ENVIRONMENTAL ASSESSMENT

2009 Drought Water Bank

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

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APPENDIX

2009 DROUGHT WATER BANK
ENVIRONMENTAL ASSESSMENT

1. INTRODUCTION

To help facilitate the transfer of water throughout the State, the Department of Water Resources (DWR) proposes to initiate a 2009 Drought Water Bank (DWB). To implement the DWB, DWR would purchase water from willing sellers upstream of the Sacramento-San Joaquin Delta (Delta). This water would be conveyed, using State Water Project (SWP) or Central Valley Project (CVP) facilities, to water users that are at risk of experiencing water shortages in 2009 due to drought conditions and that require supplemental water supplies to meet anticipated demands. The Governor of California has requested emergency drought assistance under the Reclamation States Emergency Drought Relief Act of 1991 (Act), Public Law 102-250, as amended. The Commissioner of the Bureau of Reclamation (Reclamation) has determined that emergency drought assistance is merited. The Mid Pacific Region of Reclamation would participate in the DWB pursuant to Section 101 of the Act, to ensure that operations of the two projects can be coordinated effectively to maximize the ability of the DWB to move water from willing sellers to buyers to address critical water needs. Reclamation would review and approve, as appropriate, proposed transfers by CVP contractors in accordance with the Interim Guidelines for the Implementation of Water Transfers under the Central Valley Project Improvement Act (CVPIA).

DWR has initiated dry year water purchasing programs in the past, including drought water banks during the early 1990s, and dry year water purchase programs in 2001 through 2004. Water supplies from the 2009 DWB would be open to water providers who can obtain water from CVP or SWP facilities either directly or by exchange with other water providers who have access to water supplies from the SWP or CVP. Contract provisions of the SWP and CVP will be honored in determining access to Delta pumping capability if this capacity becomes constrained. DWR will coordinate closely with Reclamation, Department of Fish and Game (DFG), U.S. Fish and Wildlife Service (Service), and National Marine Fisheries Service (NOAA Fisheries) on the proposed DWB.

1.2 PURPOSE AND NEED

Since 2007 and 2008 were critically dry years and reservoir storage levels are expected to be low in 2009, it is likely that some California water providers will need to supplement local and imported supplies with water transfers from willing sellers. Based on the initial water supply allocations from the CVP and SWP, the nature of the supply shortage will likely severely limit supply for existing agricultural use and limit supply for municipal needs including minimum health and safety requirements. The purpose of the proposed action is to help facilitate the transfer of water throughout the State from CVP contractor willing sellers of water upstream of the Delta to buyers that are at risk of experiencing water shortages in 2009.

2. ALTERNATIVES

2.1 No Action

Under the no action alternative, Reclamation would not approve the proposed transfers of water from CVP contractors to DWR's DWB for transfer to buyers who are at risk of experiencing water shortages in 2009. However, DWR would likely proceed with water transfers from non-CVP entities under the 2009 DWB. Also, some CVP contractor water transfers would likely occur outside of the DWB. Reclamation would review, complete environmental compliance documentation for, and approve as appropriate, CVP water transfers as they are individually proposed in accordance with the Interim Guidelines for the Implementation of Water Transfers under the CVPIA.

2.2 Proposed Action

Since the transfers Reclamation proposes to approve for the DWB represents only a portion of overall transfers supporting the DWB, the DWB is not dependent upon Reclamation's approval, and DWR would likely proceed with DWB transfers that do not require Reclamation's approval, the Proposed Action only includes those actions over which Reclamation has approval authority. The remainder of the transfers that could occur under the DWB are considered in the context of cumulative impacts. Twenty CVP contractors have expressed interest in submitting proposals for transfering water to DWR for the 2009 DWB (Table 1). Subject to approval in accordance with the Interim Guidelines for the Implementation of Water Transfers under the CVPIA, as applicable, Reclamation proposes to approve these transfers.

The proposed action would make water available to buyers from willing sellers upstream of the Delta during the 2009 water year only. A total of up to 199,885 af from CVP contractors would be made available for transfer through a combination of crop idling, crop substitution, groundwater substitution, and reservoir reoperation, and would be available for purchase by public and private water providers in California based on certain needs criteria developed by DWR (http://www.water.ca.gov/drought/). The existing SWP and CVP facilities would be used to convey water to providers that require supplemental water supplies to meet anticipated demands and that are at risk of experiencing water shortages in 2009 due to drought conditions. Water transfers to areas downstream of the Delta would be assumed to lose an estimated 20 percent of the water obtained from the Sacramento River and its tributaries to carriage losses (water required to meet water quality standards) in the Delta.

Water transfers involving conveyance through the Delta would be implemented within the operational parameters of the Biological Opinions on the Continued Long-term Operations of the CVP/SWP (Opinions) and any other regulatory restrictions in place at the time of implementation of the water transfers. Current Operational parameters applicable to conveyance of transfer water for the DWB include: a maximum amount of 600,000 acre feet per year is allowed for all types of water transfers; and transfer water being conveyed through the Delta will be conveyed during July through September only.

Contract provisions of the SWP and CVP will be honored in determining access to Delta pumping capability if this capacity becomes constrained.

2.2.1 Sellers

Table 1 lists agencies that may be willing to sell CVP water to the DWB along with a maximum amount of potentially available water volumes. DWR would only make purchases from willing sellers. These estimates reflect the potential upper limit of available water. However, actual purchases would depend on hydrology, DWB funding (interested buyers), and the amounts that sellers would ultimately have available for transfer in 2009, as well as compliance with CVPIA transfer requirements, as applicable. The potential transfers identified in Table 1 may not all occur. Figure 1 shows the location of potential sellers.

Table 1
Potential Sellers (Upper Limits)

	(AF)			
Water Agency (County)	***Stored Reservoir Water***	***Groundwater Substitution***	***Crop Idling/ Substitution***	***% of CVP Allocation***
Sacramento River Area of Analysis				
Glenn-Colusa Irrigation District (Glenn and Colusa)			50,000	6
Lewis Ranch (Colusa)		2,000		32
Maxwell ID (Colusa)		1,200	2,500	21
Meridian Farms (Sutter)		1,000	2,000	9
Natomas Central MWC (Sutter and Sacramento)		10,000		11
Reclamation (via Orland Unit Water User's Association) (Glenn)	10,000			
Parrot Investment Company (Butte)			1,500	8
Pelger MWC (Sutter)		1,500	2,000	40
Pleasant Grove-Verona MWC		6,000	4,000	38

(Sutter)				
Princeton-Cordua-Glenn ID (Glenn and Colusa)			3,000	4
Provident ID (Glenn and Colusa)			3,000	6
Reclamation District 108 (Colusa and Yolo)		4,000	20,000	10
Reclamation District 1004 (Colusa and Glenn)		20,000	10,000	42
River Garden Farms (Yolo)		3,500		12
Sacramento River Ranch (Yolo)			1,296	32
Sutter MWC (Sutter)			10,000	4
Sycamore MWC (Butte)		2,400	6,360	28
American River Area of Analysis				
City of Sacramento (Sacramento)		5,000		6
Totals	10,000	56,600	140,528	

2.2.2 Buyers

Table 2 identifies potential buyers who have indicated interest in participating in the 2009 DWB. Potential buyers would be located in the export service region and upstream of Delta region shown on Figure 2. Not all of these potential buyers may end up actually purchasing water from the DWB in 2009. These potential buyers are predicting significantly reduced 2009 water supply allocations. It is anticipated that water made available to them from the DWB would be prioritized as follows: existing health and safety domestic needs, municipal supply subject to water shortage contingency plan measures, and agricultural irrigation for existing crops and livestock subject to water shortage contingency plan measures. Buyers' participation in the DWB will be subject to the terms identified on DWR's DWB website (http://www.water.ca.gov/drought/), including meeting a needs assessment and having a plan with the goal of 20% reduction in water demand based on conservation efforts.

DWR would administer the distribution of water from the DWB based on DWR's DWB needs criteria (http://www.water.ca.gov/drought/). Water would be allocated in accordance with priority of need, with health and safety considerations paramount. Under critically dry conditions DWR will use the following priorities for allocating water

to buyers:

• Health and safety needs, including indoor residential and institutional and emergency uses

• Preservation of high-value assets such as survival of permanent crops (trees and vines), minimum deliveries to commercial and industrial customers

• Deliveries sufficient to meet up to 60 percent of normal urban demands; deliveries sufficient to meet up to 25 percent of normal agricultural demands

The Governor of the State of California has declared a state of emergency regarding drought conditions, and has ordered that the State Water Resources Control Board shall expedite the processing and consideration of the request by DWR for approval of the consolidation of the places of use and points of diversion for the SWP and CVP to allow flexibility among the projects and to facilitate water transfers and exchanges. DWR has petitioned the State Water Resources Control Board (SWRCB) for a temporary consolidated place of use for the CVP and SWP service areas. Since the outcome of this petition will not be known for a few months, water from the DWB would be allocated in one of the following ways:

- If the SWRCB approves the petition for a consolidated place of use for the CVP and SWP, then DWR would allocate DWB water to CVP and SWP users alike based solely on application of their needs criteria priorities, and thus the majority of the DWB water would be allocated to meet health and safety needs, as it is the top priority considered in DWR's needs criteria.
- However, if the SWRCB does not approve the petition for a consolidated place of use for the CVP and SWP, then the amount of water acquired from CVP sellers would need to be allocated to CVP users and the amount of water acquired by SWP sellers would need to be allocated to SWP users. DWR would then apply their needs criteria priorities within these bounds.

Table 2 ***Potential Buyers (Upper Limits)***		
Water Agency		***Amount Requested (AF)***
Downstream from the Delta Region		
CVP	**Primary Beneficial Use**	
San Luis & Delta Mendota Water Authority		**180,000**
Byron Bethany Irrigation District	Agriculture	
Del Puerto Water District	Agriculture	
Eagle Field Water District	Agriculture	
James Irrigation District	Agriculture	

Laguna Water District	Agriculture	
Mercy Springs Water District	Agriculture	
Oro Loma Water District	Agriculture	
Pacheco Water District	Agriculture	
Panoche Water District	Agriculture	
Patterson Irrigation District	Agriculture	
RD 1606	Agriculture	
San Benito County Water District	Agriculture	
Santa Clara Valley Water District	Municipal and Industrial	30,000
Tranquility Irrigation District	Agriculture	
West Side Irrigation District	Agriculture	
West Stanislaus Irrigation District	Agriculture	
Westlands Water District	Agriculture	
City of Avenal	Municipal and Industrial	
City of Coalinga	Municipal and Industrial	
City of Huron	Municipal and Industrial	
Avenal State Prison	Municipal and Industrial	
Broadview Water District	Agriculture	
Banta Carbona Irrigation District	Agriculture	
SWP		
Alameda County WD	Municipal and Industrial	20,000
Antelope Valley East Kern Water Agency	Municipal and Industrial	28,212
Castaic Lake Water Authority	Municipal and Industrial	10,000
Central Coast Water Authority	Municipal and Industrial	15,000
Contra Costa Water District	Municipal and Industrial	20,000
Desert Water Agency	Municipal and Industrial	10,000
Dudley Ridge Water District	Agriculture	7,500
Kern County Water Agency	Agriculture	123,333
Metropolitan Water District of Southern California	Municipal and Industrial	300,000
Mojave Water Agency	Municipal and Industrial	1,000
Oak Flat Water District	Agriculture	1,000
Palmdale Water District	Municipal	8,000

	and Industrial	
San Bernardino Valley Municipal Water District	Municipal and Industrial	20,000
San Diego County Water Authoirity	Municipal and Industrial	10,000
Tulare Lake Basin Water Storage District	Agriculture	20,000
Walnut Valley Water District	Municipal and Industrial	10,000
Upstream from the Delta Region		
CVP		
Bella Vista Water District	Municipal and Industrial	2,000
Dunnigan Water District	Agriculture	2,000
East Bay Municipal Utility District*	Municipal and Industrial	10,000
Tehama Colusa Canal Authority	Agriculture	25,000
SWP		
City of Yuba City	Municipal and Industrial	2,000
Napa County Flood Control and Water Conservation District	Municipal and Industrial	13,860

* Upon completion of the Freeport Regional Water Project (if during the 2009 water year), East Bay Municipal Utility District would be considered an upstream of Delta potential buyer for the 2009 DWB.

2.2.3 Potential Water Transfer Methods

Crop Idling/Substitution

Crop idling would make water available for transfer that would have otherwise been used for agricultural production. The proceeds from the water transfer would pay farmers to idle land that they would otherwise have placed in production. Rice is the most likely crop that would be idled; however, crop idling could involve other crops, such as alfalfa.

Crop idling water would be available at the beginning of the season as soon as the crop is not planted. Typically, water acquisitions from crop idling would be retained in upstream reservoirs until they could be transferred through the Delta and pumped south. However, releases from Lake Shasta would likely need to be maintained during April and May to meet downstream temperature and flow requirements. Therefore, water acquired from sellers on the Sacramento River most likely could not be backed up into Lake Shasta and could not be conveyed south until the Delta pumps are available in July through September.

Crop substitution is another potential method to make water available for the DWB. Crop substitution acquisitions would pay farmers to substitute a crop with one that uses less water, and the surplus water would be available for transfer. Since crop substitution

has similar effects to crop idling, it is included in the crop idling discussion for the remainder of this document.

To minimize socioeconomic effects on local areas and to minimize effects on special status species, the project agencies will not approve water transfers via crop idling if more than 20 percent of recent harvested rice acreage in the county would be idled. Transfers made available by crop idling/substitution by CVP contractors may yield up to 120,635 af.

A central objective of any water transfer program based on crop idling or substitution is to reduce the consumptive use or surface water applied for irrigation. Reclamation and DWR will ensure that each approved transfer proposal makes a credible case that reduction in surface water diversions would occur consistent with Reclamation's Interim Guidelines for Implementation of Water Transfers Under XXXIV of Public Law 102-575 (http://www.usbr.gov/mp/cvpia/3405a/docs/int_guide_imp_water_trans.pdf). Diversion data for the project year will be evaluated by Reclamation and DWR.

Groundwater Substitution

Groundwater substitution is another proposed method to make water available for the DWB. Groundwater substitution transfers occur when sellers forego their surface water supplies and pump an equivalent amount of groundwater as an alternative supply. Because the potential groundwater substitution transfers are primarily from agricultural users, the water from this acquisition method would be available during the irrigation season of April through October. Typically, surface water made available through groundwater substitution is stored upstream until the Delta pumps have the capacity available to convey water south. However, as previously discussed, on the Sacramento River, water often cannot be held in Lake Shasta because of downstream temperature and flow requirements. All transfer water under the proposed action that would require conveyance through the Delta would be moved through the Delta from July through September. Transfers made available by groundwater substitution may yield up to 69,250 af. The groundwater substitution option is explained in detail on the DWR's DWB website (http://www.water.ca.gov/drought/).

Reservoir Reoperation

Reservoir re-operation is another avenue for water to be made available to the DWB. To ensure that purchasing this water would not affect downstream users, DWR and Reclamation would limit acquisitions to water that would not have otherwise been released downstream. Stored reservoir water sellers will be required to demonstrate that stored water released for transfer would be in addition to the quantity of water normally released under historical and projected reservoir operations. Under the proposed action, DWR may purchase up to 10,000 af of CVP stored reservoir water from Reclamation via Orland Unit Water Users Association from Stony Gorge Reservoir.

No other types of water transfers would be allowed under the DWB. California laws contain numerous protections that apply to water transfers. However, there are three fundamental principles that apply: no injury to other legal users of water, no unreasonable

effects to fish, wildlife or other instream beneficial uses of water, and no unreasonable effects on the overall economy or the environment in the counties from which the water is transferred. California Water Code Section 1745 et seq. protects the underlying water rights from forfeiture for water transfers. Additional information about water rights protection and water transfers is located at www.waterrights.ca.gov in a State Water Resources Control Board (SWRCB) staff document titled "A Guide to Water Transfers". The project agencies will not support or participate in any water transfer where the aforementioned fundamental principles of water transfers have not been adequately addressed. DWR's water purchase agreements expressly recognize the legal protections afforded the seller's underlying water rights in a water transfer.

2.3 Environmental Commitments

Transfers will be made without injuring other legal water users and without unreasonably affecting fish, wildlife, or other instream beneficial uses, as well as in accordance with all applicable sections of the Water Code (http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=wat&codebody=&hits=20).

- As previously described in this section, transfers involving conveyance through the Delta will be implemented within the operational parameters of the Biological Opinions on Continued Long-term Operations of the CVP/SWP.

- As previously described in this section, stored reservoir water sellers will be required to demonstrate that stored water released for transfer would be in addition to the quantity of water normally released under historical and projected reservoir operations. In their transfer proposals, sellers will be required to provide monthly reservoir operations for the previous 10 years showing monthly releases and storage levels and the method of measuring stored water releases and accounting for transfer water and reservoir refill (ie reservoir refill criteria) to track reservoir operations during and after the transfer of water.

- As described in Section 3.1, sellers will be required to maintain return flows under the proposed action to minimize potential water supply effects to neighboring and downstream water users.

- As described in Section 3.1, water transfers under the proposed action will be implemented in accordance with meeting flow and temperature requirements on the Sacramento River.

- As described in Section 3.1, the SWRCB will review potential reservoir release for transfers via reservoir reoperation to ensure that potential effects to supply or to other legal users will be minimized.

- As described in Section 3.2, well reviews and monitoring and mitigation plans will be implemented under the proposed action to minimize potential effects of groundwater substitution. Well reviews, monitoring and mitigation plans will be coordinated and

implemented in conjunction with local ordinances, basin management objectives, and all other applicable regulations.

- As described in Section 3.3, DWR and Reclamation have incorporated the following measures into the proposed action to continue with standard Project operating procedures and to improve the water quality to users south and downstream of the Delta.

    - Carriage water will be used to protect and maintain chloride concentrations in the Delta.

    - DWR will only purchase water if it meets all of the required provisions of DWR's acceptance criteria governing conveyance of non-Project water through the California Aqueduct.

- The 2009 DWB will adopt the crop idling conservation measures from the Environmental Water Account (EWA) Biological Opinion (2004) with some modifications, described below. The following actions to protect the giant garter snake (GGS) will be incorporated into contracts between DWR and the water seller. As part of the contract, DWR will have access to the land to verify how the water transfer is being made available and to verify that the actions to protect the GGS are being implemented:

    - The block size of idled rice parcels will be limited to 320 acres in size with no more than 20 percent of rice fields idled cumulatively (from all sources of fallowing) in each county or area within 1 mile of the following refuge areas: Sacramento National Wildlife Refuge Complex (Sacramento, Delevan, Colusa, Sutter, Butte Sink and Llano Seco Unit), Gray Lodge Wildlife Area (WA), Upper Butte Basin WA, and Gilsizer Slough Conservation Easement. The 320-acre blocks will not be located on opposite sides of a canal or other waterway, and will not be immediately adjacent to another fallowed parcel (a checkerboard pattern is the preferred layout);

    - Parcels participating in crop idling for the 2009 DWB will not include:

        - Lands between Refuges that serve as corridors: lands adjacent to Hunters and Logan Creeks between Sacramento National Wildlife Refuge (NWR) and Delevan NWR; the Colusa Basin drainage canal between Delevan and Colusa NWRs; Little Butte Creek between Llano Seco (NWR unit) and Upper Butte Basin WA; and Butte Creek between Upper Butte Basin and Gray Lodge WA;

        - Lands adjacent to Butte Creek, Colusa Drainage Canal, Gilsizer Slough, the land side of the Toe Drain along the Sutter Bypass, Willow Slough and Willow Slough Bypass in Yolo County, and

        - Lands in the Natomas Basin;

    - The water seller will maintain a depth of at least two feet of water in the major irrigation and drainage canals (but never more than existing conditions) to provide movement corridors;

    - Water will not be purchased from a field fallowed in the previous two years by another program;

- As described in the BA (Appendix), as part of a Giant Garter Snake Baseline Monitoring and Research Strategy for the development of a GGS Conservation Strategy, in addition to the measures described above, DWR and Reclamation are proposing research goals to help quantify and evaluate the response of the GGS to riceland idling. The focus of the Strategy will be in the Colusa, Butte, Sutter, and Yolo Basins. The BA includes further details on these proposed conservation measures.

- In addition, during formal consultation with the Service, Reclamation has committed to implementing the following measures as described in the April 14, 2009 Biological Opinion:

    - Reclamation will work with DWR to document the compliance with the commitment to assure that idled parcels are no more then 320 acres in size, not located across a canal or other waterway, are not immediately adjacent to another fallowed parcel, and are distributed across the landscape in a checkerboard pattern.

    - Reclamation will reject parcels that do not conform to these criteria from participating in the DWB.

    - Reclamation will create maps showing the location of parcels enrolled to sell water to the DWB by rice fallowing or crop substitution which demonstrate compliance with the spatial criteria for fallowing rice. Reclamation will provide the maps to the Service by June 14, 2009.

    - Reclamation will gather information on the level of participation by DWB entities in the BMP's for giant garter snake.

    - Reclamation will provide this information to the Service at the end of August 2009.

    - Reporting Requirements - Reclamation will submit a monthly compliance report prepared by DWR to the Sacramento Fish and Wildlife Office beginning sixty (60) calendar days from signing contracts to participate in the DWB. This report shall detail (i) total acreage affected and location

where the fallowing occurred; (ii) confirmation that acreage fallowed conformed to the checkerboard pattern; (iii) confirmation that buffer zones have been complied with; (iv) confirmation that water levels are being maintained in ditches around affected fields; (v) occurrences of incidental take of any giant garter snake, if any; (vi) an explanation of failure to meet such measures, if any; and (vii) other pertinent information.

- As described in Section 3.8, In order to limit reduction in the amount of over-winter forage for migratory birds, including greater sandhill crane, DWR and Reclamation will avoid or minimize actions near known wintering areas in the Butte Sink (from Chico in the north to the Sutter Buttes and from Sacramento River in the west to Highway 99) that could adversely affect foraging and roosting habitat.

- As described in Section 3.8, as part of the review process for the identification of areas acceptable for crop idling, DWR and Reclamation will review current species distribution/occurrence information from the Natural Diversity Database and other sources (including rookeries, breeding colonies, and concentration areas). DWR and Reclamation will then use the information to make decisions that will avoid crop idling actions that could result in the substantial loss or degradation of suitable habitat in areas that support core populations of evaluated species that are essential to maintaining the viability and distribution of evaluated species, including black tern. Conservation measures proposed for GGS in the BA (Appendix) will also benefit the black tern.

- As described in Section 3.8, DWR will evaluate the potential for suitable nesting habitat within 2 miles of idled parcels by conducting a California Natural Diversity Database (CNDDB) search of nesting records of Swainson's hawk and by conducting a field visit to evaluate the surrounding habitats. If a Swainson's hawk is known to nest within 2 miles of the idled field or suitable nesting habitat occurs within 2 miles of the idled field, then the area within a 2 mile radius of the nest site, or suitable nesting habitat, will be characterized by habitat and type of agriculture. The goal of this evaluation will be to determine if the acreage of the idled field will constitute a significant loss of foraging habitat in comparison to the surrounding 10,000 acres. Through these evaluations DWR, will determine the level of potential impact to foraging Swainson's hawks. Idling transfers will proceed as long as the impact to foraging habitat is determined to be less than significant.

- As described in Section 3.8, to ensure effects of crop idling actions on western pond turtle habitat are avoided or minimized, water levels in drainage canals will be maintained to within 6 inches of existing conditions and canals will not be allowed to completely dry out.

- As described in Section 3.9, Reclamation and DWR and willing sellers will work together to implement one, or a combination, of the following mitigation measures that is appropriate to reduce air quality impacts within their district: retrofit non-

program pumps in amounts necessary to offset the maximum increases in project-related air pollutant emissions; or purchase offsets to compensate for producing project-related emissions.

- In order to avoid potential impacts to cultural resources, Reclamation and DWR will review the previously described requirements for information tracking reservoir operations for potential transfers of stored reservoir water. Reclamation will not approve transfers that would drawdown reservoirs beyond historic operational levels.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section discusses the affected environment and environmental consequences of the proposed action. The overall study area includes specific areas of analysis for each resource that may be directly or indirectly affected by potential DWB acquisitions. In a general sense, these areas of analysis comprise (1) watersheds of rivers that may be the source of stored reservoir water or may participate in groundwater substitution or crop idling; (2) rivers used to convey DWB transfer water; (3) lands that may be used for crop idling and adjacent lands; (4) groundwater basins that may be affected by groundwater substitution (5) district, on-farm and SWP or CVP conveyance facilities; and (6) storage and conveyance facilities in areas that would receive water from DWB transfers.

The proposed action would not affect the following resources: recreation, noise, hazardous and toxic waste, and transportation and traffic. Therefore, they are not analyzed in further detail.

3.1 Surface Water Resources

3.1.1 Affected Environment

The California Water Plan provides a framework for water managers, legislators, and the public to consider options and make decisions regarding California's water future. The Plan, which is updated every five years, presents basic data and information on California's water resources including water supply evaluations and assessments of agricultural, urban, and environmental water uses to quantify the gap between water supplies and uses. The Plan also identifies and evaluates existing and proposed statewide demand management and water supply augmentation programs and projects to address the State's water needs (http://www.waterplan.water.ca.gov/).

<u>Acquisition</u>

The proposed action would involve potential water transfers from CVP contractors in the Sacramento River hydrologic region: Glenn Colusa Irrigation District, Lewis Ranch, Maxwell Irrigation District, Meridian Farms Water Company, Natomas Central Mutual Water Company, Pelger Mutual Water Company, Pleasant Grove-Verona Mutual Water Company, Princeton-Codora Irrigation District, Provident Irrigation District, Reclamation District 108, Reclamation District 1004, River Garden Farms, Sacramento River Ranch, Sutter Mutual Water Company, and Sycamore Mutual Water Company in the Sacramento

River area; Parrot Investment Company on Butte Creek; Reclamation via Orland Unit Water User's Association on Stony Creek, and the City of Sacramento in the American River area.

Sacramento River

The Sacramento River flows south for 447 miles through the northern Central Valley of California, between the Pacific Coast Range and the Sierra Nevada. The chief tributaries of the Sacramento River are the Pit, Feather, McCloud and American rivers.

Glenn Colusa Irrigation District

Glenn-Colusa Irrigation District (GCID) has been diverting Sacramento River water since 1883 and was one of the first large-scale water users within the Sacramento Valley. The District conveys Sacramento River water through irrigation canals to approximately 141,000 acres. In addition, GCID delivers water to 20,000 acres of wildlife habitat comprising the Sacramento, Delevan, and Colusa National Wildlife Refuges.

GCID's Hamilton City pump station is located approximately 100 miles north of the City of Sacramento. The pump station is situated on an oxbow off the main stem of the Sacramento River. Water flow passes through the existing fish screens where a portion of it is pumped into GCID's main irrigation canal. The remaining flow in the oxbow passes by the screens and then back into the main stem of the Sacramento River. GCID diverts a maximum of 3,000 cubic feet per second (cfs) from the Sacramento River, with the peak demand occurring in the spring (GCID 2009).

Maxwell Irrigation District

Maxwell Irrigation District has a forty year contract with Reclamation, consisting of 11,980 af of base supply available during the months of April through October and 6,000 af of project supply available during the "critical" months of July, August, and September. The point of diversion is the District's pumping plant on the Sacramento River. The District also holds several state diversion licenses and is a signatory to the "Five Party Agreement" which allows for diversion of water from the Colusa Basin (2047) Drain.

