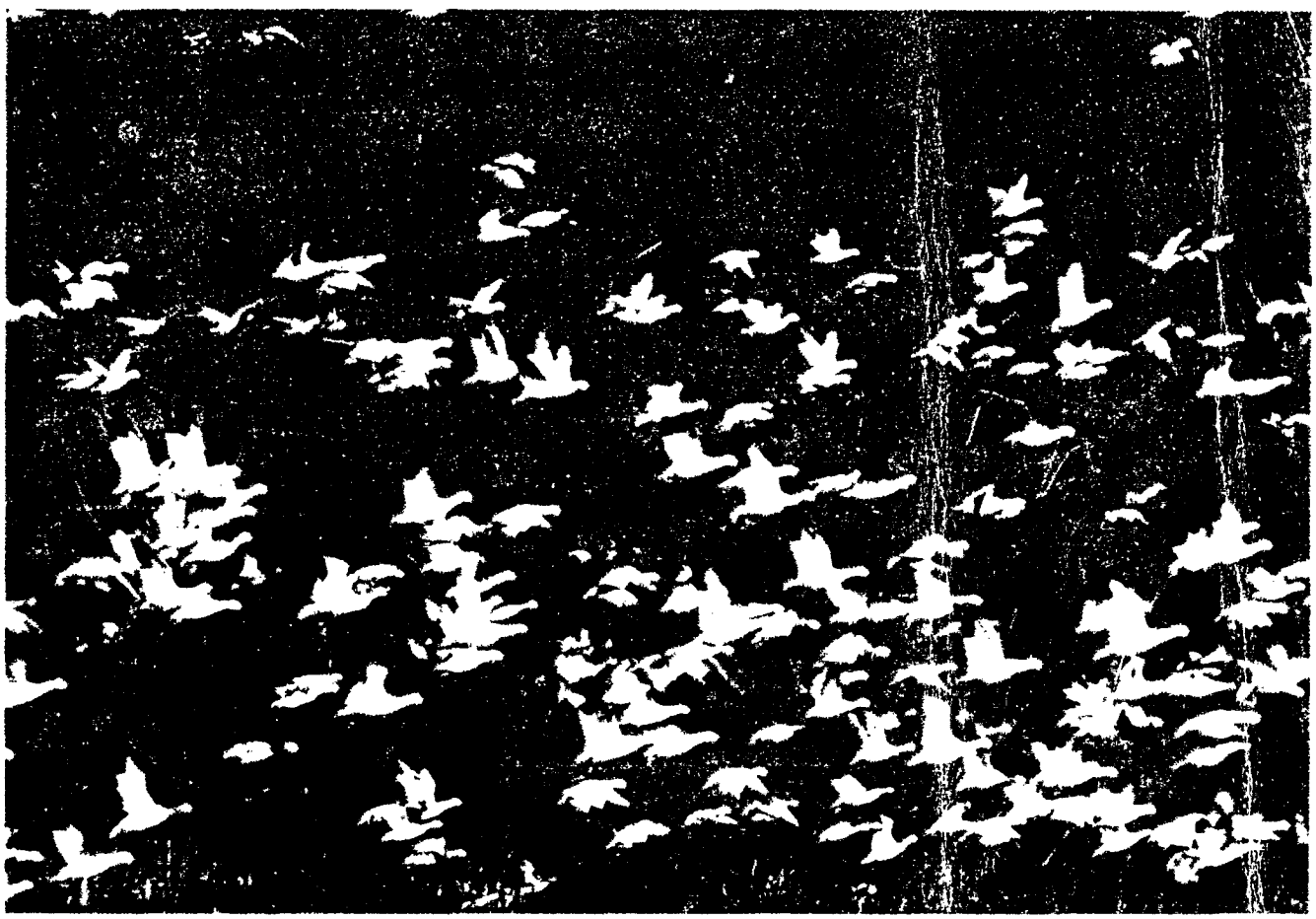
REPORT ON REFUGE WATER SUPPLY INVESTIGATIONS

Central Valley Hydrologic Basin, California



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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
MID-PACIFIC REGION

