

Chapter Ten: WETLAND WATER SUPPLIES

This chapter outlines the requirements for Central Valley managed wetland water supplies and the current conditions in the valley for obtaining water supplies to meet objectives stated in the 2006 Plan. The chapter also summarizes the history of wetland water supplies in the valley, the significant changes to supplies over time, and the most current and pressing water-related issues within each of the valley's nine basins.

Introduction

Ensuring reliable and affordable water supplies for wetland management may be the Central Valley Joint Venture's (JV) greatest challenge. Since publication of the 1990 Central Valley Habitat Joint Venture Implementation Plan (1990 Plan; Central Valley Habitat Joint Venture 1990), human demand for water in the Central Valley has increased at an alarming rate. At the same time, complex factors have caused the reduction of available water supplies for many wetlands. These include in-stream dedication for threatened and endangered fish species, human population growth, and urbanization. The economic and political competition for water has become intense, and the cost of water in some basins has risen 400% since 1993 (D. Garrison, U.S. Fish and Wildlife Service, personal communication). Stakeholders with competing agricultural, urban, and environmental interests are lobbying on many fronts for reallocation of existing supplies.

Water shortages in California currently approach 1.6 million acre-feet in an average water year and 5.1 million acre-feet in drought years. This deficit is expected to increase to 2.4 million acre-feet in average years and to 6.2 million acre-feet in drought years by 2020 (California Department of Water Resources 1998).

The challenge facing both private and public wetland managers in the Central Valley is two-fold: (1) increasing the reliability of water sources for wetland management; and (2) ensuring that funds for water supplies cover the increasing costs of water in an increasingly

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competitive water market. Many private wetland managers rely on water supplies that are reduced in below-average water years, depend on return flows from agriculture, and/or are part of low-priority contracts with water purveyors. Increasing the reliability of these water sources is a priority for the JV, but water reliability does not guarantee long-term affordability. Wetland managers who continue to have access to reliable water supplies may ultimately be unable to afford water as prices increase. This chapter identifies JV efforts needed to secure reliable and accessible water supplies for Central Valley wetlands.

This chapter has three sections: (1) the history of Central Valley wetland water supplies; (2) water supplies needed to meet integrated bird habitat objectives; and (3) water issues and proposed actions.

The History of Central Valley Wetland Water Supplies

Historical Overview

The loss of wetlands in the Central Valley since the 1850s has been well documented by a variety of publications and reports. Surveys in the 1850s estimated there to be over four million acres of wetlands in the valley. The resulting influx of immigrants into California following the discovery of gold, initiated the changes that led to the conversion of over 90% of Central Valley wetlands. Human settlement increased the need to control annual flooding of the major valley river systems to protect developing cities, homesteads and associated infrastructure. As flood control levees were built to tame the rivers, agricultural lands expanded, and dams were constructed to provide additional flood control and water storage for expanding urban, industrial, and agricultural needs. As the population of California increased, so did this demand for agricultural products and other services. By the 1950s, expanding agricultural development had decreased Central Valley wetlands to an estimated 290,000 acres (Central Valley Habitat Joint Venture 1990).

The continued decline of Central Valley wetlands occurred between 1950 and 1970. Water supplies for managed wetlands during this period were not secure. Most managed wetlands depended upon agricultural irrigation return flows, low-priority water contracts, or non-binding agreements with water districts. Some of those historic agreements continue to this day. Examples include wetlands in the Butte Sink area that receive fall and winter water via a 1922 agreement with Western Canal Company and Pacific Gas & Electric Company; the Sacramento, Delevan, and Colusa National Wildlife Refuges (NWR), which receive water through agreements with Glenn-Colusa Irrigation District; and the Gray Lodge Wildlife Area (WA), which receives a portion of its water needs from the Biggs-West Gridley Water District for lands allocated “Class 1” Feather River settlement water. Another example involves the Grassland Mutual Water Association, which filed suit against the Department of the Interior after losing San Joaquin River supplies when the Friant Dam Project began diverting flows from the San Joaquin River for agriculture and municipal and industrial uses in the Tulare Basin. A settlement provided 50,000 acre-feet of water (if and when available) for wetlands within the Grassland Water District (GWD) during the fall and winter months. The California Department of Fish and Game (CDFG) also negotiated agreements with the U.S. Bureau of Reclamation (USBR) and various local water districts for many of its wildlife areas. With few exceptions, these contracts and agreements provided water supplies on an “if and when available basis,” with supplies being severely reduced, or eliminated, during drought years. This situation continued during the 1970s until a severe drought during the latter part of the decade greatly reduced wetland water supplies and, in some instances, eliminated all wetland water deliveries.

