

APPENDIX M

**BIOLOGICAL CONSULTATION AND
CONCURRENCE**

APPENDIX M1

**Fish & Wildlife Coordination Act
Report for the San Luis Drainage
Feature Re-Evaluation**



United States Department of the Interior

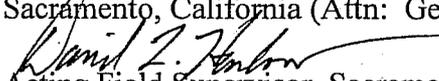


FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In reply refer to:
San Luis Drainage Feature Re-Evaluation

Memorandum

To: Regional Director, U.S. Bureau of Reclamation,
Sacramento, California (Attn: Gerald Robbins)

From: 
Acting Field Supervisor, Sacramento Fish and Wildlife Office,
Sacramento, California

Subject: Fish and Wildlife Coordination Act Report for the San Luis Drainage Feature
Re-Evaluation

This memorandum transmits the Fish and Wildlife Service's Fish and Wildlife Coordination Act Report for the San Luis Drainage Feature Re-Evaluation Project. This Report is prepared under the authority of, and in accordance with, the provisions of section 2(b) of the Fish and Wildlife Coordination Act (48 stat. 401, as amended; 16 U.S.C. 661, et seq.). The Report assesses potential project effects on fish and wildlife resources and provides our recommendations to avoid, minimize or compensate potential adverse effects, and is based on the Service's review of the 2004 *Plan Formulation Report Addendum* and the 2005 *Draft Environmental Impact Statement for the San Luis Drainage Feature Re-Evaluation Project* in western Fresno County, California. A Draft FWCA Report was submitted to the California Department of Fish and Game and National Oceanic and Atmospheric Administration National Marine Fisheries Service for review and comment, and this final report is being distributed to these agencies for information purposes. The project's effects on federally listed species, pursuant to section 7 of the Endangered Species Act of 1973, as amended, are being addressed separately.

We greatly appreciate the cooperation and assistance provided by the Bureau of Reclamation in the preparation of this report. We also appreciate the review and comments provided by California Department of Fish and Game and NOAA Fisheries.

If you have any questions regarding this report, please contact Steven Detwiler at (916) 414-6738, or Mark Littlefield at (916) 414-6520.

Attachment

TAKE PRIDE
IN AMERICA 

cc:

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United States Department of the Interior
U. S. Fish and Wildlife Service

Fish and Wildlife Coordination Act Report

San Luis Drainage Feature Re-Evaluation Project



Sacramento Fish and Wildlife Office
Sacramento, California

March 2006

EXECUTIVE SUMMARY

This is the U.S. Fish and Wildlife Service's (Service) report on the effects of the U.S. Bureau of Reclamation's (Reclamation) proposed Central Valley Project's San Luis Drainage Feature Re-Evaluation Project (SLDFR) on fish and wildlife resources. It addresses the impacts of the proposed project on fish and wildlife resources in the San Joaquin Valley, specifically within the Westlands Water District (Westlands), the Northerly San Luis Unit Area, San Joaquin River Basin, and the Sacramento/San Joaquin River Delta. This report has been prepared under the authority of, and in accordance with, the provisions of the Fish and Wildlife Coordination Act (FWCA) (48 stat. 401, as amended; 16 U.S.C. 661 et. seq.). The FWCA applies to any proposal or authorization to impound, divert, deepen the channel, or otherwise control or modify streams or other bodies of water (excluding impoundments of less than 10 acres in area) that are constructed, licensed or permitted by any Federal department or agency. Agencies are required to consult with the Service and to give equal consideration to the preservation, conservation, and enhancement of fish and wildlife resources with other project purposes.

Our analysis is based in part on engineering, hydrological, biological, and environmental contaminant-related information provided by Reclamation through December 2005, including: Reclamation's San Luis Drainage Feature Re-Evaluation Draft Environmental Impact Statement (Draft EIS), dated May 2005; SLDFR Plan Formulation Report, dated December 2002; the Plan Formulation Report Addendum, dated July 2004; the Draft Alternatives Report, dated October 4, 2002; the Preliminary Alternatives Report, dated December 2001; the Draft Work Plan for the San Luis Drainage Feature Re-Evaluation and Environmental Impact Statement, dated October 2001; the Functional Analysis Study Workshop Report, dated August 2001; Interagency Scoping Workshop documents; the San Luis Act; Court of Appeals findings (Case Number 95-15300); the Draft White Paper-Mitigation Requirements Related to Evaporation Ponds in the San Joaquin, dated July 2002; and information shared within and between the SLDFR Mitigation Work Group and the informal Land Retirement planning team. An administrative draft of the Final EIS has not been made available to the Service; and, as such, some of the information in this FWCA report is based on draft language, informal electronic mail correspondence, and verbal communication from Reclamation.

Our evaluation of effects to natural resources are based on literature reviews, field reconnaissance, personal communications, and an analysis of resource information provided by Reclamation and various contractors (URS and HydroFocus). Based on data provided by Reclamation, the expected construction period for the proposed project has been estimated to span from 5 to 20 years, with a project life of 50 years, resulting in a 50+ year period of analysis. Construction is expected to start in 2006, and to be completed by 2026.

At the time of printing this report (coincident with the Final EIS), Reclamation has not yet selected precise locations for specific project features, although a general mitigation proposal (with an "initial estimate" of acreage obligations) and broad planning level analysis have been completed. The Service is able to analyze the current proposal in a similarly broad perspective,

and Reclamation has agreed that the specific siting of facilities associated with SLDFR are subject to future consultations with the Service under section 7 of the Endangered Species Act of 1973, as amended (ESA). Additionally, the Service intends to continue participation with the SLDFR Mitigation Work Group during future phases of the planning process, including assistance with the feasibility analysis, facilities siting, and the preparation of the mitigation monitoring and adaptive management plans. During this planning process, amendments to this report may be necessary.

Our Draft FWCA report (dated February 2005): 1) evaluated the impacts of in-valley disposal and three drainage impaired agricultural land retirement alternatives as described in the Administrative Draft EIS; 2) recommended methods for mitigating losses to affected natural resources; and 3) encouraged the comprehensive management of biological resources within Westlands, and any lands retired by this action. In that report, the Service recommended that Reclamation:

1. Provide further evaluation of the proposed action and alternatives to assist in avoiding and/or minimizing fish and wildlife impacts associated with construction and operation of evaporation ponds, most notably to migratory birds as defined and protected under the Migratory Bird Treaty Act (MBTA).
2. Include and evaluate a full land retirement alternative (Service's Preferred Land Retirement Alternative) on all drainage impaired lands in the San Luis Unit (SLU), maximizing elimination of drainage at its source and avoidance of adverse fish and wildlife effects.
3. Fully support efforts of the Mitigation Working Group so that mitigation requirements for In-Valley Alternatives include and evaluate: 1) associated revised mitigation protocols; 2) risks associated with reuse facilities and possible mitigation measures; and 3) specific management plans, including a detailed cost estimation and framing of the Adaptive Monitoring and Management Plans mentioned in the Administrative Draft EIS.
4. Include participation of the California Department of Fish and Game (CDFG) and California Department of Water Resources in the Mitigation Work Group.
5. Fully consider and include mandates and directives as provided under the Central Valley Project Improvement Act, the California-Federal Bay Delta Program (CALFED), the ESA, the Clean Water Act, and the MBTA.
6. Include a full range of water demand and supply management options, including irrigation efficiency and land retirement and fallowing.
7. Provide a more detailed assessment of land management options to maximize recovery of threatened and endangered species within the planning area.

8. Initiate and complete consultation under section 7 of the ESA to determine potential project effects on listed and other special status species, and incorporate appropriate conservation measures for affected species into project implementation.
9. Initiate and complete consultation under the State Endangered Species Act to determine potential project effects on State-listed species.

Of these nine principal recommendations, the Service is pleased to acknowledge that Reclamation has met or made significant progress on five elements (Items 1, 3, 4, 6, and 8); and discussions are ongoing on two (Items 5 and 7), while one issue was left outstanding (Item 2). We are unaware where item #9 stands as of this writing. At this stage of the planning process (some 6 months from the anticipated Record of Decision), the Service recognizes that it is infeasible to incorporate additional alternatives into the SLDFR planning process and still meet the court-mandated deadline.

Given the stage of the project (as this report is to be incorporated with the Final SLDFR EIS), the focus of this Final FWCA report will assess the alternatives as finally presented by the information provided to the Service by Reclamation to date. As of this writing, only the Draft EIS has been provided to the Service, although an advance draft version of the final evaporation pond mitigation plan for the various In-Valley disposal alternatives has been presented through the Mitigation Working Group. Other pending information needs have been partially satisfied through formal and informal Inter-agency meetings and discussions.

In the intervening months since the completion of the Draft EIS, Reclamation and the Service have engaged in ongoing discussions regarding fish and wildlife resource considerations. The milestones in this effort are enumerated, as follows:

- During 2005, Reclamation funded the Service to derive and provide mitigation protocols for adult avian mortality associated with selenium exposure to birds using the proposed evaporation basins. A white paper (Appendix 1) was completed by Service staff, and provided for review by the Mitigation Working Group. Reclamation, with the Service's endorsement, has contracted with Dr. Harry Ohlendorf of CH₂M Hill for expert independent review on the risk assessment approach and elements presented within the Service's adult avian mortality mitigation protocol.
- Dr. Andy Gordus of the CDFG has been invited and participated in several of the ongoing Mitigation Working Group conference calls.
- The Service and Reclamation engaged in a joint meeting with our Solicitors to discuss elements specific to the ESA consultation process, and the appropriate relationship of the SLDFR process to the SLU Long-term Contract renewals. This meeting was followed by a smaller interagency meeting specific to SLDFR where it was agreed that specific

language would be added to the San Luis contract renewal allowing for reassessment of the water needs analyses for districts within the Unit if a project alternative involving significant land retirement was approved as part of the SLDFR. Some of the concerns addressed in our Draft FWCA report regarding conversion of upslope remnant natural habitats within, and adjacent to, the SLU District boundaries were thereby deferred to the SLU Long-Term Contract Renewal process.

- Reclamation has (due to timing constraints) deferred detailed discussions regarding mitigation monitoring, adaptive management, and specific elements (e.g., specific site locations and water supplies) of the initial mitigation obligations to the feasibility analysis phase (following release of the Final EIS) of the SLDFR. These will be continued in coordination with the Mitigation Working Group, involving members of the Service, CDFG, and the California Central Valley Regional Water Quality Control Board, Fresno (Regional Board).
- Reclamation has funded the Endangered Species Recovery Program (CSU Fresno) to assess and provide guidance specific to upland threatened and endangered species (particularly the San Joaquin Kit Fox) recovery and land retirement within the SLU. Interagency discussions with respect to management of retired lands consistent with the Service's *Recovery Plan for Upland Species of the San Joaquin Valley, California*, and possible integration of future mitigation planning and land retirement with existing initiatives to recover threatened and endangered flora and fauna, are ongoing.
- Reclamation initiated section 7 consultation with the Service beginning November 7, 2005, and will be providing significant assistance through the Fresno field office towards completion of the Biological Opinion. The Biological Opinion is evaluating the effects of the two "bookend" alternatives—"In-Valley Disposal" and "In-Valley Drainage Impaired Area," to assure that the breadth of effects to protected species are being captured through the full range of possible project conditions (maximum disposal via evaporation basins, or maximum drainage reduction via land retirement).
- In the interagency meeting held December 6, 2005, Reclamation indicated that the project is predicated on the successful compliance with the 10 $\mu\text{g/L}$ waterborne selenium concentration following pre-treatment. Further, it was agreed that the effluent would be treated to oxidize the selenium to selenate. These thresholds form the basis for the underlying risk assessments, and this agreement is therefore a critical project element. The Service's understanding of this agreement is that failure to meet this objective will necessitate future FWCA, National Environmental Policy Act, and ESA consultation.
- Reclamation indicated in the same meeting that "land retirement" as constituted within the SLDFR planning involves the purchase of "non-irrigation covenants" akin to the former Sumner Peck and Britz settlements.

- On December 11, 2005, a memorandum from URS Corporation was provided to the Service with an "initial estimate" for up-front mitigation acreage provisions for effects to migratory birds from the operation of the SLDFR evaporation ponds, and the obligation of up to twice this initial estimate to be costed out through the feasibility planning phase.
- Reclamation informally notified the Service that the preferred alternative identified in the Final EIS will be the Drainage-Impaired Area alternative.

The analyses and discussion within our FWCA Report are based on the public documents and information enumerated above. In order to finalize this document for administrative review and signature on schedule, it was necessary to impose a cutoff for new information feeding the analysis contained herein. Therefore, this FWCA Report is complete to the best of our ability, based on available information as of February 1, 2006. As of this writing, the section 7 consultation is ongoing, but will not be complete before the deadline for compilation and printing of the Final EIS and FWCA Report. Therefore, additional conservation measures and contingencies specific to threatened and endangered species may be forthcoming within the Biological Opinion that are not included herein.

What follows in this report is a broad, but comprehensive assessment of potential project effects on fish and wildlife resources; and our recommendations to avoid, minimize or compensate potential adverse effects associated with the construction and operation of the San Luis Drainage Feature Re-Evaluation as encompassed by the presented alternatives.

Following from our final assessment contained herein, the Service recommends the following to Reclamation:

- (1). *Adopt a policy that maximizes land retirement (through all appropriate means) on drainage-impaired lands.* In recommending mitigation for adverse impacts to any of the habitats affected by the proposed project, the Service recommends following, to the extent feasible, the sequential mitigation steps recommended in the Council on Environmental Quality's regulations. These steps favor *avoidance* above *minimization* of impacts and *compensation* for unavoidable adverse effects. To avoid and minimize risks and effects to fish and wildlife resources in the San Joaquin Valley and Pacific Flyway, the Service recommends land retirement on all drainage impaired lands in the SLU. This approach would maximize the elimination of drainage at its source, and therefore avoidance of adverse fish and wildlife effects.
- (2). *Maximize avoidance and/or minimization of Project impacts to fish and wildlife.* The Service prefers a more conservative approach to mitigation, and would encourage Reclamation to include appropriate up-front mitigation prescriptions within the "initial estimate" for mitigation. Specifically, these are reflected in the seasonal protocol outputs from the adult avian mortality model (Appendix 1); or, during the breeding season, by the 1995 Service Alternative and Compensation Habitat protocols (limited to the mutually agreed-upon amendments).

(3). *Consider and include policies, directives, and requirements of all applicable laws, policies and programs.* The Service recommends that Reclamation, in its efforts to solve SLU drainage issues, fully consider and include mandates and directives as provided under the Central Valley Project Improvement Act, CALFED, the ESA, the Clean Water Act, and the MBTA. As an example, retiring drainage impaired lands in the SLU should reduce water demand such that unmet environmental needs, including refuge level 4 water supplies, could be met through water made available via land retirement.

(4). *Continue to support efforts of the Mitigation Work Group.* The Mitigation Working Group efforts to date have been generally fruitful. There are many outstanding issues, however, that have been deferred until after the Final EIS' release due to considerable time constraints. These include: the preparation of mitigation monitoring and adaptive management plans, full discussion of risks associated with reuse facilities and possible mitigation measures, final siting and management planning for project facilities, and detailed cost estimation and framing of the feasibility analysis. The Service hopes to continue this collaboration with Reclamation, the Regional Board, and CDFG through the next year and into the implementation of the selected alternative in the Record of Decision.

(5) *Expand the Mitigation Work Group, or form new technical advisory committees to match the shifting project emphasis.* The next phase of SLDFR involves siting and management of project facilities, including mitigation wetlands. The Mitigation Working Group would benefit from the expertise of experienced wetland managers and restoration ecologists. The Service recommends broadening the scope of participants within the group, or at least establishing a more formal outreach effort to ensure proper coordination and incorporation of local expertise for successful implementation of broad project objectives.

(6). *Maximize efforts to assist recovery of threatened and endangered species.* The Service recommends that Reclamation begin the planning phase for the objectives to further listed species recovery associated with land retirement as soon as possible. The Service further recommends that Reclamation, jointly with the Service's Sacramento Fish and Wildlife Office, convene a SLDFR technical team under the larger San Joaquin Valley Recovery Team, and invite other interested parties and stakeholders to coordinate and integrate these recovery objectives in a practical manner.

(7). *Finish section 7 consultation with Sacramento Field Office Endangered Species Division.* At the time that this FWCA Report was completed and submitted for printing and release in the Final SLDFR EIS, the section 7 endangered species consultation had not been completed. It is fully expected that the final Biological Opinion will be available by the time the Record of Decision is released. Some elements contained within the ESA document may not be reflected fully in this FWCA Report.

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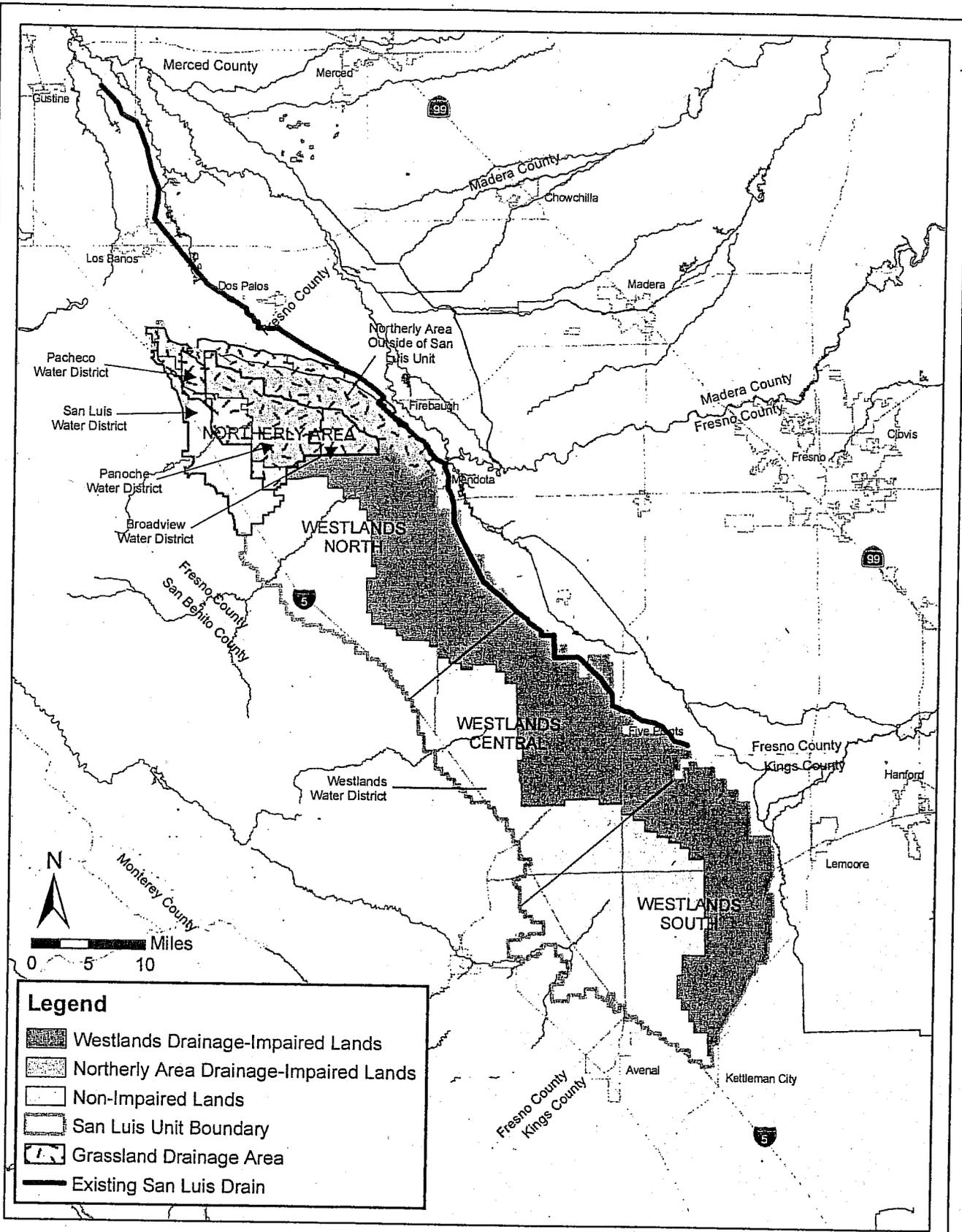
INTRODUCTION

The San Luis Unit (SLU) has received Central Valley Project (CVP) contract water for about 40 years, with only partial drainwater removal services. Sustaining irrigated agricultural productivity in a large area of the CVP's SLU requires drainwater management. The San Luis Act of 1960 (Public Law 86-488) recognized the drainage management requirement, and several lawsuit decisions confirmed the Federal government's obligation to provide drainage service when irrigation water is applied to the Unit. However, the means by which to provide drainage service remain at issue. Under current land management practices, when irrigation water is provided to the SLU, a substantial area (379,000 acres) requires drainage service to remove saline groundwater from the shallow water table and maintain agriculture on these impaired lands (USBR 2004a and 2004b) (See Map #1).

Since 1991, available water supplies and institutional constraints have limited the export capabilities of the U.S. Bureau of Reclamation's (Reclamation) Tracy Pumping Plant. Water supplies and pumping restrictions have recently limited Westlands Water District's (Westlands) to an average annual water supply of less than 60 percent of full contract quantity over the last decade (Westlands, 2002). Despite the limitations on available Sacramento/San Joaquin River Delta (Delta) water supplies, Westlands has been able to deliver irrigation water quantities near or above contract amounts (see Westlands Annual Water reports, 1992-2000) through an aggressive and innovative State and Federal water acquisition/transfer program along with conjunctive water uses.

During the proposed lifespan of long-term agricultural contracts (to be renewed this year for another 25 years), CVP south of Delta contract deliveries have been projected to increase to better meet competing demands (USBR, 2004c). Westlands recently proposed a land retirement plan encompassing 200,000 acres in exchange for firm future deliveries of the remaining allotment of their full contracted water quantities—805,000 of 1.15 million acre feet, or 70 percent supply (Westlands, 2002). In rough terms, the San Luis Drainage Feature Re-evaluation (SLDFR) Water Needs alternative (which projects 194,000 acres of land would be retired and assumes 70 percent available water supply) is roughly concordant with the major elements of the Westlands plan, though Reclamation made it clear in the Draft Environmental Impact Statement (Draft EIS) that this 70 percent assumption was not explicit and not predictive of future water supplies or needs. In other words, the fate of the water and the firm obligation of that volume are not guaranteed within the SLDFR.