THIS REPORT WAS PREPARED UNDER THE DIRECTION OF THE REGIONAL DIRECTOR, MID-PACIFIC REGION OF THE BUREAU OF RECLAMATION, PURSUANT TO FEDERAL RECLAMATION LAWS (ACT OF JUNE 17, 1902, 32 STAT. 388 AND ACTS AMENDATORY THEREOF OR SUPPLEMENTARY THERETO). THE PURPOSE OF THIS REPORT IS AS A PUBLIC INFORMATION DOCUMENT. THIS REPORT PROVIDES INFORMATION AND ALTERNATIVES FOR FURTHER CONSIDERATION BY THE BUREAU OF RECLAMATION, THE SECRETARY OF THE INTERIOR, AND OTHER FEDERAL AGENCIES. PUBLICATION OF THE FINDINGS AND RECOMMENDATIONS HEREIN SHOULD NOT BE CONSTRUED AS REPRESENTING EITHER THE APPROVAL OR DISAPPROVAL OF THE COMMISSIONER OF THE BUREAU OF RECLAMATION OR THE SECRETARY OF THE INTERIOR.

EXECUTIVE SUMMARY

INTRODUCTION

The wetlands of California's Central Valley provide critical habitat for migratory birds and for resident wildlife, including many threatened and endangered animal and plant species. The Central Valley is part of the Pacific Flyway, a migratory waterfowl route extending over Canada, the United States, and Mexico. Management of the Flyway is governed by international treaties between the United States, Mexico, and Japan. The Bureau of Reclamation (Reclamation) is the lead agency in a cooperative effort among Federal, State, and local agencies in planning for the development of dependable water supplies for California's Central Valley refuges.

This report presents an analysis of water needs and provides an array of potential water sources and delivery systems for providing a dependable supply of good quality water to ten National Wildlife Refuges (NWR), four State Wildlife Management Areas (WMA), and one privately managed wetland area (RCD) within the Central Valley hydrologic basin of California. The names and locations of these managed wetland areas (collectively referred to as refuges) are presented in Figure S-1.

The intended purpose of this document is to provide information and resource data which, when combined with appropriate information from related investigations discussed in this summary, will be the basis for selecting recommended plans for water delivery to each of the 15 refuges. Those plans together with appropriate environmental documentation will be presented in a Refuge Water Supply Planning Report, which is scheduled to be completed in November, 1989.

SCOPE OF STUDY

The scope of this study is to gather, update, and organize all existing and available information relative to current and desired water use, power needs, surface water delivery systems, groundwater availability, recreation and wildlife resources, and habitat management objectives for each of the 15 refuges. Based upon that information, alternative plans are to be formulated for each refuge to provide dependable water supplies under four water delivery options, as follows:

Level 1 - Existing firm supply
Level 2 - Current average annual water supply
Level 3 - Supply for full use of existing development
Level 4 - Supply for optimum habitat management

A recommended plan for water delivery to each refuge, using the information relative to water allocation and environmental impacts

currently being developed in the Sacramento River and Delta Export Water Contracting Environmental Impact Statements (EIS's), will be selected from the alternatives and presented in the Refuge Water Supply Planning Report.

STUDY ORGANIZATION

Reclamation is the lead agency for this multi-agency study and is responsible for the preparation of this report and the forthcoming Refuge Water Supply Planning Report. The Fish and Wildlife Service, State Departments of Fish and Game and Water Resources, and California Waterfowl Association comprise the core group of agencies and organizations which participated on the planning team and provided technical expertise relative to water and wildlife resources. The Grassland Resource Conservation District has provided both information on privately operated wetlands and monetary contributions for planning efforts through the California Waterfowl Association.

PROBLEMS AND NEEDS

Background

The Pacific Flyway is the westernmost of four migratory waterfowl routes transecting the North American continent. The Pacific Flyway is unlike the others, however, in that most of the wintering waterfowl concentrate in a relatively small area: California's Central Valley. Historically, the Central Valley contained over 4 million acres of wetlands. However, through the conversion of those lands to other uses, the total available acres of wetlands have been reduced to approximately 300,000 acres. Federal National Wildlife Refuges and State Wildlife Management Areas comprise approximately one third of this acreage, with most of the remainder in private ownership.

Each year about 10 to 12 million waterfowl, along with other migratory birds, are estimated to winter in or pass through the Central Valley, more than in all of the other flyway states combined.