Meridian Farms Water Company

The Meridian Farms Water Company (MFWC) provides irrigation water to three distinct service areas encompassing 9,150 total acres, with an estimated annual water delivery of 35,000 acre-feet. The water service is provided by surface water diversions from the Sacramento River, drain water reuse, and groundwater pumping. MFWC diverts water from the Sacramento River under the provisions of a License for Diversion and Use of Water with a priority date of September 10, 1918, which allows for 9,000 af to be diverted annually. The Sacramento River diversions are located at Meridian, Drexler, and Grimes.

Natomas Central MWC

Natomas Mutual Water Company (Natomas Central) supplies water to about 31,575 acres primarily by surface water, reuse of tail water, and by one groundwater well. Natomas Central diverts up to 120,200 af from the Sacramento River during the irrigation season under a CVP settlement contract. Natomas Central can also divert Sacramento River water during non-irrigation seasons for environmental water use (wetlands enhancement and rice straw decomposition). Such diversions outside the irrigation season are not a part of the Sacramento River Settlement Contract. Natomas Central has two main pump stations on the Sacramento River: Prichard Lake Pumping Plant and Elkhorn Pumping Plant. Natomas Central also diverts water from the Natomas Cross Channel along the Natomas Central's northern boundary.

Natomas Central uses about 36,000 acre-feet of tailwater each year as an alternative supply to Sacramento River water. A recirculation system captures all tailwater and returns it either directly to the fields or into the main irrigation canals. During a normal irrigation season, Natomas Central reuses agricultural drainage water until the end of the rice irrigation season (between August 15 and September 1) before releasing the drainage water to the Sacramento River. Natomas Central does not supply treated water for Municipal and Industrial (M&I) uses, but does provide water for landscaping. Water demand is greatest during July and August due to agricultural needs and a hot, dry climate (Reclamation et al. 2000).

Pelger Mutual Water Company

Pelger Mutual Water Company (PMWC) is located on the Sacramento River near Robbins. This entity has appropriative water rights as well as a Sacramento River Settlement Contract with Reclamation for 8,860 af. Their diversion is located on the east bank of the Sacramento River at river mile 56.96L. This district recycles drain water back to irrigation ditches. During dry years, the district's water supply is supplemented by groundwater from private landowners' wells.

Pleasant Grove-Verona Mutual Water Company

Pleasant Grove-Verona MWC (PGV) provides irrigation water for 7,330 acres of farmland through two contracts with Reclamation for a total of 26,290 af. Surface water is the primary source of water supply within PGV. The surface water source for this contract is the Sacramento River. Shareholders divert water under their individual water rights and pursuant to the Reclamation contract from the Natomas Cross Canal.

Princeton-Codora-Glenn Irrigation District

Princeton-Codora-Glenn Irrigation District (PCGID) encompasses 12,000 acres and is located east of Willows. PCGID is adjacent to the Sacramento River.

Provident Irrigation District

Provident Irrigation District (PID) encompasses 16,000 acres and is located west of Willows. PID is located just to the west of PCGID, with the Colusa Drain being the boundary between the two districts.

Reclamation District 108

Reclamation District 108 has a settlement contract with Reclamation to divert water from the Sacramento River as well as CVP Project water. Reclamation District 108 operates seven pumping plants that divert water from the Sacramento River for irrigation, and one that diverts water from the Colusa Basin Drain as a supplemental irrigation supply. Reclamation District 108's permit allows 75 cubic feet per second (cfs) to be pumped from the Colusa Basin Drain.

Reclamation District 1004

RD 1004 is located between the Sacramento River and Butte Creek between Princeton to the north and Colusa to the south. RD 1004 has appropriative water rights as well as a Sacramento River Settlement Contract with Reclamation. Surface water sources available to RD 1004 include the Sacramento River, Butte Creek and extensive recirculation of tail water. RD 1004's main pumping plant on the Sacramento River is located near Princeton at about river mile 164L. RD 1004's appropriative water rights for Butte Creek allow diversions at several locations between White Mallard Dam and Butte Slough.

River Garden Farms

River Garden Farms is located in Yolo County on the west border of the Sacramento Valley. They have appropriative water rights as well as a Sacramento River Settlement Contract with Reclamation for 29,800 af.

Sacramento River Ranch

Sacramento River Ranch (River Ranch) is comprised of 3,985 acres and is located northwest of Sacramento in an unincorporated area of Yolo County. The River Ranch's source of surface water is the Sacramento River and Knights Landing Ridge Cut. Five appropriative water rights cover a portion of the River Ranch and adjacent lands. Pursuant to these licenses, the River Ranch has a maximum annual diversion quantity of 7,094 af, which may be diverted from April through October. These water right licenses have historically been used by the River Ranch to provide water for irrigation purposes. In addition, a portion of the River Ranch is subject to a settlement contract with Reclamation, which authorizes the diversion and use of 4,000 af per year from the Sacramento River.

Sutter Mutual Water Company

Sutter Mutual Water Company is located 45 miles northwest of Sacramento and is bordered on the north by the Tisdale Bypass, the west by the Sacramento River, and on the east by the Sutter Bypass. The southern boundary is located at the southern end of Sutter County near Freemont Weir where the Sacramento and Feather River come together. They have appropriative water rights as well as a Sacramento River Water Rights Settlement Contract with Reclamation for 226,000 af.

Sycamore Mutual Water Company

Sycamore Mutual Water Company is located on the west side of the Sacramento River near Meridian. They have appropriative water rights, as well as a Sacramento River Settlement Contract with Reclamation for 31,800 af.

Stony Creek

Stony Creek is a westside stream originating in the Coast Range and draining into the Sacramento River south of Hamilton City. There are three storage reservoirs in the watershed.

Orland Unit Water User's Association

Reclamation holds water rights on Stony Creek for the Orland Project, which is administered and operated by the Orland Unit Water User's Association. The Orland Project includes two major dams and reservoirs with a combined storage of 100,000 acre feet and two diversion dams on Stony Creek. The Orland Project includes 126 miles of canals and laterals in and around Orland, California, and provides irrigation water to approximately 20,000 acres.

Butte Creek

Butte Creek is tributary to the Sacramento River, joining the river in the vicinity of Colusa. About 110 miles in length, it runs through much of Butte County, California.

Parrott Investment Company

Parrott Ranch encompasses approximately 17,000 acres located adjacent to the left bank of the Sacramento River, approximately 4 miles west of the town of Durham. They hold an agreement with Reclamation and riparian claims for diversions of natural flow from Butte Creek, and adjudicated pre-1914 and post-1914 appropriative water rights for diversion from Butte Creek flow originating from the west Branch of the Feather River.

American River

The American River originates in the high Sierra Nevada just west of Lake Tahoe. Its three main forks—the South, Middle and North—flow through the Sierra foothills and converge east of Sacramento at Folsom Reservoir. The American River converges with the Sacramento River near Sacramento.

City of Sacramento

Sacramento County Water Agency presently has a CVP entitlement of 22,000 acre-feet (af) through Reclamation. Surface water provides 85% of the water supplied annually by the district (City of Sacramento 2008).

Conveyance Facilities

In California, lakes, rivers, and reservoirs receive their water from precipitation and runoff, which is available during the rainy season (typically November through April). Water users need water year-round, with increased water needs during the summer because of increased temperatures and agricultural uses. This imbalance is exacerbated by the differences in precipitation and demand between northern California and southern California. More than 70 percent of runoff originates in northern California, but more than 75 percent of urban and agricultural demand is south of Sacramento (DWR 1998). Because of the uneven distribution of the location of water supply and water demand, aqueducts and canals are used to transport water to users. The amount of water that can be transported south is dependent on Delta pump capacity and as per regulatory requirements, such as the previously mentioned Opinions and Delta water quality standards.

Direct flows to the Delta drain over 40 percent of the State of California. The Sacramento River contributes roughly 75 to 80 percent of the Delta inflow in most years, while the San Joaquin River contributes about 10 to 15 percent. Precipitation also contributes an annual average inflow of 990,000 acre-feet, approximately 5 percent of the annual inflow. The rivers flow through the Delta and into Suisun Bay. From Suisun Bay, water flows through the Carquinez Strait into San Pablo Bay, then south into San Francisco Bay, and then out to sea through the Golden Gate. In general, water that is not consumed or stored in northern California or pumped through the Delta to central and southern California flows out to the Bay and into the ocean.

Water transfers originating upstream from the Delta and going to service areas downstream of the Delta would require moving water through the Delta. Water conveyance through the Delta is a significant constraint. Constraints to conveying water through the Delta range from physical limitations to regulatory requirements. A series of regulations and agreements with the SWRCB, U.S. Fish and Wildlife Service (Service), National Marine Fisheries Service (NOAA Fisheries), California Department of Fish and Game (CDFG), and U.S. Army Corps of Engineers (Corps) govern current SWP and CVP operations in the Delta. These regulations and agreements limit the volume of water that can be exported from the Delta based on Delta hydrodynamics, water quality, and potential impacts on fisheries. Reclamation and DWR will ensure careful coordination of transfers with existing SWP and CVP operations in meeting water rights, water quality, and fishery protection measures when approving proposed water transfers.

CVP/SWP Project facilities that would potentially be utilized under the proposed action would include San Luis Reservoir, Lake Shasta and Folsom Lake; and SWP and CVP pumping and conveyance facilities, which would be used for conveying DWB transfer water. The SWP operates its Harvey O. Banks Pumping Plant in the southern Delta to lift

water into the California Aqueduct for delivery to SWP customers in the south San Francisco Bay Area, San Luis Obispo and Santa Barbara Counties, the San Joaquin Valley, and southern California; and into the North Bay Aqueduct for delivery to SWP customers in Solano and Napa counties. The CVP operates the C.W. "Bill" Jones Pumping Plant to lift water from the Southern Delta into the Delta-Mendota Canal to service CVP contractors in the San Joaquin Valley and the Tulare Basin. Under the proposed action, water may also be transferred from sellers upstream of the Delta to buyers upstream of the Delta, using existing district, CVP and SWP conveyance facilities, including the Tehama Colusa Canal.

The California Aqueduct delivers imported water to the Metropolitan WD service area from northern California sources to storage reservoirs such as Pyramid Lake, Castaic Lake, Silverwood Lake, and Lake Perris. Other Metropolitan WD water supplies include the Colorado River Aqueduct, local groundwater supplies, Metropolitan WD storage reservoirs (e.g., Diamond Valley), and reclaimed water. Castaic Lake, Lake Perris, Lake Mathews, and Diamond Valley Reservoir are four facilities in southern California that would potentially receive transfer water under the proposed action. The Castaic Dam and reservoir facility is about 45 miles northwest of Los Angeles. Castaic Lake is the terminus for the west branch of the California Aqueduct. Lake Perris is about 11 miles southeast of Riverside and 60 miles southeast of downtown Los Angeles. The lake is the southern terminus of the SWP's East Branch of the California Aqueduct. Diamond Valley Reservoir, recently completed by the Metropolitan WD, is 80 miles southwest of Los Angeles. This reservoir receives water distributed through Metropolitan WD's water distribution system, which includes all Metropolitan WD's water sources. Anderson Reservoir, in Santa Clara County, is another facility that would potentially receive transfer water under the proposed action. Santa Clara Valley WD uses Anderson Reservoir for groundwater recharge and as a secondary drinking source. The reservoir is the largest lake in the county.

Further information on these water resources and facilities is available in the EWA 2003 Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) and EWA 2007 Draft Supplemental EIS/EIR, which are hereby incorporated by reference.

Receiving Areas

The proposed action would potentially transfer water to districts as identified in Table2. These areas receive water from multiple sources, including the SWP, the CVP, local surface water sources, and groundwater. Subject to critical needs criteria, DWB water would only be provided to districts for meeting existing M&I and agricultural needs that would otherwise have been met through CVP and SWP allocations.

DWR would administer the distribution of water from the DWB based on DWR's DWB needs criteria (http://www.water.ca.gov/drought/).

The Governor of the State of California has declared a state of emergency regarding drought conditions, and has ordered that the State Water Resources Control Board shall expedite the processing and consideration of the request by DWR for approval of the consolidation of the places of use and points of diversion for the SWP and CVP to allow flexibility among the projects and to facilitate water transfers and exchanges. It is anticipated that the State Water Resources Control Board (SWRCB) will approve a consolidated place of use for the CVP and SWP in order to facilitate these transfers.

3.1.2 Environmental Consequences

No Action

If the proposed action were not implemented, CVP water transfers would not occur under the 2009 Drought Water Bank. Although non-CVP transfers could occur via the DWB, and some transfers outside of the DWB may occur, potential buyers identified in this analysis would likely experience water shortages.

Proposed Action

Acquisition Areas

Temporary changes in water right permits may be needed for some water transfers. Individual water right holders would be responsible for obtaining changes to water rights from the SWRCB as needed. However, DWR and Reclamation are willing to use the flexibility under their respective water rights to accommodate water transfers under the DWB. This accommodation will be implemented as consistent with the water right permits of DWR and USBR, their water supply contracts, and State and Federal law and policies. DWR has petitioned the State Water Resources Control Board (SWRCB) for a consolidated place of use for the CVP and SWP service areas. However, the decision on this petition is not currently available.

Acquisition of water via crop idling could reduce the water supply for Sacramento River users not participating in the DWB who rely on return flows from fields that, under the proposed action, would be idled. Idling fields would reduce tailwater, which could reduce supplies to downstream users. Decreases in return flows to agricultural drainages used by others, could reduce water available to neighboring agriculture and other water users. In order to minimize this potential effect, willing sellers will be required to maintain water levels in drainage systems that do not reduce supplies to downstream users. Monitoring of water levels in district conveyance facilities will be implemented by willing sellers. This water would not be purchased by the DWB; it is part of the water that the willing seller would have diverted under the existing condition.

Groundwater substitution could decrease water levels in neighboring surface water channels. As described in Section 3.2, well reviews and monitoring programs will be implemented in accordance with all applicable local, regional and State regulations and Basin Management Objectives to minimize this potential impact. Well-specific data, including location of production and monitoring wells, driller's log giving geology and well construction details, and additional information that characterizes the hydrogeologic environment near the well will be evaluated.

Acquisition of water via groundwater substitution or crop idling would change the rate and timing of flows in the Sacramento River. The rate and timing of changes to flows in the Sacramento River would depend on the amount of water potential sellers in this region make available and the scheduled release of that water. However, flow and temperature requirements, including Water Right Orders 90-5 and 91-1 temperature control planning requirements for the Sacramento River, would continue to be met under the proposed action. Because of flow and temperature requirements in the Sacramento River, Lake Shasta would most likely not be able to store otherwise diverted surface water made available from groundwater substitution and crop idling in April and May. Depending on hydrologic conditions, Lake Shasta may be able to store water from crop idling and groundwater substitution in June because users would not need the surface water released under the existing condition for agricultural use. Sacramento River flows between Lake Shasta and the point of diversion could decrease in June. The decrease in flow corresponds only to the amount of water that the willing seller would have used under the no action alternative. The remaining river flow would supply other agencies' water needs as it would under the existing condition because the timing and quantity of their water release would also be the same as under the no action alternative.

During July through September, water from Lake Shasta would be released into the Sacramento River; however, those agencies that have sold water to the DWB would divert less water off the river than they would under the no action alternative. The Sacramento River would therefore have increased flows donstream of those points of diversion; upstream of those points of diversion Sacramento River flows would be the same as under the existing condition. Also, releases from Lake Shasta would be timed to provide water when the export pumps are available (July through September). Although there would be a change in timing and rate of riverflows, the annual supply of water to Project or non-Project users would not decrease due to the proposed action. .

Acquisition of water via groundwater substitution from the City of Sacramento and Sacramento Suburban Water District could change the rate and timing of flows in the American River. The rate and timing of flow changes would depend on the amount of water the City of Sacramento and Sacramento Suburban Water District make available and the scheduled release of that water. During April through June, Folsom Reservoir would store water. Groundwater would replace surface water released from Folsom Reservoir for use under the existing condition. Surface water would therefore not be released from Folsom Reservoir to meet those water supply requirements. During July

through September, water from Folsom Reservoir would be released into the Lower American River system.

River flows would increase below the point of diversion under the proposed action. The increase in flow corresponds only to the amount of water that the willing seller would have used under the existing condition. The flow would supply other agencies' water needs as it would under the existing condition because the timing and quantity of their water release would also be the same as under the existing condition. During July through September, water from Folsom Lake would be released into the American River that, under the existing condition, would have been used by the City of Sacramento. Therefore, river flows downstream of the points of diversion for City of Sacramento and Sacramento Suburban WD would increase compared to the existing condition.

Although there would be a change in timing and rate of riverflows, the annual supply of water to Project or non-Project users would not decrease**.**

Acquisition of stored reservoir water from Reclamation via Orland Unit Water Users Association could reduce carryover storage compared to the existing condition. Orland Unit Water Users Association would release up to 10,000 af (20% of capacity) from Stony Gorge Reservoir which has a storage capacity of 50,300 af. Refill of the reservoir would take place during the following winter and spring. Following the transfer, if insufficient water were available to refill the reservoir (e.g., in a low runoff year), a decrease in available supply to users during the following summer could result. Potential sellers would decide the amount of water to sell, and it is anticipated that sellers would calculate the amount of carryover storage that could be released without adverse effects, factoring the potential for a dry year and less refill into the decision-making process. Sellers would not sell water to the DWB that would be needed for its water users and will be required to demonstrate this in their transfer proposal to DWR.

Stored reservoir water sellers will be required to demonstrate that stored water released for transfer would be in addition to the quantity of water normally released under historical and projected reservoir operations. In their transfer proposals, sellers will be required to provide monthly reservoir operations for the previous 10 years showing monthly releases and storage levels and the method of measuring stored water releases and accounting for transfer water and reservoir refill (ie reservoir refill criteria) to track reservoir operations during and after the transfer of water. DWR and Reclamation will not approve reservoir reoperation transfers that would draw down reservoirs beyond historic operational levels. Additionally, the SWRCB will also review the potential reservoir release to ensure that potential effects to supply or to other legal users will be minimized.

The proposed action is not expected to change the flow regimes and storage patterns in rivers, creeks and other channels contained by levees. Typically, water would be released from reservoirs during the mid- to late-summer and fall, when rivers and channels are substantially below flood stage capacity (typically less than 25 percent of spring runoff flows). Releases of water under the proposed action would not exceed typical releases

from the reservoirs.

Receiving Areas

The program would likely result in increased water supplies in 2009 to SWP and CVP contractors in need. Under the existing condition, water users would be subject to reductions in their water supply due to dry hydrologic conditions. Under the proposed action, additional water supply would benefit water users who meet the previously mentioned critical needs criteria for existing uses, including urban and agricultural (permanent crops 3 to 5 years old) uses only. This increased water supply would be a beneficial effect, and would not be in excess of contract totals.

3.2 Groundwater Resources

3.2.1 Affected Environment

Sacramento Valley Groundwater Basin

Groundwater substitution transfers for the DWB would be within the Sacramento Valley Groundwater Basin. The Sacramento Valley Groundwater Basin extends from the Redding Groundwater Basin to the San Joaquin Valley including Tehama, Glenn, Butte, Yuba, Colusa, Placer and Yolo Counties. It is bordered by Red Bluff Arch to the north, the Coast Ranges to the west, the Sierra Nevada to the east, and the San Joaquin Valley to the south.

The Sacramento Valley Groundwater Basin is a north-northwestern trending asymmetrical trough filled with as much as 10 miles of both marine and continental rocks and sediment (Page 1986). On the eastern side, the basin overlies basement bedrock that rises relatively gently to form the Sierra Nevada, while on the western side the underlying basement bedrock rises more steeply to form the Coast Ranges. Overlying the basement bedrock are marine sandstone, shale, and conglomerate rocks, which generally contain brackish or saline water (DWR 2001). The more recent continental deposits, overlying the marine sediments, contain freshwater. These continental deposits are generally 2,000 to 3,000 feet thick (Page 1986). The depth (below ground surface) to the base of freshwater typically ranges from 1,000 to 3,000 feet (Bertoldi 1991). Along the eastern and northeastern portion of the basin are the Tuscan and Mehrten formations, derived from the Cascade and Sierra Nevada. The Tehama Formation in the western portion of the basin is derived from Coast Range sediment. In most of the Sacramento Valley Groundwater Basin, the Tuscan, Mehrten, and Tehama formations are overlain with relatively thin alluvial deposits.

In the Sacramento Valley Groundwater Basin, freshwater is present primarily in the Tuscan, Mehrten, and Tehama formations and in alluvial deposits. Groundwater users in the basin pump primarily from deeper continental deposits. Groundwater is recharged by deep percolation of applied water and rainfall infiltration from streambeds and lateral inflow along the basin boundaries. Average annual precipitation in the Sacramento

Valley Groundwater Basin ranges from 13 to 26 inches, with the higher precipitation occurring along the eastern and northern edges of the basin. Typically, 80 to 90 percent of the basin's precipitation occurs from November to April. Further east in the Sierra Nevada, precipitation ranges from 40 to 90 inches, much in the form of snow (Bertoldi 1991). The quantity and timing of snowpack melt are the predominant factors affecting the surface and groundwater hydrology, and peak runoff in the basin typically lags peak precipitation by one to two months (Bertoldi 1991).

The main surface water feature in the Sacramento Valley Groundwater Basin is the Sacramento River, which has several major tributaries draining the Sierra Nevada, including the Feather River, Yuba River, and American River. Stony Creek, Cache Creek, and Putah Creek, draining the Coast Range are the main west side tributaries of the Sacramento River. Surface water and groundwater interact on a regional basis, and, as such, gains and losses to groundwater vary significantly geographically and temporally. In areas where groundwater levels have declined, such as in Sacramento County, streams that formerly gained water from groundwater now lose water to the groundwater system through seepage.

Irrigated agriculture in the Sacramento Valley Groundwater Basin increased steadily from less than 500,000 acres in the 1940s to more than 1.5 million acres by 1980 (Reclamation 1997). Correspondingly, groundwater production to support agriculture rose from less than 500,000 acre-feet annually to more than 2 million acre-feet annually by the mid-1990s (DWR 1998).

In general, groundwater flows inward from the edges of the basin and south parallel to the Sacramento River. In some areas there are groundwater depressions associated with extraction that influence local groundwater gradients. Prior to the completion of CVP facilities in the area (1964-1971), pumping along the west side of the basin caused groundwater levels to decline. Following construction of the CVP, the delivery of surface water and reduction in groundwater extraction resulted in a recovery to historic groundwater levels by the mid to late-1970s. Throughout the basin, individuals, counties, cities, and special legislative agencies manage and/or develop groundwater resources. Many agencies use groundwater to supplement surface water; therefore, groundwater production is closely linked to surface water availability.

Historically, land subsidence occurred in the eastern portion of Yolo County and the southern portion of Colusa County, owing to groundwater extraction and geology. The earliest studies on land subsidence in the Sacramento Valley occurred in the early 1970s when the USGS, in cooperation with DWR, measured elevation changes along survey lines containing first and second order benchmarks. Results indicated subsidence between 1934 and 1942, in 1964, and in 1967 between Zamora and Davis and between Zamora and Arbuckle. A 1994 USGS study using a global positioning system survey indicated a subsidence rate of 4 cenitmeters/year for areas centered on Davis and extending toward Dixon and an area centered on Woodland extending toward Zamora (DWR Northern District 2002).

DWR is monitoring land subsidence in several areas throughout the Sacramento Valley. These figures indicate that the ground surface displacement generally occurs during periods of high groundwater extraction. The Conaway Ranch extensometer shows a net reduction (inelastic subsidence) of less than half an inch between 1991 and 2001 while the Zamora extensometer shows a net reduction of about 2 inches over the same time period. Additional data from the Zamora extensometer, not shown here, indicates a net subsidence of over 6 inches from 1988 to 1992. Yolo County, in cooperation with DWR, has developed a countywide global positioning system (GPS) designed to survey and monitor future land subsidence (DWR Northern District 2002).

Groundwater quality in the Sacramento Valley Groundwater Basin is generally good and sufficient for municipal, agricultural, domestic, and industrial uses. However, there are some localized groundwater quality issues in the basin. In general, natural groundwater quality is influenced by stream flow and recharge from the surrounding Coast Ranges and Sierra Nevada. Runoff from the Sierra Nevada is generally of higher quality than runoff from the Coast Ranges, because of the presence of marine sediments in the Coast Range. Specific groundwater quality issues are discussed below.

Total Dissolved Solids (TDS) in the region generally consist of inorganic salts and small amounts of organic matter. The California and EPA secondary drinking water standard for TDS is 500 milligrams per liter (mg/L), and the agricultural water quality goal for TDS is 450 mg/L. Generally, in the Sacramento Valley Groundwater Basin, TDS levels are between 200 and 500 mg/L, while in the southern part of the basin the TDS levels are higher than that due to the local geology. Along the eastern boundary of the basin, TDS concentrations tend to be less than 200 mg/L, indicative of the low level of TDS concentrations in Sierra Nevada runoff. Several areas in the basin have naturally occurring high concentrations of TDS, with concentrations that exceed 500 mg/L. TDS concentrations as high as 1,500 mg/L have been recorded (Bertoldi 1991). One of these high TDS areas is west of the Sacramento River, between Putah Creek and the confluence of the Sacramento and San Joaquin Rivers; another is in the south-central part of the Sacramento Basin, south of Sutter Buttes, in the area between the confluence of the Sacramento and Yuba Rivers.

Nitrate (measured as nitrogen) is regulated in drinking water and has a maximum contaminate level (MCL) of 10 mg/L. Nitrates found in groundwater could be due to fertilizer use, leachate from septic tanks, wastewater disposal, and natural deposits. In irrigation water, nitrate could be an asset because of its value as a fertilizer; however, algae growth and environmental problems could arise from concentrations exceeding 30 mg/L. Concentrations of nitrate as nitrogen exceeding 10 mg/L are found throughout the Central Valley; however, concentrations exceeding 30 mg/L are rare and localized (Bertoldi 1991). In the Sacramento Groundwater Basin, two areas of potential nitrate problems have been identified: one in northern Yuba and southern Butte Counties, east of Sutter Buttes, and another in northern Butte and southern Tehama Counties (Reclamation 1997).

In low concentrations, boron is important for plant growth, but it could adversely affect certain crops at concentrations as low as 0.5 mg/L. In the Central Valley, boron is usually from natural sources, such as marine deposits; in general, only localized portions of the Sacramento Valley Groundwater Basin have concentrations exceeding 0.75 mg/L, the largest area being in the southwestern part of the basin from Arbuckle to Rio Vista (Bertoldi 1991).

Arsenic and selenium are naturally occurring trace elements. The California drinking water standard for selenium is 0.05 mg/L. On January 22, 2001, EPA lowered the arsenic standard from 0.05 mg/L to 0.01 mg/L. For agricultural use, arsenic concentrations should not exceed 1 mg/L. Selenium is toxic to humans and animals at low concentrations and can accumulate in the environment and in wildlife (DWR Northern District 2002). According to the SWRCB, there are no elevated concentrations of arsenic or selenium in the Sacramento Groundwater Basin.

Regulatory Background

Groundwater use is subject to limited statewide regulation; however, all water use in California is subject to constitutional provisions that prohibit waste and unreasonable use of water (SWRCB 1999). In general, groundwater and groundwater-related transfers are subject to a number of provisions in the Water Code. These provisions require compliance with: 1) local groundwater management plans, 2) the "no injury" rule, and 3) Section 1220 that regulates the direct export of groundwater from the combined Sacramento and Delta-Central Sierra Basins.

The State Water Code (Section 1745.10) requires that for short term water transfers, the transferred water may not be replaced with groundwater unless the following criteria are met (SWRCB 1999):

- The transfer is consistent with applicable groundwater management plans; or
- The transferring water supplier approves the transfer and, in the absence of a groundwater management plan, determines that the transfer will not create, or contribute to, conditions of long-term overdraft in the groundwater basin.