The U.S. Fish and Wildlife Service (Service) has had difficulty separating the SLU long-term contract renewal action from the SLDFR, considering that significant portions of the Unit are slated for retirement in several action alternatives. However, as mentioned above, Reclamation has indicated that language in the subsequent San Luis contract will be amended to reserve the Department of the Interior's right for reassessment of the Westlands Water Needs analysis (an analysis that has not been updated since 1989).



Legend

-  Westlands Drainage-Impaired Lands
-  Northerly Area Drainage-Impaired Lands
-  Non-Impaired Lands
-  San Luis Unit Boundary
-  Grassland Drainage Area
-  Existing San Luis Drain

San Luis Drainage
Feature Re-evaluation

17324004

Drainage Study Area

MAP
1

The Northerly San Luis Unit and Exchange Contractors Area (Northerly Area) encompasses a total of 81,000 drainage-impaired acres, including lands held by San Joaquin exchange contractors and the Delta-Mendota Canal Unit outside of the SLU boundary. Lands in this area have the highest groundwater selenium concentrations [50 to 1,000 $\mu\text{g/L}$ (parts per billion)] within the SLDFR planning boundary.

Since the mid-1990s, water districts in the Northerly Area have benefited from drainage discharge via the Grasslands Bypass Project (GBP). Under this program, contaminated drainwater is separated from specific wetland supply channels that feed private duck clubs within the Grasslands Water District; and, subsequently, Federal lands managed within the San Luis National Wildlife Refuge complex. This drainwater is then discharged into the San Joaquin River via the San Luis Drain and Mud Slough. Loading restrictions are placed on this discharge to regulate water quality in the river over time. The GBP, in tandem with on-farm and regional drainage reduction programs, has reduced selenium loads overall and in specific sensitive wetland habitats, however exceedances continue to occur in the Grasslands wetland supply channels and San Joaquin River.

The GBP use agreement expires December 2009, and drainage discharge limitations will become more restrictive in the future. Beginning in 2010, more rigorous water quality objectives will apply to the San Joaquin River. As a result, the SLDFR planning process has eliminated river discharge as a viable disposal option. The SLDFR EIS includes evaporation ponds in the Northerly Area as a component of all In-Valley alternatives. In general terms, the drainwater that currently goes to the River will instead be ponded in terminal evaporation/percolation basins.

In 1992, the Central Valley Project Improvement Act (CVPIA) was signed into law and directed the provision of "substantial deference" to the San Joaquin Valley Drainage Program (SJVDP, 1990) recommendations while implementing the CVPIA. The CVPIA [section 3406(b)(3)] includes permanent land fallowing as a mechanism to acquire water for fish and wildlife purposes. The CVPIA [section 3408(j)] includes consideration of purchase of water rights and purchase and idling of agricultural land to increase project yield. Likewise, reducing SLU water demands and making water available for other purposes could contribute towards CALFED's goal to improve water supply reliability. Removing drainwater contaminants from agricultural discharges to the San Joaquin River would contribute to CALFED's ecosystem improvement goal.

PROJECT AREA

The project area includes the agricultural districts within CVP's SLU located in the northwest portion of Kings County, in western Fresno County, and in the southwestern tip of Merced County, California. In addition, the project area includes drainage impaired lands for the San Joaquin Exchange Contractors and Delta-Mendota Canal Unit. The Ocean Disposal Alternative

also includes the northwestern tip of Kern County and northern San Luis Obispo County. The Delta Disposal alternatives also include Stanislaus, San Joaquin, Alameda, Solano, and Contra Costa counties.

The SLDFR planning area contains about 730,000 acres, most of which is intensively managed agricultural land. Of these 730,000 acres, about 379,000 acres are, or are projected to be, drainage impaired within the planning horizon. The drainage study area is semiarid, characterized by hot, dry summers and mild winters. Summer temperatures may reach 110 degrees Fahrenheit (F), while winter temperatures may fall below 25 degrees F. Average annual precipitation is 8.6 inches per year, but varies from 2.4 to 20.6 inches.

The SLU includes Westlands in the south and the San Luis, Panoche, and Pacheco water districts in the Northerly Area. The SLDFR planning area also includes districts within the Delta-Mendota Canal Unit (Broadview, Widren, Oro Loma, Mercy Springs, and Eagle Field water districts) and San Joaquin Exchange Contractors (Firebaugh Canal Water District and Central California Irrigation District). All CVP water contract supply sources and supply system's operational issues are outside the project scope. However, the interrelated and interdependent components of all alternatives, including the No Action, will continue to affect aquatic and terrestrial resources Statewide.

The water sources for the SLU include the San Joaquin, Stanislaus, American, Sacramento, Trinity, and Feather rivers, and at times, most tributaries to these main river systems. The water year type and CVP/State Water Project Operational Criteria and Plan (OCAP) (USBR, 2004d), coupled with all regulatory requirements, will continue to determine available irrigation water supplies for the SLU. Water conveyed from Folsom, Shasta, Trinity, Oroville, New Melones, and Millerton reservoirs, dependent on contract renewal quantities and Delta pumping constraints (included in OCAP) will continue to supplement the SLU's water supply. Note that water flow contributions outside of unregulated flood flows from Friant Dam to the San Joaquin River remain the subject of current and ongoing litigation.

PROJECT DESCRIPTION

Reclamation has identified seven action alternatives, in addition to the No Action alternative, to "meet the needs of the Unit for drainage service, fulfill the requirements of the February 2000 Court Order, and be completed under the authority of Public Law 86-488." The EIS states that all phases of the project assume that farmers will be adopting on-farm and in-district drainage reduction actions regardless of which ultimate drainage solution alternative the Federal government selects. Drainage reduction actions include recycling drainwater, managing shallow groundwater, and reducing canal seepage. Following on-farm and in-district actions, the EIS compares and contrasts the following alternatives:

No Action

- Part of the Northerly Area's planned In-Valley Treatment/Drainage Reuse Facility would be constructed without Federal action. The constructed and funded components include 2,700 acres for planting with salt-tolerant crops irrigated with increasingly saline drainwater (Integrated On-Farm Drainage Management—IFDM)
- Land retirement of 44,106 acres in Westlands, 10,000 acres in Broadview, and 65,000 acres currently fallowed by the Westlands/Sagoupe Settlement (total 119,106 ac)
- The San Luis Drain would not be used to convey drainage except for the Northerly Area of the Unit via the GBP up to 2009
- No additional irrigated acres would be brought on line
- No new managed wildlife areas would be developed within the study area
- No changes to land following patterns

Action Alternatives

1) Out of Valley—Ocean Disposal

- 19,000 acres of regional reuse facilities
- 177 miles of buried pipeline conveyance of drainwater—using existing right-of-way when possible—including 3 tunnels through the coastal range and 10 pumping plants
- Estimated total present worth cost of \$655 million (2002 dollars), with an annual equivalent cost of \$39.4 million

2) Out of Valley—Delta-Chipps Island Disposal

- 19,000 acres of regional reuse facilities
- 160 acres of selenium treatment facilities
- Utilizes existing San Luis Drain
- 191 miles of pipeline and canal conveyance using existing right-of-ways (108 miles of new construction and 83 miles of the existing San Luis Drain)
- Canals and low-head pipelines in agricultural and sparsely populated areas
- Pipelines in urban and rapid growth areas
- Estimated total present worth cost of \$560 million (2002 dollars), with an annual equivalent cost of \$33.7 million

3) Out of Valley—Delta-Carquinez Strait Disposal

- 19,000 acres of regional reuse facilities
- 160 acres of selenium treatment facilities
- Utilizes existing San Luis Drain
- 208 miles of pipeline and canal conveyance using existing rights-of-way (125 miles of new construction and 83 miles of the existing San Luis Drain)
- Canals and low-head pipelines in agricultural and sparsely populated areas
- Pipelines in urban and rapid growth areas
- Estimated total present worth cost of \$605 million (2002 dollars), with an annual equivalent cost of \$36.4 million

4) In-Valley Disposal Alternative

- No new land retirement
- Reported as 44,106 acres retirement (Sumner Peck, Britz settlements, and CVPIA demonstration program)
- Up to 3,290 acres evaporation basins
- 718 acres of mitigation habitat (wetlands)—with contingency provision up to 1,436 acres
- 19,000 acres of regional reuse facilities
- PFR Addendum, estimated cost - \$661 million, with an annual equivalent cost of \$46.4 million
- Administrative Draft EIS, estimated cost - \$511 million, with an annual equivalent cost of \$30.7 million
- Draft EIS, estimated cost - \$560 million, with an annual equivalent cost of \$33.8 million

5) In-Valley Groundwater Quality Land Retirement Alternative

- 92,592 acres total retirement (existing 44,106 acres plus an additional 48,486 acres reflecting lands with shallow groundwater quality containing >50 µg selenium/L water)
- Up to 2,890 acres evaporation basins
- 621 acres of mitigation habitat (wetlands)—with contingency provision up to 1,242 acres
- 16,700 acres of regional reuse facilities
- PFR Addendum, estimated cost \$719 million, annual equivalent - \$43 million
- Administrative Draft EIS, estimated cost - \$572 million, with an annual equivalent cost of \$34.4 million
- Draft EIS, estimated cost - \$630 million, with an annual equivalent cost of \$37.6 million

6) In-Valley/Water Needs Land Retirement

- 193,956 acres total projected retirement [existing 44,106 plus an additional 149,850 acres that include: lands with >20 µg selenium/L water, the 65,000 acres acquired by Westlands that could later be brought back into production with drainage service {Sagoupe} and 10,000 acres from the Broadview Water District]
- Up to 2,150 acres evaporation basins
- Acreage represents the amount required to “retire enough lands to meet the internal water use needs of Westlands”
- 463 acres of mitigation habitat (wetlands)—with contingency provision up to 926 acres
- 12,500 acres of reuse facilities
- PFR Addendum, estimated cost -\$881 million, annual equivalent cost of \$53 million
- Administrative Draft EIS, estimated cost \$713 million, annual equivalent - \$43 million
- Draft EIS, estimated cost - \$770 million, with an annual equivalent cost of \$46.5 million

7) In-Valley/Drainage Impaired Area Land Retirement

- 308,000 acres total projected retirement (44,106 plus 263,894 acres representing the remainder of Westlands drainage-impaired lands, plus the 10,000 acres in Broadview)
- Excludes retirement of lands within the Northerly Area (71,000 acres) currently served by Grasslands Bypass Project
- Up to 1,270 acres evaporation basins in the Northerly Area
- 274 acres of mitigation habitat (wetlands)—with contingency provision up to 548 acres
- 7,500 acres (1,700 acres existing) of reuse facilities
- PFR Addendum, estimated cost of \$1.092 billion, annual equivalent \$65.7 million
- Administrative Draft EIS, estimated cost of \$862 million, annual equivalent \$51.9 million
- Draft EIS, estimated cost - \$860 million, with an annual equivalent cost of \$51.6 million

The current aspects of the project that differ from descriptions during the early SLDFR planning phase are the notable inclusion of varying degrees of land retirement; revised cost estimates; and a more robust and precise risk assessment analysis, including modified effluent water quality projections based upon drainwater pretreatment using Applied Biosciences, Inc.’s AbMet[®] treatment technology. The initial alternatives screening eliminated complete land retirement on all SLDFR planning area lands (totaling 379,000 acres) needing drainage service as one possible alternative amongst those in consideration. This particular option (proposed by the Service during the planning process and ultimately presented in the Draft FWCA report as the “Service-Preferred Land Retirement Alternative”) has not been adopted for purposes of National Environmental Policy Act (NEPA) analysis as part of SLDFR planning.

All SLDFR alternatives assume discontinuing Northerly Area drainwater disposal to the San Joaquin River by 2009—an action that will occur independent of SLDFR. The EIS states that Northerly Area sump and check drain discharges to the Delta-Mendota Canal would continue unless an action alternative is implemented, or the State issues a discharge abatement order.

EXISTING CONDITIONS

The affected environment includes the major CVP and State Water Project (SWP) reservoirs, the Sacramento, American, Feather, Trinity, and San Joaquin rivers, and the Delta. The upland, riparian, and aquatic habitats downstream of major reservoirs on each river system are potentially affected by cumulative CVP and SWP actions. The magnitude of this particular project, involving such large expanses of land and the appreciable volume of water associated with the use and management of that land, makes this interconnection of effects all the more significant. However, biological resources in the water supply source areas are outside the project scope, and are considered indirect effects not part of this evaluation.

The project area is located in California's San Joaquin River Basin. Actions within the SLU's water service boundaries directly influence Service National Wildlife Refuges (Refuge), California Department of Fish and Game (CDFG) Wildlife Management Area (WMA) water supplies, and San Joaquin River water flow and quality. The irrigated areas within the SLU (and environs) are utilized for agricultural production, including a variety of row crops (e.g., cotton, alfalfa, sugar beets, etc.) and permanent crops (e.g., orchards, vineyards).

The Northerly Area of the SLU includes intensively managed agricultural land, irrigation water delivery canals, and drainage canals. It is currently serviced by the GBP, and subsurface agricultural drainwater (drainwater) generated from these fields eventually flows to the San Joaquin River via Mud Slough. In 13 years of monitoring, the GBP has documented elevated concentrations of selenium in fish and invertebrates in the natural waterways where drainwater is being released (SFEI, 2004). These loads may be harming fish in Mud Slough and the lower San Joaquin River, as well as higher vertebrates that consume these organisms. San Joaquin River tributaries and releases from New Melones Reservoir dilute the drainwater discharges prior to reaching the Delta.

Sumps and check drains in the Northerly Area continue to discharge drainwater into the Delta-Mendota Canal and Mendota Pool. Releases to the San Joaquin River via the GBP are permitted by the State Water Resources Control Board (State Board) through 2009, at which point it is presumed some other drainage service option or drainwater management strategies will need to be employed by area growers.

In general, agricultural practices limit habitat available for fish and wildlife resources within the identified action area boundaries, including Westlands. The Westlands area includes intensively managed agricultural land, irrigation water delivery canals, and drainage canals. Currently, due to water supply and drainage concerns, a significant portion of Westlands is held in fallow (see No Action alternative features above). The SLDFR planning process targets the use of "retired" lands for reuse or evaporation pond sites, to the extent possible.

Fish and Wildlife Resources and Agricultural Drainage in the San Joaquin Valley, California (Moore et al., 1990) thoroughly describes the condition of the San Joaquin River and associated Basin resources. Since the 1990 publication, several State and Federal Wildlife Refuge additions have occurred. The Draft EIS (USBR, 2004a) includes a brief description of the biological resources in the drainage service area and along pipeline routes. This description was compiled from literature searches and geographic information system mapping. The Service herein expands the biological resource evaluation presented in the Draft EIS. Scientific names for plant and animal species mentioned herein appear by taxon (in alphabetical order) in Appendix 2.

Terrestrial Resources

The SLU historically supported California prairie (including vernal pools) and San Joaquin saltbush vegetation on the valley floor, and riparian wetland communities along the San Joaquin River (Moore et al., 1990). Today, irrigated agriculture has largely replaced these communities. The practice of planting crops directly adjacent to the river channel bank has confined riparian vegetation to a narrow band within and alongside the San Joaquin River. As of 1990, about 4 percent of the historic San Joaquin Valley riparian vegetation acreage remained (Moore et al., 1990). There are seven general terrestrial habitat types in the project area, including: agricultural and fallowed cropland; San Joaquin saltbush and California prairie/annual grasslands; drainwater reuse areas; restoration sites; and riparian areas. These are discussed in more detail below.

Agricultural lands/Fallowed Cropland

Intensively managed or temporarily fallowed agricultural lands are the predominant land use feature in the SLDFR planning area. The EIS states that cotton is the main crop, followed by tomatoes and lettuce. Currently, the SLU growers are shifting their cropping patterns to increased acreages of fruit and nut orchards. For the last several years on average, Westlands has fallowed some 70,000-100,000 acres each year (pers. comm., J. Robbins)—presumably this is the same land projected as “retired” under the No Action SLDFR alternative (excepting Broadview). Fallowed land management varies, but much of this land is now allowed to grow forage plants, followed by sheep grazing (pers. comm., Scott Phillips, December 7, 2004).

San Joaquin Saltbush

San Joaquin saltbush is generally dominated by salt-tolerant shrubs such as perennial and annual saltbush, iodine bush, alkali blite, burning bush, and goldenbush. Grasses and forbs found in alkali desert scrub communities include alkali heath, alkali weed, dock, pickleweed, alkali heliotrope, annual saltbush, alkali sacaton, and saltgrass. As of 1990, about 8 percent of the historic San Joaquin saltbush habitat remained in the San Joaquin Valley (Moore et al., 1990).

California Prairie/Annual Grassland

California prairie is characterized by native perennial grasses, such as purple needlegrass and alkali sacaton, and is typically found in moist, lightly grazed relict areas within annual grasslands. Less than 1 percent of historic California prairie remains in the San Joaquin Valley. Most of the historic California prairie habitat is now replaced by annual grassland community. Annual grasslands in the San Joaquin Valley are dominated by introduced annuals such as oats, soft chess, ripgut brome, red brome, barley, and foxtail fescue.

As of 1990, there were about 17,000 acres of California prairie/annual grassland and San Joaquin saltbush habitat remaining in the SLU—the vast majority of which occur in the western portion of Westlands along the Interstate 5 corridor (USBR, 1991). Some wildlife species that use San Joaquin saltbush and California prairie/annual grassland habitats include various species of mice and kangaroo rats, ground squirrels, riparian brush rabbit, blunt-nosed leopard lizard, Swainson's hawk, and red-tailed hawk.

Drainwater Reuse Areas

Currently, nearly 3,000 acres are being managed as reuse facilities in the Northerly Area of the SLU (the San Joaquin River Water Quality Improvement Project, aka “Panoche” facility; Terrill et al., 2004). This land is managed as irrigated agriculture, utilizing drainwater to irrigate salt tolerant plants (primarily alfalfa and barley), which are harvested when mature. These facilities function to lower drainwater volume and concentrate salts prior to disposal to the San Joaquin River.

The Draft EIS states that cultivated plants in the reuse areas consume 3.4 acre-feet of water per acre, with an additional 1.1 acre-feet of water per acre reaching groundwater for subsequent drainage service. Land management practices on the reuse areas limit their habitat value, however reports do confirm use by area wildlife, including nesting avifauna (Terrill et al., 2004).

Restoration Sites

In 1998, the Department of the Interior retired 1,646 acres in the SJVDP's Westlands Subarea through the CVPIA Land Retirement Program. In 2001, an additional 440 acres were added to the project. The sites are located immediately to the west and south of the Mendota WMA in western Fresno County. This land was purchased to remove irrigation from impaired lands and reduce drainage problems.

Ten monitoring wells revealed that after 4 years, the perched groundwater level dropped 6 feet, and in all areas was at least 7 feet below the surface. Monitoring several sumps on the Tranquility site (located about 2 miles south of Mendota WMA) revealed that all were dry by October 2000. This project also monitors and evaluates revegetation and restoration of these lands, and will help direct future restoration actions (USDI, 2004).

Currently, these 2,086 retired acres, along with the Britz and Sumner Peck lands (for which the Federal government retains non-irrigation covenants through legal settlement), comprise the only area in the SLU that the Service, in this evaluation, considers permanently removed from irrigated agriculture. However, if any of these lands are converted to reuse facilities as part of SLDFR, this land use would technically constitute irrigated agriculture. The remaining “retired” lands as defined in all proposed alternatives may revert to irrigated agriculture when groundwater levels drop and irrigation water is available.

Riparian Systems

Remnant native forested and scrub-shrub wetlands (commonly referred to as riparian vegetation) are restricted to the San Joaquin River channel, remnant stands along some intermittent tributaries (such as Los Banos Creek, Panoche Creek, and Cantua Creek), and some of the larger sloughs within or adjacent to the study area in the north. Dominant plant species include: cottonwood, California sycamore, and valley oak. Typical shrubs include: wild rose, California blackberry, blue elderberry, and willow. Hoary nettle, poison hemlock, and various species of rushes and grasses are commonly found in the herbaceous layer (USBR, 1991).

There are about 500 acres of riparian habitat along Mud and Salt Sloughs (USBR, 1991). As stated above, 4 percent of the historic San Joaquin Valley riparian habitat remains today.

Aquatic Resources

The San Joaquin Basin is drained by the San Joaquin River, which flowing north, eventually empties into the San Francisco Bay via the Delta. Much of the natural flows in area streams are diverted for agricultural and municipal use. As of the late 1980s, less than 1 percent of the San Joaquin Valley's developed water supply was delivered to wetlands (Moore et al., 1990). Recently, refuge level 2 actions under the CVPIA have improved wetland water supply reliability, but water supplies are the primary factor dictating the type and condition of wetlands in the Valley.

San Joaquin River flows are currently maintained from tributaries downstream of Mendota Pool through Federal Energy Regulatory Commission (FERC) required instream flows and water quality flow releases from New Melones Reservoir. FERC flow releases are required to maintain viable fishery and recreational resources downstream of associated dams. Prior to 1992, agricultural tailwater and drainwater contributed substantial flows to the river. However, today these river flow contributions have decreased due to tailwater recapture, drainwater volume reduction, groundwater pumping, and water transfer programs.

Numerous kinds of wetlands (including vernal pools, free-flowing streams, and permanent and seasonal wetlands) occurred in the San Joaquin Valley in historical times. Many of these natural habitat types have been reduced to tiny remnants of their historic extent. Existing wetland types

are often characterized by man-made or man-modified features such as irrigation canals, managed wetlands (including rice fields), evaporation ponds, and ephemeral groundwater pools. These categories either occur within the SLDFR planning area, adjacent to it, or are potentially affected by water management practices in the study area.

About 8 percent of the historic San Joaquin Valley wetland acreage remains (Moore et al., 1990). Since the Moore report, several wetland area additions occurred in the San Joaquin Valley, but overall the wetland area remains below 10 percent of historical acreage.