It is a popular misconception that wetland refuges are established and maintained primarily for the benefit of waterfowl (ducks, geese, and swans) and waterfowl hunters. While it is true that hunting is a popular activity at most refuges, such activity is tightly regulated. A portion of the revenue received from hunting activities is used to acquire land for migratory bird refuges and waterfowl production areas. It is important, however, to recognize that refuges also provide a multitude of other uses such as: sanctuaries for the purpose of resting, feeding, and breeding for millions of other migratory birds and resident wildlife; flood control; erosion control; nutrient cycling; groundwater recharge; and numerous recreation and educational opportunities.

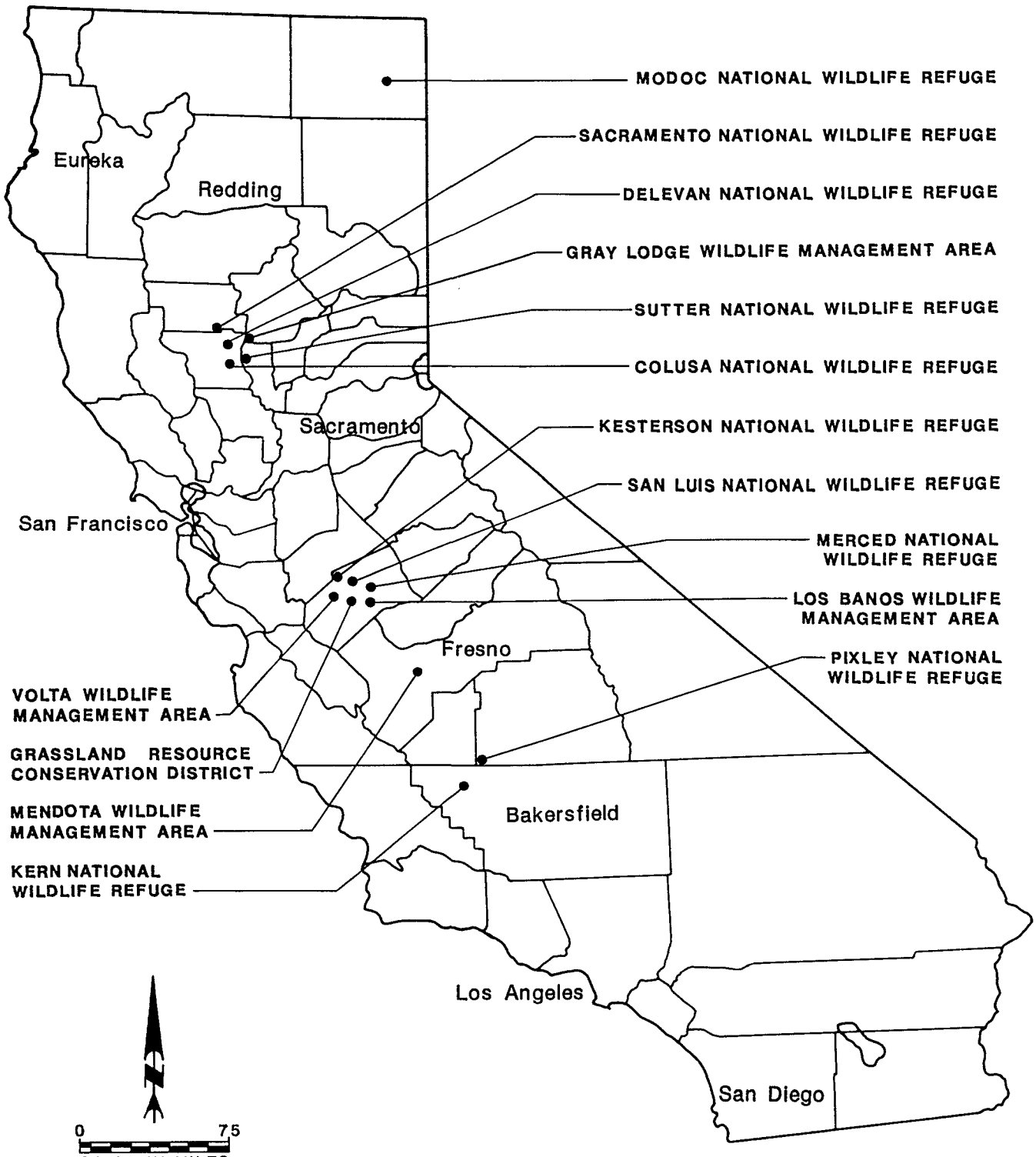

FIGURE S-1

STUDY AREA AND REFUGE LOCATION MAP

Problems

The importance of the remaining Central Valley Wetlands to the Pacific Flyway cannot be overstated. Wintering habitat is the single most important limiting factor for waterfowl using the Flyway. The Fish and Wildlife Service has ranked Central Valley wetland habitat fourth out of 33 on the national habitat priority scale, with a highest priority designation for wintering habitat preservation nationally.

As demands for fresh water increase throughout the Central Valley, available supplies of surface water, groundwater, and agricultural return flows are expected to diminish. It is a consensus among refuge managers and wildlife biologists that without a dependable supply of water to maintain Central Valley refuge wetland habitat, waterfowl numbers could be significantly reduced in the near future.

Currently, only seven of the 15 refuges studied are receiving a firm water supply. Only Mendota Wildlife Management Area has a firm supply in the amount considered necessary for the proper management of existing wetlands and facilities within the refuge boundaries. The remaining refuges must depend on the sources mentioned above and run-off available only during wet weather periods to meet refuge needs. The amount of water available to the refuges varies each year and commonly is not delivered at the time of year desired for appropriate wetland management. Typically, the refuges receive water only after all the agricultural, municipal and industrial demands are fulfilled. The pumping of groundwater could, in part, alleviate the problem of water shortages; however, the costs of pumping have been prohibitive.