In addition to these requirements, State well standards and local ordinances govern well placement, and the Water Code requires submission of well completion reports.

The "no injury" provisions of the Water Code provide that transfers cannot cause "injury to any legal user of the water involved." Groundwater users are protected by the provisions as long as they are legal users of water. The "no-injury" rules typically apply to legal third parties. Although not defined in the Water Code, third parties are typically not the entities conducting the transfer or receiving the transferred water, but are the parties (including Indian tribes) that could be affected by the transfers.

Other groundwater regulation is related primarily to water quality issues, which are addressed through a number of different legislative acts and are the responsibility of several different State agencies including:

- **The State Water Resource Control Board (SWRCB) and nine regional water quality control boards** - responsible for protecting water quality for present and future beneficial use;

- **The Department of Toxic Substances Control** - responsible for protecting public health from improper handling, storage, transport, and disposal of hazardous materials;

- **The Department of Pesticide Regulation** - responsible for preventing pesticide pollution of groundwater;

- **The Department of Health Services** - responsible for drinking water supplies and standards;

- **The California Integrated Waste Management Board** - oversees non-hazardous solid waste disposal, and

- **The Department of Conservation** - responsible for preventing groundwater contamination due to oil, gas, and geothermal drilling and related activities.

Local groundwater management plans and county ordinances vary by authority/agency and region, but typically involve provisions to limit or prevent groundwater overdraft, regulate transfers, and protect groundwater quality. Potential sellers have begun coordination with their respective counties regarding the proposed action and will continue this coordination through the transfer approval process.

Glenn County Ordinance 1115: Ordinance 1115 requires that management objectives for minimum groundwater levels, minimum water quality and maximum inelastic subsidence be established for each of the 17 sub-areas defined based on surface water districts and known groundwater sub-basins. The management objectives can be considered a set of trigger points where action will be taken if the BMO levels are exceeded. Representatives from each sub-area established the objectives, the methodology used, and the wells to be monitored for their own area. The management objectives for each sub-area are evaluated annually and any changes must be approved by the Board of Supervisors. A basic tenet of the BMO for each sub-area is that water management practices or activities in one management sub-area shall not negatively impact the water management objectives of another sub-area.

At this time sub-area BMOs have been established for groundwater levels only. Water quality monitoring began in the summer of 2003. Localized monitoring for subsidence began in the summer of 2002 with the installation of an extensometer. Installation of a GPS-based wide area subsidence monitoring system is planned for 2004. It is anticipated that the BMOs will change as more data becomes available and experience is gained in evaluating the data.

The California Department of Water Resources has been measuring groundwater levels semi-annually in many wells in the county for a long period of time. Many of the sub-areas are using data from selected wells in the DWR monitoring grid to establish and monitor BMO compliance. Two extensometers have been installed to continuously monitor for subsidence over localized

areas. The extensometers have been placed in areas with heavy groundwater pumping.

If a BMO threshold is exceeded, a process is set in motion. First the TAC undertakes a fact finding process to determine the regional extent, magnitude, and cause(s) of the non-compliance. The TAC then reports its findings to the WAC and recommends possible corrective actions to resolve the problem. The GCWAC then tries to resolve the problem in the affected area through negotiations. Some of the possible actions available that may be taken by the GCWAC might be to coordinate the following voluntary actions in the affected area:

· Rescheduling and/or redistributing groundwater extractions
· Termination of groundwater substitution extractions, if deemed the cause of the non-compliance
· Reduction of groundwater extraction rates
· Termination of groundwater extractions
· Development of groundwater recharge programs
· Modification of BMO levels (Glenn County 2000)

The Water Advisory Committee shall collect the following data from any district (and) or person engaged in a groundwater substitution program or groundwater export program: the weekly amounts of groundwater extracted from each well, the precise location of the wells, all pumping and non-pumping groundwater level measurements made during the groundwater substitution period, the time periods during which the groundwater substitution program will occur, and all required environmental documentation. It shall be the responsibility of the district and (or) person involved in the groundwater substitution program to provide this information to the Water Advisory Committee including any monetary costs of providing such data.

Colusa County Ordinance 615: This ordinance prohibits direct or indirect extraction of groundwater for transfer outside county boundaries without permit approval, except in certain circumstances. The ordinance does have an exemption process that would allow transfers to occur without obtaining a permit. The permit approval process includes a public and environmental review. Permits would only be approved after the environmental review determines that the proposed action would not result in the following: 1) overdraft or increased overdraft, 2) damage to aquifer storage or transmissivity, 3) exceedance of the annual yield or foreseeable injury to beneficial overlying groundwater users and property users, 4) injury to water replenishment, storage, or restoration projects, and 5) noncompliance with Water Code Section 1220. Three-year permits may also impose additional conditions to avoid adverse effects. Violators of this permitting process may be subject to a fine (Colusa County 1999).

Chapter 33 Groundwater Conservation: This Butte County ordinance authorizes the establishment of a countywide groundwater-monitoring program to be implemented by the Butte County Water Commission in cooperation with the Butte Basin Water Users Association, DWR, and Regional Water Quality Control Board. The ordinance requires completion of an annual report disclosing monitoring data from this program (four sampling rounds a year) in addition to data from other cities and agencies. The ordinance also requires a permit for all groundwater extraction that are to be transferred outside the county directly or indirectly via groundwater substitution (Butte County 1999).

Butte County Well-Spacing Ordinance: This ordinance requires the filing of a permit for construction, repair, deepening, or destruction of private or public water supply wells. It also sets restrictions on the spacing of wells based on capacity. This ordinance is intended to ensure that water obtained from wells within Butte County would be suitable for use and would not cause pollution or impairment of the quality of groundwater within the county (DWR Northern District 2002). In addition to the established ordinances and groundwater management plans, a Butte Basin groundwater model has been developed to: 1) assess the groundwater resources of the Butte groundwater basin; 2) develop a quantitative understanding of the groundwater hydrology; and 3) evaluate potential regional hydrologic effects associated with proposed water management alternatives (Butte Basin Water Users Association 1996).

In addition to the established ordinances and groundwater management plans, a Butte Basin groundwater model has been developed to: 1) assess the groundwater resources of the Butte groundwater basin; 2) develop a quantitative understanding of the groundwater hydrology; and 3) evaluate potential regional hydrologic effects associated with proposed water management alternatives (Butte Basin Water Users Association 1996).

Yolo County Export Ordinance No. 1617 .Yolo County Export Ordinance No. 1617 is similar to the Colusa County Ordinance described above. Indirect or direct export of groundwater outside Yolo County requires a permit. The Director of Community Development may review the permit application with the affected county department, DWR, RWQCB, and any other interested local water agency neighboring the area of the proposed action. Following a CEQA environmental review and a public review, the Board of Supervisors of Yolo County may grant the permit as long as the evidence supports that the extraction would not cause 1) adverse effects to long-term storage and transmissivity of the aquifer, 2) exceedance of safe yield unless it is in compliance with an established conjunctive use program, 3) noncompliance with Water Code section 1220, and 4) injury to water replenishment, storage, or restoration projects. The board may impose additional conditions to the permit to ensure compliance with the aforementioned criteria. This ordinance, like the Colusa Ordinance, subjects violators to fines (Yolo County 1996).

Acquisition Areas

Lewis Ranch

Groundwater would be pumped from two existing wells located within Lewis Ranch which have been used in previous transfers. No water has been pumped during irrigation season from either well in the last three years. Colusa County Ordinance Number 615 is applicable to this District.

Maxwell Irrigation District

Maxwell Irrigation District owns two deep groundwater wells with a combined pumping capacity of approximately 9,500 gpm. Colusa County Ordinance Number 615 is applicable to this District.

Meridian Farms Water Company

Meridian Farms Water Company has submitted an application to Sutter County for permits to drill two wells (Sutter County 2008). Applicable groundwater management plans, agreements and county ordinances include: Chapter 33 of the Butte County Code, and the Butte County Well Spacing Ordinance.

Natomas Central Mutual Water Company

Historically, Natomas Central MWC (Natomas Central) has relied on surface water diverted from the Sacramento River and consequently, has relatively limited groundwater development. Natomas Central has used groundwater as a supplement to surface supplies during dry years through the discretion of private landowners. Natomas Central owns two wells and has 61 privately owned wells. Fifty percent of the domestic wells are 150 feet deep or less.

Applicable groundwater management plans, agreements and county ordinances include: Water Forum Agreement; Sacramento County Water Agency Act, Sections 32-33; and Sacramento Groundwater Authority Regional Water Management Plan. Because Natomas Central is a private entity, the agency cannot adopt a formal AB3030 Plan; however, Natomas Central has developed a groundwater management plan (that contains many of the components specified in AB3030) to serve as an "effective equivalent." The overall goal of the plan is to expand the Agency's local groundwater use for agriculture and other users while continuing to use local surface water supplies. Additional goals of the plan are to: 1) continue groundwater development in accordance with the perennial yield, 2) implement conjunctive use that preserves surface water rights and supplies, 3) cooperate with local agencies to find a solution to alleviate the groundwater depression east of the service area, and 4) cooperate in implementing CALFED Regional Partnerships that address the beneficial use of surplus surface water supplies incorporating regional and local transfers. The plan prioritizes the AB3030 elements according to first and second priority (Luhdorff & Scalmanini Consulting Engineers 2002).

Natomas Central is also a signatory of the Water Forum Agreement (WFA), accepting to "endorse and, where appropriate, participate in implementation of the Sacramento North Area Groundwater Management Authority to maintain a North Area estimated average sustainable yield of 131,000 acre-feet (Water Forum 1999)." (See Local Groundwater Management in the North American Groundwater Purchase in this section for more details.) Natomas Central MWC and the Sacramento Groundwater Authority (SGA) are preparing a Memorandum of Understanding (MOU) regarding the cooperative management of water resources. Components of the management program include 1) development of a groundwater monitoring and data collection system; 2) development of economic incentives and disincentives to encourage, if necessary, the implementation of regional conjunctive use; 3) development of a regional, pilot groundwater banking and exchange/surface water transfer program; 4) coordination of groundwater quality

protection; and 5) development of a comprehensive outreach and education program (Luhdorff & Scalmanini 2002).

Currently, DWR is monitoring groundwater levels in 19 wells throughout the agency (Luhdorff & Scalmanini 2002). In contrast to the groundwater levels in much of the North American subbasin that have historically varied, historical groundwater levels underlying Natomas Central MWC boundaries have remained relatively stable. However, a cone of depression near McClellan Air Force Base, four miles east of the southeast corner of Natomas Central MWC, influences groundwater flow in the eastern portion of the service area. Groundwater levels are lowest in the eastern portion of the service area, near the pumping depression, and increase westward towards the Sacramento River. Groundwater level declines, resulting from the droughts in 1976-1977 and 1988-1992, have been followed by recovery for the majority of the service area, with the exception of some wells in the eastern portion of the service area following the 1988-1992 drought. The highest groundwater levels have been observed along the northern boundary of the Natomas Cross Canal. Because of the aquifer's relatively short recovery period, a DWB-related transfer would likely have a minimal effect on long-term groundwater level trends.

Land subsidence monitoring within the vicinity of Natomas Central includes one DWR extensometer on the Natomas Cross Canal. Areas of historic subsidence are just west of the service area.

Groundwater underlying McClellan Air Force Base east of the Natomas Central MWC is contaminated by organic solvents and is migrating southward, towards the City of Sacramento wells. Remedial measures currently in use include supplying some domestic well users with municipal sources, monitoring, installing physical surface barriers, and groundwater pump and treat systems. There is potential for contamination to migrate into Natomas Central; however, groundwater levels would have to be substantially lowered for several years for this to occur (Luhdorff & Scalmanini 2002).

Elevated levels of TDS, chloride, sodium, bicarbonate, boron, iron, manganese, and arsenic have been detected in the western portions of the agency, west of Highway 99 that could be harmful to some crops. Elevated levels of boron and iron have also been detected near the Sacramento International Airport (Luhdorff & Scalmanini 2002).

Pelger Mutual Water Company

During dry years, the district's water supply is supplemented by groundwater from private landowners' wells. Groundwater is the source of much of the potable water in Sutter County. Sutter County is in the process of preparing a groundwater management plan, with one goal being to determine the quantity and quality of groundwater available and how to best manage the groundwater basins (Sutter County 2008). Applicable groundwater management plans, agreements and county ordinances include: Chapter 33 of the Butte County Code, and the Butte County Well Spacing Ordinance.

Pleasant Grove Verona

In most years, groundwater is used by individual shareholders to supplement surface water supply for short periods of time, typically during peak demand periods. Exceptions to this may occur in 2009 which would require shareholders to pump additional groundwater to make up for the reduced surface water available. Because all groundwater wells within PGV are owned and operated by the individual shareholders, PGV does not regularly maintain records of groundwater use. Applicable groundwater management plans, agreements and county ordinances include: Chapter 33 of the Butte County Code, and the Butte County Well Spacing Ordinance.

Reclamation District 108

Groundwater substitution transfers in Yolo County would require a county permit. Applicable groundwater management plans, agreements and county ordinances include: County Ordinance 615 and Yolo County Export Ordinance No. 1617.

The Colusa subbasin has areas of documented historical subsidence and areas of possible historical subsidence. Land subsidence monitoring just south of RD 108 has detected localized subsidence. The southern portion of RD 108 may have also experienced local subsidence. Recently, one of RD 108's southern canals required repair because of a loss of freeboard that was linked to subsidence (Bair 2002). Land subsidence monitoring within the potentially affected area includes Yolo County's countywide global positioning system.

DWR monitors groundwater levels semiannually in 98 wells and groundwater quality in 30 wells throughout the Colusa subbasin. The Department of Health Services also monitors for groundwater quality in 134 wells throughout the subbasin (DWR 2002).Although groundwater quality in the area is sufficient for most agricultural and municipal purposes, elevated levels of manganese, fluoride, boron, magnesium, sulfate, sodium, iron, nitrates, TDS, ammonia, and phosphorus have been detected in localized areas throughout the Colusa subbasin (DWR 2002 and DWR Northern District 2002). Inducing the movement or migration of reduced quality water into previously unaffected areas through groundwater pumping is not likely to be a concern unless groundwater levels and/or flow patterns are substantially altered for a long period of time.

Reclamation District 1004

Groundwater for the proposed action would be pumped from privately owned wells within RD 1004. There are approximately 50 privately owned wells within the District. RD 1004 maintains no records of pumping from these wells, as they are privately owned. Colusa County Ordinance Number 615 is applicable to this District.

River Garden Farms

DWR conducted groundwater monitoring at River Garden Farms during groundwater

substitution transfers in 2003. Flow meter readings indicated that 1,581 af of groundwater was pumped from two wells to replace surface water use during the transfer period. Pumping occurred from July 3 to October 31, 2003. No long term impacts from pumping this groundwater were identified. Groundwater quality testing in 2003 indicated that the groundwater quality was suitable for most municipal and agricultural uses. Yolo County Export Ordinance No. 1617 applies to this district.

Sycamore Mutual Water Company

Applicable groundwater management plans, agreements and county ordinances include: Colusa County Ordinance 615.

City of Sacramento

Groundwater extracted under the proposed action would most likely be extracted from wells owned by the City of Sacramento, Fair Oaks WD, and Citrus Heights WD. Groundwater supplies 15% of the water supplied annually by this district (City of Sacramento 2008). DWR currently monitors groundwater levels in 53 wells semi-annually and in 7 wells monthly throughout the North American subbasin. Sacramento County also monitors groundwater levels in 17 wells throughout the county (DWR 2002). Groundwater levels in Sacramento County were relatively stable at an elevation of 30 feet above mean sea level in the 1930s. In the northern third of the subbasin, groundwater pumping resulted in groundwater level declines until the mid-1960s when the Camp Far Reservoir was completed in 1963, supplying surface water (Fielden 2003). In contrast, pumping in the southern portion of the subbasin has increased steadily since the 1970s, causing groundwater levels to generally decrease by about one and one-half feet per year. (This does not pertain to the portion of the subbasin underlying Natomas Central MWC. The greatest declines have been observed in the vicinity of McClellan Air Force Base (DWR 2002).

Applicable groundwater management plans, agreements and county ordinances include: Water Forum Agreement (WFA), Sacramento County Water Agency Act, Sections 32-33, and Sacramento Groundwater Authority (SGA) Regional Water Management Plan. The 131,000 acre-foot sustainable yield noted in the WFA applies to the Sacramento County portion of the North American Subbasin, which is managed by the SGA. In 1991, the Sacramento City-County Office of Metropolitan Water Planning was formed to develop a regional water plan for the Sacramento area. Six years of negotiations among many participant stakeholders led to the WFA adopted in 1998. The agreement consists of seven major elements designed to meet the following overall objective: “Provide a reliable and safe water supply for the region’s economic health and planned development to the year 2030; and preserve the fishery, wildlife, recreational, and aesthetic values of the Lower American River.” The WFA’s Groundwater Element encourages the management of the limited groundwater resources in three hydrogeologic areas within Sacramento County (Water Forum 1999). The WFA area that could be affected by the proposed action includes only the “North Area,” bounded on the north and east by the Sacramento County line, by the Sacramento River on the west, and by the American

River on the south. Two of the major outcomes of this agreement are a recommended sustainable yield of 131,000 acre-feet for the North Area and the formation of the SGA and the American River Basin Cooperating Agencies (ARBCA) (Water Forum 1999). The paragraphs below provide additional information on the SGA and ARBCA and on the American River Basin Regional Conjunctive Use Program and Natomas Central MWC.

Sacramento Groundwater Authority: SGA is a joint powers authority that was established in 1998 to manage and protect the North Area in Sacramento County. SGA's 16 member board of directors is comprised of representatives from the overlying water purveyors in the basin along with an individual representative from agriculture and an individual representative from self-supplied groundwater users (mostly parks and recreational districts).

SGA member agencies serve the needs of over 500,000 people in the Sacramento area. Current water deliveries total about 300,000 acre-feet per year, with about one-third of this from groundwater pumping and the remaining amount from surface water deliveries from the American and Sacramento Rivers. Over 70 percent of the deliveries are for municipal and industrial supplies, and about 30 percent to agriculture in the western portion of the service area.

SGA's primary mission is to protect the basin's safe yield, defined in the WFA, and water quality. Additional goals and objectives include: 1) Develop/facilitate a regional conjunctive use program consistent with the WFA. The basin has approximately 600,000 acre-feet of evacuated storage that could be exercised in such a program. The ultimate potential wet year in-lieu banking potential is about 100,000 acre-feet per year, with a potential dry year surface water exchange potential of over 50,000 per year. Recently, facility improvements have been under construction (with assistance from a $22 million Proposition 13 grant) to produce 25,000 acre-feet of dry-year surface water yield available for exchange with American River (or downstream) users; 2) mitigate conditions of regional groundwater overdraft; 3) replenish groundwater extraction; 4) mitigate groundwater contaminant migration; 5) monitor groundwater elevations and quality; and 6) develop relationships with State and Federal Agencies.

American River Basin Cooperating Agency: ARBCA was formed in 1997 to develop a regional partnership for water resources planning and conjunctive use and to develop a Regional Water Master Plan on a cooperative basis. ARBCA membership includes the SGA, water purveyors from Sacramento County, the City of Roseville, and Placer County. An SGA/ARBCA partnership is developing a regional groundwater management plan that incorporates both the Water Forum Plan and the Regional Water Master Plan (Thomas 2001).

American River Basin Regional Conjunctive Use Program: A partnership between SGA and ARBCA resulted in the American River Basin Regional Conjunctive Use Program. An outcome of the WFA, this Program intends to assist in meeting the WFA objectives, discussed above, by using the overdrafted basin in the North Area for groundwater banking. Groundwater recharge consists of either direct recharge using surface water

from the American River and/or Sacramento River, or, in lieu of recharge, application of surface water substituted for groundwater. During the "exchange cycle," (groundwater substitution) the banked groundwater is substituted for surface water, allowing the surface water to remain in reservoirs. This additional reservoir water helps maintain the WFA American River flow standards for environmental purposes. The project could bank up to 40,200 acre-feet of groundwater in wet years and recover up to 25,000 acre-feet of banked water for the surface water exchange in dry years. The average annual yield is expected to be about 21,400 acre-feet per year (SGA 2001).

Minor subsidence of up to 0.4 feet occurred in SGA's management area between 1912 and the 1960s (EDAW and SWRI 1999). These historical data, in addition to projected groundwater extraction, do not indicate the likelihood of any substantial subsidence from groundwater pumping in the future. The WFA's sustainable yield results in a stabilized groundwater level of approximately –83 feet msl with a range of –70 to –87 feet msl. As part of the WFA EIS/EIR, potential subsidence was evaluated assuming that groundwater level declines would not exceed levels stipulated by the WFA. The WFA used the Integrated Groundwater-Surface Water Model (IGSM) to model subsidence. The model indicated that an additional 0.35 foot of subsidence over several decades was possible, assuming the ratio of about 0.02 foot of subsidence per foot of groundwater level decline (EDAW and SWRI 1999). Land subsidence monitoring within the vicinity of the SGA service area includes one DWR extensometer on the Natomas Cross Canal at the border of Natomas Central MWC.

The Department of Health Service monitors water quality in 339 wells throughout the North American subbasin, and DWR monitors groundwater quality in 32 wells (DWR 2002). Groundwater in this district is generally of good quality; however, there are areas of concern. Reduced quality water at several well sites has caused the wells to be shut down. Elevated levels of TDS, chloride, sodium, bicarbonate, boron, fluoride, nitrate, iron manganese, and arsenic have been detected in localized areas. Contaminated sites in the area include an abandoned Pacific Gas and Electric (PG&E) site adjacent to the Sacramento River near Old Sacramento, the Union Pacific Railroad yards in downtown Sacramento and in the City of Roseville (EDAW and SWRI 1999), and a TCE plume in Fair Oaks WD. Contaminants underlying McClellan Air Force Base have migrated south, toward the City of Sacramento wells. Remedial measures implemented include supplying some domestic well users with municipal water sources, groundwater monitoring, installing physical surface barriers in one location, and extracting and treating groundwater (Luhdorff & Scalmanini 2002).

3.2.1 Environmental Consequences

No Action

Groundwater development would continue to occur in these districts during 2009. As water demand continues to increase throughout California, the development of groundwater resources, both through extraction and groundwater banking, would likely

increase. Water agencies are taking initiative to manage their groundwater resources. The no action alternative would not change this trend, and it would result in the same conditions as those under existing conditions.

Proposed Action

Crop idling and groundwater substitution transfers under the proposed action could affect groundwater resources. Changes in groundwater levels could cause secondary effects. Declining groundwater levels could result in: 1) increased groundwater pumping cost due to increased pumping depth, 2) decreased yield from groundwater wells due to reduction in the saturated thickness of the aquifer, 3) reduced groundwater in storage, and 4) decrease of the groundwater table to a level below the vegetative root zone, which could result in environmental effects.

Groundwater pumping within the vicinity of a surface water body could change the existing interactions between surface and groundwater, potentially resulting in decreased stream flows and levels, with potential adverse effects to the riparian habitat and downstream users. The pumping of groundwater near wetland habitats could also result in adverse environmental effects.

Excessive groundwater extraction from confined and unconfined aquifers could result in a lowering of groundwater levels and, in confined aquifers, a decline in water pressure. The reduction in water pressure results in a loss of support for clay and silt beds, which subsequently compress, causing a lowering of the ground surface (land subsidence). The compaction of fine-grained deposits, such as clay and silt, is permanent. The possible consequences of land subsidence are 1) infrastructure damage and 2) alteration of drainage pattern.

Changes in groundwater levels or in the prevailing groundwater flow regime could cause a change in groundwater quality through a number of mechanisms. One mechanism is the potential mobilization of areas of poorer quality water, drawn down from shallow zones, or drawn up into previously unaffected areas. Changes in groundwater gradients and flow directions could also cause (or speed) the lateral migration of poorer quality water. Artificial or enhanced recharge of the aquifer with water of poorer quality, or even different geochemical constituents, could also have an adverse effect on existing conditions. Geochemical differences between the recharged water and groundwater could affect resultant groundwater quality through geochemical processes such as precipitation, bacterial activity, ion exchange, and adsorption.

To minimize or avoid these potential adverse effects, groundwater-related transfers must comply with three levels of conditions: 1) State regulations, 2) local groundwater management and county ordinances, including Basin Management Objectives, and 3) DWR's groundwater purchasing process.

Acquisition of Sacramento River CVP contractor water via crop idling could decrease applied water recharge to the local groundwater system underlying the barren (idled) fields, potentially causing a decline in groundwater levels.

Crop idling transfers under the proposed action would be limited to 20 percent of the land within each county that would have been cropped with rice. Reducing applied water would result in a loss of recharge to the Sacramento Valley Groundwater Basin. This loss, however, would be relatively small when compared to the total amount of water that recharges the Sacramento Groundwater Basin. A large portion of the total recharge to the Basin occurs through precipitation and runoff over the spring and winter months. Groundwater levels generally recover during the rainy winter season. A 20 percent reduction in applied local water recharge would result in a much smaller reduction of overall basin recharge and would be well within the variability of annual recharge. Furthermore, the land used for rice production consists of low permeable soils. A substantial portion of the applied water does not percolate to the underlying aquifer, but rather discharges to the farmer's surface drainage system.

Acquisition of water via groundwater substitution could affect groundwater hydrology. The potential effects would be decline in groundwater levels, interaction with surface water, land subsidence, and water quality impacts.

***Groundwater levels**:* Groundwater substitution may result in temporary declines of groundwater levels. Historically, groundwater levels have remained relatively stable within the Sacramento Valley Groundwater Basin**.** In some areas, groundwater levels decreased during the droughts of 1976-1977, and 1987-1994 but rebounded in the following wet years (DWR 2002). Groundwater levels tend to decrease during the irrigation season and rebound in the wet winter months. A large portion of recharge in the basin is likely through percolation of natural runoff (DWR Northern District 2002). Because of the aquifer's relatively short recovery period, and the fact that it is a one year program, a DWB-related transfer would likely have a minimal effect on long-term groundwater level trends.

Groundwater substitution under the proposed action could result in temporary drawdown that exceeds historical seasonal fluctuations. Increased groundwater pumping could also cause localized declines of groundwater levels, or cones of depression, near pumping wells. To reduce these effects, willing sellers will be required to implement monitoring and mitigation programs under the proposed action. The programs would monitor groundwater level fluctuations within the local pumping area. As part of the transfer approval process, DWR and Reclamation will review potential sellers' proposed monitoring and mitigation plans for consistency with applicable regulations as discussed in the affected environment section.

***Interaction with Surface Water**:* Pumping close to the Sacramento River, and close to tributaries could reduce channel flows. This reduction in channel flows could adversely affect riparian and aquatic habitats, including wildlife refuge habitat, as well as downstream water users.

Groundwater pumping for groundwater substitution transfers could reduce flows in nearby surface water bodies. To reduce these effects, potential sellers will be required to include a monitoring and mitigation plan as part of their proposal in the transfer approval process. DWR and Reclamation will review these monitoring and mitigation plans for

consistency with applicable regulations as discussed in the affected environment section. Also, as part of the transfer approval process, potential sellers will be required to submit well information for review by DWR and Reclamation. DWR and Reclamation will review the location and screened interval of the proposed production wells. Production wells within 2 miles of a surface water body will be required to meet well depth criteria if insufficient data is provided to show that pumping would not result in adverse effects. Furthermore, the well review may determine that pumping activities should be limited to a specified depth in some areas, in order to avoid hydraulic interaction between pumping and overlying surface water systems.

Land Subsidence*:* Groundwater extraction for groundwater substitution transfers would decrease groundwater levels, increasing the potential for subsidence. Additional subsidence monitoring may be necessary, depending on the hydrology, expected groundwater use for an irrigation season, and the potential extraction by willing sellers in the region for the proposed action. Therefore, potential sellers' monitoring and mitigation plans will be required to include subsidence monitoring, as appropriate for the region.

