unit. Two refuges, the Mendota and Volta WAs, do not use groundwater pumping at all.

Several other refuges, including the Merced Unit, East Bear Creek Unit, and the China Island Unit, rely more heavily on groundwater pumping, so have greater power demand. The Merced Unit operates 21 groundwater wells, and groundwater is typically used during the winter when the Merced Irrigation District dewaters its delivery system. Under an agreement between Reclamation and the Service, Reclamation has paid a majority of the power costs associated with groundwater pumping on the Merced Unit since the implementation of CVPIA. The East Bear Creek Unit currently operates four groundwater wells, and groundwater has continued to be an important water supply for the China Island Unit, particularly in drought years.

Groundwater pumping facilities are operated on approximately 15 of the 165 hunting clubs in the Grassland RCD. Some of these wells have not been kept fully operational because of poor yields, poor groundwater quality, or corrosive effects. In addition, high pumping costs preclude use of these wells as more than a supplemental supply.

5.10.2 Environmental Consequences

The proposed project would implement the CVPIA provisions to deliver up to Level 4 water supplies to the San Luis NWR Complex; the Los Banos, Volta, North Grasslands, and Mendota WAs; and the Grassland RCD. The power impacts of providing this water have been evaluated in the CVPIA PEIS, as summarized in Section 3, but 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. Accordingly, the focus of the analysis is on those refuges that use groundwater (Merced Unit, East Bear Creek Unit, China Island Unit, Grassland RCD).

5.10.2.1 San Luis NWR Complex

No Action Alternative

As described above, groundwater use is limited primarily to the Merced and East Bear Creek Units of the San Luis NWR Complex.

For the Merced Unit, groundwater pumping has decreased in recent years because of delivery of water by the Merced Irrigation District. Under the No Action Alternative,

however, groundwater pumping would continue to be necessary in the winter months when water deliveries from the Merced Irrigation District are not available. As described above, Reclamation has paid the majority of the Service's groundwater pumping costs for the Merced Unit since the passage of the CVPIA. This arrangement is expected to continue under the No Action Alternative.

The East Bear Creek Unit is still undergoing habitat improvements pursuant to the Action Plan, and has not received full Level 2 and Level 4 deliveries under the No Action Alternative. In addition, water conveyance options are still being developed for the East Bear Creek Unit. Until conveyance options are completed, it is anticipated that, under the No Action Alternative, groundwater pumping would continue to occur in order to support refuge habitats. It is also anticipated that Reclamation would pay the Service's power costs for groundwater pumping on the East Bear Creek Unit, but this would be a temporary circumstance until conveyance facilities are completed.

Proposed Action

Entering into long-term water service agreements would not change groundwater pumping activities compared to that described above under the No Action Alternative. Accordingly, the same power use and cost effects described under the No Action Alternative are expected under the Proposed Action, as well. It is expected that overall power use effects would be beneficial once the necessary conveyance improvements are complete.

State Wildlife Areas

No Action Alternative

Under the No Action Alternative, groundwater pumping is expected to decrease on the China Island Unit of the North Grasslands WA. At this time, internal conveyance facilities on the China Island Unit are being improved in order to use full Level 4 deliveries. As these activities are completed, Reclamation expects to provide up to full Level 4 water supplies, thus making groundwater pumping unnecessary, except possibly in dry years when Level 2 supplies are reduced. Accordingly, beneficial impacts are expected in terms of power use and costs.

Proposed Action

Entering into long-term water service agreements would not change groundwater pumping compared to that described above under the No Action Alternative. Accordingly, the same power use and cost benefits described under the No Action Alternative are expected under the Proposed Action as well. The same beneficial effects described under the No Action Alternative would also occur relative to existing conditions.

Grassland Resource Conservation District

No Action Alternative

Under the No Action Alternative, increased surface water deliveries have resulted in, and is expected to continue to result in, a decrease in groundwater pumping. Some groundwater pumping may still continue to occur in dry years in order to supplement decreased Level 2 deliveries, but overall groundwater use is still expected to continue declining. Accordingly, beneficial impacts are expected in terms of power use and costs.

Proposed Action

Entering into long-term water service agreements would not change groundwater pumping activities on the Grasslands RCD compared to that described above under the No Action Alternative. Accordingly, the same power use and cost benefits described under the No Action Alternative are expected under the Proposed Action, as well. Most of the power use benefits on the Grasslands RCD described above have already been realized from delivery of Level 2 and Level 4 water supplies. Accordingly, there would be little change in power use on the Grasslands RCD relative to existing conditions.

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 in project plans justifiable means and measures for wildlife purposes.

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 Federal Endangered Species Act

Reclamation conducted formal consultation with the Service to address potential effects of the Proposed Action on listed species. The purpose of this process was to ensure that the management practices currently being implemented on the state and federal refuges and the Grassland RCD meet ESA requirements for protection of federal special-status species. The Service issued a Biological Opinion on January 16, 2001, concluding that the Proposed Action, with recommended mitigation measures, is not likely to adversely affect listed species. Additional actions are under way to comply with CESA requirements for the protection of state-listed species.

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 San Joaquin River basin. NMFS concluded that the Proposed Action is not likely to adversely affect anadromous salmonids.

6.3 California Endangered Species Act

The CDFG previously consulted on and issued biological opinions on the effects of management of the state WAs. Because these existing biological opinions address management of the state WAs, no additional consultation is required for compliance with the California Endangered Species Act for the Proposed Action. For Grassland RCD, measures to avoid take of state listed species have been incorporated into the Proposed Action (see Chapter 4). Because take of listed species would be avoided, the Proposed Action would comply with CESA.

6.4 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.

6.5 Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests in property or rights held in trust by the United States 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 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, pers. comm., 31 January, 2000). Therefore, implementation of the Proposed Action will not affect ITAs.

6.6 Environmental Justice

Executive Order 12898 requires each federal agency to achieve environmental justice as part of its mission, by identifying and addressing disproportionately high and adverse human health or environmental effects, including social and economic effects, of its programs, policies, and activities on minority populations and low-income populations of the United States. Reclamation has determined that entering into long-term water supply agreements with the refuges would not disproportionately impact minority or low-income populations.

Social and economic impacts identified in Section 5 are generally anticipated to be beneficial, in addition to being shared across income levels.

6.7 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, CDFG, and GWD have committed to implement additional conservation measures for various special-status plant and animal species, as follows.

- The Service would implement conservation measures for the following species, as described in Appendix C, Table C-1.

  - Aleutian Canada goose
  - bald eagle
  - blunt-nosed leopard lizard
  - Fresno kangaroo rat
  - giant garter snake
  - giant kangaroo rat
  - San Joaquin kit fox
  - valley elderberry longhorn beetle
  - vernal pool fairy shrimp
  - longhorn fairy shrimp
  - Conservancy fairy shrimp
  - vernal pool tadpole shrimp
  - Colusa grass

- CDGF would implement conservation measures pursuant to existing CESA Biological Opinions, and additional measures pursuant to the ESA Biological Opinion completed January 16, 2001, for the following species as described in Appendix C, Tables C-2 and C-3.

  - Aleutian Canada goose
  - bald eagle
  - blunt-nosed leopard lizard
  - California red-legged frog
  - giant garter snake
  - Fresno kangaroo rat
  - giant kangaroo rat
  - San Joaquin kit fox
  - valley elderberry longhorn beetle
  - vernal pool fairy shrimp
  - longhorn fairy shrimp
  - Conservancy fairy shrimp
  - vernal pool tadpole shrimp
  - Ferris's bird's-beak
  - Hoover's eriastrum
  - palmate-bracted bird's-beak
  - San Joaquin woolly threads

- GWD would implement conservation measures for the following species, as described in Appendix C, Table C-4:

  - Aleutian Canada goose
  - bald eagle
  - giant garter snake
  - Fresno kangaroo rat
  - giant kangaroo rat
  - San Joaquin kit fox

References

Adams, C. J. 1988. Archaeological Survey Report for Proposed Surface Rehabilitation and Widening – 10-MER-140. Prepared for Jim Jelinek, Chief, District 10 Environmental Branch, Stockton, California.

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

California Native Plant Society. 1994. "Inventory of rare and endangered vascular plants of California." California Native Plant Society Special Publication No. 1. 5th Edition. Sacramento, CA.

California Department of Fish and Game (CDFG). 1983. "A plan for protecting, enhancing, and increasing California's wetlands for waterfowl." Sacramento, California.

CDFG. 1988. *Los Banos Wildlife Area Management Plan.*

CDFG. 1994. *Mendota Wildlife Area Management Plan.*

CDFG. 1998. *North Grasslands Wildlife Area Management Plan.*

CDFG. 2000. Final Draft *Volta Wildlife Area Management Plan.*

Cook, S.F. 1955. *The Aboriginial Populations of the San Joaquin Valley, California.* University of California Press Anthropological Records 16(2). Berkeley.

Dietz, Frank. 1998. Cultural Resources Assessment within the Lower San Joaquin Levee District on the Eastside Bypass, Merced County, California (SJ21, SJ22 & SJ25).

ESCA-Tech Corporation. 1980. Final Report – Archaeological and Historical Survey, Kesterson Reservoir. Submitted to: U.S. Department of Interior, Water And Power Resources Service.

Fresno County. 1980. Fresno County General Plan.

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

Haversat, T. and G. S. Breschini. 1985. A Cultural Resources Overview and Management Plan for the San Luis, Merced, and Kesterson National Wildlife Refuges, Merced County, California. Submitted to the U.S. Fish and Wildlife Service, Portland, Oregon.