Vernal Pools

Vernal pools, a type of seasonal wetland, once were commonly interspersed within the California prairie of the San Joaquin Valley. Vernal pools occur throughout the State, and may occur within the boundaries of the project area (USBR, 1991). These seasonal pools are usually small (10-165 feet across), although some can be as large as a few hundred acres. They are typically shallow (4-24 inches deep), characterized by shallow depressions underlain by an impervious substrate (e.g., clays) that prevents or greatly hinders the downward percolation of water. They vary in pH from acidic to neutral or subalkaline. Plant composition is largely annual, highly endemic flora, and approximately 70 percent of the documented vernal pool species are native annuals (Holland and Jain, 1988).

Two forms of vernal pools are found in the San Joaquin Valley: northern claypan vernal pools, and intergrades with alkali sink pools. Valley pools are typically saline or alkaline, and occur in basins or low-lying plains. Common salt-tolerant flora characteristic of valley pools include: salt grass, *Downingia*, peppergrass, sandwort, locoweed, alkali weed, gum plant, and clover. Terrace vernal pools occur on neutral to slightly acid soils. Characteristic taxa of terrace pools include: foxtail, *Blennosperma*, primrose, white brodiaea, hairgrass, *Evax caulescens*, hedge hyssop, quillwort, toad rush, rush, meadowfoam, flowering quillwort, *Allocarya stipitata*, loosestrife, *Navarretia*, woolly marbles, and several species from the genera *Downingia*, *Eryngium*, *Lasthenia*, and *Orcuttia* (Holland and Jain, 1988).

Managed Wetlands

Water supplies limit State and Federal refuge wetland management strategies. Until 1985, managers relied heavily on agricultural drainwater to meet management objectives. This practice was generally discontinued in the fall of 1985 due to water quality concerns (discussed below). In 1992, the CVPIA identified level 2 refuge water supplies as a project component, and these supplies are met when possible.

As a rule of thumb, permanent wetlands managed within the San Luis National Wildlife Refuge complex require 10 to 13 acre-feet/acre irrigation water per year; while semi-permanent and seasonal wetlands, need an annual average of 7 and 3 acre-feet/acre, respectively (pers. comm).

K. Forrest, August 11, 2003). Management of seasonally-flooded emergent wetlands within the State of California's Mendota WMA requires from 1.5 to 10 acre-feet/acre of water annually. Here, adjacent to the SLU, swamp timothy requires an application of 1.5 acre-feet/acre annually, while watergrass uses 3 acre-feet/acre. Natural food crops such as swamp timothy, alkali bulrush, smartweed, and millet are grown for wildlife. The canals are periodically dewatered to manage cattail. Under different conditions, watergrass is managed with 5-6 acre-feet/acre annually at Los Banos WMA. Operators of private hunting clubs generally manage their lands less intensively with an average annual application of 3 acre-feet/acre.

A common wetland/wildlife management approach in the San Joaquin Valley is to mimic naturally occurring seasonally-flooded emergent wetlands with the carefully timed delivery of available water supplies. Flat lands are managed as moist soil units, and produce stands of swamp timothy, spikerush, smartweed, watergrass, and wild millet to provide habitat for wintering waterfowl and other aquatic birds. Sites are drained in mid-March to permit spring seed germination. Beginning in mid-April, about 1 acre-foot/acre of water is applied to encourage the growth of waterfowl foods. Managers begin to flood sites in mid-August, if water is available, and attempt to maintain a depth of 8 inches of water from mid-September through mid-March (primarily for dabbling duck species).

A less common wetland management strategy attempts to provide winter roosting, nesting, and brooding habitat for water birds by providing permanent water. Technically, these are semi-permanently and permanently flooded emergent and unconsolidated bottom wetlands (Cowardin et al., 1979), and are limited to sites with uneven terrain that can support a combination of deep ponds, islands, and shallows. Common plants found in deep ponds include common cattail, hardstem bulrush, alkali bulrush, widgeongrass, and horned pondweed. Swamp timothy, spikerush, smartweed, and watergrass are found in the shallows.

Wetland managers attempt to maximize water depths at 3-4 feet from mid-September through early May. Ponds are then drawn down to permit seed germination in exposed shallows. Food plants are then irrigated in early June and again in early July. Relatively few of these "permanent" wetlands contain water year-round. On an annual basis, about one quarter of water use (2.5 acre-feet/acre) is dedicated to filling and maintaining flooded conditions from mid-September through February. An additional 2.5 acre-feet/acre is required to maintain these conditions from March through May. The remaining one-half of the water budget (5 acre-feet/acre) is used for irrigation and counteracting evapotranspiration losses from June through mid-September.

Non-natural Surface Waters (Storage and Conveyance Systems)

Water-related habitat resources begin with the water impoundments, water storage, and water conveyance to respective use areas. Following Delta diversion and conveyance, irrigation water used on the SLDFR planning area agricultural lands results in groundwater with high concentrations of salts and trace elements such as boron and selenium. In the Northerly Area, much of this contaminated water is collected using a tile drain system, conveyed through open ditches and canals, then ultimately disposed into the San Joaquin River.

Additionally, Northerly Area sumps and check drains discharge drainwater to the Delta-Mendota Canal—flowing to the Mendota Pool. The Mendota Pool provides water to public and private managed wetlands within the region. Westlands currently does not have a disposal outlet, so the contaminated water remains in the groundwater system (except for subsurface drainage accretion flows to the San Joaquin River).

Unlined canals and drains provide marginal wetland and aquatic habitat throughout the project area. The habitat quality varies depending on the degree and frequency of maintenance, water quality, habitat type of adjacent lands, consistency of flows, and other factors. Some canal and drain reaches contain emergent and aquatic plants such as bulrushes, cattails, and pondweed, as well as undesirable invasives such as perennial pepperweed. Larger canals and drains support warmwater fish.

Evaporation Ponds

Evaporation ponds exploit a simple technology whereby drainwater is collected and then reduced in volume by sun and wind action. Existing ponds in the Tulare Basin generally take advantage of high evaporation rates (2.8 to 5 feet per acre annually) using a shallow (2-3 feet), open basin design with gradual side slopes (up to 8:1) to concentrate salts and toxic elements within the ponds. The development of evaporation ponds has created a new and unique habitat that is attractive to the wildlife adapted to the San Joaquin Valley's historic wetlands.

Evaporation ponds are generally highly saline environments—existing ponds contain an estimated 31.9 parts per thousand total dissolved solids, on average (Moore et al., 1990). Extreme salinity conditions within the ponds limit biological diversity. Organisms that can tolerate high and fluctuating salinity and temperatures and low dissolved oxygen exploit a situation in which there is reduced competition and predation. Productivity of some aquatic food-chain organisms such as widgeongrass, water boatman, midge flies, brine flies, and brine shrimp is often quite high, and primary production at some ponds has been several orders of magnitude higher than natural saline aquatic systems. The presence of surface water in an arid landscape and abundant food make evaporation ponds very attractive to aquatic birds. Kesterson Reservoir, which essentially functioned as an evaporation basin between 1981 and 1986, demonstrated the threats these ponds pose to aquatic birds.

Within the San Joaquin Valley, there are about 4,700 acres of evaporation ponds currently in operation. Associated with these evaporation ponds are about 550 acres of mitigation habitat (pers. comm., A. Toto). Evaporation ponds are regulated under Waste Discharge Requirements issued by the California Central Valley Regional Water Quality Control Board, Fresno (Regional Board). Currently, there are no permitted evaporation ponds within the SLDFR planning area. In 1992, the Sumner Peck ponds were closed, and the drainage impaired lands that they served were subsequently retired from irrigated agriculture in 2002 by a settlement with Interior. The Britz-Deavenport Five Points facility was converted to Integrated On-Farm Drainage Management (IFDM) in 2005. Water quality data from these former SLU facilities are provided in Table 1 for reference.

Table 1. Selenium concentrations at inflow and within historic evaporation ponds located within the SLDFR Planning Area.

POND NAME	MEAN INFLOW CONC. ^a (ppb)	MEAN POND CONC. (ppb)
Sumner Peck ^b (pond owners)	619.3	1,014.0
Britz Deavenport Five Points	81.8	49.7

^a Concentrations are presented as aggregate geometric means.

^b Sumner Peck is somewhat atypical in that values for selenium are the highest concentrations discovered to date within the entire San Joaquin Valley, and mean pond concentrations exceeded California State toxic waste criteria.

Fish and Wildlife Resources (Northerly Area and Westlands)

The rich habitats of the San Joaquin Valley floor historically supported a diverse and abundant assemblage of resident and migratory fish and wildlife species. Today, native habitats have been largely reduced to relic stands isolated in ecological preserves and wildlife refuges. Native wildlife dependent upon these habitats have disappeared or been reduced in numbers. With the exception of some grassland areas in the northern districts, temporarily fallowed cropland, and the CVPIA demonstration restoration sites, the project area is largely irrigated cropland.

Wildlife use of this area currently is dominated by species (native and exotic) able to use limited grassland, saltbush, temporarily fallowed cropland, and remnant riparian areas. However, there

are many native species using remnant grasslands and grazing lands in the adjacent western foothill locations.

Mammals

In general, small mammal populations are restricted to sites that are not routinely disturbed by cultivation. Typical species associated with California prairie/annual grassland and San Joaquin saltbush habitats include: deer mice, southern grasshopper mice, western harvest mice, house mice, and kangaroo rats. California voles, shrews, raccoons, and several species of bats are found in the valley-foothill riparian habitat. Alfalfa and grain fields also support small mammal populations, although no estimates of abundance are available.

Species recorded at the CVPIA restoration sites include: western harvest mice, deer mice, house mice, Heerman's kangaroo rats, California voles, shrews, pocket gophers, black-tailed jackrabbits, desert cottontails, and black-tailed hares (USDI, 2004). Mammalian species of concern that are present, or may be present, in the project area include: San Joaquin kit fox, riparian brush rabbit, and Fresno, giant, and Tipton kangaroo rats.

Birds

Land management practices in the project area limit bird species diversity and population densities. Most of the waterfowl of the Pacific Flyway winter in California's Central Valley. Some 10 to 20 million waterfowl, along with many other migratory bird species, either winter in or pass through the Central Valley annually. Historically, over 4 million acres of wetlands were available as winter habitat for these species. Today, some 300,000 acres of wetlands remain, with approximately one-third in public ownership. The availability of winter habitat is the single most important limiting factor to waterfowl in the Pacific Flyway. The Service ranks Central Valley wetland habitat as second out of 33 locations on its national habitat priority scale.

Large numbers of migratory, wintering, and breeding waterfowl, shorebirds, wading birds, and other water birds are attracted to the abundant invertebrate food source found at many evaporation ponds in the Tulare Basin. The ducks most frequently observed at these ponds include: northern pintails, northern shovelers, mallards, cinnamon and green-winged teal, gadwalls, ruddy ducks, and redheads. Wintering ruddy ducks were observed using evaporation ponds in greater densities than at nearby private duck clubs or Kern National Wildlife Refuge (Barnum and Euliss, 1991). Additionally, high densities of eared grebes, American coots, American avocets, black-necked stilts, black-bellied plovers, killdeer, greater and lesser yellowlegs, long-billed dowitchers, dunlin, least and western sandpipers, Wilson's phalaropes, and great blue herons have been documented at Tulare Basin evaporation ponds (H.T. Harvey, unpubl. data; TLDD, unpubl. data).

Shorebirds nest on levees and wavebreaks at many of these ponds. The predominant nesting species are American avocets and black-necked stilts; however, appreciable numbers of killdeer are frequently observed nesting at these facilities, and western snowy plover are recurrent nesters at certain evaporation ponds. In addition, evaporation basins are highly attractive nuisances for migratory shorebirds, and occasionally attract visiting species of management concern, including: Pacific golden plover, marbled godwit, red knot, black skimmer, black tern, and California least tern (H.T. Harvey, unpubl. data). So attractive are evaporation ponds as foraging areas, that even diving ducks have been known to nest on their bare soils, and one site has recorded nesting California least terns (pers. comm., J. Skorupa)—a species listed as endangered by the Service.

A large number of raptors visit the study area either during migration or in search of nesting sites. Such species include: bald eagles; peregrine and prairie falcons; northern harriers; and Swainson's, ferruginous, and rough-legged hawks. Raptors that nest in the area include: northern harriers; short-eared, great-horned, and burrowing owls; red-tailed hawks; golden eagles; white-tailed kites; and American kestrels. Peregrine falcons have been observed frequently foraging at evaporation basins, and in three instances sick falcons were recovered by biologists monitoring the systems. Researchers analyzed feathers and blood from these individuals, and concluded that selenium toxicosis was likely a contributing factor to the moribund condition of the birds (pers. comm., J. Skorupa).

Additional bird species of management concern that are present, or may be present, in the project area, include: American bittern, least bittern, mountain plover, whimbrel, white-faced ibis, long-billed curlew, burrowing owl, loggerhead shrike, lark sparrow, sage sparrow, grasshopper sparrow, and tricolored blackbird.

Reptiles and amphibians

Land management practices limit the presence of reptiles and amphibians within the project area. However, observations and surveys from the CVPIA demonstration project noted steady colonization from nearby parcels. Reported species include: western spadefoot toad, California king snake, and western fence lizard (USDI, 2004). Giant garter snakes are known to inhabit certain sites within the SLDFR planning area (e.g., Mendota WMA). Additional reptile species of concern that are present, or may be present in or near the project area, include: blunt-nosed leopard lizard, California red-legged frog, and California tiger salamander.

Fisheries

Regional aquatic fish resources include various anadromous and resident species that reside in, or pass through, not only the San Joaquin River, but the Delta, and Suisun Bay. These waterways are cumulatively affected by direct and indirect project effects. Common fish species present in the canals include: largemouth and striped bass; threadfin shad; Sacramento blackfish; bluegill;

white catfish; black bullhead; black crappie; green sunfish; common carp; goldfish; red shiner; inland silverside; fathead minnow; and mosquito fish.

Special Status Species

The Draft EIS documents the paring process from which 85 special-status species (identified by National Oceanic and Atmospheric Administration-National Marine Fisheries Service, CDFG, and the Service) were reduced to 27 species that could be affected to varying degrees as a result of construction and implementation of the in-valley alternatives. The pared list of at-risk species is presented in Table 7.1 of that document. The reader is referred to the appropriate corresponding table in the Final EIS for this species list.

FUTURE CONDITIONS WITHOUT PROJECT

With continued irrigation, seleniferous drainwater currently is accumulating under many of the soils of the SLU. Areas lacking subsurface drainage are impacted to the extent that applied irrigation waters are unable to percolate through to the deep groundwater table, or seep laterally onto adjacent areas. The rate at which the saline water table encroaches on the root zone is a function of application rates, evapotranspiration, and soil permeability.

The SLDFR EIS assumes under the No Action Alternative that 109,100 acres of irrigated agricultural lands would be retired from agricultural production in Westlands. This acreage figure includes 7,000 acres of CVPIA land retirement, 65,000 acres from the Sagouspe settlement (Sagouspe et al. v. Westlands Water District et al., Case No. F-01-6342 OWW LJO), 34,100 acres from the Sumner Peck settlement (Sumner Peck Ranch, Inc. v. Bureau of Reclamation, No. CV-F-91-048), and 3,000 acres from the Britz settlement (a separate action executed September 3, 2002). The CVPIA's land retirement program includes 2,086 acres that are currently managed to restore natural vegetation.

The Service's Draft Coordination Act Report for SLDFR (USFWS, 2005) contained speculations regarding future land use and irrigation management based on the premise that "land retirement" was an open and undefined parameter (based on the information available at the time).

Reclamation has since informed the Service that the objective for land retirement, as defined through SLDFR, is the acquisition of non-irrigation covenants similar to those in effect from the Peck and Britz settlements (pers. comm., M. Delamore).

The scenarios that follow represent the Service's best approximation of anticipated conditions under different (with- and without-project) futures. To the extent that they may differ from conditions outlined within the Action and No Action alternatives presented elsewhere within the EIS, the reader should be aware that these future scenarios are outlined under our broader FWCA

analysis (not necessarily confined to terms and regulations within the larger NEPA analysis). The scenarios are separated between the Northerly Area and Westlands, owing to the much different practical, legal, and environmental circumstances associated within these two regions, and to the fact that all SLDFR action alternatives involve the same project features for the Northerly Area.

Future Without Project: Northerly Area

Without drainage service to the Northerly Area (including San Joaquin exchange contractors, Delta-Mendota Canal contractors, and some SLU contractors) groundwater levels are expected to rise and infiltrate the root zone. Growers in the region will be forced to deal with their drainage problems on-site. Delta-Mendota Canal sumps and check drains would continue to discharge flows into the Delta-Mendota Canal absent an action alternative or imposition of a State Board discharge abatement order.

The initial options available to growers include: further reductions in applied irrigation water through increased efficiencies and fallowing, reductions in drainage via reuse facilities (aka, IFDM), and terminal disposal via evaporation basins. It is likely that growers will implement smaller scale IFDM facilities similar to the model being successfully demonstrated at Red Rock Ranch by John Diener. These will require some sort of terminal evaporation component to handle overflow and the highly saline drainage.

Solar evaporators were recently granted license to operate (SB 1371) under the provisions that they are part of integrated, on-farm drainage management systems, are equal to or smaller than 2 percent of the total area of these systems, water is applied by timed sprinklers or other equipment allowing application at a rate not exceeding evaporation (to avoid standing water), and that operation of these evaporators does not lead to ground or surface water contamination.

For purposes of this analysis, it is presumed that selenium pre-treatment via AbMet[®] will not be available and practical at these smaller scales, given the likely expense of operation. Even if growers got together district-wide to maximize economies of scale, the current AbMet[®] process remains unproven (it is not clear that growers themselves can bear the burden of research and development of this system at the rate that Reclamation is currently funding). Given that pre-treatment is considered impractical in this context, and acknowledging that the Northerly Area has the highest concentrations of selenium in subsurface drainage; it is also predicted that mitigation needs in terms of both dollar and water costs will render evaporation basins in the Northerly Area prohibitive for individual growers.

Given these constraints, it is reasonable to presume two alternative scenarios would be available to Northerly Area growers—onsite drainwater management via IFDM, or elective retirement from irrigated agriculture. Some growers will find it possible to successfully implement irrigation efficiencies (perhaps augmented by rotational fallowing), reuse facilities, and solar

evaporators. These facilities are all regulated under applicable State and Federal laws; and would, in theory, be monitored by the respective agencies with appropriate jurisdiction. The Service remains concerned, however, with the reality of privately managed IFDM. It should at least be noted for the purposes of projecting fish and wildlife resource impacts that appropriate biomonitoring and environmental compliance are more likely under the Federal nexus of SLDFR (specifically tasked and funded to conduct such monitoring and mitigation) as opposed to smaller scale, owner-operated and licensed facilities.

Rather than operate IFDM facilities, it is logical to presume that some landowners will opt to sell some or all their lands and/or water to neighboring districts (as witnessed in the recent Sagoupe purchase, and the pending acquisition of Broadview Water District lands by Westlands). It is likely that fallowing of agricultural areas would be in part predicted by groundwater quality—lands already compromised by shallow water tables and/or poorest quality groundwater will be selectively retired earliest. The management of fallowed lands is predicted to follow the Sagoupe example—with much of the lands allocated to sheep grazing (pers. comm., Scott Philips). Dry land farming is another land use option for these fallowed acres.

At some level of fallowing, conditions will reach a theoretical equilibrium between application rates, lateral flow, deep percolation, and evapotranspiration. It is difficult to predict what this eventual equilibrium will be. On a regional scale, it would be reasonable within this future scenario to presume the water need for the Northerly Area SLU will in part diminish over time. In crude terms, we can presume that fallowing some proportion of the Northerly Area drainage-impaired lands will reduce the water needs proportionately.

Changes in land use such as these, if conducted on a sufficiently large scale, may have attendant impacts on wildlife resources (e.g., creating areas of marginal habitat that may draw, though not necessarily sustain, terrestrial mammals and migratory avifauna to these sites as areas for colonization and/or migration corridors). Whether these changes manifest as benefit or detriment to wildlife populations are a function of the quality of land opted against, and the management and quality of the newly colonized fallowed land. These factors are species-, and site-dependent, and so cannot be predicted one way or another in general terms.

The remnant water made available through fallowing would be available for other beneficial uses. To some extent, these may be reallocated within-district, however this water will likely also be marketed to other water districts (e.g., Westlands) and/or to Federal refuges (to meet Level 4 needs). The influence to the local water market, and third-party interests, from these actions are hard to predict; and it is likely that the market itself may drive individual grower decisions (i.e., the appearance of a willing buyer at the appropriate price will manifest the willing seller). It is difficult to determine *a priori* what the allocation of water will be under this “future without project” scenario, and to what extent wildlife refuges may benefit from additional water, or what specific land use changes (with attendant impacts to regional fish and wildlife resources) may occur absent Federal drainage service.

San Joaquin River

Releases of drainwater to the San Joaquin River via the GBP are permitted by the State Board through 2009. In 13 years of monitoring, the GBP has documented elevated concentrations of selenium in fish and invertebrates in the natural waterways where drainwater is being released. These loads may be harming fish in Mud Slough and the lower San Joaquin River, as well as higher vertebrates that consume these organisms.

The main water sources for the exchange contractor's water marketing program are recaptured tailwater and groundwater pumping that previous to the program reached the San Joaquin River (USBR, 2004e). In theory, if irrigation flows to the Northerly Area are reduced significantly due to fallowing, groundwater flow to feed the San Joaquin River will also further decrease. It is difficult to determine the actual amount of surface water this would involve, as it depends on volumes of accretion flows currently feeding the river. The volume of flows reaching the system via the GBP—albeit salt, boron, and selenium-laden—nevertheless contribute to River flows, and these will end in 2010. This volume of water has been estimated to amount to 30,000 acre-feet per year (USBR, 2004e).

The Service has inquired with Reclamation whether these effects may create the need to find alternate water sources to maintain flows within the river channel downstream of the Grassland Bypass discharge site to meet downstream water-right holder obligations. We have been informally notified that this does not seem to be an issue, so for purposes of our analysis we will assume this not to be the case.

