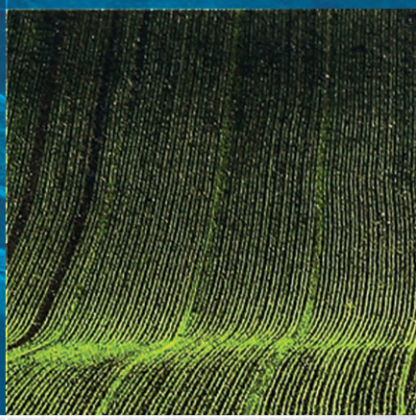
# RECLAMATION

*Managing Water in the West*

# 2010-2011
## Water Transfer Program
## Draft Environmental Assessment

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

January 2010









# Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

# 2010-2011 Water Transfer Program

## Draft Environmental Assessment

*Prepared for*

**United States Department of the Interior**
**Bureau of Reclamation**
**Mid Pacific Region**
**Sacramento, California**

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**Bureau of Reclamation**
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# Abbreviations and Acronyms

| | |
|---|---|
| APCD | Air Pollution Control District |
| AQMD | Air Quality Management District |
| ATCM | Airborne Toxic Control Measure |
| BA | Biological Assessment |
| BACT | Best Available Control Technology |
| bhp | brake-horsepower |
| BO | Biological Opinion |
| CAA | Clean Air Act |
| CAAQS | California Ambient Air Quality Standards |
| CARB | California Air Resources Board |
| CCR | California Code of Regulations |
| CDFG | California Department of Fish and Game |
| CEQA | California Environmental Quality Act |
| cfs | cubic feet per second |
| CI | compression ignition |
| CO | carbon monoxide |
| $CO_2$ | carbon dioxide |
| COA | Coordinated Operating Agreement |
| Corps | U.S. Army Corps of Engineers |
| CPG | Conaway Preservation Group |
| CVP | Central Valley Project |
| CVPIA | Central Valley Project Improvement Act |
| CWA | Federal Clean Water Act |
| Delta | Sacramento-San Joaquin Delta |
| DOC | Department of Conservation |
| DPM | diesel particulate matter |
| DPS | Distinct Population Segment |
| DWR | Department of Water Resources |
| EA | Environmental Assessment |
| EFH | Essential fish habitat |
| EIS/EIR | Environmental Impact Statement/Environmental Impact Report |
| ESU | Evolutionarily Significant Unit |
| ETAW | evapotranspiration of applied water |
| FMMP | Farmland Mapping and Monitoring Program |
| FONSI | Finding of No Significant Impacts |

| | |
|---|---|
| FR | Federal Register |
| g/bhp-hr | grams per brake-horsepower hour |
| GGS | giant garter snake |
| hp | horsepower |
| ID | Irrigation district |
| $km^2$ | square kilometers |
| M&I | municipal and industrial |
| MCL | maximum contaminant level |
| MWC | Mutual Water Company |
| mg/L | milligrams per liter |
| mm | millimeters |
| MTBE | methyl tertiary butyl ether |
| NAAQS | National Ambient Air Quality Standards |
| NEPA | National Environmental Protection Act |
| NTU | nephelometric turbidity units |
| NMFS | National Marine Fisheries Service |
| $NO_x$ | nitrogen oxides |
| NWR | National Wildlife Refuge |
| $O_3$ | ozone |
| PG&E | Pacific Gas and Electric |
| $PM_{10}$ | particulate matter 10 microns |
| $PM_{2.5}$ | particulate matter 2.5 microns |
| PP | pumping plant |
| RD | Reclamation District |
| Reclamation | Bureau of Reclamation |
| SFNA | Sacramento Federal Ozone Nonattainment Area |
| $SO_2$ | sulfur dioxide |
| SWP | State Water Project |
| SWRCB | State Water Resources Control Board |
| TDS | Total Dissolved Solids |
| TOC | total organic compounds |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| VOC | volatile organic compounds |
| WA | Wildlife Area |
| WC | Water Company |
| WD | Water District |

# Chapter 1
# Introduction

This document is an Environmental Assessment (EA) for water transfers in 2010 and 2011 that has been prepared by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) to satisfy the requirements of the National Environmental Policy Act (NEPA) (42 United States Code §4231 et seq.), the Council of Environmental Quality's Regulations for Implementing Procedural Provisions of NEPA (40 Code of Federal Regulations §1500-1508) and the Department of the Interior's NEPA regulations (43 CFR Part 46).

The document describes the affected environment and the potential direct, indirect, and cumulative effects related to approval and facilitation of water transfers. This document also identifies measures that have been incorporated into the project to minimize or avoid project-related impacts. Minimization measures are analyzed according to the Department of Interior's NEPA regulations (43 Code of Federal Regulations §46.130).

## 1.1 Background

To help facilitate the transfer of water throughout the State, Reclamation and the Department of Water Resources (DWR) are considering whether they should approve and facilitate water transfers between willing sellers and buyers. Transfers that would require the use of Central Valley Project (CVP) or State Water Project (SWP) facilities would be approved on an individual basis, but are referred to collectively as the 2010-2011 Water Transfer Program for analysis purposes. Most transfers would occur from willing sellers upstream from the Sacramento-San Joaquin Delta (Delta) to buyers that export water from the Delta. The transfer water would be conveyed, using CVP or SWP facilities, to water users that are at risk of experiencing water shortages in 2010 and 2011 due to drought conditions and that require supplemental water supplies to meet anticipated demands. Reclamation would review and approve, as appropriate, proposed transfers of CVP water in accordance with the Interim Guidelines for the Implementation of Water Transfers under the Central Valley Project Improvement Act (CVPIA).

Reclamation and DWR have facilitated transfers in past years. In 2009, DWR implemented a Drought Water Bank to purchase water from willing sellers and provide it to users that were experiencing shortages. Reclamation completed an Environmental Assessment on the CVP-related transfers requiring approval (Reclamation 2009).

Water supplies from the 2010-2011 Water Transfer Program could be made available to water providers who obtain conveyance water from CVP or SWP facilities either directly or by exchange with other water providers who have access to water supplies from the CVP or SWP. Reclamation will honor CVP contract provisions in determining access to Delta pumping capability if this capacity becomes constrained. Consistent with existing operational and regulatory restrictions in place for SWP operations, DWR will determine the availability of its facilities including the Delta pumping capacity for the conveyance of transfer water if such conveyance is needed.

## 1.2 Purpose and Need

California has experienced a severe drought in recent years that has threatened water supplies to many water districts. Local water districts are eager to identify additional supplies to avoid shortages for their customers. Water transfers are an opportunity to augment limited supplies. Transfers of CVP water require Reclamation approval according to the CVPIA, as discussed above; therefore, Reclamation involvement in the transfer process is necessary. Additionally, Reclamation is considering facilitating transfers because supporting water users in need is consistent with the agency's vision.

The hydrologic conditions for 2010 and 2011 are not yet known, but it is likely that some California water providers will need to supplement local and imported supplies to meet essential demands because of past dry years and low reservoir storage levels. 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 willing sellers of CVP water upstream of the Delta to buyers that are at risk of experiencing water shortages in 2010 and 2011.

## 1.3 Document Organization

The remainder of this document is organized as follows:

- **Chapter 2** – presents the No Action Alternative and the Proposed Action analyzed in this EA;
- **Chapter 3** – presents the Affected Environment and Environmental Consequences of the alternatives by resource area;
- **Chapter 4** – describes the consultation and coordination that occurred during the development of this document;
- **Chapter 5** – presents the list of preparers; and
- **Chapter 6** – includes the references cited in the document.

# Chapter 2
# Alternatives

## 2.1 No Action

Under the No Action Alternative, Reclamation would not approve the proposed transfers of CVP water from willing sellers upstream from the Delta to users in other basins in 2010 and 2011. However, other transfers that do not involve the CVP may occur under the No Action Alternative. Additionally, CVP transfers within basins would continue to occur and would still require Reclamation's approval. Some CVP entities may decide that they are interested in selling CVP water to buyers in export areas under the No Action Alternative; however, they would need to complete individual NEPA analysis for each transfer to allow Reclamation to complete the evaluation of the transfers for approval.

Under the No Action Alternative, some agricultural and urban water users may face potential shortages in the absence of water transfers. These users may take alternative water supply actions in response to potential shortages, including increased groundwater pumping, cropland idling, reduction of landscape irrigation, or water rationing.

## 2.2 Proposed Action

The Proposed Action includes one-year or two-year water transfers in 2010 and 2011 over which Reclamation has approval authority, which are any transfers that involve CVP water supplies or require use of CVP facilities. Water transfers included in the Proposed Action represent only a portion of the expected overall transfers in 2010 and 2011. The remaining transfers are not dependent upon Reclamation's approval; this EA considers these transfers in the context of cumulative impacts.

The Proposed Action includes potential transfers of CVP water from sixteen entities located upstream from the Delta, listed in Table 2-1 and shown in Figure 2-1. Subject to approval in accordance with the Interim Guidelines for the Implementation of Water Transfers under the CVPIA, Reclamation proposes to approve these transfers. Reclamation would evaluate each proposal individually, as it is received, to determine if it meets CVPIA requirements. Reclamation has followed this process in past years when approving transfers (such as in 2009 for the Drought Water Bank).

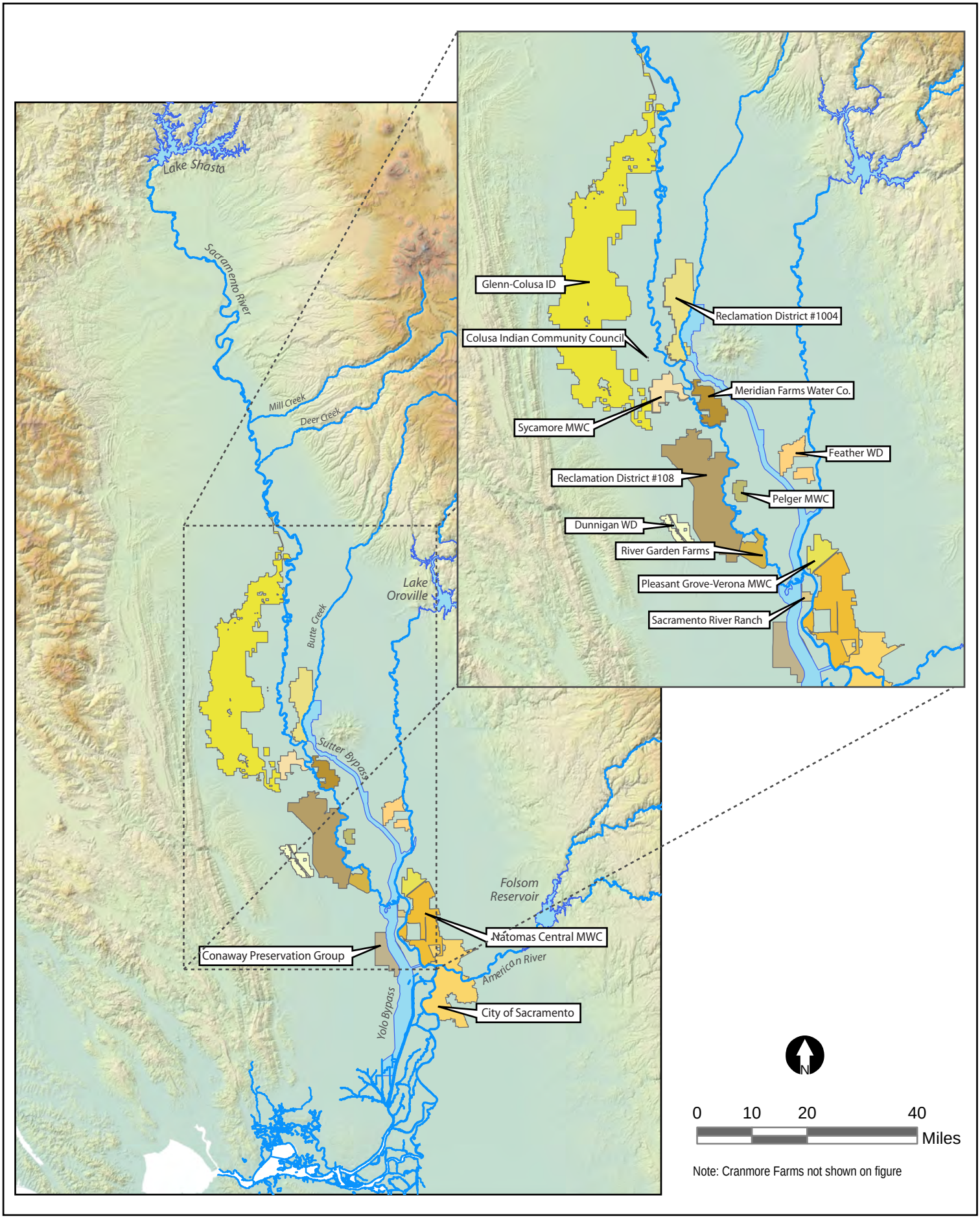



**Figure 2-1. Potential Sellers**

The Proposed Action could make water available to buyers from willing sellers upstream from the Delta during the 2010 and 2011 water years only. Annually, a total of up to approximately 200,000 acre feet of CVP water would be made available for transfer through groundwater substitution, cropland idling, and crop shifting. The existing CVP and SWP facilities could be used to convey transfer water to entities that require supplemental water supplies to meet anticipated demands or face potential water shortages. Water transfers that must move through 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 and flow related objectives) in the Delta. Additional losses may be assessed for conveyance losses along the California Aqueduct and the Delta Mendota Canal.

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) (National Marine Fisheries Service 2009; U.S. Fish and Wildlife Service 2008) 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 include:

- A maximum amount of water transfers covered in the Opinions is 600,000 acre feet per year; and
- Transfer water will be conveyed during July through September only.

DWR and Reclamation will determine availability of Delta pumping capability capacity throughout the transfer period.

### 2.2.1 Sellers

Table 2-1 lists agencies that may be willing to sell CVP water in 2010 and 2011. This list represents agencies that have expressed interest in current or prior year programs. The table also identifies potential maximum acre foot estimates for groundwater substitution and/or cropland idling/crop shifting transfers. The acre foot values reflect the potential upper limit of available water for transfer by each agency for each transfer type; however, actual purchases would depend on hydrology, interested buyers, and compliance with CVPIA transfer requirements. Because of the uncertainty of hydrologic and operating conditions in 2010 and 2011, it is likely that only a portion of the potential transfers identified in Table 2-1 would occur. Additionally, many agencies are uncertain about whether they would participate through groundwater substitution or cropland idling/crop shifting transfers. They have included their potential upper limit for both types of transfers, but they would not sell the maximum amount of both types in the same year. Entities that are not listed in this table may decide that they are interested in selling CVP water, but those

transfers may require supplemental NEPA analysis to allow Reclamation to complete the evaluation of the transfers.

**Table 2-1. Potential Sellers (Upper Limits)**

| Acre feet | | |
|---|---|---|
| **Water Agency (County)** | **Groundwater Substitution** | **Cropland Idling/ Crop Shifting** |
| Upstream from the Delta Region | | |
| Sacramento River Area of Analysis | | |
| Colusa Indian Community Council/Cachil Dehe Band of Wintun Indians | 500 | |
| Conaway Preservation Group (Yolo) | 13,440 | 13,440 |
| Cranmore Farms (Pinnacle Land Ventures, LLC or Broomieside Farms) (Sutter) | 4,511 | 4,511 |
| Dunnigan WD (Yolo) | 1,500 | 1,500 |
| Feather Water District (Sutter) | 3,000 | |
| Glenn-Colusa Irrigation District (Glenn and Colusa) | 20,000 | 20,000 |
| Meridian Farms (Sutter) | 2,000 | 2,000 |
| Natomas Central MWC (Sutter and Sacramento) | 10,000 | |
| Pelger MWC (Sutter) | 1,730 | 1,730 |
| Pleasant Grove-Verona MWC (Sutter) | 9,637 | 4,000 |
| Reclamation District 108 (Colusa and Yolo) | 5,000 | 20,000 |
| Reclamation District 1004 (Glenn and Colusa) | 10,000 | 10,000 |
| River Garden Farms (Yolo) | 8,000 | |
| Sacramento River Ranch (Yolo) | 3,219 | 3,219 |
| Sycamore MWC (Colusa) | 10,000 | 10,000 |
| American River Area of Analysis | | |
| City of Sacramento (Sacramento) | 3,000 | |
| **Totals** | **105,537** | **90,400** |

### 2.2.2 Buyers

Table 2-2 identifies potential buyers who may be interested in participating in the 2010 or 2011 water transfers. The buyers are separated into those that are upstream from the Delta or in the Export Service Area (areas served by the Delta export pumps, CVP's C.W. "Bill" Jones Pumping Plant (Jones PP) and SWP's Harvey O. Banks Pumping Plant (Banks PP)). Not all of these potential buyers may end up actually purchasing water from transfers. Purchase decisions depend on a number of factors, including, but not limited to, hydrology, water demands, availability of other supplies, and transfer costs. A major concern to potential buyers is the ability to move the purchased water through the Delta to the buyer's service area. Export of the transfer water by Reclamation through the Delta is dependent on availability of capacity at the CVP or SWP pumping facilities and subject to other operational requirements. Available CVP and SWP capacity is severely limited due to operational and regulatory restrictions. The pumping window for transfers is July through

September. Pumping within this window can be further reduced based on specific hydrologic conditions and regulatory compliance or water quality issues. Reclamation and DWR cannot guarantee that a specific quantity of transfer capacity will be available.

**Table 2-2. Potential Buyers**

| Export Service Area Region |
|---|
| **CVP** |
| Contra Costa Water District |
| **San Luis & Delta Mendota Water Authority** |
| Byron Bethany Irrigation District |
| Del Puerto Water District |
| Eagle Field Water District |
| James Irrigation District |
| Laguna Water District |
| Mercy Springs Water District |
| Oro Loma Water District |
| Pacheco Water District |
| Panoche Water District |
| Patterson Irrigation District |
| RD 1606 |
| San Benito County Water District |
| Santa Clara Valley Water District |
| Tranquility Irrigation District |
| West Side Irrigation District |
| West Stanislaus Irrigation District |
| Westlands Water District |
| City of Avenal |
| City of Coalinga |
| City of Huron |
| Avenal State Prison |
| Broadview Water District |
| Banta Carbona Irrigation District |
| **SWP** |
| Alameda County WD |
| Antelope Valley East Kern Water Agency |
| Castaic Lake Water Agency |
| Central Coast Water Authority |
| Desert Water Agency |
| Dudley Ridge Water District |
| East Bay Municipal Utility District |
| Kern County Water Agency |
| Metropolitan Water District of Southern California |
| Mojave Water Agency |
| Oak Flat Water District |
| Palmdale Water District |
| San Bernardino Valley Municipal Water District |
| San Diego County Water Authority |
| Santa Clara Valley Water District |
| Tulare Lake Basin Water Storage District |

**Table 2-2. Potential Buyers**

| Upstream from the Delta Region |
|---|
| **CVP** |
| Bella Vista Water District |
| East Bay Municipal Utility District |
| **Tehama-Colusa Canal Authority** |
| Colusa County Water District |
| Corning Water District |
| Cortina Water District |
| Davis Water District |
| Dunnigan Water District |
| 4M Water District |
| Glenn-Colusa Irrigation District |
| Glide Water District |
| Hothouse Water District |
| Kanawha Water District |
| Kirkwood Water District |
| Lagrande Water District |
| Orland-Artois Water District |
| Proberta Water District |
| Thomes Creek Water District |
| Westside Water District |
| **SWP** |
| City of Yuba City |
| Napa County Flood Control and Water Conservation District |

### 2.2.3 Potential Water Transfer Methods

In 2010 and 2011, Reclamation could approve transfers from groundwater substitution or cropland idling/crop shifting, which are further described below. No other types of water transfers are covered by the evaluation in this EA for 2010 and 2011.

Reclamation approves transfers consistent with provisions of the CVPIA that protect against injury to third parties as a result of water transfers. Several important CVPIA principles include requirements that the transfer will not violate the provisions of Federal or State law, will have no significant adverse effect on the ability to deliver CVP water, will be limited to water that would be consumptively used or irretrievably lost to beneficial use, will have no significant long-term adverse impact on groundwater conditions, and will not adversely affect water supplies for fish and wildlife purposes. Reclamation will not approve any water transfer for which these basic principles have not been adequately addressed.

Additional information about water rights protection and water transfers is located at http://www.waterboards.ca.gov/waterrights/water_issues/programs/water_transfers/ in a State Water Resources Control Board (SWRCB) staff document titled “A Guide to Water Transfers” (SWRCB 1999).

#### *2.2.3.1 Groundwater Substitution*

Groundwater substitution is a proposed method to make water available for transfer. 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 could be available during the irrigation season of April through October. Sellers could make transfers available during only a part of this time by switching between surface water sources and groundwater pumping.

For transfers that must travel through the Delta to reach sellers, Reclamation and DWR would export transfer water during July through September when capacity is available at the Jones PP and Banks PP. CVP transfer water conveyed at the Banks PP could occur upon the SWRCB's approval of Joint Points of Diversion. Reclamation would attempt to retain surface water made available through groundwater substitution in upstream storage facilities until the Delta export pumps have the capacity available to convey water south. In general, to retain water made available through water transfers in upstream facilities, Reclamation and DWR will have had to declare the Delta is in a "balanced" water condition under the terms of the Coordinated Operating Agreement (COA). Reclamation and DWR will strive to facilitate the conveyance of additional transfer water through the export pumps during the summer months based on the availability of unused export capacity. The hydrologic risk of unused capacity not being available is born by the transfer parties.

Some transfers may not need to move through Banks PP or Jones PP to reach the buyers. For example, transfers could be diverted at Freeport or at Barker Slough to reach some potential buyers. These facilities are not restricted to moving transfers from July through September, and may be able to pump water for a longer period (subject to their specific requirements). Transfers made available by groundwater substitution may provide up to approximately 106,000 acre feet, but the buyers would receive less because of conveyance losses.

An objective in planning a groundwater substitution transfer is to ensure that groundwater levels recover to their typical spring high levels under average hydrologic conditions. Because groundwater levels generally recover at the expense of stream flow, the wells used in a transfer should be sited and pumped in such a manner that the stream flow losses resulting from pumping peak during the wet season, when losses to stream flow minimally affect other legal users of water. Sellers would not be paid for pumped water that would result in stream flow losses during the pumping season. Reclamation assumes that stream flow losses due to groundwater pumping for transfers are 12 percent of the amount pumped for transfer (see Section 3.2 for more information).

#### *2.2.3.2 Cropland Idling/Crop Shifting*

Cropland idling/crop shifting would make water available for transfer that would have been used for agricultural irrigation without the transfer. Typically, the proceeds from the water transfer would pay farmers to idle land that they would have placed in production. Rice has been the crop idled most frequently in previous transfer programs.

Cropland idling water would be available at the beginning of the season as soon as the crop is not planted. Most cropland idling/crop shifting transfer would occur in the Sacramento River area of analysis. For transfers that need to move through Jones PP or Banks PP, transfers could be conveyed July through September when capacity would be available. Reclamation would attempt to retain water acquired from cropland idling in upstream reservoirs until the transfer water could be released and exported through the Delta during July through September, with the same constraints as described for groundwater substitution. As with groundwater substitution, transfers diverted at other facilities may not be subject to the same constraints.

Crop shifting is another potential method to make water available for transfer in 2010 and 2011. Crop shifting acquisitions would pay farmers to substitute a crop with one that uses less water, and the surplus water would be available for transfer. Because crop substitution has similar effects to cropland idling, it is included in the cropland idling discussion for the remainder of this document. Transfers made available by cropland idling/crop shifting by CVP contractors may provide up to approximately 90,400 acre feet, but the buyers would receive less because of conveyance losses.

The quantity of water made available for transfer through cropland idling or crop shifting will be calculated based on the evapotranspiration of applied water (ETAW). ETAW is the portion of applied surface water that is evaporated from the soil and plant surfaces and actually used by the crop. Table 2-3 shows crops that could be included in transfers and their associated ETAW. Crops in Table 2-3 include crops that could be planted as part of a crop shifting transfer; that is, crops with low ETAW and could be planted in the place of crops with higher ETAW. Not all crops would be considered for participation in a transfer. Pasture, deciduous orchard, alfalfa (in the Delta region), and vineyard crops would not be considered because a number of factors make it difficult to determine the real water savings, including a lack of authoritative ETAW values and substantial variability in cultural practices.