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

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

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

Parks, V. 1999. U.S. Fish and Wildlife Service Archaeological and Historical Resources Identification Report: Gallo Cattle Co. Restoration – GWMA 99.

Pope, J. L. 1976. The Archeology of the San Luis Island National Wildlife Refuge, Merced County, California. February 1976. Prepared for the U.S. Fish and Wildlife Service.

Shapiro, W. 1987a. An Archaeological Assessment Within Portions of the Lower San Joaquin Levee District and the Madera County Flood Control and Water Conservation Levees: Merced and Madera Counties, California. Prepared for the U.S. Army Corps of Engineers, Sacramento District.

Shapiro, W. 1987b. Addendum Report: An Archaeological Assessment Within Portions of the Lower San Joaquin Levee District and the Madera County Flood Control and Water Conservation Levees: Merced and Madera Counties, California. Prepared for the U.S. Army Corps of Engineers, Sacramento District.

Southwick Associates. 1995. The Economic Contributions of Bird and Waterfowl Recreation in the United States During 1991. Prepared for the International Association of Fish and Wildlife Agencies and the USFWS North American Waterfowl and Wetlands Office. March 1995.

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

True, D.L., P. Bouey, and M. Basgall. 1981. Archaeological Survey of the Proposed San Luis Drain Project: Kesterson Reservoir to the Sacramento-San Joaquin Delta, California. Submitted to U.S. Department of Interior, Bureau of Reclamation.

U.S. Bureau of Reclamation (Reclamation). 1950. “Waterfowl conservation in the lower San Joaquin Valley.” Sacramento, California.

U.S. Bureau of Reclamation (Reclamation). 1978a. “Fish and wildlife problems, opportunities, and solutions.” Working document No. 12, USBR, Sacramento, California.

U.S. Bureau of Reclamation (Reclamation). 1978b. “Water availability study for California wetlands.” Prepared by CH2M HILL.

U.S. Bureau of Reclamation (Reclamation). 1986. “Central Valley Fish and Wildlife Management Study: New waterfowl habitat potential within the Central Valley, California.” Special Report, September 1986.

U.S. Bureau of Reclamation (Reclamation). 1989. “Report on refuge water supply investigations: Central valley hydrologic basin, California.” Mid Pacific Region.

U.S. Bureau of Reclamation (Reclamation). 1992. “Refuge water supply study, plan coordination team interim report.” Mid-Pacific Region, Sacramento, California.

U.S. Bureau of Reclamation (Reclamation). 1999. “Final Environmental Assessment and Finding of No Significant Impact. The temporary acquisition of water from Semitropic Water Storage District for San Joaquin Valley wetland habitat areas.” Mid-Pacific Region, Sacramento, California.

U.S. Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (Service) and California Department of Fish and Game (CDFG). 1989. San Joaquin Basin Action Plan/Kesterson Mitigation Plan.

U.S. Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (Service) and California Department of Fish and Game (CDFG). 1995. "San Joaquin Basin action plan: Wetlands development and management plan in the North Grasslands area." Merced County, California.

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

U.S. Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service, California Department of Fish and Game, Grassland Resource Conservation District. 1998. "Final Task Force Report: An interagency coordinated program for wetland water use planning, Central Valley, California." Prepared by Tetra Tech, Environmental Science Associates, and CONCUR.

U.S. Bureau of Reclamation (Reclamation) and California Department of Fish and Game (CDFG). 1999. "Final Environmental Assessment / Initial Study, and Proposed FONSI / Negative Declaration." Conveyance of refuge water supply project, Mendota Wildlife Area.

U.S. Fish and Wildlife Service (Service). 1978b. "Concept plan for waterfowl wintering habitat preservation." Region 1, Portland, Oregon.

U.S. Fish and Wildlife Service (Service). 1990. "Central Valley habitat joint venture implementation plan." Portland, Oregon.

U.S. Fish and Wildlife Service (Service). 1996. Draft "Water Management Strategy for the National Wildlife Refuges of the Central Valley of California."

Welch, P. and G. J. West. 1996. Cultural Resources Inventory for the China Island Wetland Development and the J Lateral Pipeline.

West, G. J. 1990. Archeological Reconnaissance: Pollutant Plume Detection Wells, Freitas Ranch Property, Merced County, California.

West, J. and P. Welch. 1995. Cultural Resources Report: Kesterson NWR Proposed Canal and Trail.

Woodward, J. 1993. Archaeological Reconnaissance of Great Valley Grasslands State Park.

List of Preparers

U.S. Bureau of Reclamation

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

U.S. Fish and Wildlife Service

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

California Department of Fish and Game

Jim Steele	Environmental Specialist
John Beam	Refuge Manager, Los Banos WA

Grassland Water District

Dean Kwasny	Wildlife Biologist

CH2M HILL

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

Appendix A:
CEQA Initial Study Checklist – State Wildlife Areas

Appendix A
CEQA Initial Study Checklist – State Wildlife Areas

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
1416 Ninth Street
Sacramento, CA 95814
(916) 653-1485

4. Project Location: Los Banos, Volta, and portions of the North Grasslands Wildlife Areas in Merced County, and the Mendota Wildlife Area in Fresno County.

5. Project Sponsor: Department of Fish and Game

6. General Plan Designation: Agricultural (Merced County General Plan)
Agriculture (Fresno 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 were provided as described in Reclamation's *Report on Refuge Water Supply Investigations* and the *San Joaquin Basin Action Plan/Kesterson Mitigation Plan*. The specific actions to be undertaken with regard to the refuges considered in this Initial Study are described in the following sections.

Los Banos Wildlife Area

Under the proposed long-term contract, Reclamation would ensure that the Los Banos Wildlife Area (WA) is provided with a firm, reliable water supply of 16,670 acre-feet per year (afa), subject to deficiencies. In addition, Reclamation would seek to supply the Los Banos WA with up to an additional increment of 8,826 afa through its Water Acquisition Program. This water (up to a total of 25,496 afa under the proposed contract) would be used by CDFG to support the efficient use of existing wetland habitats on the Los Banos WA. No new wetland areas would be created, and existing wetlands would generally not be converted to different habitat types (e.g., seasonal wetlands to permanent wetlands). Currently, most of the refuge water supplies required under the CVPIA are being delivered to the Los Banos WA, either directly by Reclamation or under previous water supply agreements.

North Grasslands Wildlife Area: China Island Unit

Under the proposed long-term contract, Reclamation would ensure that the China Island Unit of the North Grasslands WA is provided with a firm, reliable water supply of 6,967 afa, subject to deficiencies. In addition, Reclamation would seek to supply the China Island Unit with up to an additional increment of 3,483 afa through its Water Acquisition Program. This water (up to a total of 10,450 afa under the proposed contract) would be used by CDFG to support the efficient use of wetland habitats on the China Island Unit. Currently, restoration activities are underway to create wetland habitat on the China Island Unit, pursuant to the *San Joaquin Basin Action Plan/Kesterson Mitigation Plan*. In support of these new habitat areas, Reclamation has provided water to the China Island Unit under the CVPIA, and in addition CDFG uses groundwater to support wetland areas. Delivery of the full refuge water supplies under the CVPIA, however, cannot occur until additional conveyance infrastructure is developed on the China Island Unit. CDFG is currently in the process of developing these internal conveyance facilities.

North Grasslands Wildlife Area: Salt Slough Unit

Under the proposed long-term contract, Reclamation would ensure that the Salt Slough Unit of the North Grasslands WA is provided with a firm, reliable water supply of 6,680 afa, subject to deficiencies. In addition, Reclamation would seek to supply the Salt Slough Unit with up to an additional increment of 3,340 afa through its Water Acquisition Program. This water (up to a total of 10,020 afa under the proposed contract) would be used by CDFG to support the efficient use of wetland habitats on the Salt Slough Unit. Restoration activities to create wetland habitat have recently been completed on the Salt Slough Unit, pursuant to the *San Joaquin Basin Action Plan/Kesterson Mitigation Plan*. Under the CVPIA, Reclamation has provided most of the water to support these new habitat areas, but additional deliveries are necessary in order to meet the full refuge water supply requirement.

Mendota Wildlife Area

Under the proposed long-term contract, Reclamation would ensure that the Mendota WA is provided with a firm, reliable water supply of 27,954 afa, subject to deficiencies. In addition, Reclamation would seek to supply the Mendota WA with up to an additional increment of 1,694 afa through its Water Acquisition Program. This water (up to a total of 29,618 afa under the proposed contract) would be used by CDFG to support the efficient use of existing wetland habitats on the Mendota WA. No new wetland areas would be created, and existing wetlands would generally not be converted to different habitat types. Currently, the full refuge water supply amounts required under the CVPIA can be delivered to the Mendota WA under a previous water supply agreement with Reclamation. However, improvements to the Mendota Pool upstream of the refuge are necessary in order to allow this water to be delivered in a manner that more effectively supports refuge habitat management. Potential improvements to the Mendota Pool are currently under consideration by Reclamation as part of a separate project.

9. Surrounding Land Uses and Setting:

The Los Banos, Volta, and North Grasslands Wildlife Areas are part of the larger Grasslands Ecological Area. The Los Banos and North Grasslands Wildlife Areas are bordered by other refuge lands (primarily federal refuges of the San Luis National Wildlife Refuge Complex and the private wetlands of the Grassland Resource Conservation District). The Volta

Wildlife Area is bordered by the Grassland Resource Conservation District and private farmlands. The Mendota WA is bordered entirely by private farmlands.