Wetland Water Supply Studies

The combination of drought and poor wetland water supply reliability resulted in significant impacts to wetland habitat and waterbird populations, and in particular, wintering waterfowl. By the end of the decade, political pressure from concerned landowners and wildlife agencies resulted in publication of the *Total Water Management Study for the Central Valley Basin of California* (U.S. Bureau of Reclamation unpublished report). This study included Working Document No. 12, “Fish and Wildlife Problems, Opportunities, and Solutions” (U.S. Bureau of Reclamation 1978), a survey of major fish and wildlife problems and improvement opportunities within the geographical area encompassed by the Central Valley Project (CVP)¹. As a result of the study’s findings, the USBR initiated the *Central Valley Fish and Wildlife Management Study of 1979* (U.S. Bureau of Reclamation 1979). The goal of the study was the development of a comprehensive baseline of Central Valley fish and wildlife resources and to recommend specific solutions to water related issues.

¹The Central Valley Project is a federal water project initially authorized in 1935 as a long-term plan to utilize water in California’s Central Valley. The original goals of the project were flood control, improved transportation of water, and the development of water supplies for industrial, municipal, and agricultural use. Fish and wildlife needs were eventually added as goals, with the CVPIA furthering this objective through the allocation of CVP water supplies for specific fish and wildlife purposes.

These studies continued into the early 1980s and resulted in a report that addressed waterfowl and wetland habitat, *Central Valley Fish and Wildlife Management Study: Refuge Water Supply, Central Valley Hydrologic Basin, California 1986* (U.S. Bureau of Reclamation 1986). This study served as the basis for the *Report on Refuge Water Supply Investigations, Central Valley Hydrologic Basin, California* (1989 Report; U.S. Department of Interior 1989).

As these investigations progressed, other actions were underway that would significantly affect Central Valley wetlands. The *North American Waterfowl Management Plan* (U.S. Fish and Wildlife Service 1986), an international treaty between the United States and Canada, was signed in 1986 and identified the Central Valley as one of the six priority habitat areas for North American waterfowl. The JV was subsequently formed in 1988, and based upon the findings of the 1989 Report, one of the objectives stated in the 1990 Plan was to secure firm, reliable water supplies for publicly-owned Central Valley wetlands and the privately managed wetlands located within the Grassland Resource Conservation District (GRCD) and elsewhere in the valley.

The Central Valley Project Improvement Act

CVPIA Mandates Water for Wetlands

Efforts to secure reliable and accessible sources of water started with ecologically sound estimates of wetland water needs for optimal habitat management and were identified as Level 4 water supplies in the 1989 Report. Due to an investment in the legislative process by JV partners, provisions were made in the 1992 Central Valley Project Improvement Act (CVPIA) Title 34 of Public Law 103-575 Section 3406 (d)(1-5) to meet this need. This law authorized water supplies for those wetland areas covered by the 1989 Report and the San Joaquin Basin Action Plan (Action Plan; U.S. Bureau of Reclamation et al. 1989), a plan developed to mitigate for the habitat losses resulting from the Kesterson NWR selenium contamination of the 1980s, and to implement the objectives of the JV.

Another specific provision of the CVPIA, 3406 (d)(6)(A,B), required the investigation of water and conveyance needs for private wetlands not covered by the provisions of CVPIA 3406 (d)(1-5) of the act. The *Central Valley Wetlands Water Supply Investigations, CVPIA 3406 (d)(6)(A,B), A Report to Congress* (Water Report; U.S. Fish and Wildlife Service 2000) was produced as a result. Central Valley water suppliers were interviewed and their comments incorporated into the Water Report. Most expressed concern over the long-term shortages of water supplies resulting from a statewide lack of new water development (e.g., groundwater banking, new reservoirs, and new conveyance infrastructure); a reduction of Colorado River water supplies; and increasing urban and environmental demands that reduce supplies for agricultural and other uses. Although most suppliers face no legal obstructions to providing wetland water, many admitted that agriculture would have priority if water shortages develop.

To date, the CVPIA is one of the most important legislative actions taken to protect and restore Central Valley wetland habitat, and has laid the foundation for many significant and beneficial conservation activities in subsequent years. Since 1992, delivery of water supplies of adequate quality and quantity to certain NWRs, WAs, and the private wetlands of the GRCD through CVPIA has improved wetland habitat quality and benefited many wetland-dependent wildlife populations, including waterfowl, shorebirds, colonial waterbirds, and several threatened and endangered species. These benefits have been documented in annual reports to Congress and in a variety of studies and reports conducted by the U.S. Fish and Wildlife Service (USFWS) and CDFG, which are summarized here:

- A 300% increase in waterfowl food production within the GRCD;
- An 89% reduction in avian disease outbreaks on the Sacramento NWR Complex since 1992;
- A 49% increase in fall shorebird use Central Valley-wide;
- An increase in bird use days on private lands in the San Joaquin Valley from 38,000 to 115,000; during the first year of CVPIA implementation, and today, the San Joaquin Valley hosts 500,000 to 1 million birds each year;
- A 50% increase in the number of heron and egret rookeries in the San Joaquin Valley;
- A 61% increase in visitor use on the Sacramento NWR Complex between 1992 and 2006;
- Increases in threatened or endangered species (western pond turtles, tricolored blackbirds, and giant garter snakes);

The CVPIA statutorily obligates the Secretary of Interior to consult with the JV in matters involving wetland water acquisition and delivery. Considering this obligation, the JV maintains a unique responsibility to consider water supply issues related to the implementation of this 2006 Plan by participating in forums where water issues and policies are being discussed, to assure that policy makers address wetland water needs.

- Marked increases in white-faced ibis and Sandhill cranes (e.g., white-faced ibis populations increased from 100 birds in 1991 to 15,000 in 2002 at the Sutter NWR);
- The Agricultural Waterfowl Incentive Program, CVPIA 3406 (b)(22), funded the flooding of an average of 40,000 acres of agricultural lands each winter between 1997 and 2003, providing a substantial portion of the annual waterfowl energetic need within the Pacific Flyway during that time.

These habitat improvements have led to research studies by universities, government agencies, and non-governmental conservation organizations such as the California Waterfowl Association; Ducks Unlimited, Inc.; PRBO Conservation Science; University of California, Davis; United States Geological Survey's Biological Research Division, Dixon Field Station; and others.

Several long-term water conveyance/supply contracts and agreements were negotiated during the 1990s that increase the reliability of CVPIA water supplies being delivered for the next 25 years. These contracts and agreements called for the establishment of an Interagency Refuge Water Management Team (Team). Comprised of USBR, USFWS, CDFG, and the GRCD, the Team meets regularly, collaborating on the acquisition and allocation of incremental water supplies necessary for wetlands to operate at full habitat development levels (Level 4) and other wetland water related issues.

CVPIA Mandate Falls Short of Realization

The CVPIA mandated delivery of historic water supplies (Level 2 supplies) and two-thirds of the full water supply requirements for lands identified in the Action Plan from the CVP. In addition, Level 4 water supplies were to be acquired through purchase from willing sellers and provided in 10% increments per year until 2002, when full water supply requirements were authorized. These full water levels have not been achieved, due in large part to state and federal budget shortages, inconsistency in the timing of water deliveries, and increases in the cost of blocks of water made available annually from willing sellers on the open market (also known as "spot market"). Budgetary constraints within USBR's annual CVPIA Restoration Fund and the state's inability to cover their 25% cost-share mandate, required by CVPIA, have restricted the amount of Level 4 water supplies that can be acquired each year. These budget shortfalls also have inhibited the ability to complete the construction of conveyance facilities necessary to deliver water to refuge boundaries. In some cases, conveyance facilities to provide water delivery to the property boundary are still awaiting construction, and in the case of the Action Plan lands, wetland restoration has still not been completed. Some wetland areas still lack sufficient infrastructure to beneficially use their incremental Level 4 water supplies, even if delivered to the property boundary.

Water costs have escalated as water acquisitions to meet CVPIA, CALFED, urban, and agricultural needs have influenced sharp increases in spot market prices, further stressing limited budgets. USBR is currently studying the potential of increasing groundwater usage on CVPIA wetlands to offset both funding and supply limitations.

Water Supplies Needed to Meet Integrated Bird Habitat Objectives

The 2006 Plan addresses the habitat needs of six bird groups. To increase the efficiency of bird conservation in the Central Valley, the habitat needs of these bird groups were integrated at the basin scale where possible. Chapter 11 (Summary Chapter) provides a full description of these integrated habitat objectives and how they were obtained. The water needs associated with these integrated objectives are presented here.

Estimated annual water supplies needed to properly manage state, federal and GRCD seasonal and semi-permanent wetlands for each basin were identified in the 1989 Report and the Interagency Coordinated Program (ICP) task force report, *An Interagency Coordinated Program for Wetland Water Use Planning: Central Valley, California* (ICP Report; U.S. Bureau of Reclamation et al. 1998). These annual water needs, as well as the amount of water needed for winter-flooded agricultural habitat, are described in Table 10-1.

The water needs that are associated with integrated bird objectives are a function of the amount of existing habitat, as well as the amount of additional habitat that must be restored to fully meet bird needs in the Central Valley. Table 10-2 presents the annual water needs that are associated with existing wetland habitats in the Central Valley, based on acre-feet per acre requirements identified in Table 10-1.