Needs

The refuges of the Central Valley need to obtain dependable supplies of good quality water, delivered on a timely basis, to preserve critical wetland habitat for the migratory birds of the Pacific Flyway. The existing water deliveries and supplemental water requirements for each refuge are presented in Table S-1.

Each refuge has its own unique set of problems and needs. Some require additional water during the fall and winter months, some need summer supplies, while others need better quality water than is currently provided. The alternative plans for water delivery were based upon each refuge's needs and represent extensive field investigations. They were developed based upon criteria such as, availability of water, operational flexibility, conjunctive use possibilities, ease of implementation, costs, and potential environmental impacts. Additional alternatives or modifications to alternatives presented in this report may be developed during the preparation of the Refuge Water Supply Planning Report.

Table S-2 provides a summary of alternatives developed for each refuge.

TABLE S-1

REFUGE WATER SUPPLY NEEDS

Refuge	Level 1 (ac-ft)	Level 2 (ac-ft)	Level 3 (ac-ft)	Level 4 (ac-ft)
Modoc NWR	18,550	18,550	19,500	20,550
Sacramento NWR	0	46,400	50,000	50,000
Delevan NWR	0	20,950	25,000	30,000
Colusa NWR	0	25,000	25,000	25,000
Sutter NWR	0	23,500	30,000	30,000
Gray Lodge WMA	8,000	35,400	41,000	44,000
Total Sacramento Valley	26,550	169,800	190,500	199,550
Grassland RCD[a]	50,000	125,000	180,000	180,000
Volta WMA	10,000	10,000	13,000	16,000
Los Banos WMA	6,200	16,670	22,500	25,000
Kesterson NWR	3,500	3,500	10,000	10,000
San Luis NWR	0	13,350	19,000	19,000
Merced NWR	0	13,500	16,000	16,000
Mendota WMA	25,463[b]	18,500	24,000	29,650
Pixley NWR	0	1,280	3,000	6,000
Kern NWR	0	9,950	15,050	25,000
Total San Joaquin Valley	95,163[b]	211,750	302,550	326,650
TOTAL	121,713[b]	381,550	493,050	526,200

Water Supply Level 1: Existing firm water supply

Water Supply Level 2: Current average annual water deliveries

Water Supply Level 3: Full use of existing development

Water Supply Level 4: Optimum management

(a) As of 1985, Grassland Resource Conservation District no longer receives agricultural drainage flows due to water quality concerns.