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:

John Beam, Manager, Los Banos 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.

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 five refuge units each have a high degree of visual intactness including wetland, upland, and riparian areas. Implementing the proposed project would allow existing wetland areas to be managed more effectively. Providing for year-round use of wetlands will slightly increase visual quality, and therefore this impact is considered to be beneficial. Minor construction activities will be necessary on the China Island Unit to improve internal conveyance of increased water supplies; however, the limited extent of construction would not affect visual resources.

	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 Dept. 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 the refuges for waterfowl and other wildlife habitat purposes is consistent with the policies of the Merced and Fresno 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 other changes would occur that would result in a conversion of farmland to non-agricultural 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?	☐	☐	☑	☐
(b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☑	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(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. No air quality impacts would occur.

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 project. The reader is referred to this analysis for an understanding of the habitat and associated plant and animal resources of the five refuge units.

With the exception of the China Island Unit, CVPIA refuge water supplies have been available to the state WAs. The increase in reliable water supplies to the full amount would allow optimal management of on-refuge habitats. However, because the refuges have been receiving most of the water required by the CVPIA, the habitat conditions would not change substantially from existing conditions. Expansion of wetland habitats to non-wetland areas would not occur on the state Wildlife Areas. Rather, increased and reliable water supplies would enable more effective management of existing habitats. Expected improvements in habitat management include:

- 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.

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

- 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 two to four weeks during the summer.

Full CVPIA water supplies would continue to support 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. Additional conservation measures would be implemented on the state Wildlife Areas to avoid and minimize potential impacts to special-status species from a wide range habitat management activities and operational regimes. In combination, the improvements in habitat quality and availability, and the additional conservation measures would provide greater benefit to special-status species than currently exists.

(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: The wetland habitat types found on the five refuge units are considered sensitive; however, the proposed project is intended to improve habitat management activities on the refuges.

(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, and would not affect jurisdictional waters.

(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 (e.g., increased permanent wetland habitat). The extent of these habitat changes is not expected to adversely affect wildlife movement and dispersal.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(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 Merced and Fresno County General Plans. In addition, the project facilitates the implementation of Management Plans for each of the refuges.

(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 Central California and Southern San Joaquin Valley Information Centers, each refuge unit has a high potential for prehistoric cultural resources. Standard CDFG processes for protection of cultural resources call for pre-construction surveys where subsurface excavation is planned, and consultation with the Office of Historic Preservation where appropriate. However, management activities under the proposed project would not affect cultural resources.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
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.	☐	☐	☐	☑
(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.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☑
(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 refuges, 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 in the vicinity of the Los Banos, Volta, North Grasslands, and Mendota WAs.

(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 five refuge units 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 due to wildfire at the refuges is very 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 Refuge Water Supply project. The reader is referred to this analysis for an understanding of the water resources on and near the refuge units.

The NEPA analyses conducted for the CVPIA indicated that providing full refuge water supplies under the CVPIA would increase total dissolved solids (TDS) concentrations in the San Joaquin River. This analysis assumed that all of the return flows from these refuges would enter the San Joaquin River in the spring months prior to April when the standard for electrical conductivity (EC) at Vernalis is 1000 microsiemens/cm (Ms/cm). However, CVPIA implementation also would lead to increased water releases from the San Joaquin River tributaries under the Vernalis Adaptive Management Plan (VAMP). This would reduce the TDS concentrations in the San Joaquin River as compared to the pre-CVPIA conditions, which included delivery of some CVPIA refuge water supplies.

A project-specific analysis was conducted to evaluate potential water quality impacts. The prior analysis conducted for the CVPIA assumed that all of the return flows from the refuges were released in March. However, consistent with the flow-through management practices currently being used on the refuges, the subsequent analysis allowed for return flows throughout the year. Without considering dilution in the San Joaquin River, the analysis showed that the delivery of full refuge water supplies would require additional releases from new Melones Reservoir in December through April of average water years in order to meet water quality standards at Vernalis. Additional New Melones releases would be required in January, February, and April of critically dry years. However, dilution can be considered in evaluating the impacts on compliance with the Vernalis water quality standards. Due to the flows in the San Joaquin River, there would not be a need for additional releases from New Melones Reservoir to meet the Vernalis standards under the proposed project. Additional information describing the results of the analysis can be found in the NEPA documentation prepared for this project.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(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 refuges is expected to have a beneficial effect on the local aquifer by allowing for additional recharge.

(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?	☐	☐	☐	☑
(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?	☐	☐	☐	☑

Comment: No physical activities would occur on the project area. The application of additional water would not alter on-site drainage patterns.

(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 refuges. Accordingly, the quantity of discharge water would increase. However, flows would not exceed channel capacity in the San Joaquin River and other drainages.

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

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

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(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?	☐	☐	☐	☑
(h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☑

Comment: No housing units or 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 project area 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 on or near the refuges.

(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 refuges, including the Central Valley Project Improvement Act, the North American Waterfowl Management Plan (including the management plan of the Central Valley Project Joint Venture), the Merced and Fresno County General Plans, the Management Plans for the Los Banos, North Grasslands, and Mendota WAs, and the draft Management Plan for the Volta WA.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(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?	☐	☐	☐	☑
(b) 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 refuges 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, and would not generate noise.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(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 airports or airstrips are located near the project area.

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 due to enhanced recreation 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) Would the project 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:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(i) Fire protection?	☐	☐	☐	☑
(ii) Police protection?	☐	☐	☐	☑

Comment: Public use of the refuges is primarily for recreational duck hunting and bird watching. Recreation use may increase due to the more effective management of existing wetlands and continued development of the China Island and Salt Slough Units, but this is not expected to translate into an increased need for public services such as police and fire protection.

(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) Would the project 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 recreation use of the refuges (especially the China Island and Salt Slough Units), and have 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)?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(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?	☐	☐	☐	☑
(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 due to improvement of on-refuge habitats (and therefore improved duck populations), this is not expected to translate into a noticeable difference in terms of traffic (i.e., hunters and bird watchers traveling to the refuges). Accordingly, traffic-related impacts (e.g., congestion, safety, parking) would not be impacted 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 refuges. 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 due to implementation of the proposed project.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(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?	☐	☐	☑	☐

Comment: The amount of water discharge 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 five refuge units with sufficient water to effectively manage wetland habitats per Reclamation's *Report on Refuge Water Supply Investigations*, the *San Joaquin Basin Action Plan/Kesterson Mitigation Plan*, and the Management Plans of the individual refuges.

(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 refuge units 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 five refuge units 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?	☐	☐	☐	☑

Appendix B:
CEQA Initial Study Checklist – Grassland Water District

Appendix B
CEQA Initial Study Checklist – Grassland Water District

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

2. Lead Agency: Grassland Water District

3. Contact Person: Mr. Don Marciochi, General Manager
Grassland Water District
22759 S. Mercy Springs Road
Los Banos, CA 93635
(209) 826-5188

4. Project Location: Private lands within the Grassland Resource Conservation District in western Merced County, and also the Blue Goose Unit of the San Luis National Wildlife Refuge and the Gadwall Unit of the North Grasslands Wildlife Area.

5. Project Sponsor: Grassland Water District

6. General Plan Designation: Agriculture (Merced County General Plan)

7. Zoning: Varies. The three zoning classifications applicable to the project area include A-1 (General Agricultural), A-2 (Exclusive Agricultural), and PAID (Planned Agricultural Industrial Development).

8. Description of Project:

Under the proposed project, the Grassland Water District (GWD) 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 were provided as described in Reclamation's *Report on Refuge Water Supply Investigations*. Pursuant to this report, Reclamation would ensure that GWD is provided with a firm, reliable water supply of 125,000 acre-feet per year (afa), subject to deficiencies. In addition, Reclamation would seek to supply GWD with up to an additional increment of 55,000 afa through its Water Acquisition Program. This water (up to a total of 180,000 afa under the proposed contract) would be used by GWD to support the efficient use of existing wetland habitats on private lands within the Grassland Resource Conservation District (GRCD), and also on the Blue Goose Unit of the San Luis National Wildlife Refuge and the Gadwall Unit of the North Grasslands Wildlife Area.

9. Surrounding Land Uses and Setting:

The GRCD is a part of the larger Grasslands Ecological Area. The northern portion of the GRCD includes and is bordered by other refuge lands to the east (primarily federal refuges of the San Luis National Wildlife Refuge Complex and the state Los Banos, Volta, and North Grasslands Wildlife Areas). Lands west of northern GRCD are primarily in agricultural production. The southern portion of the GRCD is surrounded primarily by agricultural lands.

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:

Dean Kwasny, Biologist, Grassland Water District
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.

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 Grasslands Ecological Area, including the GRCD, has a high degree of visual intactness including wetland, upland, and riparian areas. Implementing the proposed project would allow existing wetland areas to be managed more effectively. Providing for year-round use of wetlands will slightly increase visual quality, and therefore this impact is considered to be beneficial. No other visual changes are expected to occur.

(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.

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

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 Dept. 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: The proposed project is for increased delivery of water to existing wetland areas, no farmland would be converted to non-farm uses. However, the GWD would be obligated to provide water to farmlands within its boundaries that are converted to duck clubs or other refuge uses.

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

Comment: Continued use of GRCD wetland areas for waterfowl and other wildlife habitat purposes is consistent with the policies of the Merced County General Plan with regard to the Grasslands Ecological Area.