CVPIA Level II supplies currently total 422,252 acre-feet or 37% of annual water needs of existing wetlands. Full Level 4 supplies total 555, 515 acre-feet, or 49% of existing wetland need (the reliability of Level 4 deliveries is directly related to annual spot market water costs, water availability, and Restoration Fund revenue levels for that year).

Beyond CVPIA Level 2 and 4 supplies, the reliability of water supplies needed to meet the full 1,129,151 acre-feet need of these wetlands remains largely unknown. Table 10-3 presents the annual water needs of additional seasonal and semi-permanent wetlands (new wetlands) that must be restored to achieve integrated habitat objectives for bird groups included in the 2006 Plan. These represent new water needs above and beyond the water being supplied to existing wetlands. Finally, Table 10-4 presents the combined water requirements of existing wetlands and wetlands that must be restored to fully meet integrated habitat objectives for the Central Valley. This overall estimate also includes the water needed for winter-flooding of agricultural habitats that must be maintained even when wetland objectives are fully met. Although this overall estimate of about 2.3 million acre-feet includes “new” water that is needed for wetlands yet to be restored, much of this water need is currently being met on existing wetland and agricultural habitats. However, the long-term reliability of these supplies remains uncertain.

Table 10-1. Annual water requirements (acre-feet per acre) by habitat type and basin.

Basin	Seasonal Wetlands ^a (acre-feet/acre)	Semi-Permanent ^a Wetlands (acre-feet/acre)	Winter Flooded ^b Agriculture (acre-feet/acre)
AMERICAN	5.0	7.4	2.5
BUTTE	5.6	7.4	2.5
COLUSA	5.0	7.4	2.5
SUTTER	5.0	7.4	2.5
YOLO	5.0	7.4	2.5
DELTA	4.75	7.4	2.5
SUISUN	4.75	7.4	0
SAN JOAQUIN	5.45	7.4	0
TULARE	5.25	8.0	0

^aU.S. Fish and Wildlife Service 2000; U.S. Bureau of Reclamation et al., 1998.

^bDale Garrison, U.S. Fish and Wildlife Service, personal communication.

Table 10-2. Total annual water needs for existing wetland habitats in the Central Valley.

Basin	Seasonal Wetlands (acres)	Seasonal Wetland Water Needs (acre-feet)	Semi-Permanent Wetlands (acres)	Semi-Permanent Wetland Water Needs (acre-feet)	Total Water Needs (acre-feet)
AMERICAN	3,187	15,935	562	4,159	20,094
BUTTE	23,340	130,704	4,119	30,481	161,185
COLUSA	22,390	111,950	3,951	29,237	141,187
SUTTER	1,951	9,755	344	2,546	12,301
YOLO	8,558	42,790	1,512	11,189	53,979
DELTA	6,349	30,158	1,121	8,295	38,453
SUISUN	32,232	153,102	5,688	42,091	195,193
SAN JOAQUIN	61,013	332,521	6,779	50,165	382,686
TULARE	20,212	106,113	2,245	17,960	124,073
TOTAL	179,232	933,028	26,321	196,123	1,129,151

Table 10-3. Total annual water needs for additional wetland habitats that must be restored to fully meet integrated bird habitat objectives.

Basin	Seasonal Wetlands (acres)	Seasonal Wetland Water Needs (acre-feet)	Semi-Permanent Wetlands (acres)	Semi-Permanent Wetland Water Needs (acre-feet)	Total Water Needs (acre-feet)
AMERICAN	20,396	101,980	425	3,145	105,125
BUTTE	17,396	97,418	425	3,145	100,563
COLUSA	2,396	11,980	425	3,145	15,125
SUTTER	4,396	21,980	425	3,145	25,125
YOLO	3,170	15,850	508	3,759	19,609
DELTA	19,170	91,058	1,208	8,939	99,997
SUISUN	0	0	333	2,464	2,464
SAN JOAQUIN	20,340	110,853	2,815	20,831	131,684
TULARE	21,263	111,631	5,935	47,480	159,111
TOTAL	108,527	562,750	12,500	96,053	658,803

Table 10-4. Total annual water needs for wetland and winter-flooded agricultural habitats in the Central Valley when integrated bird habitat objectives are met.

Basin	Seasonal Wetlands (acre-feet) ^a	Semi-Permanent Wetlands (acre-feet) ^b	Agricultural Winter Flooding (acre-feet) ^c	Total Water (acre-feet) ^d
AMERICAN	117,915	7,304	125,000	250,219
BUTTE	228,122	33,626	155,000	416,748
COLUSA	123,930	32,382	112,500	268,812
SUTTER	31,735	5,691	25,000	62,426
YOLO	58,640	14,948	7,500	81,088
DELTA	121,215	17,234	72,500 ^e	210,949
SUISUN	153,102	44,555	0	197,657
SAN JOAQUIN	443,374	70,996	0	514,370
TULARE	217,744	65,440	0	283,184
TOTAL	1,495,777	292,176	497,500	2,285,453

^aAnnual water needs for managed seasonal wetlands (public and private) when seasonal wetland objectives are met for the Central Valley.