**Table 2-3. Estimated ETAW Values (in acre feet/acre) For Various Crops Suitable for Idling or Shifting Transfers**

| Crop | ETAW |
|---|---|
| Alfalfa[(1)] | 1.7 (July – Sept) |
| Bean | 1.5 |
| Corn | 1.8 |
| Cotton | 2.3 |
| Melon | 1.1 |
| Milo | 1.6 |
| Onion | 1.1 |
| Pumpkin | 1.1 |
| Rice | 3.3 |
| Rye Grass (Winter Irrigation) | 0 |
| Safflower | .7 |
| Sudan Grass | 3.0 |
| Sugar Beets | 2.5 |
| Sunflower | 1.4 |
| Tomato | 1.8 |
| Vine Seed/ Cucurbits | 1.1 |
| Wheat (over wintered) | 0.5 |
| Wild Rice | 2.0 |

Notes:
(1) Only alfalfa grown north of the American River will be allowed in the 2010-2011 Water Transfer Program but fields must be completely disced on, or prior to, July 1 of transfer year. Alfalfa is not allowed if it is grown in the foothills, in the Delta, in areas with high water tables, or land irrigated with water that does not come from the Sacramento or Feather Rivers or their tributaries.

## 2.3 Environmental Commitments

This section presents Environmental Commitments included in the Proposed Action to reduce potential environmental impacts from water transfers in 2010 and 2011. These Environmental Commitments will also be included in the Biological Assessment (BA) prepared for the 2010-2011 Water Transfer Program. Appendix A summarizes environmental commitments of the project.

- 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 or any restrictions in place the time the transfer occurs (National Marine Fisheries Service 2009; U.S. Fish and Wildlife Service 2008).
- Sellers will be required to maintain flows at the downstream end of their distribution system under the Proposed Action to minimize

potential water supply effects to neighboring and downstream water users.

- Water transfers under the Proposed Action will be implemented in accordance with meeting flow and temperature requirements on the Sacramento River.
- 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. Reclamation and DWR have published draft technical information related to cropland idling/shifting and groundwater substitution transfers titled Draft Technical Information for Water Transfers in 2010 (Reclamation and DWR 2009). This information is available at http://www.water.ca.gov/drought/transfers/.
- Carriage water will be used to maintain water quality standard concentrations in the Delta. Reclamation has incorporated this measure into the Proposed Action to continue with standard CVP and SWP operating procedures and to improve the water quality to users south and downstream of the Delta.

- The water transfers in 2010 and 2011 will adopt the cropland idling conservation measures in the 2009 Drought Water Bank Biological Opinion, with some modifications. These measures are designed to minimize effects from crop idling water transfers. As part of the approval process, Reclamation 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 giant garter snake (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. 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). Reclamation will work with DWR to document compliance.

    - Reclamation, with DWR's assistance, will provide a map(s) to the U.S. Fish and Wildlife Service (USFWS) in June of each year showing the parcels of riceland that are idled for the purpose of transferring water in 2010 and 2011. These maps will be prepared to comport to Reclamation’s GIS standards.

- Parcels participating in cropland idling will not include:
    - 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 during the two previous years (water may be purchased from the same parcel in successive years).

- As part of a Giant Garter Snake Baseline Monitoring and Research Strategy for the development of a GGS Conservation Strategy, Reclamation and DWR 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.
- In order to limit reduction in the amount of over-winter forage for migratory birds, including greater sandhill crane, transfers 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 part of the review process for the identification of areas acceptable for cropland idling, Reclamation will review current species distribution/occurrence information from the Natural Diversity Database and other sources (including rookeries, breeding colonies, and concentration areas). Reclamation will then use the information to make decisions that will avoid cropland 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 will also benefit the black tern.
- To ensure effects of cropland 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.
- To minimize effects to the kit fox, water transferred will only be used to irrigate lands/crops that were under irrigation over the 3-year period

prior to the transfer to ensure it is applied only to currently-cultivated lands.

- To minimize socioeconomic effects on local areas and to minimize effects on special status species, Reclamation will not approve water transfers via cropland idling if more than 20 percent of recent harvested crop acreage in the county for each eligible crop, including rice, would be idled.

# Chapter 3
# Affected Environment and Environmental Consequences

This section discusses the affected environment and environmental consequences of the Proposed Action and the No Action Alternative. This section also presents minimization measures, when necessary, to reduce potential adverse effects to environmental resources. Appendix A summarizes minimization measures.

The overall study area includes specific areas of analysis for each resource that may be directly or indirectly affected by the Proposed Action. In a general sense, these areas of analysis comprise (1) watersheds of rivers that may be involved in groundwater substitution or cropland idling; (2) rivers used to convey transferred water; (3) lands that may be used for cropland idling and adjacent lands; (4) groundwater basins that may be affected by groundwater substitution (5) district, on-farm and CVP conveyance facilities; and (6) storage and conveyance facilities in areas that would receive water from program transfers. The affected environment section describes the area of analysis for each resource.

The Proposed Action would not affect the following resources: recreation, noise, hazardous and toxic waste, public health and safety, and transportation and traffic. Therefore, they are not analyzed further in this document.

## 3.1 Surface Water Resources

### 3.1.1 Affected Environment

#### *3.1.1.1 Acquisition Areas*

The Proposed Action would involve potential water transfers from CVP contractors in the Sacramento River hydrologic region. Table 2-1 lists the participating CVP sellers, which are further described below. The Proposed Action is not expected to adversely affect the values for which a component of the National Wild and Scenic Rivers System was established.

**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 to the Sacramento River are the Pit, Feather, McCloud and American Rivers.

*Colusa Indian Community Council/Cachil Dehe Band of Wintun Indians* The Colusa Indian Community Council/Cachil Dehe Band of Wintun Indians diverts water from the Sacramento River for agricultural uses under a Settlement Contract. The contract amount is for up to 180 acre feet annually. The Colusa Indian Community Council/Cachil Dehe Band of Wintun Indians could transfer water from both its CVP contract and water rights.

*Cranmore Farms (Pinnacle Land Ventures, LLC or Broomieside Farms)* Cranmore Farms diverts water for agricultural use from three diversion points off the Sacramento River. The contract amount is for up to 10,070 acre feet annually.

*Dunnigan Water District* The Dunnigan Water District (WD) diverts water for irrigation and M&I use from the Sacramento River at the Red Bluff Diversion Dam. The water is delivered to the district through the Tehama-Colusa Canal. Dunnigan Water District can divert up to 19,000 acre feet annually.

*Conaway Preservation Group* The Conaway Preservation Group (CPG), a private farming company, is the owner of the Conaway Ranch. Conaway Ranch is in Reclamation District (RD) 2035 and constitutes over 80 percent of the 20,445-acre service area of RD 2035. CPG is generally west of the Sacramento River in the Sacramento Valley in eastern Yolo County.

CPG's settlement contract water is a major contributor to the Conaway Ranch water supply during its annual operational term of April 1 through October 31. Diversions under water right permits from Willow Slough and Cache Creek, and pumping of groundwater from 23 wells supplements the contract water supply. After irrigation season, CPG's other water sources, including rights from the Sacramento River, Willow Slough, and Cache Creek, are used to meet Conaway Ranch's water needs.

Pursuant to Section 5 of the Conaway Ranch Settlement Agreement with Yolo County, written notification to Yolo County is required for short-term water transfer from Conaway Preservation Group outside of Yolo County.

*Feather Water District* Feather WD has a CVP contract to receive up to 20,000 acre feet per year of Sacramento River water. CVP water is delivered to the Feather WD at the confluence of the Feather River for diversion on the Feather River through exchange.

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

habitat comprising the Sacramento, Delevan, and Colusa National Wildlife Refuges.

Glenn-Colusa ID's Hamilton City pump station is approximately 100 miles north of the City of Sacramento. The pump station is on an oxbow off the main stem of the Sacramento River. Glenn-Colusa ID diverts a maximum of 3,000 cubic feet per second (cfs) from the Sacramento River, with the peak demand occurring in the spring (Glenn-Colusa ID 2009).

*Meridian Farms Water Company* The Meridian Farms Water Company (WC) provides irrigation water to three distinct service areas encompassing 9,150 total acres, with an estimated annual water delivery of 35,000 acre feet. Surface water diversions from the Sacramento River (located at Meridian, Drexler, and Grimes), drain water reuse, and groundwater pumping provide the water supply to Meridian Farms WC. Meridian Farms WC 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 acre feet to be diverted annually.

*Natomas Central Mutual Water Company* Natomas Central Mutual Water Company (MWC) supplies water to about 31,575 acres primarily by surface water, reuse of tail water, and by one groundwater well. Natomas Central MWC diverts up to 120,200 acre feet from the Sacramento River during the irrigation season under a CVP settlement contract. Natomas Central MWC 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 MWC has two main pump stations on the Sacramento River: Prichard Lake Pumping Plant and Elkhorn Pumping Plant. Natomas Central MWC also diverts water from the Natomas Cross Canal along the Natomas Central MWC's northern boundary.

*Pelger Mutual Water Company* Pelger MWC is 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 acre feet. Pelger MWC recycles drain water back to irrigation ditches. During dry years, Pelger MWC's water supply is supplemented by groundwater from private landowners' wells.

*Pleasant Grove-Verona Mutual Water Company* Pleasant Grove-Verona MWC provides irrigation water for 7,330 acres of farmland through a contract with Reclamation for a total of 26,290 acre feet. Surface water from the Sacramento River is the primary source of water supply within Pleasant Grove-Verona MWC. Shareholders divert water under their individual water rights and pursuant to the Reclamation contract from the Natomas Cross Canal.

*Reclamation District 108* RD 108 has a settlement contract with Reclamation to divert water from the Sacramento River as well as CVP water. RD 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 cfs to be pumped from the Colusa Basin Drain.

*Reclamation District 1004* RD 1004 is 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 near Princeton. 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 in Yolo County on the west border of the Sacramento Valley. They have direct diversion water rights on the Sacramento River (near Knights Landing) to divert up to 32 cfs during the irrigation season. River Garden Farms also has a Sacramento River Settlement Contract with Reclamation for 29,800 acre feet.

*Sacramento River Ranch* Sacramento River Ranch is northwest of Sacramento in an unincorporated area of Yolo County and comprises 3,985 acres. Sacramento 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 Sacramento River Ranch and adjacent lands. Pursuant to these licenses, Sacramento River Ranch has a maximum annual diversion quantity of 7,094 acre feet, which may be diverted from April through October. These water right licenses have historically been used by Sacramento River Ranch to provide water for irrigation purposes. In addition, a portion of Sacramento River Ranch is subject to a settlement contract with Reclamation, which authorizes the diversion and use of 4,000 acre feet per year from the Sacramento River.

*Sycamore Mutual Water Company* Sycamore MWC (also known as Sycamore Family Trust) is on the west side of the Sacramento River near Meridian. It has appropriative water rights, as well as a Sacramento River Settlement Contract with Reclamation for 31,800 acre feet.

**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* The City of Sacramento provides water to users within city limits and to a small area outside of the city near Fruitridge. The City of Sacramento has water rights on both the Sacramento and American Rivers. The city also has an agreement with Reclamation regarding use of these water rights.

#### *3.1.1.2 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 annual hydrology, Delta pump capacity and regulatory restrictions, such as Biological Opinions (National Marine Fisheries Service 2009; U.S. Fish and Wildlife Service 2008).

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.

Most water transfers originating upstream from the Delta and going to service areas in the San Francisco Bay Area, San Joaquin Valley, and Southern California 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, USFWS, National Marine Fisheries Service (NMFS), 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 schedule and volume of water that can be exported from the Delta based on Delta hydrodynamics, water quality, and potential impacts on fisheries. Table 3.1-1 shows monthly average pumping at Jones PP and Banks PP during 2009 to indicate pumping patterns throughout the year. Reclamation and DWR will ensure careful coordination of transfers with existing CVP and SWP operations

in meeting water rights, water quality, and fishery protection measures when approving proposed water transfers.

**Table 3.1-1. Average Monthly Delta Export Pumping in 2009**

| | Jones PP (cfs) | Banks PP (cfs) |
|---|---|---|
| January | 2,072 | 2,395 |
| February | 1,912 | 1,978 |
| March | 2,863 | 2,820 |
| April | 1,407 | 1,324 |
| May | 1,040 | 986 |
| June | 1,310 | 511 |
| July | 3,910 | 6,220 |
| August | 4,114 | 4,030 |
| September | 4,094 | 2,441 |
| October | 3,949 | 2,001 |
| November | 2,833 | 1,506 |
| December[1] | 2,068 | 2,854 |

Source: DWR 2009
Note 1: December averages include dates from 12/1/2009 through 12/17/2009

Some transfers would not require water to move through the Delta, such as transfers to members of the Tehama-Colusa Canal Authority or East Bay Municipal Utility District (through the new Freeport diversion). These facilities are not subject to the same constraints as facilities within the Delta, but all transfers must adhere to standards and requirements associated with operating these facilities.

CVP/SWP facilities that could potentially be utilized under the Proposed Action include Shasta Reservoir and Folsom Reservoir, and SWP and CVP pumping and conveyance facilities, which would be used for conveying transfer water. The SWP operates its Banks PP 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 the Barker Slough Pumping Plant into the North Bay Aqueduct for delivery to SWP customers in Solano and Napa Counties. The CVP operates the Jones PP 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 from the Delta to buyers upstream from the Delta, using existing district, CVP and SWP conveyance facilities, including the Tehama-Colusa Canal.

#### *3.1.1.3 Receiving Areas*

The Proposed Action would potentially transfer water to districts as identified in Table 2-2. These areas receive water from multiple sources, including the SWP, the CVP, local surface water sources, and groundwater. Most of these potential buyers would require water to be moved through the Delta.

## 3.1.2 Environmental Consequences

This section describes environmental consequences of the No Action Alternative and Proposed Action.

### *3.1.2.1 No Action*

Under the No Action Alternative, other water transfers outside of the Proposed Action would likely occur and buyers would implement other projects and programs to increase water supplies, including conservation, recycled water, and groundwater use. However, during dry and critical water years, potential buyers could experience water shortages that could affect their ability to meet customer demands.

### *3.1.2.2 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 as needed.

*Acquisition of water via groundwater substitution or cropland idling would change the rate and timing of flows in the Sacramento River compared to the No Action Alternative.* 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, all 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. Most buyers will require water to be moved through the Delta and pumped at Jones PP or Banks PP, which do not have capacity for transfer water between April and June. Depending on hydrologic conditions, Reclamation would attempt to retain surface water made available in Shasta Reservoir until Delta export pumps have the capacity to convey water south. Reclamation could only store water if the Delta is in a "balanced" water condition under the terms of the COA.

If water cannot be stored, Shasta Reservoir would release flows on the same schedule as if they were being used to irrigate crops, but the flows would not be diverted because the crops would be idled. Sacramento River flows would increase below the historic point of diversion for districts participating in cropland idling.

If water is stored, the Sacramento River flows between Shasta Reservoir and the historic point of diversion could decrease in June. The decrease in flow corresponds only to the amount of water that the willing seller would have consumptively used under the No Action Alternative. The remaining river flow would supply other agencies' water needs as it would under the No Action Alternative because the flow changes associated with the transfer would not affect the timing and quantity of water releases for any non-participating entity.

During July through September, water from Shasta Reservoir would be released into the Sacramento River; however, those agencies that have sold water would divert less water from the river than they would under the No Action Alternative. The Sacramento River would therefore have increased flows downstream from those historic points of diversion; upstream from those points of diversion, Sacramento River flows would be the same as the No Action Alternative. Although there would be a change in timing and rate of river flows, the annual supply of water to users that are not participating in transfers would not decrease due to the Proposed Action.

In addition to the buyers that would require use of Jones PP or Banks PP to transfer water, several buyers may divert transferred water through other facilities, such as the Freeport Regional Water Project or Barker Slough Pumping Plant. These facilities do not have the same pumping constraints as the Jones PP and Banks PP, so they could receive water from cropland idling on the schedule that the crop would have consumptively used the water if they are not otherwise constrained. Flows would increase on the Sacramento River between the sellers' points of diversion and the buyers' points of diversion. These transfers would also result in a change in timing and rate of river flow, but the annual supply of water to users not participating in transfers would not change compared to the No Action Alternative.

*Acquisition of water via groundwater substitution from the City of Sacramento could change the rate and timing of flows in the American River compared to the No Action Alternative.* The rate and timing of flow changes would depend on the amount of water the City of Sacramento would make available and the scheduled release of that water. Reclamation would attempt to store water made available April through June in Folsom Reservoir until made available April through June. Groundwater would replace surface water released from Folsom Reservoir for use under the No Action Alternative. 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.

River flows would decrease between Folsom Reservoir and the historic diversion points for the City of Sacramento between April and June under the Proposed Action. The river flows would decrease only by the amount that would have been diverted by the City of Sacramento. River flows would increase when the transfers are released from Folsom Reservoir during July through September. The flow changes would not affect other agencies' water supplies because the timing and quantity of their water releases would be the same as under the No Action Alternative. Although there would be a change in timing and rate of river flows, the annual supply of water to users that are not participating in transfers would not decrease.

River flows would follow different flow patterns if the buyers do not require the water to be exported from the Delta through Jones PP or Banks PP. Other facilities, such as Barker Slough Pumping Plant and the Freeport Regional Water Project, do not have the same pumping constraints as the Delta pumping facilities. These transfers could proceed on the same schedule that the City of Sacramento would have used the water in the No Action Alternative if the pumping facilities are not otherwise constrained. These transfers would result in an increase in flow below the city's historic point of diversion until the buyers' point of diversion. Releases from Folsom Reservoir would be the same as the No Action Alternative.

*Acquisition of water via cropland idling could reduce the water supply for users not participating in the transfer who rely on return flows from fields that, under the Proposed Action, would be idled.* If farmers in Sutter, Glenn, Colusa, and Yolo Counties idled crops under the 2010-2011 Water Transfer Program, their water agency would reduce diversions by the amount of water that would have been consumed by the idled crops, plus some portion of the system losses in field losses (deep percolation to groundwater or tailwater runoff). Of the amount of water that is applied to a particular field, a portion percolates into the groundwater aquifer and a portion runs off the field back into the conveyance system. This "tailwater" that runs back into the conveyance system could then be used again by water users downstream of the conveyance system. Some downstream water users depend on tailwater that flows out of the service area of an upstream diverter. If farmers idle land, a portion of the tailwater historically released would no longer be available to downstream. However, as stated in Section 2.3 Environmental Commitments, "Sellers will be required to maintain flows at the downstream end of their distribution system under the Proposed Action to minimize potential water supply effects to neighboring and downstream water users." Therefore, there would be no impact to downstream water users compared to the No Action Alternative.

#### *3.1.2.3 Receiving Areas*

*The Proposed Action would likely result in increased water supplies in 2010 and 2011 in the buyers' service area.* Under the No Action Alternative, 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 receive the transferred water. For transfers to agricultural users, water would only be delivered to lands that were previously irrigated within the past three years (based on conservation measures to protect the San Joaquin kit fox); therefore, the transfer water would help provide supplemental water to lands that are experiencing substantial shortages. Water transfers to M&I users would also help relieve shortages. The increased water supply would be a beneficial effect.

# 3.2 Groundwater Resources

## 3.2.1 Affected Environment

### *3.2.1.1 Sacramento Valley Groundwater Basin*

Groundwater substitution transfers would originate from the Sacramento Valley Groundwater Basin (Figure 3.2-1). The basin is within Tehama, Glenn, Butte, Yuba, Colusa, Placer and Yolo Counties. The basin is bordered by Red Bluff Arch to the north (separating the basin from the Redding Basin), the Coast Ranges to the west, the Sierra Nevada to the east, and the Sacramento-San Joaquin Delta to the south.

**Geology, Hydrogeology, and Hydrology** 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 is recharged by deep percolation of applied water, 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.

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).

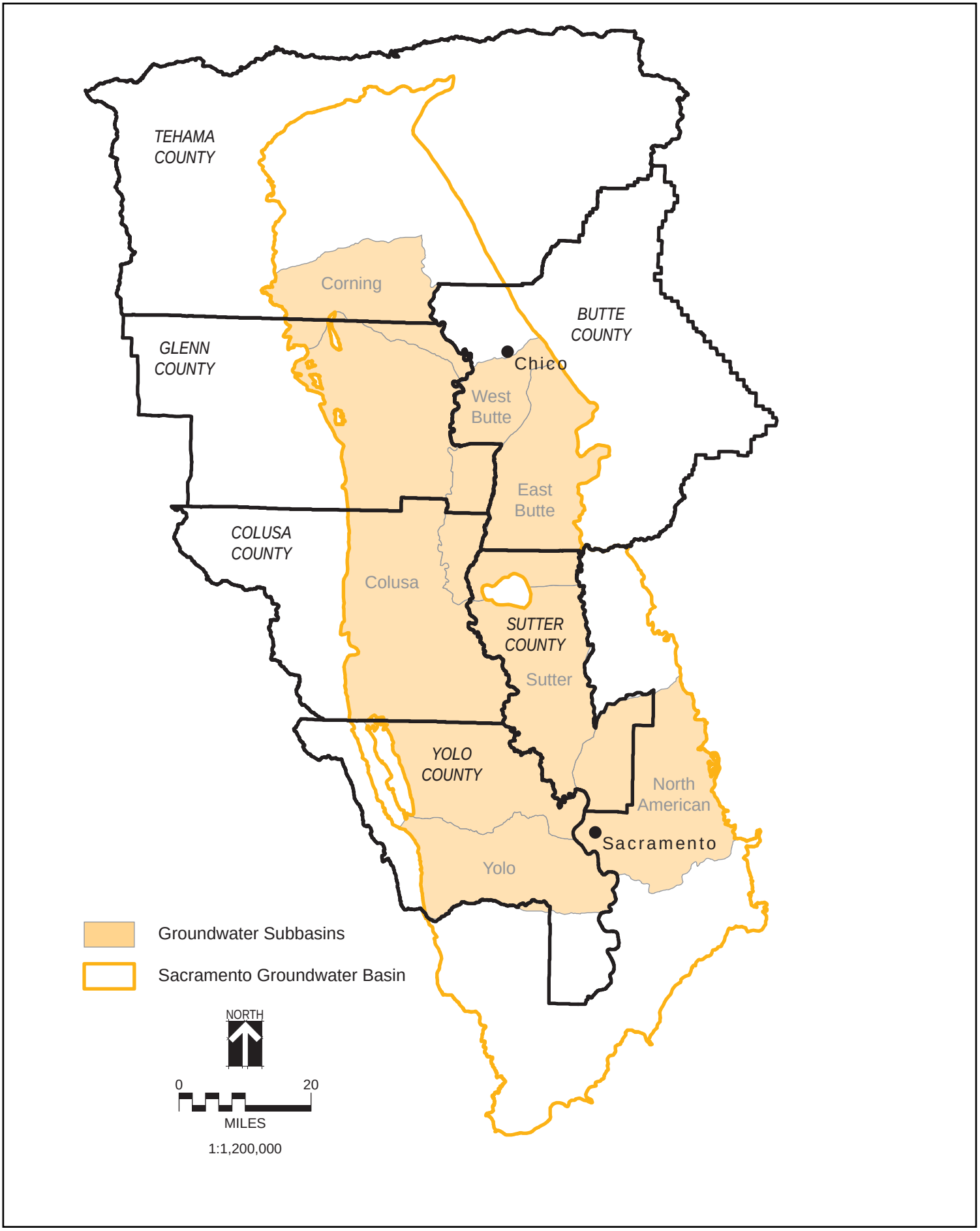



**Figure 3.2-1. Sacramento Valley Groundwater Basin**

The main surface water feature in the Sacramento Valley Groundwater Basin is the Sacramento River, which has several major tributaries draining the Sierra Nevadas, including the Feather, Yuba, and American Rivers. Stony, Cache, and Putah Creeks drain the Coast Range and are the main west side tributaries to 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.

**Groundwater Production, Levels, and Storage** Irrigated agriculture in the Sacramento Valley Groundwater Basin is over 1.2 million acres (USDA 2009). Groundwater production in the basin has recently been estimated to be about 2.5 million acre-feet or more in dry years. Irrigation wells range from 100 to 600 feet deep, on average; some wells in the southern portion of the basin have been drilled beyond 1,000 feet (NCWA 2006).