Future Without Project: Westlands Water District

The “No Action” alternative for Westlands is confounded by a fundamental planning constraint—specifically that “no action” is not a legally sanctioned future scenario. The U.S. Eastern District of California Court concluded that the Department of the Interior must provide drainage service to the agricultural districts in the SLU, and ordered Reclamation to apply for a Waste Discharge Requirement for Out of Valley drainage disposal in the south Delta (i.e., to complete the San Luis Drain) (*Sumner Peck Ranch, Inc. v. Bureau of Reclamation*, No. CV-F-91-048; *Firebaugh Canal Co. v. USA*, No. CV-F-88-634). The U.S. Court of Appeals for the Ninth Circuit confirmed that providing drainage service was integrally linked to providing delivery of irrigation water, but reversed the District Court's order directing Reclamation to complete the San Luis Drain—giving the Department of the Interior more discretion in how to meet the obligation to provide drainage service (*Firebaugh Canal Company, Central California Irrigation District, and Sumner Peck Ranch Inc., v. United States Department of the Interior, Bureau of Reclamation*; Case No. 95-15300, D.C. No. CV-88-00634-OWW).

While the No Action Alternative as presented in the EIS reflects a legitimate and necessary element of the SLDFR within the prescriptions of NEPA, it is probably not a viable future within the mandates of the Court Order. Under the future with a No-Action alternative, it is likely that Westlands would continue their pursuit for redress under the pending judicial order in the absence of federally-provided drainage service. This means that the options open to the Department of the Interior are either to provide drainage service (within the discretion granted by the Ninth Circuit and subject to appropriate regulations [see below]), default to some uncertain court-directed solution, or settle with the plaintiffs out of court.

The purpose of environmental review under FWCA is to address likely future impacts to fish and wildlife resources in the event the project under consideration is not constructed. Herein, we present our approximation for that future, inclusive of all political, legal, and practical considerations, to the best of our ability. We believe that, among these options, legal settlement represents the most likely future scenario; however the specifics of such settlement remain an open and wide-ranging panorama.

It is difficult and premature to speculate upon specific elements of a prospective settlement, although it should be seen how the differing aspects and nature of that settlement with respect to which lands are retired, and how much, has a bearing on specific fish and wildlife impacts. All that is left for planning and risk assessment purposes is to set the context for different land/drainage management strategies, frame the discussion with respect to attendant risks associated with each, and identify from among the range of possible future realities those that have a lesser or greater impact on regional fish and wildlife resources.

When forecasting the events following a “future-without project” scenario, precedent in this case is set by the Sumner Peck and Britz settlements. In these circumstances, Reclamation paid \$107 million, in addition to \$32 million from Westlands, in exchange for the right to prohibit irrigation on 34,000 acres of highly seleniferous lands owned by Sumner Peck Ranch; and \$7.3 million for a similar arrangement with Britz Farms for 3,006 impaired acres. The settlement lands are precluded from future irrigation of any kind (CVP water, pumped groundwater, etc.) as dictated by the non-irrigation covenants that Reclamation holds on these properties. If a legal settlement is reached that releases Department of the Interior from drainage service obligations tied to the San Luis Act, it is assumed that the Department of the Interior would hold a similar non-irrigation covenant on such lands. The likely use for these impaired lands would then be livestock grazing, and perhaps some dry land farming—depending on prevailing market conditions.

In December 2002, Westlands laid out a proposal for land retirement of up to 200,000 acres of impaired lands, while holding onto the associated water right, and in exchange for firm future supply of 70 percent of contract (Westlands, 2002). The plan originally proposed 200,000 acres for permanent retirement from irrigated agriculture; however it is outlined in the EIS that

298,000 acres in Westlands are drainage-impaired (or 308,000 acres including the 10,000 acres within the Broadview acquisition included within the Drainage Impaired Area alternative in the EIS).

Considering Westlands' argument that the provisions of the San Luis Act (as affirmed in the February 9th Circuit decision) direct Reclamation to provide drainage service, it is logical to presume that Westlands would expect either drainage service, or some form of compensation for the full acreage of impaired lands. Given this reality, it is not clear why they proposed 200,000 acres as the retirement goal in 2002 when a full 308,000 acres are now under consideration. Presumably, either Westlands envisioned some sort of drainage reduction measures and/or IFDM to retain some portion of their problem lands in irrigated agriculture, or it was willing to leave certain lands fallow and use the associated irrigation water elsewhere within district.

For purposes of this assessment, it will be assumed that Westlands will attempt, inasmuch as practical without Federal drainage service, to maintain irrigated agriculture on lands within their current district. Some proportion (probably considerably less than 308,000 acres) of the full acreage of drainage impaired lands within district would be retired from irrigated agriculture with Federal money as part of an associated legal settlement relieving Interior's drainage service obligation under the San Luis Act. The amount of retired land under this scenario is difficult to predict. Over the last several years, Westlands has fallowed between 70,000-100,000 acres annually—the Britz and Peck settlement lands inclusive (pers. comm, J. Robbins). It is logical to presume this amount would be maintained at a minimum, and probable that the same lands would be part of the settlement. In this respect, there would be no change from the status quo.

It is predicted that the remainder of the 308,000 acres within Westlands (plus Broadview) that are not retired would at least in part be farmed with some proportion of the total acreage dedicated to IFDM. The Action alternatives that include drainwater reuse facilities will be similar to our "future without project" estimation, where IFDM in large scale is projected. The key differences here are that evaporation ponds may or may not be part of the picture (as IFDM can rely in part on solar evaporators for the terminal disposal step), and that the management of drainwater will likely be more spread over the scale of individual operators, as opposed to regional management under Federal oversight (the SLDFR facilities outlined in the EIS).

In rough terms (based on crude figures and summary comparison), one might conclude that the net effect of this "future without project" scenario to fish and wildlife resources may be similar to either the status quo, or the EIS' Groundwater Quality Alternative (seeing that they all involve similar areas of land retired). However, the differences between the EIS' No Action, Action Alternatives, and a potential legal settlement are seen in the fine details not reflected in the broad snapshot expressed by gross acreage allocations to respective land use types. In other words, the functional difference in each alternative case is the *specific* lands that would be retired.

The Groundwater Quality Alternative (retiring only 92,592 acres) targets those lands with groundwater exceeding 50 $\mu\text{g/L}$ selenium. To some extent, the additional 48,486 acres above the Peck and Britz settlement lands that will be retired may coincide with a portion of the currently fallowed Sagouspe and Broadview lands (but the magnitude of this overlap is uncertain). The retirement of these lands is not directly tied to groundwater selenium concentrations *per se*, since these presumably were retired as a function of groundwater depths, salinity, percolation rates, and perhaps economic realities.

The No Action alternative predicts 119,106 acres “retired”—including the Sagouspe and Broadview lands that are currently (or projected to be in the near-future) fallowed. This amount of land retirement effectively exceeds all Action alternatives, excepting the Water Needs and Drainage Impaired Area options. The overlap between these particular lands and $>50 \mu\text{g/L}$ groundwater selenium concentrations, as has been mentioned, is uncertain. It is logical to presume that the conditions of any potential future settlement with Westlands would extensively overlap these already fallowed lands. In this respect, the No Action and legal settlement, at least in the case of Westlands, may be roughly approximate. But it is difficult to attach any degree of certainty to this prediction, and so speculation in such matters is a dubious endeavor.

It can be assumed that one clear difference between the NEPA No Action and a prospective legal settlement would be that, to the extent that these same 119,106 acres are involved, the No Action does not retire the lands from irrigated agriculture at the discretion of Interior. Finally, it is the Service’s understanding that all SLDFR action alternatives (and, clearly, any prospective settlement) are on a “willing-seller” basis. That being the case, it isn’t clear how different any one action alternative may be from another in practice.

The Service’s recommendations with respect to SLDFR have consistently favored land retirement as the best and safest solution for the drainage problem. The In-Valley Alternative would restore the Sagouspe and Broadview lands to irrigated agriculture via active drainage service (tile drains and evaporation basins). The Service assumes under a “future without project” scenario that the overall acreage currently in fallow will range from roughly approximate to the status quo, to some higher amount (pending specific terms of settlement). This translates into direct impacts to fish and wildlife resources ranging from no net change to potential benefits.

It has not been made clear whether the irrigation water made available from the “retirement” of any SLU lands will remain in-district (the EIS makes no explicit commitments with respect to water supply or need). The fate of the water that would have irrigated these lands has a large influence on associated environmental effects—whether beneficial or detrimental. For example, should cropping patterns change as a result of shifting available supply towards more permanent crops, these would have some influence on habitat features. Should excess water be available to suit development along the I-5 corridor, these have clear implications for wildlife. Should excess water allow conversion of remnant native habitat to any other land use, these attendant impacts may be serious. Further, should excess water provide a surplus allowing the shift of other

available supplies (e.g., safe sustainable groundwater yield) towards these aforementioned ends, these impacts have been facilitated indirectly by the action. Without explicit information about the fate of associated water supplies (and the needs driving these), it is not possible to determine the water-related costs and benefits associated to the future-without-project absent the SLDFR action.

Terrestrial Resources under future without (Northerly Area and Westlands)

Under the No-Action scenario, most “retired” agricultural lands would be managed as dry-land farms or grazed. However, temporarily fallowed lands may resume intermittent cultivation if perched groundwater falls below crop root zones. The conversion of large expanses of retired lands to grazing may provide some habitat benefits to terrestrial species. Dry land farming may also contribute some benefits, although land management practices such as weed and insect control are important factors.

Without conservation easements, any remaining acreage of California prairie/annual grassland and saltbush plant communities may shift to irrigated agriculture as drainage impaired lands are fallowed. These remnant California prairie and saltbush habitats provide important habitat functions and value, while conversion of these areas to row crops would provide minimal habitat function or value.

As mentioned above, some of the “retired” land would be operated as reuse areas. Without the project, it is likely that drainwater reuse areas would initially expand before some are retired permanently due to high soil and groundwater salinity. In the interim, the reuse areas may provide some habitat value, but also risk (see **Risks to Wildlife Resources**, following).

Aquatic Resources and Wetlands under future without (Northerly Area and Westlands)

The future without project conditions are dependent on maintaining adequate instream flows and achieving water quality standards to sustain and improve aquatic resources, water quality, and public health. The EIS assumes that current GBP drainwater discharges to the San Joaquin River will stop by 2009, and the Service’s Draft FWCA report indicated that information regarding probable impacts (beneficial or detrimental) to the San Joaquin River as these particular drainwater discharges are ceased is lacking in the Draft EIS. The Final EIS for the San Joaquin Exchange Contract 10 Year Transfer Program (USBR, 2004e) states:

“Over the period of the Exchange Contractors proposed water transfer (10 years) the Grassland Bypass Project will be phased out and flows of drainwater to the San Joaquin River will be reduced, which will have the effect of improving the quality of water at Vernalis and reducing the flows. The volume of water that will be removed is on the order of 30,000 acre-feet/year, a change in flow greater than most of the options analyzed for this project. The improvement in water quality due to elimination or large

reduction in drainage flows would tend to offset any decrease in water quality that could occur due to some of the transfer scenarios.”

As of this writing, we are aware that Reclamation has funded CH₂M Hill to conduct CalSim modeling looking at this and other related effects tied to flows and water quality in the lower San Joaquin River, however no updated analysis has been provided to the Service. The provision of drainage service to the Northerly Area of the SLU is integrally tied to the impacts of the GBP, and to the extent these influence flow and water quality conditions as far downstream as the Delta, the impacts of SLDFR (whether beneficial or detrimental) are potentially wide-ranging.

Under a “future without project,” water conveyance canals and drainage canals would continue to provide limited aquatic habitat in the water service area on a seasonal basis. However, because drainwater sump and check drain discharges into the Delta-Mendota Canal would continue, selenium concentrations in Mendota Pool would remain elevated. Under the No Action scenario, it is presumed that uncontrolled seepage and lateral transport of seleniferous groundwater will continue to degrade area waterways as has been observed in the Grasslands area (Eppinger and Chilcott, 2002). The Service has determined and confirmed with Reclamation (pers. comm., C. Eacock) that certain areas leading to water quality exceedences for selenium in the Grasslands area service canals are not part of the SLDFR. The Regional Board (Eppinger and Chilcott, 2002), states:

“Two areas have been identified where agricultural subsurface drainage can enter wetland water supply canals from farmland not contained in the DPA (Grasslands Drainage Area). One area is west of the wetland water supply channels and historically drained into the Almond Drive Drain. Since Water Year 1999, these discharges have been collected in the CCID Main Drain and diverted into the CCID Main Canal downstream of internal supply channels. Data for Water Years 1999 and 2000 is not available for the Almond Drain site.

The second area where agricultural subsurface drainage can enter wetland water supply canals from outside the DPA is a triangle-shaped area of approximately 7,000 acres south of the Poso Drain (also known as the Rice Drain) and north of the DPA. This area historically drained into the Poso Drain, entering South GWD (Grassland Water District) from the east. Three sites on the Poso (Rice) Drain were monitored for selenium during Water Years 1999 and 2000. Selenium concentrations at all three sites were above 2 $\mu\text{g/L}$ a majority of the time, though a change in tail water management after June 1999 has apparently helped to reduce and stabilize concentrations.”

Based on the best available information to the Service, areas outlined by the Board but not serviced by the GBP (or part of SLDFR) will continue to degrade local water quality; and will continue to degrade water quality in certain channels serving the Grasslands duck clubs—regardless of Federal action.

Should surplus CVP water become available through fallowing and subsequent water needs reassessment, there is potential for enhancement of aquatic habitat pursuant to the guidance provided in the CVPIA. The potential benefits to fish and wildlife resources associated with such reallocation would be in proportion to the volume of water provided.

Fish and Wildlife Resources (Northerly Area and Westlands)

Fish and wildlife diversity and abundance are dependent on the available habitat quality and quantity. Habitat conditions without the project are not expected to improve significantly. Further, the potential for detrimental influence from shifting land use patterns and the conversion of remnant native habitats to agriculture may continue to reduce wildlife population size and community diversity.

Birds

As noted earlier, current land management practices in the project area limit bird species diversity and abundance. The predicted "without-project" conditions may result in converting remnant bird habitats to agriculture. Converting remnant California prairie/annual grassland and saltbush habitat to agriculture would further stress species dependent on those habitats.

Given undisturbed habitat conditions, birds rapidly colonize fallowed land areas. The CVPIA *Land Retirement Demonstration Project, Year Four 2002 Annual Report* (USDI, 2004) recorded that bird species (including some of management concern) immediately colonized or frequented the undisturbed parcels. As a result, fallowed areas would provide some benefits to bird species. However, the benefit accrued through increasing the acreage of fallowed land would be more than counteracted by the detrimental effect to regional bird populations if large expanses of remnant native habitat are converted to agriculture (or developed for housing) with excess water shifted from those fallowed lands to areas upslope.

Mammals

Anticipated conversion of remnant California prairie/annual grassland and saltbush habitats would decrease small mammal populations, and those of species dependent on these populations (e.g., San Joaquin Kit Fox). Based on findings of the CVPIA Demonstration Project (USDI, 2004), we expect that small mammals will attempt to recolonize retired and/or fallowed lands. The management of these lands will be under the individual grower's discretion, and activities such as discing, chemical weed abatement, and pest control may be harmful to terrestrial mammal species.

Reptiles and Amphibians

Reptile and amphibian populations would follow the same downward population trend with continued habitat conversions and current land management practices. Drainwater disposal from sumps and check drains to the Delta-Mendota Canal would continue affecting water quality of the Mendota Pool and wetland supply channels—potentially affecting aquatic-dependent species such as the giant garter snake.

Fisheries

The limited fishery resources supported by delivery and drainage canals would not change without the project. However, the EIS assumes that Northerly Area drainwater discharges to the San Joaquin River will stop by 2009. The EIS states that discontinuing surface collected drainwater releases to the river will improve water quality. The Service agrees that removing a pollution source lessens river deterioration, if all other parameters remain unchanged. A more complete analysis of changes expected to occur with respect to water volume and quality would help frame a discussion of expected changes to the natural environment of the San Joaquin River and South Delta as interdependent actions such as the termination of the GBP occur.

Sensitive Species

The level of effect to federally listed species (and other special status species) in the future without the project is difficult to determine. The Draft EIS states that no significant impacts on special-status species would be expected to occur under the No Action alternative. However, it should be assumed the current trends of general habitat loss and population decline would continue and possibly increase over time. As mentioned earlier, irrigation water made available from retirement of drainage-impaired lands could possibly be used to convert areas of remnant habitat. This potentiality may occur even without SLDFR action, given prevailing conditions within, and adjacent to, the drainage problem area. The Service remains concerned that these development pressures may be facilitated by the reallocation of irrigation water freed from use on drainage-impaired lands within the down-slope project planning area.

FUTURE CONDITIONS WITH PROJECT

Reclamation is currently evaluating seven alternatives, including a “No Action” alternative within the SLDFR. Based on the Service’s knowledge of the project, three alternatives being proposed—Ocean Disposal and Delta/Bay Disposal (to one of two discharge sites)—are unlikely to be constructed due to engineering and permitting-related issues. The Service is not satisfied that the wildlife risks associated with the three Out-of-Valley drainage solutions detailed in the EIS have been fully addressed or enumerated. We do not concur with the risk assessments associated with these Out-of-Valley alternatives as presented in the EIS. These assessments

underestimate the potential adverse effects of these alternatives, and the Service believes these alternatives involve real and potential risks to fish and wildlife species, including threatened, endangered, and sensitive species (from both construction and operation of these disposal options).

During the trial phase in the initial suit by the Sumner Peck et al. plaintiffs, Reclamation presented extensive technical testimony supporting the contention that completing the master drain (to the Bay/Delta) would likely result in widespread environmental damage in violation of several federal laws (NEPA, ESA, MBTA, etc.), and therefore the Department of the Interior should be relieved of any directive to complete a master drain under the provisions of the San Luis Act. Judge Wanger did not rule against that technical evidence, but ruled instead that the evidence was irrelevant unless it would lead to the State Board denying a discharge permit. The true test would therefore be for Reclamation to apply for a discharge permit, and until that had been done (and the permit denied), the environmental arguments for relief from the San Luis Act were not ripe (*Sumner Peck Ranch, Inc. v. Bureau of Reclamation*, No. CV-F-91-048; *Firebaugh Canal Co. v. USA*, No. CV-F-88-634 [E.D.C.A. Mar. 10, 1995]).

The Service believes that this body of scientific evidence as presented by the Department of the Interior in the aforementioned court proceeding should be considered with the findings within the SLDFR EIS with respect to the environmental effects of Out-of-Valley solutions. If Reclamation intends to carry any of these Out-of-Valley options forward through the Record of Decision, a thorough risk assessment, mitigation, and mitigation monitoring components would have to be developed that adequately characterize these attendant risks. However, due to time constraints, and clear indication from Reclamation that the preferred alternative would likely be from among the suite of In-Valley options, our detailed comments and assessments have focused on the four In-Valley alternatives.

As mentioned above, Reclamation has deferred detailed discussions regarding mitigation monitoring, adaptive management, and specific elements (e.g., specific locations and water supplies) of the initial mitigation obligations to the feasibility analysis phase (following release of the Final EIS) of the SLDFR. The Service anticipates that these discussions will continue in coordination with the Mitigation Work Group. Among the suite of presented alternatives, Reclamation has selected the Drainage-Impaired Area Alternative as the preferred SLDFR action alternative.

Future With Project: Northerly Area

The proposed features of the various alternatives are detailed briefly in the Introduction section above, and in detail within the EIS. All In-Valley alternatives presented include the construction of evaporation basins and reuse facilities in the Northerly Area to provide drainage service for the drainage-impaired lands (71,000 to 81,000 acres, depending on the disposition of the Broadview lands). The Delta-Mendota Canal sumps are connected to the drainage features, so Mendota Pool

discharges from these sources would stop. Treatment facilities include 1,270 projected acres of evaporation basins and 7,500 acres of reuse facilities (of which 1,700 acres are already in place in Panoche Water District).

Reclamation has estimated that for these project features, a total of 274 acres of mitigation habitat (representing a combination of shallow “alternative” habitat and shallow- and deepwater “compensation” habitat) will be initially provided, and up to 548 total acres of such habitat (double the initial estimate) will be costed-out on a contingency basis within the feasibility analysis (URS, 2006). Alternative mitigation habitats would be constructed adjacent to evaporation basins to effectively dilute contaminant exposure in adult migratory birds to a dietary concentration of 10 mg/kg selenium based on amendments to the existing Service protocol (USFWS, 1995b).

In this case, Reclamation is basing the mitigation prescription on the difference between maximum and average “wetted area” of the SLDFR evaporation ponds, reflecting the footprint of the ponds projected to actually expose shorebirds and dabbling ducks to elevated dietary concentrations of selenium (that area that will have ponded water at <2 feet depth at a given time). This reflects a different approach than that under effect for the existing Tulare Basin evaporation facilities regulated by the State Board. Reclamation has also informed the Service through the Mitigation Working Group (pers. comm., M. Delamore; Jan 19, 2006) that alternative habitat will only be provided at such time that shallow water on the evaporation ponds is present to facilitate foraging by dabbling ducks and shorebirds. This, too, reflects a change from current policy as approved by the Service and enforced by the State Board.

Compensation habitat is located remote from evaporation facilities, and is designed to compensate for population-level losses associated with operating the evaporation ponds. Reclamation has calculated this acreage as the amount needed that is over and above the prescribed alternative habitat acreage (i.e., to compensate for the losses that may be observed after diluting the adult dietary exposure via alternative habitat). These mitigation estimates within the EIS are based on a modified analysis from the existing Service Compensation Habitat Protocol (USFWS, 1995a) and the Adult Avian Mortality Protocol (Appendix 1).

In this case, the total acreage of ponds are input through the mitigation protocols for risk assessment purposes to migratory diving birds (as the entirety of the ponds are anticipated to be utilized by these species), and Reclamation is following the Service’s request that all mitigation for diving birds be in the form of compensation habitat (so as to not encourage nesting within a realistic foraging range of breeding individuals). The various modified protocols prescribe different acreages by season and bird “guild.” The methods used to calculate these figures are found in the associated protocols, and (where they differ from Service’s approach) outlined within the EIS.