(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 other changes would occur that would affect the conversion of farmlands to non-agricultural 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?	☐	☐	☐	☑
(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)?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☑

Comment: The proposed project would provide additional water supplies to existing wetlands in the GRCD to improve management of wetland habitats. No aspect of this activity would potentially degrade air quality in the San Joaquin 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 project. The reader is referred to this analysis for an understanding of the habitat and associated plant and animal resources of the GRCD.

Currently, the GWD is receiving almost all of the water supplies required under the CVPIA. Accordingly, habitat conditions under the proposed project would be similar to existing conditions, which reflect a continuing improvement in quality over time due to the greater management flexibility allowed by the increased water supplies. Expected improvements in habitat management include:

- 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 two to four weeks during the summer.

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

Improvements in wetland habitat quality and availability would also have beneficial effects for other wetland-associated wildlife, including a variety of invertebrates, reptiles, amphibians, mammals, and shorebirds, by providing foraging and resting areas. In addition, Grassland WD would implement additional conservation measures to avoid and minimize potential impacts to special-status species from a wide range of management activities. These additional conservation measures would improve protection of special-status species. In combination, the improvements in habitat quality and availability, and the additional conservation measures would provide greater benefit to special-status species than currently exist.

(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: The Grasslands Ecological Area is an important habitat of worldwide significance, and the proposed project is intended to improve habitat management activities on the GRCD.

(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, and would not include any activities that would fill or otherwise impact wetlands.

(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 (e.g., 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 Merced County General Plan in support of the Grasslands Ecological Area. In addition, the project facilitates the implementation of GWD's Water 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 prior archeological surveys conducted on the GRCD, the site has a high potential to contain significant archeological resources. However, changes in management of existing wetland areas would not cause disruption of the ground surface, and therefore the potential to disrupt cultural resources is limited.

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.	☐	☐	☐	☑
(ii) Strong seismic ground shaking?	☐	☐	☐	☑
(iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(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?	☐	☐	☐	☑
(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?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(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 refuges in the GRCD, 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: The Gustine Airport is located adjacent to the GRCD; however, delivery of water supplies under the proposed project would not result in any safety hazards for the with regard to the airport.

(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 GRCD would have no effect on emergency response or evacuation.

(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 due to wildfire in the GRCD is very 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 Refuge Water Supply project. The reader is referred to this analysis for an understanding of GRCD water quality issues.

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

The NEPA analyses conducted for the CVPIA indicated that providing full refuge water supplies under the CVPIA would increase total dissolved solids (TDS) concentrations in the San Joaquin River. This analysis assumed that all of the return flows from these refuges would enter the San Joaquin River in the spring months prior to April when the standard for electrical conductivity (EC) at Vernalis is 1000 microsiemens/cm (Ms/cm). However, CVPIA implementation also would lead to increased water releases from the San Joaquin River tributaries under the Vernalis Adaptive Management Plan (VAMP). This would reduce the TDS concentrations in the San Joaquin River as compared to the pre-CVPIA conditions, which included delivery of some CVPIA refuge water supplies.

A project-specific analysis was conducted to evaluate potential water quality impacts. The prior analysis conducted for the CVPIA assumed that all of the return flows from the refuges were released in March. However, consistent with the flow-through management practices currently being used on the refuges, the subsequent analysis allowed for return flows throughout the year. Without considering dilution in the San Joaquin River, the analysis showed that the delivery of full refuge water supplies would require additional releases from New Melones Reservoir in December through April of average water years in order to meet water quality standards at Vernalis. Additional New Melones releases would be required in January, February, and April of critically dry years. However, dilution can be considered in evaluating the impacts on compliance with the Vernalis water quality standards. Due to the flows in the San Joaquin River, there would not be a need for additional releases from New Melones Reservoir to meet the Vernalis standards under the proposed project. Additional information describing the results of the analysis can be found in the NEPA documentation prepared for this project.

(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 GRCD area is expected to have a beneficial effect on the local aquifer by allowing for additional recharge.

(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?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(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?	☐	☐	☑	☐

Comment: The proposed project would not cause a physical modification that would alter surface drainage patterns.

(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 GRCD. Accordingly, the quantity of discharge water would increase. However, flows would not exceed channel capacity in the San Joaquin River and other drainages.

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

Comment: No housing units or 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 GRCD is not subject to the effects of seiches, tsunamis, or mudflows.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
IX. LAND USE AND PLANNING: Would the project:				
(a) Physically divide an established community?	☐	☐	☐	☑
Comment: There are no established communities within the GRCD.				
(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 GRCD, including the Central Valley Project Improvement Act, the North American Waterfowl Management Plan (including the management plan of the Central Valley Project Joint Venture), the GWD Water Management Plan, and the Merced County General Plan.				
(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?	☐	☐	☐	☑
(b) 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 GRCD, and therefore excavation of mineral resources would not be precluded.				
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?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
(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, and would not generate noise or 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: The Gustine airport is located adjacent to the GRCD; however, no element of the proposed project would affect how the airports are operated or how people reside or work in the general area.

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 due to enhanced recreation 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?	☐	☐	☐	☑

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

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

XIII. PUBLIC SERVICES: Would the project:

(a) Would the project 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 GRCD is primarily for recreational duck hunting on private clubs. Recreation use may increase due to the more effective management of existing wetlands, but this is not expected to translate into an increased need for public services such as police and fire protection.

(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) Would the project 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 recreation use of private duck clubs in the GRCD, and have overall recreation benefits throughout the Grasslands Ecological Area. 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?	☐	☐	☑	☐

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

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?	☐	☐	☐	☑
(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 due to improvement of on-refuge habitats (and therefore improved duck populations), this is not expected to translate into a noticeable difference in terms of traffic (i.e., hunters traveling to individual duck clubs in the GRCD). Accordingly, traffic-related impacts (e.g., congestion, safety, parking) would not be impacted 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?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
Comment: There are no wastewater treatment requirements applicable to the individual landowners on the GRCD. 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 due to 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?	☐	☐	☑	☐
Comment: The amount of water discharge 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 GWD with sufficient water to effectively manage wetland habitats on the GRCD, per Reclamation's *Report on Refuge Water Supply Investigations* and GWD's Water 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 GRCD 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 GRCD would not generate solid waste.				

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
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?	☐	☐	☑	☐
(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?	☐	☐	☐	☑

Appendix C:
Management Measures for Listed Species and Other Special-Status Species under the Project Alternatives

APPENDIX C

Management Measures for Listed Species and Other Special-Status Species

TABLE C-1
Measures to Avoid Take of Special-Status Species on the San Luis NWR Complex under the Proposed Action

Species	Avoidance Measures
Aleutian Canada goose	Do not convert agricultural lands to other uses in the high-use areas identified for Aleutian Canada geese. Any proposed conversion of agricultural land requires formal consultation. To the extent practicable, restrict construction activities in areas used for Aleutian Canada goose wintering habitat to the period between May 15 and September 30. To the extent practicable, avoid disturbing flocks of foraging geese during peak goose foraging times: the first and last two hours of daylight. In the event that take cannot be avoided, contact the Service for information prior to starting the action.
Bald eagle	If construction activities are going to occur near areas with suitable nesting sites (snags or large trees more than 20 inches in diameter), survey for eagle activity before construction. Construction activities must not occur within one-half mile of a nest site from January 1 through August 31. Construction activities must not occur within one-half mile of a roost site from November 15 through March 15. Avoid removing large mature trees or snags, more than 20 inches in diameter at breast height (DBH), along watercourses, lakes, or reservoirs. Maintain and protect local fish populations from sedimentation and other habitat disturbance. If nest surveys are conducted, begin after mid-April. In the event that take cannot be avoided, contact the Service for information before starting the action.
Blunt-nosed leopard lizard	Before staging and construction, have a Service-approved biologist survey for the presence of the habitat types used by this species and signs of leopard lizards, such as burrows. The protocol developed by the CDFG shall be used to survey for this species. During the blunt-nosed leopard lizard's hibernation time, surveys are unreliable and cannot be used to determine absence of this species. Notice will be given to the CDFG and the Service 30 days before beginning construction to determine whether capture is desired. For projects from 5 to 10 acres in size (or 5 to 10 linear miles), within suitable habitat, schedule surface disturbance activities during the active season (approximately April 15 to October 15). A Service-approved biologist will survey any trenches in the morning and late afternoon to remove lizards that fall into the trench.

TABLE C-1
Measures to Avoid Take of Special-Status Species on the San Luis NWR Complex under the Proposed Action

Species	Avoidance Measures
	A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the habitat types and sign listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. In the event that take cannot be avoided, contact the Service for information before starting the action.
Fresno kangaroo rat	Before any ground disturbing activities, have a Serviced-approved biologist survey for the presence of the plant associations considered habitat for the Fresno kangaroo rat. The Service-approved biologist must survey for the presence of Fresno kangaroo rat sign, such as burrow systems, haystacks, and areas of clipped vegetation. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less that 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within one-half mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers. In the event that take cannot be avoided, contact the Service for information prior to starting the action.
Giant garter snake	Avoid construction activities within 200 feet from the banks of giant garter snake aquatic habitat. Confine movement of heavy equipment to existing roadways to minimize habitat disturbance. Construction activity within habitat should be conducted between May 1 and October 1. This is the active period for giant garter snakes and direct mortality is lessened, because snakes are expected to actively move and avoid danger. Between October 2 and April 30, contact the Service's Sacramento Fish and Wildlife Office to determine whether additional measures are necessary to minimize and avoid take. Confine clearing to the minimal area necessary to facilitate construction activities. Flag and designate avoided giant garter snake habitat within or adjacent to the project area as Environmentally Sensitive Areas. This area should be avoided by all construction personnel.