(b) Only 18,500 ac-ft can be delivered to Mendota WMA without modifications of existing facilities.

TABLE S-2

SUMMARY OF DELIVERY ALTERNATIVES

Refuge	Level 1	Level 2	Level 3	Level 4
Modoc NWR	None	2A. Rehabilitate Well	3A. Rehabilitate Well	4A. Construct Wells, Rehabilitate Dam on Pit River.
				4B. Construct Wells in the Godfrey Tract.
Sacramento NWR	None	2A. Construct Pipeline from Tehama-Colusa Canal.	3A. Construct Pipeline from Tehama-Colusa Canal.	4A. Construct Pipeline from Tehama-Colusa Canal.
		2B. Deliver CVP Water through Kanawha WD.	3B. Deliver CVP Water through Kanawha WD.	4B. Deliver CVP Water through Kanawha WD.
		2C. Construct Pipeline to Transport CVP Water from Tehama-Colusa Canal.	3C. Construct Pipeline to Transport CVP Water from Tehama-Colusa Canal.	4C. Construct Pipeline to Transport CVP Water from Tehama-Colusa Canal.
		2D. Delivery CVP Water from Tehama-Colusa Canal to GCID Lateral 35-C.	3D. Deliver CVP Water from Tehama-Colusa Canal to GCID Lateral 35-C.	4D. Deliver CVP Water from Tehama-Colusa Canal to GCID Lateral 35-C.
		2E. Implement a Conjunctive Use Plan.	3E. Implement a Conjunctive Use Plan.	4E. Implement a Conjunctive Use Plan.
Delevan NWR[a]	None	2A. Convey Water from Sacramento NWR.	3A. Convey Water from Sacramento NWR	4A. Construct Pump Station on 2047 Drain
		2B. Construct Crossover on GCID Lateral 41-1.	3B. Construct Crossover on GCID Lateral 41-1.	4B. Construct Siphons Under the MID Canal
		2C. Improve Hunter's Creek No. 2 Diversion Weir.	3C. Improve Hunter's Creek No. 2 Diversion Weir.	4C. Implement a Conjunctive Use Plan.
		2D. Implement a Conjunctive Use Plan.	3D. Implement a Conjunctive Use Plan.	
Colusa NWR[a]	None	2A. Construct Weir on 2047 Drain and replace Davis Weir.	3A. Construct Weir on 2047 Drain and replace Davis Weir.	4A. Construct Facilities to Serve Tracts 4, 7, 9, and 11.
		2B. Convey CVP Water through Zumwalt Farms and Glenn-Colusa ID.	3B. Convey CVP Water through Zumwalt Farms and Glenn-Colusa ID.	4B. Implement a Conjunctive Use Plan.
		2C. Implement a Conjunctive Use Plan.	3C. Implement a Conjunctive Use Plan.	

TABLE S-2

SUMMARY OF DELIVERY ALTERNATIVES
(Continued)

Refuge	Level 1	Level 2	Level 3	Level 4
Sutter NWR	None	2A. Deliver Water from Thermalito Afterbay through Butte Creek.	3A. Deliver Water from Thermalito Afterbay through Butte Creek.	4A. Deliver Water from Thermalito Afterbay through Butte Creek.
		2B. Delivery Water from Thermalito Afterbay through Wadsworth Canal.	3B. Delivery Water from Thermalito Afterbay through Wadsworth Canal.	4B. Delivery Water from Thermalito Afterbay through Wadsworth Canal.
		2C. Obtain Water from Sutter Extension Water District.	3C. Obtain Water from Sutter Extension Water District.	4C. Obtain Water from Sutter Extension Water District.
		2D. Implement a Conjunctive Use Plan.	3D. Implement a Conjunctive Use Plan.	4D. Implement a Conjunctive Use Plan.
Gray Lodge WMA	None	2A. Construct Ditch from Cherokee Canal.	3A. Construct Ditch from Cherokee Canal.	4A. Construct Ditch from Cherokee Canal.
		2B. Construct Canal from Thermalito Afterbay.	3B. Construct Canal from Thermalito Afterbay.	4B. Construct Canal from Thermalito Afterbay.
		2C. Improve BWGID System.	3C. Improve BWGID System.	4C. Improve BWGID System.
		2D. Implement a Conjunctive Use Plan.	3D. Implement a Conjunctive Use Plan.	4D. Implement a Conjunctive Use Plan.
Grassland Resource Conservation District	None	2A. Convey Water Under the Zahm-Sansoni-Nelson Plan.	3A. Construct Turnouts on Delta-Mendota Canal at Almond Drive and Russell Avenue.	4A. Construct Turnouts on Delta-Mendota Canal at Almond Drive and Russell Avenue.
		2B. Utilize the Wolfson Bypass.	3B. Implement a Conjunctive Use Plan.	4B. Implement a Conjunctive Use Plan.
		2C. Implement a Conjunctive Use Plan.		
Volta WMA	None	None	3A. Construct Turnouts at Main Canal and Upgrade Outtakes.	4A. Construct Turnouts at Main Canal and Upgrade Outtakes.
			3B. Implement a Conjunctive Use Plan.	4B. Implement a Conjunctive Use Plan.