Subsurface agricultural drainwater discharges to the San Joaquin River will end in 2009, and Reclamation may need to secure additional water to replace water lost to downstream water-right holders. The issue of replacing lost river flows to maintain water supplies has not been fully addressed to date. If this is a valid concern, the amount of water needed to maintain flows in all alternative scenarios would not change, however, the source of the water likely would. Under the In-Valley, Groundwater Quality, and Water Needs alternatives; replacement water flows would come from new supply, as no water is released for other beneficial uses by these three alternatives. Under the preferred maximum retirement scenario (the Drainage Impaired Lands alternative), about one-half of Westlands and all Broadview Water District's drainage-impaired lands would be retired. In this case, water currently under contract in excess of the remaining irrigation demands in the Unit would be potentially available for mitigation purposes (pers. comm., M. Delamore).

All In-Valley disposal options mentioned in the EIS include identical provisions for reuse and evaporation basins in the Northerly Area. These will effectively shift most risk to fish and wildlife away from Mud Slough and the San Joaquin River and to wildlife, notably migratory birds, opportunely using these drainwater disposal facilities (i.e., evaporation ponds and reuse areas). More information on the wildlife risks associated with reuse facilities is presented within the **Discussion** section of this report.

Future With Project: Westlands Water District

Under the current suite of alternatives detailed in the EIS, project elements within Westlands would include land retirement ranging from no additional acres to retiring an additional 263,894 drainage-impaired acres; and building and maintaining from 0 to 2,020 acres of evaporation basins. These final evaporation pond acreage figures depend on the area of drainage-impaired lands remaining in irrigation (i.e., the amount required decreases in inverse proportion to the amount of land retirement involved with each action alternative). A total of up to 11,500 acres of reuse facilities are proposed to reduce drainwater volume in Westlands.

Reclamation has estimated that for these project features, from 189-444 acres (alternative dependent) of mixed mitigation habitat will be initially provided within the Westlands subarea, and up to 378-888 total acres of such habitat (double the initial estimate) will be costed-out on a contingency basis within the feasibility analysis (URS, 2006). These are calculated as discussed in the Northerly Area "with-project" section above, using the same assumptions and conditions.

Evaporation pond and reuse area features represent the most significant direct environmental risk factors associated with the current project. An indirect risk of concern is the possible additional water being reallocated for agriculture on areas not currently being cultivated on threatened and endangered species habitats within and immediately adjacent to the SLDFR planning area. These risks are discussed further in the **Discussion** section of this FWCA report.

The assumptions with respect to net effects to area fish and wildlife resources from project related actions are based on the expectation that the current water needs analyses for any districts in the SLU where retirement from irrigated agriculture occurs via SLDFR action (or out-of-court settlement) would not be amended to take into account the fallowing of drainage-impaired lands. This reanalysis would not be applicable to the exchange contractors—who hold firm water rights. However, if Reclamation chooses to renew the needs analyses for appropriate SLU districts in light of cropping pattern changes, irrigation water would be made available for other beneficial uses.

The CVPIA (section 3406[a][2]) amends the Central Valley Project Authorizations Act of 1937 to include equal consideration for agricultural, domestic, and fish and wildlife enhancement. The Service assumes some portion of surplus water made available from any future reassessments of district water needs analyses by Reclamation would be used for fish and wildlife enhancement. This action could be a significant benefit to fish and wildlife resources, although it is contingent on actions by Reclamation not necessarily tied to the SLDFR project in isolation.

The EIS does not address these specific contingencies, nor does it address the influence of project-related actions to the regional water market. Lacking explicit and precise information with respect to the actual water needs analysis (last conducted in 1989) and detailed rationale for its inherent figures, we are left to presume that water needs within Westlands would decrease in rough proportion to acreage retired. For purposes of crude assessment, the current contract amount of 1.15 million acre-feet per year minus an average contract deficiency delivery of 30 percent on an annual basis would yield 805,000 acre-feet (matching the 70 percent assumption within the Water Needs Alternative).

In the future condition under the Drainage-Impaired Area alternative, the demand of 1.15 million acre-feet would be reduced by roughly half, as about 50 percent of the land is retired. Assuming 100 percent delivery of the remaining water, this would yield an average of about 575,000 acre-feet per year for Westlands water need. The difference between Westlands adjusted need and projected delivery (at 70 percent) would presumably make available about 230,000 acre-feet per year (average annual yield) for other uses within the CVP. Furthermore, Westlands would need to purchase less water to supplement contract deliveries. If Westlands purchased less water on the market, more water would be available for other users (and perhaps at a lower cost). This surplus water represents a significant project benefit, which can be redistributed via the CVPIA to (in part) enhance fish and wildlife resources.

If a significant volume of water that otherwise would have irrigated the eastern (downslope) portions of Westlands is redistributed to the western half of the district, it is not clear if new drainage impairment may eventually manifest. Information has not been provided to ascertain the expected percolation, lateral transport, and evapotranspiration rates for this region, and it is unclear to what extent these contingencies have been modeled and factored into the project review. This potential problem could counter the benefits of fallowing downslope lands—

effectively the drainage problem area simply shifted westward. The Draft FWCA report recommended that this element of the planning process be thoroughly evaluated and explained in more detail to allow full, long-term assessment of the effects of this plan. However, for purposes of the current analysis, it has been assumed that during the 50-year planning horizon for this project, upslope drainage problems would not be an issue.

Terrestrial Resources under Future with Project (Northerly Area and Westlands)

The Northerly Area includes 71,000 drainage-impaired acres, plus 10,000 acres in Broadview Water District. All In-Valley options propose 1,270 acres of evaporation ponds and 7,500 acres of reuse sites in the Northerly Area. A seasonal maximum of up to 182 acres of shallow water alternative habitat would be constructed and intermittently operated to dilute shorebird and dabbling duck exposure at the evaporation pond, for which an additional 13 acres of shallow water habitat would operate to compensate for residual losses at the pond/alternative habitat complex. A total of up to 79 acres of deepwater compensation habitat for diving birds would be built and maintained (depending on season).

The Westlands' identified project boundaries include about 606,000 acres (298,000 drainage-impaired) of intensively cultivated agricultural land. The project at maximum buildout would result in converting up to 13,520 acres of agricultural land with low habitat value to evaporation ponds and reuse areas (habitats with high attendant risks). The "with-project" alternatives propose permanently removing irrigation from up to an additional 263,894 drainage-impaired acres (44,106 acres are currently removed), or providing full drainage service. The EIS notes that, to the extent possible, existing fallowed land will be used for drainage treatment, reuse, and disposal facilities. It is assumed that of the "retired" lands, up to 2,020 acres would be used for the proposed evaporation ponds; and up to 11,500 acres would be used for regional reuse and treatment facilities.

A seasonal maximum of 125 to 296 acres (alternative dependent) of shallow water alternative habitat would be constructed and intermittently operated to dilute shorebird and dabbling duck exposure at the evaporation pond, for which an additional 9-21 acres of shallow water habitat would operate to compensate for residual losses at the pond/alternative habitat complex. A total of up to 55-127 acres (alternative dependent) of deepwater compensation habitat for diving birds would be built and maintained (depending on season).

The Service assumes that within the SLDFR planning area, a total of up to 22,290 acres of low wildlife value agricultural or temporarily fallowed land would be converted to areas potentially hazardous to wildlife (reuse, treatment, and evaporation ponds). The EIS notes that, to the extent possible, existing fallowed land would be used for drainage treatment, reuse, and disposal facilities. Even though reuse areas pose a potential threat to wildlife, there is no mention of mitigation or compensation for up to 19,000 acres (reuse areas) irrigated with drainwater contaminated with salts and selenium.

The EIS' In-Valley options identify retiring up to 298,000 acres in Westlands and 10,000 acres (Broadview) in the Northerly Area. Retired lands would provide high to low value terrestrial habitats dependent on the selected land management strategy. A final land management plan would allow a determination on the future value of retired lands to terrestrial resources.

Aquatic Resources under Future with Project (Northerly Area and Westlands)

It remains unclear if CVP water supply augmentation and/or demand reduction actions would occur to assure meeting baseline environmental needs while accommodating present uses and/or projected state-wide growth. The baseline analysis in the EIS lacks detail concerning the water supply/demand elements of the project. The Service assumes that these issues would be addressed in long-term contract renewals; however, Reclamation should identify if this is not the case.

The limited aquatic resources within the project boundaries are not likely to change in terms of overall extent, however there may be some enhancement of quality of these habitats with respect to drainwater contamination. As with the "No Action" Alternative, San Joaquin River drainwater discharges will cease by 2009, except for contributions via groundwater accretion flows. The EIS assumes that current GBP drainwater discharges to the San Joaquin River will stop by 2009. For at least the section of Mud Slough (North) and the San Joaquin River downstream, this is an anticipated benefit independent of the SLDFR.

Depending on the fate of the subsurface tailwater in question, the termination of the GBP may be a benefit or detriment for aquatic resources of the region. In the case of SLDFR action, the closed collection and conveyance facilities would isolate drainwater from fresher water bodies (and from groundwater infiltration). As such, area waterways should observe a slight to significant increase in water quality. In the absence of SLDFR action, it is reasonable to presume that privately operated facilities would not involve as elaborate a collection and conveyance system, and the use of open ditches (exposed to wildlife) would continue, and perhaps expand.

The In-Valley disposal options for the SLU propose up to 3,290 acres of evaporation ponds (Kesterson was 1,200 acres) with a projected influent selenium concentration of 10 $\mu\text{g/L}$. The addition of these features into the landscape of the San Joaquin Valley will provide an attractive nuisance that is expected to detrimentally impact individual migratory birds utilizing the ponds. Mitigation habitat would be provided in the form of alternative habitat that would attempt to draw wildlife away from the ponds, and as compensation habitat to replace wildlife losses at the ponds. In theory, the amount of mitigation habitat provided would enhance the landscape in equal measure to the degradation the presence of the ponds reflects. However, the accurate estimation and quantification of this balance point is a difficult and expensive endeavor.

Water supplies for mitigation areas have not been explicitly identified to date. However, this subject is currently being discussed as part of the feasibility planning phase of SLDFR, along

with the development of a detailed mitigation monitoring plan to determine if the initial estimate for mitigation and/or compensation acreage is sufficient. To the Service's knowledge, a remedial action plan, if the outer bound contingency for mitigation fails to adequately protect fish and wildlife resources, is not discussed in the EIS.

Fish and Wildlife Resources under Future with Project (Northerly Area and Westlands)

Fish and wildlife diversity and abundance are dependent on the available habitat quality and quantity. The predicted with-project habitat conditions depend on the magnitude of land retirement and subsequent land management practices. The Service is hopeful that a cooperative working relationship with Reclamation can be fostered in order to maximize the integration and coordination of existing initiatives and funding sources towards the objective of recovery of threatened and endangered species within the project area, consistent with the Service's *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS, 1998).

Wildlife use data on about 102,000 acres of existing non-irrigated, grazed drainage-impaired land is not available. However, part of this land (65,000 acres from the Saguospe settlement) could revert to agriculture either through the provision of drainage service, or to the extent that these particular lands may not be part of some future retired lands as part of SLDFR action or settlement. It is reasonable to presume that the currently fallowed Saguospe lands would in part coincide with any retirement action, however the overlap between these lands and the varied SLDFR action alternatives has not been clearly presented.

With respect to the CVPIA Land Retirement Program, the Draft EIS (Table 2.3-1) projects 7,000 acres total retired lands within Westlands through this program by 2007 (with or without SLDFR action). The Service is not convinced this assumption is accurate. While the table footnotes indicate an assumed retirement rate of 981 acres per year each year from 2003-2007, as of this writing in 2006, the CVPIA Retirement Program stands at 2,091 acres within Westlands—none of the anticipated expansions have occurred. The objectives of CVPIA in giving deference to the San Joaquin Valley Drainage Program Rainbow Report (SJVDP, 1990)—which prescribed a land retirement target of 33,000 acres—may already be considered met by the Peck and Britz non-irrigation covenant acres (37,106 acres).

Finally, the Service assumes that the with-project condition includes the potential to convert remnant natural habitat (consisting of California prairie/annual grassland and saltbush habitats within and adjacent to the project boundary) to agriculture. This potential consequence carries significant risk to area wildlife resources. While this may not be a direct effect of SLDFR action, it has not been made clear that these actions may not be indirectly facilitated by decisions made within the current planning process—especially if water that once irrigated lands to be retired remains in district in sufficient volume to enable additional development.

The founding assumptions for the Biological Opinion (submitted via email to the Service 1/25/06) state that any land retirement program undertaken as part of the SLDFR will have explicit objectives to further listed species recovery consistent with meeting drainage related goals. Furthermore, lands retired will be dryland farmed, grazed, or fallowed—in roughly equal proportions (about 1/3 each). Fallowed lands will be disced twice annually. The preferred alternative will result in the conversion of some 200,000+ additional acres away from intensive cultivation. In the assumed ratio of one-third to fallow, grazing, and dry-land farming, this means an additional ~70,000 acres rededicated to these alternate land use strategies. The potential therefore exists within the SLDFR for large-scale and significant changes in the natural conditions extant in the Northwestern San Joaquin Valley.

Birds

As noted earlier, current land management practices in the project area limit bird species diversity and abundance. A definitive land management strategy for retired lands is necessary in order for the Service to fully predict habitat value for birds. With implementation of the preferred alternative, the existing acreage of fallowed lands will expand significantly. It is expected that grazing and dry-land farming will, on average, increase habitat values for certain bird species within Westlands (those capable of utilizing post-disturbance successional, semi-arid non-native grasslands).

As water that would have irrigated these lands is in part reallocated westward, there will be some shifting in crop types (with associated beneficial and detrimental impacts to avifauna connected to specific crop types). If, consistent with CVPIA objectives, a portion of this water is allocated to meet fish and wildlife enhancement goals, a significant project benefit to migratory birds is expected (to aquatic dependent species, and potentially riparian-associated passerines). If shifts in water allocation occur that facilitate conversion of natural habitat within and adjacent to the SLDFR project area, this impact represents a further stress to species dependent on these habitats.

As stated above, “retired” land value to wildlife depends on the adopted land management strategy. In general terms, the reversion of lands from intensively managed agriculture to intermittent or non-cultivation represents a modest benefit to migratory avifauna. Given current knowledge of fallowed land regeneration, adequate habitat would readily establish on these areas, which would be rapidly colonized by many bird species. The CVPIA *Land Retirement Demonstration Project, Year Four 2002 Annual Report* (USDI, 2004) recorded that bird species, including some of special concern, immediately colonized or frequented the undisturbed parcels.

The risks to birds associated with evaporation ponds with high selenium include both lethal and sublethal effects. Given the magnitude of the project—where alternatives include installing up to 3,290 acres of evaporation ponds—the Service predicts significant lethal and sublethal effects to both migratory and non-migratory bird species associated with all action alternatives.

The Draft FWCA report contained an extensive critique of the anticipated selenium pretreatment technology. Reclamation has since committed to meeting performance objectives of 10 $\mu\text{g/L}$ selenium as selenate in the AbMet[®] effluent as part of the project description (pers. comm., M. Delamore). Presumably, these would be explicitly written into the pond waste discharge requirements from the Board. Under these conditions, it is likely that the mitigation required to compensate for expected impacts to migratory bird populations for the evaporation pond acreages projected within SLDFR would be feasibly provided (i.e., it is reasonable to presume water of sufficient quality and in sufficient quantity would be available for mitigation purposes). Within the context of the preferred alternative, surplus water from land retirement in excess of Westlands water needs would be the logical supply. It should be noted here that this water is for mitigation purposes, and would not meet enhancement objectives consistent with CVPIA goals.

Mammals

As with migratory birds, colonization by small mammals is expected within any grazed and fallowed areas generated through land retirement (see USDI, 2004). Depending on the location and size of potentially “retired” lands, significant mammal habitat improvement is possible. The precise habitat value would depend on specific land management strategies and how these would be implemented over time (e.g., for how many years the retired lands would be left “unmanaged” between periods of intense agriculture). As outlined within the SLDFR, the management of these lands will be under the individual grower’s discretion, and activities such as discing, chemical weed abatement, and pest control may be harmful to terrestrial mammal species. Discing of fallowed lands would be a disturbance that is expected to be, in the long-term, detrimental to small mammal populations—especially if fallowed lands become an attractant to species that are sensitive to direct or indirect mortality as a consequence of discing. Grazing, in general, is expected to be more consistent with sustaining small mammal populations and species recovery.

It is therefore assumed herein that two-thirds of the retired lands would provide little or no wildlife benefit, and one-third of the retired lands would provide some benefit to small mammal populations within the project area. Besides the management of particular parcels of land, their location relative to extant populations of native mammals from which colonization may occur is an important co-variable determining the value or risk associated with each site.

Reclamation has agreed that “any land retirement program undertaken as part of the SLDFR would have explicit objectives to further listed species recovery consistent with meeting drainage related goals.” If these objectives are properly coordinated within the objectives of the Recovery Plan, aligned within agency programs and policies, and eventually funded, significant benefits to threatened and endangered species are anticipated.

In contrast to the potential indirect project-associated benefits, the Service is concerned about an indirect risk associated within the larger context of the SLDFR. The potential conversion of remnant California prairie/annual grassland and saltbush habitats associated with both agricultural and urban development would decrease small mammal populations, and the association of higher vertebrate mammals connected with these prey items. These concerns are acute in the region of the Interstate-5 corridor on the western edge of Fresno County, and in areas adjacent to the project area (i.e., expansion and encroachment lands), where threatened and endangered species such as the San Joaquin Kit Fox are known to inhabit.

Reclamation and the Service have agreed that these issues will in large part be handled in the San Luis Long-term Contract Renewal consultation, and of this writing it is understood that language is being added to the renewed San Luis Contract that allows for reassessment of Westlands' water needs analysis should significant land retirement follow implementation of a SLDFR alternative. For FWCA purposes herein, it is sufficient to acknowledge that fish and wildlife resource issues tied to non-sensitive flora and fauna are associated with the same areas of concern. Therefore, protecting these remnant habitats for threatened and endangered species would likewise protect their value to the associated non-special status species.

Reptiles and Amphibians

Reptile and amphibian habitat may improve depending on management of potentially retired lands. Under current agricultural land management practices, impacts to terrestrial species would follow the same downward population trend with continued habitat conversions. To date, it appears unlikely that any land management strategies would be adopted with specific aims to enhance reptile or amphibian habitat as part of SLDFR retirement actions.

Water quality in the Mendota Pool and wetland supply channels is expected to improve as discharges from the Delta-Mendota Canal sumps are collected and disposed via project features (e.g., pipelines, reuse, and evaporation ponds). This could provide a benefit to aquatic-dependent species such as the giant garter snake. One of the sites being considered for enhancement as compensatory mitigation for evaporation pond effects to migratory birds is the Mendota WMA near Mendota Pool. The Service is very interested in prospects for integrating the management of this area (to the extent practical) for giant garter snake recovery. Discussions on this matter are ongoing as part of the feasibility planning stage of SLDFR.

Fisheries

The limited fishery resources supported by delivery and drainage canals are not expected to change with the project overall. However, to the extent that service ditches and canals in the Northerly Area are discontinued in favor of the closed collection and conveyance facility as part of SLDFR, it is presumed that these limited aquatic resources would experience an increase in

water quality, simultaneous to a decrease in water volume. The influence to area fisheries is mixed, but likely a benefit overall (albeit probably very limited in extent).

The EIS assumes that Northerly Area drainwater discharges to the San Joaquin River will stop by 2009. Clearly, discontinuing surface collected drainwater releases to the River will improve water quality, however flows will also be reduced, and this may have undesirable indirect effects. The results of this analysis were not available as of the preparation of this report. The Service agrees that removing a pollution source lessens river deterioration, if all other parameters remain unchanged. However, with the project, highly contaminated groundwater accretion flows to the river would continue, with less dilution flows. Data related to quantity and quality of groundwater reaching the river is not available at this time, so impacts could not be determined. Taking beneficial effects within Mud Slough, the San Luis Drain, and the lower San Joaquin River into account, it is assumed in general that SLDFR action would be a net benefit to fishery resources in the region.

Sensitive Species

The level of effect to federally listed species (and other special status species) in the future with the project is difficult to determine. However, these elements are being addressed in the associated consultation under section 7 of the ESA. Because retired lands could present a significant opportunity to improve habitats for the recovery of upland listed species, the Service and project proponents continue to discuss the habitat improvement potentials and possibilities for retired lands.

SERVICE POLICIES, LAWS AND GUIDELINES APPLICABLE TO THIS PROJECT

Service Mitigation Policy

The Service's Mitigation Policy, as issued in the Federal Register Vol. 46(15): 7656-7663, outlines how the Service will work with partners to help mitigate any adverse impacts from land and water development projects on fish, wildlife, and their habitats. The purpose of this policy is to help assure consistent and effective recommendations by outlining policy guidelines for the levels of mitigation needed, as well as the various methods for accomplishing the mitigation. In addition, it allows Federal action agencies and private developers to anticipate Service recommendations and plan for mitigation measures early—thus avoiding delays late in the planning process.

Under the Service's Mitigation Policy, resources are divided into four resource categories to ensure that recommended mitigation is consistent with the fish and wildlife habitat functions and values involved. How a proposed action affects selected (evaluation) species within their corresponding habitats is one element in determining what mitigation the Service will seek for

the project. The categories cover a range of habitat functions and values, from those considered to be unique and irreplaceable, to those believed to be much more common and of relatively lesser value to fish and wildlife. Each of the four resource categories has criteria with specific mitigation goals. The criteria are: 1) areas of high value for the evaluation species that are unique and irreplaceable; 2) areas of high value for the evaluation species that are scarce, or are becoming scarce, regionally; 3) areas of high to medium value for the evaluation species that are relatively abundant; and 4) areas with medium to low value for the evaluation species. The respective mitigation goals are: 1) no net loss of existing habitat value; 2) no net loss of in-kind habitat value; 3) no net loss of habitat value, while minimizing loss of in-kind habitat value; and 4) minimize loss of habitat value.