TABLE C-1
Measures to Avoid Take of Special-Status Species on the San Luis NWR Complex under the Proposed Action

Species	Avoidance Measures
	Construction personnel should receive a Service-approved worker environmental awareness training. This training instructs workers to recognize giant garter snake and its habitat(s). The project area should be surveyed for giant garter snakes 24 hours before construction activities. Survey of the project area should be repeated if a lapse in construction activity of 2 weeks or greater has occurred. If a snake is encountered during construction, activities shall cease until appropriate corrective measures have been completed or it has been determined that the snake will not be harmed. Report any sightings and any incidental take to the Service immediately by telephone at (916) 979-2725. Any dewatered habitat should remain dry for at least 15 consecutive days after April 15 and before excavating or filling of the dewatered habitat. After completion of construction activities, remove any temporary fill and construction debris and, wherever feasible, restore disturbed areas to pre-project conditions. Restoration work may include replanting species removed from banks or with emergent vegetation in the active channel. In the event that take cannot be avoided, contact the Service for information before starting the action.
Giant kangaroo rat	Before any ground-disturbing activities, have a Service-approved biologist survey for the presence of the plant associations considered habitat for the giant kangaroo rat. The Service-approved biologist must survey for the presence of giant kangaroo rat sign, such as burrow systems (precincts), haystacks, and areas of clipped vegetation. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake *and* flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within one-half mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed weekly. In the event that take cannot be avoided, contact the Service for information prior to starting the action.
San Joaquin kit fox	Project-related vehicles should observe a 20-mph speed limit in all project areas, except on county roads and State and Federal highways; this is particularly important at night when kit foxes are most active. To the extent possible, night-time construction should be minimized. Off-road traffic outside of designated project areas should be prohibited. To prevent inadvertent entrapment of kit foxes or other animals during the construction phase of a project, all excavated, steep-walled holes or trenches more than 2 feet deep should be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they should be thoroughly inspected for trapped animals. If at any time a trapped or injured kit fox is discovered, the procedures under number 13 of this section must be followed.

TABLE C-1
Measures to Avoid Take of Special-Status Species on the San Luis NWR Complex under the Proposed Action

Species	Avoidance Measures
	Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe becoming trapped or injured. All construction pipes, culverts, or similar structures with a diameter of 4-inches or greater that are stored at a construction site for one or more overnight periods should be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe should not be moved until the Service has been consulted. If necessary, and under the direct supervision of the biologist, the pipe may be moved once to remove it from the path of construction activity, until the fox has escaped. All food-related trash items such as wrappers, cans, bottles, and food scraps should be disposed of in closed containers and removed at least once a week from a construction or project site. No firearms shall be allowed on the project site. To prevent harassment, mortality of kit foxes, or destruction of dens by dogs or cats, no pets should be permitted on project sites. Use of rodenticides and herbicides in project areas should be restricted. This is necessary to prevent primary or secondary poisoning of kit foxes and the depletion of prey populations on which they depend. All uses of such compounds should observe label and other restrictions mandated by the U. S. Environmental Protection Agency, California Department of Food and Agriculture, and other State and Federal legislation, as well as additional project-related restrictions deemed necessary by the Service. If rodent control must be conducted, zinc phosphide should be used because of proven lower risk to kit fox. A representative shall be appointed by the project proponent, who will be the contact source for any employee or contractor who might inadvertently kill or injure a kit fox or who finds a dead, injured or entrapped individual. The representative will be identified during the employee education program. The representative's name and telephone number shall be provided to the Service. An employee education program should be conducted for any project that has expected impacts to kit fox or other endangered species. The program should consist of a brief presentation by persons knowledgeable in kit fox biology and legislative protection to explain endangered species concerns to contractors, their employees, and military and agency personnel involved in the project. The program should include the following: a description of the San Joaquin kit fox and its habitat needs; a report of the occurrence of kit fox in the project area; an explanation of the status of the species and its protection under the Endangered Species Act; and a list of measures being taken to reduce impacts to the species during project construction and implementation. A fact sheet conveying this information should be prepared for distribution to the above-mentioned people and anyone else who may enter the project site. Upon completion of the project, all areas subject to temporary ground disturbances, including storage and staging areas, temporary roads, pipeline corridors, etc., should be re-contoured if necessary, and revegetated to promote restoration of the area to pre-project conditions. An area subject to "temporary" disturbance means any area that is disturbed during the project, but that after project completion will not be subject to further disturbance and has the potential to be revegetated. Appropriate methods and plant species used to revegetate such areas should be determined on a site-specific basis in consultation with the Service, California Department of Fish and Game (CDFG) and revegetation experts. In the case of trapped animals, escape ramps or structures should be installed

TABLE C-1
Measures to Avoid Take of Special-Status Species on the San Luis NWR Complex under the Proposed Action

Species	Avoidance Measures
	immediately to allow the animal(s) to escape, or the Service should be contacted for advice. Any contractor, employee, or military or agency personnel who inadvertently kills or injures a San Joaquin kit fox shall immediately report the incident to their representative. This representative shall contact the CDFG immediately in the case of a dead, injured or entrapped kit fox. The Sacramento Fox and Wildlife Office and CDFG will be notified in writing within three working days of the accidental death or injury to a San Joaquin kit fox during project related activities. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal and any other pertinent information.
Valley elderberry longhorn beetle	A qualified biologist should survey proposed project sites within the range of the valley elderberry longhorn beetle for the presence of the beetle and its elderberry host plant. 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 should 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 should be used in the 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 must 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, the Service should be contacted for information before starting the action.

TABLE C-1
Measures to Avoid Take of Special-Status Species on the San Luis NWR Complex under the Proposed Action

Species	Avoidance Measures
Vernal pool fairy shrimp Longhorn fairy shrimp Conservancy fairy shrimp Vernal pool tadpole shrimp	Stay at least 250 feet from the margin of the pool/swale edge. When conducting activities beyond 250 feet from habitat, be careful to avoid activities that will eventually result in effects to the pool/swale through changes in hydrology, sedimentation, or contamination of the habitat. Adequate fencing will be placed and maintained around any avoided (preserved) vernal pool habitat to prevent impacts from vehicles. If habitat is avoided (preserved) onsite, then a Service-approved biologist (monitor) will inspect any construction-related activities at the proposed project site to ensure that no unnecessary take of listed species or destruction of their habitat occurs. The biologist will have the authority to stop all activities that may result in such take or destruction until appropriate corrective measures have been completed. The biologist also will be required to report immediately any unauthorized impacts to the Service and CDFG. All onsite construction personnel will receive instruction regarding the presence of listed species and the importance of avoiding impacts to these species and their habitat. The applicant will ensure that activities that are inconsistent with the maintenance of the suitability of remaining habitat and associated onsite watershed are prohibited. This includes, but is not limited to: (i) alteration of existing topography or any other alteration or uses for any purposes, including the exploration for or development of mineral extraction; (ii) placement of any new structures on these parcels; (iii) dumping, burning, and/or burying of rubbish, garbage, or any other wastes or fill materials; (iv) building of any new roads or trails; (v) killing, removal, alteration, or replacement of any existing native vegetation; (vi) placement of stormwater drains; (vii) fire protection activities not required to protect existing structures at the project site; and (viii) use of pesticides or other toxic chemicals. In the event that take cannot be avoided, contact the Service for information before starting the action.
Colusa grass	Before any ground-disturbing activities, have a Service-approved botanist survey for the presence of the soils and plant association considered habitat for this species. Avoid known occupied habitat by at least 300 feet. Be careful not to directly or indirectly affect the habitat through changes in hydrology, sedimentation, or contamination of the habitat or the surrounding area. Temporarily fence the plant or plants to be avoided so that it is obvious that it/they are not to be disturbed (such as bright orange construction fencing). Take appropriate measures to avoid and minimize adverse effects such as the temporary construction of berms or drains to protect the area. After the work is completed, restore the surrounding areas to their original condition. If seeding is necessary when restoring to previous condition, use locally native, non-invasive species that will not compete with the listed plants. If repair activities must come within 300 feet of the habitat, initiate formal consultation with the Service before starting the project.

TABLE C-2
Measures to Protect Federally-Listed Species Required in CESA Biological Opinions for each CDFG Wildlife Area in the San Joaquin River Basin.