Groundwater Quality*:* The migration of reduced quality water, agricultural use of reduced quality water, and the distribution of reduced quality water are three types of potential water quality impacts associated with increased groundwater withdrawals related to the proposed action.

Groundwater extraction under the proposed action would be limited to withdrawals during the irrigation season of the 2009 Water Year and extraction near areas of reduced groundwater quality concern would be avoided through the review of well data during the transfer approval process. Consequently, adverse effects from the migration of reduced groundwater quality would be anticipated to be minimal.

Groundwater extracted may be of reduced quality relative to the surface supply allotment the districts normally receive. However, groundwater quality is normally adequate for agricultural purposes. The required monitoring programs would monitor groundwater quality within the local pumping area. If monitoring indicated that adverse effects related to the degradation of groundwater quality from the transfer occurred, willing sellers in the region will be responsible for monitoring this degradation and mitigating any adverse effects in accordance with all applicable regulations, as described in the affected environment section.

As discussed above, in many areas that may participate in the proposed DWB, groundwater data indicates that during normal and wet years, groundwater levels tend to recover to pre-irrigation levels. During dry years, however, groundwater use is typically increased and percolation from natural runoff is often lower than normal, causing groundwater levels to decline more than in normal and wet years. Furthermore, when dry years occur consecutively, groundwater levels are likely to decline throughout the dry period and then only recover after several normal or wet years. Historical water-level data illustrates this trend: groundwater levels tend to recover during normal and wet years, but the likelihood of full recovery decreases during dry years. Therefore, since

groundwater transfers under the proposed action would be occurring during a dry period, the transfer could contribute to groundwater levels declining over a period of several years, if there is not sufficient wet season recovery following the transfers. To reduce these effects, potential sellers will be required to evaluate groundwater levels, in accordance with all applicable regulations as described in the affected environment section, prior to each DWB transfer as part of their monitoring plan. If groundwater levels prior to a proposed purchase were low relative to previous years, a pre-purchase evaluation would be performed to evaluate regional groundwater levels and potential drawdown. During the transfer approval process, DWR and Reclamation will review the preliminary groundwater level monitoring data and will not approve transfers with probable regional effects.

Acquisition of American or Sacramento River water in the North American groundwater subbasin via groundwater substitution would affect groundwater hydrology. The potential effects would be decline in groundwater levels, interaction with surface water, land subsidence, and water quality impacts. Groundwater substitution in this subbasin would include potential transfers from Natomas Central Mutual Water Company and the City of Sacramento.

***Groundwater Levels**:* Groundwater substitution could result in temporary declines of groundwater levels. Groundwater substitution under the proposed action could result in temporary drawdown that exceeds historical seasonal fluctuations. The potential groundwater level decline in Natomas Central MWC, assuming an acquisition amount of 10,000 acre-feet, could be 4 feet in addition to typical seasonal fluctuations. Shallow domestic wells would be most susceptible to adverse effects. Fifty percent of the domestic wells are 150 feet deep or less. Increased groundwater pumping could cause localized declines of groundwater levels, or cones of depression, near pumping wells, possibly causing effects to wells within the cone of depression. As previously described, the well review data, mitigation and monitoring plans that will be required from sellers during the transfer approval process will reduce the potential for this effect.

***Interaction with Surface Water**:* Pumping near the Sacramento River could reduce channel flows and thus adversely affect riparian and aquatic habitats and downstream water users. Furthermore, pumping activities could drain or interrupt the water supply to wetlands in the area and adversely affect wetland habitats.

Groundwater pumping for groundwater substitution transfers could reduce flows in nearby surface water bodies. To reduce these effects, potential sellers will be required to include a monitoring and mitigation plan as part of their proposal in the transfer approval process. DWR and Reclamation will review these monitoring and mitigation plans for consistency with applicable regulations as discussed in the affected environment section. Also, as part of the transfer approval process, potential sellers will be required to submit well information for review by DWR and Reclamation. DWR and Reclamation will review the location and screened interval of the proposed production wells. Production wells within 2 miles of a surface water body will be required to meet well depth criteria if insufficient data is provided to show that pumping would not result in adverse effects.

Furthermore, the well review may determine that pumping activities should be limited to a specified depth in some areas, in order to avoid hydraulic interaction between pumping and overlying surface water systems. In addition to the well review, the potential sellers' monitoring and mitigation plan will be required to address identifying and mitigating local impacts, including those from potential groundwater/surface water interaction.

Land Subsidence*:* While land subsidence has not been detected within the area, groundwater extraction under the proposed action could decrease groundwater levels, increasing the potential for local subsidence. If transfers under the proposed action do not cause the groundwater levels to decline below historical levels, the potential for subsidence would be minimized. However, additional subsidence monitoring may be necessary, depending on the hydrology, expected groundwater use for an irrigation season, and the potential extraction by willing sellers in the region for the proposed action. Therefore, potential sellers' monitoring and mitigation plans will be required to include subsidence monitoring, as appropriate for the region.

Groundwater Quality*:* The migration of reduced quality groundwater and on-farm use of reduced quality water are two types of potential water quality effects associated with increased groundwater withdrawals. However, transfers would be limited to short-term withdrawals during the 2009 irrigation season and would most likely not result in substantial groundwater declines. The well review required during the transfer approval process will provide further assurances that the potential for reduced groundwater quality migration will be evaluated prior to approval of the transfer, further reducing the likelihood of adverse effects.

Potential Natomas Central MWC farmers that may participate in the groundwater substitution transfers could experience changes in water quality as they switch from surface water to groundwater. The required monitoring programs would monitor groundwater quality within the local pumping area. If monitoring indicated that adverse effects related to the degradation of groundwater quality from the transfer occurred, willing sellers in the region will be responsible for monitoring this degradation and mitigating any adverse effects in accordance with all applicable regulations, as described in the affected environment section.

As discussed above, in many areas that may participate in the DWB, groundwater data indicate that during normal and wet years groundwater levels tend to recover to pre-irrigation levels. During dry years, however, groundwater use is typically increased, and percolation from natural runoff is often lower than normal, causing groundwater levels to decline more than during normal and wet years. Furthermore, when dry years occur consecutively, groundwater levels would likely decline throughout the dry period and then only recover after several normal or wet years. Historical water level data illustrate this trend: groundwater levels tend to recover during normal and wet years, but the likelihood of full recovery decreases during dry years. Therefore, since groundwater transfers under the proposed action would be occurring during a dry period, the transfer could contribute to groundwater levels declining over a period of several years, if there is not sufficient wet season recovery following the transfers. To reduce these effects,

potential sellers will be required to evaluate groundwater levels, in accordance with all applicable regulations as described in the affected environment section, prior to each DWB transfer as part of their monitoring plan. If groundwater levels prior to a proposed purchase were low relative to previous years, a pre-purchase evaluation would be performed to evaluate regional groundwater levels and potential drawdown. During the transfer approval process, DWR and Reclamation will review the preliminary groundwater level monitoring data and will not approve transfers with probable regional effects.

As a result of the WFA, groundwater extraction in the SGA's management area are not to exceed the defined sustainable yield, which should maintain groundwater levels above –70 to –80 feet msl (EDAW and SWRI 1999). Any DWB-related groundwater extraction would also be subject to this limit and consequently, DWB transfers could not contribute to the exceedance of the sustainable yield.

Increased groundwater pumping could also cause localized declines of groundwater levels, or cones of depression, surrounding the pumping wells. These declines could be larger than the regional declines**,** possibly causing local effects to wells within the cone of depression. Groundwater substitution transfers could result in groundwater declines in excess of seasonal variation. As previously described, the well review data, mitigation and monitoring plans that will be required from sellers during the transfer approval process will reduce the potential for this effect.

Mitigation Measures

Each district will be required to confirm that the proposed groundwater pumping will be compatible with local groundwater management plans. DWR and Reclamation's transfer approval process and groundwater mitigation measures set forth a framework that is designed to avoid and minimize adverse groundwater effects. DWR and Reclamation will adopt these mitigation measures to assure that DWB purchases minimize the potential for adverse effects related to groundwater extraction. The agencies have employed similar measures on other transfers, and are committed to implementing these measures for any groundwater-related actions.

*Well Review Process**:*** Potential sellers will be required to submit well data for Reclamation and DWR review as part of the transfer approval process, including potential interference effects to Indian Trust Assets (ITAs).

- Well data will required will include:
  - Well Identification: Well owner name, well owners identification number, water district or agency where well is located, and the water district or agency's well identification number (if different from well owners identification number).
  - Well Location:
    - Including latitude and longitude and the Township, Range and Section. The location can be determined with a hand-held GPS unit or other instrument with equal or greater measuring precision.

        - A map, with at least as much hydrologic and physical detail as a 7.5 minute USGS quad sheet, showing the location of all wells that will be involved in the transfer and the location of all surface water features within two miles of the agency service area boundary. Include location of wells in the monitoring network

    - Historic Operations: Operation records indicating the volume of water pumped from each well in 2008. Records of power consumption may be submitted in place of flow measurements from a totalizing flow meter. If needed, records of power consumption and well production from 2009 may be used to calculate the relationship needed to determine the well's production in 2008. Document and identify areas normally irrigated by wells involved in the transfer.
    - Proposed Operations: Describe the well's projected operation (e.g. is groundwater to be applied to surrounding land, or is groundwater to be pumped into district canals, etc.), and the projected beneficial use of pumped water. Verify that a totalizing flowmeter has been installed and calibrated.
    - Well Construction: Provide total well depth, depth of annular surface seal, gravel pack intervals, casing size, casing perforation interval (or open hole interval), and well's construction method (cable tool, rotary gravel pack well, etc.)
    - Geologic Log: Provide details of geologic materials described on the well log.
    - Estimated Well Capacity: Identify estimated well capacity and method for determining capacity
    - If available, provide results of a PG&E well efficiency test, independent well drawdown tests, water quality data, and/or site-specific studies that document aquifer properties surrounding the well or extent of the well's hydrologic connection with any surface waters.
    - Pump Power: Verify that each well is powered by an electric source, or that offsetting reductions in diesel or gasoline emissions are provided elsewhere.
        - The amount of information submitted for each well will depend on its location relative to surface water features and other areas that may be sensitive to groundwater pumping effects.

- A review team, composed of DWR and Reclamation technical staff (that includes California Certified Hydrogeologists), will review and evaluate the information provided by potential sellers. The review is intended to ensure that the wells used in the program would not pose an unacceptable risk of depleting surface water and that the seller has developed monitoring and mitigation programs necessary to recognize and avoid and mitigate for significant environmental and water user effects that could occur as a result of the groundwater transfer.

- If the review team concludes that the potential for effects would be relatively low and that the proposed transfers to the DWB would reasonably address mitigation of anticipated adverse effects, the process to initiate the transfer could commence. However, if modifications were necessary, the review team will provide recommendations to the seller regarding changes that must be made prior to the transfer in order for the Bank to purchase the water proposed for transfer. The review team will work with the seller to identify appropriate means to address any changes to the submitted proposal to comply with transfer approval principles.

- If project agencies find that a proposed groundwater transfer could potentially adversely affect ITAs, Reclamation and the willing selling agency will consult with the potentially affected tribe(s) and the Bureau of Indian Affairs, before finalizing transfer approval. During consultation, commitments will be developed to negate or minimize potential effects. Such commitments could include more frequent groundwater monitoring or, the discontinuation of groundwater pumping if groundwater levels are drawn down to a level that would cause one or more of the effects that are described earlier in this section. The consultation process will ensure that all potential adverse effects are addressed prior to approval of the DWB transfer.

- If agreement were reached on an acceptable project proposal, DWR, Reclamation and the willing seller would negotiate a contract to implement the proposed transfer.

The review team recognizes that site conditions vary agency-to-agency and the extent of information that needs to be submitted would differ. These recommendations would serve as an initial guideline to selling agencies concerning the level of detail and type of information that may be needed to evaluate the proposed well operations and programs for compatibility with DWB transfer approval principles. The review team may require additional information prior to project implementation, or additional studies during implementation, to verify the validity of the hydrogeologic analysis underlying the project proposal. The primary objective of the review team would be to develop reasonable assurance that all significant groundwater effects that could result from groundwater transfers to the DWB have been identified, assessed, avoided where possible, and mitigated if avoidance were not possible.

Monitoring Plan:
Seller must document that the monitoring program incorporates each of the elements listed below.

1. A monitoring well network that adequately covers the surface area and aquifer intervals within the affected pumping area

2. Periodic meter readings of instantaneous flow (gpm) and total discharge volume at each of the groundwater substitution wells

3. Groundwater level measuring of sufficient frequency and duration to quickly and accurately identify program-related impacts

4. Groundwater quality testing

5. The means to detect land subsidence or a credible analysis demonstrating that subsidence is unlikely to occur

6. The means to coordinate data collection and cooperate with other monitoring efforts in the area.

7. Data evaluation and reporting

As an example, monitoring plans will include the following specifics, as appropriate:

- Equip each well used in the proposed action with a properly calibrated flow meter reporting cumulative amounts pumped in af.
- Measure water levels in the transfer wells weekly before the wells are pumped for transfer, at the termination of pumping for the transfer, and monthly thereafter until water levels recover to the pre-pumping level or seasonal high levels are reached in the following season. DWR staff will work with the Districts to establish measuring and recording methods.
- DWR staff will work with the districts to identify non-pumping wells in the vicinity of the project to obtain water level measurements on a monthly basis over the pre-pumping, pumping, and recovery period for the proposed transfer.

- Specific conductance will be measured weekly in samples from each production well when it is initially pumped, approximately two months after initial pumping, and at the termination of pumping for each proposed transfer. DWR staff will observe initial measurements to compare readings between DWR and district equipment.
- Districts will cooperate with DWR staff to obtain groundwater quality samples from each pumping well during the transfer. Samples will be analyzed for cations and anions, general water quality parameters, boron, and arsenic.

Mitigation Plan: To ensure that mitigation programs will be tailored to local conditions, the mitigation plan will include the following elements:

1. A procedure for the seller to receive reports of purported environmental or third party effects and to report that information to DWR and Reclamation and, as required, to local agencies

2. A procedure for investigating any reported effect, including a means to resolve disputes involving the seller and parties claiming to be injured by transfer activities

3. Development of mitigation options, in cooperation with the affected third parties, for legitimate effects

4. Assurances that adequate financial resources are available to cover reasonably anticipated mitigation needs

DWR's DWB website (http://www.water.ca.gov/drought/) describes the systematic process that Reclamation and DWR will follow when deciding whether to purchase water through groundwater based transfers. The objectives of this process are: to mitigate significant environmental effects that occur; to minimize potential effects to other legal users of water; to provide a process for review and response to reported third party effects; and to assure that a local mitigation strategy is in place prior to the groundwater transfer.

The process will be a collaborative effort between willing sellers, DWR and Reclamation. This process recognizes that the seller will be responsible for assessing and mitigating significant adverse effects resulting from the transfer within the source area of the transfer. It also recognizes that DWR principles require them to determine whether the seller has an adequate mitigation plan in place. Accordingly, DWR will take on the responsibility of reviewing existing groundwater levels in the local area of transfer and approving the seller's extraction wells, monitoring, and mitigation plans prior to the initiation of a groundwater based transfer to the purchasing agencies.

3.3 Water Quality

3.3.1 Affected Environment

The area of analysis for water quality includes the waterbodies with the potential to be affected by the program, including the Sacramento and American River systems; and previously described conveyance facilities. The regulatory setting for the proposed action includes the Safe Drinking Water Act, Surface Water Treatment Rule, Stage 1 Disinfectants and Disinfection Byproducts Rule (D/DBPR) and Long-Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR), Federal Clean Water Act, Porter-Cologne Act, Regional Water Quality Control Plans, Water Quality Control Plan for the San Francisco Bay/ Sacramento-San Joaquin Delta Estuary, State Water Resources Control Board Decision 1641, DWR Non-Project Water Acceptance Criteria, and U.S. Bureau of Reclamation Groundwater Acceptance Criteria.

Certain waterbodies in the proposed action's area of analysis are listed as water quality limited (impaired) as listed on the 303(d) list under the CWA for one or more of the constituents of concern. In addition to constituents of concern with regard to 303 (d) listed waterbodies, there are water quality constituents of concern with respect to drinking water. Water quality constituents of concern for drinking water that are relevant to the DWB Program include total trihalomethanes (chloroform, bromodichloro-methane, bromoform, and chlorodibromomethane).

Beneficial uses are critical to water quality management in California. State law defines beneficial uses of California's waters that may be protected against quality degradation to include (but not limited to) "...domestic; municipal; agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves" (Water Code Section 13050(f)). Protection and enhancement of existing and potential beneficial uses are primary goals of water quality planning.

Further information on these regulations, constituents of concern and beneficial uses is included in the Water Quality Section of the EWA 2003 Draft EIS/EIR and EWA 2007 Supplemental EIS/EIR, which are hereby incorporated by reference.

Acquisition Areas

Sacramento River Area of Analysis

The Sacramento River Basin covers nearly 70,000 square kilometers (km^2) in the north-central part of California (USGS 2002a). Land cover in the mountainous parts of the basin is primarily forest, except in parts of the Coast Ranges where land cover is forestland and rangeland. Previous mining activities in the Klamath Mountains have resulted in acid mine drainage into Keswick Reservoir, along with the associated metals cadmium, copper, and zinc. Mercury, from previous mining activities in the Coast Ranges, enters the Sacramento Valley through Cache Creek and Putah Creek, which drain into the Yolo Bypass. The Yolo Bypass reenters the lower Sacramento River through Cache Slough and during low-flow and storm water runoff conditions, mercury can be transported downstream to receiving waters.

Lake Shasta is located on the upper Sacramento River in the Shasta Trinity National Forest and is used as a storage facility for water from snowmelt in the upper Sierra Nevada Mountains. Water quality in Lake Shasta generally is considered to be of good quality.

The Sacramento River is the largest river in California, providing water for municipal, agricultural, recreation, and environmental purposes throughout northern and southern California.

American River Area of Analysis

The American River is a large tributary to the Sacramento River. Forestland constitutes the greatest percentage of land use or land cover (77 percent). Gold mining also occurred within the American River basin. Placer gold was first discovered in the American River in 1848, triggering the exploration and mining of gold that followed. The lower American River is listed as an impaired waterbody owing to mercury lost during gold recovery. However, water quality in the lower American River is generally considered to be of good quality.

Conveyance

The Sacramento-San Joaquin Delta (Delta) Region forms the lowest part of the Central Valley, bordering and lying between the Sacramento and San Joaquin rivers, and extending from the confluence of these rivers inland as far as Sacramento and Stockton. The Delta is an important agricultural area, with more than 75 percent of the region's total production used for corn, grain, hay, and pasture. Although much of the Delta is used for agriculture, the land also provides habitat for wildlife. Many agricultural fields are flooded in the winter, providing foraging and roosting sites for migratory waterfowl. In addition to lands that are used seasonally, the California Department of Fish and Game (CDFG) manages thousands of acres specifically for wildlife including Lower Sherman Island and White Slough Wildlife Areas, Woodbridge Ecological Reserve, and Palm Tract Conservation Easement (SWRCB 1997).

The principal factors affecting Delta hydrodynamic conditions are: 1) river inflow from the San Joaquin and Sacramento River systems, 2) daily tidal inflow and outflow through the San Francisco Bay, and 3) export pumping from the south Delta through the SWP Banks Pumping Plant and CVP Jones Pumping Plant. Because tidal inflows are approximately equivalent to tidal outflows during each daily tidal cycle, tributary inflows and export pumping are the principal variables that define the range of hydrodynamic conditions in the Delta. Freshwater flows into the Delta from three major sources: the Sacramento River, the San Joaquin River, and the eastside streams. The Sacramento River contributes about 77 percent of the freshwater flows, the San Joaquin River contributes roughly 15 percent, and streams on the east side provide the remainder.

Flow that enters the Delta via the Sacramento River flows by various routes to the export pumps in the southern Delta. Some of this flow is drawn to the SWP and CVP pumps through interior Delta channels, facilitated by the CVP's Delta Cross Channel. Water that does not travel into the Central Delta continues towards the San Francisco Bay. Under certain conditions, additional Sacramento River waters flow into the Central and South Delta. The Sacramento River waters flow through Threemile Slough, around the western end of Sherman Island and up the San Joaquin River towards the export pumps. When freshwater outflow is relatively low, water with a higher salt concentration enters the Central and South Delta as tidal inflow from the San Francisco Bay. When SWP and CVP exports cause flow from the Sacramento River to move toward the pumps, then "reverse flow" occurs in the lower San Joaquin River. Prolonged reverse flow has the potential to adversely affect water quality in the Delta and at the export pumps by increasing salinity (SWRCB 1997, Entrix 1996, CALFED 2002a).

The existing water quality constituents of concern in the Delta can be categorized broadly as metals, pesticides, nutrient enrichment and associated eutrophication, constituents associated with suspended sediments and turbidity, salinity, bromide, and organic carbon. Water quality constituents that are of specific concern with respect to drinking water, including salinity, bromide, and organic carbon.

Receiving Areas

San Luis Reservoir

Total organic carbon (TOC) concentrations ranged from 2.0 to 4.1 mg/L, with an average concentration of 2.7 mg/L (DWR 2001b). These TOC levels are considered relatively high for source water, but were lower than the TOC measurements at the Banks Pumping Plant (DWR 2001b). There was no apparent seasonal trend in carbon levels within each year, except in 1996, when carbon levels appeared to be higher in January through March, and then declined (DWR 2001b).

Bromide samples were collected monthly in 1999 and ranged from 0.18 to 0.22 mg/L, with a mean of 0.20 mg/L (DWR 2001b). Measured bromide values exceeded the recommended CALFED target of 0.05 mg/L (DWR 2001b). High bromide concentrations result from source water from both the California Aqueduct and the Delta Mendota Canal, which are affected by tidal inflows and seawater intrusion (DWR 2001b).

In San Luis Reservoir, the low-point problem and associated algal growth is the primary concern. In San Luis Reservoir, the low point refers to a range of minimum reservoir levels that occur in late summer and fall. The low-point problem is produced by a combination of warm-season algae growth and decreasing summer water levels. San Luis reservoir typically is at its high point in late winter and early spring, following the rainy season. During the spring and early summer, water is released from San Luis Reservoir into O'Neill Forebay. Additionally, some water is pumped through the Pacheco Pumping Plant for distribution to San Felipe Division contractors (including the Santa Clara Valley WD) via an upper intake located at approximately elevation 376 feet. As the summer progresses, algae begins to grow near the reservoir surface. At the same time, the reservoir water surface elevation decreases as water is withdrawn for the summer peak use season. The upper Pacheco intake at elevation 376 feet is closed when the reservoir water surface elevation reaches approximately 406 feet. For the remainder of the dry season, water is pumped through the Pacheco Pumping Plant via the lower intake, located at approximately 334 feet (Santa Clara Valley WD 2002).

The low-point problem begins when the reservoir water surface elevation approaches 369 feet, corresponding to a storage capacity of 300,000 acre-feet. At this capacity, the water surface elevation in the reservoir is approximately 35 feet above the lower intake to the Pacheco Pumping Plant. Because the near-surface algae layer can be more than 30 feet thick in late summer, algae may be drawn into the lower intake. High algae content reduces the effectiveness of water treatment and can affect the quality and taste of treated water. As the reservoir is progressively drawn down below 300,000 acre-feet, increasing amounts of algae may enter the intake, and water quality problems can worsen. When the water surface elevation reaches approximately 354 feet (209,000 acre-feet), algae concentrations may be so high that the water delivered to the Pacheco Pumping Plant is untreatable (Santa Clara Valley Water District 2002).

Historical data suggest that algal blooms caused taste and odor problems for the Santa Clara Valley Water District (WD) during the drought years from 1992 to 1993 (DWR 2001b). From 1996 to 1999, the Santa Clara Valley WD did not report any serious algal

blooms and taste and odor were not serious water quality concerns during this period (DWR 2001b). There were no drought years during this period, and precipitation records show that rainfall was heavy in 1995 and 1996, reaching a record high of 24.1 inches in the reservoir watershed during 1998 (DWR 2001b). Strong winds mix the surface water with water at greater depths, making it less likely that a thermocline will become established in the reservoir (DWR 2001b). Wind disturbances and the lack of thermocline establishment apparently limited growth of blue-green algae during this period (DWR 2001b).

Typically, taste and odor concerns associated with algal growth in the reservoir are more serious water quality concerns during drought years (DWR 2001b). In the fall, especially during drought years, a greater demand by SWP contractors creates lower water levels in the reservoir (DWR 2001b). Because of the improved light penetration and greater likelihood of establishment of a thermocline in the reservoir, algal blooms, consisting primarily of the blue-green algae *Aphanizomenon flosaquae*, are more likely to occur (DWR 2001b). During fall months, winds blow accumulated blue-green algae toward the intake, and taste and odor concerns may result (DWR 2001b).

Anderson Reservoir

Since late 1996, the Santa Clara Valley WD has found low levels of a gasoline additive known as methyl tertiary butyl ether (MTBE) present in Anderson Reservoir. At very low levels, this substance can foul the taste and odor of drinking water. To help control the amount of MTBE entering the reservoir, county parks have reduced the number of boats, allowing access only to vessels fueled with MTBE-free fuel. They have also relocated personal watercraft to Calero Lake, instituted controls on refueling, and are providing boating safety education through park rangers (Santa Clara Valley WD 2002a). The reservoir is filled with water from San Luis Reservoir, so the water quality within Anderson Reservoir is similar to that for San Luis Reservoir.

Castaic Lake

Primary land uses in the Castaic Lake watershed include recreation and related activities, livestock grazing, limited residential development and some historic mining (DWR 2001b). Each of these represents a potential source of contamination to the lake by the direct addition of contaminants or by increasing potential runoff into the lake. Wastewater treatment facilities such as septic systems, algal blooms, crude oil pipelines, spills from traffic accidents, geologic hazards, fires, and future construction within the watershed represent additional potential sources of contamination to the lake. Castaic Lake water quality is affected by outflow from Pyramid Lake and the Elderberry Forebay as well as the small natural streams feeding the lake, particularly Castaic Creek.

Lake Perris

Lake Perris becomes thermally stratified in the summer months presenting some significant water quality concerns that limit the use of lake water. High nutrient levels in the epilimnion (upper level) stimulate nuisance algae growth that degrades the odor and taste of the water and causes treatment difficulties by clogging filters. In addition,

microbial respiration fueled by periodic algae die-offs cause anoxic conditions in the hypolimnion (lower layer). Anoxic water decreases aesthetic values and is difficult and expensive to treat. In addition to nutrient enrichment, recreation, wastewater treatment and facilities, urban runoff, animal populations, and leaking storage tanks have contributed contaminants to the lake in the past (DWR 2001b).

Diamond Valley Lake

Construction of the three dams holding Diamond Valley Lake water was completed in 1999 (Water Technology 2003). The reservoir was dedicated in March 2000 and began generating electricity in May 2001 (Metropolitan WD 2001a; Metropolitan WD 2001b). Due to the lack of publicly available data and the short operating time of the reservoir, water quality data were not available for Diamond Valley Lake.

Lake Mathews

The lands immediately surrounding the lake have been held by the Metropolitan WD, and human intrusions have been few. As Riverside continued to grow during the latter part of the century, surrounding areas began to be developed primarily as custom built homes on small ranchettes. Additionally, since the 1930s, many of the surrounding lands were and continue to be used for citrus agriculture. In July 1997, the SWRCB approved a resolution project for the Drainage Water Quality Management Plan (DWQMP) for the Lake Mathews Watershed Project. The project is designed to protect Lake Mathews from nonpoint source and storm water pollution originating in the upstream watershed. The facilities include natural wetlands, ponds and a dam to purify the contaminated runoff (SWRCB 1998). As part of a mitigation plan for its water projects, and recognizing the value to wildlife of such a large, open source of water, the Metropolitan WD lands (approximately 4,000 acres) surrounding the lake were formally designated as a State Ecological Reserve in 1982.