Historically, groundwater levels in the Basin have remained steady, declining moderately during extended droughts and recovering to pre-drought levels after subsequent wet periods. DWR extensively monitors groundwater levels in the basin. The groundwater level monitoring grid includes active and inactive wells that were drilled by different methods, with different designs, for different uses. Types of well use include domestic, irrigation, observation, and other wells. The total depth of monitoring grid wells ranges from 18 to 1,380 feet below ground surface.

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 Tehama-Colusa Canal, the delivery of surface water and reduction in groundwater extraction resulted in a recovery to historic groundwater levels by the mid to late-1990s. 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.

**Land Subsidence** Subsidence generally occurs in small increments during dry years when groundwater is increasingly pumped. DWR has implemented an ongoing program to monitor subsidence within the Sacramento Valley.

DWR and 20 participating local, state, and Federal agencies recently established a regional GPS geodetic control network in the Sacramento Valley, which allows land surface elevations to be precisely measured using a consistent vertical datum to monitor land subsidence as a result of underground water withdrawal (DWR 2008). The GPS network includes 339 survey monuments and extends across the Sacramento Valley, including Colusa, Sutter, Glenn, Butte, Yolo, Yuba, Tehama, and Placer Counties (DWR 2008).

Complementary to the regional GPS network, DWR monitors 13 extensometers in the Sacramento Valley (DWR 2008). Data from the GPS network and complementary groundwater levels in monitoring wells revealed a correlation between land subsidence and groundwater declines during the growing season (DWR 2008). DWR found that land partially or fully rebounds as aquifers recharge in winter (DWR 2008). Out of the 13 extensometers, only three of them indicate that inelastic subsidence may be occurring:

- 09N03E08C004M, in Yolo County near Reclamation District 2035: 0.04 to 0.05 foot decline from 1992 to present;
- 11N01E24Q008M, in Yolo County near the Yolo-Zamora area: 0.4 to 0.5 foot decline from 1992 to present; and
- 21N02W33M001M, in Glenn County: 0.015 foot decline from 2005 to present.

The third extensometer has a very short period of record during only a dry period, so these results may be elastic and may not indicate long-term subsidence.

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. As much as 4 feet of land subsidence due to groundwater withdrawal has occurred since the 1950s. The area between Zamora, Knights Landing, and Woodland has been most affected (Yolo County 2009). Subsidence in this region is generally related to groundwater pumping and subsequent consolidation of aquifer sediments.

**Groundwater Quality** 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.

Within the Sacramento Valley, water quality issues may include occurrences of saltwater intrusion, elevated levels of naturally occurring boron, nitrates, and other introduced chemicals. For nearly 60 years, DWR has provided groundwater monitoring to assess water quality issues throughout Central California via a network of approximately 400 monitoring wells. Water quality data is gathered and analyzed for temperature, pH, conductivity, minerals, nutrients, bacteria, organic compounds such as pesticides, and elements including iron and arsenic.

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 (DWR 2003; Butte County Water Commission 2009). 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.

From 1994 to 2000, DWR monitored water quality in 1,356 public supply water wells. Samples indicated that 1,282 wells, or 95 percent, met the primary maximum contaminant levels (MCLs) for drinking water. In the remaining five percent, analysis detected at least one constituent above a primary MCL. Out of the five percent of samples that had a constituent over the MCL, the exceedences included: 33 percent nitrates, 32 percent volatile and semivolatile organic compounds (mostly tetrachloroethylene, trichloroethylene, and benzene), 26 percent inorganic compounds (mostly manganese and iron), 5 percent radiological compounds (gross alpha 4), and 4 percent pesticides (di(2-ethylhexyl)phthalate) (DWR 2003).

Nitrate (measured as nitrogen) is regulated in drinking water and has an 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 (DWR 2003).

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 (Bertoldi 1991). In Yolo County, some groundwater, especially in the Cache Creek fan, has high boron concentrations.

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.

#### *3.2.1.2 Regulatory Background*

**State Regulations** 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. In general, groundwater and groundwater-related transfers are subject to a number of provisions in the Water Code. These provisions require compliance with: (1) Section 1220, (2) Section 1810, and (3) local groundwater management plans.

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.

State Water Code Section 1220 also regulates the direct export of groundwater from the combined Sacramento and Delta-Central Sierra Basins. It states that groundwater cannot be exported from these basins unless pumping complies with a groundwater management plan, adopted by the county board of

supervisors in collaboration with affected water districts, and approved by a vote from the counties that lie within the basin. This excludes water seepage into groundwater from water supply project or export facilities, which may be returned to the facilities. In certain cases, the county board of supervisors may select a county water agency to represent the board.

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

California Water Code Section 1810 and the CVPIA protect against injury to third parties as a result of water transfers. Three fundamental principles include (1) no injury to other legal users of water; (2) no unreasonable effects on fish, wildlife or other in-stream beneficial uses of water; and (3) no unreasonable effects on the overall economy or the environment in the counties from which the water is transferred. These principles must be met for approval of water transfers. Other groundwater regulation is related primarily to water quality issues. These issues are addressed through a number of different legislative acts and are the responsibility of several different State agencies including:

- State Water Resource Control Board and nine Regional Water Quality Control Boards: Responsible for protecting water quality for present and future beneficial use;
- California Department of Toxic Substances Control: Responsible for protecting public health from improper handling, storage, transport, and disposal of hazardous materials;
- California Department of Pesticide Regulation: Responsible for preventing pesticide pollution of groundwater;
- California Department of Public Health: Responsible for drinking water supplies and standards;
- California Integrated Waste Management Board: Oversees non-hazardous solid waste disposal; and
- California Department of Conservation: Responsible for preventing groundwater contamination due to oil, gas, and geothermal drilling and related activities.

**Local Regulations** Existing groundwater management plans and local regulations in various areas can affect the potential transfer of water. Local groundwater management plans and county ordinances vary by region and the authority/agency involved. These plans 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. Table 3.2-1 provides brief descriptions of the water

transfer requirements for individual counties, in geographic order from north to south.

**Table 3.2-1. Description of County Ordinances and Plans Pertaining to Groundwater Transfers**

| County | Description | Sources for More Information |
|---|---|---|
| Tehama | Ordinance requires a permit to extract groundwater for off-parcel use, prohibits mining of groundwater, and restricts the radius of influence associated with the operation of a well participating in transfer operations to the parcel on which the well is located, among other requirements. | Tehama County Health Agency, Environmental Health Division http://www.tehamacountywater.ca.gov/ http://www.tehamacountywater.ca.gov/exp_ord_1617.htm |
| Butte | Ordinance requires permits for groundwater extraction for use outside the County, and requires a permit for groundwater substitution pumping. Butte County also has a well spacing ordinance. The Butte County Water Commission advises the Board of Supervisors with technical information from the Butte County Water Advisory Committee and Technical Advisory Committee. | Butte County Department of Water and Resource Conservation http://www.buttecounty.net/Water%20and%20Resource%20Conservation.aspx |
| Glenn | Ordinance uses basin management objectives of groundwater levels, groundwater quality, and land subsidence to help define safe yield and overdraft of the basin. The ordinance is enforced by the Glenn County Board of Supervisors | Glenn County Department of Agriculture http://www.glenncountywater.org/about_us.aspx |
| Colusa | Ordinance requires a permit for extraction and export of groundwater, either directly or indirectly, for use outside of the County. Application for a transfer permit is filed with Colusa County Groundwater Commission, through the Director of the Planning and Building Department. | County Director of Planning and Building http://www.codepublishing.com/CA/colusacounty/ http://colusagroundwater.ucdavis.edu/index.htm |
| Sutter | Sutter County has no ordinance governing the extraction and export of groundwater. According to its general plan, Sutter County has a long-term interest in discouraging water transfer/export sales if they result in long-term supply losses. | Sutter County Planning Services http://www.co.sutter.ca.us/doc/government/depts/cs/ps/gp/gp_home |
| Yolo | Ordinance requires a permit for extraction and export of groundwater, including the extraction of groundwater to replace a surface water supply. Application for a permit should be filed with the Director of Community Development. | Director of Community Development http://www.yolocounty.org/Index.aspx?page=432#Title%2010 |
| Sacra-mento | Ordinance requires a permit for groundwater or surface water to be transported in any manner outside the County. Application for a permit must be filed with the Director of the Sacramento Department of Water Resources. | Sacramento Department of Water Resources http://www.msa.saccounty.net/waterresources/drainage/docs/20051018Title3Zone41MASTERrev.pdf |

**Acquisition Areas** The following agencies are listed in Section 2.2.1 as potential sellers via groundwater substitution.

*Colusa Indian Community Council/Cachil Dehe Band of Wintun Indians* The Colusa Indian Community Council/Cachil Dehe Band of Wintun Indians receives surface water from the Sacramento River to irrigate rice and walnuts. The community could transfer up to 500 acre feet through groundwater substitution using one private well that is approximately 1,000 feet deep.

*Conaway Preservation Group* CPG purchased the 17,300-acre Conaway Ranch in 2004. The Ranch has considerable groundwater resources, and currently holds rights to more than 50,000 acre-feet of water from the Sacramento River. Farming activities on the ranch include mainly rice, but alfalfa, wheat, tomatoes, and safflower are also grown. This agency could transfer 13,440 acre-feet through groundwater substitution. Yolo County Export Ordinance No. 1617 applies to CPG.

*Cranmore Farms (Pinnacle Land Ventures, LLC or Broomieside Farms)* Cranmore Farms receives surface supplies from the Sacramento River and could transfer up to 4,511 acre-feet through groundwater substitution and/or cropland idling/crop shifting. Cranmore Farms' water supply for irrigation may be supplemented by groundwater from its two existing wells. Within the next year, Cranmore Farms may construct additional groundwater wells for use within the property. For the upcoming water transfers, it has yet to be determined which wells within Cranmore Farms would participate in a groundwater substitution program.

*Dunnigan Water District* Dunnigan WD receives surface water supplies from the Sacramento River to irrigate almonds, wine grapes, alfalfa, tomatoes, and rice. Dunnigan WD may transfer a maximum of 1,500 acre-feet through groundwater substitution and/or cropland idling/crop shifting. Groundwater substitution would use six or seven irrigation wells that range from 775 to 920 feet deep. Yolo County Export Ordinance No. 1617 applies to Dunnigan WD.

*Feather Water District* Feather WD's surface water supply for irrigation may be supplemented by groundwater from its two wells. For the upcoming water transfers, it has yet to be determined which wells within Feather WD would participate in a groundwater substitution program. Feather WD plans to make a maximum annual volume of up to 3,000 acre-feet of surface water available for transfer through groundwater substitution.

*Glenn-Colusa Irrigation District* Glenn-Colusa ID receives surface water supplies from the Sacramento River and could transfer up to 20,000 acre-feet through groundwater substitution and/or cropland idling/crop shifting.

*Meridian Farms Water Company* Meridian Farms WC receives surface water from the Sacramento River and could transfer up to 2,000 acre feet through groundwater substitution and/or cropland idling/crop shifting. Meridian Farms WC uses surface water to irrigate rice, tomatoes, wheat, alfalfa, hay, walnuts, beans, vineseed, corn, and sunflowers. For groundwater substitution transfers, Meridian Farms WC may use three wells that range from 145 to 192 feet deep, but the exact wells that may participate are not yet certain.

*Natomas Central Mutual Water Company* Natomas Central MWC receives surface water from the Sacramento River and could transfer up to 10,000 acre feet through groundwater substitution. Historically, Natomas Central MWC has relied on surface water diverted from the Sacramento River and, consequently, has relatively limited groundwater development. Natomas Central MWC has used groundwater as a supplement to surface supplies during dry years through the discretion of private landowners. Natomas Central MWC owns two wells; there are 61 privately-owned wells within the MWC's area.

*Pelger Mutual Water Company* Pelger MWC receives surface water supplies from the Sacramento River and could transfer up to 1,730 acre feet through groundwater substitution and/or cropland idling/crop shifting. Pelger MWC's water supply for irrigation may be supplemented by groundwater from private landowners' wells. Three private wells were used for participation in the 2009 Drought Water Bank, but it has yet to be determined which wells within Pelger MWC are planned for use in upcoming transfers.

*Pleasant Grove-Verona Mutual Water Company* Pleasant Grove-Verona MWC receives surface water from the Sacramento River and could transfer up to 9,637 acre feet through groundwater substitution or 4,000 acre feet through cropland idling/crop shifting. In the Pleasant Grove-Verona MWC area, groundwater is usually only 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 cases of reduced surface water availability. During these periods, shareholders may pump additional groundwater to make up for the reduced surface water availability. All groundwater wells within Pleasant Grove-Verona MWC are owned and operated by the individual shareholders.

*Reclamation District 108* RD 108 is in the Colusa groundwater subbasin and receives surface water from the Sacramento River. RD 108 could transfer up to 5,000 acre feet through groundwater substitution and 20,000 acre feet through cropland idling/crop substitution. RD 108 has two wells they typically use in groundwater substitution transfers that are in Colusa County.

*Reclamation District 1004* RD 1004 receives surface water from the Sacramento River and Butte Creek. RD 1004 could transfer up to 10,000 acre feet through groundwater substitution and/or cropland idling/crop shifting.

Groundwater for the Proposed Action would be pumped from privately owned wells within RD 1004. RD 1004 maintains no records of pumping from the approximately 50 privately owned wells within the district. Colusa County Ordinance No. 615 is applicable to RD 1004.

*River Garden Farms* River Garden Farms receives surface water from the Sacramento River and could transfer up to 8,000 acre feet through groundwater substitution. The groundwater substitution transfers could use seven wells owned privately by River Garden Farms. The wells range in depth from approximately 350 feet to 650 feet and could pump approximately 3,000 gallons per minute (gpm) to 1,800 gpm. Yolo County Export Ordinance No. 1617 applies to River Garden Farms.

*City of Sacramento* The City of Sacramento receives surface water from the American River and could transfer up to 3,000 acre feet through groundwater substitution. Groundwater extracted under the Proposed Action would most likely be extracted from wells owned by the City of Sacramento and Sacramento Suburban Water District. Groundwater provides 15 percent of the annual water supply within the city's retail service area (City of Sacramento 2008). The city may use up to 27 active municipal wells in the area that have casing depths ranging from 200 to 350 feet below ground surface.

*Sacramento River Ranch* Sacramento River Ranch's service area comprises approximately 3,985 acres in Yolo County and receives surface water from the Sacramento River to irrigate permanent and row crops, such as alfalfa, orchard grass, wheat, rice, tomatoes, corn, oats, and safflower. Sacramento River Ranch could transfer up to 3,219 acre feet through groundwater substitution and/or cropland idling/crop shifting. Sacramento River Ranch would pump groundwater for irrigation instead of diverting surface water, under its appropriative water rights licenses (1200, 9994, 9995, 9996, 9997) and Sacramento River Settlement Contract (Contract No. 14-06-200-2149A-R-1 with Reclamation, dated April 5, 2005). This contract approved the diversion and use of 4,000 acre-feet per year (1,300 acre-feet from July through September) from the Sacramento River. Sacramento River Ranch would likely use the same wells as used in past transfers (Wells GW-1 123448, GW-9 123447, and GW-10 33839). These wells are irrigation wells that are at least 150 feet deep and have pumping capacities of 3500, 2500, and 3000 gpm, respectively.

*Sycamore Mutual Water Company* Sycamore MWC (also known as Sycamore Family Trust) receives surface water from the Sacramento River and could transfer up to 10,000 acre feet through groundwater substitution or cropland idling/crop substitution. Sycamore MWC uses surface water to irrigate rice, tomatoes, beans, vineseed, corn, alfalfa, and wheat. Water transfers could use four existing wells (approximately 900 feet deep) owned and operated by private landowners or potentially new wells.

## 3.2.2 Environmental Consequences

### *3.2.2.1 No Action*

Under the No Action Alternative, Reclamation would not approve the proposed transfers of CVP water to buyers in 2010 and 2011. However, other transfers may occur under the No Action Alternative. Some users in the export service area may face potential shortages in the absence of water transfers. These users may take alternative water supply actions in response to potential shortages, including increased groundwater pumping, cropland idling, reduction of landscape irrigation, or water rationing. These actions, particularly increased groundwater pumping, could cause groundwater levels to decline in the areas of the Central Valley and southern California served by the CVP and SWP.

### *3.2.2.2 Proposed Action*

*Water transfers 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** Increased groundwater substitution pumping may result in temporary declines of groundwater levels. Groundwater substitution pumping would typically occur during the irrigation season and the pumped groundwater would be used for crop irrigation.

Declining groundwater levels as a result of increased groundwater substitution pumping could cause: (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, and (3) decrease of the groundwater table to a level below the vegetative root zone, which could result in environmental effects.

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 because the Proposed Action is only a two year program, transfers in 2010 and 2011 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, Reclamation will review potential sellers' proposed monitoring and mitigation plans for consistency with applicable Federal, state and local regulations.

As discussed above, in many areas that may participate in the proposed 2010-2011 Water Transfer Program, 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.

Because 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 prior to each 2010-2011 Water Transfer Program 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, Reclamation and DWR will review the preliminary groundwater level monitoring data and will not approve transfers with substantial adverse regional effects.

**Groundwater/Surface Water Interaction** A basic principle in understanding the groundwater/surface water flow dynamics is that all groundwater originates as surface water at some point. Water typically enters the ground via recharge from the ground surface (e.g. as precipitation, snow melt) or from leakage through streambeds as shown in Figure 3.2-2. Therefore, all groundwater pumped through substitution pumping started off at the surface. The length of time required for the water to reach the groundwater system varies based on the local hydrogeologic conditions.

The implementation of groundwater substitution pumping can lower the groundwater table and may change the relative difference between the groundwater and surface water levels. This change has a direct impact on the volume that a seller receives credit for being transferred.

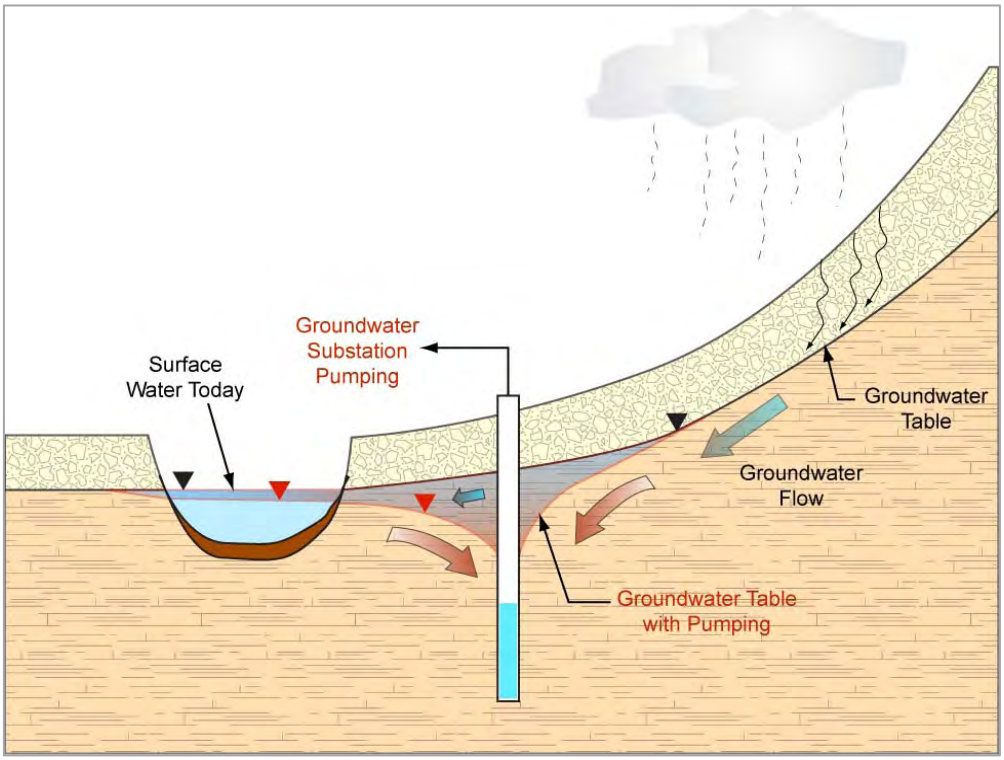



**Figure 3.2-2: Schematic Linkage between Groundwater and Surface Water**

In Figure 3.2-2, groundwater substitution pumping results in a change in the groundwater/surface water interaction characteristics. In this case, the water pumped from a groundwater well may have two impacts that reduce the amount of surface water compared to pre-pumping conditions. These mechanisms are:

- Induced leakage. The lowering of the groundwater table causes a condition where the groundwater table is lower than that the water level in the surface water. This conditions causes leakage out of the surface water.

- Interception of groundwater. The placement of groundwater substitution pumping may intercept groundwater that may normally have discharged to the surface water (i.e., water that has already percolated into the ground may be pumped out prior the water reaching the surface water and being allowed to enter the “gaining” stream).

Due to this depletion in streamflow, Reclamation recognizes that the volume of water that can be realistically transferred is not the same as the volume of groundwater pumped through a substitution action. The amount of water that can justifiably be considered to be transferred is the volume of substitution pumping less the amount of induced leakage and the amount of intercepted groundwater flow. The minimization measures in Section 3.2.2.3 would reduce

the potential for stream depletion associated with groundwater-surface water interaction.

**Land Subsidence** Inelastic land subsidence can occur where groundwater extraction causes consolidation of clay beds within an aquifer system. Although land subsidence may result in a substantial decline in ground surface elevation over a long period of time, it generally occurs very gradually and over a large area of the ground surface. As a consequence, substantial change to the appearance of the landscape may not result. It can, however, cause problems with flood control and water distribution systems. Subsidence can reduce the freeboard of levees, allowing water to over top them more easily. It also can change the grade, or even the direction of flow, in canals. In addition, subsidence may damage wells by collapsing well casings.

Groundwater extraction for groundwater substitution transfers would decrease groundwater levels, increasing the potential for subsidence. The potential for subsidence is small if the groundwater substitution pumping is small compared to overall pumping in a region. The minimization measures in Section 3.2.2.3 require all groundwater substitution transfers to monitor for subsidence or provide a credible analysis why it would be unlikely.

**Groundwater Quality** The changes in groundwater flow patterns (e.g., direction, gradient) due to increased groundwater substitution pumping may result in changes in groundwater quality from the migration of reduced quality water.

Groundwater extraction under the Proposed Action would be limited to withdrawals during the irrigation season of the 2010 and 2011 water years. 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.

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.

#### *3.2.2.3 Minimization Measures*

The Draft Technical Information Papers for Water Transfers in 2010 (Reclamation and DWR 2009) provides guidance for the development of proposals for groundwater substitution water transfers. The objectives of this process are: to mitigate adverse 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 seller will be

responsible for assessing and minimizing or avoiding adverse effects resulting from the transfer within the source area of the transfer.

Each district will be required to confirm that the proposed groundwater pumping will be compatible with state and local regulations and groundwater management plans. Reclamation and DWR's transfer approval process and groundwater minimization measures set forth a framework that is designed to avoid and minimize adverse groundwater effects. Reclamation and DWR will verify that sellers adopt these minimization measures to minimize the potential for adverse effects related to groundwater extraction.

**Well Review Process** Potential sellers will be required to submit well data for Reclamation and DWR review as part of the transfer approval process. Required information is detailed in the Draft Technical Information Papers for Water Transfers in 2010 (Reclamation and DWR 2009) for groundwater substitution transfers.

**Well Locations** Reclamation and DWR will continue to use the well acceptance criteria in Table 3.2-2 to minimize effects associated with groundwater-surface water interaction.

Reclamation and DWR assume that stream flow losses due to groundwater pumping for transfers are 12 percent of the amount pumped. Sellers may submit modeling information from approved models to demonstrate that this percentage should be different. Reclamation and DWR continue to require well location and construction information to ensure that the criteria in Table 3.2-2 are met.

**Monitoring Plan** Potential sellers will be required to complete and implement a monitoring plan that must include the following components: (1) a network of monitoring wells to characterize groundwater levels before, during, and after transfer; (2) periodic flow meter readings at the extraction pumps; (3) periodic measurements of groundwater levels; (4) groundwater quality testing; (5) means to detect land subsidence or a credible analysis demonstrating that subsidence is unlikely; and (6) a coordinated means to collect data and cooperate with other monitoring efforts in the area.