The Service reviews a variety of criteria to outline mitigation recommendations and determine the agency's position on a specific project or proposal. The criteria are not mutually exclusive, and are meant to provide a framework for the Service to fulfill its technical assistance role to Federal action agencies and the public. The action agencies are then charged with making the final decision to approve the proposal and require some level of mitigation, if appropriate. In this process, the Service considers whether:

- (1) Proposals are ecologically sound;
- (2) The least environmentally damaging reasonable alternative is selected;
- (3) Every reasonable effort is made to avoid or minimize damage or loss of fish and wildlife resources and uses;
- (4) All important recommended means and measures have been adopted with guaranteed implementation to satisfactorily compensate for unavoidable damage or loss consistent with the appropriate mitigation goal; and
- (5) For wetlands and shallow water habitats, the proposed activity is clearly water-dependent and there is a demonstrated public need.

Migratory Bird Treaty Act

Federal courts have recently affirmed that Federal agencies are subject to prohibitions outlined in the MBTA, including restrictions on "take" of migratory birds.

The MBTA prohibits the intentional or unintentional takings of migratory birds except under specific authorized and permitted activities. On January 10, 2001, Executive Order 13286 was signed by the President of the United States. The order requires Federal agencies to incorporate migratory bird conservation measures into their agency activities. Furthermore, the order stipulates that Federal agencies are required to develop a Memorandum of Understanding (MOU) with the Service outlining how the agency will promote conservation of migratory birds. The MOU will outline how the Federal agency will:

- (1) support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions;
- (2) restore and enhance the habitat of migratory birds, as practicable;
- (3) prevent or abate the pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable;
- (4) design migratory bird habitat and population conservation principles, measures, and practices, into agency plans and planning processes (natural resource, land management, and environmental quality planning, including, but not limited to, forest and rangeland planning, coastal management planning, watershed planning, etc.) as practicable, and coordinate with other agencies and nonfederal partners in planning efforts;
- (5) within established authorities and in conjunction with the adoption, amendment, or revision of agency management plans and guidance, ensure that agency plans and actions promote programs and recommendations of comprehensive migratory bird planning efforts such as Partners-in-Flight, U.S. National Shorebird Plan, North American Waterfowl Management Plan, North American Colonial Waterbird Plan, and other planning efforts, as well as guidance from other sources;
- (6) ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern;
- (7) provide notice to the Service in advance of conducting an action that is intended to take migratory birds, or annually report to the Service on the number of individuals of each species of migratory birds intentionally taken during the conduct of any agency action, including but not limited to banding or marking, scientific collecting, taxidermy, and depredation control;
- (8) minimize the intentional take of species of concern by: (i) delineating standards and procedures for such take; and (ii) developing procedures for the review and evaluation of take actions. With respect to intentional take, the MOU shall be consistent with the appropriate sections of 50 C.F.R. parts 10, 21, and 22;
- (9) identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors. With respect to those actions so identified, the agency shall develop and use principles, standards, and practices that will lessen

the amount of unintentional take, developing any such conservation efforts in cooperation with the Service. These principles, standards, and practices shall be regularly evaluated and revised to ensure that they are effective in lessening the detrimental effect of agency actions on migratory bird populations. The agency also shall inventory and monitor bird habitat and populations within the agency's capabilities and authorities to the extent feasible to facilitate decisions about the need for, and effectiveness of, conservation efforts.

If evaporation pond complexes are authorized and approved, the MBTA states that a Memorandum of Understanding with the Service is needed to outline the project's migratory bird conservation measures.

Central Valley Project Improvement Act

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 amends previous authorizations of the California CVP to include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic water supply uses, and fish and wildlife enhancement having an equal priority with power generation.

Purposes of CVPIA are defined as follows in section 3402 of the Act: a) to protect, restore, and enhance fish, wildlife, and associated habitats in the Central Valley and Trinity River Basin of California; b) to address impacts of the CVP on fish, wildlife, and associated habitats; c) to improve the operational flexibility of the CVP; d) to increase water-related benefits provided by the CVP to the State of California through expanded use of voluntary water transfers and improved water conservation; e) to contribute to the State of California's interim and long-term efforts to protect the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; and f) to achieve a reasonable balance among competing demands for use of CVP water, including the requirements of fish and wildlife, agriculture, and municipal, industrial, and power contractors.

Endangered Species Act of 1973, as Amended

Under the ESA, all Federal agencies shall seek to conserve endangered species and threatened species and utilize their authorities in furtherance of the purposes of the ESA. Also, all Federal agencies shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species [section 2 (c) (2)].

If a listed species may be present in a project area, the action agency shall prepare a biological assessment to identify any endangered species or threatened species which is likely to be affected by the action.

If a listed species may be affected by the action each Federal agency, in consultation with the Service, shall insure that any action authorized, funded, or carried out by the action agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species.

Related Projects or Reasonably Foreseeable Inter-related Actions

In addition to the proposed action, other related actions are being studied or being implemented by Reclamation. While the following actions or processes are not directly related to the proposed action, there are numerous and appreciable inter-relationships with the SLDFR—as nothing water-related within the CVP operates in isolation.

Operational Criteria and Plan and South Delta Improvement Project

OCAP was developed in order to operate the Central Valley Project (CVP) and State Water Project in a coordinated manner to divert, store, and convey project water consistent with applicable law. OCAP-associated actions include: increased flows in the Trinity River, an intertie between the California Aqueduct and Delta-Mendota Canal, the Freeport Regional Water Project, water transfers, and renewal of long-term CVP water service contracts.

The purpose of the South Delta Improvement Project (SDIP) is to increase water deliveries and delivery reliability for SWP and water contractors south of the Delta; to ensure adequate water levels and water quality for agricultural diverters in the south Delta downstream of the head of Old River; and to reduce movement of Central Valley fall-/late fall-run Chinook salmon in the south Delta via the Old River. SDIP includes the following actions: increased pumping at the SWP Banks Pumping Plant by increasing the permitted limit for diversions at the SWP's Clifton Court Forebay to 8,500 cfs; construction of a permanent operable fish control gate on Old River; replacement of seasonal barriers with permanent operable flow gates on Middle River, Grant Line Canal, and Old River; and dredging portions of Middle River, Old River, and West, Grant Line, Victoria and North canals (Jones and Stokes, 2005).

CVP Long-Term Contract Renewals

Pursuant to section 3404 (c) of the CVPIA, Reclamation is in the process of renewing existing long-term CVP water service contracts. The renewals are subject to a separate, tiered analysis that is consistent with NEPA tiering described in the Programmatic EIS for the CVPIA. Reclamation proposes to renew 114 CVP water service contracts throughout the Central Valley. These contracts include an annual maximum quantity of 5.6 million acre-feet of CVP water and provide water service to 3.2 million irrigable acres of land and an urban population in excess of 4.3 million. Reclamation intends to have most of the long-term CVP renewal contracts signed in 2005, including those contracts involved in the SLDFR planning area (i.e., San Luis Unit and Delta-Mendota Canal Unit). The terms of the CVP long-term contract renewals will be 25 years

for agricultural and combined agricultural and Municipal and Industrial (M&I) contracts, and 40 years for M&I-only contracts. The effects of renewal of long-term contracts over the next 25-40 years will undoubtedly have a significant impact on future land use, and the ability for the CVP to meet demands and obligations; including agricultural, domestic, and fish and wildlife enhancement. The environmental effects of long-term contract renewals are being evaluated under separate NEPA analyses and ESA consultations.

Litigation on Friant Division Long-Term Contracts

In 2003, the Natural Resource Defense Council (NRDC) et al. filed a seventh amended complaint against Reclamation et al. over its operation of Friant Dam and long-term renewal of water supply contracts for the Friant Division (NRDC et al. v. Kirk Rogers [Reclamation] et al. 2003; Case No. CIV-S-88-1658 U.S. District Court for the Eastern District of California). The complaint alleges violations of: 1) section 8 of the Reclamation Act of 1902, section 5937 of the California Fish and Game Code, and the Administrative Procedure Act (APA); 2) NEPA and APA; and 3) Various aspects of ESA and APA; and 4) Federal Reclamation Law and APA. Of the claims filed in 2003 by the plaintiffs, the judge has heard arguments and ruled on the complaint regarding section 5937 of California Fish and Game Code. In August 2004, U.S. District Judge Lawrence K. Karlton found that Reclamation was not operating Friant Dam in a manner consistent with section 5937 of CDFG Law. Judge Karlton's ruling may result in additional flows in the San Joaquin River for the purpose of restoration of anadromous fish. The quantity of this additional flow has yet to be determined in a remedy phase of this case.

Consolidated Place of Use: Mitigation for Encroachment Lands

The Final EIR for Consolidated and Conformed Place of Use (CPOU) for the CVP (SWRCB, 1999) identified and analyzed impacts associated with CVP deliveries to encroachment lands (lands within the boundaries of CVP water contractor service areas that have already received CVP water, but are located outside the authorized CVP Place of Use). Of the 45,390 acres of encroachment lands that served CVP water for agricultural purposes, the following encroachment was identified in the SLU:

<u>San Luis WD</u>	789 acres of alkali scrub
	7,847 acres of annual grassland
	2,032 acres of valley-foothill riparian/fresh emergent wetland
<u>Westlands WD</u>	1,611 acres of valley-foothill riparian/fresh emergent wetland
	6,653 acres of annual grassland
	22,343 acres of alkali scrub

The Final EIR for CPOU (from page 2-91) stated,

“Reclamation shall be required to develop a schedule for feasible implementation and monitoring of mitigation or restoration actions subject to approval of the SWRCB. In addition, the SWRCB will also compare each mitigation or restoration project’s environmental/habitat benefits with a set of criteria to be developed jointly by Reclamation and the Service, that will assign environmental/habitat target values that need to be restored or mitigated for, pursuant to the approval of the petition to change the CPOU focusing primarily on listed species habitats lost on encroachment lands as identified in Table 2-36 found on page 2-79.”

Some of the lands proposed for retirement by Reclamation as a part of the SLDFR may potentially serve as a means to address the encroachment land mitigation requirement from the SWRCB.

DISCUSSION

The San Luis Drainage Feature Re-evaluation is an opportunity to resolve a problem that has vexed the northwestern San Joaquin Valley for decades; has involved Federal and State outlays numbering into the hundreds of millions of dollars; has featured over two decades of intense scrutiny and investigation; and, not surprisingly, has involved frequent litigation. Salt balance issues are an inevitable consequence of irrigated agriculture in semi-arid climates with soils offering inadequate drainage. In many respects, the decisions made during the crafting of the San Luis Act, followed by the construction and delivery of water via the CVP and the subsequent history with the discoveries of dead waterfowl and deformed embryos at Kesterson Reservoir, have come to a head with the SLDFR—and Reclamation is now charged with the unenviable challenge of providing a solution to the drainage problem.

The Out-of-Valley alternatives presented in the SLDFR carry considerable associated risk. The weight of scientific evidence argues heavily against Delta disposal, and recent events there—indicating quite clearly a system under severe stress (Bertness et al., 2005)—make the prospect of adding to those stressors an exceedingly imprudent gamble. Ocean disposal involves considerable uncertainty, though these marine systems are known to be very efficient recyclers of environmental selenium (pers. comm., S. Luoma). The risks to the taxpayers of stranded investments should a project fully built out prove environmentally damaging is also a prospect not to be taken lightly.

Of the In-Valley alternatives, all four scenarios involve significant acreage of evaporation ponds. In the case of SLDFR, Reclamation is anticipating extensive pond redesign (relative to conditions at the historic Kesterson Reservoir); and adding reuse facilities, reverse-osmosis (RO) treatment, and even selenium removal technology. These modifications significantly add to the

cost of drainage service¹, and their final influence will only be realized post-construction—as monitoring exhibits the extent to which engineering and human ingenuity can salvage the San Luis experiment. In the years since Kesterson, the Service has also developed mitigation protocols to deal with privately operated evaporation ponds within the Tulare Basin, and these have been modified to apply to the anticipated SLDFR ponds.

The Service has consistently advocated minimizing detrimental effects to fish and wildlife resources through maximizing land retirement. As such, the Service prefers In-Valley alternatives that minimize the acreage of evaporation basins. Considering that the preferred Drainage Impaired Area alternative contains the fewest prescribed acres of evaporation ponds, and our expectation that surplus water available from the retirement of 308,000 acres within Westlands would in part be reallocated to fish and wildlife enhancement, this action is the Service's environmentally-preferred alternative amongst those presented in the SLDFR EIS.

Risks to Wildlife Resources from Project

The Service is very concerned about the construction and operation of new evaporation ponds—a technology known to carry significant risk to migratory birds, as evidenced by the history at Kesterson Reservoir and by the currently operating ponds in the Tulare Basin. Kesterson Reservoir was the terminal disposal site for drainwater from lands within Westlands, and became the *de facto* terminus of the San Luis Drain as its 12 shallow ponds functioned as an evaporation and seepage basin. Seven of these 12 evaporation ponds studied exhibited statistically significant adverse biological effects (including impaired hatchability, elevated frequencies of embryo deformities and reproductive failure) (Moore et al., 1990). The significant wildlife impacts noted at Kesterson Reservoir developed only a short time (2-6 years) after the reservoir began receiving subsurface agricultural drainage water.

Given the design of the proposed SLDFR evaporation ponds, it is anticipated that waterfowl species at greatest risk would be diving ducks, American coots, eared grebes, and some dabbling ducks such as northern shovelers; however, a wide range of avifauna can be expected to frequent the ponds. This would especially be the case during periods of drawdown, when shallow foraging habitat will attract very high numbers of shorebirds and dabbling ducks feeding upon the dense concentrations of invertebrates likely to inhabit these basins. This eventuality may be exacerbated by the proximity of some of these ponds to area duck clubs and refuges (e.g., the Northerly Area evaporation basin is proposed immediately adjacent to the south Grasslands management area duck clubs). During the hunting season, these ponds will serve as ideal refugia for waterfowl, and ecotoxic risk may effectively be magnified.

¹ Reclamation has indicated to Service staff that RO treatment will cost between \$200-\$400 per acre-foot (pers. comm., S. Irvine, Nov 2005), and AbMet[®] will cost \$320 an acre-foot (\$1.3 million/year to treat 4,000 acre foot per year (Afy) produced after source control, reuse and RO). The treatment plant for the Northerly Area is projected to cost \$27 million. (pers. comm., M. Delamore, Nov 2005).

Specific risks associated with avian use of evaporation basins have been well characterized (Moore et al., 1990; Skorupa, 1998; Gordus et al., 2002; Ohlendorf, 2003; among others). These are primarily associated with elevated concentrations of selenium in the drainwater, but there are also other constituents of potential concern (e.g., boron and salts). These effects are mentioned in the EIS, with additional discussion provided in the planning memoranda provided to Reclamation during earlier phases of this process (USFWS, 2003; USFWS, 2004). As such, specific symptoms will not be enumerated in detail. It is sufficient to say that these effects would be expressed as either reduced adult survival, and/or impaired reproduction. Either endpoint has negative impacts on migratory bird populations. With the exception of adverse effects to individuals from threatened and endangered species, compensation measures discussed herein are directed to population-level effects.

Risks associated with reuse facilities have been less characterized to date. Biomonitoring at Red Rock Ranch (Diener Farms) in 1996 established that the method of furrow irrigation being used was attracting breeding waterbirds. More than 56 percent of 30 assessable embryos were deformed at one site, and overall monitoring yielded avian eggs exceeding 25 mg/kg, dry weight selenium. The threshold value for embryotoxic effects in eggs of aquatic birds is only 6 mg/kg dry weight selenium (Skorupa, 1998). Since that initial work, studies conducted by the Service and the California Department of Water Resources at reuse areas have confirmed nesting activity by numerous aquatic species (e.g., killdeer, black-necked stilt, among others) as well as terrestrial birds (e.g., house finch, mourning doves, loggerhead shrikes, etc.) in pasture and grain fields.

Reproductive risks associated with the Red Rock Ranch site were some of the highest encountered anywhere. However, nest densities were lower; so in terms of overall risk to the population, these sites are probably less harmful than evaporation basins (on an acre per acre basis). Nevertheless, it should be understood that reuse facilities, even when well managed, are not without risks to nesting birds. This is especially the case for birds associated with an aquatic food web. In monitoring of 13 non-shorebird species, only one deformity was observed among collected eggs (Brewer's blackbird). Presumably, exposure for many of these other species was lower than that observed in the ground-nesting aquatic species, as reflected in egg selenium residues.

To date, 23 species of migratory birds have been documented to nest at drainwater reuse sites (Skorupa et al., 2004; Terrill et al., 2004). Avian nests have been located and sampled in every habitat component of the reuse facilities—proving that these sites are capable of attracting foraging and nesting birds. Despite implementation of wildlife management plans intended to eliminate avian nesting in 1997 by the site managers at the Red Rock Ranch and Mendota agroforestry sites, additional eggs were found by Service biologists during brief site visits in the spring of 1998.

During the nesting season of 2003 at the Panoche reuse facility, a pasture inadvertently flooded and shorebird nests with significantly elevated egg selenium concentrations were documented. History has shown that avian species are very opportunistic. In a landscape devoid of natural habitat, and given the inevitability of human error or unforeseen circumstances, it should be assumed that avian use of reuse facilities will occur.

In addition to avian reproductive activity at reuse facilities, there are concerns associated with foraging by migratory avifauna (particularly sensitive species) during non-breeding seasons. Mountain plover have been observed foraging at the Panoche reuse facility (pers. comm., J. McGahan). Monitoring of this same site by H.T. Harvey & Associates (Terrill et al., 2004) has confirmed use by the following threatened or species of management concern: white-faced ibis, northern harrier, Swainson's hawk, long-billed curlew, black tern, burrowing owl, loggerhead shrike, and tricolored blackbirds. Of these, burrowing owl and loggerhead shrikes were observed nesting at the facilities.

The use of these facilities by terrestrial threatened and endangered mammals has not been monitored to date, so risk to these species are unquantified. Given the available avian use data from limited monitoring activity at reuse facilities, a comprehensive monitoring plan is an essential component of the SLDFR. Considering that there are no plans presented in the EIS for mitigation for up to 19,000 acres of reuse facilities, thorough mitigation monitoring and adaptive contingencies in the event that effects are documented must be developed as part of the feasibility planning phase following release of the Final EIS.

At a minimum, the Service expects that detailed observations of avian nesting activity and performance at reuse facilities would be factored into the mitigation monitoring phase of the SLDFR, and appropriate mitigation for affected species would be provided if risks associated with the operation of these sites prove greater than presently anticipated by Reclamation. For aquatic nesting birds, mitigation can readily be provided in addition to the ongoing compensatory habitat obligations. Mitigation for upland species or nesting passerines would be more problematic, although it is anticipated that land will be readily available and relatively inexpensive (if taken from the existing retired acreage).

Avoiding Adverse Wildlife Resource Effects Due to Project (Potential Benefits from SLDFR).

A benefit of the proposed action alternatives is the use of enclosed pipelines as opposed to drainage ditches to convey drainwater. Monitoring of the region surrounding the Panoche reuse facility (Terrill et al., 2004) has shown that shorebird nesting and use of open conveyance facilities leads to elevated egg selenium concentrations. Egg selenium concentrations in shorebird eggs collected from canal levees ranged well above safe thresholds (from <3 mg/kg to >40 mg/kg) along these selected "reference" areas. To the extent that drainage service would include enclosed conveyance to replace existing open channels, these represent a project benefit.

In 2002, Service staff discovered groundwater pooling and shorebird nesting activity near a cotton gin off Mt. Whitney Avenue. Eggs collected from this site had a very high incidence of embryo deformities, and some of the highest selenium concentrations in eggs observed at any site. The frequency of such events is uncertain, but it is probable this particular site was not unique. To the degree that drainage service would contain and collect excess groundwater in facilities that are controlled, monitored, and adequately mitigated, and to the extent that such sites as the one mentioned above exist (currently or in the future), the project can be expected to avoid continued adverse effects to avifauna.

Additional benefits associated with capturing tile drainage currently feeding the Delta-Mendota Canal have already been mentioned. Further, there is potential benefit to wildlife from the management and placement of retired lands. The Service is hopeful that the explicit objectives for species recovery being developed as part of any land retirement action would include siting and management of these lands to the maximum practical extent for the benefit of listed species and native flora and fauna.

The Service also anticipates that the project would benefit wildlife as compared to the future-without or No Action scenarios as a consequence of Federal investment in environmental monitoring and mitigation components. Although the same regulations generally apply in the circumstance where private landowners may need to resort to IFDM or other drainage disposal options, it is an unfortunate reality that compliance monitoring and mitigation for such facilities are generally not as extensive as would be anticipated within the Federal nexus of the SLDFR. The Service therefore sees a benefit in capturing drainwater-associated fish and wildlife impacts under a comprehensive and formal management plan, overseen with Federal and State agency guidance.

Finally, a significant project benefit would be realized should land retirement lead to surplus water reallocation within the CVP consistent with the guidelines provided in the CVPIA. With the Drainage-Impaired Area preferred alternative, a significant portion of Westlands is slated for retirement. On the surface, it is evident that a reassessment of water needs for this district would yield a significant volume of water for other beneficial uses. The Service anticipates significant benefits from the allocation of part of this surplus to meet fish and wildlife enhancement objectives within the CVP.

Adequacy of Mitigation Prescriptions

Effects to Aquatic Resources

In 1995, the Service presented mitigation protocols (USFWS, 1995a; USFWS, 1995b) developed to minimize and compensate for reproductive impacts to the principal species utilizing evaporation basins during the spring and summer seasons. The Alternative Habitat Protocol prescribes a precise acreage of mitigation (clean habitat placed adjacent to evaporation facilities)

designed to dilute selenium exposure to breeding shorebirds by drawing them away from the ponds to forage on clean wetlands. The Compensation Habitat Protocol is designed to compensate for unavoidable losses on the ponds by replacing lost production (as measured in numbers of hatchlings) using habitat placed outside of the expected foraging range of the evaporation facilities. The mitigation protocols are quantitative risk assessment models that are sensitive to both the degree of contamination (selenium concentration in bird eggs), and size of the ponds.