Public access within the Lake Mathews Reserve is limited to non-Metropolitan WD lands only, and the lake is not open for public recreation. The Reserve is open daily from dawn to dusk, but since motorized vehicles are not allowed on Reserve lands, access to these non-Metropolitan WD lands is by foot or horse travel only (Center for Natural Lands Management 2003).

In July 2002, Metropolitan WD officials announced that the musty taste and odor in their tap water was not a health hazard, but an aesthetic problem. The earthy taste and odor came from an especially large persistent algal bloom within the California Aqueduct and Lake Mathews. The cause was identified as 2-methylisoborneal (MIB) and geosmin, whose growth tends to increase in the summer months with the warmer temperatures. DWR applied copper sulfate to the east end of the California Aqueduct to control the algal bloom. Investigations took place at Lake Mathews to determine if a similar treatment was needed at this location (Metropolitan WD 2002).

Lake Mathews receives its water from the Colorado River Aqueduct, but water supplies from this source are much higher in salinity than those from the SWP, so the water is blended at the Robert A. Skinner Filtration Plant at Lake Skinner before it is delivered.

TDS concentrations ranged from 480 mg/L to 521 mg/L and averaged 500 mg/L, which is lower than the State MCL of 1,000 mg/L (Rincon 2003). Conductivity was not high in the reservoir.

3.3.2 Environmental Consequences

No Action

It is anticipated that if the DWB were not implemented, actions to protect water quality would continue under existing regulatory requirements. DWR and Reclamation would continue to attempt to re-operate the SWP and CVP, respectively, to avoid decreased deliveries to export users.

There would be no variation from the existing condition in the reservoir storage levels, river flows, or water temperatures under the No Action Alternative. As such, water quality under the No Action Alternative would exhibit the same range of constituent levels and be subject to the same environmental, riverine, and oceanic influences and variations (e.g., tidal currents, wind patterns, oceanic inflow, climatic variations, water supply operations, and established inland flow regimes) that already are present under the Existing Condition. Further, there would be no variation in the existing range of timing, magnitude and duration of actions occurring under the No Action Alternative, as compared to the Existing Condition. Therefore, there would be no water quality effects associated with No Action Alternative.

Proposed Action

Acquisition of Sacramento River CVP contractor water via stored reservoir water, groundwater substitution and crop idling under the proposed action would alter surface water elevation and reservoir storage in Lake Shasta and Folsom Reservoir relative to the existing condition.

Overall, Lake Shasta and Folsom Reservoir end-of-month water surface elevation and reservoir storage under the proposed action would be essentially equivalent to or greater than end-of-month water surface elevation and reservoir storage under the existing condition. Therefore, implementation of the proposed action would not adversely affect concentrations of water quality constituents or water temperatures in Lake Shasta or Folsom Reservoir. As a result, any differences in water surface elevation and reservoir storage would not be of sufficient magnitude and frequency to affect water quality in such a way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards or substantial degradation of water quality.

Acquisition of Sacramento River contractor water via stored reservoir water, groundwater substitution, and crop idling under the proposed action would not substantially decrease Sacramento River flow, relative to the existing condition.

Overall, under the proposed action, Sacramento River flow at Keswick Dam and Freeport would be essentially equivalent to or greater than the flows under the existing condition.

Increases in Sacramento River flow at Freeport during summer months would allow dilution of water quality constituents, including pesticides and fertilizers present in agricultural run-off. As a result, any differences in flow under the proposed action would not be of sufficient frequency and magnitude to affect water quality in a way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality. Therefore, potential flow-related changes to water quality under the proposed action would be less than significant.

Acquisition of Sacramento River contractor water via stored reservoir water, groundwater substitution, and crop idling under the proposed action would not substantially increase Sacramento River water temperature, relative to the existing condition.

Under the proposed action, water temperatures in the Sacramento River at Bend Bridge would be essentially equivalent to or less than water temperatures under the existing condition. Additionally, under the proposed action, water temperature in the Sacramento River at Freeport during a critical, dry or below normal year would be essentially equivalent to or less than the existing condition.

Overall, water temperature in the Sacramento River at Bend Bridge and Freeport under the proposed action would be essentially equivalent to or less than water temperatures relative to the existing condition. Any differences in water temperature would not be of sufficient frequency and magnitude to affect water quality in such a way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality.

Acquisition of stored groundwater from Sacramento Groundwater Authority members under the proposed action would increase lower American River flow, relative to the existing condition.

Under the proposed action, flow in the lower American River downstream of Nimbus Dam, at Watt Avenue, and at the mouth of the American River during a critical, dry, or below normal year would be essentially equivalent to or greater than the existing condition for all months included in the analysis.

Overall, under the proposed action, lower American River flow downstream of Nimbus Dam, at Watt Avenue, and at the mouth would be essentially equivalent to or greater than the flows under the existing condition. Increases in lower American River flow at all three locations during July and August and during September at Nimbus Dam would allow dilution of water quality constituents, including pesticides and fertilizers present in agricultural run-off. As a result, any differences in flow would not be of sufficient frequency and magnitude to affect water quality in a way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality. Therefore, potential flow-related changes to water quality under the proposed action would be less than significant.

Acquisition of stored groundwater from Sacramento Groundwater Authority members under the proposed action would not substantially increase American River water temperature, relative to the existing condition.

Overall, water temperature in the American River below Nimbus Dam, at Watt Avenue and at the mouth under the proposed action would slightly increase or would otherwise be essentially equivalent to or less than water temperatures relative to the existing condition. Any differences in water temperature would not be of sufficient frequency and magnitude to affect water quality in such a way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality.

Acquisition of water via crop idling of rice in the Sacramento Valley would result in temporary conversion of lands from rice crops to bare fields.

Crop management practices and soil textures are key factors in determination of erosion potential. Idling would result in an increased number of bare fields, which may result in increased potential for sediment transport via wind erosion. Increased sediment transport via wind erosion could result in increased deposition of transported sediment onto surface water bodies, thus potentially affecting water quality directly. However, the rice crop cycle and the soil textures in the Sacramento Valley reduce the potential for wind erosion in this region. The process of rice cultivation includes incorporating the leftover rice straw into the soils after harvest through discing, a commonly used practice among farmers. After harvest and discing in late September and October, the fields are flooded to aid in decomposition of the straw. Under the crop idling component of the proposed action, no irrigation water would be applied to the fields after farmers flood their fields in the winter, and the soil would be expected to remain moist until approximately mid-May. Once dried, the combination of decomposed straw and clay soils produces a hard, crust-like surface. If left undisturbed, this surface texture would remain intact throughout the summer, when wind erosion would be expected to occur, until winter rains begin.

In contrast to sandy topsoil, this surface type would not be conducive to soil loss from wind erosion. During the winter rains, the hard, crust-like surface would remain intact and the amount of sediment transported through winter runoff would not be expected to increase. Therefore, there would be little to no increase in sediment transport resulting from wind erosion or winter runoff from idled fields under the proposed action as compared to the existing condition. Because there would be little to no increase in sediment transport under the proposed action as compared to the existing condition, there would be little to no increase in the amount of fugitive dust or sediment that could be deposited onto and in surface waterbodies. As a result, there would be little to no decrease in the physiochemical qualities of surface water and adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality would not be expected.

Acquisition of water via crop idling of rice in the Sacramento Valley would alter the timing and quantity of water applied to the land.

Under the existing condition, farmers would harvest their crop in late September and October. Residue disposal and discing would occur in late October and November. During the winter, farmers would flood the rice fields to aid in decomposition of the rice straw. Fields would be disced the following March and April, planted, and irrigated throughout the summer. Harvest of the rice crop would occur in late September and October, thus completing the rice crop cycle. Under the proposed action, farmers would harvest in late September and October, and disc in late October and November for residue disposal purposes. Farmers would flood the rice fields during the winter to aid in decomposition of the rice straw. However, with idling, crop lands would not be planted and irrigated the following summer. The soil would be expected to remain moist until approximately mid-May as a result of the flooding of the fields in the winter. The decomposed straw and clay soil would dry throughout the summer, resulting in a hard, crust-like surface. The soil would not become moist again until the winter rains begin in approximately November.

With respect to the timing and quantity of water applied to the land, the existing condition and conditions under the proposed action would differ in some regards. Under the existing condition, crops would be harvested in late September and October and the leftover rice straw would be incorporated into the soil through discing following harvest. During the winter rains, beginning in November, fields would be wetted by rainfall. Additionally, under the existing condition, water would be applied to fields in the winter to aid in rice straw decomposition and in the summer for irrigation. Fertilizers and pesticides would be applied in the spring, and the land would be irrigated throughout the summer. Under the proposed action, crops would be harvested in late September and October and the leftover rice straw would be incorporated into the soil through discing following harvest. Water would be applied to fields in the winter as in the existing condition. However, water would not be applied during the following summer for irrigation because of crop idling. As in the existing condition, rainfall beginning in November would serve to wet the fields in the fall. Water would not be applied to fields during the following winter because there would be little rice straw to decompose due to crop idling.

The difference in timing and quantity of water applied to the land may have the potential to alter the timing or concentration of associated leaching and runoff. Because more total water would be applied to fields under the existing condition as compared to the proposed action, there would be more potential for leaching of salts and trace elements under the existing condition. Additionally, application of fertilizers and pesticides associated with growing crops under the existing condition would result in increased concentrations of nitrogen and phosphorus in surface water runoff as compared to the proposed action. Because there would be less total leaching potential under the proposed action as compared to the existing condition, there would be no decrease in water quality due to timing and application of water to the land as a result of idling. In fact, there would potentially be an improvement in the quality of surface water runoff returning to rivers and lakes.

Acquisition of water via groundwater substitution would result in substitution of groundwater for surface water typically applied to agricultural fields.

Acquisition of water via groundwater substitution under the proposed action would involve substitution of groundwater for surface water. Under the proposed action, groundwater would be pumped from wells and used to irrigate fields, allowing farmers to forego their surface water entitlements. Groundwater would be applied to fields in lieu of surface water and would mix with surface water in agricultural drainages prior to irrigation return flow reaching the mainstem rivers. Under the existing condition, some groundwater is currently used to supplement surface water entitlements. However, the additional groundwater substitution that would be needed for implementation of the proposed action would not be required under the existing condition, and surface water would be used to irrigate fields instead of substituted groundwater under the existing condition.

The increase in the amount of groundwater substituted for surface water under the proposed action, as compared to the existing condition, would be so small in comparison to the amount of surface water currently used to irrigate agricultural fields that the quality of the surface water, even after mixing with groundwater, would not be substantially decreased. Constituents of concern that may be present in the groundwater and subsequently input into surface water as a result of mixing with irrigation return flows, would be heavily diluted once in contact with the existing supply of surface water, given the high volume of surface water that is currently used for irrigation purposes.

Additionally, any acquisitions purchased by groundwater substitution under the proposed action must adhere to the collaborative and systematic process set forth by DWR and Reclamation regarding obligatory transfer requirements between willing sellers and the purchasing agencies. This process has been established to ensure that potential effects to other legal users of water and third party effects are detected and that a local mitigation strategy has been developed prior to the groundwater transfer. As part of this process, the seller must recognize, assess and mitigate any adverse effects resulting from the transfer. Purchasing agencies also have a responsibility for assuring that the seller has an adequate mitigation program in place. To assist both parties of the transaction, a groundwater mitigation measure has been established to provide a framework with which to consider potential effects resulting from groundwater substitution. The groundwater mitigation measure includes: 1) a well review; 2) pre-purchase groundwater evaluation; 3) a monitoring program; and 4) a mitigation program. In addition to this environmental review, the groundwater mitigation measure provides further assurances that all potential adverse effects resulting from groundwater substitution are identified through a local monitoring program and locally mitigated. Any associated mitigation measures and related funding will be provided through local mitigation programs, which are tailored to the local conditions specific to each region.

In summary, the proportion of potential DWB-purchased groundwater that would be available for irrigation purposes using groundwater substitution under the proposed

action, as compared to the total volume of surface water that is already in use on agricultural fields, would result in dilution of constituents of concern that may be input into surface water. Mixing of agricultural groundwater runoff with agricultural surface water runoff would result in sufficient dilution within the irrigation return flows, prior to draining into mainstem river reaches. Additionally, acquisitions via groundwater substitution under the proposed action would not occur unless the water transfer conformed to the provisions set forth in the groundwater mitigation measures.

Mitigation Measures

For groundwater substitution, the groundwater mitigation measures previously described provide assurances that local monitoring and mitigation programs will be developed prior to approval of DWB transfers.

DWR and Reclamation have incorporated the following measures into the proposed action to continue with standard Project operating procedures and to improve the water quality to users south of and downstream of the Delta.

1. Carriage water will be used to protect and maintain chloride concentrations in the Delta.

2. DWR will only purchase water if it meets all of the required provisions of DWR's acceptance criteria governing conveyance of non-Project water through the California Aqueduct.

3.4 Geology and Soils

3.4.1 Affected Environment

Key variables described in this section include geology, chemical processes, and soil properties. This chapter focuses on the counties in which crop idling would take place: Glenn, Colusa, Yolo, Sutter, Butte, and Placer Counties.

<u>Glenn County</u>

The terrain in the western portion of Glenn County is steeper than in the eastern portion. Two major geologic provinces within the county define the overall topography of the area, the Sacramento Valley and the Coast Range. Elevations of the Sacramento Valley range from approximately 100 feet above mean sea level at the Sacramento River to approximately 300 feet above msl at the western edge of the valley. A small area in southeastern Glenn County lies on the eastern side of the Sacramento River; this portion of the county has little discernable slope. The eastern third of Glenn County contains a majority of prime and statewide-important farmland. Farmland of local importance is concentrated toward the central portion of the county. Soil types in Glenn County can be divided into five general land categories defined by physiographic position, soil texture, soil profile, and slope. These land categories are:

- **Mountain soils** - These soils are shallow to deep, well drained to excessively drained, and mostly steep to very steep.
- **Soils of the foothills** - In the foothills, the soils are formed mainly from hard, unaltered sedimentary rock of the Knoxville formation and other formations of the Cretaceous period and from poorly consolidated siltstone of the Tehama formation.
- **Soils of Older Alluvial Fans and Low Terraces** - Soils of older and low terraces are well drained to somewhat poorly drained and are mostly moderately permeable to very slowly permeable.
- **Basin Soils** - The soils of the basins are in the southwestern part of the County. Soils of the basins are characteristically fine textured and poorly drained. Slopes are nearly level, and runoff is very slow.
- **Soils of the More Recent Alluvial Fans and Flood Plains** - Most of the soils on the more recent alluvial fans and flood plains of the county are along Stony Creek and the Sacramento River. The soils generally consist of shallow to deep, well-drained to excessively-drained gravelly and non-gravelly stratified material.

Glenn County contains soils with low, medium, and high shrink-swell potential. Western Glenn County has soils with predominantly low to medium shrink-swell potential, while the southeastern portion of the County contains soils with higher expansive potential.

Colusa County

Colusa County is surrounded by the Sacramento River to the east, the Coast Ranges and foothills to the west, Cache Creek to the south, and Stony Creek to the north. The eastern third of Colusa County is virtually flat with a gently increasing elevation gradient towards the northwest. The central portion of Colusa is characterized by level to gently rolling valley lands. The high, steep ridges of the Coast Ranges make up the western third of Colusa County. Deep alluvial valleys, such as Bear Valley, Indian Valley, and Antelope Valley, cut horizontally across the north-south Coast Range. Elevations range from 40 feet above msl in the east to 7,056 feet at the summit of Snow Mountain in the northwestern corner of the county.

The region consists of low alluvial plains and alluvial fans. These alluvial deposits are divided into several different sub-basins based on geologic composition. These include the Stony Creek Fan, Cache Creek Floodplain, Arbuckle and Dunnigan Plains, and the Willows-to-Williams Plain.

Northwestern Colusa County consists of very gravelly sandy loam soils. The area is surrounded by unweathered bedrock. The majority of the western half of the county consists of very gravelly-sandy loam and very gravelly loam. The eastern half of Colusa is dominated by silty clay. The eastern portion of the county also has stratified soil made up of silty clay loam and fine sandy loam. Southern Colusa is gravel-loam.

The eastern portion of Colusa County is classified as containing unique farmland and prime farmland. Central Colusa County is dominated by locally important farmland.

The majority of Colusa County has expansive soils with a high shrink-swell potential; a portion of southern Colusa contains soils with a low shrink-swell potential.

Yolo County

Yolo County lies within the California Coast Range and the Sacramento Valley. The western part of the county is in the Coast Range and is characterized by hilly to steep, mountainous uplands. The soils vary from moderately deep to very shallow, though much of the area is bare. The soils in this part of the county are used principally for range; the less productive areas are used as wildlife habitat (Soil Conservation Service 1972).

The gradient becomes more gradual moving east across the county from the Coast Range. Rounded hills and broad slopes become the dominant feature. The soils are moderately deep to softly consolidated material, or are shallow to a claypan. They are used for dryland small grains and pasture (Soil Conservation Service 1972). Most of the county, approximately two-thirds, lies within the Sacramento Valley. The topography is nearly level and soils are used for irrigated and dryland crops as well as orchards.

The soils of western Yolo County are predominantly loams to silty clay loams. Northern and eastern Yolo soils are silt loams to silty clay loams. Clay soils are present in northeastern Yolo County. The majority of Yolo County is classified as containing locally important farmland and prime farmland. Central and western Yolo County contains soils with low to moderate shrink swell potential. Southeastern Yolo County soils are classified as containing high shrink swell potential.

Butte County

Butte County includes valley, foothill, and mountain zones. The surface geology of the Sacramento Valley portion of Butte County comprises primarily alluvial deposits resulting from the eroded material from surrounding mountain ranges. Along the base of the foothills, alluvial fan and terrace deposits of the Riverbank and Modesto Formations indicate the edge of the valley sedimentary units.

The soils associated with the valley area and alluvial fans of Butte County are deep, nearly level, very fertile, and support agricultural practices. The Butte Basin was, prior to the implementation of flood control on the Feather and Sacramento Rivers, an area of extensive seasonal flooding. Early reports depict a slow-moving body of water covering from 30 to nearly 150 square miles. This slow-moving floodwater deposited the fine clay that now provides the rich agricultural soil utilized primarily for rice production.

The Foothill region occupies the transitional geologic zone between Tertiary sediments in the west part of Butte County and Mesozioc-Paleozoic rocks in the east part of the county. Jurassic and Cretaceous sedimentary rocks outcrop in the northern Foothill region. Soils in the foothills are shallow, gentle to steep sloping, less fertile, and residual.

The Mountain region is the easternmost region in Butte County. Mesozoic and Paleozoic age plutonic, volcanic, and metamorphic rocks make up the majority of the surface and

subsurface geology. Other geologic formations consist of Tertiary volcanic sediments, including the Tuscan formation. High mountain soils in Butte County are shallow to deep, moderate to steep sloping, and residual. These soils support forestry and wildlife habitat including rangeland.

The western third of the county is classified as irrigated farmland. The northern tip of the county is underlain by weathered bedrock of the Tuscan Formation. Sandy loams dominate the eastern portion of the county. Sandy clay loam and clay loam are also present in this area. The central portion of the county is primarily unweathered bedrock of the Modesto Formation. Loams are present in the northern and southern areas. Silty clays are confined to the southwestern portion of Butte County. Soils in eastern Butte County have a low to moderate shrink swell potential. The edge of western Butte County contains soils that are highly expansive.

Sutter County

The topography of Sutter County mimics the gradual slopes of the Sacramento River Valley. The only prominent topographic feature within the County is the Sutter Buttes, a Pliocene volcanic plug that rises 2,000 feet above the surrounding valley floor (Sutter County 1996). In Sutter County, the sedimentary rocks are of both marine and continental origin frequently imbedded within tuff-breccias. Beneath 125 feet of recent alluvial fan, floodplain, and stream channel deposits are as much as 100 feet of Pleistocene sands and gravels which together make up the continental sediments of the Pleistocene and Recent ages (Sutter County 1996).

The western and southern portions of the County contain areas of prime farmland. The eastern portion of the county is designated largely as statewide important farmland. The western and southern portion of Sutter County contain silty clay soils, stratified soils of silty clay loam, and fine sandy loam. The eastern portion of the county contains loam soils.

Approximately 83 percent of Sutter County soil types have been identified in the Soil Survey for Sutter County as having slight erodibility and generally consist of those soil types with slopes of 0 to 9 percent (Sutter County 1996). About 10 percent of Sutter County soils have moderate erodibility. These soil types usually have slopes of 9 to 30 percent. About 6 percent of Sutter County soil types have high to very high erodibility and generally consist of those soils types with slopes of 30 to 75 percent. The moderate and high erodibility groups contain soil types found in the Sutter Buttes (Sutter County 1996).

Expansive soils within Sutter County are most likely in basins and on basin rims. Soils with no or low expansion potential occur along the rivers and river valleys and on steep mountain slopes (Sutter County 1996).

3.4.2 Environmental Consequences

No Action
Under the no action alternative, water transfers for the DWB would not occur. Crop idling would occur, as it exists without the project; some fields would be idled because of unreliable water supplies, economic factors, or as part of a crop rotation. Because there would be no change under this alternative, the no action alternative is considered equivalent to the existing condition.

Proposed Action
The proposed action would potentially cause soils to shrink due to the reduction in applied irrigation water. Soils would swell during the winter rains. Because the lands that are being idled are agricultural, there are minimal structures that could be affected by expansive soils. Under the existing condition, soils would also be exposed to shrinking and swelling during cycles of irrigation. (Soils are irrigated, then left to dry out, then irrigated again.) The shrinking and swelling of soils would not have adverse effects on structures or roads, and the soils undergo similar scenarios under the existing condition.

Acquisition of water via crop idling in the Sacramento Valley would result in temporary conversion of lands from rice crops to bare fields. However, the rice crop cycle and soil texture reduces the potential for erosion. The process of rice cultivation includes incorporating the leftover rice straw into the soils after harvest. The fields are then flooded during the winter to aid in decomposition of the straw. If no irrigation water is applied to the fields after this point, the soils would remain moist until approximately mid-May. Once dried, the combination of the decomposed straw and clay soils produces a hard, crust-like surface. This surface texture would remain until the following winter rains if not disturbed. In contrast to sandy topsoil, this surface type would not be conducive to soil loss from wind erosion. Therefore, there would be little to no soil loss from wind erosion off the idled rice fields.

3.5 Agriculture and Land Use

3.5.1 Affected Environment
Several programs exist to promote the preservation of open space and agricultural lands and wildlife habitat in the State, including the Williamson Act, California Farmland Conservancy Program, Conservation Reserve Program, Wetlands Reserve Program, CALFED Ecosystem Restoration Prorgam, Farmland Mapping and Monitoring Program.

Although agriculture remains a mainstay of Butte County's economy, farmland is increasingly being converted to urban uses and a significant amount of farmland is being restored to natural uses. In 2000, of the 917,909 acres mapped in Butte County, 522,297 acres were in agricultural use, 40,185 acres were urbanized, 21,643 acres were water and 333,784 acres were "other." (FMMP 2002).

In 2000, of the 740,392 acres mapped in Colusa County, 573,420 were in agricultural use, 4,257 acres were urbanized, 1,838 acres were water and 160,877 acres were "other" (FMMP 2002). In 2000, of the 849,127 acres mapped in Glenn County, 583,974 were in agricultural use, 5,609 acres were urbanized, 5,759 acres were water, and 253,678 acres were "other." (FMMP 2002). Since 1990, 9,333 acres of farmland have gone out of production in Sutter County, and 2,354 acres of new urban land have been created (DOC 2002). In 2000, of the 389,439 acres mapped in Sutter County, 352,187 were in agricultural use, 11,360 acres were urbanized, 1,848 acres were water, and 24,044 acres were "other." (FMMP 2002)

Yolo County's agricultural land will continue to face development pressure in the foreseeable future. Since 1990, 22,253 acres of farmland have gone out of production in Yolo County and 3,513 acres of new urban land have been created (DOC 2002). In 2000, of the 653,451 acres mapped in Yolo County, 553,536 were in agricultural use, 25,939 acres were urbanized, 7,399 acres were water, and 66,577 acres were "other." (FMMP 2002)

The 5-year average rice acreage in Yolo County increased from 28,822 acres to 35,758 acres, mainly because of an increase in rice planted in 2003 and 2004. Idling the maximum rice acreage in the Upstream from the Delta Region under 2001 to 2005 average acreages would yield about 296,000 acre-feet.

As reported in the UCCE crop budgets, total production costs for rice increased about $300 per acre from 2001 to 2007. This increase was largely due to a $230 increase in operating costs for cultural and harvesting activities. One notable difference in the rice production costs is the change in the price of labor and the price of fuel. Labor costs increased about $6.00 per hour from 2001 to 2007 and fuel increased about $1.30 per gallon (UCCE 2001, UCCE 2007).

Average acreage changes are within 6 percent for Butte, Colusa, Glenn, and Sutter Counties. The 5-year average rice acreage in Yolo County increased from 28,822 acres to 35,758 acres.

Over the last 25 years, the acreage of planted rice in the Sacramento Valley has varied from a low of approximately 330,000 acres in 1983 to a high of over 508,000 acres in 1999. Planted acreage varies as a result of a number of factors, including economic and environmental changes, and regular crop rotations. Crop rotation and fallowing are a standard rice farming practice that can reduce disease and increase water quality. In the Sacramento Valley, up to 30% of rice is grown in rotation with other crops and up to 70% is in a rice/fallow rotation (Hill et. al. 1998).

Between 1997 and 2005, rice production in the Sacramento Valley has varied from 369,600 to 508,900 acres with an annual decline of 18,900 acres in 1995 and 72,000 acres in 2001 (Table 3.5-1). During this time period, the annual decline of rice planted by county was as high as a 53% in Sacramento County in 2006 and more than 35% of the declines were changes greater than 10% (Table 3.5-1).

Table 3. Estimated Sacramento Valley Rice Production (acres) from 1995-2006 by County.

Year	Butte	Colusa	Glenn	Sacramento	Sutter	Yolo	Yuba	Total
1995	83,000	122,000	79,000	10,300	82,000	27,000	32,000	435,300
1996	97,000	136,000	87,000	8,800	86,000	21,600	34,000	470,400
1997	97,000	137,000	89,000	9,400	90,000	24,000	35,000	481,400
1998	88,000	121,000	83,000	9,100	91,000	20,400	37,300	449,800
1999	102,500	135,000	88,000	9,700	104,500	30,000	39,200	508,900
2000	98,000	145,000	87,500	9,000	108,000	35,500	39,000	522,000
2001	86,800	126,300	78,300	7,800	87,700	26,000	37,100	450,000
2002	100,000	138,500	87,500	8,200	101,700	31,500	36,000	503,400
2003	87,800	138,000	82,500	8,100	96,900	32,300	35,400	481,000
2004	105,800	156,400	90,300	9,600	124,000	41,900	34,300	562,300
2005	96,800	145,600	87,100	7,900	101,800	29,200	33,300	501,700
2006	99,100	145,900	87,500	3,700	106,600	28,900	33,200	504,900
Average	95,150	137,225	85,558	8,467	98,350	29,025	35,483	489,258

[1] California Field Crop Statistics, 1996-2007, California Agricultural Service.