**Mitigation Plan** Potential sellers will also be required to complete and implement a mitigation plan that must include the following components: (1) procedure for the seller to receive reports of potential impacts and to report that information to Reclamation; (2) procedure for investigating reported effect; (3) development of mitigation options, in cooperation with the affected party; (4) assurances that adequate financial resources are available to cover reasonably anticipated mitigation needs; and (5) commitment to avoid or mitigate such effects during future transfers.

**Table 3.2-2. Well Acceptance Criteria**

| Well Location[1] | Criteria for Acceptance |
|---|---|
| Between one and two miles away from of a **major** surface water tributary to the Delta or a delineated wetland | Well(s) may be accepted if:<br>Sufficient information is submitted to demonstrate that the well is not connected to the surface water system tributary to the Delta, or<br>The well perforations are deeper than 50 feet from the ground surface and sufficient information demonstrates that the well is not connected to the surface water system tributary to the Delta.<br>They do not pose a risk of adversely affecting groundwater quality. |
| Within one mile of a **major** surface water tributary to the Delta or a delineated wetland | Well(s) may be accepted if:<br>The uppermost perforation start below 150 feet bgs; or<br>The uppermost perforations start between 100 and 150 feet bgs and the wells has a surface annular seal to at least 20 feet; a total of at least 50 percent fine-grained materials in the interval above 100 feet bgs; and at least one fine-grained layer that exceeds 40 feet in thickness in the interval above 100 feet bgs; or<br>Sufficient information is submitted to demonstrate that the well is not connected to the surface water system tributary to the Delta. |
| Between one-half and one mile away from a **minor** surface water tributary to the Delta or a delineated wetland | Well(s) may be accepted if:<br>Sufficient information is submitted to demonstrate that the well is not connected to the surface water system tributary to the Delta, or<br>The well perforations are deeper than 50 feet from the ground surface and sufficient information demonstrates that the well is not connected to the surface water system tributary to the Delta.<br>They do not pose a risk of adversely affecting groundwater quality. |
| Within one-half mile of a **minor** surface water tributary to the Delta or a delineated wetland | Well(s) may be accepted if:<br>The uppermost perforation starts below 150 feet bgs; or<br>The uppermost perforations start between 100 and 150 feet bgs and the wells has a surface annular seal to at least 20 feet; a total of at least 50 percent fine-grained materials in the interval above 100 feet bgs; and at least one fine-grained layer that exceeds 40 feet in thickness in the interval above 100 feet bgs; or<br>Sufficient information is submitted to demonstrate that the well is not connected to the surface water system tributary to the Delta; or<br>Sufficient information is submitted to demonstrate that the surface water feature does not flow during times when the Delta is in balanced conditions. |

[1] **Major** surface water features tributary to the Delta affected by groundwater pumping are: Sacramento River, Feather River, Big Chico Creek, Cottonwood Creek, Stony Creek, Yuba River, including the Yuba Gold Fields, American River and the Cosumnes River.
**Minor** surface water features tributary to the Delta potentially affected by groundwater pumping are: Colusa Basin Drain, Tule/Toe Canal, and Natomas Cross Canal.

# 3.3 Water Quality

This section describes the affected environment and environmental consequences for water quality. The area of analysis for water quality includes the waterbodies with the potential to be affected by water transfers, including the Sacramento and American River systems and the Delta.

## 3.3.1 Affected Environment

The regulatory setting for the Proposed Action includes the Safe Drinking Water Act, Surface Water Treatment Rule, Stage 1 Disinfectants and Disinfection Byproducts Rule and Long-Term 1 Enhanced Surface Water Treatment Rule, Federal Clean Water Act (CWA), 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 (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 relevant to the Proposed Action 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 chapter of the 2004 Final EWA EIS/EIR (Reclamation 2004, pgs 5-2 through 5-15).

### *3.3.1.1 Acquisition Areas*

**Sacramento River** The Sacramento River Basin covers nearly 70,000 square kilometers ($km^2$) in the north-central part of California (Reclamation 2009). 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.

Shasta Reservoir is on the upper Sacramento River in the Shasta Trinity National Forest. Water quality in Shasta Reservoir 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** The American River is a large tributary to the Sacramento River. Forestland constitutes a large percentage of land use or land cover in the American River basin. In the past, gold mining was substantial within the 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 primarily from mercury lost during gold recovery. However, water quality in the Lower American River is generally considered to be of good quality.

#### *3.3.1.2 Delta Region*

The Sacramento-San Joaquin Delta (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.

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 CVP and SWP are operated subject to the terms and conditions contained in their water rights permits issued by the SWRCB. Decision 1641 contains water quality and flow objectives that Reclamation and DWR are required to meet. The objectives are intended to protect the beneficial uses within the Delta including agricultural, municipal and industrial, and fish and wildlife beneficial uses (DWR 2006).

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 water flows into the Central and South Delta. The Sacramento River water flows 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, higher salinity water from the western Delta can be drawn into the Central and South Delta as tidal inflow from the San Francisco Bay. Under certain hydrologic conditions SWP and CVP exports cause flow from the Sacramento River to move toward the pumps resulting in "reverse flows" 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 (Reclamation 2009).

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.

## 3.3.2 Environmental Consequences

### *3.3.2.1 No Action Alternative*

If the Proposed Action were not implemented, actions to protect water quality would continue under existing regulatory requirements. Water quality and water temperatures of rivers and reservoirs 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. Therefore, there would be no substantial water quality effects associated with No Action Alternative.

### *3.3.2.2 Proposed Action*

*Water transfers via groundwater substitution and cropland idling/crop shifting would alter surface water elevation and reservoir storage in Shasta Reservoir and Folsom Reservoir relative to the No Action Alternative*. Reclamation would strive to store water made available during April through June in Shasta Reservoir or Folsom Reservoir, but it is very unlikely in Shasta Reservoir because of downstream flow and temperature requirements. Overall, Shasta Reservoir and Folsom Reservoir water surface elevation and reservoir storage under the Proposed Action would be incrementally slightly higher than under the No Action Alternative. The magnitude of changes under the Proposed

Action would be less than those identified for the EWA program in the 2004 Final EWA EIS/EIR, which was a maximum decrease of 19,000 acre feet, about 0.6 percent, during August in Shasta Reservoir (Reclamation 2004, pg 5-62) and a maximum decrease of 4,000 acre feet, about 0.6 percent, in July in Folsom Reservoir (Reclamation 2004, pg 5-66).[1] Because of the small, incremental changes relative to the size of the reservoirs, implementation of the Proposed Action would not adversely affect concentration of water quality constituents or water temperatures in Shasta Reservoir or Folsom Reservoir. As a result, any differences in water surface elevation and reservoir storage would not be of sufficient magnitude and frequency to adversely affect water quality, designated beneficial uses, or conflict with existing regulatory standards

*Water transfers via groundwater substitution and cropland idling/crop shifting would not substantially decrease Sacramento River flow, relative to the No Action Alternative.* Under the Proposed Action, Sacramento River flow at Keswick Dam and Freeport would be essentially equivalent to or greater than the flows under the No Action Alternative. The magnitude of changes under the Proposed Action would be less than those identified for the EWA program in the 2004 Final EWA EIS/EIR, which was a slight decrease in flow (less than 0.8 percent) in August and September below Keswick (Reclamation 2004, pg 5-75) and only increases in flow at Freeport (Reclamation 2004, pg 5-76). 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 adversely affect water quality.

*Water transfers via groundwater substitution and cropland idling/crop shifting would not substantially increase Sacramento River water temperature, relative to the No Action Alternative*. Water temperature in the Sacramento River would be essentially equivalent to water temperatures relative to the No Action Alternative. The magnitude of changes in temperature under the Proposed Action would be less than those identified for the EWA program in the 2004 Final EWA EIS/EIR, which did not indicate any changes in temperature relative to the baseline condition (Reclamation 2004, pg 5-77). Therefore, the Proposed Action would not affect water temperature in the Sacramento River.

[1] The EWA program and 2010-2011 Water Transfer Program include similar transfer actions; therefore, model results for the EWA are assumed to be adequate for this analysis. Although existing conditions and Project operations have changed since the 2004 Final EWA EIS/EIR, water quality impacts for the EWA program were found to be small, as described. It is unlikely that the magnitude of these impacts would change under different baseline conditions for the 2010-2011 Water Transfer Program.

*Groundwater substitution transfers would change lower American River flow relative to the No Action Alternative.* Under the Proposed Action, Reclamation may store water from these transfers in Folsom Reservoir during April, May, and June for buyers that require water to move through Banks PP or Jones PP during July-September. Storing water would decrease flows in the lower American River downstream of Nimbus Dam to the typical point of diversion. The decrease in flow would be small compared to the overall river flows. If Reclamation can store water, it would be released from July through August. The increased flows in the lower American River would allow dilution of water quality constituents, including pesticides and fertilizers present in agricultural run-off.

If the buyers do not require water to be moved through Banks PP or Jones PP, the transfers may be able to occur on the same schedule that releases would have been made in the No Action Alternative. This flow pattern would result in no change between Nimbus Dam and the point of diversion, and a small increase downstream of the point of diversion.

All differences in flow would be small compared to the overall river flow. The Proposed Action includes only 3,000 acre feet of transfer water from the City of Sacramento in the American River area of analysis over the three month transfer period, which would not result in substantial flow changes in the Lower American River relative to the No Action Alternative. The changes would not be of sufficient frequency and magnitude to affect water quality.

*Groundwater substitution transfers would not substantially increase American River water temperature relative to the No Action Alternative.* The Proposed Action includes only 3,000 acre feet of transfer water from the City of Sacramento in the American River area of analysis over the three month transfer period, which would not substantially change existing water temperatures in the Lower American River. Any differences in water temperature under the Proposed Action would not be of sufficient frequency and magnitude to affect water quality.

*Water transfers via cropland idling would increase erosion and sediment deposition in water bodies, which would affect water quality.* Idling would result in an increased number of bare fields, which may result in increased potential for sediment transport via wind erosion and deposition of transported sediment onto surface water bodies.

Crop management practices and soil textures are key factors in determination of erosion potential. The rice crop cycle reduces the potential for wind erosion. The process of rice cultivation, further described in Section 3.4.2, would leave a hard, crust-like surface after harvesting and flooding practices. If left undisturbed, this surface texture would remain intact throughout the summer, when wind erosion would be expected to occur, until winter rains begin.

Because of the clay soils, there would be little to no sediment transport from winds. During the winter rains, the hard, crust-like surface would remain intact and the amount of sediment transported through winter water runoff would not be expected to increase. The effects of soil erosion on water quality would be minimal.

The Proposed Action includes additional crops that could be idled under water transfers, which could be planted on soils more susceptible to erosion. Because the soils within the potential crop idling areas have slight erosion potential and farmers would manage idled land to reduce erosion, there would not be substantial effects to water quality.

*Water transfers via cropland idling would alter the quantity of water applied to the land, which could reduce soil leaching.* Under the Proposed Action, willing sellers would not apply irrigation water to participating fields during the growing season, which could reduce the potential for leaching of salts and trace elements. Additionally, growers would not apply fertilizers and pesticides associated with growing crops, which could result in decreased nutrient concentrations in surface water runoff as compared to the No Action Alternative. Reduced leaching and nutrient concentrations in runoff could be a potential benefit to water quality.

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

The increase in the amount of groundwater substituted for surface water under the Proposed Action, as compared to the No Action Alternative, would be so small in comparison to the amount of surface water currently used to irrigate agricultural fields in the Sacramento Valley that the quality of the surface water, even after mixing with groundwater, would not substantially change.

Additionally, any groundwater substitution transfers must comply with mitigation and monitoring components outlined in the Draft Technical Information for Water Transfers in 2010. The seller must recognize, assess and mitigate any adverse effects resulting from the transfer. These measures would minimize potential effects to water quality for downstream users.

# 3.4 Geology and Soils

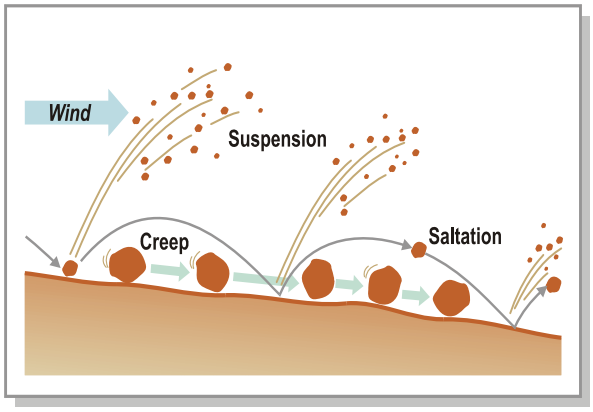
This section presents the potential impacts to geology and soils resulting from the Proposed Action. Factors such as surface soil texture, precipitation, and wind velocity and duration can affect soils. The focus of this section is on the chemical processes, properties, and erodibility of soils due to cropland idling. Section 3.2, Groundwater Resources, addresses the issues of geomorphology and land subsidence.

## 3.4.1 Affected Environment/Existing Conditions

### *3.4.1.1 Wind Erosion*

Wind erosion is affected by soil erodibility, climatic factors, soil surface roughness, width of field, and quantity of vegetative coverage. Wind erosion reduces soil depth and can remove organic matter and needed plant nutrients by dispersing the nutrients contained in the surface soils.

Wind transports soil particles in three ways: saltation, surface creep, and suspension (Figure 3.4-1).




Source: NRCS 1998

**Figure 3.4-1. Wind Erosion Processes**

*Saltation* occurs when particles ranging in size from 0.1 to 0.5 millimeters (mm) in diameter are lifted from the ground, follow distinct paths influenced by air resistance and gravity, fall back to the ground, and cause the movement of additional particles. Generally, saltation occurs within one foot of the soil surface (based on velocity and other factors) and particles typically travel a distance of about 10 times their heights. Fifty to 80 percent of total soil transport is by saltation.

*Surface creep* moves sand-sized particles set in motion by the effect of saltating particles. During high winds, the soil particles roll across the ground surface as the particles are pushed by the flow. Surface creep can account for 7 to 25 percent of the total soil transport.

*Suspension* is defined as the wind moving finer particles, less than 0.1 mm in diameter, upward by diffusion. These particles can remain in the air mass for lengthened periods of time. Suspension accounts for 20 to 60 percent of the total soil transport, depending on soil texture and wind velocity.

#### *3.4.1.2 Expansive Soils*

Expansive soils are soils with the potential to experience considerable changes in volume, either shrinking or swelling, with changes in moisture content. The shrink-swell capacity of the soil refers to the potential of soil to shrink when desiccated and swell or expand when rehydrated.

The magnitude of shrink-swell capacity in expansive soils is influenced by:

- Amount of expansive silt or clay in the soil;
- Thickness of the expansive soil zone;
- Thickness of the active zone (depth at which the soils are not affected by dry or wet conditions); and
- Climate (variations in soil moisture content as attributed to climatic or man-induced changes).

Soils composed primarily of sand and gravel are not considered expansive (i.e., the soil volume does not change with a change in moisture content). Soils containing silts and clays may possess expansive characteristics. Soils are classified as having low, moderate, high, and very high potential for volume changes (or shrink/swell potential) based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity [USDA, Natural Resources Conservation Service 2006]) as follows.

**Low** – These soils include sands and silts with relatively low amounts of clay minerals. These soils experience a change of less than 3 percent (USDA, Natural Resources Conservation Service 2006).

**Moderate** – These soils include silty clay and clay textured. These soils experience a change of between 3 and 6 percent (USDA, Natural Resources Conservation Service 2006).

**High** - These soils include clays. These soils experience a change of between 6 and 9 percent (USDA, Natural Resources Conservation Service 2006).

**Very High** – These soils experience a change greater than 9 percent (Natural Resources Conservation Service 2006).

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures (USDA, Natural Resources Conservation Service 2006). Figure 3.4-2 shows expansive soils in the Butte, Colusa, Glenn, Sutter, and Yolo counties.

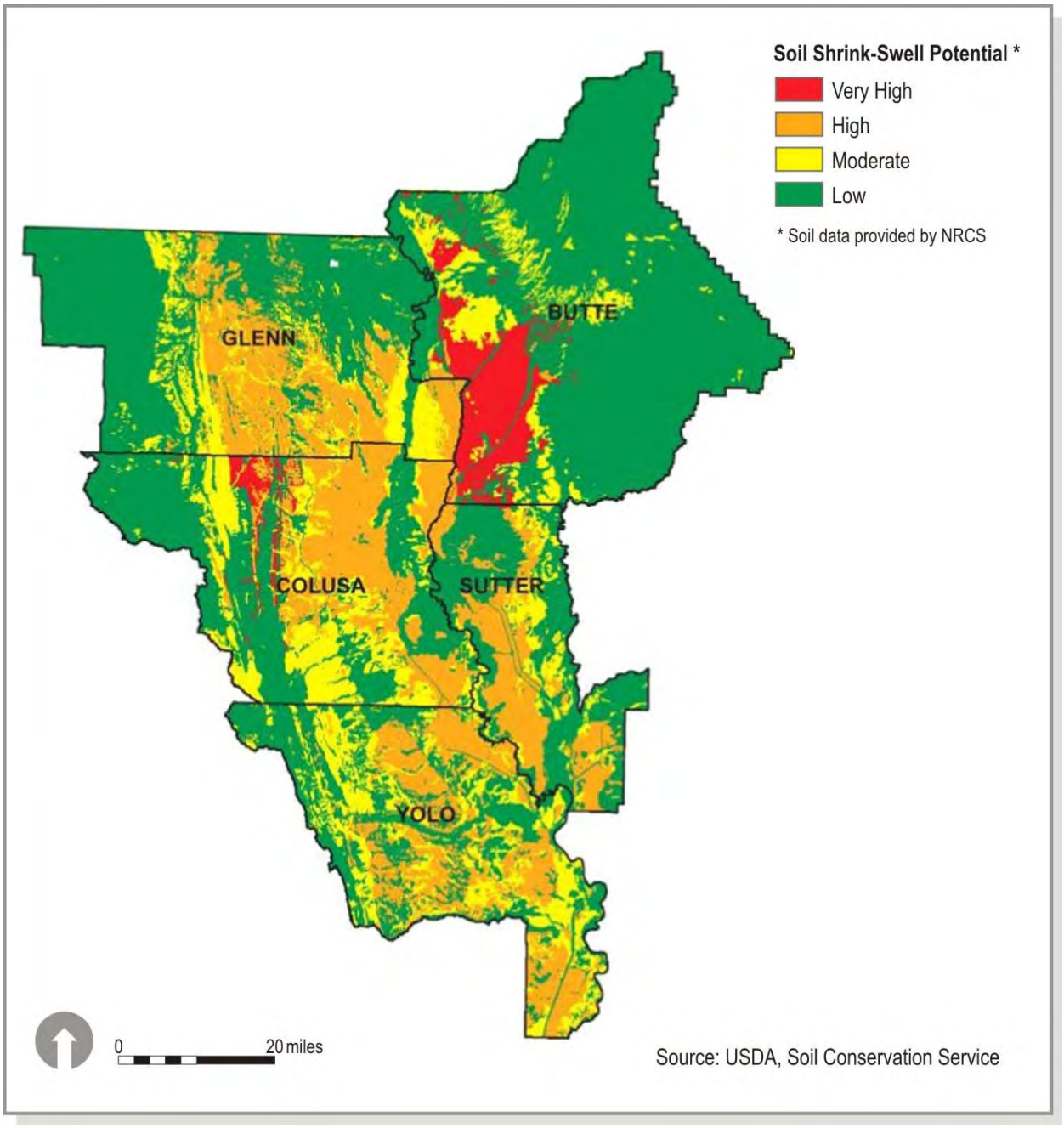



**Figure 3.4.2: Soil Shrink Swell Potential**

### *3.4.1.3 Geology and Soil Properties*

This section describes geology and soil properties in Butte, Colusa, Glenn, Sutter, and Yolo Counties. Figure 3.4-3 shows soil types within the counties.

**Butte County** Butte County includes valley, foothill, and mountain zones. There is little irrigated agriculture in the foothill and mountain zones because soils are generally unsuited for cultivation, but do support forestry and grazing. The region supports some orchard and grain crops in the foothill areas.

The soils associated with the valley area and alluvial fans of Butte County are deep, nearly level, very fertile, and support agricultural practices. Figure 3.4-3 shows soil types in the Sacramento Valley region. 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.

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.

**Colusa County** 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.

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.

Figure 3.4-3 shows soils in Colusa County, which largely consist of gravelly loam and silty clay soil textures. 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.

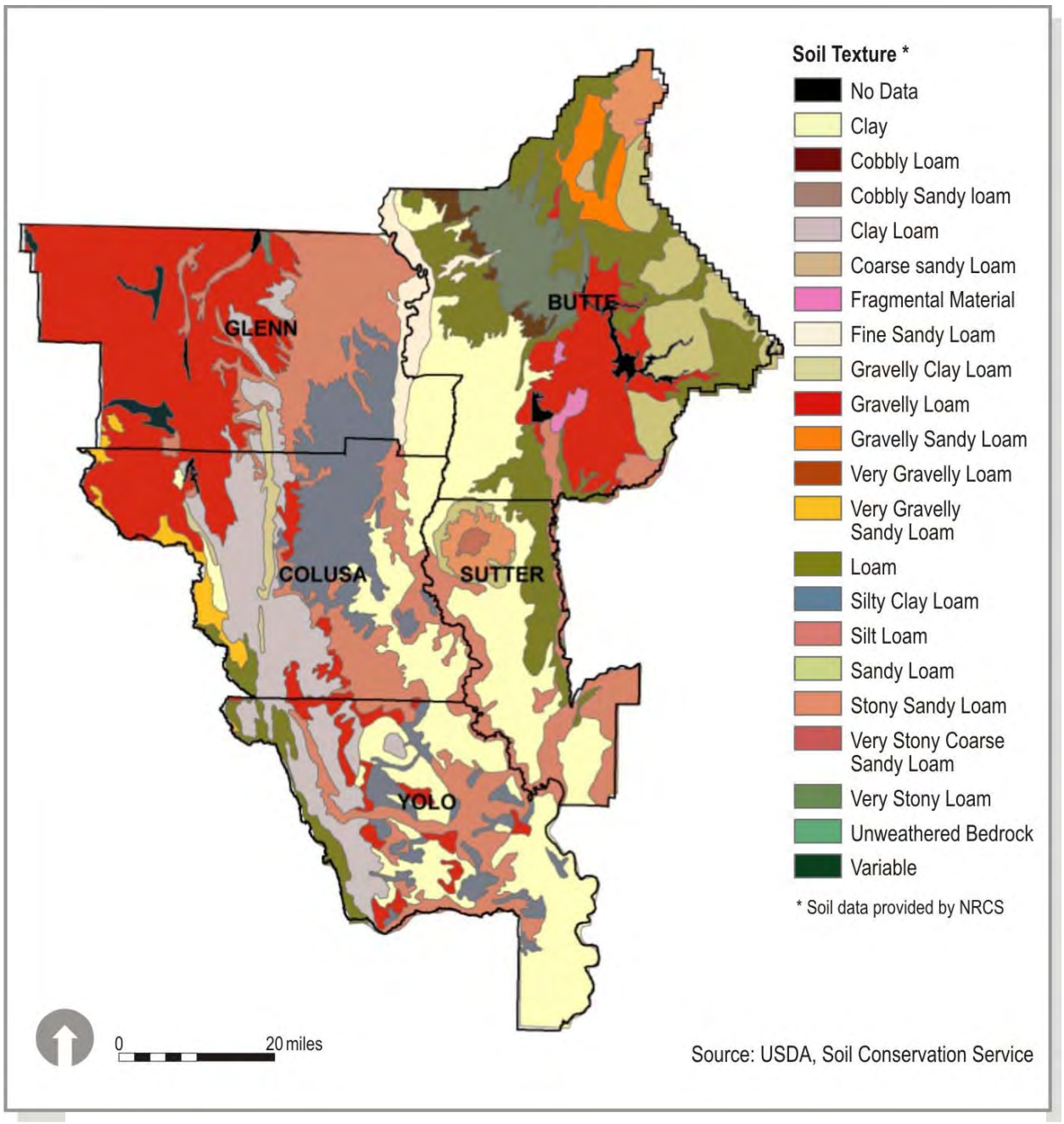



**Figure 3.4-3. Soil Surface Texture**

**Glenn County** 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. 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.