The protocols underwent extensive peer and public review, and meeting the acreage obligations put forth in the respective models are conditions built into each evaporation basin's Waste Discharge Requirements (WDR's) as regulated by the Regional Board. In addition to meeting these habitat obligations, operators are expected to maintain specific conditions at their facilities (e.g., steep slopes, vegetation control, etc.) to minimize waterfowl attractiveness to the ponds. Operators also report annually to the Regional Board, and limited egg collections are conducted as a biomonitoring tool.

It was intended at the inception of these two protocols that providing the prescribed acreage of breeding habitat year-round would also mitigate for effects to other exposed species using the ponds. Further analysis reveals that these provisions are not applicable across all species. For example, census data from monitoring conducted in the intervening years (H.T. Harvey & Assoc., unpubl. data; Hansen Environmental, unpubl. data) indicate significant use of evaporation ponds by diving aquatic birds such as ruddy ducks, eared grebes, and American coots. Existing alternative and compensation habitats, designed as they are for breeding shorebirds, are not suitable habitat for these deeper-water foragers. Unfortunately, evaporation basins constitute very attractive habitat to diving birds; and it is unlikely that any measure of pond design and deterrence such as hazing can be completely effective at keeping these species from foraging at future evaporation facilities.

The existing compensation habitat protocol measures lost production, in terms of eggs (actually hatchlings) that perish due to selenium contamination at the evaporation basins. There is a prescription to replace lost production in kind by new production at clean compensation habitat. What these protocols do not adequately address is the impact of adult mortality—or the loss of breeding adults from the population. Demographically, this is a distinctly different event.

For example, using the American coot (analysis derived from data in Brisbin and Mowbray, 2002); for every 100 eggs laid, approximately 75 chicks will hatch under baseline conditions. Of these hatchlings, if we presume a relatively high survival rate to fledging (75 percent), a total of 56 of those 100 eggs will eventually reach full size and fly. A survival rate during the first year of 44 percent (Ryder, 1963) leaves a total of 25 birds that will reach recruitment (coots enter the breeding population at 1 year old, though many individuals do not find pair bonds and do not reproduce until 2 years of age). By the second year (at survival rate of 49 percent), only 12 birds remain.

Given the age structure that this life table would produce in a normal population, the median age of a coot in the wild would roughly fall between 1 and 2 years old. For purposes of this illustration, and considering 2 years is the best reliable measure for a fully functional adult coot, we shall look at this age class. A single 2 year old coot therefore represents 6.25 hatchlings. From the demographic perspective, loss of that same individual as an adult would require 6.25 times the compensation provided by the current breeding-centered compensation protocol.

This illustration belies a further complication with the expanded mitigation protocols. The question arises whether it is preferable to mitigate for effects at the same level they are induced. Where reproductive impairment is concerned, it is logical to mitigate using the provision of clean habitat for nesting avifauna. In the case of migratory and wintering avifauna—when adult and juvenile mortality are the endpoint of concern—it seems more practical to provide clean habitat to increase survival population-wide to the same extent the presence of the proposed contaminated ponds reduces the number of individuals that would have survived had the ponds not been operating. In essence, for each bird lost, there must be another adult survive that *otherwise would not* if the alternative habitat (and evaporation ponds) did not exist. The accurate calculation of this particular amount of habitat is a daunting prospect, and invariably involves broad assumptions and considerable uncertainty.

During the past year, Reclamation funded Service technical staff to complete an additional protocol to look specifically at the endpoint of adult mortality from exposure to dietary selenium at the projected SLDFR ponds. The white paper detailing the assumptions and conceptual model, along with appropriate justifications for chosen parameters feeding the risk assessment appear as Appendix 1 (attached). The final recommended areas for mitigation acreages are presented in Table 2, following.

It is the Service's position that Reclamation should provide mitigation acreage for the SLDFR evaporation ponds in the following fashion: 1) In order to protect breeding birds during spring and summer, the acreage prescriptions from the Service's Alternative and/or Compensation Habitat protocols (USFWS, 1995a and 1995b) should be provided. 2) For all other seasons, at a minimum, the prescriptions from the Adult Mortality Compensation protocol should be available to suit the conditions most ideal to each respective guild. Effectively, this means that during the breeding season, the higher output from either the 1995 reproductive protocols or the Adult Mortality model would be the mitigation requirement. If future mitigation monitoring proves that evaporation ponds are not attracting foraging avifauna (or mitigation habitats are performing better than the historic data project), then mitigation requirements would be appropriately adjusted during the following iteration of the issuance of Waste Discharge Requirements (WDR) by the Regional Board (i.e., five years hence).

Table 2. Mitigation Prescriptions to Compensate for Adult Mortality from SLDFR Evaporation Ponds by Avian Guild and by Season.

		In Valley Alternative	Groundwater Quality	Water Needs Alternative	Drainage Impaired Lands
		3290 ac Evap Ponds	2890 ac Evap Ponds	2150 ac Evap Ponds	1270 ac Evap Ponds
Season	Bird Category	acres mitigation needed	acres mitigation needed	acres mitigation needed	acres mitigation needed
Spring Migration	Dabblers	0	0	0	0
(Feb-Apr)	Divers	0	0	0	0
	Shorebirds	0	0	0	0
Breeding	Dabblers	440	386	287	170
(May-Jul)	Divers	2030	1784	1327	784
	Shorebirds	33	29	22	13
Fall Migration	Dabblers	10	9	7	4
(Aug-Oct)	Divers	190	167	124	73
	Shorebirds	18	16	12	7
Winter	Dabblers	97	86	64	38
(Nov-Jan)	Divers	1088	956	711	420
	Shorebirds	105	92	69	41

- Acreages presented in the table reflect the higher of two estimates provided by the Model A and Model B (the “density-independent” and “density-dependent” compensation protocols). Note that these acreages are not to be confused with alternative or compensation habitat obligations as prescribed by the existing 1995 reproductive impairment protocols. However, habitat provided for impacts to breeding avifauna may be used to serve the dual purpose of compensating for projected losses of adults from the population. It is recommended that breeding season acreages provided to either dilute or compensate for reproductive losses associated with the ponds include best management practices to be functionally attractive, and sustainable for breeding birds (which may include actual provision of this habitat in months preceding the actual breeding season).

Over the past 2 years, the Service has participated in the Mitigation Work Group that has completed the risk assessment for the proposed SLDFR evaporation basins. As the 1995 protocols are based on measured egg selenium (data clearly not available for the SLDFR ponds), it was first necessary to project egg selenium concentrations from influent waterborne

concentrations. This has been completed using historic data from existing evaporation facilities and correlating waterborne to dietary selenium concentrations (an evaporation basin bioconcentration model).

In the Draft FWCA report, the Service acknowledged it is generally in agreement with this particular portion of the risk assessment as collaboratively finalized, with the significant caveat that we believed the projections for influent waterborne selenium at 10 $\mu\text{g/L}$ based on successful AbMet[®] treatment were premature. The Service recommended running the mitigation calculations through the mutually-derived bioconcentration model using waterborne selenium concentrations under the assumptions of both successful treatment, and no pretreatment.

Since this time, additional testing has been conducted with the pretreatment system, including bioaccumulation field trials. As of this writing, this information has not been released to the Service. However, Reclamation has since committed to meeting the 10 $\mu\text{g/L}$ objective as part of the project description (pers. Comm., M. Delamore).

An additional concern the Service had about the composition of the waterborne selenium (technically, in which oxidation state the total Se would be in the effluent) was relieved through a further commitment by Reclamation to fully oxidize the selenium in the effluent to selenate (SeO_4^{2-})—the least bioavailable form in the environment. Given these commitments, the Service agreed that the current bioconcentration model projections (which assumes 10 $\mu\text{g/L}$ and uses historic evaporation pond data) is adequate for risk assessment purposes associated with the SLDFR.

Mitigation prescriptions derived within the Service protocols are based on exposure and effects to avian populations utilizing the ponds. These are a multivariate function combining habitat selection, as well as the toxicology of selenium specific to each receptor species, among other variables. The Service compensation protocols are basically empirically-derived predictive models that calculate equilibrium points for which provision of clean habitat will equally offset population losses associated with selenium exposure on the evaporation ponds.

Exposure is a function of habitat availability and quality, while effects projections are interpreted and extrapolated based on standard toxicological methods (dose-response curve-fitting, and risk-modeling). All of these approaches and parameters are subject to uncertainty and professional interpretation. The founding assumptions and decision points within the risk assessment, then, become critical elements feeding the final risk projections. The assumptions associated with the Service protocols (in the case of the 1995 protocols and the current white paper presented in Appendix 1) are clearly enumerated within each respective document. As these have been amended in part by Reclamation for the SLDFR risk assessment, it is important to highlight the revisions that have been applied for the mitigation prescriptions appearing in the EIS. In addition to the bioconcentration modeling that was required to project dietary exposure, Reclamation has proposed the following changes to adapt the Service mitigation protocols to SLDFR:

1) Rather than calculate mitigation for the entire acreage of evaporation ponds (for the dabbling ducks and shorebirds “guilds”), the ponds will be designed with steep-sloping hardened walls and maintained at depth of at least 4 feet to eliminate use by these two groups of birds. The difference between average- and maximum-wetted evaporation pond acres were assumed to be the pond area likely to attract these species, and this figure was input to the mitigation models to generate the “initial estimate” of required mitigation. Mitigation prescriptions for diving birds assume these species will be using all evaporation pond acres.

2) Reclamation is proposing to dilute adult dietary exposure to their estimated No Observed Adverse Effects Level (NOAEL) concentration of 10 mg/kg in the diet of adult dabbling ducks and shorebirds using the modified Service Alternative Habitat Protocol (these acres are presented in the EIS as “shallow water alternative habitat”). According to this approach, remaining mitigation needs would be driven by breeding season effects alone, as adult mortality is not expected at this level of dietary dilution.

3) If drawdown occurs on the evaporation ponds during the breeding season, the acreage required over and above the amount of alternative habitat being provided to protect adult birds and their eggs (in #2 above) would be provided as compensation habitat to replace lost reproduction.

4) The provision of habitat would be timed to coincide with the appearance of shallow water on the evaporation basins (drawdown) in the case of shorebirds and dabbling ducks (these acres are presented as “shallow water compensation habitat” in the EIS). Unless such conditions occur, no mitigation habitat for shorebirds or dabbling ducks will be flooded.

5) Diving duck mitigation habitat would be provided entirely in the form of compensation habitat, to avoid drawing nesting birds into the immediate vicinity of foraging areas on the evaporation basins (these acres are presented in the EIS as “deepwater compensation habitat”).

6) On a contingency basis, Reclamation will provide as much as two times the initial estimate of total mitigation acres² (this area is the higher outside limit for which cost estimates feeding the feasibility analysis will be calculated).

In adapting the risk assessment for the proposed San Luis ponds, URS Corporation (with input from the Service), has expanded the protocols to include other species expected to be found at the evaporation basins. As mentioned above, a key additional endpoint—adult mortality—is now also incorporated to better reflect the range of impacts realized from the operation of these facilities. These additions represent a significant positive step towards a comprehensive treatment of ecotoxic risk to migratory birds at the proposed SLDFR ponds. However, there

² This contingency estimate applies to each respective habitat category (i.e., deepwater compensation, and shallow water alternative and compensation habitat estimates).

remain technical elements of this risk assessment and proposed mitigation plan with which the Service and Reclamation cannot find concurrence. Specific outstanding differences are enumerated in the paragraphs following, using the numbered items from above.

Item #1: Calculating mitigation acreages based on the difference between mean and maximum wetted area of the evaporation basins.

The habitat attractiveness metric (K values) used in the protocols are from existing evaporation ponds with existing management strategies, and are based on density estimates system-wide—covering the area of drawn-down (<2 foot depth) and full (2 foot to 3 + foot depth) cells equally. Admittedly, these management strategies generally do not consider effects to foraging avifauna (and as such, drawdown is often more a function of water management and drainwater supply schedules). So while it seems reasonable to predict that active management of the SLDFR ponds for the protection of foraging birds is possible and may decrease shorebird and dabbler exposure, the extension of our existing K data to reflect the true attractiveness of the actual drawdown acreage (rather than the entire pond complex) is probably an inappropriate use of the data.

The net result is an overestimate of K values, and inadequate mitigation prescriptions. For example, assume a theoretical case of a 100-acre alternative habitat wetland with a mean density of 4 birds per acre (total 400 birds in censuses, on average). If an adjacent 1,000 acre evaporation pond contained an average of 2,000 birds per census, the mean density for the entire system would be 2 birds per acre on a system-wide basis (consistent with the figures feeding our current density estimates). The calculated K value in the alternative habitat model would be $4/2 = 2$ —or the alternative habitat is assumed twice as attractive as evaporation pond habitat.

However, if in fact the majority of birds during censuses on the pond were within some drawn down subsection of the evaporation basin (say on 200 acres worth), the actual attractiveness of that habitat or density is $2,000/200$ or 10 birds per acre. Using this figure instead in the K calculation yields a value of $4/10 = 0.4$ birds per acre. In this example, the smaller drawdown area of the evaporation basin actually was 2.5 times *more* attractive than the alternative habitat to foraging birds. For that subunit (the drawn down acreage of the pond), we have now considerably underestimated the relative attractiveness of the alternative habitat.

Earlier in the discussions around the appropriate summary statistic to use for K, there was consideration for either median or mean values as the most useful measure. The inherent problem was high outliers, or an incidence of occasionally very high evaporation pond census counts for certain species. It is likely that these high counts reflect specifically those drawdown events where shallow habitat was very attractive to foraging flocks of shorebirds and dabblers (pers. Comm., J. Seay). Given this likelihood, a better measure of attractiveness for the difference between maximum- and average-wetted area for the evaporation ponds would be found in the summary statistics that preferentially capture the higher end of the evaporation pond census data distribution (or in the case of the K metric, which reflects counts on the alternative

habitat versus the evaporation ponds, the relationship is inverse and the high evaporation pond counts lead to low K values).

However, given the uncertainties involved and the biases inherent in the data, it is debatable whether this analytical modification is more or less advantageous than sticking to the traditional acre-by-acre approach. It is therefore preferentially recommended that the traditional approach (calculating mitigation acreages using existing K values and for all pond acreage) is maintained, and assuming that the degree to which Reclamation may further reduce attractiveness on the SLDFR ponds by engineering design and active water management reflects an additional protective measure that will serve to buffer risk. It should be noted that this buffer would also serve to protect migratory birds from mortality associated with evaporation pond stressors other than selenium (e.g., salt toxicosis and salt encrustation on feathers). The Service believes this strategy is the most appropriate use of already imperfect data, in that we are erring on the side of empiricism above projection.

Upon raising these concerns within the Mitigation Working Group, the response from URS included, 1) that intensive hazing and managing mitigation habitats to maximize attractiveness should be able to maintain comparable K figures to those estimated using the modified approach (mitigating for the drawdown acres alone); and 2) that the economic incentive for building vertical side walls on the ponds is predicated on the modified approach (without the up-front mitigation requirement reduction, the up-front investment in engineering doesn't pay off).

The Service believes that the alternative habitat from which the existing bird density estimates are derived are already managed largely to provide ideal shallow water habitat (as pond operators in general have no other interest or incentive to allocate fresh water resources to these systems). While, in practice, the Service acknowledges Reclamation may well improve upon the performance of the (lower-budget) private operations built to date; it is unclear that a substantial improvement upon these systems is a fair presumption—especially when the assumption in Item #4 is taken into account (see discussion below).

In terms of the incentive for vertical side walls and intensive management of pond depths, the Service agrees that the SLDFR pond systems would most likely prove less attractive to shorebirds and dabbling ducks than current evaporation basins. However, the Service believes that the incentive for radical pond redesign rests on its own merits, and will be rewarded should their actual performance during the mitigation monitoring phase prove as exceptional as planners anticipate. The difference in this case is that performance would be empirically proven, rather than projected *a priori*. In the interest of protecting migratory bird populations, the Service unequivocally prefers proof to projections, and recommends this more conservative approach.

Item #2: The 10 mg/kg dilution standard for the adult mortality threshold.

The dilution standard in the EIS for non-breeding effects is currently based on a No Observed Adverse Effect Level (NOAEL) in mallards of 10 mg/kg in the diet (Heinz et al., 1989; Heinz and Fitzgerald, 1993). Fairbrother and Fowles (1990) documented depressed immunocompetence at as little as 2.2 mg/L selenium in the drinking water of mallards. Skorupa et al. (1996) estimate this corresponds to a dietary concentration of 5.5 mg/kg selenium. If this finding is accurate, the NOAEL for selenium as indicated from that study is actually somewhere below 5.5 mg/kg in the diet of mallards. Further, this study was conducted under lab conditions, where additional stressors (e.g., winter, competition, predation) are not factors.

The Service does not concur that 10 mg/kg dietary selenium is an appropriate target for the adult-mortality dilution standard in the mitigation calculations. Further discussion regarding the most appropriate estimate to apply to the SLDFR ponds for the adult mortality NOAEL is presented in Appendix 1. Basically, the Service prefers a dilution standard closer to 5 mg/kg (dry weight) selenium in the diet of migratory birds using the SLDFR evaporation basins.

Moreover, the adult mortality protocol is based on a conflicting assumption to one of the underlying premises of the Service's 1995 breeding protocols. Specifically, the landscape assimilative approach for breeding birds is tied to narrower home ranges associated with the selection and establishment of territories associated with specific nesting sites. The adult mortality protocols are insensitive to location (as they are conceptualized on a much larger landscape). This particular protocol is a regional model, and assumes that home ranges for exposed avifauna are broader in area, and more flexible than breeding season home ranges. As such, the location of provided mitigation habitat is not a critical parameter (only the total amount and the performance with respect to survival of birds using this habitat).

While the Service agrees that Reclamation's dilution followed by compensation approach is theoretically possible, it is not clear that the breeding season alternative habitat protocol (USFWS, 1995b) is robust enough to adapt to an adult-level dilution strategy (except insofar as the provided acreage meets the prescriptions as outlined in the adult mortality protocol [Appendix 1]). Conceptually, locating mitigation habitats remotely from evaporation ponds (compensation habitat) will increase residence time on these facilities, and reduce the likelihood of foraging at evaporation basins. If Reclamation is confident evaporation basin management will minimize attractiveness of these facilities to dabbling ducks and shorebirds, it may be more productive in the end to mitigate for adult mortality with compensation as opposed to alternative habitat.

Item #3: Compensation habitat above the alternative habitat prescription during the breeding season.

With respect to reproductive impacts to shorebirds and dabbling ducks, the Service generally concurs with this strategy—as the existing protocols are flexible in this regard. The net effect on a population level would provide compensatory replacement for lost production. The only difference in the Service’s recommended approach (to use a tighter adult mortality dilution standard) would be that the compensation habitat required to offset any residual breeding season losses would be reduced (as more alternative habitat is required).

It should be noted that strategies involving the dilution of adult exposure to a dietary threshold as high as 10 mg/kg will lead to egg concentrations of 20 mg/kg or higher, and significant reproductive impairment is expected at these levels. One might argue that provision of alternative habitat at this level falls so far short of the alternative habitat protocol’s fundamental underlying objective (to dilute dietary selenium to 2.6 mg/kg) to render it functionally ineffectual. For example, it isn’t clear that partially diluting the influence of the ponds with the provision of modest acreages of adjacent alternative habitat may not be a counterproductive strategy overall (in essence, breeding shorebirds and dabbling ducks are being drawn to the ponds and their eggs will exhibit significantly elevated selenium concentrations—with the attendant reproductive effects).

Given these possibilities, it is probably more prudent to use the varied models in discrete form to apply to the specific endpoints of interest. In other words, if alternative habitat is to be constructed, it may be preferable to apply the 1995 protocol without modifying the dilution standard, or simply to locate all mitigation habitats remote from the SLDFR ponds in the form of compensation habitat. This strategy may well prove more productive in the end, considering the technical difficulties of delivering high quality water to the probable location of future evaporation basins (assuming these areas will be located in low-lying drainage impaired areas, adjacent to reuse facilities, where source water would have to travel through canals subject to low-quality groundwater seepage, etc.).

Item #4) The provision of habitat timed to coincide with the appearance of shallow water on the evaporation basins.

The Service is concerned about the efficacy of this current strategy. It is not clear that productive and attractive habitat can be created in the very short-term that this practice envisions. Alternative and compensation habitats are designed to attract and sustain migratory birds as mitigation for the exposure on the evaporation basins. A strategy that simply irrigates graded and constructed basins held empty for the majority of the year may not provide habitat of sufficient quality to support sufficient densities of shorebirds and dabbling ducks. For example, what timing and duration of inundation is required to support the appropriate vegetation and

invertebrate community at sufficient densities? How will mudflats suitable for foraging be maintained or provided within the near-term as freshwater is applied to predominantly inoperable wetlands likely characterized by substantial vegetative cover? How readily could operators create attractive nesting habitat within the time frame (and exposure interval) of the initiation of breeding? Experience has shown that private duck clubs, State and Federal refuges with careful, annual maintenance towards wetland management consistently draw higher numbers of dabbling ducks relative to clubs that basically flood up solely during the hunting season (pers. Comm., D. Garrison).

The existing evaporation basins are mitigated with wetlands on a year-round basis. If Reclamation plans to vary mitigation acreages by season (consistent with adopting the adult mortality protocols during the non-breeding season), some management adaptations are foreseeable. However, changes on a scale as radical as these (flooding reactively in anticipation of shallow water events on the ponds as opposed to the anticipation of breeding) require details and justification to support the contention that this sort of mitigation will be effective. In this case, the Service again prefers a precautionary approach that starts with what is known, and iteratively scales back or implements other options as monitoring and experimentation support planning projections.

Item #5) Diving duck mitigation habitat shall be entirely in the form of compensation habitat.

The Service concurs with this approach for the purpose of avoiding drawing nesting diving birds into the immediate vicinity of the evaporation basins.

Item #6) On a contingency basis, Reclamation will provide as much as two times the "initial estimate" of mitigation acres.