3.5.2 Environmental Consequences

No Action

Under the no action alternative, water transfers for the DWB would not occur. Crop idling would occur, as it exists without the project; some fields would be idled because of unreliable water supplies, economic factors, or as part of a crop rotation. Because there would be no change under this alternative, the no action alternative is considered equivalent to the existing condition.

Under the no action alternative, the trend of land conversion from agricultural uses to urbanization and non-agricultural uses would likely continue and possibly accelerate. Population growth is a major factor resulting in the reduction of agricultural lands. Metropolitan areas in the Central Valley, such as Sacramento, Stockton, Fresno, and Bakersfield are expected to expand with population growth, necessitating further development of land. Recently, farmers have also been affected by urbanization through the water transfer market. Urban water supply reductions and growing populations have increased urban water demand, and lower agricultural prices have increased farmers' willingness to sell.

Under the no action alternative, water transfers involving crop idling would likely continue at recent levels. Generally, water transfers would not affect land use because transfers are temporary. Farming patterns often change annually. If single year water

transfers are made, land use patterns would not vary substantially from normal farming practices. Farmers would also continue to idle some land temporarily depending on crop rotations and the agricultural market. Lands are temporarily removed from farm production for improvements such as land leveling and weed abatement. Farmers also rotate land to reduce pest problems and build soils. Farmers would continue to place back into production other previously-idled land. These continued farming practices would continue to cause some fluctuation in agricultural land use.

Under the no action alternative, statewide and Federal programs to preserve open space and agricultural lands would continue to be implemented. Several programs would also take agricultural land out of production. This would neither interfere with other land protection programs nor bring enrolled lands to an incompatible use. Any actions associated with the no action alternative would be less than significant.

Proposed Action

Water acquisitions from crop idling could alter agricultural land use conditions. However, temporal (one year) water transfers from the DWB are expected to contribute a relatively small amount of rice idling acreage in relation to the normal variation in planted rice acreage resulting from typical farming practices.

Decisions to modify cropping patterns would be made by the local water user. The amount of land contained in an idling program would be limited and only done when necessary for water supply purposes.

Crop shifting and idling programs have the potential to affect the local economy if they are taken to an extreme. Those parties that depend on farming related activities could experience some decrease in business if land idling becomes too extensive. Various studies have shown that limiting cropland idling to 20 percent of the total irrigable land in a county limits economic effects. More information on this is available in the 2007 EWA Draft and Final Supplemental EIS/EIR, which are hereby incorporated by reference.

Water districts and others participating in crop shifting/idling programs need to be sensitive to the possible economic impacts of their actions on their business partners and neighbors. Geographically dispersing the acres idled would avoid or minimize possible economic effects. In addition, water districts and individuals that receive funds from the sale of water related to the proposed action are encouraged to continue their normal business practice of investing income back into their operation and as much as possible, in the local economy. These reinvestments may not benefit those potentially affected by the crop shifting/idling program, but can help offset overall economic impacts in the county.

Crop idling would result in a temporary effect to land use. Farmers would resume planting on the field in the following year. Crop idling under the proposed action would

not result in any permanent changes to land use. If crop idling would change the classification of farmland to levels less than Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP and Prime Farmland under the Williamson Act, the project agencies would not approve transfer of water from that parcel.

To minimize the potential for adverse land use effects, water would not be acquired from a particular parcel of land if idling the land would result in a lower classification of the land as defined under the FMMP and Williamson Act. The Project Agencies would gather accurate data regarding land classifications of cropland previously idled in participating counties. Data on recent idling history of specific parcels would be obtained from the seller.

3.6 Vegetation and Wildlife

3.6.1 Affected Environment

The following sections contain information on the habitat types potentially affected by the proposed action. THe 2003 EWA Draft EIS/EIR, which is hereby incorporated by reference, contains detailed information on the vegetation and habitat types found in the study area.

Nontidal freshwater permanent emergent (NFPE) habitat can be found scattered along the Sacramento River typically in areas with slow moving backwaters. Substantial portions of these habitats occur at the Colusa, Sutter, and Tisdale Bypasses, the Butte Sink, and at the Fremont Weir.

Natural seasonal wetland (NSW) habitat can be found scattered along the Sacramento River typically in areas with slow moving backwaters. Substantial portions of these habitats occur at the Colusa, Sutter, and Tisdale Bypasses, the Butte Sink, and at the Fremont Weir. NSW habitat can be found scattered along the American River typically in areas with slow moving backwaters.

Dominant natural seasonal wetland vegetation includes big leaf sedge, bulrush, and redroot nutgrass. Wildlife associated with natural seasonal wetlands are predominantly special-status species. Common species can include ducks, geese, heron, and other waterfowl, wading, and shorebirds. Special-status animal species associated with NSW include American peregrine falcon, California gull, greater sandhill crane, long-billed curlew, northern harrier, short-eared owl, Swainson's hawk, tricolored blackbird, white-tailed kite, giant garter snake, California red-legged frog, California tiger salamander, western spadefoot toad, conservancy fairy shrimp, Delta green ground beetle, longhorn fairy shrimp, mid-valley fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp. Special-status plant species associated with NSW include Henderson's bentgrass, Ferris' milkvetch, alkali milk vetch, heartscale, brittlescale, San Joaquin spearscale, lesser saltscale, succulent owl's clover, Hoover's spurge, Hispid bird's beak, palmate-bracted bird's beak, recurved larkspur, Boggs Lake hedge-hyssop, Ahart's dwarf

rush, Contra Costa goldfields, Legenere, Heckard's peppergrass, Butte County meadowfoam, pincushion navarretia, Colusa grass, San Joaquin Valley orcutt grass, hairy orcutt grass, slender orcutt grass, Sacramento orcutt grass, Ahart's paronychia, and Greene's tuctoria.

Managed seasonal wetlands (MSW) on the west side of the Sacramento River generally occur between Willows and Dunnigan, CA along the Colusa Main Drain. Substantial portions of these habitats also occur at the Colusa, Sutter (including the Sutter Bypass Wildlife Area), Tisdale, and Yolo (including the Yolo Bypass Wildlife Area) Bypasses, at the Fremont Weir, and as a part of the Sacramento National Wildlife Refuge Complex (six refuges totaling 35,000 acres). MSW habitat between the Sacramento River generally occur along Butte Creek in the Butte Basin (Upper Butte Basin and Gray Lodge Wildlife Areas), around the Thermalito Afterbay, and along Angel Slough north of Butte City, CA (Llano Seco Rancho Wildlife Area).

Dominant managed seasonal wetland habitats can include the same vegetation as for natural seasonal wetlands. MSW habitats are often managed for waterfowl such as mallards, pintails, American widgeon, and Canada and other geese. MSW habitats also support a variety of wading and shorebirds, such as herons, egrets, terns, and gulls. Special-status animal species associated with MSW include Aleutian Canada goose, American peregrine falcon, bald eagle, black tern, California gull, greater sandhill crane, long-billed curlew, northern harrier, short-eared owl, Swainson's hawk, tricolored blackbird, western snowy plover, white-faced ibis, white-tailed kite, giant garter snake, western pond turtle, California red-legged frog, and vernal pool tadpole shrimp. Special-status plant species associated with MSW are often the same as those species found in natural seasonal wetlands.

South of Red Bluff, the Sacramento River enters the Sacramento Valley and transitions into Valley Riverine Aquatic and Valley Foothill Riparian (VFR) habitat. Along most of the Sacramento River and its tributaries, remnants of riparian communities are all that remain of once very productive and extensive riparian areas. Between Red Bluff and Chico, the river is mostly unleveed and contains substantial remnants of the Sacramento Valley's riparian forests. One of the most important factors, other than agriculture, affecting riparian habitat downstream of Chico Landing is the Sacramento River Flood Control Project constructed by the US Army Corps of Engineers (Sacramento River Advisory Council 2001). The flood control project has confined riparian vegetation to a narrow band between the river and the riverside of the levees. Natural areas within this reach include the Redding Arboretum and Kutras River Access; the largely riparian, Anderson River Park owned by CDFG; the Woodson Bridge State Recreation Area; the Bidwell-Sacramento River State Park; the Colusa-Sacramento River State Recreation Area; and the Sacramento River Wildlife Area. Riparian forest systems include riparian forest successional stages, gravel bars and bare cut banks, shady vegetated banks, and sheltered wetlands such as sloughs, side channels, and oxbow lakes (Sacramento River Advisory Council 2001). Plant communities found in conjunction with riparian forests include valley oak woodland, wetland, and non-native grassland.

River regulation in California's Central Valley has created artificially stable inter- and intra-annual hydrological conditions that have impaired recruitment and altered the age structure of native riparian tree populations that have evolved with pre-regulation cycles of flooding and summer drought (Stella, et. al. 2003). Changes in hydrology have caused an overall decline in bank erosion rates and an accompanying decrease in point bar formation. Fewer suitable sites for cottonwood and willow forest regeneration are now available, changing the pattern of riparian forest succession. For example, in the absence of river processes on the Lower American River such as new gravel and sand bar formation, and in combination with increased summer flows, cottonwood recruitment has been virtually eliminated and existing stands appear to be aging without opportunities for replacement. Instead alders have increased in abundance by taking advantage of the more consistent summer flows and increased bank stability (USFWS 1991b). On the Sacramento River, controlled flows have resulted in a higher survival percentage through lack of scouring and a continual provision of moisture reducing losses from desiccation (Strahan 1985).

Also affected by changes in hydrology is the inundation frequency along rivers. The frequency of overbank flooding required for natural establishment, maturation, and regeneration of the later stage successional forests continually affects smaller and smaller land areas. According to the Sacramento River Advisory Council (2001), another factor in reduced riparian forests along rivers is conversion of the land to agricultural practices.

More than 60 percent of all vertebrates spend some portion of their life cycle in riparian habitat (Reclamation and SJRG 1999). In California over 225 species of birds, mammals, reptiles, and amphibians depend on riparian habitats, and cottonwood-willow riparian areas support more breeding avian species than any other comparable broad California habitat type (Sacramento River Advisory Council 2001and Stillwater Sciences 2002). Riparian areas also serve as a corridor for wildlife movement, providing access to additional seasonal food sources and new territories for dispersing young, and allowing for the movement of individuals into and out of areas, thus ensuring a good mix of genetic material into a population (Sacramento River Advisory Council 2001).

Some of the riparian habitat has a lush canopy with associated shade and cover, which provides habitat for a myriad of insects. Rough ever-sloughing bark of common riparian trees attracts wood-boring larvae and provides forage for bark-gleaning and trunk-scaling birds. Woodpeckers, warblers, flycatchers, and owls are common inhabitants of this habitat. The tall trees also attract wintering and breeding raptors (Reclamation and SJRG 1999). Other wildlife that use riparian habitats include California towhee, Bewick's wren, belted kingfisher, scrub jay, rufous-sided towhee, blue grosbeak, tree swallow, yellow-rumped warbler, lazuli bunting, western tanager, northern oriole, western fence lizard, Pacific tree frog, western toad, bullfrog, western skink, western whiptail, southern alligator lizard, racer, gopher snake, king snake, garter snake, rattlesnake, opossum, black-tailed hair, western gray squirrel, ringtail, river otter, striped skunk, raccoon, beaver, a number of bat species, and mule deer. Special-status animal species associated with VFR habitat include greater western mastiff bat, ringtail, riparian brush rabbit, San Joaquin Valley woodrat, western yellow-billed cuckoo, bank swallow, bald eagle, black-

crowned night heron, California yellow warbler, Cooper's hawk, double-crested cormorant, golden eagle, great blue heron, great egret, least bell's vireo, little willow flycatcher, long-eared owl, osprey, snowy egret, Swainson's hawk, white-tailed kite, yellow-breasted chat, giant garter snake, western pond turtle, California red-legged frog, foothill yellow-legged frog, and valley elderberry longhorn beetle. Special-status plant species include silky cryptantha, Delta coyote-thistle, marsh checkerbloom, fox sedge, rose-mallow, northern California black walnut, and Sanford's arrowhead.

Montane Riparian (MR) habitat occurs along the Sacramento River between Red Bluff, CA and Lake Shasta. MR habitat vegetation is dominated by cottonwood (black and Fremont [at lower altitudes]), white alder, big leaf maple, dogwood, box elder, quaking aspen, wild azalea, water birch, and buttonwillow trees. As with VFR a wide variety of wildlife is supported by riparian habitats. Special-status species associated with MR habitat include California wolverine, greater western mastiff bat, ringtail, bald eagle, black-crowned night heron, California yellow warbler, Cooper's hawk, double-crested cormorant, great blue heron, great egret, least bell's vireo, little willow flycatcher, long-eared owl, osprey, snowy egret, yellow-breasted chat, California red-legged frog, foothill yellow-legged frog, silky cryptantha, valley elderberry longhorn beetle, and saw-toothed lewisia.

Seasonally flooded agriculture is found throughout the Sacramento Valley. However, currently the proposed action would only consider idling up to approximately 48,000 acres of rice in five counties (Glenn, Colusa, Butte, Sutter, and Yolo). These counties typically harvest about 496,820 acres of rice (USDA 2002). For more information on crop idling within these counties refer to Section 2.4.2.1.3 of the EWA 2003 Draft EIS/EIR, which is hereby incorporated by reference. For the purposes of the DWB, actions affecting seasonally flooded agriculture would be focused on rice fields.

Rice fields provide important foraging habitat for a variety of wildlife species. Many species forage on post-harvest waste grain (on average 300-350 pounds per acre depending upon harvest method) and other food found within the fields (more than 250 pounds per acre), such as duckweed, fish, and crayfish and other invertebrates (Brouder and Hill 1995). Typically various birds and rodents consume rice waste grain and then raptors feed on the birds and rodents. Duckweed and other moist soil plants can provide high quality food for waterfowl. Water level manipulations are necessary for moist soil plant germination and maturity. Fish are often entrained in the irrigation canals that supply water to the rice fields. Crayfish are found in the canal banks and berms of the rice fields. Simply continuing to pump water through the canals will ensure some level of fish and crayfish abundance for wildlife such as herons, cranes, egrets, etc. Other invertebrates and their larvae can be found in very shallow water particularly during an early to midseason drawdown. These invertebrates, such as bloodworms, are particularly important to shorebirds.

Rice also provides resting, nesting, and breeding habitat similar to natural wetlands. Irrigation ditches can contain wetland vegetation such as cattails, which provide cover habitat for rails, egrets, herons, bitterns, marsh wrens, sparrows, and common

yellowthroats. Rice fields provide pair, brood, and nesting habitat for species such as the mallard, northern pintail, and black tern.

Certain special-status species rely on, to varying degrees, seasonally flooded agricultural lands, in particular rice fields and their associated uplands, drainage ditches, irrigation canals, and dikes. The 2003 EWA Draft EIS/EIR contains more detailed information and is hereby incorporated by reference, but this analysis focuses on potential impacts to GGS, black tern and greater sandhill crane, as they could be potentially affected by the proposed action.

3.6.2 Environmental Consequences

No Action

Under the no action alternative, water transfers for the DWB would not occur. Crop idling and groundwater use would occur, as under the existing condition. Some fields would be idled because of unreliable water supplies, economic factors, or as part of a crop rotation. Because there would be no change under this alternative, the no action alternative is considered equivalent to the existing condition.

Proposed Action

As a part of groundwater substitution transfers, the willing sellers would use groundwater to irrigate crops and decrease use of surface water. Pumping additional groundwater would decrease groundwater levels in the vicinity of the sellers' pumps. Potentially affected habitat includes trees that access groundwater as a source of water through taproots in addition to extensive horizontal roots that use soil moisture as a water source. Decreasing groundwater levels could reduce part of the water base for species within these habitats.

The EWA 2003 Draft EIS/EIR Chapter 6, Groundwater Resources, which is hereby incorporated by reference, analyzes in detail how groundwater substitution transfers could affect groundwater levels and surrounding beneficial users, including the environment. Mitigation measures to avoid and mininimize potential adverse effects would require monitoring to identify if any effects are occurring, and implementation of additional measures by the seller if any effects should occur. The additional mitigation steps could be cessation of pumping or use of a replacement water source for the affected area. The well review and required monitoring and mitigation plans described in the groundwater section would minimize or avoid these potential effects.

Natural and managed seasonal wetlands and riparian communities often depend on surface water/groundwater interactions for part or all of their water supply. Subsurface drawdown related to groundwater substitution transfers could result in hydrologic changes to nearby streams and marshes, potentially affecting these habitats.

Before groundwater substitution actions are initiated, the hydrogeologic conditions of wells used for groundwater substitution will be examined to minimize the potential risk of depleting surface water sources and adversely affecting hydrologic conditions of

associated habitats. Implementation of the well review and monitoring and mitigation requirements will ensure the effects on these communities from groundwater substitution actions are avoided or minimized.

Landowners with managed seasonal wetland communities often depend upon agricultural return flows for part or all of their water supply. The following conservation measure will ensure effects on this wetland community will be avoided or minimized. The project agencies would maintain flow for landowners of managed seasonal wetlands who depend upon agricultural return flows for part or all of their water supply by requiring potential sellers to maintain drainage systems at a water level that would maintain existing wetlands providing habitat to covered species. As a part of the contractual agreements, DWR will require the willing seller of water for crop idling to maintain their drainage systems at a water level that will maintain existing wetlands providing habitat to covered species. As part of the monitoring program to ensure compliance with the contractual requirements, Reclamation and DWR will periodically verify that the seller is adhering to the agreement and that no effects are occurring.

Conservation measures for seasonally flooded agricultural lands are provided for the GGS (Appendix). The primary measures applicable to seasonally flooded agricultural lands include limiting the size of idled land blocks to less than 320 acres, maintaining ditch habitat and ditch water flows, and not idling the same field consecutively in addition to research and monitoring that would be implemented under the conservation strategy (Appendix).

The DWB is a one year transfer program and does not require long-term changes in agricultural practices for participation. Alfalfa is considered high quality foraging habitat (Estep 1989, Babcock, 1995, Swolgaard et al., 2008). However, there is also recognition that fallowed fields provide moderately good foraging habitat (Estep 1989). Estep (1989) classifies alfalfa as foraging habitat with high prey abundance and high prey availability and classifies fallowed fields as having moderate prey abundance and high prey availability. Swolgaard et al. (2008) found that while Swainson's hawks showed strong selection towards foraging in alfalfa, idled fields were used in rates similar to other crop types and annual grassland.

Despite the equivocal nature of the potential affects to Swainson's hawk foraging habitat, alfalfa idling proposals will be evaluated to address potential temporal change in foraging habitat values to nesting Swainson's hawks. DWR will evaluate the potential for suitable nesting habitat within 2 miles of the idled parcel by conducting a California Natural Diversity Database (CNDDB) search of nesting records of Swainson's hawk and by conducting a field visit to evaluate the surrounding habitats. The distance of 2 miles was chosen because this would result in a circular home range, centered on the nesting feature of approximately 10,000 acres. Based on the best available scientific information, this size seems a reasonable representation of the average home range of a nesting Swainson's hawk in the Sacramento Valley.

If a Swainson's hawk is known to nest within 2 miles of the idled field or suitable nesting

habitat occurs within 2 miles of the idled field, then the area within a 2 mile radius of the nest site, or suitable nesting habitat, will be characterized by habitat and type of agriculture. The goal of this evaluation will be to determine if the acreage of the idled field will constitute a significant loss of foraging habitat in comparison to the surrounding 10,000 acres. Through these evaluations DWR, will determine the level of potential impact to foraging Swainson's hawks. Idling transfers will proceed as long as the impact to foraging habitat is determined to be less than significant.

3.7 Fisheries

3.7.1 Affected Environment

This section describes the existing conditions related to fisheries and aquatic ecosystems in all water bodies that may be influenced by implementation of the proposed action. This includes the Sacramento and American River systems, the Sacramento-San Joaquin Delta, San Luis Reservoir, Anderson Reservoir, and Department of Water Resources (DWR) and Metropolitan Water District (Metropolitan WD) reservoirs in southern California.

Species of primary management concern evaluated in this analysis include those that are recreationally or commercially important (fall-run Chinook salmon (Oncorhynchus tshawytscha), steelhead (Oncorhynchus mykiss), American shad (Alosa sapidissima), and striped bass (Morone saxatilis)). Special Status species are addressed in a subsequent section.

Upstream of the Delta

The Sacramento River area of analysis includes Lake Shasta, the Sacramento River from Keswick Dam (the upstream extent of anadromous fish migration and spawning) to the Delta (at approximately Chipps Island near Pittsburg), and Butte Creek from Centerville Head Dam to the confluence with the Sacramento River.

The American River area of analysis includes Folsom Reservoir, Lake Natoma, and the Nimbus Fish Hatchery; and the lower American River, extending from Nimbus Dam to the confluence with the Sacramento River.

Delta

Reclamation operates CVP facilities in the Delta, including the Jones Pumping Plant, Tracy Fish Collection Facility, and Delta Cross Channel. SWP facilities in the south Delta include Clifton Court Forebay, Skinner Fish Facility, Banks Pumping Plant, and the intake channel to the pumping plant. Delta water enters the SWP at Clifton Court Forebay. The forebay stores water until the off-peak use period when most pumping at the Banks Pumping Plant occurs. Water flows from the Forebay, through the primary intake channel of the Skinner Fish Facility where fish screens (louvers) divert fish into the salvage facilities. The fish facility also reduces the amount of floating debris conveyed to the pumps.

DWR conducts daily fish monitoring and fish salvage operations at the SWP Skinner Fish Facility. Total fish salvage is estimated using data on the species composition and numbers of fish collected in each subsample, in combination with information on screen efficiency, the percentage of time and volume subsampled, and estimates of pre-salvage predation mortality and losses. These estimates show high seasonal and interannual variability in fish losses.

Migratory (e.g., anadromous) fish species which inhabit the Bay-Delta system and its tributaries include, but are not limited to, white sturgeon, green sturgeon, Chinook salmon (including fall-run, spring-run, winter-run, and late-fall-run Chinook salmon), steelhead, American shad, Pacific lamprey and river lamprey (Moyle 2002). The Bay-Delta estuary and tributaries also support a diverse community of resident fish which includes, but is not limited to, Sacramento sucker, prickly and riffle sculpin, California roach, hardhead, hitch, Sacramento blackfish, Sacramento pikeminnow, speckled dace, Sacramento splittail, tule perch, inland silverside, black crappie, bluegill, green sunfish, largemouth bass, smallmouth bass, white crappie, threadfin shad, carp, golden shiner, black and brown bullhead, channel catfish, white catfish, and a variety of other species which inhabit the more estuarine and freshwater portions of the Bay-Delta system (Moyle 2002).

Fish that are not bypassed by the salvage facility may survive passage through the pumps and enter the aqueduct. Fish, including striped bass and freshwater species, may rear in the canals and downstream reservoirs. These fish support recreational fisheries along the aqueduct and in downstream reservoirs. They are lost to Delta populations, however. New studies are in progress to better understand fish losses associated with operation of the Skinner Fish Facility. These studies include an evaluation of predation and mortality at each phase of the salvage operations (collection, handling, and transport and release). Assessment of acute mortality and injury to delta smelt and the assessment of fish predation during the salvage phases and at release sites are two ongoing studies (IEP 2005a).

Downstream from the Delta

The Downstream from the Delta area of analysis includes San Luis Reservoir, Anderson Reservoir, Castaic Lake, Lake Perris, Diamond Valley Lake, and Lake Mathews.

3.7.2 Environmental Consequences

No Action

Under the no action alternative, water transfers for the DWB would not occur. Because there would be no change under this alternative, the No Action Alternative is considered equivalent to the existing condition.

Proposed Action

The timeframe of July through September was identified as a window when water could

be moved through the Delta for export with less impact than would occur at other times of year, so that is when transfer water would be conveyed through the Delta under the proposed action. It is important to note that the previous discussion of existing conditions for fishery species pertains primarily to the Delta, and is included for context of the overall program. However, because the proposed action would occur within the operational parameters of the Biological Opinions on the Continued Long-term Operations of the CVP/SWP (Opinions) and any other regulatory restrictions in place at the time of implementation of the water transfers, the proposed action would not result in a change in Delta operations.

Groundwater substitution and crop idling would result in seasonal changes in the timing of releases from upstream reservoirs, potentially reducing coldwater habitat availability and the acreage of littoral habitat available for spawning and rearing and increasing the frequency of potential nest dewatering events. However, reductions in reservoir water surface elevation would not be of sufficient magnitude to result in substantial changes in coldwater habitat availability or increases in the frequency of potential nest dewatering events. Another potential impact of seasonal changes in the timing of releases from upstream reservoirs would be altered flows in the Sacramento River. However, as previously discussed, flow and temperature requirements would still be maintained under the proposed action. Therefore, changes in flows and water temperatures would not be of sufficient frequency or magnitude to affect Chinook salmon or steelhead adult immigration, spawning, egg incubation, and initial rearing, or juvenile rearing and emigration.

Groundwater substitution and crop idling would also result in decreased agricultural return flows in Butte Creek from July through September, potentially reducing adult holding and spawning or juvenile rearing habitat and decreasing flows during adult immigration or juvenile emigration for spring-run, fall-run, or late-fall-run Chinook salmon and steelhead below the Western Canal Siphon. However, decreases in agricultural return flows would occur outside of the migration periods for these species, and thus they would not be present.

3.8 Special Status Species

3.8.1 Affected Environment

The Vegetation and Wildlife Section contains information on special status species that have the potential to occur in the project area. However, terrestrial species potentially affected by the proposed action include giant garter snake (ggs), San Joaquin Kit Fox (kit fox), greater sandhill crane, black tern, and western pond turtle. Further information on the affected environment and potential effects of the proposed action on kit fox and ggs is included in the Appendix. Further information on the affected environment for greater sandhill crane, black tern and western pond turtle is provided in the 2003 EWA Draft EIS/EIR, which is hereby incorporated by reference.

Special status fish species within the proposed action's area of effect include winter- and spring-run Chinook salmon, steelhead, delta smelt, longfin smelt and green sturgeon.

The timeframe of July through September was identified as a window when water could be moved through the Delta for export with less impact than would occur at other times of year, so that is when transfer water would be conveyed through the Delta under the proposed action. Because the proposed action would involve water transfers conveyed using existing facilities within the existing operational parameters addressed in the Biological Opinions on the Continued Long-term Operations of the CVP/SWP (Opinions) and any other regulatory restrictions in place at the time of implementation of the water transfers, Endangered Species Act Section 7 consultation and Essential fish Habitat consultation for special status fish species is being done under the consultation for the Continued Long-term Operations of the CVP/SWP, and no further consultation is required.

3.8.2 Environmental Consequences

No Action

Under the no action alternative, water transfers for the DWB would not occur. Crop idling and groundwater use would occur, as it exists without the project. Some fields would be idled because of unreliable water supplies, economic factors, or as part of a crop rotation. Because there would be no change under this alternative, the no action alternative is considered equivalent to the existing condition.

Proposed Action

GGS

See Biological Assessment included in Appendix.

Kit Fox

See Biological Assessment included in Appendix.

Greater Sandhill Crane

Crop idling of seasonally flooded agricultural land could reduce the amount of over winter forage for migratory birds. In order to limit reduction in the amount of over-winter forage for migratory birds, DWR and Reclamation will avoid or minimize actions near known wintering areas in the Butte Sink (from Chico in the north to the Sutter Buttes and from Sacramento River in the west to Highway 99) that could adversely affect foraging and roosting habitat.

Black Tern

Crop idling of seasonally flooded agricultural land could reduce the amount of nesting and forage habitat during the summer rearing season. As part of the review process for the identification of areas acceptable for crop idling, DWR and Reclamation will review current species distribution/occurrence information from the Natural Diversity Database and other sources (including rookeries, breeding colonies, and concentration areas). DWR and Reclamation will then use the information to make decisions that will avoid crop idling actions that could result in the substantial loss or degradation of suitable

habitat in areas that support core populations of evaluated species that are essential to maintaining the viability and distribution of evaluated species. Conservation measures proposed for ggs in the BA (Appendix) will also benefit the black tern.