TABLE S-2

SUMMARY OF DELIVERY ALTERNATIVES
(Continued)

Refuge	Level 1	Level 2	Level 3	Level 4
Los Banos WMA[b]	None	2A. Reconstruct SLCC Facilities.	3A. Reconstruct SLCC Facilities.	4A. Reconstruct SLCC Facilities.
		2B. Implement a Conjunctive Use Plan.	3B. Implement a Conjunctive Use Plan.	4B. Implement a Conjunctive Use Plan.
Kesterson NWR[b]	None	2A. Rehabilitate Santa Fe Canal.	3A. Extend Eagle Ditch into Refuge.	4A. Extend Eagle Ditch into Refuge.
			3B. Extend West Side Ditch to Eagle Ditch.	4B. Extend West Side Ditch to Eagle Ditch.
			3C. Convey Water from Garzas Creek to Los Banos Creek.	4C. Convey Water from Garzas Creek to Los Banos Creek.
			3D. Utilize Mud Slough.	4D. Utilize Mud Slough.
			3E. Extend Santa Fe Canal.	4E. Extend Santa Fe Canal.
			3F. Implement a Conjunctive Use Plan.	4F. Implement a Conjunctive Use Plan.
San Luis NWR[b]	None	2A. Enlarge and Line SLCC Facilities.	3A. Enlarge and Line SLCC Facilities.	4A. Enlarge and Line SLCC Facilities.
		2B. Construct Lift Pumps to Utilize San Joaquin River Water.	3B. Construct Lift Pumps to Utilize San Joaquin River Water.	4B. Construct Lift Pumps to Utilize San Joaquin River Water.
		2C. Implement a Conjunctive Use Plan.	3C. Implement a Conjunctive Use Plan.	4C. Implement a Conjunctive Use Plan.
Merced NWR	None	2A. Utilize the East Side Bypass	3A. Extend Casebeer Lateral to Refuge Boundary.	4A. Extend Casebeer Lateral to Refuge Boundary.
		2B. Implement a Conjunctive Use Plan	3B. Extend Casebeer Lateral to Deadman Creek.	4B. Extend Casebeer Lateral to Deadman Creek.
			3C. Implement a Conjunctive Use Plan.	4C. Implement a Conjunctive Use Plan.
			3D. Utilize Treated Wastewater from the Merced Treatment Plant.	4D. Utilize Treated Wastewater from the Merced Treatment Plant.

TABLE S-2

SUMMARY OF DELIVERY ALTERNATIVES
(Continued)