The Service prefers the approach suggested in the Adult Mortality Protocol for the application of safety margins. Specifically, we have applied a two-fold extrapolation factor intended to serve the combined function of protecting for species that may be more sensitive than the mallard (e.g., coots) and to scale from lab to field conditions (where natural stressors serve to lower observed effects levels). This safety factor has been applied at the level of the dose-response curve as opposed to the final mitigation estimate. It is the Service's opinion that this parameter is the appropriate target for the application of safety factors—the field of risk assessment itself is largely predicated on this very approach.

The reason that this particular application has a large influence on the final mitigation prescriptions is precisely because of the steepness of the associated dose-response curve for selenium-induced mortality. However, the Service does not believe that the magnitude of this difference argues for applying the safety factor at some other point in the risk assessment. The substantial differences in acreage prescriptions observed by applying a two-fold safety factor to the dose-response curve should instead be a clear warning to decision-makers about the very real

and substantial risks associated with even a slight miscalculation within a project whose mitigation is based upon already uncertain predictive models. The Service therefore cannot concur with the approach of applying a safety factor at the level of the initial estimate for mitigation acres, unless that safety factor is considerably magnified (to recapture the very risks it sidesteps by shifting the metric away from the more appropriate parameter).

Effects to Terrestrial Resources

As part of SLDFR, the Service has been advocating the development of land management plans for the lands to be “retired” by the possible alternatives. The Service has identified lands in the region spanning between Cantua Creek and the Mendota WMA, largely slated for retirement, that may serve as useful lands on which to place restored corridors and easements with land management practices to aid recovery for San Joaquin kit fox (among others).

As discussed in several interagency meetings, the Service is very concerned about indirect effects of accelerated conversion of native habitats within the western portions of the SLU delivery area. It seems logical to presume that releasing significant volumes of water for other uses within the discretion of the various SLU districts may lead to expansion of irrigated acreage into these sensitive areas. There remains significant confusion surrounding the mapping boundaries concerning authorized place of use, expansion areas, encroachment areas, and contract service areas for districts both directly involved with the current project alternatives (i.e., Westlands), and indirectly connected through existing and pending water transfer arrangements (e.g., Coalinga, Avenal, Pleasant Valley, and others). Reclamation has consistently maintained that these elements are separate from the SLDFR, and indeed by mutual agreement with the Service, these issues have largely been deferred to the San Luis Long-Term Contract Renewal evaluation. It is sufficient to mention for purposes herein that these issues remain unresolved to date.

Reclamation has since pledged that any land retirement program undertaken as part of the SLDFR will have explicit objectives to further listed species recovery consistent with meeting drainage related goals (Biological Opinion draft assumptions language, January 25, 2006). The Service is very pleased with this element, and looks forward to coordinating with Reclamation toward the integration of these shared objectives within the implementation of the SLDFR. The Service recommends that Reclamation begin the planning phase of these elements of the project as soon as possible (preferably in tandem with the feasibility analysis and mitigation siting and management planning to be conducted this spring). The Service further recommends that Reclamation, jointly with the Sacramento Fish and Wildlife Office, convene a SLDFR technical team under the larger San Joaquin Valley Recovery Team, and invite other interested parties and stakeholders to coordinate and integrate these recovery objectives in a practical manner.

Resource Categories

Many elements of proposed project would occur on low habitat value agricultural land. However, some cultivated land could be converted to drainwater reuse facilities and evaporation ponds, potentially toxic to wildlife. Also, by potentially freeing up water, there could be expansion of farming into native/annual grasslands west of Interstate 5.

Through application of the Service's Mitigation Policy, we have determined the following mitigation planning and goals would apply to the habitats potentially adversely impacted by the proposed action:

- Wetlands and wildlife management areas receiving water supplies from the Delta-Mendota Canal, San Joaquin River, and Mendota Pool. The evaluation species for the wetlands habitats found on these areas are the waterfowl and shorebird guilds. These species were selected because (a) they utilize this habitat for feeding, loafing and breeding, (b) they are important for consumptive and non-consumptive human uses (i.e., waterfowl hunting and bird watching), and (c) the Service is responsible for their management under the Migratory Bird Treaty Act. Wetland habitats are severely reduced in the project area and ecoregion, and are valuable for a variety of wildlife species. Therefore, the Service designates this habitat as Resource Category 2. Our associated mitigation planning goal for this category is "no net loss of in-kind habitat value."
- California prairie (pastures) salt bush, vernal pools, and riparian habitats. The evaluation species selected for these habitats are Swainson's hawk, California vole, and migratory birds. Swainson's hawk was selected because it (a) either nests or forages in one or more of these habitats and (b) has high non-consumptive human uses (bird watching). California vole was selected as an evaluation species because it is a ground-dwelling species in these habitats which serves as a prey for higher trophic-level predatory mammals and birds. Migratory birds were selected because (a) they utilize this habitat for feeding, loafing and breeding, (b) they are important for consumptive and non-consumptive human uses (i.e., waterfowl hunting and bird watching), and (c) the Service is responsible for their management under the Migratory Bird Treaty Act. These habitats are reduced in acreage in the project area and ecoregion and are valuable to a variety of wildlife species. Therefore, the Service lists these habitats as Resource Category 2. Our associated mitigation planning goal is for "no net loss of in-kind habitat value."
- SLU agriculture land growing cotton, tomato, pasture, grain and hay, idled fields, and other agricultural fields. Small mammals were selected as the evaluation species for the above identified agricultural lands in the project area. Small mammals were selected because of their important role in the food web as prey species for raptors and larger mammals that forage in these lands. Typically, agricultural lands in the project area are

characterized by intensive farming. The type of crop grown and past harvest land management practices affect the value of the lands for wildlife (crop type is usually a key factor in assigning value); therefore, the Services designates these agricultural habitats in the project area potentially impacted by the project as Resource Category 4. Our associated mitigation planning goal is to “minimize any loss of habitat value.”

- All San Joaquin Valley river systems and the Bay/Delta. Anadromous fish and migratory birds were selected as the evaluation species for these habitats. Anadromous fish were selected because (a) they are dependent on these habitat for one or more phases of their life cycle (i.e., spawning, rearing), (b) they are important for consumptive human uses (i.e., sport and commercial fishing), and (c) the State and Federal governments’ responsibility for their management. Migratory birds were selected as evaluation species because (a) they utilize this habitat for feeding, loafing and breeding, (b) they are important for consumptive and non-consumptive human uses (i.e., waterfowl hunting and bird watching), and (c) the Service is responsible for their management under the Migratory Bird Treaty Act. The health of this system is critical to anadromous fisheries and migratory avifauna, and is explicitly tasked through CALFED and other initiatives. Therefore, the Service lists these habitats as Resource Category 2. Our associated mitigation planning goal is for “no net loss of in-kind habitat value.”

Evaluation of In-Valley Action Alternatives

As of this writing, the Service’s understands that Reclamation has selected the Drainage-Impaired Area action as the preferred alternative for SLDFR action. From the environmental perspective, the preference of the Service is, and has been, no new evaporation facilities. Therefore, alternatives that eliminate or minimize the acreage of evaporation facilities are environmentally-preferred. The proposed modifications to basin design over and above current state of the art (e.g., using near-vertical walls) may help reduce, though not eliminate risks to nesting avifauna. In the case of wintering diving ducks and coots, these may have no influence on foraging activity, basin use, and therefore risk.

The greater the amount of land retirement, the lesser the requirement for evaporation ponds, reuse facilities, and the attendant mitigation to compensate for the negative environmental effects of these disposal alternatives. Given the incredible amount of risk and uncertainty inherent in (up to) roughly doubling the Valley’s acreage of evaporation facilities containing selenium in biota and salts at concentrations sufficient to cause significant avian mortality, it is clear that alternatives which minimize this element via effectively reducing the volume of seleniferous and saline drainage from the impaired lands within the SLU are environmentally preferred. As such, the Service fully concurs with the selection of the Drainage Impaired Area action as the preferred SLDFR alternative (among the ones being evaluated).

Considering that the Drainage Impaired Area alternative is projected to generate a surplus of available CVP water—water the Service believes should revert to beneficial uses consistent with the objectives of CVPIA—this action also carries potentially significant attendant benefits for fish and wildlife enhancement in the region. The Service’s calculations suggest that approximately 230,000 acre-feet per year would be made available through this action. The benefits to the natural environment of the region from a portion of this water could be appreciable.

However, as the Service has mentioned in previous planning aid memoranda, NEPA comment letters, and our Draft FWCA report, we believe *full* land retirement of the 379,000 acres identified as drainage impaired lands is the best all-around solution to the drainage problem. The Service disagrees with providing high-risk drainage service based on unproven treatment systems. Retiring all drainage impaired land continues as our environmentally-preferred action. It would maximize avoidance of adverse environmental effects (both lethal and sublethal), avoid evaporation pond mitigation uncertainties and associated expenditures, and help resolve the drainage problem in a balanced resource management approach.

We believe the Service’s Preferred Land Retirement Alternative (*full* retirement) for the San Luis Drain Feature Re-Evaluation Project would release Reclamation from any future obligation to provide drainage service to the SLU while maximizing avoidance of adverse environmental effects. Our contention is that a full retirement alternative represents the most logical and least risky option to finally solve the drainage problem from the perspective of protecting and enhancing regional fish and wildlife resources. This land retirement alternative is compatible with CALFED and CVPIA goals and objectives by reducing project water demand, increasing available supplies, enhancing fish and wildlife habitat, and reducing contaminants reaching the Delta. It is an approach that appears most compatible with both the Service and Reclamation’s respective missions, since the goal is to find a drainage solution for the study area which includes measures to preserve, protect, restore, and enhance fish and wildlife resources affected by water deliveries to the SLU.

The Service strongly prefers to address SLU drainage issues with options that would eliminate the need for drainage service altogether. The Service believes the SLDFR should seek a more permanent and complete resolution of drainage issues in the San Joaquin Valley. Drainwater management is expensive and risk-laden. There are simply too many outstanding uncertainties associated with the SLDFR to safely project successful, cost-effective implementation of a drainage management strategy; manageable wildlife risks; and, therefore, adequate and feasible mitigation.

The Service is extremely uncomfortable permitting evaporation basins as a drainage-service option given the history of Kesterson Reservoir. We therefore believe that the only real,

sustainable solution to the drainage problem in the San Joaquin Valley is to remove the fundamental underlying source of the problem.

SUMMARY

The Service has significant regulatory and resource management responsibilities in the California's Central Valley, including the San Joaquin Valley. The Service is very interested in finally resolving the drainage problem in the San Joaquin River Basin, and has actively participated in many past efforts addressing the drainage issue. The Service continues to support the goals of the SJVDP Rainbow Report (SJVDP, 1990), which approached the resolution of the drainage problem by recommending an integrated, comprehensive program of pragmatic actions representing a broad political consensus. However, the Service recognizes that since SJVDP sunsetted, almost 16 years have elapsed. New programs for environmental protection, enhancement, and restoration are on-going under the CVPIA and CALFED, and these dictate a revised focus of the SJVDP's recommendations. The Rainbow Report action components need prioritization to reflect current conditions and objectives.

The Service does recognize some project benefits (relative to the status quo) amongst the various elements of the SLDFR. Net benefits are expected for the lower San Joaquin River—a system currently impacted by drainwater discharges via the GBP. There may be some anticipated benefits to Grasslands management area duck clubs and Refuge water from water quality improvements in the Delta-Mendota Canal, yet lands in the region will continue discharging drainwater to service canals in the region. There are anticipated benefits from implementing closed collection and conveyance facilities as opposed to the existing system of open drains. There are potential significant benefits associated with any surplus water that may be created by extensive land retirement (consistent with the preferred alternative). Similarly, a proactive land retirement strategy that incorporates siting and management practices to further species recovery on retired lands holds the potential for significant benefits to upland species and habitats in the region.

What is probably clearly evident to readers of this report is that the influence of the SLDFR to fish and wildlife resources is a complicated picture. Environmental risks and benefits are a mixed bag, with many outcomes dependent on difficult to predict contingencies. What even the environmentally-preferred alternative within the SLDFR is doing in the Northerly Area is essentially shifting pollution risk from the River to migratory birds in the 1,270-acre evaporation basin and 7,500-acre reuse facilities. Detrimental impacts on the reuse areas are expected to be smaller scale, but acute. The impacts associated with the new evaporation basins would be large scale, especially if implemented with lower levels of land retirement as proposed in the In-Valley or Groundwater Quality alternatives. Finally, the mitigation prescriptions presented in Table 2 for adult mortality are associated with only selenium induced mortality. The risk assessment has

not quantified risk, or prescribed mitigation for impacts associated with salt toxicosis or encrustacean (known fatal endpoints on existing evaporation ponds).

On balance, it is the Service's opinion that Reclamation's alternatives presented in the EIS do not provide equal consideration to fish and wildlife resources. The ability of the Service to successfully implement its mission and accomplish its regulatory responsibilities and conservation management objectives at the ecosystem level would be hampered by implementing any of the currently presented alternatives. Although the current alternatives indeed discontinue Grassland Bypass drainage discharges to the San Joaquin River prior to 2009, none as currently envisioned would contribute to CALFED or CVPIA goals and objectives to improve the Bay-Delta ecosystem, while providing a more reliable water supply.

In this action (along with concurrent contract renewals and other decisions), Reclamation is responsible for implementing policies that will undoubtedly have a significant impact upon land and water use within and beyond the San Joaquin River Basin for several decades to come. The Service believes that any decision on this project will be potentially significant to San Joaquin Valley fish and wildlife resources.

Mitigation Approaches

In recommending mitigation for adverse impacts to any of the habitats affected by the proposed project, the Service recommends following, to the extent feasible, the sequential mitigation steps recommended in the Council on Environmental Quality's regulations. These steps favor *avoidance* above *minimization* of impacts and *compensation* for unavoidable adverse effects.

The CVPIA affords fish and wildlife equal status along with agriculture, municipal, and industrial water users. The currently proposed alternatives within the SLDFR do not provide fish and wildlife resources equal status. The proposed mitigation measures for adverse impacts of evaporation ponds presented to the Service to date fall short of our best-available scientific estimate for the amount of habitat that would be required to compensate for losses of migratory birds.

The Service remains very concerned with the potential for adverse environmental effects of installing over 3,200 acres of highly toxic evaporation ponds, and up to 19,000 acres of drainwater reuse acreage. Considering the high degree of uncertainty relating to the attendant risk assessments, in a worst case scenario, the Service is concerned that the amount of clean freshwater finally required for adequate mitigation may not be available, and therefore adequate compensation would be infeasible.

Given such attendant uncertainty in the risk assessment projections, mitigation through **compensation** must include a contingency plan to cease water deliveries to drainage-impaired land and close evaporation pond complexes should treatment, compensation, and/or mitigation

efforts fail. In such an unfortunate circumstance, adequate mitigation measures would shift the risk back upon the project itself, and in this worst case scenario, Reclamation would be forced to abandon all investments in infrastructure towards In-Valley drainwater disposal and re-evaluate from the remaining options. The Service believes that there is a real possibility that adequate mitigation will be infeasible on a scale required for the full scale In-Valley disposal alternative (>3,200 acres of evaporation basins), and suggests that such disposal options are not the most prudent means to solve the drainage problem.

The Service recognizes the value in **minimizing** potential adverse effects. Evaporation basins are a clear and proven risk to migratory birds, including species of management concern. In this light, strategies to minimize source-loading such as irrigation efficiency are recognized and valued contributors to reducing exposure. Proposed actions to limit attractiveness to waterbirds (e.g., steeper slopes, vegetation control, hazing, sheet pile pond separators) are useful, but not entirely effective. Many of these measures are already part of the Waste Discharge Requirements for existing ponds within the Tulare Lake Basin, however census data (the same data upon which the current risk assessment protocols are dependent) show that avian use of these modified systems continues. Treatment holds the promise for reducing influent selenium concentrations and perhaps dietary exposure, but this technology remains unproven (see USFWS, 2004). Clearly, the best avenue for risk minimization is to minimize the acreage of evaporation basins themselves. Therefore, the Service finds that eliminating or minimizing the acreage of evaporation basins needed to dispose of drainage water is environmentally-preferred.

Finally, the Service clearly favors **avoidance** of effects to protect fish and wildlife resources. The Service believes that this option is clear and straight forward with respect to the SLDFR—through land retirement. The In-Valley action alternatives in the EIS with increasing levels of land retirement require decreasing acreages of evaporation facilities. However, even the most aggressive land retirement alternative (the preferred alternative, “Drainage Impaired Lands”) still requires extensive evaporation basins—coincidentally in the most selenium-laden region (the Northerly Area).

Although the Service fully concurs that this action alternative is the environmentally-preferred option within the suite of alternatives presented in the SLDFR, this alternative still carries significant risks to migratory- and birds of management concern. Simply shifting risks from one system towards an alternate one does not represent a drainage-solution. In the interest of protecting and enhancing regional fish and wildlife resources, the Service would prefer to see complete retirement from irrigated agriculture of all drainage-impaired lands within the SLU. The Service believes this action reflects the only real and sustainable option currently available to the Department of the Interior as a means to finally solve the drainage problem.

RECOMMENDATIONS

The Service provides the following recommendations to Reclamation that apply specifically to the SLDFR, and generally to larger management objectives within the San Joaquin River Basin, San Francisco Bay, and Sacramento/San Joaquin Delta. We believe implementation of these recommendations will provide a focus on long-term, sustainable ecosystem values, will lead to a much-improved balance of water supply with demands, will provide for sustainable agriculture and improved water quality, and will increase the quantity and quality of San Joaquin Valley habitat. In addition, implementing these recommendations will assist in the recovery of numerous listed species, and the protection of millions of migratory birds.

The Service recommends that Reclamation:

(1). *Adopt a policy that maximizes retirement (through all appropriate means) on drainage-impaired lands.* In recommending mitigation for adverse impacts to any of the habitats affected by the proposed project, the Service recommends following, to the extent feasible, the sequential mitigation steps recommended in the Council on Environmental Quality's regulations. These steps favor *avoidance* above *minimization* of impacts and *compensation* for unavoidable adverse effects. To avoid and minimize risks and effects to fish and wildlife resources in the San Joaquin Valley and Pacific Flyway, the Service recommends land retirement on all drainage impaired lands in the SLU. This approach would maximize the elimination of drainage at its source, and therefore avoidance of adverse fish and wildlife effects.

(2). *Maximize avoidance and/or minimization of Project impacts to fish and wildlife.* The Service prefers a more conservative approach to mitigation, and would encourage Reclamation to include appropriate up-front mitigation prescriptions within the "initial estimate" for mitigation. Specifically, these are reflected in the seasonal protocol outputs from the adult mortality model (Appendix 1); or, during the breeding season, by the 1995 Service Alternative and Compensation Habitat protocols (limited to the mutually agreed-upon amendments, as above). Upon meeting this standard, it is recommended that this initial estimate for contingency planning purposes be doubled for contingency planning within the feasibility analysis. The Service prefers to start with our best-available-scientific estimate for mitigation, and adjust acreages up or down following appropriately-designed, statistically-robust mitigation monitoring studies (consistent with existing WDR's in operation on current evaporation basins).

(3). *Consider and include mandates, directives, and requirements of all applicable laws, policies and programs.* The Service recommends that Reclamation, in its efforts to solve SLU drainage issues, fully consider and include mandates and directives as provided under the CVPIA, the CALFED Bay/Delta Program, the ESA, the Clean Water Act, and the Migratory Bird Treaty Act. As an example, retiring drainage impaired lands in the SLU should reduce water demand such that unmet environmental needs, including refuge level 4 water supplies, could be met through water made available via land retirement.

(4). *Continue to support efforts of the Mitigation Work Group.* The Mitigation Working Group efforts to date have been generally fruitful. There are many outstanding issues, however, that have been deferred until after the Final EIS release due in part to considerable time constraints. These include: the preparation of mitigation monitoring and adaptive management plans; full discussion of risks associated with reuse facilities and possible mitigation measures; final siting and management planning for project facilities; and detailed cost estimation and framing of the feasibility analysis. The Service hopes to continue this collaboration with Reclamation, the Regional Board, and CDFG through the next year and into the implementation of the selected alternative in the Record of Decision.

(5) *Expand the Mitigation Work Group, or form new technical advisory committees to match the shifting project emphasis.* The next phase of SLDFR involves siting and management of project facilities, including mitigation wetlands. The Mitigation Working Group would benefit from the expertise of experienced wetland managers and restoration ecologists. The Service recommends broadening the scope of participants within the group, or at least establishing a more formal outreach effort to ensure proper coordination and incorporation of local expertise for successful implementation of broad project objectives.

(6). *Maximize efforts to assist recovery of threatened and endangered species.* The Service recommends that Reclamation begin the planning phase for the objectives to further listed species recovery associated with land retirement as soon as possible. The Service further recommends that Reclamation, jointly with the Sacramento Fish and Wildlife Office, convene a SLDFR technical team under the larger San Joaquin Valley Recovery Team, and invite other interested parties and stakeholders to coordinate and integrate these recovery objectives in a practical manner.

(7). *Finalize section 7 consultation with Sacramento Field Office Endangered Species Division.* At the time that this report was completed and submitted for printing and release in the Final SLDFR EIS, the section 7 endangered species consultation had not been completed. It is fully expected that the final Biological Opinion will be available by the time the Record of Decision is released. However, due to these timing constraints, some elements contained within the ESA document may not be reflected fully in this report.

This report and associated documents are intended to assist the Bureau of Reclamation in the preparation of the SLDFR, EIS and associated Record of Decision. The risk analysis associated with the Service's FWCA report is specific to the SLDFR and the potential operation of evaporation basins constructed to provide drainage service to the SLU. The information and analysis contained herein is for technical planning purposes only, and do not constitute official policy of the Service with respect to take or mitigation for take of migratory birds protected under the Migratory Bird Treaty Act of 1918 (16 USC 703-712; Ch.128; July 13, 1918; 40 Stat.755).

The Service remains committed to its Service Mitigation Policy which states that it is our policy to recommend, in order of preference, avoidance and minimization of impacts to fish and wildlife resources, before compensation for losses. The prescriptions for mitigation acreage provided in this report and the models contained herein would be applicable under this third (least preferable) tier of mitigation. The recommendations provided herein are meant to be conceptually accurate and scientifically defensible, and are intended to stand independent of issues regarding the legality of mitigation for take of migratory birds protected by the Migratory Bird Treaty Act.

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