Western Pond Turtle
Ditches and drains associated with rice fields provide suitable habitat for the western pond turtle. To ensure effects of crop idling actions on western pond turtle habitat are avoided or minimized, water levels in drainage canals will be maintained to within 6 inches of existing conditions and canals will not be allowed to completely dry out. Conservation measures proposed for GGS in the BA (Appendix) will also benefit the western pond turtle.

3.9 Air Quality

3.9.1 Affected Environment
This chapter focuses on the areas where groundwater substitution and crop idling would take place. Therefore, effects are assessed in the Upstream from the Delta Region: Glenn, Colusa, Yolo, Sutter, Butte, and Sacramento, Counties. Air quality in California is regulated by the United States Environmental Protection Agency, (USEPA) and the California Air Resources Board (CARB), and locally by Air Pollution Control or Air Quality Management Districts (APCD and AQMD respectively). The following APCD/AQMDs regulate air quality within the area of analysis:

- Butte County AQMD
- Colusa County APCD
- Feather River AQMD
- Glenn County APCD
- Sacramento Metro AQMD
- Yolo-Solano AQMD

The Upstream from the Delta Region includes portions of the Sacramento Valley Air Basins. During the summer in the Sacramento Valley Air Basin, the Pacific high-pressure system can create low-elevation inversion layers that prevent the vertical dispersion of air. As a result, air pollutants can become concentrated during summer, lowering air quality. During winter, when the Pacific high-pressure system moves south, stormy, rainy weather dominates the region intermittently. Prevailing winter winds from the southeast disperse pollutants, often resulting in clear, sunny weather and good air quality over most of this portion of the region. In the Sacramento Valley Air Basin, ozone and PM_{10} are pollutants of concern because concentrations of these pollutants have been found to exceed standards; ozone is a seasonal problem from approximately May through October. Seasonal conditions, such as agricultural harvesting and summer forest fires, affect peak PM_{10} concentrations, which are much higher than the annual average.

Glenn, Colusa, Butte, Sutter, Sacramento, and Yolo Counties are nonattainment areas for State PM_{10} standards. All counties are in attainment for Federal standards except Sacramento, which is classified as a moderate nonattainment area for PM_{10}. On a State level, Yolo County is a serious nonattainment area for ozone; Colusa, and Glenn Counties are moderate nonattainment areas for ozone. According to Federal standards, Yolo County is a severe nonattainment area for ozone; Colusa and Glenn Counties are in attainment.

Butte, Sacramento, and Sutter Counties are nonattainment areas for ozone concentrations. On the Federal level, Butte County is classified as transitional for ozone, Sacramento, and Sutter Counties are severe nonattainment.

3.9.2 Environmental Consequences

No Action

Baseline trends in air quality can reasonably be expected to continue if no action is taken. Total air emissions are expected to increase, even assuming that emissions allowable from individual and mobile sources would be regulated more strictly. Increased population and associated increases in the need for more vehicles would be a contributor to the rise in pollutant emissions. Given the one year duration of the program however, increases (or decreases) beyond current trends would likely be unnoticeable. Therefore, there are no air quality effects of the no action alternative.

Proposed Action

The potential effects on air quality due to groundwater substitution and crop idling would not differ by county. Therefore, the effects of the proposed action are evaluated for the Upstream from the Delta Region as a whole.

Groundwater substitution would require use of groundwater pumps to retrieve groundwater. Groundwater substitution would take place in Glenn, Colusa, Yolo, Butte, Sutter, and Sacramento, Counties. Agricultural users would use groundwater instead of surface water for their water supply. The use of groundwater would require pumps to lift the groundwater to the surface. Groundwater pumps can be driven by many different means.

Electric pumps do not emit pollutants at the pump; the source of pollutants can be traced to emissions from the powerplant. Powerplants are given permits based on their maximum operating potential. Although the electricity required to power the groundwater pumps would not be needed under the existing condition, the additional electricity would not cause any powerplant to exceed operating capacity. A majority of power is derived from fossil fuel combusted at powerplants to generate electricity required to run the groundwater pumps. CO_2 is the primary pollutant emitted as a result of the oxidation of the carbon in the fuel. NO_x and PM_{10} are also emitted. As mentioned previously, these pollutants are noteworthy because many of the counties in the Upstream from the Delta Region are nonattainment areas for ozone and PM_{10}.

Diesel pump engines emit air pollutants through the exhaust. The primary pollutants from the pumps are NO_x, TOC, CO, and particulates (including visible and nonvisible emissions). Pumps that run on propane burn much cleaner than diesel, but still contribute NO_x, CO_2, VOCs, and trace amounts of SO_2 and particulate matter.

The pumps that would be used for groundwater substitution are existing pumps; no new pumps would be installed as a result of this alternative. The pumps have most likely been used in the past and will be used in the future; thus, the pumps are not a new source of emissions. However, groundwater substitution activities would result in use of the pumps at times when they would otherwise not be used. It is therefore necessary to quantify the project-related emissions to determine effects.

The project-related emissions, both NO_x and PM_{10}, in Sacramento, Yolo, Sutter, Glenn, and Colusa Counties have been accounted for within CARB's inventory as is demonstrated by the fact that the average project emissions produced from groundwater pumping would fall below the diesel-fueled groundwater pump emission inventory. However, because the project-related emissions would be produced in a nonattainment area, the project would contribute to an existing air quality violation, which is a significant impact. Butte County exceeds CARB's inventory, also producing a significant impact. The mitigation measures listed below would lower emissions to a negligible amount.

Acquisition of water via crop idling in the Sacramento Valley would result in temporary conversion of lands from rice crops to bare fields. The overall effects on air quality are based on the effects of the reduction of air emissions due to declining use of farming equipment and pesticide applications and the effects, if any, of leaving rice fields idled.

During a typical calendar year of operation for rice production, farm equipment is required for preparing seedbeds, plowing and discing in March and April, harvesting in late September and October, and disposing of residue and discing in late October through November. Rice farmers apply fertilizers and pesticides during the spring. The equipment required for these activities produces both dust from disturbed soils and combustion emissions, which contribute to poor air quality. Idling rice fields would reduce the use of farm equipment and associated pollutant emissions, resulting in a beneficial impact on air quality.

The only potential adverse effect on air quality from idled rice fields would be PM_{10} from potential erosion of barren fields (caused by wind or vehicles driving on the fields). The soil texture in the Sacramento Valley reduces the potential for erosion. Increased soil erosion creates a larger amount of soil particulates entrained into the air; a percentage of which are particles small enough to be considered PM_{10}. Soil types in the Sacramento Valley are generally not considered highly erodible.

The rice crop cycle also reduces the potential for erosion. The process of rice cultivation includes incorporating the leftover rice straw into the soil after harvest. Farmers flood the rice fields during the winter to aid in decomposition of the straw. If no additional irrigation water were applied to the fields after this point (because the farmers would sell

water to the DWB), the soils would remain moist until approximately mid-May. Once dried, the combination of the decomposed straw and clay soils produces a hard, crust-like surface. This surface type, in contrast to sandy topsoil, would not be conducive to soil loss from wind erosion (Mutters 2002). Therefore, there would be little to no fugitive dust from wind erosion off the idled rice fields. Effects on sensitive receptors, such as nearby residents, would also be minimal.

Mitigation Measures

Groundwater Substitution

If water is obtained from groundwater substitution, increased groundwater pumping would increase NO_x emissions. Reclamation and DWR and willing sellers will work together to implement one, or a combination, of the following mitigation measures that is appropriate. The mitigation measures will be implemented within the willing seller's air district.

- DWR and Reclamation will require willing sellers to use only electric pumps. For each groundwater pump that is not electric that is used for groundwater substitution for the proposed action, the willing seller will retrofit non-program pumps in amounts necessary to offset the maximum increases in project-related air pollutant emissions;

- DWR and Reclamation will require willing sellers to purchase offsets to compensate for producing project-related emissions. Offsets can incorporate a variety of emission reduction options including converting diesel pumps to electric or propane (as stated above), reduced fossil fuel consumption because of crop idling transfers (approximately 15 percent reduction), an accelerated pump repair schedule (approximately 20 percent reduction), or conversion to solar pumps (complete reduction in emissions). The willing seller can also include additional emission reduction options; however, the willing seller must include quantitative data indicating how those options lower the emissions to acceptable levels.

3.10 Power

3.10 Affected Environment

Hydroelectric facilities are a part of the State Water Project (SWP) and Central Valley Project (CVP) facilities at dams and reservoirs. As water is released from Project reservoirs, the generation facilities produce power that is both used by the Projects and marketed to electric utilities, government and public installations, and commercial customers. Both Projects rely on their hydropower resources to reduce the cost of operations and maintenance and to repay the cost of Project facilities. Hydropower from the Projects is an important renewable energy and comprises approximately 36 percent of the online capacity of California hydroelectric facilities. Overall, CVP/SWP hydroelectric facilities are nearly seven percent of the total online capacity of California power plants.

The area of analysis for the evaluation of potential effects upon hydropower generation due to implementation of the proposed action includes the power plants, pumping plants and associated facilities located along the SWP and CVP Projects of the Sacramento and American river systems, as well as those of the Delta Region and downstream of Delta area. Also in the area of analysis are reservoirs, powerplants, and pumping plants not owned or operated as part of the SWP or CVP. The specific hydroelectric facilities are listed in the 2003 EWA Draft EIS/EIR, which is hereby incorporated by reference.

Other hydroelectric generation facilities in the area of analysis are owned by investor-owned utility companies, such as PG&E and Southern California Edison (SCE); by municipal agencies, such as the Sacramento Municipal Utility District (SMUD); and by several agencies.

Western is the marketing agency for power generated at Reclamation's CVP facilities. Created in 1977 under the Department of Energy (DOE) Organization Act, Western markets and transmits electric power throughout 15 western states. Western's Sierra Nevada Customer Service Region (Sierra Nevada Region) annually markets approximately 8,000,000 kilowatthours (kWh), including 3,000,000 kWh produced by CVP generation and 5,000,000 kWh produced by other sources.

3.10.2 Environmental Consequences

No Action Alternative

The no action alternative reflects the condition for CVP/SWP power production should the proposed action not be implemented. Without DWB water purchases, the Project power facilities would operate as under the existing conditions. Under the no action alternative there would be no changes in CVP/SWP power production or usage, no new power facilities constructed/operated, and no facilities would be taken off-line. Therefore, no effects would be associated with the no action alternative.

Proposed Action

Acquisition of Sacramento River CVP Contractor water via groundwater substitution or crop idling may cause changes in the release pattern from reservoirs in June through September. Transfer water from idling or groundwater substitution could be temporarily stored in reservoirs and then released during July through September. The proposed action would not change the amount of water that is released from the reservoirs, but could alter the release pattern. Reservoir surface water elevation likely would be slightly lower than the existing condition because of "borrowing" of reservoir storage for July pumping of DWB water prior to August/September crop idling water being available; reduced head (on average less than 0.3 foot) would therefore slightly decrease the head component of generation efficiency. As stated previously, the value of power fluctuates throughout the year. Typically, prices are higher in late summer and fall and lower in the spring. Groundwater substitution would have no effect on power generation, and crop-idling would create slightly increased generation in July and slightly less generation in August and September compared to the existing condition. However, in an open market,

seasonal price fluctuations may not always reflect the norm. Buyers would be responsible for covering any additional costs. During times when acquisition of water for the DWB would result in the value of power generated later in the summer being less than under the existing condition. This would minimize the potential for adverse effects on power production and energy.

Acquisition of water through groundwater substitution would decrease reservoir releases in April through June. Power generation would be decreased while water was held in reservoirs and increased when released between July and September. It is anticipated that willing sellers would incorporate provisions for potential decreases in revenue from power production into the contractual arrangements made with the DWR.

The proposed action could affect the regional electricity market; although it is not anticipated to have a major effect on generation from CVP or SWP hydroelectric power plants.

The proposed action would result in an average electricity increase at the Project pumps during July, August, and September, depending on the amount of water actually transferred under the proposed action. In addition, groundwater wells in the Sacramento Valley would increase their use of electricity for water supply replacement. However, this increase in electricity use would represent less than 2 percent of the projected statewide electrical surplus during these months.

3.11 Cultural Resources

3.11.1 Affected Environment

Cultural resources is a term used to describe 'archaeological sites' depicting evidence of past human use of the landscape and the 'built environment' which is represented in structures such as dams, roadways, and buildings. Cultural resources may also be Traditional Cultural Properties or sites of religious and cultural significance which are important to Native American individuals and communities.

The National Historic Preservation Act (NHPA) of 1966 is the primary Federal legislation which outline the Federal government's responsibility to cultural resources. More specifically, Section 106 of the NHPA and its implementing regulations located at 36 CFR Part 800, outline the Federal government's responsibility in identifying and evaluating the historic significance of cultural resources. Other applicable Federal cultural resources laws and regulations that could apply include, but are not limited to, the Native American Graves Protections and Repatriation Act (NAGPRA), and the Archaeological Resources Protection Act (ARPA).

Section 106 of the NHPA requires the Federal government to take into account the effects of an undertaking on cultural resources listed on or eligible for listing on the National Register of Historic Places (National Register) and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. Those resources that are on

or eligible for inclusion in the National Register are referred to as historic properties. Historic properties may include prehistoric and historic districts, sites, buildings, structures, or objects.

As part of the Section 106 process, once an undertaking is initiated, the Federal agency must first determine if the action is the type of action that has the potential to affect historic properties. If the action is the type of action that has the potential to affect historic properties, the Federal agency must; 1) identify the area of potential effects (APE), 2) determine if historic properties are present within the APE, 3) determine the effect that the undertaking will have on historic properties, and 4) consult with the State Historic Preservation Officer (SHPO), to seek concurrence on the Federal agency'sfindings. In addition, the Federal agency is required through the Section 106 process to consult with Indian Tribes concerning the identification of sites of religious or cultural significance, and to consult with individuals or groups who are entitled to be consulting parties or have requested to be consulting parties. If the undertaking will result in adverse effects to historic properties, these adverse effects must be resolved in consultation with the SHPO and other parties identified during the Section 106 process before the undertaking can proceed to implementation.

Ethnographic studies indicate that the Native American tribes that occupied the Upstream from the Delta Region at the time of contact included the Pit River Indians, Yana, Nisenan, Maidu, Konkow, and Sierra Miwok. Evidence of the early human occupation along the headwaters of the American River dates from 2000 B.C. or earlier to 500 A.D. The climate and topography north of the Delta area supports a variety of forest, grassland, savannah, riparian, and wetland habitats. Native American groups that occupied the American River drainages survived on non-domesticated plants and animals that provided food and material for baskets, houses, and clothing. For generations, Native Californians created baskets from willows, sedge root, bulrush root and new shoots of the western redbud. Some modern Native Americans maintain their culture by gathering vegetation and wildlife formerly used by their ancestors and performing traditional ceremonies. Historic era cultural resources in the upstream from the Delta region include those associated with California's gold rush, such as mining machinery, sluices, cabins, and mills. Other historic sites include those pertaining to cattle ranches and wagon trains.

Native Americans inhabiting the Delta at the time of European contact were Northern Valley Yokuts who were settled along the San Joaquin River. Plains Miwok people lived primarily in the north with territory extending nearly to Sacramento (DWR, Reclamation 1996). Wintun and Nisenan occupied areas on the north and northeastern Delta. Those in the south Delta proper were the Chulamni or Nochochomne.

Many cultural resources exist within the Delta region, as described in Section 7.11 of the CALFED PEIS/EIR, which is hereby incorporated by reference. Because DWB water acquisitions would not affect cultural resources in the Delta, no further description of cultural resources or historic properties is included here.

The original inhabitants of the downstream from the Delta area include the Yokuts and the Costanoans. The Costanoans claimed the coastal region from the southern border of

San Francisco Bay south to Point Sur; descendants of the Costanoans currently refer to themselves as Ohlone. The Yokuts efficiently incorporated tule into tribal life. Tule or bulrush, an emergent, grows most abundantly in muddy substrates found along the shores of shallow lakes, ponds, sloughs, and marshes. Tribal members incorporated tule into their permanent dwellings, which they often built in a street-like setting. Yokuts also used bundles of tule for their canoes. Coiled jar-like vessels with flat shoulders and constricted necks are distinguishing characteristics of Yokuts' basketry. Red and black bands of either diamonds or hexagons mark the traditional Yokuts basket pattern (Kroeber 1925).

3.11.2 Environmental Consequences

No Action

Under the no action alternative, surface water facilities would continue to operate in the same manner as current operations. Individual agencies would continue to manage cultural resources in a manner consistent with State and Federal laws.

Water and irrigation districts would continue to operate their systems as in the existing conditions, where they frequently move water between facilities. Cultural resources would be subject to currently existing effects, and the no action alternative would reflect the system as it is presently operating.

Under the no action alternative, there would be no need to approve an overall action. Individual water transfers would be assessed on a case by case basis. In lieu of a water transfer assessment and subsequent approval, there is no undertaking as defined by Section 301(7) of the NHPA. Without an undertaking there is no initiation of the Section 106 process.

Proposed Action

The proposed action would result in water being transferred through existing facilities and would not result in the construction of new facilities or the modification of existing facilities. The water transferred under the proposed action would be used in a manner consistent with existing water usage to meet critical needs. The water would not be used to bring new lands into agricultural production or to supplement any specific development. A potential risk associated with the proposed action is that water transfers of stored reservoir water could result in reservoir water levels that exceed historic lows outside normal operation. This could potentially expose cultural resources that are traditionally under water. If reservoir operations remain within historic levels, then the proposed action would have no potential to affect historic properties pursuant to the regulations at 36 CFR Part 800.3(a)(1) resulting in no affect to cultural resources. If the proposed action would draw water below historic operation levels, this effect could potentially be adverse to cultural resources eligible for inclusion in the National Register below the normal zone of operation and may require additional consideration under Section 106.

Mitigation Measures

Stored reservoir water transfers could result in drawdown beyond historic operating levels and could potentially expose cultural resources eligible for inclusion in the National Register. In order to avoid this potential impact, during the transfer approval process, Reclamation and DWR will require data from the potential seller showing that releasing the water would not draw down the reservoir beyond historic operational levels. Reclamation and DWR will not approve transfers that would drawdown reservoirs beyond historic operational levels.

3.12 Indian Trust Assets (ITAs)

3.12.1 Affected Environment

Indian Trust Assets (ITAs) are legal interests in property held in trust by the U.S. for federally-recognized Indian tribes or individual Indians. An Indian trust has three components: (1) the trustee, (2) the beneficiary, and (3) the trust asset. ITAs can include land, minerals, federally-reserved hunting and fishing rights, federally-reserved water rights, and in-stream flows associated with trust land. Beneficiaries of the Indian trust relationship are federally-recognized Indian tribes with trust land; the U.S. is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the U.S. The characterization and application of the U.S. trust relationship have been defined by case law that interprets Congressional acts, executive orders, and historic treaty provisions.

Consistent with President William J. Clinton's 1994 memorandum, "Government-to-Government Relations with Native American Tribal Governments," Bureau of Reclamation (Reclamation) assesses the effect of its programs on tribal trust resources and federally-recognized tribal governments. Reclamation is tasked to actively engage federally-recognized tribal governments and consult with such tribes on government-to-government level (Federal Register, Vol 59, No. 85, May 4, 1994, pages 22951 -22952) when its actions affect ITAs. The U.S. Department of the Interior (DOI) Departmental Manual Part 512.2 ascribes the responsibility for ensuring protection of ITAs to the heads of bureaus and offices (DOI 1995). Part 512, Chapter 2 of the Departmental Manual states that it is the policy of the Department of the Interior to recognize and fulfill its legal obligations to identify, protect, and conserve the trust resources of federally recognized Indian tribes and tribal members. All bureaus are responsible for, among other things, identifying any impact of their plans, projects, programs or activities on Indian trust assets; ensuring that potential impacts are explicitly addressed in planning, decision, and operational documents; and consulting with recognized tribes who may be affected by proposed activities. Consistent with this, Reclamation's Indian trust policy states that Reclamation will carry out its activities in a manner which protects Indian trust assets and avoids adverse impacts when possible, or provides appropriate mitigation or compensation when it is not. To carry out this policy, Reclamation incorporated procedures into its NEPA compliance procedures to require evaluation of the potential effects of its proposed actions on trust assets. (Reclamation-July 2, 1993). Reclamation is responsible for assessing whether the implementation OF A 2009 Drought Water Bank

with the Department of Water Resources (DWR) facilitating the project has the potential to affect ITAs. It is noted that Reclamation will comply with procedures contained in Departmental Manual Part 512.2, guidelines, which protect ITAs throughout the project.

Based on the actions to be undertaken it is determined that there are potential affects to Indian Trust Assets.

Maidu and Wintun people inhabited the downstream Colusa Basin section of the Sacramento River (CDM 1995; Glenn Colusa Irrigation District, California Department of Fish & Game, U.S. Bureau of Reclamation, U.S. Army Corps of Engineers 1998). The Wintun Tribe comprises three divisions: Patwin, Nomlaki, and Wintu. Present-day descendants of the Wintun live on the Colusa (Cachil Dehe) and Cortina Rancherias in Colusa County and Rumsey Rancheria in Yolo County. Wintun-Wailaki descendants in Glenn County live on the Grindstone Creek Rancheria. The Paskenta Band of Nomlaki Indians has a large tract of trust land in Tehama County, just northwest of Orland, near I-5. Colusa County has one PDA; there are no PDAs in Glenn and Yolo Counties.

Evidence indicates that the Feather River region was inhabited by the Wintun and Maidu people for thousands of years. The Konkow, the northwestern branch of the Maidu nation, inhabited portions of the Central Valley and western slopes of the Sierra Nevada to the north and northeast of Sutter Buttes. The Konkow were bordered on the west by the Nomlaki (Wintun) and on the north by the Yana and Northeastern Maidu. The southernmost group of the Yana was the Yahi (City of Oroville 1995; Butte County 1998). The southernmost Maidu called themselves the Nisenan people, and occupied the drainages of the Yuba, Bear, and American Rivers, and the lower drainages of the Feather River (Sutter County 2001). Major political Nisenan sites were along the mouths of the Feather, American, and Yuba Rivers. Abundant game, waterfowl, fish, and plant resources supported the entire region (Wilson and Towne 1978).

Descendants of the Maidu live on the Greenville Rancheria in Plumas County and on the Mooretown, Berry Creek, and Enterprise Rancherias in Butte County. The Mechoopda Indian Tribe of the Chico Rancheria (a federally-recognized Tribe) recently acquired 50 acres in fee status in Butte County. Fee land by definition is not held in trust by the United States.

Two PDAs exist in Butte County. Sutter County has no rancherias, reservations, or PDAs.

Native Americans indigenous to Yuba County are the Maidu. Southern Maidu occupied the Bullards Bar area. Valley Nisenan villages were generally located along watercourses (Yuba County 1994). Yuba County has no rancherias, reservations or PDAs.

Inhabited largely by the Yokuts Indian group, the San Joaquin Valley contained approximately 50 different Yokuts tribes. Tribes typically occupied areas along small creeks and streams where villagers could weave lodges out of the profusely growing tule. The Yokuts were nearly extinct by the 1800s due to diseases brought by missionaries and

miners (Merced County 2001). Merced County contains no rancherias, reservations, or PDAs.

3.12.2 Environmental Consequences

No Action
The no action alternative would have no effect on ITAs.

Proposed Action
It is presumed there are no off-reservation, federally-reserved hunting, fishing, or gathering rights near reservoirs proposed for stored reservoir water transfer. Crop idling could produce fugitive dust that may affect adjacent land uses. Rainfall and rice production practices in upstream areas, and mitigation measures outlined in previous sections would reduce potential effects.

Groundwater substitution could result in increased depth to groundwater in neighboring vicinities and/or increasing costs of groundwater pumping. This action could interfere with federally reserved water rights.

Potential effects on ITAs stem from actions or activities that would affect Indian trust lands and federally reserved hunting, fishing, gathering, water, or other rights. Groundwater substitution could potentially affect ITAs. The first step of the impact analysis was to identify likely locations for groundwater substitution transfers and their relationship to ITAs through the following process:

1) The Bureau of Indian Affairs 2000 Indian Trust Lands map was used to identify and eliminate tribal trust lands in the foothills of the Coast Range and Sierra Nevada, as groundwater transfers will not take place in these locations.
2) Indian trust lands located outside of groundwater basins (in areas of consolidated rock) and far from any pumping related to the proposed action in the Central Valley were eliminated (such as the Cortina and Table Mountain Rancherias). Bank groundwater substitution transfers would not occur in these areas.
3) Potentially affected ITAs in unconsolidated deposits of sands and gravels with major rivers and streams that act as recharge sources in the Central Valley include those associated with the:

    a. Colusa (Cachil Dehe) Rancheria

    b. Paskenta Band of Nomlaki Indians

4) Consistent and careful monitoring would ensure that groundwater transfers do not deplete riverflows.

If the project agencies identify potential impacts to ITAs, tribal consultation will then precede any DWB groundwater transfer in the vicinity of the identified tribes. Government–to-government consultation shall take place to determine interests,

concerns, effects, and appropriate mitigation measures. Consultation may involve the project agencies, the Bureau of Indian Affairs, the Regional Solicitor's Office, and DWR. The project agencies will discuss appropriate avoidance and/or mitigation strategies on a government-to-government basis. Separate mitigation measures may be required for different types of trust assets, including federally reserved water, land, minerals, hunting, fishing, and gathering rights.

Consultation could identify any of the following mitigation measures as appropriate for reducing effects to a less than significant level:

- more frequent groundwater monitoring
- more detailed pre-purchase groundwater evaluation
- estimates of potential interference with Indian wells
- discontinuation of DWB groundwater pumping if groundwater levels are drawn down to a level of concern. (Refer to Section 3.2.2).

Mitigation measures necessary to reduce effects to will be developed in consultation with the affected federally recognized tribe(s), before implementation. Other mitigation measures will be used as determined appropriate through tribal consultation.

3.13 Socioeconomics

3.13.1 Affected Environment

Rice is a major commodity in the upstream from the Delta counties of Glenn, Butte, Colusa, and Yolo. In 2000, milled rice in Butte County contributed 18 percent to California's rice income (CAC 2000). Average county rice acreage has remained stable from 2001 to 2005 relative to 1995 to 1999 averages. Of the region's 713,873 people, approximately 23,900 (3.3 percent) are farm laborers (REIS 1999).

Median family income measures the annual income received by an average family living within a household. The larger the median family income of the county, the more income tax revenue is generated, which can be used to provide community services for the unemployed.

Per capita income is the total of all wages, interest, rents, and other incomes divided by the number of people in the county. In Yolo County, people earn high per capita incomes, relative to other counties in the Region. Again, taxes on higher incomes provide relatively more compensatory social services to offset unemployment effects and contribute to social stability.

The percentage of people living below poverty level is also a measure of community stability. Counties experiencing high poverty rates earn less revenue per capita than those with lower poverty rates. These counties must provide more services for the economically disadvantaged and have fewer resources.

The last economic indicator that influences community stability is unemployment rate. A high unemployment rate increases the demand for more social services, which the county is expected to supply. In Colusa County, the 1999 unemployment rate was relatively high (15.9 percent). Colusa's unemployment rate, coupled with its low per capita income, represents a less stable community structure that is less effective in buffering employment loss than other counties with lower employment rates (California Economic Development Department [EDD] 1999).