Western soils are designated as cobbly-loam. The southeastern area includes silty clay soils. The central portion of the county contains clay loam soils. Weathered bedrock is found specifically in the northern central part of the county.

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.

**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 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).

**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.

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.

## 3.4.2 Environmental Consequences

### *3.4.2.1 No Action*

Under the No Action Alternative, the 2010-2011 Water Transfer Program would not occur. Non-CVP transfers would likely occur that could include some crop idling. Some CVP transfers could also occur if the proponents complete environmental documents and obtain Reclamation approval. Under normal farming practices, farmers would continue to idle some fields because of economic factors or as part of a crop rotation. Normal farming practices would involve loosening of soils during land preparation and harvesting, which could increase potential effects from soil erosion. Crop idling under water transfers and as normal crop rotations would also leave some soils susceptible to erosion. Most of the soils in the Sacramento Valley have some clay content in them, which reduces erosion potential. For other soils, farmers often manage potential soil erosion impacts to maintain crop yields. Therefore, there would not be substantial impacts from wind erosion.

### *3.4.2.2 Proposed Action*

*Cropland idling water transfers could potentially cause expansive soils to shrink due to the reduction in applied irrigation water*. Expansive soils shrink and swell depending on moisture. Under existing conditions, agricultural soils in the counties where cropland idling is proposed swell and shrink in response to winter rains and irrigation cycles (soils are irrigated, then left to dry out, then irrigated again). The Proposed Action may increase the extent of soil shrinkage due to lack of irrigation. However, because the proposed idling lands are agricultural and subject to normal swelling and shrinkage, structures or roads in the vicinity of the cropland are also subject to the same changes. The shrinking and swelling of soils due to cropland idling would not have adverse effects on these structures or roads. Therefore, potential impacts from soil instability under the Proposed Action would not be substantial.

*Cropland idling water transfers that temporary convert cropland to bare fields could increase soil loss from wind erosion*. In the case of rice crops, the 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.

The Proposed Action includes additional crops that could be idled under a water transfer, which could be planted on soils more susceptible to erosion. Figure 3.4-3 shows soil texture within the Sacramento Valley. In general, soils that contain some percentage of clay content are less susceptible to erosion. Soils with a high sand content are generally more erodible; soils classified as sand, sandy loam, or loam can be considered more erodible than other soils. As shown in Figure 3.4-3, major soil types in the Sacramento Valley are clay, clay loam, gravelly loam, and silt loam. Clay and gravelly soils have a slight potential for erosion and would not be affected by wind erosion.

Silt loam soils, present in northern Glenn County, along the Sacramento River, and in portions of Yolo County, have a potential for erosion. The northern valley portion of Glenn County typically grows citrus and subtropical crops, such as olives, which would not be idled under a water transfer. Therefore, erodible soils in this area would not be affected. In other areas with silt loam soils, farmers would likely manage the land during the idling season to reduce potential soil erosion impacts. Soil erosion could affect crop yields in subsequent seasons, which would affect farm production and revenue. Farmers would take measures to avoid this as part of normal farming practices. As a result, there would not be substantial impacts from wind erosion on silt loam soils.

There are some loam and sandy loam soils in the mountain and foothill zones in eastern Butte County that are also susceptible to erosion; however, these areas would not participate in crop idling transfers.

*Cropland idling water transfers would reduce the amount of water applied to the fields and could reduce the potential leaching of salts and other trace elements.* Cropland idling would also reduce applied water to agricultural fields, thereby reducing the potential for salts and other trace elements to leach into the groundwater or be mobilized as runoff and enter nearby water bodies. This would be a beneficial impact. Trace elements bound to soil particles could, however, be mobilized by wind; and these soil particles could travel to adjacent lands as a result of wind erosion of idled fields. Mobilized soil particles would move by saltation, surface creep, or suspension from one field and could replace the soil lost on an adjacent field. Because the soil particles would be blown randomly, it would be unlikely that these particles would concentrate in a single area. The potential for trace elements bound to soil particles to collect at a particular site and affect the soil quality at that site would not be a substantial impact.

# 3.5 Agricultural Land Use

Water transfers including cropland idling and crop shifting could affect land use in agricultural areas. This section describes existing land use conditions in the counties proposed for cropland idling and crop shifting and analyzes the Proposed Action's potential impacts on agricultural land.

## 3.5.1 Affected Environment

Established in 1982, the Farmland Mapping and Monitoring Program (FMMP) produces maps and statistical data used for analyzing effects on California's agricultural resources. FMMP characterizes land use into the following categories:

- **Prime Farmland** – Land with the best combination of physical and chemical features able to sustain long-term production of agricultural crops. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for production of irrigated crops at some time during the two update cycles[2] prior to the mapping date.
- **Farmland of Statewide Importance** – Land similar to Prime Farmland that has a good combination of physical and chemical characteristics for the production of crops. This land has minor shortcomings, such as greater slopes or less ability to store soil moisture than Prime Farmland. Land must have been used for production of irrigated crops at some time during the two update cycles prior to the mapping date.
- **Unique Farmland** – Lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include non-irrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the two update cycles prior to the mapping date.
- **Farmland of Local Importance** – Land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee.
- **Grazing Land** – Land on which the existing vegetation is suited to the grazing of livestock.

[2] An update cycle is 2 years.

- **Urban and Built-Up Land** – Land occupied by structures with a building density of at least one unit to 1.5 acres, or approximately six structures to one 10-acre parcel.
- **Other Land** – Land that does not meet the criteria of any other category. Includes environmental restoration, confined animal facilities, and low density residential.
- **Water** – Water areas with an extent of at least 40 acres.
- **Interim Farmland Mapping Categories** - For farmed areas lacking modern soil survey information and for which there is expressed local concern regarding the status of farmland, Irrigated and Nonirrigated Farmland substitute for the categories of important farmland. Only Butte and Kern counties have Interim Farmland data. The FMMP defines Irrigated and Nonirrigated Farmland as follows:
- **Irrigated Farmland** - Cropped land with a developed irrigation water supply that is dependable and of adequate quality. Land must have been used for irrigated agricultural production at some time during the 4 years prior to the mapping date.
- **Nonirrigated Farmland** - Land on which agricultural commodities are produced on a continuing or cyclic basis using stored soil moisture.

The most recent Farmland Conversion Report states that steady urbanization resulted in accelerated losses of irrigated farmland during the 2004-2006 period compared with the 2002-2004 period (Department of Conservation [DOC] 2008). During the 2004-2006 period, California's total farm and grazing lands decreased by 275 square miles (176,014 acres, as documented by the FMMP). The highest quality farmland, Prime Farmland, comprised 46 percent of the loss (81,247 acres). The following sub-sections describe agricultural land use in Butte, Colusa, Glenn, Sutter, and Yolo counties.

**Butte** In 2006, of the 1,073,254 acres mapped in Butte County, 649,736 acres were in agricultural use, 44,803 acres were urbanized, 22,819 acres were water and 355,896 acres were "other" (DOC 2008a). Of the acres classified as agricultural land in 2006:

- 196,219 acres were Prime Farmland;
- 21,604 were Farmland of Statewide Importance; and
- 24,235 were Unique Farmland (DOC 2008a).

**Colusa** In 2006, of the 740,392 acres mapped in Colusa County, 567,621 were in agricultural use, 4,877 acres were urbanized, 1,911 acres were water, and 165,983 acres were "other" (DOC 2008a). Of the total agricultural acres inventoried in 2006:

- 200,182 were Prime Farmland;
- 2,170 were Farmland of Statewide Importance;
- 123,318 were Unique Farmland; and
- 232,921 were Farmland of Local Importance (DOC 2008a).

**Glenn** In 2006, a total of 576,502 acres of agricultural land was inventoried. Of this:

- 161,685 acres were Prime Farmland;
- 87,867 acres were Farmland of Statewide Importance;
- 17,469 acres were Unique Farmland; and
- 80,290 acres were Farmland of Local Importance (DOC 2008a).

**Sutter** The 2006 inventory of land use categories and land use changes included 389,439 acres in Sutter County. Of this, 343,772 acres were agricultural land. Within the agricultural land subgroup:

- 165,817 acres were Prime Farmland;
- 107,194 acres were Farmland of Statewide Importance; and
- 19,245 acres were Unique Farmland (DOC 2008a).

**Yolo** The California Department of Conservation, Division of Land Resource Protection inventoried a total of 653,453 acres in Yolo County in 2008. Of these: 540,591 acres were agricultural land; 29,343 acres were urban; 7,815 acres were water; and 74,356 acres were "other" (DOC 2008a). The agricultural land was further divided into:

- 257,893 acres of Prime Farmland;
- 16,989 acres of Farmland of Statewide Importance;
- 50,197 acres of Unique Farmland; and
- 65,173 acres of Farmland of Local Importance (DOC 2008a).

Since 1992, the acreage of planted rice in the Sacramento Valley has varied from a low of approximately 370,000 acres in 1992 to a high of over 562,000 acres in 2004. 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.

The maximum annual decline of rice acreage was 72,000 acres from 2000 to 2001. Rice acreage increased by 81,300 acres in the 2004 season from 2003.

Rice acreage in all counties, except Sacramento County, has increased since 1992; the largest increase was in Colusa County.

## 3.5.2 Environmental Consequences

### *3.5.2.1 No Action*

Under the No Action Alternative, water transfers for the 2010-2011 Water Transfer Program would not occur. Cropland idling or crop substitution would occur for non-CVP transfers, CVP transfers (covered under individual NEPA documentation and with Reclamation approval), or under normal farming practices. As part of crop rotations, farmers frequently remove some lands are temporarily 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; however, in the long-term, agricultural land uses would remain largely the same as existing conditions. Short-term water transfers would also not affect long-term agricultural land use because the farmers would presumably put the land back into production after the transfer year.

Under the No Action Alternative, some farmers may need to idle crops in the San Joaquin Valley because of water shortages. Farmers would likely look to alternative water supplies, such as groundwater, if transfers were not available under the No Action Alternative. With alternate water supplies, there would be no permanent changes to land uses. If supplies are not available, some farmers may take land out of production for either the short-term or the long-term. Depending on the severity of the shortage under the No Action Alternative, effects to land use may be temporary or long-term.

Under the No Action Alternative, the trend of land conversion from agricultural uses to urbanization and non-agricultural uses would likely continue and could possibly accelerate. Population growth is a major factor resulting in the reduction of agricultural lands. Urban water supply reductions and growing populations have increased urban water demand, and lower agricultural prices have increased farmers' willingness to sell.

Statewide and Federal programs to preserve open space and agricultural lands would continue to be implemented under the No Action Alternative. 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.

#### *3.5.2.2 Proposed Action*

*Water transfers via cropland idling could alter agricultural land use conditions.* The Proposed Action includes idling transfers up to 90,400 acre feet, which would be up to a maximum of 27,400 acres of rice land in a transfer year. If farmers choose to idle or shift field crops other than rice, the maximum acreage idled would increase because of the lower water requirements of other crops. The maximum amount of crop acreage proposed for idling under the 2010-2011 Water Transfer Program would be within normal annual variations of farmed land in the region. Table 3.5-1 shows that rice acreage has varied over 80,000 acres in subsequent years, which is more that the proposed maximum rice idling acreage. Annual variations in other field crops can be even greater because many are rotated in multi-crop sequences.

**Table 3.5-1. Estimated Sacramento Valley Rice Production (acres) from 1992-2007 by County.**

| Year | Butte | Colusa | Glenn | Sacramento | Sutter | Yolo | Yuba | Total | Total Annual Change |
|---|---|---|---|---|---|---|---|---|---|
| 1992 | 76,300 | 94,800 | 65,800 | 8,900 | 73,100 | 19,000 | 31,700 | 369,600 | -- |
| 1993 | 79,300 | 112,000 | 74,500 | 10,400 | 81,000 | 21,400 | 31,300 | 409,900 | 40,300 |
| 1994 | 88,000 | 123,000 | 81,000 | 11,500 | 90,000 | 26,700 | 34,000 | 454,200 | 44,300 |
| 1995 | 83,000 | 122,000 | 79,000 | 10,300 | 82,000 | 27,000 | 32,000 | 435,300 | -18,900 |
| 1996 | 97,000 | 136,000 | 87,000 | 8,800 | 86,000 | 21,600 | 34,000 | 470,400 | 35,100 |
| 1997 | 97,000 | 137,000 | 89,000 | 9,400 | 90,000 | 24,000 | 35,000 | 481,400 | 11,000 |
| 1998 | 88,000 | 121,000 | 83,000 | 9,100 | 91,000 | 20,400 | 37,300 | 449,800 | -31,600 |
| 1999 | 102,500 | 135,000 | 88,000 | 9,700 | 104,500 | 30,000 | 39,200 | 508,900 | 59,100 |
| 2000 | 98,000 | 145,000 | 87,500 | 9,000 | 108,000 | 35,500 | 39,000 | 522,000 | 13,100 |
| 2001 | 86,800 | 126,300 | 78,300 | 7,800 | 87,700 | 26,000 | 37,100 | 450,000 | -72,000 |
| 2002 | 100,000 | 138,500 | 87,500 | 8,200 | 101,700 | 31,500 | 36,000 | 503,400 | 53,400 |
| 2003 | 87,800 | 138,000 | 82,500 | 8,100 | 96,900 | 32,300 | 35,400 | 481,000 | -22,400 |
| 2004 | 105,800 | 156,400 | 90,300 | 9,600 | 124,000 | 41,900 | 34,300 | 562,300 | 81,300 |
| 2005 | 96,800 | 145,600 | 87,100 | 7,900 | 101,800 | 29,200 | 33,300 | 501,700 | -60,600 |
| 2006 | 99,100 | 145,900 | 87,500 | 3,700 | 106,600 | 28,900 | 33,200 | 504,900 | 3,200 |
| 2007 | 102,000 | 155,000 | 86,500 | 3,700 | 106,000 | 23,800 | 33,700 | 510,700 | 5,800 |
| 2008[1] | 105,300 | 150,200 | 77,800 | 2,500 | 92,300 | 30,000 | 35,300 | 493,400 | -17,300 |
| Average | 94,000 | 134,000 | 83,000 | 8,000 | 95,000 | 28,000 | 35,000 | 477,000 | -- |

Source: Reclamation 2009, CAC 2008
[1]CAC 2009

One-year water transfers under the Proposed Action temporarily take land out of production, but would not affect the long-term agricultural uses of the land. One-year transfers would be similar to a fallowing a field under a normal crop rotation. Farmers would resume planting on the idled field in the following year. There would be no permanent changes to the land. Cropland idling transfers would not affect the long-term designations of Prime Farmland or other FMMP classifications.

Because cropland idling would be temporary and farmers would continue agricultural uses of the land in subsequent years, the land use effects would not be substantial.

Crop shifting actions would not affect land uses because the farmers would continue to produce a crop on the fields included in the water transfer.

## 3.6 Vegetation and Wildlife

This section describes the affected environment related to vegetation and wildlife, including habitat types for special-status species. This section examines the impacts to general vegetation and wildlife species; Section 3.8 discusses special status species in more detail.

### 3.6.1 Affected Environment

The following sections contain information on the habitat types potentially affected by the Proposed Action. The 2004 Final EWA EIS/EIR contains detailed information on the vegetation and habitat types found in the study area (Reclamation 2004, pgs 10-6 through 10-29). Figure 3.6-1 shows Federal and State wildlife refuges and wildlife areas in the potential transfer area.

Nontidal freshwater permanent emergent 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. The dominant vegetation for nontidal freshwater permanent emergent includes thingrass, spikerush, big leaf sedge, bulrush, redroot nutgrass, tules, cattails, common reed, and water grass. Examples of amphibians include bullfrogs, western toads, and Pacific tree frogs. Birds include herons, egrets, bitterns, merganser, wood duck, and yellow warbler.

Natural seasonal wetland 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 habitat is also found in slow-moving backwater areas along the American River.

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, as well as wading birds, and shorebirds. Special-status animal species associated with natural seasonal wetlands include American peregrine falcon, California gull, greater sandhill crane, long-billed curlew, northern harrier, short-eared owl, Swainson's hawk, merlin, tricolored blackbird, white-tailed kite, GGS, California red-legged frog, California tiger salamander, western spadefoot toad, conservancy fairy shrimp, Delta green

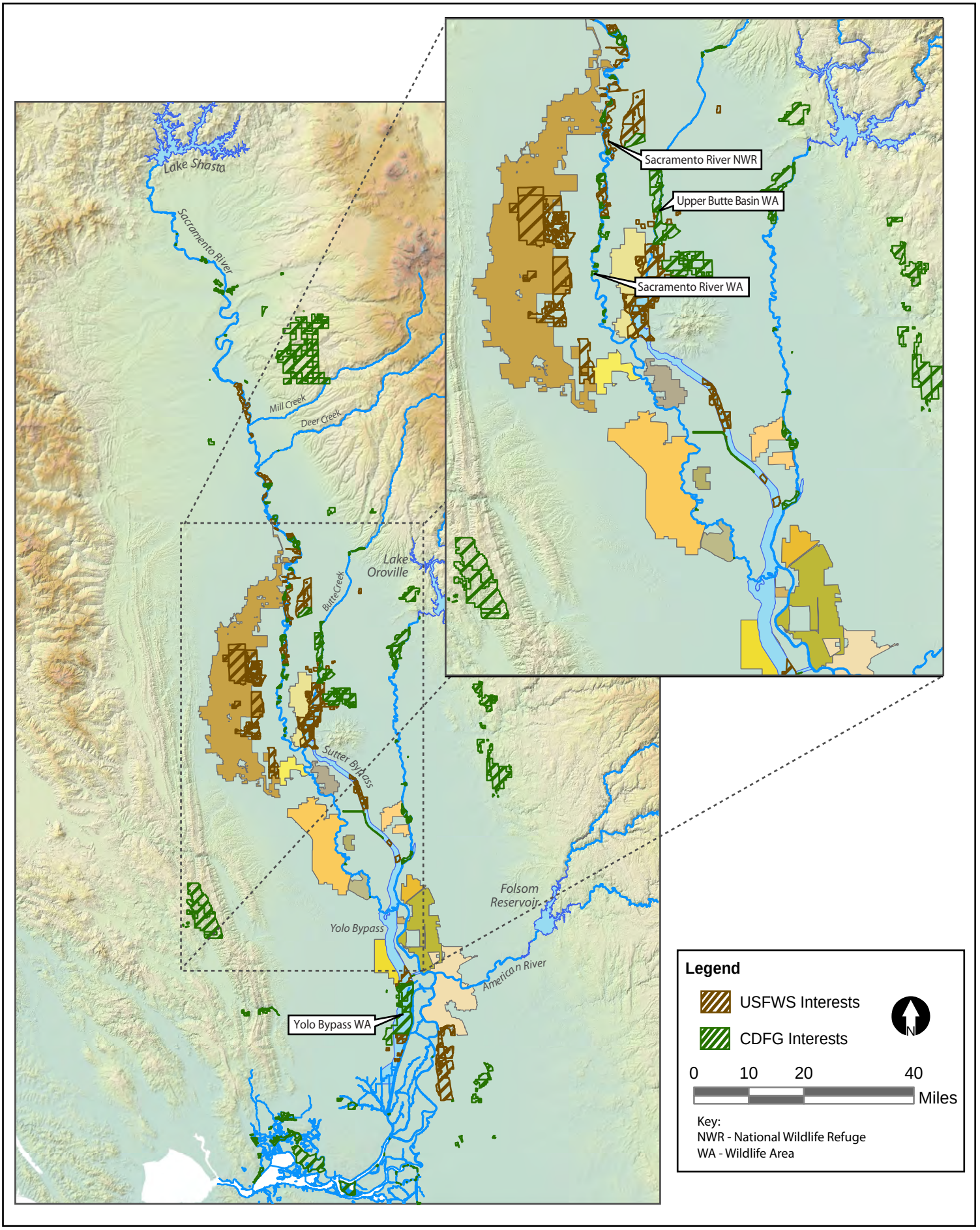



**Figure 3.6-1. Federal and State Wildlife Refuges and Wildlife Areas**

ground beetle, longhorn fairy shrimp, mid-valley fairy shrimp, California linderiella, 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, Jepson's milkvetch, 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 on the west side of the Sacramento River generally occur between Willows and Dunnigan along the Colusa Basin 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). Managed seasonal wetland 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 (Llano Seco Rancho Wildlife Area).

Dominant managed seasonal wetland habitats can include the same vegetation as for natural seasonal wetlands. Managed seasonal wetland habitats are often managed for waterfowl such as mallards, pintails, American widgeon, and Canada and other geese. Managed seasonal wetland habitats also support a variety of wading birds and shorebirds, such as herons, egrets, terns, and gulls. Special-status animal species associated with managed seasonal wetlands 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, GGS, western pond turtle, California red-legged frog, and vernal pool tadpole shrimp. Special-status plant species associated with managed seasonal wetlands 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 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 Corps (Sacramento River Advisory Council 2001). This project protects the levee system owned and maintained by the State of

California. 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 1991). On the Sacramento River, controlled flows have resulted in a higher percentage survival through lack of scouring and a continual provision of moisture reducing losses from desiccation (Strahan 1985).

The river inundation frequency is also affected by changes in hydrology. 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 2001, 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, mule deer, and a number of bat species. Special-status animal species associated with valley foothill riparian habitat include greater western mastiff bat, ringtail, riparian brush rabbit, San Joaquin Valley woodrat, western yellow-billed cuckoo, California black rail, 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, GGS, 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 (button-celery), marsh checkerbloom, lone buckwheat, Indian valley brodiaea, Milo Baker's lupine, Keck's checkerbloom, soft bird's beak, fox sedge, rose-mallow, northern California black walnut, and Sanford's arrowhead.

Montane Riparian habitat occurs along the Sacramento River between Red Bluff and Shasta Reservoir. Montane riparian 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 valley foothill riparian, a wide variety of wildlife is supported by riparian habitats. Special-status species associated with montane riparian habitat include California wolverine, Sierra Nevada red fox, great grey owl, greater western mastiff bat, ringtail cat, 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, red mountain catchfly, and saw-toothed lewisia.

Seasonally flooded agriculture is found throughout the Sacramento Valley.

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 produced 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, and egrets. Other invertebrates and their larvae can be found in very shallow water, particularly during an early to midseason drawdown. Invertebrates found in these areas (e.g., 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. Appendices A and B further describe special status species with the potential to occur in the area of analysis.

Upland cropland habitat includes agricultural lands farmed for profit that are not seasonally flooded. Upland cropland areas are found throughout the Sacramento Valley. For this analysis upland crops include alfalfa, milo, rye grass, sudan grass, sunflower, wild rice, tomatoes, melons, onions, vine seed, sugar beets, corn, beans, cotton, wheat, and safflower. Upland cropland vegetation throughout the Sacramento Valley is dominated by cereal rye, barley, wheat, milo, corn, dry beans, safflower, sunflower, alfalfa, cotton, tomatoes, lettuce, Bermuda grass, ryegrass, tall fescue, almonds, walnuts, peaches, plums, and grapes and other fruits and vegetables. Most of these crops are annuals; planted in the spring and harvested during summer or fall. Wheat and other dryland grains are planted in the fall and harvested in the late spring, early summer. Sugar beets can also be left over winter and harvested in the spring.

Wildlife use of upland crop areas varies throughout the growing season with crop type, level of disturbance, and available cover. Upland crop fields provide important foraging habitat for a variety of wildlife species. Many species forage on crops (waste and otherwise) and other food found within the fields, such as invertebrates. Typically various birds and rodents consume the crops

and invertebrates and then raptors feed on the birds and rodents. Irrigation ditches associated with upland cropland can contain wetland vegetation such as cattails, which provide cover habitat for rails, egrets, herons, bitterns, marsh wrens, sparrows, and common yellowthroats. Upland cropland special-status species includes Aleutian Canada goose, California gull, greater sandhill crane, long-billed curlew, mountain plover, northern harrier, Swainson's hawk, tricolored blackbird, western burrowing owl, white-faced ibis, and white-tailed kite.