Wildlife Area/Species	Measures to Protect Listed Species[a]
Los Banos WA	
Aleutian Canada goose	Management of Los Banos WA includes providing roosting, foraging, and loafing habitat for Aleutian Canada geese. No adverse effects to this species are expected.
Bald eagle	Because the Los Banos Management Plan provides for the continued maintenance of habitat for this species, the Plan's implementation will not affect bald eagles.
California red-legged frog	Surveys will be conducted for this species. If California red-legged frogs are found, the Management Plan will be revised to provide for the maintenance and/or improvement of habitat for this species, and a revised Biological Opinion will be prepared. Any needed mitigation measures will be developed, will receive public review, and will be implemented prior to any activities that might affect this species.
Giant garter snake	No alteration of potential giant garter snake habitat will occur until multiple-year surveys for the species have been conducted and a management plan for the species has been developed. The giant garter snake management plan shall receive public review and a revised Biological Opinion will be prepared. Any needed mitigation measures will be developed, will receive public review, and will be implemented prior to any activities that might affect this species.
Fresno kangaroo rat	Prior to any land or vegetation disturbance or modification of water regime, all upland habitat will be surveyed by a qualified biologist to determine whether this species is present. After the surveys are completed, the Los Banos WA will initiate internal consultation pursuant to CESA and also will consult with the Service. Prior to any activities on these areas, a revised Biological Opinion will be prepared. Any needed mitigation measures will be developed, receive public review, and be implemented prior to any activities that might affect Fresno kangaroo rats.
North Grasslands WA	
Giant garter snake	CDFG will consult with the Service prior to implementing the Management Plan. Restoration will create permanent and semi-permanent wetlands that will enhance and increase habitat. Earthen ditches and ditch banks shall not be cleaned or altered in winter months. Ditch cleaning and maintenance in the summer will only be accomplished in small segments so that habitat is not significantly reduced. Once restoration and development is complete, rubble or rip-rap can be added to create potential denning areas near appropriate waterways and wetlands.
Mendota WA	
Aleutian Canada goose	Proposed management of Mendota WA will have no adverse impact upon or jeopardize the continued existence of Aleutian Canada geese. The project will provide additional loafing and roosting sites within the WA. Future tasks within the WA will improve foraging habitat.
Blunt-nosed leopard lizard	Within 60 days prior to initiation of construction or maintenance of habitat suitable for use by the blunt-nosed leopard lizard, the CDFG will conduct a pre-activity survey, according to CDFG-approved methodology, to inventory lands that will be subject to disturbance for the occurrence of listed species. If blunt-nosed leopard lizards are found, appropriate avoidance measures or full mitigation for

TABLE C-2
Measures to Protect Federally-Listed Species Required in CESA Biological Opinions for each CDFG Wildlife Area in the San Joaquin River Basin.

Wildlife Area/Species	Measures to Protect Listed Species[a]
	unavoidable impact shall be developed and approved by the Environmental Services Division and the Service prior to any ground-disturbing activities.
	To the extent possible, habitat development and maintenance activities should be restricted to daylight hours when blunt-nosed leopard lizards are most active and capable of escaping potential harm.
	Use of rodenticides and herbicides on the site shall be permitted only if it is part of a CDFG-approved management plan, or unless such use is otherwise approved on a case-by-case basis.
Giant garter snake	Operation and maintenance activities conducted within or near habitat suitable for giant garters snakes should be conducted between May 1 and October, during the snake's active period.
	Cleaning of ditches and canals should be done from one side of the canal only.
	Canals in which construction or maintenance activities are planned should be dewatered at least 15 days prior to construction.
	"Rip rap" installed around water control structures and erodible ditch banks should be placed in a manner that will provide escape cover for snakes. A base of river rock should be placed on the levee for levee protection and covered with large pieces of concrete rubble to provide escape cover.
Fresno kangaroo rat	Within 60 days prior to initiation of construction or maintenance of habitat suitable for use by the Fresno kangaroo rats, CDFG will conduct a pre-activity survey, according to CDFG-approved methodology, to inventory lands that will be subject to disturbance for the occurrence of listed species. If Fresno kangaroo rats are found, appropriate avoidance measures or full mitigation for unavoidable impact shall be developed and approved by the Environmental Services Division and the USFWS prior to any ground-disturbing activities.
	To the extent possible, habitat development and maintenance activities during evening hours shall be minimized.
	Use of rodenticides and herbicides on the site shall be permitted only if it is part of a CDFG-approved management plan or unless such use is otherwise approved on a case-by-case basis.
San Joaquin kit fox	Within 60 days prior to initiation of construction or maintenance activities in habitat suitable for use by the San Joaquin kit foxes, the CDFG will conduct a pre-activity survey to inventory lands that will be subject to disturbance for the occurrence of listed species. If San Joaquin kit foxes are found, appropriate avoidance measures or full mitigation for unavoidable impact shall be developed and approved by the Environmental Services Division and Service prior to any ground-disturbing activities.
	To the extent possible, habitat development and maintenance activities during evening hours shall be minimized.
	Use of rodenticides and herbicides on the site shall be permitted only if it is part of a management plan approved by CDFG, or unless such use is otherwise approved on a case-by-case basis.

TABLE C-2
Measures to Protect Federally-Listed Species Required in CESA Biological Opinions for each CDFG Wildlife Area in the San Joaquin River Basin.

Wildlife Area/Species	Measures to Protect Listed Species[a]
Ferris bird's-beak Hoover's eriastrum San Joaquin woolly-threads	Conduct an area-wide botanical survey to assemble a comprehensive list of all botanical species and map all known populations of sensitive species within the wildlife area. Prior to implementation of specific habitat development projects or maintenance tasks within habitat types known to be suitable for these species, conduct a botanical survey to determine whether any sensitive species are present. If a sensitive plant is present, the Regional Plant Ecologist should be notified for consultation to develop measures that will avoid direct take or indirect take of the species. If take is unavoidable, measures shall be adopted and fully implemented before the start of the project to mitigate/compensate for the loss. Coordinate with the appropriate Service personnel regarding activities that might impact federally listed species.

[a] These measures would be implemented under both the No Action Alternative and the Proposed Action.

TABLE C-3
Measures to Avoid Take of Special-Status Species that CDFG Would Implement under the Proposed Action in Addition Protective Measures of CESA Biological Opinions for Each Wildlife Area in the San Joaquin River Basin

Species	Avoidance Measures
Aleutian Canada goose	Do not convert agricultural lands to other uses in the high-use areas identified for Aleutian Canada geese. Any proposed conversion of agricultural land requires formal consultation. To the extent practicable, restrict construction activities in areas used for Aleutian Canada goose wintering habitat to the period between May 15 and September 30. To the extent practicable, avoid disturbing flocks of foraging geese during peak goose foraging times: the first and last two hours of daylight. In the event that take cannot be avoided, contact the Service for information prior to starting the action.
Bald eagle	If construction activities are going to occur near areas with suitable nesting sites (snags or large trees more than 20 inches in diameter) survey for eagle activity prior to construction. Construction activities must not occur within one-half mile of a nest site from January 1 through August 31. Construction activities must not occur within one-half mile of a roost site from November 15 through March 15. Avoid removing large, mature trees or snags larger than 20 inches in diameter at breast height (DBH) along watercourses, lakes or reservoirs. Maintain and protect local fish populations from sedimentation and other habitat disturbance. If nest surveys are conducted, begin after mid-April. In the event that take cannot be avoided, contact the Service for information prior to starting the action.
Blunt-nosed leopard lizard	Before staging and construction, have a Service-approved biologist survey for the presence of the habitat types used by this species and signs of leopard lizards, such as burrows. The protocol developed by the CDFG shall be used to survey for this species. During the blunt-nosed leopard lizard's hibernation time, surveys are unreliable and cannot be used to determine absence of this species. Notice will be given to the CDFG and the Service 30 days before beginning construction to determine whether capture is desired. For projects from 5 to 10 acres in size (or 5 to 10 linear miles), within suitable habitat, schedule surface disturbance activities during the active season (approximately April 15 to October 15). A Service-approved biologist will survey any trenches in the morning and late afternoon to remove lizards that fall into the trench. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the habitat types and sign listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat.

TABLE C-3
Measures to Avoid Take of Special-Status Species that CDFG Would Implement under the Proposed Action in Addition Protective Measures of CESA Biological Opinions for Each Wildlife Area in the San Joaquin River Basin

Species	Avoidance Measures
	No domestic animals (pets) shall be allowed on the project site.
	On unposted roads, vehicle speeds shall not exceed 25 miles per hour.
	Trash shall be disposed of in covered containers and removed daily.
	In the event that take cannot be avoided, contact the Service for information before starting the action.
Giant garter snake	Avoid construction activities within 200 feet of the banks of giant garter snake aquatic habitat. Confine movement of heavy equipment to existing roadways to minimize habitat disturbance.
	Construction activity within habitat should be conducted between May 1 and October 1. This is the active period for giant garter snakes and direct mortality is lessened, because snakes are expected to actively move and avoid danger. Between October 2 and April 30 contact the Service's Sacramento Fish and Wildlife Office to determine whether additional measures are necessary to minimize and avoid take.
	Confine clearing to the minimal area necessary to facilitate construction activities. Flag and designate avoided giant garter snake habitat within or adjacent to the project area as Environmentally Sensitive Areas. This area should be avoided by all construction personnel.
	Construction personnel should receive a Service-approved worker environmental awareness training. This training instructs workers to recognize giant garter snake and its habitat(s).
	The project area should be surveyed for giant garter snakes 24 hours prior to construction activities. Survey of the project area should be repeated if a lapse in construction activity of 2 weeks or greater has occurred. If a snake is encountered during construction, activities shall cease until appropriate corrective measures have been completed or it has been determined that the snake will not be harmed. Report any sightings and any incidental take to the Service immediately by telephone at (916) 979-2725.
	Any dewatered habitat should remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of the dewatered habitat.
	After completion of construction activities, remove any temporary fill and construction debris and, wherever feasible, restore disturbed areas to pre-project conditions. Restoration work may include replanting species removed from banks or with emergent vegetation in the active channel.
	To the extent possible, the majority of canal cleaning and excavation will be performed only from May 1 to October 1.
	Excavation will typically occur from only one side of the canal during a given year. (When possible, one side of the canal will be left undisturbed indefinitely.)
	Excavation above the high flow watermark will be avoided whenever possible to minimize disturbance to burrows and retreat sites.
	Vegetation on the tops and sides of canals will be left as undisturbed as possible.
	Roads adjacent to giant garter snake habitat will: 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. These measures decrease the risk of injuring snakes and minimize loss and disturbance of vegetative cover.