California has an infrastructure in place that buffers the needs of the unemployed. Programs offering services include, but are not limited to, Experience Works that provides training for mature workers, as well as public programs that include MediCal, CalWORKS, food stamps, regional occupational training programs, and others. These programs would likely offer services to individuals displaced by crop idling. Interviews with individuals involved with farm labor indicate that the services offered do not include affordable medical insurance coverage, and generally displaced farmworkers find it difficult to meet the most basic financial obligations of rent and utilities. Therefore, displaced farmworkers would most likely require financial supplements to cover fixed expenses and medical insurance (Quiroga-Valvodinos 2003; Clayton 2003).

Factors affecting social well-being of the unemployed also include steady employment and job guarantees. Job guarantees are influenced by seasonal and economic changes. Natural conditions can lengthen or shorten employment (e.g., water shortages can reduce the number of acres farmed). The effect of natural occurrences on farm labor in the past is a component of the assessment.

In general, stable communities are typically areas that collect sizable tax revenues and have large urban centers with broad-based economies more capable of providing an assortment of public services, including unemployment compensation. The large and diverse industries of urban centers provide job opportunities, income, and tax revenues that serve to stabilize the communities. These more stable communities are identified by sizeable median incomes, low unemployment, and the number of re-employment opportunities. Conversely, a less stable community would be a smaller county, city, or local government with smaller economic base, higher unemployment, fewer re-employment opportunities, limited social services, and fewer revenues. Unemployment has a larger effect on these communities.

The population in the Upstream from the Delta region areas earns higher median and per capita incomes than those in the Downstream from the Delta area, which have greater poverty and unemployment rates than Upstream of the Delta Region.

Chapter 3 of the 2007 EWA draft EIS/EIR includes further socioeconomic information, which is hereby incorporated by reference.

3.13.2 Environmental Consequences

No Action

Farmworker employment would either remain the same or increase. Farmers would continue to temporarily idle some land due to land practices and other issues, while other

farmers would place previously idled land back into production. The continued rotation of these farming practices would cause some fluctuations in agricultural employment, but those changes would likely reflect those that occur under the existing condition. The no action alternative could adversely affect farmworker employment in the downstream of Delta region due to water shortage related fallowing.

Proposed Action

The maximum amount of water that would be made available by crop idling is 140,528 af. This equates to approximately 46,843 acres of crop idling. However, it is likely that the actual amount of water that is actually transferred via this method in 2009 would be less. This is a worst case scenario analysis.

Crop shifting and cropland idling programs have the potential to affect the local economy if they are taken to an extreme. Those parties that depend on farming related activities can experience some decrease in business if land idling becomes extensive. Various studies have shown that limiting cropland idling to 20% of the total irrigable land in a county limits economic effects. The most recent evaluation can be found in the 2007 EWA supplemental EIR/EIS, which is hereby incorporated by reference.

Water districts and others participating in crop shifting and cropland idling programs need to be sensitive to the possible economic impacts of their actions on their business partners and their neighbors. Geographically distributing the acres that are idled can avoid or minimize possible economic effects. In addition, water districts and individuals that receive funds from the sale of water related to these programs are encouraged to continue their normal business practices of investing income back into their operation and as much as possible, within the local economy. These reinvestments may not benefit those possibly affected by the cropland idling program but can help offset overall economic impacts in the county.

The proposed action would have no growth inducing impacts, as the water transferred under the proposed action would be used for existing demand subject to certain needs criteria.

3.14 Environmental Justice

3.14.1 Affected Environment

Executive Order 12898, dated February 11, 1994, requires Federal agencies to ensure that their actions do not disproportionately impact minority and disadvantaged populations. The percentages of Caucasians and Hispanics have increased in most counties and poverty rates have decreased relative to 1999 conditions. Recent (2005) farm labor employment, which remains largely Hispanic, is similar to 1999 levels in the 2003 EWA EIS/EIR, which is hereby incorporated by reference, except for Yolo and Fresno Counties. Farm employment in 2005 in Yolo County was 2,551 workers, which is a

decrease relative to all 1980 to 1999 data. Farm employment in Fresno County was 23,559 workers, which is also lower than all 1980 to 1999 data.

A recent National Agricultural Workers Survey (Rosenberg 1998) provides a thumbnail sketch of California's agricultural workers and verifies that California is heavily dependent upon foreign workers, especially those from Mexico. According to the survey, 91percent of California's crop workers were born in Mexico, compared to 82 percent in 1990-91. Survey results show that the median total family income for California farm laborers ranged from $7,500 to $10,000. Unauthorized workers earn a median income that ranges from $2,500 to $5,000. According to family size and income, 61 percent of California's farmworking families live in poverty – a percentage that is increasing (Rosenberg 1998).

3.14.2 Environmental Consequences

No Action

The No Action Alternative would have no effect on environmental justice.

Proposed Action

The farm labor effects of rice idling actions would be similar to effects presented in the 2007 EWA EIS/EIR because 5-year average rice acreages and labor requirements for rice production are similar to values in the 2004 EWA EIS/EIR. Because of the farmworker profile, crop idling could have disproportionate effects on low income and minority farmworkers. However, limiting cropland idling to 20% of the total irrigable land in a county would reduce these potential effects.

3.15 Climate Change

3.15.1 Affected Environment

The United Nations Intergovernmental Panel on Climate Change predicts that changes in the earth's climate will continue through the 21st century and that the rate of change may increase significantly in the future because of human activity (IPCC, 2001b) [IPCC 2001b in this chapter]. Many researchers studying California's climate believe that changes in the earth's climate have already affected California and will continue to do so in the future. Climate change may seriously affect the State's water resources. Temperature increases could affect water demand and aquatic ecosystems. Changes in the timing and amount of precipitation and runoff could occur. Sea level rise could adversely affect the Sacramento-San Joaquin River Delta and coastal areas of the State.

Climate change is identified in the 2005 update of the California Water Plan (Bulletin 160-05) as a key consideration in planning for the State's future water management (DWR, 2005a). The 2005 Water Plan update qualitatively describes the effects that climate change may have on the State's water supply. It also describes efforts that should be taken to quantitatively evaluate climate change effects for the next Water Plan update.

Sea level rise would conceptually affect water project operations by increasing the need for operations to repulse salt water intruding into the Delta. Such effects were not examined during preparation of the DWR report (DWR 2006) due to lack of existing tools for that type of analysis (current Work Team activities involve collaborations to develop these necessary tools). The report does discuss surrogates that provide indication of increased operation challenges associated with repulsing saltwater intrusion caused by sea level rise.

3.15.2 Environmental Consequences

No Action
The no action alternative would have no effect on climate change.

Proposed Action
Since the proposed action would have no construction element and would use existing facilities within the range of normal operations, it would have no effect on climate change. As the proposed action is for a one year program, climate change is not expected to affect the proposed action.

3.16 Aesthetics

3.16.1 Affected Environment

The Upstream from the Delta Region is bordered on the east by the Sierra Nevada, on the northwest by the Coast Ranges, and on the south by the northern extent of the San Joaquin River watershed. Agriculture in the Central Valley, forests in the upper watersheds, and grasslands and woodlands in the foothills characterize the region visually. Other low-elevation characteristics include occasional wetlands, vernal pools, and riparian areas. Much of the upper watershed on the east side of the Central Valley is forested, which limits views for motorists traveling through the area. Scenic stream corridors in the foothills include the American River, and its smaller tributaries.

Historical changes from grasslands, floodplains, and extensive riparian areas to cropland, rice fields, and orchards have altered the visual variety in the Central Valley portion of the Upstream from the Delta Region. The valley floor is primarily irrigated agriculture that is Variety Class C – the least visually distinctive category. Important (Variety Class A or B) visual resources on the valley floor include the Sacramento National Wildlife Refuge Complex, which contains the Sacramento National Wildlife Refuge (NWR), Colusa NWR, Delevan NWR, Sacramento River NWR, Sutter NWR, and Butte Sink NWR.

Reservoirs in the region increase the level of scenic attractiveness at their maximum operating levels. Reservoirs are generally Class A or B visual resources when their water surface elevations are near to or at their maximum. As drawdown occurs during the

summer and fall, an increasing area of shoreline devoid of vegetation, commonly referred to as a "bathtub ring", appears in the area between the normal high water mark and the actual lake level. The exposed rock and soil of the drawdown zone contrasts with the vegetated areas above the high water level and with the lake's surface. As a consequence of reservoir operations, the level of scenic attractiveness tends to decline in July and August with increasing drawdown.

Seasonal variations in flow levels of the rivers within this region provide for a wide range of aesthetic opportunities. Most of the rivers in this region have low flow regulations in place. Flow requirements for the various rivers and streams may be found in State Water Resources Control Board water right permits or licenses, Federal Energy Regulatory Commission (FERC) hydropower licenses, and interagency agreements (White 2003). Because there are minimum flow requirements and the flows are managed, riparian vegetation along the rivers reflects the results of current management practices. These practices include levees for flood control, managed floodplains and overflow bypasses, and controlled releases from reservoirs and result in a narrow riparian corridor. None-the-less, riparian vegetation remains an important visual aspect to all streams and river corridors. Water, shade, and dense cover distinguish the riparian areas from the surrounding land. In addition, riparian areas are popular wildlife habitat as they offer food, water, and protection from both the sun and from large-scale human disturbance.

Highways with high viewer sensitivity in the area of analysis include: Interstate 5, Highway 99, and State Routes 70 and 20. Agricultural areas along these highways and other roads in the Central Valley are generally Class C.

The only upland elevations in the northern Central Valley upstream from the Delta are 32,000 acres in the Sutter Buttes. Rising from the valley floor, the Sutter Buttes, generally a Class A visual resource, provide visual drama from a wide viewing area.

3.16.2 Environmental Consequences

No Action

The no action alternative would have no effect on visual resources.

Proposed Action

The proposed action does not involve construction, introduction of new scenic features, or activities that would visually change the landscape for more than one season. Therefore, there would not be any visual effects of acquisitions under the proposed action. The proposed action could, however, result in temporary changes or seasonal changes in the landscape.

Acquisition of water in Butte, Colusa, Glenn, Sutter, and Yolo Counties via crop idling would result in temporary conversion of lands from rice crops to dry fields during the

summer growing season. A portion of this area's rice acreage, near Interstate 5 and Highway 99, are visible to large numbers of viewers. The specific locations where rice farmland idling will occur is not known so it is not known if the idled land would be visible to the general public. Rice acreage (agricultural land) is generally considered a Class C visual resource. Each year, some portions of the existing rice acres are normally idled, creating a patchwork of flooded and dry fields. DWB crop idling actions would increase the amount of dried fields during the summer months to a maximum of 20 percent total rice acreage in each county. The proposed action would not affect the Class C rating of rice acreage because idling only changes the mosaic pattern of farmland practices and does not add a new visual feature to the landscape. Therefore, there would be no effect to the character of the landscape or visual attractiveness in the area.

Waterfowl use flooded agricultural land during the summer for brood, cover, and rearing habitat and during migratory periods and winter for cover and forage. During the winter, large numbers of waterfowl can occasionally be observed in rice fields, increasing the visual attractiveness of the area. However, in the summer, the dry fields can create upland habitats suitable for raptors and their prey, increasing a potential for viewing different types of wildlife. However crop idling is not a permanent practice, and this effect would be temporary.

Acquisition of Sacramento River CVP Contractor water via groundwater substitution and crop idling could decrease Sacramento River flows from Lake Shasta downstream to diversion pumps in June. Acquisition of up to 120,000 acre-feet of water via groundwater substitution and up to 158,000 acre-feet from crop idling would decrease flows by 1,160 cubic feet per second (cfs) in June. However, existing flow requirements for the Sacramento River would still be met under the proposed action. The reduction would represent a minimal decrease in median monthly flow and would not result in a visual effect. The Sacramento River is generally considered a Class B visual resource. The decreases in flow would be insufficient to reduce the riparian vegetation corridor along the river. The minimal percent reduction of flow and the temporary nature of the decrease would not change the character of the landscape or detract from the overall scenic attractiveness of the Sacramento River.

Acquisition of Sacramento River contractor water via groundwater substitution and crop idling would increase Sacramento River flows downstream from Lake Shasta in July through September. Flows in this reach would decrease in August and September, respectively. Downstream from the diversion point, flows would increase in April through September. An increase in flow could contribute to the character of the landscape; therefore, there would be no adverse effect.

Acquisition of Sacramento River CVP contractor water via groundwater substitution and crop idling would change the timing of releases from Lake Shasta. Lake Shasta would hold back water that would have been released under the existing condition. The lake level would decline faster in July and August compared to existing conditions; however, end of month elevation in September would be the same as the existing condition because of reduced releases during September. Lake Shasta elevation would be lower in July and

August, and equal to the existing condition in September. Differences of these magnitudes relative to the existing condition would not change the character of the landscape or scenic attractiveness (Class A or B) of Lake Shasta. The existing "bathtub" rings, under the existing condition would be large enough that an additional drop of less than 2 feet would not result in any major visible effects. Reduction of surface water elevation also would have minimal effect on the visual features of riparian vegetation along the banks.

Acquisition of stored reservoir water would increase downstream river flows from June through October. Releases would increase relative to the existing condition. An increase in flow could contribute to the character of the landscape of the resource; therefore, there would be no adverse effect.

Acquisition of stored reservoir water would decrease downstream flows during refill of reservoirs. River flows would decrease during the winter and early spring. During the winter, the river is already at a time of high flows under the existing condition. A decrease in flow that could occur under the proposed action would not result in any change to Class A or B visual resources.

Acquisition of Sacramento Groundwater Authority's water via stored groundwater purchase would increase American River flows downstream from Folsom Lake from June through December. An increase in flow would contribute to the landscape character of the resource.

Aacquisition of stored reservoir water would decrease surface water elevations from June to refill at Reservoirs. The proposed action would draw down the reservoirs past the average low level exhibited under the existing condition, causing the bathtub rings to be more extensive. The existing rings; however, are large enough that an additional drop would not significantly alter the landscape character or detract from the scenic attractiveness of the reservoirs. There would be little change to Class A or B visual resources of reservoirs.

Acquisition of Sacramento Groundwater Authority's water via stored groundwater purchase would change surface water elevations in Folsom Lake. During July and August, the surface water elevation at Folsom Lake would be lower than under the existing condition. End of month elevation in September would be the same as under the existing condition because of reduced releases during September. The small changes in surface water elevation would have little effect on Class A or B visual resources of Folsom Lake; therefore, any visual effect would be less than significant.

The proposed action would not result in any effect to Class A or B visual resources in the Delta. The character of the landscape and the level of scenic attractiveness would not change from the existing condition.

The proposed action would have a beneficial effect on the visual resources associated with conveyance and storage facilities downstream of the Delta.

3.17 Cumulative Effects

Crop idling and groundwater substitution transfers have been implemented in previous drought response efforts, such as in the 1990's. Crop idling is also done on a regular basis as part of crop rotation and for other reasons, such as in response to hydrologic conditions, in the potentially affected areas. Groundwater use has also been implemented to supplement surface water in the past in many of the potentially affected areas. The Natomas Central MWC has transferred water via groundwater substitution to Westlands WD under the 2001 Forbearance Agreement. Natomas MWC's service area did not experience any significant impacts as a result of the 2001 transfers.

During the 2002 irrigation season, the Sacramento Groundwater Authority provided 7,143 acre-feet of groundwater to the EWA Program via groundwater purchase. This sale was a pilot operation with the option that it could be expanded in the future.

It is anticipated that crop idling actions will continue as part of routine crop rotation practices and in response to hydrologic conditions and that groundwater use will continue to supplement surface water supplies. It is anticipated that groundwater use may increase in 2009, given the current hydrologic forecast and anticipated shortages in surface water supplies. GCID is pursuing a landowner groundwater well program. Also, as previously mentioned, some transfers outside of the DWB may occur in 2009, including water transferred under the Lower Yuba River Accord. Also, local projects involving groundwater may be implemented, such as the Stony Creek Fan Aquifer Performance Testing Plan, Conjunctive Water Management Program and Lower Tuscan Integrated Planning Program.

Potential future projects involving groundwater include further investigations of the Lower Tuscan Aquifer and the Sacramento Valley Water Management Program (SVWMP). SVWMP, however, would not occur concurrently with the 2009 DWB, as it is currently in the planning stages of development.

The following non-CVP entities have indicated interest in providing water for the 2009 DWB. As previously described for potential CVP sellers, the numbers presented in Table 3 are estimates and do not necessarily reflect the amount of water that would be available in 2009. These estimates reflect the potential upper limit of available water in order to include the maximum extent of potential transfers in the environmental analysis.

Table 4
Potential Non-CVP Sellers (Upper Limits)
(AF)

Water Agency	***Stored Reservoir Water***	***Groundwater Substitution***	***Crop Idling/ Substitution***
Sacramento River Area of Analysis			
Amaral Ranch		2,000	2,000

(Sutter)			
Upper Swanston Ranch (Yolo)		8,500	
Feather River Area of Analysis			
Brown's Valley ID (Yuba)	5,000		
Butte WD (Butte and Sutter)		10,000	10,000
Garden Highway MWC (Sutter)		2,000	
Goose Club Farms (Sutter)			5,000
Richvale ID (Butte)			10,000
South Sutter WD (Sutter and Placer)	10,000		
Plumas Mutual Water Company (Yuba)		2,800	1,750
Sutter Extension WD (Sutter)		11,000	14,000
Western Canal Water District (Butte and Glenn)			20,000
American River Area of Analysis			
Placer County WA (Placer)	20,000		
Sacramento Suburban WD		12,000	
Merced/San Joaquin River Area of Analysis			
Merced Irrigation District (Merced)	25,000		
TOTALS	60,000	48,300	62,750

Abbreviations:
GW: Groundwater
ID: Irrigation District
MWC: Mutual Water Company
WA: Water Agency
WD: Water District

From non-CVP sources, the DWB could potentially transfer up to 62,750 af from crop idling, 48,300 af from groundwater substitution, and 60,000 af from reservoir reoperation. Totals from all sources for the DWB would be up to 183,385 af from crop idling, 117,550 af from groundwater substitution, and 70,000 af from reservoir reoperation. The cumulative total amount potentially transferred under the DWB from all sources would be up to 370,935 af.

Programs in addition to the proposed action that would acquire water through groundwater substitution and crop idling would create additional changes in the timing and quantity of water released from reservoirs, altering river flows. However, the flow representing only the seller's supply would be altered. Crop idling would reduce the water supply for users not participating in the DWB who rely on return flows from fields that, with the proposed action, would be idled. Crop idling in addition to that done under the proposed action could further reduce return flows causing a cumulative impact. However, the proposed action includes mitigation measures to maintain return flows; therefore, the proposed action would not be contributing to a cumulative impact.

Programs that acquire water through stored reservoir water could draw reservoirs down below the existing condition, lessen the possibility of refill, and affect water supply for users the following year. However, as previously stated, it is anticipated that the agencies selling water to the DWB would manage their water responsibly, whether the water was sold for one program or for multiple programs, and DWR and Reclamation will not approve proposed transfers that would draw reservoirs down beyond historic averages.

The recent reduction in recharge (due to the decrease in precipitation and runoff) in addition to the increase in groundwater transfers would lower groundwater levels. Multi-year groundwater acquisition for other programs in areas that have repeatedly transferred groundwater may also be more susceptible to adverse effects. In these areas groundwater levels may not fully recover following a transfer and may experience a substantial net decline in groundwater levels over several years.

Coordination of programs is required to minimize and avoid the potential for cumulative effects to groundwater resources. The approach in this analysis is one based primarily on measures designed to avoid causing adverse groundwater effects; other programs may take other approaches, such as mitigating impacts on a site-specific basis. The DWB's groundwater mitigation measures require a pre-purchase evaluation for areas in which groundwater levels (prior to the transfer) are sufficiently low to warrant potential regional adverse effects. If the evaluation shows that DWB groundwater extraction would likely result in regional adverse effects, DWR and Reclamation would not approve groundwater substitution from the area of concern. The groundwater mitigation measures require that the local selling agencies establish monitoring and mitigation programs prior to DWB transfers.

The additional knowledge and greater flexibility provided by these programs would be beneficial for the understanding of transfer effects. Monitoring in 2009 would focus on identifying potential hydraulic effects. The information acquired from these monitoring programs may be useful for minimizing and/or avoiding the cumulative effects of the acquisition programs mentioned above, further minimizing the potential for cumulative effects.

If other programs use the same reservoirs as the proposed action, water surface elevations and end-of-month storage levels could drop further, resulting in adverse effects to water quality, such as an increase in concentrations of constituents. In order to avoid and minimize the potential for cumulative impacts, DWR and Reclamation will coordinate

with other entities to cooperatively set release limits on reservoirs such that the reservoirs would not be drawn down below the levels required to maintain suitable water quality levels within the reservoirs, especially during the summer season, when water levels are already low within the reservoirs.

Actions in addition to the DWB would further reduce river flow during the summer and further increase flow in the fall. However, potential increases in flow late in the season could be cumulatively beneficial to the water quality (e.g., dilution of constituents). Overall, flow rates will be governed by established regulatory requirements for anadromous and riverine fish, through such agencies as the Service and NOAA Fisheries and Delta water quality standards, through SWRCB, which would prevent flow rates from increasing or decreasing in a manner that would be cumulatively harmful to resources.

Although erodible soils exist in the Upstream from the Delta Region, conditions (both existing management practices and weather conditions) are not favorable for erosion of soils in this region. Therefore, soil loss from the proposed action in combination with other programs would not likely produce a cumulative impact.

Reclamation and DWR will monitor cumulative economic effects of crop shifting/idling programs in 2009 on the Sacramento Valley. The project agencies will limit their participation in crop idling programs for water transfers both inside and outside of the DWB, to ensure that crop idling is limited to 20% of agricultural land per county. Crop idling by other foreseeable water acquisition programs would be on a voluntary, year-by-year basis. Farmers can choose to offer their water for sale to any of the above programs during any season that the programs are in operation, subject to project conditions. The farmers can then decide to resume planting in the subsequent season. Therefore, crop idling would be a temporary effect and would not permanently alter any land use patterns. Water acquisition programs also would not result in any land being converted to incompatible uses. Land classifications could change under the cumulative condition if parcels are repeatedly idled under other programs. However, with the mitigation measures identified above, any DWB water acquisitions via crop idling would not decrease the amount of land categorized as Prime, Statewide Important, or Unique under the FMMP and Prime Farmland under the Williamson Act. Therefore, the proposed action would not permanently change land use practices and would not contribute to any potential cumulative effects. Because crop idling is temporary and DWB actions would not result in any changes to land use classifications, the DWB would not cumulatively contribute to long term adverse affects to agricultural land use.

In the Upstream from the Delta Region, other sources would contribute to NO_x emissions from groundwater pumping, including increased groundwater use due to decreased surface water supplies, and potential water transfers outside of the DWB. In the Upstream from the Delta Region, ozone attainment status is an issue of concern; additional emissions of ozone precursors from other programs would contribute to already high ozone concentration areas. However, implementation of the mitigation

measures listed above would also alleviate the cumulative impact. Therefore the proposed action's contribution would not be cumulatively considerable.

Other water transfer programs and cropping decisions based on hydrology and other factors implemented outside the DWB would also cumulatively contribute to crop idling. Due to the lack of highly erodible soils in the Upstream from the Delta Region, the emission of PM_{10} from the proposed action in combination with other programs would not produce a cumulatively considerable effect.

Cumulative effects analysis for cultural resources focuses on those programs, that potentially acquire water through stored reservoir water purchase and crop idling. All transfers that lower reservoirs could incrementally increase the drawdown zone to beyond the historic operational levels. The previously described mitigation measure would avoid this potential cumulative effect.

The ITA cumulative analysis focuses only on those programs that potentially pose incrementally detrimental effects through groundwater substitution in all areas of the State. Groundwater substitution is a component of the DWB, potential water transfers outside of the DWB, and agricultural practice. It is reasonable to assume that other groundwater usage programs could evolve in the foreseeable future. Other programs may take different approaches to avoiding or mitigating impacts. Careful monitoring and management is necessary to mitigate any potential effects. Additionally, all groundwater substitution acquisitions in the Sacramento Valley require notification of the DWR and Reclamation before such acquisitions are finalized in order for the project agencies to fully execute their Indian Trust responsibilities. After deliberation by subject matter experts and consultation with appropriate tribal and Bureau of Indian Affairs officials, mitigation would avoid and minimize effects.

Cumulative effects would apply to those water acquisition programs purchasing water via crop idling in the Upstream from the Delta Region during dry years. Crop idling would most likely occur in the Upstream from the Delta Region during dry years because capacity through the Delta increases. In order to avoid or decrease adverse social effects on community stability, the drought water bank would incorporate the following :

1) DWR would not purchase water via crop idling if more than 20 percent of recent harvested rice acreage in the county would be idled

2) DWR would also acquire less water by crop idling when the level of land idling is already larger than historically normal.

Social effects of land idling are exacerbated when an unusual amount of land is already being idled. Therefore, idling less land in a local area when the amount of land idling is already more than historically normal would lessen economic effects.

DWR and Reclamation will monitor the cumulative economic effects of crop shifting and cropland idling programs in 2009 in the Sacramento Valley. The Project Agencies will either limit its participation in cropland idling programs for water transfer or take specific actions to ensure that the overall economic effect in individual counties where such

programs are implemented is not unreasonable

Based on recent data on the water transfer market, purchases under the program would not be expected to have a substantial effect on water prices for other users and that other factors have more influence on the price of water transfers than would purchases under the proposed action. Hydrologic conditions change the supply of water available for transfers, which would shift the price of water. The difference in supply of water in a wet and dry year amounts to millions of acre-feet. The regional source of the water plays a role in pricing as well. Also, agricultural prices could also affect supply of water transfers. Small changes in agricultural prices can have a large effect on water transfer supply because net returns in farming are very responsive to agricultural prices. These factors are not controlled by participants in the market.

DWR may not purchase the maximum amount of water analyzed in this environmental documentation. If the program purchased up to its potential maximum, it could account for a larger share of the water transfer market.

Non-CVP transfers under the DWB and other water transfers outside the DWB could magnify the effects described under the proposed action.

Other programs in combination with the proposed action that purchase water from the same selling agency could further draw down reservoirs. The additional water sold for other programs would reduce the existing condition as described and could cause significant effects. If all water acquisition programs purchased water from the same source, a cumulative visual effect could occur. Because DWR and Reclamation would have some involvement in other water acquisition programs due to the need to use CVP and/or SWP facilities to export the water, the project agencies would have the opportunity to assess cumulative effects and not purchase water from a water agency if an adverse cumulative effect would occur. Therefore, the proposed action would not have an incremental effect to the cumulative condition.

4. CONSULTATION AND COORDINATION

Endangered Species Act Section 7 Consultation
Reclamation has determined that the proposed action would not affect listed fish species beyond the effects that are being consulted on for the Long-term Operation of the SWP/CVP, and therefore the proposed action will be implemented subject to operational parameters of those Opinions. Reclamation has evaluated the effects of the proposed action on listed terrestrial species and critical habitats in the project area (Appendix) and has determined that the proposed action is not likely to adversely affect the San Joaquin kit fox; and may adversely affect GGS. Reclamation conducted Endangered Species Act Section 7 formal consultation with the Service. The April 14, 2009 Biological Opinion is included in Appendix A .

California Environmental Quality Act
The Governor of the State of California has declared a state of emergency regarding

drought conditions. In accordance with this declaration, DWR filed a Notice of Exemption regarding California Environmental Quality Act compliance.

Public Review

The Draft EA and Draft FONSI were released for a 15 day public comment period beginning March 5, 2009 and ending March 19, 2009. The documents were posted on Reclamation's website. A press release was issued on March 5, 2009 by the Bureau of Reclamation's Mid-Pacific Regional Public Affairs Office. Comments received and responses are included in Appendix B.

6. LIST OF PREPARERS

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