## 3.6.2 Environmental Consequences

### *3.6.2.1 No Action*

Under the No Action Alternative, water transfers for the 2010-2011 Water Transfer Program would not occur. Some cropland idling and groundwater substitution would occur upstream from the Delta under non-CVP or other water transfers. These transfers could affect wildlife habitat provided by croplands. Some habitat may be reduced because of agricultural to urban land conversion that would occur under the No Action Alternative. Reservoirs and river flows would be similar to existing conditions; therefore, available riparian habitat would not substantially change under the No Action Alternative.

In the export service area, water shortages could occur. Some water transfers would likely occur absent the Proposed Action; however, they would not likely cover the total water shortage. Some cropland would likely be taken out of production, which may affect some species that depend on cropland for foraging.

### *3.6.2.2 Proposed Action*

The Proposed Action includes Environmental Commitments incorporated into the project description to reduce potential impacts to vegetation and wildlife resources. Section 2.3 lists the Environmental Commitments. The following analysis considers the implementation of the Environmental Commitments in evaluating impacts to vegetation and wildlife.

*Groundwater substitution transfers would alter ground water levels and potentially affect natural and managed seasonal wetlands and riparian communities, upland habitats and wildlife species depending on these habitats.* 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. Natural and managed seasonal wetlands and riparian communities often depend on surface water/groundwater interactions for part or all of their water supply. Under the Proposed Action, subsurface drawdown related to groundwater substitution transfers could result in hydrologic changes to nearby streams and marshes, potentially affecting these habitats. Reduced

groundwater elevations could also affect 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 Draft Technical Information for Groundwater Substitution Water Transfers in 2010 (Reclamation and DWR 2009) discusses how groundwater substitution transfers could affect groundwater levels and surrounding beneficial uses, including the environment. Reclamation and DWR identify minimization measures to avoid and reduce potential adverse effects from groundwater substitution transfers, including monitoring and mitigation plans to implement before, during, and after the groundwater substitution transfer. Reclamation requires sellers to implement mitigation and monitoring for approval of the transfer. Mitigating for adverse effects to groundwater levels and accounting for surface water/groundwater interaction in the available transfer water would avoid substantial impacts to species and their habitats. Therefore, 2010 and 2011 groundwater substitution transfers would not have substantial adverse effects on habitats or wildlife species.

*Cropland idling transfers may decrease flows to downstream natural and managed wetlands and riparian communities dependent on agricultural return flows.* Landowners with managed seasonal wetland communities often depend upon agricultural return flows for part or all of their water supply. To avoid this potential impact, sellers will be required to maintain flows at the downstream end of their distribution system to minimize potential water supply effects to neighboring and downstream water users (see Section 2.3 Environmental Commitments). As part of the monitoring program to ensure compliance with the contractual requirements, Reclamation will periodically verify that the seller is adhering to the agreement and that no effects are occurring. As a result of this commitment, downstream managed seasonal wetland communities that depend on agricultural return flows would not be adversely affected by 2010 and 2011 cropland idling transfers.

*Rice land idling transfers would reduce habitat and forage for resident and migratory wildlife populations.* The Proposed Action includes cropland idling transfers that would provide up to 90,400 acre feet of water. If all the water came from rice idling, approximately 27,400 acres of rice would be idled in Butte, Colusa, Glenn, Sutter, and Yolo counties, which harvested about 493,400 acres of rice in 2008 (CAC 2009). It is likely that fewer rice acres would be idled than the maximum because some farmers would choose to idle or shift additional crops. Rice fields provide 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. Due to the high concentration of wildlife and vegetation that inhabit

seasonal wetlands and seasonally flooded agricultural wetlands, loss of suitable habitat for species is likely under the Proposed Action.

For successful breeding, "pair", upland nesting areas, and "brood water" habitats are needed. "Pair" water consists of shallow water (4-12 inches deep) in wetlands, ditches, or small ponds that are adjacent to upland nesting fields. These areas have good invertebrate populations that are believed to be the primary food source of pre-laying hens. Once the young have fledged, "brood water" is needed to support the hen and ducklings. Spring and summer wetlands can serve as suitable brood water providing these wetlands have a sufficient quantity of invertebrate foods, contain vegetative cover for protection from predators, and are located near upland nesting sites. Spring/summer wetlands that are flooded for part of the year (such as rice fields/duck hunting sites) can provide good duck brood habitat. Cropland idling of approximately 20 percent of the current acreage of rice fields in the Sacramento Valley would have the following effects:

- Elimination of "pair" habitat of permanent residents who use winter flooded rice fields during the months in early spring. This will also eliminate "brood" water habitat that would normally be available during the spring and summer when rice is grown.

- Elimination of shallow flooded winter rice fields that wintering waterfowl use for night roosting and for food (vegetation and invertebrates). Flooded rice fields are frequented more than the natural wetlands by invertebrates as the winter progresses. Rice fields are also relied upon more heavily than natural wetlands as the winter progresses for dense cover at night since natural wetlands vegetation becomes prostrate and trampled, thus lacking needed protective cover.

With idling transfers under the Proposed Action, there is still a large amount of forage and other habitat available to waterfowl within the Sacramento Valley. Although some waterfowl habitat may be affected, the overall effect would not be substantial.

Loss of habitat as a result of water transfers would also affect special status species. Appendix B summarizes occurrence and potential effects to special status wildlife species. Section 3.8 discusses potential impacts to GGS, black tern, greater sandhill crane, and western pond turtle, which are the species likely to be affected by rice land idling under the Proposed Action.

*Idling/shifting of upland crops could alter habitat for some upland species.* Upland cropland provides forage, resting, and nesting habitat for a variety of wildlife. Many species, including waterfowl, rely heavily on agroecosystems to meet lifecycle requirements. Cropland idling/crop shifting transfers could result in either bare land, affording little wildlife habitat, or a substitute crop with

varying wildlife value. The value of crop to wildlife as habitat varies greatly from corn and wheat, with significant wildlife benefits, to cotton, with little or no benefit. Standard farming practices throughout the Sacramento Valley are to rotate fields between crops that often offer different wildlife benefits. Cropland idling/shifting actions involving upland crops would be similar to normal crop rotation practices that vary wildlife habitat value; however, there would likely be additional idle fields relative to the No Action Alternative.

Grain crops (including corn, beans, milo, and sunflower) primarily provide mostly crop forage for birds and mammals both pre and post-harvest. Waste grain per acre typically ranges from 106-320 pounds per acre for wheat, sorghum, and corn (Ringleman 1990). Reduction in the availability of waste grain as forage to wildlife would result in an adverse effects to those species dependent upon waste grain for a large portion of their forage. The special status species that would be potentially affected by idling of upland crops are all birds capable of quickly dispersing to other areas. There is still a large amount of forage and other habitat available to wildlife species within the Sacramento Valley. Because less than 20 percent of the crop acreage would be affected by transfers, idling of upland crops would not adversely impact wildlife species.

## 3.7 Fisheries

This section describes the affected environment related to fisheries, including special status species. This section examines the impacts to general fish species; Section 3.8 discusses special status species in more detail.

### 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 DWR and Metropolitan WD reservoirs in southern California.

Species of primary management concern were selected to be analyzed for project effects based upon their ecological, commercial, and recreational significance (Table 3.7-1). Fish species listed under the Federal or California endangered species acts are both ecologically and institutionally important; some listed species are also recreationally and commercially important. The Federal-and/or state-listed species within the area of analysis are winter-run Evolutionarily Significant Unit (ESU) and spring-run ESU Chinook salmon (O*ncorhynchus tshawytscha)*, Central Valley Distinct Population Segment (DPS) steelhead *(O. mykiss)*, delta smelt (*Hypomesus transpacificus)* southern DPS green sturgeon (*Acipenser medirostris*), and longfin smelt (*Spirinchus thaleichthys*). Recreationally or commercially important species include

American shad (*Alosa sapidissima*), striped bass (*Morone saxatilis)* and fall and late-fall run Chinook salmon. Several species were also identified due to their ecological significance and sensitivity to flow and temperature: Pacific lamprey (*Lampetra tridentata*), white sturgeon (*Acipenser transmontanus*), Sacramento splittail (*Pogonichthys macrolepidotus*), and hardhead (*Mylopharodon conocephalus*)). Additional species of management concern are found in the Southern California Export Service Area south of the Transverse Ranges and include Southern California Coastal DPS steelhead (*O. mykiss*), tidewater goby (*Eucyclogobius newberryi*), Santa Ana sucker (*Catostomus santaanae*), and unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*).

**Table 3-7.1. Fish Species of Special Management Concern**

| Status | Species | Location (Area of analysis) | Primary Management Consideration[1] |
|---|---|---|---|
| Listed | Winter run Chinook Salmon | Upstream and Delta areas | FE,SE |
| | Spring run Chinook Salmon | Upstream and Delta areas | FT,ST |
| | Central Valley Steelhead | Upstream and Delta areas | FT, Recreation |
| | Southern California Steelhead | Export Area | FE, Recreation |
| | Delta smelt | Upstream and Delta areas | SE,FE |
| | Santa Ana sucker | Export Area | FT |
| | Tidewater goby | Export Area | FE |
| | Stickleback | Export Area | SE,FE |
| | Green sturgeon | Upstream and Delta areas | FT, Recreation |
| | Longfin smelt | Upstream and Delta areas | ST |
| Commercial | Fall/late-fall Chinook Salmon | Upstream and Delta areas | Commercial, Recreation. |
| Recreational | Striped bass | Upstream and Delta areas | Recreation |
| | American shad | Upstream and Delta areas | Recreation |
| Ecological | Hardhead | Upstream and Delta areas | Ecological |
| | Splittail[2] | Upstream and Delta areas | Ecological |
| | Pacific Lamprey | Upstream and Delta areas | Ecological |
| | White sturgeon | Upstream and Delta areas | Ecological, Recreation |

[1] FE-Federal endangered, FT-Federal threatened, SE-state endangered, ST-state threatened, FC-Federal candidate
[2] Under a Federal District Court ruling, the splittail rule has been remanded to USFWS. Splittail continue to be treated as a listed species.

#### *3.7.1.1 Upstream from the Delta*

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

Fish species of primary management concern from the Sacramento River area of analysis include winter-run Chinook salmon, spring-run Chinook salmon, fall-run Chinook salmon, late fall-run Chinook salmon, steelhead, Sacramento splittail, American shad, striped bass, white sturgeon, and green sturgeon.

#### *3.7.1.2 Delta*

Reclamation operates CVP facilities in the Delta, including the Jones PP, Tracy Fish Collection Facility, and Delta Cross Channel. SWP facilities in the south Delta include Clifton Court Forebay, Skinner Fish Facility, Banks PP, 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 PP occurs.

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, delta smelt, longfin smelt, Pacific and river lamprey, striped bass, and American shad (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).

#### *3.7.1.3 Export Service Area*

The Export Service Area includes San Luis Reservoir, Anderson Reservoir, Castaic Lake, Lake Perris, Diamond Valley Lake, and Lake Mathews. Some fish from the Delta may enter these water bodies, especially San Luis Reservoir, via the CVP and SWP pumps. These 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.

Species of management concern in the Southern California area south of the Transverse Ranges include Southern California Coastal DPS steelhead (*O. mykiss*), tidewater goby (*Eucyclogobius newberryi*), Santa Ana sucker (*Catostomus santaanae*), and unarmored, threespine stickleback (*Gasterosteus aculeatus williamsoni*)

### 3.7.2 Environmental Consequences

#### *3.7.2.1 No Action*

Under the No Action Alternative, water transfers for the 2010-2011 Water Transfer Program would not occur. Other water transfers could occur from upstream from the Delta to the Export Service Area. Water transfers involving conveyance through the Delta under the No Action Alternative would be implemented within the operational parameters of the Biological Opinions on the Continued Long-term Operations of the CVP/SWP and all other regulatory

restrictions in place at the time of implementation of the water transfers. The Endangered Species Act Section 7 consultation and Essential Fish Habitat consultation for special status fish species completed for those projects covers water transfers. Therefore, there would be no additional effects from water transfers under the No Action Alternative.

#### *3.7.2.2 Proposed Action*

*Water transfers could affect fisheries and aquatic ecosystems in water bodies, including Sacramento and American River systems, the Sacramento-San Joaquin Delta, San Luis Reservoir, and DWR and Metropolitan WD reservoirs in southern California.* Water transfers involving conveyance through the Delta under the Proposed Action would be implemented within the operational parameters of the Biological Opinions on the Continued Long-term Operations of the CVP/SWP and all other regulatory restrictions in place at the time of implementation of the water transfers. The Endangered Species Act Section 7 consultation and Essential Fish Habitat consultation for special status fish species completed for those projects covers water transfers.

Under the Proposed Action, water transfers would be conducted to meet Environmental Commitments in Section 2.3 of this document. These Environmental Commitments would reduce the effects of the Proposed Action on fisheries resources throughout the project area. These commitments include meeting flow and temperature requirements in the North of Delta rivers, minimizing the effects of groundwater pumping on streamflow, making release water flows similar to what would occur without cropland idling, making water transfers through the Delta in July through September, when most the most sensitive lifestages of the management species and particularly listed species are absent. Additionally, reservoir levels in Shasta Reservoir and other project reservoirs would not be changed substantially to affect fish habitat. Because of the Environmental Commitments, 2010 and 2011 water transfers would not adversely affect fish species of special management concern.

The Proposed Action could also result in increased flow in the Sacramento River during some portions of some years. Moving the maximum amount of water available from the Proposed Action (195,937 acre feet) during the period from July 1 through September 30 could result in an average flow increase in the Sacramento River of approximately 1,100 cfs. Average flow in the Sacramento River at Freeport in dry and critical years ranges from approximately 12,500 cfs in September to approximately 16,700 cfs in July (DWR 2009). The induced increase in flow under the Proposed Action would be about 6 to 9 percent. These flow changes would generally be considered to improve habitat conditions for salmonids. Sudden changes in flows could induce young salmon to move downstream prematurely. To avoid this potential effect, large flow changes should be ramped slowly.

# 3.8 Special Status Species

## 3.8.1 Affected Environment

Section 3.6 and Section 3.7 contain information on special-status species that have the potential to occur in the project area. However, not all of these species have the potential to be affected by the Proposed Action. Terrestrial species potentially affected by the Proposed Action include GGS (*Thamnopphis gigas*), San Joaquin Kit Fox (kit fox) (*Vulpes macrotis mutica*), greater sandhill crane (*Grus canadensis tabida*), black tern (*Chlidonias niger*), and western pond turtle (*Actinemys marmorata*). The following listings apply to the above species under the Federal and California Endangered Species Acts (ESA).

- Giant Garter Snake – listed as threatened under the Federal and California ESAs
- San Joaquin Kit Fox – listed as endangered under the Federal ESA and threatened under the California ESA
- Greater Sandhill Crane – listed as threatened under the California ESA and is fully protected under the California Fish and Game Code
- Black Tern – listed as a State Species of Concern
- Western Pond Turtle – status is under review under the Federal ESA and listed as a State Species of Concern

Appendix B and Appendix C summarize occurrence and potential effects to special status wildlife and plant species. Further information on the affected environment for greater sandhill crane, black tern and western pond turtle is provided in the 2004 Final EWA EIS/EIR in the Action Specific Implementation Plan (Reclamation 2004, pgs 3-42 through 3-52 and 3-63 through 3-67). The 2009 Drought Water Bank Biological Opinion includes further information on life stages and habitat of the GGS (USFWS 2009).

## 3.8.2 Environmental Consequences

### *3.8.2.1 No Action*

Under the No Action Alternative, water transfers for the 2010-2011 Water Transfer Program would not occur. Other water transfers could occur from upstream from the Delta to the Export Service Area. Water transfers involving conveyance through the Delta under the No Action Alternative would be implemented within the operational parameters of the Biological Opinions on the Continued Long-term Operations of the CVP/SWP and all other regulatory restrictions in place at the time of implementation of the water transfers. The

Endangered Species Act Section 7 consultation and Essential Fish Habitat consultation for special status fish species completed for those projects covers water transfers. Therefore, there would be no additional effects to special status fish from water transfers under the No Action Alternative.

Cropland idling transfers under the No Action Alternative could affect special status species habitat provided by croplands.

#### *3.8.2.2 Proposed Action*

*Water transfers could change reservoir releases and river flows and potentially affect special status fish species and essential fish habitat.* Special-status fish species within the Proposed Action's area of analysis include winter- and spring-run Chinook salmon, steelhead, delta smelt, longfin smelt and green sturgeon. Based on the Environmental Commitments described in Section 2.3, water transfers would not adversely impact these species.

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 (USFWS 2008, NMFS 2009) and all other regulatory restrictions in place at the time of implementation of the water transfers, the Endangered Species Act Section 7 consultation and Essential Fish Habitat consultation for special status fish species completed for those projects covers 2010 and 2011 water transfers as well, and no further consultation is required.

*Water transfers via rice land idling could potentially affect special status wildlife species and habitat.* Certain special-status species, such as the giant garter snake, rely on, to varying degrees, seasonally flooded agricultural lands, in particular rice fields and their associated uplands, drainage ditches, irrigation canals, and dikes. Rice land idling actions could reduce the amount of suitable habitat for special status species.

**Giant Garter Snake** The 2010-2011 Water Transfer Program would result in loss of habitat for GGS from rice fields that are idled or converted to other crops. Rice idling or shifting actions could affect the GGS that use flooded rice fields for foraging and protective cover habitat during the summer months. The GGS displaced from these areas would need to find other areas to live and may face increased predation risk, competition, and reduced food supplies. This may lead to increased mortality, reduced reproductive success, and reduced condition prior to the start of the overwintering period.

The 2009 Drought Water Bank Biological Opinion (USFWS 2009) identified conservation measures to reduce the potential effects of water transfers on listed species, particularly GGS. These conservation measures are included as Environmental Commitments for the 2010-2011 Water Transfer Program (Section 2.3). The primary conservation measures applicable to seasonally

flooded agricultural lands (i.e. rice fields) include: limiting the size of idled land blocks to less than 320 acres with no more that 20 percent of rice fields being idled in any one county, maintaining ditch habitat and ditch water flows, maintaining a depth of at least two feet of water in all major irrigation and drainage canals to provide movement corridors, not idling parcels of land between refuges that serve as corridors, and not idling the same field consecutively. Additionally, research and monitoring for GGS would be implemented under the Environmental Commitments. A GGS Monitoring and Research Strategy for the Sacramento Valley has been developed to implement parts of the Draft Recovery Plan for this species. Monitoring and research studies will include both long- and short-term studies to identify GGS distribution and abundance, obtain population information for GGS in the Sacramento Valley by conducting baseline surveys, and determine rice land habitat relationships for GGS. Research goals and monitoring strategies can be referenced in the 2009 Drought Water Bank Biological Opinion.

By implementation of the Environmental Commitments, some GGS would successfully relocate to find alternate forage, cover, and breeding areas. A proportion of the displaced individuals would be lost due to lack of habitat and predation. Because of the lack of available data on the population of GGS inhabiting rice fields, it is unknown how many individuals would be lost or survive. In the 2009 Drought Water Bank BO, which incorporated in the Conservation Measures described in Section 2.3, the USFWS concluded that the 2009 Drought Water Bank was unlikely to jeopardize the GGS population. As these measures are incorporated in the 2010-2011 Water Transfer Program, the Program would not likely adversely affect GGS.

**Kit Fox** Under the Proposed Action, transfer water would not to lead to the conversion of annual crops to permanent (woody) crops since water transferred for agricultural demand would only be applied to currently cultivated lands. This objective would be achieved by using transferred water to irrigate lands that were previously irrigated within the last four years (2006-2009). Kit foxes prefer open annual grassland habitats with abundant small prey item food sources. By ensuring that the conservation measures will not allow the conversion of these annual agricultural grasslands to woody crops, kit fox habitat will be maintained and habitat loss will be minimized. The 2010-2011 Water Transfer Program would not likely adversely affect the kit fox.

**Greater Sandhill Crane** Cropland idling of seasonally flooded agricultural land could reduce the amount of over-winter forage for migratory birds (Reclamation 2004). In order to limit reduction in the amount of over-winter forage for migratory birds, Reclamation and DWR 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. Based on these measures,

2010 and 2011 cropland idling transfers would not adversely affect the greater sandhill crane.

**Black Tern** Cropland idling of seasonally flooded agricultural land could reduce the amount of nesting and forage habitat during the summer rearing season, which could adversely affect the species (Reclamation 2004). As part of the review process for the identification of areas acceptable for cropland idling, Reclamation and DWR will review current species distribution/occurrence information from the Natural Diversity Database and other sources that include rookeries, breeding colonies, and concentration areas. Reclamation and DWR will avoid cropland idling actions that could result in the substantial loss or degradation of suitable habitat in areas that support core populations of evaluated species, and are essential to maintaining the viability and distribution of evaluated species. Conservation measures proposed for GGS in the BO will also benefit the black tern. Based on these measures, 2010 and 2011 cropland idling transfers would not adversely affect the black tern.

**Western Pond Turtle** Ditches and drains associated with rice fields provide suitable habitat for the western pond turtle. To ensure that effects of cropland 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 dry out completely. Conservation measures identified for GGS in the BO will also benefit the western pond turtle. Based on these measures, cropland idling transfers would not likely to adversely impact the western pond turtle.

*Water transfers via upland crop idling could potentially affect special status wildlife species and habitat.* Upland cropland idling has the potential to affect a number of special-status species includes Aleutian Canada goose, California gull, long-billed curlew, mountain plover, northern harrier, Swainson's hawk, tricolored blackbird, western burrowing owl, white-faced ibis, and white-tailed kite. Idling would reduce forage areas, but some species would respond by looking for forage in other habitats. There would continue to be a large amount of forage and other habitat available within the Sacramento Valley. Other species, such as the white face ibis, are well adapted to changes in environmental conditions such as drought and flooding; therefore, use of specific areas can vary greatly from year to year depending on habitat conditions.

The Environmental Commitments described for the GGS such as minimizing the block size and avoiding cropland idling actions that could result in the substantial loss or degradation of suitable habitat would also reduce potential effects to special status species. Appendix B summarizes potential impacts to special status species that could occur in the project area.

# 3.9 Air Quality

## 3.9.1 Affected Environment

Air quality effects are assessed in Glenn, Colusa, Yolo, Sutter, and Sacramento counties, where cropland idling and groundwater substitution transfers would originate. 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

Figure 3.9-1 shows the jurisdictions of the local APCD/AQMDs in relation to water districts and counties.

The Upstream from the Delta Region includes portions of the Sacramento Valley Air Basin. 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 ($O_3$), respirable particulate matter ($PM_{10}$), and fine particulate matter ($PM_{2.5}$) are pollutants of concern because concentrations of these pollutants have been found to exceed standards; $O_3$ is a seasonal problem from approximately May through October. Seasonal conditions, such as agricultural harvesting and summer forest fires, affect peak $PM_{10}$ and $PM_{2.5}$ concentrations, which are much higher than the annual average.

On a State level, all counties are designated as nonattainment areas for $O_3$. Colusa and Glenn counties are designated as nonattainment/transitional areas, meaning that during a single calendar year, the State standards were not exceeded more than three times at any monitoring location within the district.