TABLE C-3
Measures to Avoid Take of Special-Status Species that CDFG Would Implement under the Proposed Action in Addition Protective Measures of CESA Biological Opinions for Each Wildlife Area in the San Joaquin River Basin

Species	Avoidance Measures
	If necessary for vegetation control, burning will be conducted during the spring, summer and fall months on thoroughly dried wetlands or uplands. Where possible only one bank of vegetation will be subject to prescribed burns. Vegetation along canal banks will be left undisturbed as much as possible; fire crews will not reignite bank vegetation passed over by fire. Giant garter snakes observed within prescribed burn areas will be captured and relocated or attempts will be made to flush them away from areas where fire is likely to travel.
	Discing is restricted to dried wetlands and managed uplands. Discing and planting for spring production of wildlife forage is restricted to managed uplands and croplands. Discing activities will be avoided directly adjacent to waterways and summer wetlands unless they have been allowed to dry.
	In the event that take cannot be avoided, contact the Service for information prior to starting the action.
California red-legged frog	A Service approved biologist shall survey the work site two weeks before the onset of activities.
	If California red-legged frogs cannot be relocated within 1/4 mile of the work site within the same drainage, then the Service-approved biologist shall contact the appropriate Service office before work activities begin.
	Before any construction activities begin on any project, a Service approved biologist shall conduct a training session for all construction personnel about the California red-legged frog, its habitat, and the necessary measures to protect or avoid it on-site.
	During project activities, all trash that may attract predators shall be properly contained, removed from the work site and disposed of regularly. Following construction, all trash and construction debris shall be removed from work areas.
	All fueling and maintenance of vehicles and other equipment and staging areas shall occur at least 20 meters from any riparian habitat or water body. All workers shall be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.
	The spread or introduction of invasive exotic plant species shall be avoided to the maximum extent possible. Project sites shall be revegetated with an appropriate assemblage of grasses, riparian, or wetland vegetation suitable for the area. A species list and restoration plan shall be included with the project proposal for review by the Service.
	To the maximum extent possible, stream contours shall be returned to their original condition at the end of project activities.
	The number of access routes, number and size of staging areas, and the total area of the activity shall be limited to the minimum necessary to achieve the project goal. Routes and boundaries shall be clearly demarcated.
	Work activities should be completed between April 1 and November 1. Should the proponent or applicant demonstrate a need to conduct activities outside this period, contact the Service.
	Only Service approved biologists shall participate in activities associated with the capture, handling, and monitoring of California red-legged frogs.
	Best management practices to control erosion during and after project implementation shall be implemented.

TABLE C-3
Measures to Avoid Take of Special-Status Species that CDFG Would Implement under the Proposed Action in Addition Protective Measures of CESA Biological Opinions for Each Wildlife Area in the San Joaquin River Basin

Species	Avoidance Measures
	If a work site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh not larger than five millimeters (mm) to prevent California red-legged frogs from entering the pump system. Water shall be released or pumped downstream at an appropriate rate to maintain downstream flows during construction. Upon completion of construction activities, any barriers to flow shall be removed in a manner that will allow flow to resume with the least disturbance to the substrate. Any individuals of exotic species, such as bullfrogs, crayfish, and centrarchid fishes that are captured on site shall be permanently removed from the wild. Additional or modified measures to reduce the adverse effects of actions may be identified during the project review by the Service. In the event that take cannot be avoided, contact the Service for information prior to starting the action.
Fresno kangaroo rat	Before any ground-disturbing activities, have a Serviced-approved biologist survey for the presence of the plant associations considered habitat for the Fresno kangaroo rat. The Service-approved biologist must survey for the presence of Fresno kangaroo rat sign, such as burrow systems, haystacks, and areas of clipped vegetation. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less that 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within one-half mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers. In the event that take cannot be avoided, contact the Service for information prior to starting the action.
Giant kangaroo rat	Before any ground-disturbing activities, have a Service-approved biologist survey for the presence of the plant associations considered habitat for the giant kangaroo rat. The Service-approved biologist must survey for the presence of giant kangaroo rat sign, such as burrow systems (precincts), haystacks, and areas of clipped vegetation. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. Trash shall be disposed of in covered containers and removed weekly. In the event that take cannot be avoided, contact the Service for information prior to starting the action.

TABLE C-3
Measures to Avoid Take of Special-Status Species that CDFG Would Implement under the Proposed Action in Addition Protective Measures of CESA Biological Opinions for Each Wildlife Area in the San Joaquin River Basin

Species	Avoidance Measures
	Project-related vehicles should observe a 20-mph speed limit in all project areas, except on county roads and State and Federal highways; this is particularly important at night when kit foxes are most active. To the extent possible, night-time construction should be minimized. Off-road traffic outside of designated project areas should be prohibited.
	To prevent inadvertent entrapment of kit foxes or other animals during the construction phase of a project, all excavated, steep-walled holes or trenches more than 2 feet deep should be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they should be thoroughly inspected for trapped animals. If at any time a trapped or injured kit fox is discovered, the procedures under number 13 of this section must be followed.
	Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe becoming trapped or injured. All construction pipes, culverts, or similar structures with a diameter of 4-inches or greater that are stored at a construction site for one or more overnight periods should be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe should not be moved until the Service has been consulted. If necessary, and under the direct supervision of the biologist, the pipe may be moved once to remove it from the path of construction activity, until the fox has escaped.
	All food-related trash items such as wrappers, cans, bottles, and food scraps should be disposed of in closed containers and removed at least once a week from a construction or project site.
San Joaquin kit fox	No firearms shall be allowed on the project site.
	To prevent harassment, mortality of kit foxes, or destruction of dens by dogs or cats, no pets should be permitted on project sites.
	Use of rodenticides and herbicides in project areas should be restricted. This is necessary to prevent primary or secondary poisoning of kit foxes and the depletion of prey populations on which they depend. All uses of such compounds should observe label and other restrictions mandated by the U. S. Environmental Protection Agency, California Department of Food and Agriculture, and other State and Federal legislation, as well as additional project-related restrictions deemed necessary by the Service. If rodent control must be conducted, zinc phosphide should be used because of proven lower risk to kit fox.
	A representative shall be appointed by the project proponent, who will be the contact source for any employee or contractor who might inadvertently kill or injure a kit fox or who finds a dead, injured or entrapped individual. The representative will be identified during the employee education program. The representative's name and telephone number shall be provided to the Service.
	An employee education program should be conducted for any project that has expected impacts to kit fox or other endangered species. The program should consist of a brief presentation by persons knowledgeable in kit fox biology and legislative protection to explain endangered species concerns to contractors, their employees, and military and agency personnel involved in the project. The program should include the following: a description of the San Joaquin kit fox and its habitat needs; a report of the occurrence of kit fox in the project area; an explanation of the status of the species and its protection under the Endangered Species Act; and a list of measures being taken to reduce impacts to the

TABLE C-3
Measures to Avoid Take of Special-Status Species that CDFG Would Implement under the Proposed Action in Addition Protective Measures of CESA Biological Opinions for Each Wildlife Area in the San Joaquin River Basin

Species	Avoidance Measures
	species during project construction and implementation. A fact sheet conveying this information should be prepared for distribution to the above-mentioned people and anyone else who may enter the project site. Upon completion of the project, all areas subject to temporary ground disturbances, including storage and staging areas, temporary roads, pipeline corridors, etc., should be re-contoured if necessary, and revegetated to promote restoration of the area to pre-project conditions. An area subject to "temporary" disturbance means any area that is disturbed during the project, but that after project completion will not be subject to further disturbance and has the potential to be revegetated. Appropriate methods and plant species used to revegetate such areas should be determined on a site-specific basis in consultation with the Service, California Department of Fish and Game (CDFG) and revegetation experts. In the case of trapped animals, escape ramps or structures should be installed immediately to allow the animal(s) to escape, or the Service should be contacted for advice. Any contractor, employee, or military or agency personnel who inadvertently kills or injures a San Joaquin kit fox shall immediately report the incident to their representative. This representative shall contact the CDFG immediately in the case of a dead, injured or entrapped kit fox. The Sacramento Fox and Wildlife Office and CDFG will be notified in writing within three working days of the accidental death or injury to a San Joaquin kit fox during project related activities. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal and any other pertinent information.
Valley elderberry longhorn beetle	A qualified biologist should survey proposed project sites within the range of the valley elderberry longhorn beetle for the presence of the beetle and its elderberry host plant. 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 should 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

TABLE C-3
Measures to Avoid Take of Special-Status Species that CDFG Would Implement under the Proposed Action in Addition Protective Measures of CESA Biological Opinions for Each Wildlife Area in the San Joaquin River Basin

Species	Avoidance Measures
	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 should be used in the 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 must 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, the Service should be contacted for information before starting the action.
Vernal pool fairy shrimp Longhorn fairy shrimp Conservancy fairy shrimp Vernal pool tadpole shrimp	Stay at least 250 feet from the margin of the pool/swale edge. When conducting activities beyond 250 feet from habitat, be careful to avoid activities that will eventually result in effects to the pool/swale through changes in hydrology, sedimentation, or contamination of the habitat. Adequate fencing will be placed and maintained around any avoided (preserved) vernal pool habitat to prevent impacts from vehicles. If habitat is avoided (preserved) onsite, then a Service-approved biologist (monitor) will inspect any construction-related activities at the proposed project site to ensure that no unnecessary take of listed species or destruction of their habitat occurs. The biologist will have the authority to stop all activities that may result in such take or destruction until appropriate corrective measures have been completed. The biologist also will be required to report immediately any unauthorized impacts to the Service and CDFG. All onsite construction personnel will receive instruction regarding the presence of listed species and the importance of avoiding impacts to these species and their habitat. The applicant will ensure that activities that are inconsistent with the maintenance of the suitability of remaining habitat and associated onsite watershed are prohibited. This includes, but is not limited to: (i) alteration of existing topography or any other alteration or uses for any purposes, including the exploration for or development of mineral extraction; (ii) placement of any new structures on these parcels; (iii) dumping, burning, and/or burying of rubbish, garbage, or any other wastes or fill materials; (iv) building of any new roads or trails; (v) killing, removal, alteration, or replacement of any existing native vegetation; (vi) placement of stormwater drains; (vii) fire protection activities not required to protect existing structures at the project site; and (viii) use of pesticides or other toxic chemicals. In the event that take cannot be avoided, contact the Service for information before starting the action.