^bAnnual water needs for managed semi-permanent wetlands (public and private) when semi-permanent wetland objectives are met for the Central Valley.

^cAnnual water needs for winter-flooded agriculture (predominantly rice) when seasonal wetland objectives are met for the Central Valley.

^dSum of seasonal wetland, semi-permanent wetland, and winter-flooded agriculture water needs.

^eAlthough there is not a winter-flooding objective for the Delta Basin, this figure represents current estimates of winter-flooded corn in the basin.

Although the 2006 Plan provides an estimate of the water needed to meet integrated bird habitat objectives, the current and future availability of wetland water supplies remains unclear. Site specific investigations are needed to evaluate wetland water supplies, both for existing wetlands and for wetlands that will be restored to meet bird habitat objectives. This is a key information need for all basins in the Central Valley, and will be critical as JV partners attempt to secure reliable and affordable water supplies for all of the region's wetlands.

Water Issues and Proposed Actions

Current Issues and Challenges

Water Supplies for New Wetlands

Since the passage of CVPIA, additional wetlands have been added to NWRs and WAs that also need to be addressed, as well as the water supply needs of private wetlands within key basins. They include: Llano Seco Unit of the Sacramento River NWR, San Joaquin River NWR, Stone Lakes NWR, Butte Sink NWR, Upper Butte Basin WA, private wetlands within the Tulare Basin, and others. They contribute to the JV wetland restoration objective and utilize water supplies that were authorized when these properties were acquired. However, in many instances after the acquisition, the agencies lacked the funding to pay for the pumping, and/or conveyance of water supplies for these newly purchased wetlands.

Likewise, additions to San Joaquin Valley WAs such as North Grasslands and Volta WAs have varying reliability of supplies. For example, the Gadwall Unit addition to the North Grasslands WA falls within the GRCD and is entitled to CVPIA authorized water supplies, while recent additions to the Volta WA do not currently appear to have access to adequate water supplies.

Spotlight on Tulare Basin Wetlands

Interest in restoring historic wetland habitat conditions within the Tulare Basin has greatly increased since the passage of the CVPIA. While private wetlands within this area did not directly benefit from provisions of the CVPIA, the vast improvements that have resulted in other wetland basins that receive CVPIA water supplies has sparked renewed discussion at regional, state and federal levels in the Tulare Basin. A major initiative has resulted from these discussions, focusing on a combination of factors that could result in significant habitat restoration within the Tulare Basin.

These factors include:

- Historic wetland areas and soil types;
- Availability of water supplies, including cooperation from overlying agricultural water agencies and conjunctive use of available water resources for multiple purposes (including flood control);
- Cooperating private landowners who maintain interest in the re-establishment of wetlands on their property or willingness to protect the wildlife values of their property through state or federal ownership or conservation easements;
- Conjunctive use of existing and restored natural landscapes to provide endangered species benefits as well as wetland benefits;
- A high degree of cooperation among state and federal agencies, conservation organizations, and the agricultural community, with varying missions and authorizations.

High annual variation in runoff from the west slope of the Sierra Nevada into the southern San Joaquin Valley causes the Tulare Basin to experience the greatest fluctuation in water supplies in the Central Valley. For example, the annual runoff from the Kaweah River (a tributary to the Tulare Lake) over the past 100 years of record has ranged from approximately 93,000 acre-feet in 1977 to over 1.4 million acre-feet in 1983. Such vast fluctuations call for a strategy that takes into account this highly variable hydrology and establishes flexible wetland restoration goals within the region.

The Tulare Basin is the heart of some of the most intensively farmed and agriculturally productive lands in the world. It is also one of the fastest growing regions in California. There is no “silver bullet” strategy for finding more water for wetlands in Tulare Basin as may have been the case with implementation of the CVPIA elsewhere in the Central Valley. The basin suffers from chronic water shortages, and the impacts of having its imported water supplies significantly reduced, as a result of new laws or regulations, have not been resolved. It is facing significant new water demands for river and fishery habitat restoration and, due to its proximity to urban Southern California, has the potential to become a new source of water to meet the increasing water needs of that region. Only now are the existing and future wetlands needs of the Tulare Basin getting serious consideration in state and federal water and environmental forums.