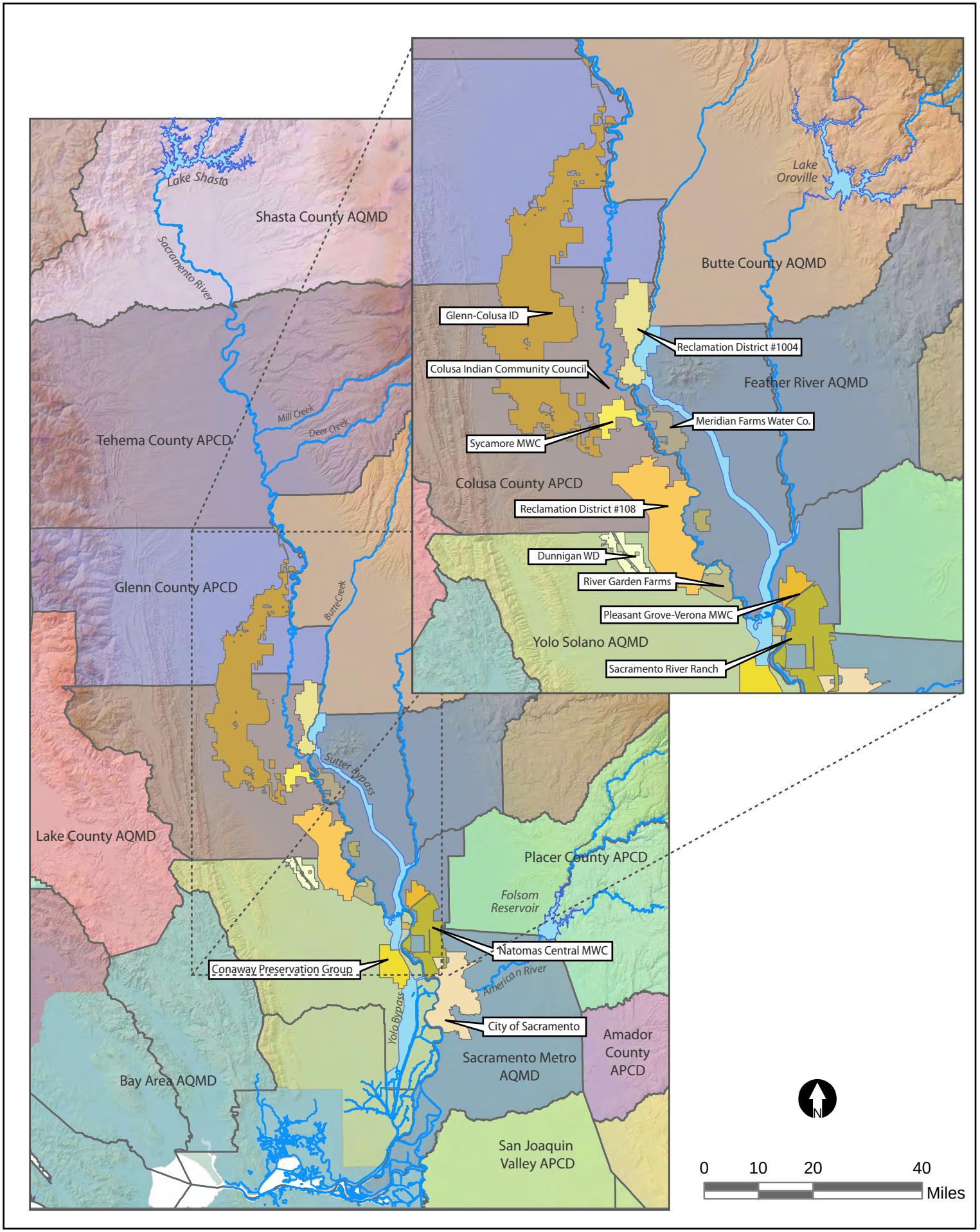



**Figure 3.9-1. Air Districts**

The areas can be reclassified as attainment areas if the state standards are not violated at any site during a three-year period. Butte, Colusa, Glenn, and the northern portion of Sutter counties[3] are classified as moderate nonattainment areas under the State's 1-hour $O_3$ standard, whereas Sacramento, Yolo, and the southern portion of Sutter[4,5] counties are classified as serious nonattainment areas. According to the Federal standards, Colusa, Glenn, and the northern portion of Sutter counties are designated as attainment areas for $O_3$. Sacramento, Yolo, and the southern portion of Sutter counties are designated as serious nonattainment areas for the Federal $O_3$ standard. Butte County and the Sutter Buttes portion of Sutter County[6] are listed as Former Subpart 1 areas.

On June 15, 2005, the 1-hour $O_3$ standard was revoked for most parts of the country and replaced with the 8-hour standard (69 FR 23951). On April 30, 2004, the USEPA issued a rule identifying how it planned to transition from the 1-hour National Ambient Air Quality Standard (NAAQS) to the implementation of the 8-hour NAAQS ("Phase 1 Implementation Rule"). Rules associated with the issues of implementation were divided into two phases with Phase 1 addressing the area designations and classifications, revocation of the 1-hour standard, and anti-backsliding principles; and Phase 2, effective January 30, 2006, dealing with any remaining issues associated with the implementation (70 FR 71612).

Subpart 1 of the Clean Air Act (CAA) contains two sets of requirements regarding the implementation of the $O_3$ NAAQS; subpart 1 contains general requirements that are applicable to nonattainment areas for all pollutants, whereas subpart 2 contains additional requirements for $O_3$ nonattainment areas. When designing the 8-hour implementation rule, the USEPA had to cover a "gap" for areas that were in attainment for the 1-hour standard, but in nonattainment for the 8-hour standard. The USEPA concluded that areas that fell within this gap, such as Butte County and the Sutter Buttes portion of Sutter County, would only be subject to subpart 1 of the CAA and were therefore classified as such in the area designations.

The United States Court of Appeals vacated the Subpart 1 portion of the Phase 1 Implementation Rule on June 8, 2007, thereby reclassifying these areas as "Former Subpart 1" until the reclassification of the areas is finalized (*South Coast Air Quality Management Dist. v. EP*A, 489 F.3d 1295 (DC Cir. 2007)). The USEPA has subsequently proposed to classify Butte County and the Sutter

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[3] The northern portion of Sutter County is under the jurisdiction of the Feather River Air Quality Management District (FRAQMD).

[4] Defined as the "[p]ortion south of a line connecting the northern border of Yolo County to the SW tip of Yuba County and continuing along the southern Yuba County border to Placer County" (69 FR 23858).

[5] Although the northern portion of Sutter County is under the jurisdiction of the FRAQMD, it is a part of the Sacramento Federal Ozone Nonattainment Area (SFNA).

[6] Defined as "[t]hat portion of the Sutter Buttes mountain range at or above 2,000 feet in elevation" (69 FR 23858).

Buttes Portion of Sutter County as marginal nonattainment areas for the 8-hour $O_3$ standard (74 FR 2936).

Table 3.9-1 summarizes the attainment status of the various counties and areas.

**Table 3.9-1. State and Federal Attainment Status**

| County | Attainment Status | | | | | |
|---|---|---|---|---|---|---|
| | CAAQS | | | NAAQS | | |
| | $O_3$ | $PM_{10}$ | $PM_{2.5}$ | $O_3$ | $PM_{10}$ | $PM_{2.5}$ |
| Butte | N[1] | N | N | N[3] | A | N |
| Colusa | N-T[1] | N | A | A | A | A |
| Glenn | N-T[1] | N | A | A | A | A |
| Sacramento | N[2] | N | N | N[4] | N[5] | N |
| Sutter | | | | | | |
| FRAQMD | N[1] | N | A | A | A | N |
| SFNA | N[2,6] | N | A | N[4] | A | N |
| Sutter Buttes | N[1] | N | A | N[3] | A | N |
| Yolo | N[2] | N | A | N[4] | A | N |

*Source: CARB 2009; USEPA 2009.*

Notes:

[1] $O_3$ nonattainment classification (1-hour standard) = moderate

[2] $O_3$ nonattainment classification (1-hour standard) = serious

[3] $O_3$ nonattainment classification (8-hour standard) = marginal (proposed)

[4] $O_3$ nonattainment classification (8-hour standard) = serious

[5] $PM_{10}$ nonattainment classification (24-hour standard) = moderate

[6] On August 27, 2009, the USEPA proposed to reclassify the Sacramento Metro Ozone non-attainment area from serious to severe-15 (74 FR 43654). The current designation and classification is based on the 1997 8-hour standard of 0.080 parts per million by volume (ppmv).

Key:

A = attainment
CAAQS = California Ambient Air Quality Standard
FRAQMD = Feather River Air Quality Management District
N = nonattainment
NAAQS = National Ambient Air Quality Standard
N-T = nonattainment-transitional
$O_3$ = ozone
$PM_{10}$ = inhalable particulate matter
$PM_{2.5}$ = fine particulate matter
SFNA = Sacramento Federal Ozone Nonattainment Area

Agricultural engines are subject to CARB's Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines (17 CCR 93115). The ATCM contains emissions limits on diesel engines greater than 50 brake-horsepower (bhp), particularly for diesel particulate matter (DPM), based on the size and use of the engine. In addition to requiring the use of CARB diesel fuel[7] or an alternative fuel like biodiesel, the ATCM also requires further reductions in emissions from the current standards starting in 2010. In addition, the individual air districts may have their own rules and regulations governing implementation of the ATCM that must be followed. Rules adopted by the various APCDs and AQMDs related to the ATCM and permitting of stationary agricultural diesel engines are summarized below:

[7] "CARB diesel fuel" is defined as diesel fuel that meets the specifications of vehicular diesel fuel, namely meeting a 15 parts per million (ppm) sulfur standard.

**Butte County AQMD**:

- Rule 441 – Registration Requirements for Stationary Compression Ignition Engines Used in Agricultural Operations
- Rule 513 – Registration Fees for Stationary Compression Ignition (CI) Engines Used in Agricultural Operations
- Rule 1001 – Airborne Toxic Control Measure for Stationary Compression Ignition (CI) Engines Used in Agricultural Operations

**Colusa County APCD** – no additional rules

**Feather River AQMD**

- Rule 4.16 – Registration Permits for Compression Ignition Engines Used in Agricultural Operations
- Rule 7.14 – Registration Fees for Compression Ignition (CI) Engines Used in Agricultural Operations

**Glenn County APCD** – no additional rules

**Sacramento Metro AQMD**:

- Rule 215 – Agricultural Permit Requirements and New Agricultural Permit Review
- Rule 311 – Registration Fees for Agricultural Compression Ignition Engines

**Yolo-Solano AQMD**

- Rule 11.3 – Agricultural Engine Registrations

The ATCM requires new stationary diesel-fueled engines to meet certain specific emission standards unless they are remotely located. An engine is defined as a remotely located engine if it is in a Federal ambient air quality area that is designated as attainment for the PM and $O_3$ NAAQS and is more than one-half mile from any residential area, school, or hospital. Assuming that the latter requirement is met (i.e., proximity to sensitive receptors), engines in Colusa or Glenn counties would not be subject to the ATCM.

For other counties, the emission rates specified in Table 3.9-2 for Noncertified ("Tier 0") Engines and in Table 3.9-3 for Tier 1- and 2-Certified Engines[8] are applicable. The different tables reflect the certification status of existing engines and the emission standard that must be met by the respective compliance dates. The ATCM generally requires that any new engines used for agricultural operations meet the current Tier 3 standard, which must then be subsequently replaced with Tier 4 engines at certain compliance dates. Any engines manufactured prior to 1996 (Tier "0" or noncertified engines) must be replaced with Tier 3 engines beginning in 2010. Tier 1 or Tier 2 certified engines must be replaced with Tier 4 engines starting in 2014 or by 12 years after the installation of the engine, whichever is later.

The ATCM does not expressly prohibit the use of diesel engines for agricultural purposes; therefore, diesel engines may be used for groundwater pumping associated with groundwater substitution transfers as long as they are replaced when required by the compliance schedule.

**Table 3.9-2. Emission Standards for Noncertified CI Agricultural Engines > 50 BHP**

| Horsepower Range (hp) | Compliance Date | Diesel PM Not to Exceed (g/bhp-hr)[1] | HC, NOx, NMHC+NOx, and CO Not to Exceed (g/bhp-hr) |
|---|---|---|---|
| 50<hp<75 | 2011 | 0.30 | Off-Road CI Engine Certification Standards for an off-road engine of the model year and maximum rated power of the engine installed to meet the applicable PM standard.[2] |
| 75≤hp<100 | 2011 | 0.30 | |
| 100≤hp<175 | 2010 | 0.22 | |
| 175≤hp<750 | 2010 | 0.15 | |
| hp>750 | 2014 | 0.075 | |

*Source: 17 CCR 93115*

Notes:

[1] The diesel PM standard indicates the emission limit that existing noncertified engines must meet by the given compliance date. The emission rates in the table reflect Tier 3 emission limits (17 CCR 2423). In other words, existing noncertified engines must be replaced with Tier 3 engines (or retrofit, if feasible) by the compliance date.

[2] If no limits have been established for an off-road engine of the same model year and maximum rated power, then the in-use stationary diesel-fueled engine used in an agricultural operation shall not exceed Tier 1 standards in title 13, CCR, section 2423 for an off-road engine of the same maximum rated power irrespective of model year.

Key:

CI = compression ignition
CO = carbon monoxide
g/bhp-hr = grams per brake-horsepower hour
HC = hydrocarbons
NMHC = non-methane hydrocarbons
hp = horsepower

[8] A certified engine is defined as "a CI engine that is certified to meet the Tier 1, Tier 2, Tier 3, or Tier 4 Off-Road CI Certification Standards as specified in title 13, California Code of Regulations, section 2423."

**Table 3.9-3. Emission Standards for Tier 1- and 2-Certified CI Agricultural Engines > 50 BHP**

| Horsepower Range (hp) | Compliance Date | Diesel PM Not to Exceed (g/bhp-hr)[1] | HC, NOx, NMHC+NOx, and CO Not to Exceed (g/hp-hr) |
|---|---|---|---|
| 50<hp<75 | 2015 [2] | 0.02 | Off-Road CI Engine Certification Standards for an off-road engine of the model year and maximum rated power of the engine installed to meet the applicable PM standard.[3] |
| 75≤hp<175 | 2015 [2] | 0.01 | |
| 175≤hp<750 | 2014 [2] | 0.01 | |
| hp>750 | 2014 [2] | 0.075 | |

*Source: 17 CCR 93115*

Notes:

[1] The diesel PM standard indicates the emission limit that existing Tier 1- or 2-certified engines must meet by the given compliance date. The emission rates in the table reflect Tier 4 emission limits (17 CCR 2423). In other words, existing Tier 1- or 2-certified engines must be replaced with Tier 4 engines (or retrofit, if feasible) by the compliance date.

[2] Or 12 years after the date of initial installation, whichever is later

[e] If no limits have been established for an off-road engine of the same model year and maximum rated power, then the in-use stationary diesel-fueled engine used in an agricultural operation shall not exceed Tier 1 standards in title 13, CCR, section 2423 for an off-road engine of the same maximum rated power irrespective of model year.

Key:

CI = compression ignition
CO = carbon monoxide
g/bhp-hr = grams per brake-horsepower hour
HC = hydrocarbons
NMHC = non-methane hydrocarbons
hp = horsepower

## 3.9.2 Environmental Consequences

### *3.9.2.1 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 two year duration of the transfers, however, increases (or decreases) beyond current trends would likely be unnoticeable. Therefore, the No Action Alternative would have minimal effects on air quality.

### *3.9.2.2 Proposed Action*

Groundwater substitution would require use of groundwater pumps to retrieve groundwater. Groundwater substitution would take place in Glenn, Colusa, Yolo, 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.

*Increased groundwater pumping for groundwater substitution transfers would increase emissions of air pollutants.* Electric pumps do not emit pollutants at the pump; the source of pollutants can be traced to emissions from the power plant. Power plants 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 power plant to exceed operating capacity. Although the power plants will be emitting various criteria pollutants from the combustion of fossil fuels, since

the emissions do not occur at the pump, they are not considered in the emission calculations.

Diesel pump engines emit air pollutants through the exhaust. The primary pollutants from the pumps are nitrogen oxides (NOx), total organic compounds (TOC), carbon monoxide (CO), and particulates (including visible and non-visible emissions). Pumps that run on propane burn much cleaner than diesel, but still contribute NOx, carbon dioxide ($CO_2$), volatile organic compounds (VOCs), and trace amounts of sulfur dioxide ($SO_2$) and particulate matter. Ozone is not emitted directly in the atmosphere, but is formed by photochemical reactions by $O_3$ precursors (NOx and VOC); therefore, NOx and VOC are regulated to control emissions of $O_3$.

The pumps that would be used for groundwater substitution are existing pumps; however, they will need to be replaced as necessary following the requirements of CARB's ATCM. Since the ATCM will require more stringent emission limits than the existing pumps, emissions are expected to decrease in the future assuming that the replacement pumps have the same operational schedule as the existing pumps. 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 following sections compare project-related emissions to several standards to determine if emissions would be substantial. The first set of standards is related to local air districts. Each air district has its own criteria for determining significance with CEQA. The various methods and thresholds of significance for CEQA are based on compliance with the CAAQS, which are least as stringent as the NAAQS, if not more stringent. It is therefore assumed that following requirements of CEQA will be sufficient for compliance with NEPA.

The second set of standards is related to the Federal Clean Air Act. The "project" is defined in this case as the total water transfers in nonattainment or maintenance areas. In accordance with CAA, General Conformity was also evaluated. The General Conformity regulations contain certain de minimis thresholds for evaluating emissions; if the total of direct and indirect emissions is below these thresholds, then the project is assumed to conform to the State Implementation Plan and no further action is required for General Conformity.

**Emission Calculations** Emissions from the operation of diesel engines were estimated to evaluate compliance with the emissions thresholds for each air district and for General Conformity. Based on permits to operate obtained for several of the engines, the geometric mean power rating for a typical engine in the area is 200 hp; the geometric mean for the pumping capacity was estimated at 3,550 gallons per minute.

The maximum volume of water sold by each of the agencies involved in the 2010-2011 Water Transfers Program is identified in Table 2-1. Using the estimated size of the engines and the pumping rate, the total hours of operation for each agency were estimated; the engines were assumed to only operate from April to October of each year, or 213 days.[9] Most diesel engines used by the agencies will be subject to the ATCM and must be at least Tier 3 certified in 2010; therefore, the emission limits in the ATCM were used to estimate the project emissions. Diesel engines that meet the "remotely located" criteria in Glenn or Colusa counties are not subject to the ATCM; therefore, these engines were not assumed to be Tier 3 certified.

Applicable standards require calculation of annual and daily emissions associated with the transfers. Table 3.9-4 includes annual emissions for each potential seller. These emissions are totaled for nonattainment areas (Yolo, Sutter, and Sacramento Counties) to provide information for the General Conformity analysis. Table 3.9-5 includes daily emissions by county.

**Local District Standards**

*Colusa and Glenn Counties* Colusa and Glenn Counties do not have individual CEQA Guidelines and are located in attainment areas for $O_3$ and PM. Assuming that any diesel engines used to pump groundwater are remotely located, they will not be subject to the ATCM emission limits; however, they will still be required to be registered. Since the counties are not located in nonattainment or maintenance areas, they are also not subject to General Conformity requirements. A project may be considered significant for these counties if it causes a violation of any air quality standard. Based on a review of each county's New Source Review requirements for permitting stationary sources (Colusa County APCD Rule 3.6; Glenn County APCD Rule 51), a source is required to install Best Available Control Technology (BACT) to continue attainment of the ambient air quality standards when emissions of VOC or NOx are greater than 25 pounds per day or emissions of PM10 are greater than 80 pounds per day.

[9] Groundwater substitution may not start until June or July if the Projects are unable to store transferred supplies in upstream reservoirs. These calculations provide an upper limit for emissions based on the total transferred volume.

**Table 3.9-4. Annual Emissions for Diesel-Fueled Agricultural Engines**

| Water Agency | County | Annual Emissions (tons per year) | | |
|---|---|---|---|---|
| | | Diesel PM | NMHC + NOx | CO |
| Colusa Indian Community Council/Cachil Dehe Band of Wintun Indians | Colusa | 0.05 | 0.49 | 0.44 |
| Conaway Preservation Group | Yolo[2,3] | 0.68 | 13.60 | 11.78 |
| Cranmore Farms (Pinnacle Land Ventures, LLC or Broomieside Farms) | Sutter[2,3] | 0.51 | 10.12 | 8.77 |
| Dunnigan WD | Yolo[2,3] | 0.08 | 1.52 | 1.32 |
| Feather Water District | Sutter | 0.27 | 2.92 | 2.63 |
| Glenn-Colusa Irrigation District | Glenn and Colusa | 1.81 | 19.46 | 17.54 |
| Meridian Farms | Sutter | 0.18 | 1.95 | 1.75 |
| Natomas Central MWC | Sutter and Sacramento[1,2,3] | 0.51 | 10.12 | 8.77 |
| Pelger MWC | Sutter | 0.16 | 1.68 | 1.52 |
| Pleasant Grove-Verona MWC | Sutter[2,3] | 0.49 | 9.75 | 8.45 |
| Reclamation District 108 | Colusa and Yolo[2,3] | 0.25 | 5.06 | 4.38 |
| Reclamation District 1004 | Glenn and Colusa | 0.90 | 9.73 | 8.77 |
| River Garden Farms | Yolo[2,3] | 0.40 | 8.09 | 7.01 |
| Sacramento River Ranch | Yolo[2,3] | 0.16 | 3.26 | 2.82 |
| Sycamore MWC | Colusa | 0.90 | 9.73 | 8.77 |
| City of Sacramento | Sacramento[1,2,3] | 0.15 | 3.04 | 2.63 |
| **Total Emissions by Nonattainment Area** | **Yolo County** | **1.58** | **31.52** | **27.32** |
| | **Sutter County** | **1.77** | **32.90** | **28.62** |
| | **Sacramento County** | **0.66** | **13.15** | **11.40** |
| **Total Emissions in Attainment Area** | **Attainment[5]** | **3.99** | **43.03** | **94.72** |

Notes:
1 Area designated as moderate nonattainment status for $PM_{10}$ (General Conformity de minimis threshold = 100 tons per year).
2 Area designated as nonattainment for $PM_{2.5}$ (General Conformity de minimis threshold = 100 tons per year).
3 Area designated as serious nonattainment for Federal ozone standards (General Conformity de minimis threshold = 50 tons per year) for NOx and VOC (precursors to $O_3$).
4 "Nonattainment" total describes the total emissions from counties that are in nonattainment of the respective air quality standard/pollutant (e.g., Yolo County, southern Sutter County, and Sacramento County).
5 "Attainment" total describes total emissions from counties/areas that are in attainment of the respective air quality standard/pollutant (e.g., Colusa County, Glenn County, and northern Sutter County).

Key:
CO = carbon monoxide
NMHC = non-methane hydrocarbons
NOx = nitrogen oxides
PM = particulate matter
VOC = volatile organic compounds

**Table 3.9-5. Daily Emission for Diesel-Fueled Agricultural Engines**

| County | Daily Emissions (pounds per day) | | |
|---|---|---|---|
| | Diesel PM | NMHC + NOx | CO |
| Colusa[1] | 36.70 | 417.47 | 374.60 |
| Glenn[1] | 25.42 | 274.06 | 246.99 |
| Sacramento[1] | 6.17 | 123.50 | 107.03 |
| Sutter[1] | 19.78 | 343.02 | 299.41 |
| Yolo[1] | 14.80 | 296.00 | 256.53 |

Note:
1 Several of the water agencies have territory that stretches over multiple counties. Since it is not known at this time where the pumps were located, the worst-case emissions were estimated. If a water agency has territory in two counties, then daily emissions were applied to each county; therefore, the total emissions shown in the table is greater than the total of all of the pumps operating simultaneously.

Key:
CO = carbon monoxide
NMHC = non-methane hydrocarbons
NOx = nitrogen oxides
PM = particulate matter

Although the emissions in Table 3.9-5 are higher than these thresholds, the emissions represent cumulative emissions from all engines. Since an individual engine would be required to meet the emission limits discussed above to be approved and permitted, then emissions from individual engines would be less than the thresholds and emissions would not be substantial under NEPA.

*Feather River Air Quality Management District* The Feather River Air Quality Management District (FRAQMD) has significant impact thresholds that are similar to those established in Colusa and Glenn Counties: 25 pounds per day for NOx and VOC and 80 pounds per day for $PM_{10}$ (FRAQMD 1998). Although the significant impact thresholds are geared towards indirect source emissions (i.e., development projects that produce emissions from vehicular traffic to the site, rather than by direct emissions from the facility), the thresholds are assumed to be applicable to stationary source projects as well.

Although the emissions in Table 3.9-5 are higher than these thresholds, the emissions represent cumulative emissions from all engines. The daily limits discussed above are consistent with those included in the FRAQMD's New Source Review Rule (Rule 10.1) for individual emission units. Since the individual engines would not exceed the daily emission limits, emissions in Sutter County would not be substantial under NEPA.

*Sacramento Metropolitan Air Quality Management District* The Sacramento Metropolitan Air Quality Management District (SMAQMD) states in its Draft *CEQA Guide to Air Quality Assessment* (SMAQMD 2009) that a stationary source[10] project is considered to be less than significant if the daily emissions of VOC and NOx are below the SMAQMD's CEQA thresholds of significance: 65 pounds per day for NOx and ROG; if the project complies with the SMAQMD's BACT and emission offset requirements; or if the source emissions are low enough to be exempt from the SMAQMD's permitting program. If agricultural engines exceed the emission thresholds that would trigger permitting, then they would be required to apply for a permit to operate, which would then require compliance with BACT and any emission offset requirements. If emissions are less than the trigger levels, then the diesel engines will be exempt from permitting. Under either scenario, the operation of diesel engines for agricultural purposes would not be substantial under NEPA.