TABLE C-3
Measures to Avoid Take of Special-Status Species that CDFG Would Implement under the Proposed Action in Addition Protective Measures of CESA Biological Opinions for Each Wildlife Area in the San Joaquin River Basin

Species	Avoidance Measures
Hoover's eriastrum Palmate-bracted bird's-beak	Before any ground-disturbing activities, have a Service-approved botanist survey for the presence of the soils and plant associations considered habitat for these species. Avoid known occupied habitat by at least 300 feet. Be careful not to directly or indirectly affect the habitat through changes in hydrology, sedimentation, or contamination of the habitat or the surrounding area. Temporarily fence the plant or plants to be avoided so that it is obvious that it/they are not to be disturbed (such as bright orange construction fencing). Take appropriate measures to avoid and minimize adverse effects such as the temporary construction of berms or drains to protect the area. After the work is completed, restore the surrounding areas to their original condition. If seeding is necessary when restoring to previous condition, use locally native, non-invasive species that will not compete with the listed plants. If repair activities must come within 300 feet of the habitat, initiate formal consultation with the Service before starting the project.

TABLE C-4
Measures to Avoid Take of Special-Status Species that Grassland WD Would Implement under the Proposed Action

Species	Avoidance Measures
Aleutian Canada goose	Do not convert agricultural lands to other uses in the high-use areas identified for Aleutian Canada geese. Any proposed conversion of agricultural land requires formal consultation. Any proposed conversion of agricultural land requires formal consultation. To the extent practicable, restrict construction activities in areas used for Aleutian Canada goose wintering habitat to the period between May 15 and September 30. To the extent practicable, avoid disturbing flocks of foraging geese during peak goose foraging times: the first and last two hours of daylight. In the event that take cannot be avoided, contact the Service for information prior to starting the action.
Bald eagle	If construction activities are going to occur near areas with suitable nesting sites (snags or large trees larger than 20 inches in diameter) survey for eagle activity prior to construction. Construction activities must not occur within one-half mile of a nest site from January 1 through August 31. Construction activities must not occur within one-half mile of a roost site from November 15 through March 15. Avoid removing large, mature trees or snags larger than 20 inches in diameter at breast height (DBH) along watercourses, lakes or reservoirs. Maintain and protect local fish populations from sedimentation and other habitat disturbance. If nest surveys are conducted, begin after mid-April. In the event that take cannot be avoided, contact the Service for information prior to starting the action.
Giant garter snake	Avoid construction activities within 200 feet from the banks of giant garter snake aquatic habitat. Confine movement of heavy equipment to existing roadways to minimize habitat disturbance. Construction activity within habitat should be conducted between May 1 and October 1. This is the active period for giant garter snakes, and direct mortality is lessened because snakes are expected to actively move and avoid danger. Between October 2 and April 30 contact the Service's Sacramento Fish and Wildlife Office to determine whether additional measures are necessary to minimize and avoid take. Confine clearing to the minimal area necessary to facilitate construction activities. Flag and designate avoided giant garter snake habitat within or adjacent to the project area as Environmentally Sensitive Areas. This area should be avoided by all construction personnel. Construction personnel should receive a Service-approved worker environmental awareness training. This training instructs workers to recognize giant garter snake and its habitat(s). The project area should be surveyed for giant garter snakes 24 hours prior to construction activities. Survey of the project area should be repeated if a lapse in construction activity of 2 weeks or greater has occurred. If a snake is encountered during construction, activities shall cease until appropriate

TABLE C-4
Measures to Avoid Take of Special-Status Species that Grassland WD Would Implement under the Proposed Action

Species	Avoidance Measures
	corrective measures have been completed or it has been determined that the snake will not be harmed. Report any sightings and any incidental take to the Service immediately by telephone at (916) 979-2725. Any dewatered habitat should remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of the dewatered habitat. After completion of construction activities, remove any temporary fill and construction debris and, wherever feasible, restore disturbed areas to pre-project conditions. Restoration work may include replanting species removed from banks or with emergent vegetation in the active channel. In the event that take cannot be avoided, contact the Service for information prior to starting the action.
Fresno kangaroo rat	Before any ground-disturbing activities, have a Serviced-approved biologist survey for the presence of the plant associations considered habitat for the Fresno kangaroo rat. The Service-approved biologist must survey for the presence of Fresno kangaroo rat sign, such as burrow systems, haystacks, and areas of clipped vegetation. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within one-half mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers. In the event that take cannot be avoided, contact the Service for information prior to starting the action.
Giant kangaroo rat	Before any ground-disturbing activities, have a Service- approved biologist survey for the presence of the plant associations considered habitat for the giant kangaroo rat. The Service- approved biologist must survey for the presence of giant kangaroo rat sign, such as burrow systems (precincts), haystacks, and areas of clipped vegetation. A Service-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within one-half mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed weekly. In the event that take cannot be avoided, contact the Service for information prior to starting the action.

TABLE C-4
Measures to Avoid Take of Special-Status Species that Grassland WD Would Implement under the Proposed Action

Species	Avoidance Measures
	Project-related vehicles should observe a 20-mph speed limit in all project areas, except on county roads and State and Federal highways; this is particularly important at night when kit foxes are most active. To the extent possible, night-time construction should be minimized. Off-road traffic outside of designated project areas should be prohibited.
	To prevent inadvertent entrapment of kit foxes or other animals during the construction phase of a project, all excavated, steep-walled holes or trenches more than 2 feet deep should be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they should be thoroughly inspected for trapped animals. If at any time a trapped or injured kit fox is discovered, the procedures under number 13 of this section must be followed.
	Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe becoming trapped or injured. All construction pipes, culverts, or similar structures with a diameter of 4-inches or greater that are stored at a construction site for one or more overnight periods should be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe should not be moved until the Service has been consulted. If necessary, and under the direct supervision of the biologist, the pipe may be moved once to remove it from the path of construction activity, until the fox has escaped.
	All food-related trash items such as wrappers, cans, bottles, and food scraps should be disposed of in closed containers and removed at least once a week from a construction or project site.
San Joaquin kit fox	No firearms shall be allowed on the project site.
	To prevent harassment, mortality of kit foxes, or destruction of dens by dogs or cats, no pets should be permitted on project sites.
	Use of rodenticides and herbicides in project areas should be restricted. This is necessary to prevent primary or secondary poisoning of kit foxes and the depletion of prey populations on which they depend. All uses of such compounds should observe label and other restrictions mandated by the U. S. Environmental Protection Agency, California Department of Food and Agriculture, and other State and Federal legislation, as well as additional project-related restrictions deemed necessary by the Service. If rodent control must be conducted, zinc phosphide should be used because of proven lower risk to kit fox.
	A representative shall be appointed by the project proponent, who will be the contact source for any employee or contractor who might inadvertently kill or injure a kit fox or who finds a dead, injured or entrapped individual. The representative will be identified during the employee education program. The representative's name and telephone number shall be provided to the Service.
	An employee education program should be conducted for any project that has expected impacts to kit fox or other endangered species. The program should consist of a brief presentation by persons knowledgeable in kit fox biology and legislative protection to explain endangered species concerns to contractors, their employees, and military and agency personnel involved in the project. The program should include the following: description of the San Joaquin kit fox and its habitat needs; a report of the occurrence of kit fox in the project area; an explanation of the status of the species and its protection under the Endangered Species Act; and a list of measures being taken to reduce impacts to the species during project construction and implementation. A fact sheet conveying

TABLE C-4
Measures to Avoid Take of Special-Status Species that Grassland WD Would Implement under the Proposed Action

Species	Avoidance Measures
	this information should be prepared for distribution to the above-mentioned people and anyone else who may enter the project site. Upon completion of the project, all areas subject to temporary ground disturbances, including storage and staging areas, temporary roads, pipeline corridors, etc., should be re-contoured if necessary, and revegetated to promote restoration of the area to pre-project conditions. An area subject to "temporary" disturbance means any area that is disturbed during the project, but that after project completion will not be subject to further disturbance and has the potential to be revegetated. Appropriate methods and plant species used to revegetate such areas should be determined on a site-specific basis in consultation with the Service, California Department of Fish and Game (CDFG) and revegetation experts. In the case of trapped animals, escape ramps or structures should be installed immediately to allow the animal(s) to escape, or the Service should be contacted for advice. Any contractor, employee, or military or agency personnel who inadvertently kills or injures a San Joaquin kit fox shall immediately report the incident to their representative. This representative shall contact the CDFG immediately in the case of a dead, injured or entrapped kit fox. The Sacramento Fox and Wildlife Office and CDFG will be notified in writing within three working days of the accidental death or injury to a San Joaquin kit fox during project related activities. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal and any other pertinent information.