Water Management Programs and Policies Affecting Wetland Water Supplies

Along with increases in wetland acreage in the Central Valley during the past decade, various activities have occurred that have the serious potential to impact the quantity and quality of water supplies to many wetland areas throughout the valley.

Federal Programs and Actions

The U.S. Department of Agriculture, through the Natural Resources Conservation Service, has restored privately-owned wetlands throughout the Central Valley through the Wetlands Reserve Program. Most of these restored wetlands utilize water supplies that were available to the landowner prior to restoration. In many instances, reliability of these water supplies is unknown, yet must be clarified as part of an overall re-evaluation of wetland water supplies for the Central Valley.

The Department of the Interior's decision to decrease the amount of Colorado River supplies for Southern California has also affected water supplies in the Central Valley. This decision initiated the search for additional municipal and industrial water supplies by the Metropolitan Water District (MWD), which supplies water to the Los Angeles and San Diego metropolitan areas. MWD has become very active in locating and acquiring water supply options, both north and south of the Sacramento San Joaquin River Delta (Delta), to help meet anticipated future demands for its service area. Typically, urban water users can pay prices that are an order of magnitude greater than can be afforded by government agencies, conservation organizations, and private landowners, resulting in the unintended consequence of "out-bidding" wetland managers.

Endangered Species Act decisions have also affected agricultural water supplies that must be diverted and pumped south of the Delta. Reduced pumping from the Delta to protect listed fish species has decreased water supplies previously available to CVP and State Water Project districts. These decreased supplies have generated an energetic water transfer program between agricultural water districts in the San Joaquin Valley. These transfers have greatly increased the demand for surplus water supplies that become available in certain years. As the demand has increased, so has the cost of acquiring these limited water supplies. These increased costs have placed additional burdens on limited public funding available to acquire necessary water supplies for private and public wetlands.

CALFED Program

Approximately half of California's surface water flows through the Delta. Half of this water is diverted for urban, agricultural and environmental use. Remaining water is discharged into the Pacific Ocean through the San Francisco Bay (Bay). The Bay-Delta ecosystem is affected by these water diversions, and courts have intervened to assure that adequate freshwater supplies enter the system. State and federal agencies are working with local water districts and other stakeholders to improve conditions in the Bay-Delta, while continuing efforts to meet California's diverse water needs. These efforts are intended to be coordinated through the CALFED Program, which was initiated following the 1994 interagency Bay-Delta Accord. The program focuses on water quality standards, coordination of State Water Project and CVP operations; and long-term solutions to problems in the Bay-Delta Estuary.

CALFED, along with several CVPIA programs and various court decisions have brought about changes in water management programs throughout the Central Valley. CALFED includes water programs that could result in less water for wetlands in some areas, while potentially increasing wetland water supplies elsewhere in the Central Valley. A major CALFED program is the Environmental Water Account (EWA). The EWA was established to replenish water supplies required for management of federally threatened or endangered fish and to improve water quality in the Delta. The water needed for increasing water transfers, the EWA, and the Vernalis Adaptive Management Plan, a plan to meet flow objectives for migrating salmon within the San Joaquin River Basin (EA Engineering, Science, and Technology 1999) have all contributed to increased competition for limited environmental water supplies.

Regional Water Quality Standards

Wetland water quality issues are affected by various Regional Water Quality Control Board (RWQCB) programs and standards. Water quality supply issues are quickly becoming more important as regulations regarding outflow from agriculture and managed wetlands increase, and wetland managers are being held accountable for discharge from their properties, regardless of its source of origin. RWQCBs are developing and adopting programs which regulate managed wetland drainage through waivers to Waste Discharge Requirements, such as the Central Valley RWQCB's Irrigated Lands Conditional Waiver Program, and development of load restrictions, including total maximum daily loads (TMDLs) of mercury, salt and boron. As discharge restrictions increase, source water quality becomes more of a concern in order to meet new restrictions.

Water Use Planning Efforts

State and federal agencies have responded to increasing concerns by wetland managers regarding water supplies. CDFG's Lands Committee examines water availability and potential use as part of its review of potential land acquisitions. The USFWS conducts a similar review prior to land acquisition that is more comprehensive than has been the case in the past. The ICP task force was established in 1998 and consists of the USFWS, USBR, GRCD, and CDFG, advised in the development of the ICP Report, a document examining water use and providing a process for the identification of effective water regimes for Central Valley wetlands.

Many agricultural and urban water districts have completed water conservation plans to comply with USBR contract requirements. The USFWS, CDFG, and GWD have completed water management plans for those NWRs, WAs, and GRCD lands with authorized CVPIA wetland water supplies. These planning efforts are designed to improve water use efficiency and conservation efforts to the benefit of all water users.