Refuge	Level 1	Level 2	Level 3	Level 4
Mendota WMA	None	None	3A. Change Operation of Mendota Pool	4A. Change Operation of Mendota Pool
			3B. Extend WWD Laterals 4 and 6 to Refuge	4B. Extend WWD Laterals 4 and 6 to Refuge
			3C. Implement a Conjunctive Use Plan.	4C. Implement a Conjunctive Use Plan.
Pixley NWR	None	None	3A. Obtain Friant-Kern Canal Water via Deer Creek.	4A. Obtain Friant-Kern Canal Water via Deer Creek.
			3B. Utilize Mid-Valley Canal Water via Deer Creek.	4B. Utilize Mid-Valley Canal Water via Deer Creek.
			3C. Obtain CVP Water via the California Aqueduct.	4C. Obtain CVP Water via the California Aqueduct.
			3D. Implement a Conjunctive Use Plan.	4D. Implement a Conjunctive Use Plan.
Kern NWR	None	2A. Transport CVP Water through the BVWSD Facilities.	3A. Transport CVP Water through the BVWSD Facilities.	4A. Transport CVP Water through the BVWSD Facilities.
		2B. Transport State Water Project Water through the LHWSD Facilities.	3B. Transport State Water Project Water through the LHWSD Facilities.	4B. Transport State Water Project Water through the LHWSD Facilities.
		2C. Transport CVP Water through the Friant-Kern Canal and Poso Creek.	3C. Transport CVP Water through the Friant-Kern Canal and Poso Creek.	4C. Transport CVP Water through the Friant-Kern Canal and Poso Creek.
		2D. Implement a Conjunctive Use Plan.	3D. Implement a Conjunctive Use Plan.	4D. Implement a Conjunctive Use Plan.

(a) All of the alternatives for these refuges require implementation of Alternatives 2A, 2B, 2C, 2D, or 2E for Sacramento NWR.

(b) All of the alternatives for these refuges require implementation of Alternatives 2A or 2B for Grassland Resource Conservation District.

RELATED INVESTIGATIONS

Present and future water development and use in the Central Valley is being redefined. Valley-wide studies underway by both Reclamation and the State of California are identifying and examining the agricultural, municipal, industrial, recreational, fish, wildlife, and water quality needs for the Central Valley's river basins. Over the next few years, 1987-1990, the State Water Resources Control Board will conduct hearings on the San Francisco Bay-Sacramento/San Joaquin Delta to receive evidence on present water use and future demand. The Board will determine beneficial and reasonable uses for the Central Valley's water supplies and develop water quality standards for the Bay and Delta accordingly.

Water Contracting EIS's

Reclamation is currently examining existing water use, in-basin needs, and future demands as part of its Sacramento River, American River, and Delta Export Water Contracting Environmental Impact Statements. These EIS's will assess all competing water demands and alternatives for contracting and distributing the uncommitted supply of the Central Valley Project in the Sacramento, American, and San Joaquin River Basins. Agricultural, municipal, industrial, fishery, wildlife, recreation, and navigational needs are being considered, as well as optimization of economic benefits and repayment of the project.

At the same time, a framework within which to coordinate the operations of the Central Valley and State Water Projects has now been effected. Public Law 99-546, enacted October 17, 1986, authorized the Secretary of the Interior to sign and implement the Coordinated Operations Agreement for the integrated, orderly and efficient operations of the Central Valley and State Water Projects.

In enacting the Coordinated Operation Agreement legislation, Congress recognized the significance of wildlife refuges in the overall picture of the Central Valley water use. By terms of the legislation, Reclamation is required to reserve 25 per cent of the remaining uncontracted yield of the Central Valley Project until 1 year after a report on refuge supply has been submitted to Congress.

Other Studies

Several other Reclamation studies and investigations related to increasing water supply, water quality, and water delivery are being conducted. The Offstream Storage Investigation is evaluating storage sites to increase water yield in the San Joaquin Valley. The use of wetlands for offstream storage is a component of this investigation. The San Joaquin Valley Conveyance Study is investigating methods to transport water to the Mid-Valley area of the San Joaquin Valley. The conjunctive use of surface and ground water is being investigated as a means to secure dependable water

supplies and increasing Central Valley yield. The multi-agency San Joaquin Valley Drainage Program is conducting investigations to develop long-term solutions to drainage problems in the San Joaquin Valley.

FINDINGS

This report represents the most comprehensive source of up-to-date information on the refuges of the Central Valley available. Based on the information developed during this study, it is clear that each refuge requires a dependable supply of good quality water to facilitate proper wetland habitat management for the migratory birds of the Pacific Flyway and resident wildlife and flora. The amount of water that is ultimately recommended for each refuge will be based upon the information in this report, the findings of the Sacramento River and Delta Export Water Contracting EIS's, and the findings of the other related investigations described above. Those recommendations will be presented in the forthcoming Refuge Water Supply Planning Report.

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