Future Issues and Challenges

Securing firm, reliable water supplies for managed wetlands in the Central Valley will become even more challenging in the future. Demand for limited water supplies will increase with continued population growth in California, and wetlands will compete for a legitimate allocation to meet wetland dependent resource needs. Wetland habitats cannot properly function without access to year-round water supplies to meet management objectives. Thus, issues and challenges that are faced today will continue and become more important as additional issues arise in future years.

Some of the most significant barriers to acquiring future water supplies for Central Valley wetlands include:

- Delta export and pumping constraints;
- Increasing competition to purchase limited water supplies;
- Increasing regulation of managed wetland water discharge;
- Capacity limitations of existing water delivery systems;
- Balance between supply and demand;
- Cost of acquiring annual and long-term water supplies;
- Current and future, state, federal, and private budget shortfalls that impact acquisition efforts;
- The State of California's ability to meet their 25% cost-share obligations under the CVPIA;
- Unreliable quality and quantity of groundwater supplies;
- Increased groundwater pumping costs;
- Annual and long-term water transfers that may adversely affect managed wetlands and fish and wildlife resources.

Water Issues by Basin

Current and future water issues affecting managed wetlands vary among basins in the Central Valley, and many of them are outlined here.

Butte Basin

- Reliance upon groundwater at Gray Lodge WA as part of Level 4 water supplies;
- A shift from optimal wetland management to the implementation of best management practices, in order to comply with vector control regulations;
- Insufficient infrastructure to deliver Level 2 and Level 4 water supplies to Gray Lodge WA;
- Ensuring that water supplies are attached to the property when protecting managed wetland habitat.

Colusa Basin

- Potential competition for water between post-harvested rice and managed wetlands, particularly during drought years;
- Timing of water use on shared conveyance systems;
- Quality issues related to surface water delivery and discharge at Sutter, Colusa, and Sacramento NWRs (e.g., boron and mercury);
- Equitable sharing of monitoring costs by those participating in water quality coalitions;

- Potential increased groundwater use (e.g., Delevan NWR);
- A shift from optimal wetland management to the implementation of best management practices, in order to comply with vector control regulations;
- Management impacts resulting from re-route of the Colusa Drain;
- Transfer of permanent water rights to out of basin agricultural and urban users (potential adverse impact to wetlands and Level 4 water supplies associated with long-term out-of-basin water transfers);
- Ensuring that water supplies are attached to the property when protecting managed wetland habitat.

Sutter Basin

- Current conveyance system at Sutter NWR is insufficient to convey Level 4 water supplies;
- Timing of water on shared conveyance systems;
- Improving the facilitation of intra-basin and inter-basin water transfers among state and federally managed wetlands;
- A shift from optimal wetland management to the implementation of best management practices, in order to comply with vector control regulations;
- Ensuring that water supplies are attached to the property when protecting managed wetland habitat.

Yolo Basin

- Competing water use and loss of habitat due to urban growth in and around the city of Woodland;
- Increased regulatory requirements on managed wetland areas as a result of new mercury TMDL standards;
- Increasing competition for water between agricultural and habitat interests due to conveyance capacity limitations (e.g., Toe Drain and Putah Creek) at Yolo Bypass WA;
- Ensuring that water supplies are attached to the property when protecting managed wetland habitat.

American Basin

- Competing water use and loss of habitat (e.g., ricelands) due to urban growth in and around the cities of Yuba City and Marysville;
- Need for more protection of open space (e.g., agricultural easements);
- No current reliable supply of water for most managed wetlands within the basin;
- Ensuring that water supplies are attached to the property when protecting managed wetland habitat.

Delta Basin

- Balancing endangered species (e.g., Delta smelt) recovery needs with wetland water supply needs;
- Saltwater intrusion into fresh water wetland habitat;
- Challenges in maintaining existing levee system;
- Increased regulatory requirements on managed wetland areas within the basin as a result of new mercury TMDL standards;
- Competing water use and loss of habitat due to urban growth in and around the primary zone of the Delta.

Suisun Basin

- Maintenance of existing salinity standards established to sustain a brackish water marsh capable of producing high-quality forage and habitat conditions suitable for waterfowl and other wetland related wildlife;
- Negative impacts to wetland water quality and habitat conditions due to potential reduction of Delta outflows and increases in state and federal water project deliveries;
- Maintenance and improvement of 220 miles of exterior levee for the protection and enhancement of diked wetland habitats and the protection of Delta water quality;
- Lack of a maintenance program to protect and support publicly and privately managed wetland resources;
- Increased stress on the levee system and the threat to diked managed wetlands due to predicted rise in sea level;
- Potential localized salinity variations due to planned tidal restoration of diked areas, and associated negative impacts to adjacent waterfowl habitat management areas;

- Increases in salinity resulting in a decrease in the life expectancy of existing water management infrastructure, and a reduction of diversity and productivity in diked wetlands;
- Concerns over water quality constituents in the marsh including, but not limited to, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, organophosphate pesticides, methyl mercury, dissolved oxygen, organic matter, and heavy metals.

San Joaquin Basin

- Lack of sufficient above ground water storage dedicated to environmental purposes;
- Groundwater issues including access, poor water quality, overdraft, and subsidence.;
- Rapid urbanization in the region is likely to shift surface water use from agricultural to urban uses;
- Lack of pumping and conveyance capacity in the existing system to transport water south through the Delta to San Joaquin Basin wetlands;
- Low priority for conveyance of Level 4 water supplies through state and federal pumping facilities in the Delta;
- Lack of conveyance system to receive Level 2 or Level 4 water supplies at East Bear Creek unit of San Luis NWR;
- Stricter RWQCB standards for wetland discharges into the San Joaquin River. (e.g., boron, mercury, salinity, dissolved oxygen and selenium);
- Federal budget shortages for CVPIA water supplies due to increased competition for Restoration Fund dollars and increased costs of purchasing annual spot market water;
- Increasing water costs, especially during periods of drought;
- Lack of willing sellers of affordable long-term water rights;
- Timing of water use on shared conveyance systems;
- Degraded water quality from use of agricultural tail-water or poor quality groundwater;
- Inability of wetland managers to plan their yearly water use due to sporadic water purchases throughout any given year;
- Lack of year round conveyance affected by the current condition of Mendota Dam affects conveyance ability to deliver Level 4 water supplies to Mendota WA and reduces conveyance capacity for the GWD;
- Ensuring that water supplies are attached to the property when protecting managed wetland habitat.

Tulare Basin

- Groundwater issues including: lack of access, poor water quality, overdraft, and subsidence;
- Lack of a conveyance system to deliver Level 4 water supplies to Pixley NWR;
- Potential impacts to water quality, habitat, and wildlife from the introduction of municipal sludge onto agricultural lands adjacent to wetland habitat;
- Continued reliance upon purchasing spot market water;
- Increasing water costs, especially during periods of drought;
- Federal budget shortages for CVPIA water supplies due to increased competition for Restoration Fund dollars;
- Degraded water quality from using agricultural tail-water or poor quality groundwater;
- Dependence upon coordinating water management with adjacent landowners in order to effectively de-water Kern NWR;
- Inability of wetland managers to plan their yearly water use due to sporadic water purchases throughout any given year;
- Lack of reliable water supplies and inadequate conveyance systems to deliver water to the private wetlands within the basin;
- Ensuring that water supplies are attached to the property when protecting managed wetland habitat.

Recommended Actions and Strategies to Secure Wetland Water Supplies

Additional water supplies may be developed through expanded storage in existing reservoirs, groundwater banking, new water storage facilities, and coastal and Central Valley desalination plants. The JV partners can play a role in exploring these options and should consider implementation of the following strategies aimed at increasing future wetland water supplies and improving wetland water supply reliability.

- Establish and fund one or more positions that would be responsible for working with relevant agencies, NGO's and water entities, to collaborate and cooperate on realistically resolving wetland water supply needs (including matters involving wetland water quality), assuring that wetland needs are integrated into regional, state and federal water discussions. The position(s) would track water transfers that may have impacts on wetland water supplies, as well as monitor water quality issues that could effect JV wetland restoration and enhancement objectives;

- Work closely with agencies and organizations conducting wetland restoration to ensure reliable water supplies are accessible to target properties;
- Seek additional state and federal funding to acquire and develop wetland water supplies, maintaining fulfillment of long-term CVPIA Level 4 water supplies as a top priority;
- Establish a public outreach program to educate the public and public officials of: (1) the benefits derived from CVPIA wetland water supplies; (2) the need to develop new sources of supply to meet the objectives of this Plan.

Summary

Since publication of the 1990 Plan, Central Valley water demands have dramatically increased. Competition for water has become intense, and the cost of obtaining wetland water supplies in some basins has risen by nearly 400%. Agricultural, urban and environmental stakeholders are aggressively lobbying on many fronts for reallocation of existing water supplies.

The 2006 Plan outlines a new strategy for the conservation of migratory birds and their habitats in a rapidly changing socio-political environment. Much of this strategy is dependent upon available and affordable water supplies. It is therefore essential for JV partners to participate in the many forums where water issues are being addressed to assure that wetland water needs are fully considered. Moreover, JV partners will need to carefully consider availability of water supplies when planning habitat acquisition, restoration and enhancement activities associated with the implementation of the 2006 Plan.