*Yolo-Solano Air Quality Management District* The Yolo-Solano Air Quality Management District (YSAQMD) established thresholds of significance for NOx and VOC of 10 tons per year each and $PM_{10}$ of 80 pounds per day (YSAQMD 2007). Emissions of $PM_{10}$ are not expected to exceed 15 pounds per

[10] A stationary source is typically defined as a single emission unit; however, if a facility has multiple emission points, then the facility as a whole can be referred to as a "stationary source." As a result, when evaluating significance, all emission points (e.g., diesel engines) associated with a party should be evaluated for compliance.

day as a result of the proposed project; however, emissions of $NO_x$ and VOC could exceed the threshold. Emissions would be minimized through measures in Section 3.9.3 and remaining emissions would not be substantial.

**General Conformity** The General Conformity regulation contains specific de minimis thresholds that must be met to avoid triggering a full General Conformity Determination. For the nonattainment regions that are designated serious nonattainment for $O_3$, the threshold is 50 tons per year; for the nonattainment regions that are designated serious nonattainment for $PM_{10}$, the threshold is 100 tons per year; and all nonattainment regions for $PM_{2.5}$ have a threshold of 100 tons per year.

For the purposes of general conformity, the nonattainment area is defined as an area designated as nonattainment under section 107 of the Clean Air Act and described in 40 CFR 81. The nonattainment areas in 40 CFR 81 are defined by counties within each air basin; therefore, the general conformity threshold applies to the total program-related emissions in each county, rather than by the individual water agency or by the larger nonattainment area (i.e., the Sacramento Federal Ozone Nonattainment area, which includes multiple counties).

The highest diesel particulate matter emissions in a nonattainment area are estimated to be approximately two tons per year (Sutter County); therefore, the Program is in compliance with General Conformity requirements for $PM_{10}$ and $PM_{2.5}$. Non-methane hydrocarbons (NMHC), which are also $O_3$ precursors, and NOx emissions are estimated to be approximately 33 tons per year in the worst nonattainment area (Sutter County). Since the engines are subject to a combined standard, it is not possible to estimate the portion of emissions that are NOx versus NMHC; therefore, it is conservatively assumed that the emissions would be all one pollutant. Even with this conservative assumption, the emissions associated with the Proposed Action are expected to be less than the General Conformity de minimis threshold for $O_3$.

**Regional Emissions** The transfer-related emissions, $NO_x$, $PM_{10}$, and $PM_{2.5}$, 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.

*Water transfers via cropland idling would increase $PM_{10}$ emissions.* Acquisition of water via cropland 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 crop fields idled.

The most frequently idled crop would be rice. 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 wind 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 for transfer), 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.

The Proposed Action includes additional crops that could be idled under a water transfer, which could be planted on soils more susceptible to erosion. Because the soils within the potential crop idling areas have slight erosion potential, there would not be substantial effects to water quality. Section 3.4.2 provides further detail on soils in these areas.

#### *3.9.2.3 Minimization Measures*

Minimization measures may not be required if the operation of the diesel pumps meet the thresholds of significance discussed in the previous paragraphs. If the operation of the pumps will result in emissions higher than the various thresholds, then the minimization measures will be used as appropriate to reduce emissions. Based on Reclamation's experience with one-year transfers in the past decade, it is highly unlikely that any of the maximum groundwater substitution acre-feet thresholds would be exceeded in 2010 or 2011.

**Groundwater Substitution** If water is obtained from groundwater substitution, increased groundwater pumping may increase $NO_x$ emissions, although the diesel pumps will be required to meet reduced $NO_x$ emission limits in future years to meet compliance with the ATCM. Emissions calculations in this section assumed that all groundwater substitution transfers in Table 2-1 occur during the same year; however, these figures represent upper limits and may not all occur. Table 3.9-6 shows the maximum amount that could be transferred from Yolo County that would allow the Proposed Action to stay below the General Conformity de minimis thresholds. If all proposed transfers in Yolo County stay below the thresholds, then no additional minimization measures would be necessary.

**Table 3.9-6. Maximum Groundwater Substitution Allowed**

| County | Maximum Groundwater Substitution (acre feet)[1] | Proposed Groundwater Substitution (acre feet) | Difference (acre-feet) |
|---|---|---|---|
| Yolo | 9,091 | 28,659 | (19,568) |

[1] Several water agencies cover multiple counties; therefore, emissions were split equally between each county in these cases.

Cropland idling would reduce emissions from engines associated with farming a crop, such as planting and harvesting equipment. If crop idling occurs in Yolo County, the reduced emissions would reduce the overall emissions from the Program within the area. For each 4.25 acre feet of water obtained through idling rice, an additional 1 acre-foot of water could be obtained through groundwater substitution without increasing the NOx emissions (Byron Buck 2009).

If transfer quantities are greater than those shown in Table 3.9-6, then Reclamation and DWR and willing sellers will work together to implement one, or a combination, of the following minimization measures that is appropriate. The minimization measures will be implemented within the willing seller's air district.

1. Reclamation and DWR 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.

2. Reclamation and DWR 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 cropland 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 Generation

### 3.10.1 Affected Environment

Hydroelectric facilities are a part of the SWP and 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 Reclamation and DWR power plants is an important renewable energy source and, as of September 2009, comprises approximately 26 percent of the online capacity of California hydroelectric facilities. Overall, DWR/Reclamation hydroelectric facilities are nearly five percent of the total online capacity of California power plants (California Energy Commission 2009).

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 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, power plants, and pumping plants not owned or operated as part of the SWP or CVP. The specific hydroelectric facilities are described in the 2004 Final EWA EIS/EIR (Reclamation 2004, pgs 16-7 and 16-11).

Other hydroelectric generation facilities in the area of analysis are owned by investor-owned utility companies such as Pacific Gas & Electric Company and Southern California Edison, by municipal agencies such as the Sacramento Municipal Utility District, and by several other agencies.

Western Area Power Administration (Western) is the marketing agency for power generated at Reclamation's CVP facilities. Created in 1977 under the Department of Energy Organization Act, Western markets and transmits electric power throughout 15 western states. In 2005, the total energy resources from the CVP, one of Western's water resource projects, was 8.2 billion kilowatt-hours (kWh), which includes CVP facility generation of 4.3 billion kWh and 3.9 billion kWh of other power purchases (to support CVP generation). The total

energy delivered by the CVP area in 2005 was 8.2 billion kWh, including CVP facilities energy use (Western Area Power Administration 2005).

## 3.10.2 Environmental Consequences

### *3.10.2.1 No Action Alternative*

Under the No Action Alternative, 2010-2011 Water Transfer Program would not occur. Some non-CVP transfers would likely occur. CVP transfers would also occur if proponents complete their own environmental documentation and obtain Reclamation approval. Water transfers under the No Action Alternative would not change the amount of water that is released from the reservoirs, but could alter the release pattern. Under the No Action Alternative, there would be no substantial changes in CVP/SWP power production or usage, no new power facilities would be constructed or operated, and no facilities would be taken off-line.

### *3.10.2.2 Proposed Action*

*Water transfers via groundwater substitution or cropland idling/crop shifting may cause changes in the release pattern from reservoirs in 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. Reclamation would attempt to retain surface water made available in upstream storage facilities until the Delta export pumps have the capacity available to convey water south. If water is held in Shasta Reservoir for cropland idling/crop shifting and groundwater substitution transfers, power generation could increase in July through September when the water is conveyed from Shasta Reservoir at greater levels than under the No Action Alternative. However, if water is not held in the reservoir, power generation would be the same as the No Action Alternative.

The value of power fluctuates throughout the year. Typically, prices are higher in late summer and fall and lower in the spring. 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 transfer water 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.

*The energy use and related pumping costs at Banks and Tracy Pumping Plants would be higher on an average annual basis compared to the No Action Alternative.* As water acquired through transfers is released downstream in July through September, Delta pumping may increase. However, the pumping increase would not be directly proportional to the increase in reservoir releases. Any water transfers that must move through 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 in the Delta. The value of power fluctuates throughout the year. Typically, prices are higher in late summer and fall and lower in the spring. However, in an open market, seasonal price fluctuations may not always reflect the norm. Altering water release patterns (power production) could produce positive or negative effects. Reclamation would incorporate provisions for potential increases in pumping costs into the requirements for approval of transfers.

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 may include prehistoric and historic districts, sites, buildings, structures, or objects. Some cultural resources are locations 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 that are important to Native American individuals and communities.

Under NEPA (42 USC Sections 4321-4327), Reclamation is required to consider potential environmental impacts and appropriate minimization measures for projects with Federal involvement. A complete list pertinent Federal laws, regulations, and guidance that direct Reclamation cultural resources policies and responsibilities is found in Reclamation's Directives and Standards Manual LND 02-01 for Cultural Resource Management.

### *3.11.1.1 Archaeological Background*

Due to the alternating periods of erosion and deposition that characterize California's Central Valley, many of the Pleistocene landscapes that might hold evidence relating to the earliest human occupations of the area have been eroded away or are under more recent alluvial deposits. Archaeological information about the earliest periods in the region has come in the form of isolated finds on

remnant landforms, including artifacts thought to date to the Paleo-Indian Period (11,550–8550 B.C.) found in the southernmost extent of San Joaquin Valley. Evidence for the Lower Archaic Period (8850–5550 B.C.) in the Central Valley is also sparse, although shells from the Pacific Coast and obsidian from the Sierra Nevada found at sites dating to this period suggest that regional interaction spheres were established early on in prehistory (Rosenthal et al. 2007:151–152).

Archaeological sites dating to the Middle Archaic Period (5550 to 550 B.C.) provide some of the oldest evidence for well-defined cultural traditions in the area. Evidence exists for increased residential stability, logistical organization, riverine adaptations, and far ranging regional exchange during the Middle Archaic (Rosenthal et al. 2007:153-155). The Windmiller Pattern (1850 to 750 B.C.), which shows a widespread uniformity of burial practices, is characteristic of the period. The Upper Archaic (550 B.C. to A.D. 1100) was marked by cultural, economic, and technological diversity. This period also saw the development of large mounded villages in the Delta and lower Sacramento Valley (Rosenthal et al. 2007:156).

During the Emergent Period (A.D. 1100 to historic times), native peoples living in the valley developed the cultural traditions noted at the time of contact with Euro-Americans. These included technological advances such as the bow and arrow and the fish weir. Indigenous trade networks also appear to have changed in the Emergent Period as shell beads assumed the role of currency in the much of the region. The population of the Central Valley, which had been growing steadily since the Middle Archaic, continued to climb in the Emergent Period, and this growth correlates with an intensification of hunting, gathering, and fishing, as well as increased socio-political complexity (Rosenthal et al. 2007:257-259).

#### *3.11.1.2 Ethnographic Background*

At the onset of European colonization of California, the Central Valley was home to an estimated 100,000 people who spoke at least eight different indigenous languages: Wintu, Yana, Nomlaki, Konkow, River Patwin, and Niesenan in the Sacramento Valley, and Miwok and Yokuts in the San Joaquin Valley. Groups speaking these languages shared many common cultural practices associated with technology, subsistence, ceremonial life, and social organization. Downstream from the Delta, the Costanoans—or Ohlone, as their descendants prefer to be called—inhabited the eastern shores of San Francisco Bay, as well as the San Francisco peninsula and the coastal areas south to Point Sur (for detailed information on particular ethnolinguistic groups see entries in Heizer 1978).

The principal form of social organization among the native groups of the Central Valley was the tribelet, which often included a primary village associated with several outlying hamlets. Most settlements consisted of houses

and granaries made of locally available materials (typically bark or tule), as well as semi-subterranean ceremonial structures. Many villages were occupied year-round, except during the fall acorn harvest. Among the Nomlaki and some Yokuts groups, however, people spent most of the year in dispersed family camps in order to exploit diverse ecological zones and only came together during the winter when they shared their surpluses and performed important ceremonies (Lightfoot et al. 2009: 303).

California Indians living in the Central Valley used a wide variety of resources. Acorns were an important food crop throughout much of prehistory, and oak stands were often owned on the individual, family, or tribelet level. Tule, or bulrush, was another principle plant and was used to make clothing, thatch houses, and construct watercraft. For basketry, which was one of the most important items of material culture in the region, native people used tule, ferns, and grasses. The native people ate the small seeds of a number of plants, as well as berries and greens. As elsewhere in California, native people in the Central Valley relied on prescribed burning to maintain a diverse landscape and encourage the growth of desired species. Communal hunts of deer, rabbit, and squirrels were also common in the region. The diets for people living along the valley's many rivers and sloughs also comprised waterfowl and fishes (Lightfoot et al. 2009: 303-338).

#### *3.11.1.3 Historic Background*

Although the Central Valley was not settled by the Spanish as part of the mission system or the associated presidio and pueblo establishments, the Spanish explored portions of the San Joaquin and Sacramento Valleys. Expeditions to the Delta region began in the 1770s and large portions of the Central Valley were explored further in the early nineteenth century as the Spanish sought the inhabitants to gain new converts and punish native raiding parties. After winning its independence from Spain, the Mexican government divided much of its territory in California into individual land grants. While these ranchos, as they came to be known, were primarily near the coast, several ranchos were also granted along the banks of the Sacramento and San Joaquin Rivers. During the Mexican period, Anglo-American trappers made their way into the Central Valley. Jedediah Smith, one of the most notable early explorers, traversed San Joaquin and Sacramento Valleys in the 1820s (Beck and Haase 1974; Hoover et al. 1990).

In the 1840s, increasing numbers of Anglo-Americans began arriving in California, and many of their major trails crossed the Central Valley. After 1848, the Gold Rush era population explosion transformed the region. Cities along the San Joaquin and Sacramento Rivers grew quickly to serve as supply centers and transportation links between San Francisco and the goldfields along the eastern tributaries. By 1849, the placer mines of the foothills were thick with miners; although most were men, they initially came from many occupations and ethnicities. Over time, however, Chinese and Hispanic miners

left the goldfields and sought work in other industries such as agriculture and ranching (Hoover et al. 1990; Rawls and Bean 1998: 91-103). The Central Valley was also the site of important early developments in oil and gas drilling.

By the late nineteenth century, the Central Valley's role as a great agricultural producer was already established. Cattle ranching was especially important in the San Joaquin Valley, and companies such as Miller & Lux and the Kern County Land Company controlled millions of acres of rangeland. With the completion of the transcontinental railway in 1869, farmers in the Central Valley began to export their crops, including many different types of fruits, nuts, and vegetables, to the rest of the nation. The demand for water for gold mining and agriculture led to the development of numerous water conveyance systems in the Central Valley. Early, privately-financed systems were dwarfed by the early twentieth century systems created by municipalities—such as the Hetch Hetchy Aqueduct—as well as those developed by the Federal government, including the Central Valley Project (Beck and Haase 1974).

#### *3.11.1.4 Summary of Potential Cultural Resource Types*

Prehistoric cultural resources in the Central Valley include various types of archaeological sites ranging from small lithic scatters to large mounded village sites, although in the case of the latter, historic-era and modern landscape modifications have destroyed most known examples (Rosenthal et al. 2007:147). Cultural resources that relate to ethnographically-documented villages or personages, or sites that represent Traditional Cultural Properties may also exist. Historic-era cultural resources in the Central Valley may include those associated with early Spanish expeditions or Mexican Ranchos. Resources related to California's Gold Rush, such as mining machinery, sluices, tailings, cabins, and mills are common in the region. Other historic sites include those pertaining to cattle ranches and early transportation routes. Many sites related to ethnic minorities, such as Overseas Chinese communities, are also known to exist in the Delta and in the Central Valley.

Because water transfers would not affect cultural resources in the Delta, no further description of Delta cultural resources or historic properties is included here.

### 3.11.2 Environmental Consequences

#### *3.11.2.1 No Action*

Under the No Action Alternative, surface water facilities would continue to operate in the same manner as under 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 they do under the existing conditions, moving water frequently 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. Without a water transfer assessment and subsequent approval, there would be no "undertaking," as defined by Section 301(7) of the NHPA, and consequently, no initiation of the Section 106 process.

#### *3.11.2.2 Proposed Action*

*Water transfers could change reservoir storage levels potentially exposing cultural resources.* 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 to meet critical needs, and in a manner consistent with existing water usage. The water would not be used to bring new lands into agricultural production or to supplement any specific development.

If reservoir operations associated with implementing water transfers remain within historic levels, then the Proposed Action will result in identical effects to cultural resources as previous conditions. This would have no additional impacts to cultural resources. If the Proposed Action would draw water below historic operation levels, this effect could result in additional impacts to cultural resources no previously affected by reservoir operations. It is not expected that transfers would draw down Project reservoirs beyond historic operational levels. The 2010-2011 Water Transfer Program does not include transfers from local stored reservoir water; therefore, thereby would be no changes in water levels in locally-owned reservoirs. There would be no impacts to cultural resources. Individual transfers that may result in effects to cultural resources may be subject to the considerations pursuant to Section 106 of the National Historic Preservation Act (16 U.S.C. 470) and its implementing regulations at 36 CFR Part 800.

## 3.12 Socioeconomics

### 3.12.1 Affected Environment

Agriculture is a primary industry in the counties upstream from the Delta. In 2008, rice was largest commodity in terms of value of agricultural production and acreage in Butte, Colusa, Glenn, and Sutter counties. In 2008, Butte, Colusa, Glenn and Sutter counties produced 85 percent of the state's total rice

income. Rice ranked third value of production in Yolo County behind processing tomatoes and alfalfa hay (County Agricultural Commissioner [CAC] 2009). In the five counties, total value of production for rice in 2008 was over $1.0 billion (CAC 2009). Total field crop production was valued about $1.4 billion in 2008. Average county rice acreage has remained relatively stable from 2001 to 2008 relative to 1995 to 1999 averages. Table 3.12-1 shows rice acreages in Sacramento Valley counties from 2006 through 2008.

**Table 3.12-1. 2006-2008 Harvested Rice Acreages in Upstream from the Delta Region Counties**

| | 2006 | 2007 | 2008 |
|---|---|---|---|
| Butte | 98,500 | 101,800 | 105,301 |
| Colusa | 145,000 | 154,700 | 150,200 |
| Glenn | 87,000 | 86,300 | 77,770 |
| Sutter | 106,000 | 105,800 | 92,344 |
| Yolo | 28,700 | 23,800 | 30,057 |
| Total | 465,200 | 472,400 | 455,672 |
| Source: CAC 2008, CAC 2009 | | | |

Field crops with relatively high acreages within the Upstream from the Delta Region counties include corn for grain and silage, wheat, and dry beans. In 2008, Yolo County had 37,571 acres of tomatoes for processing and Colusa County had 13,940 acres, but other counties had much fewer acres (CAC 2009). There was limited acreage of sorghum for grain, oats, and barley. Most other agriculture within the counties included fruit and nut trees, including almonds, walnuts, peaches and olives.

Regional economies are typically measured by several economic indicators, including median family income, per capita income, poverty rates and unemployment rates. The indicators are described below and Table 3.12-2 summarizes economic indicators for Butte, Colusa, Glenn, Sutter, and Yolo counties.

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 Butte, Colusa, Glenn, and Sutter counties because of the University of California and the County's proximity to Sacramento. 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.

**Table 3.12-2. 2008 Economic Indicators in Upstream from the Delta Region Counties**

| | Annual Median Family Income | Annual Per Capita Income | Poverty Rate (Individuals) | Unemployment Rate |
|---|---|---|---|---|
| Butte | $48,328 | $22,428 | 21.5% | 11.9% |
| Colusa[1] | $52,645 | $21,561 | 13.4% | 13.9% |
| Glenn[1] | $47,292 | $18,754 | 19.0% | 6.9% |
| Sutter | $55,353 | $21,732 | 17.1% | 11.9% |
| Yolo | $72,132 | $27,530 | 15.2% | 7.6% |

Source: American Community Survey 2009a, 2009b, 2009c, 2009d, 2009e
1 – Colusa and Glenn County data represent 3-year average data from 2006 to 2008 from the American Community Survey. 2008 single year data had not been published as of December 2009.

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 cropland 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 and Clayton 2003 as cited in Reclamation 2009).

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 2008 Final Supplemental EWA EIS/EIR includes further socioeconomic data (Reclamation 2008, pgs 3-7 to 3-11).

## 3.12.2 Environmental Consequences

### *3.12.2.1 No Action*

The regional agricultural economy would remain similar to existing conditions, which fluctuates with market conditions and farm practices. Farmers would continue to temporarily fallow some land due to land practices and other issues, while other farmers would place previously fallowed 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.

In the Export Service Area, some farmers would need to idle cropland because of water shortages. Idling could last for one year or multiple years depending on the length of the shortage. Farm income and employment would decrease as a result of cropland idling. This would be an adverse effect to regional economics under the No Action Alternative.

### *3.12.2.2 Proposed Action*

*Cropland idling/crop shifting transfers would affect output and employment in the Upstream from the Delta counties.* The maximum amount of water made available by cropland idling/crop shifting would be 90,400 acre feet in Colusa, Glenn, Sutter, and Yolo counties. It is assumed that the majority of cropland idled would be rice fields. If only rice fields were idled, the maximum acreage from idling from CVP sellers would be about 27,400 acres. The acreage would increase if farmers choose to idle other field crops because they offer less water available for transfer than rice. Table 2-3 in Section 2 summarizes water available for transfer from each crop eligible for idling/shifting transfers. It is likely that the actual amount of water that is transferred via cropland idling/crop shifting in 2010 and 2011 would be less than the maximum amount proposed in Table 2-1.

Cropland idling transfers have the potential to affect the local economy if they are taken to an extreme. Businesses and individuals that depend on farming related activities would experience some decrease in business if land idling becomes extensive. Crop shifting transfers would have less of an effect because farmers would continue to purchase inputs and hire labor to grow a crop.

Limiting cropland idling to 20 percent of total irrigated crop acreage in the county would not result in substantial effects to the regional economy. Because transfers would last for one year, farmers would likely put the land back into agricultural production in the subsequent year. Economic impacts would be temporary. The economic analysis in the 2004 Final EWA EIS/EIR indicated that idling 20 percent of rice acreage in the upstream of the Delta counties would result in a less than 1 percent change in output, employment, value added and wages and salaries (Reclamation 2004, pg 11-35). At the regional level, this effect would not be substantial. Effects may be more adverse in local communities. Rural communities have a much smaller economic base, and any changes to economic levels would be more adverse relative to a large regional economy. Because of the two-year duration of the 2010-2011 Water Transfer Program and Environmental Commitments to limit cropland idling, economic impacts would not likely be substantial.

Water districts and individuals that receive funds from the sale of water related to these programs would likely continue to spend a portion of their revenues within the local economy. These reinvestments may not benefit those possibly affected by the cropland idling transfers, but can help offset overall economic impacts in the county.

*Water transfers to the Export Service Area would reduce potential water supply shortages.* Water transfers under the Proposed Action would provide water to agricultural and urban areas in the Export Service Area. Increased water supply in agricultural areas would allow farmers to increase irrigation and possibly put previously idled land back into production. Increased irrigation could increase yields and farmer revenues. Farm employment could also increase as farmers produce more crops. This would be a beneficial effect to the regional economy. Water delivered to urban areas would increase urban agencies supplies and reduce potential drought measures or more expensive water supply alternatives. This would be a beneficial effect to urban water customers.

## 3.13 Indian Trust Assets (ITAs)

### 3.13.1 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," 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 a government-to-government level (59 Federal Register 1994) 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 ITAs; 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 ITAs and avoids adverse impacts when possible, or provides appropriate minimization measures or compensation when it does 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 is responsible for assessing whether the implementation the 2010-2011 Water Transfer Program has the potential to affect ITAs. Reclamation will comply with procedures contained in Departmental Manual Part 512.2, guidelines, which protect ITAs from adverse effects of water transfers.

Figure 3.13-1 shows the areas that could implement groundwater substitution transfers. Maidu and Wintun people once inhabited the downstream Colusa Basin section of the Sacramento River (CDM 1995; Glenn Colusa ID, CDFG CDFG, Reclamation, Corps 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 (San Diego State University 2002). The Paskenta Band of Nomlaki Indians has a large tract of trust land in Tehama County, just northwest of Orland, near I-5.

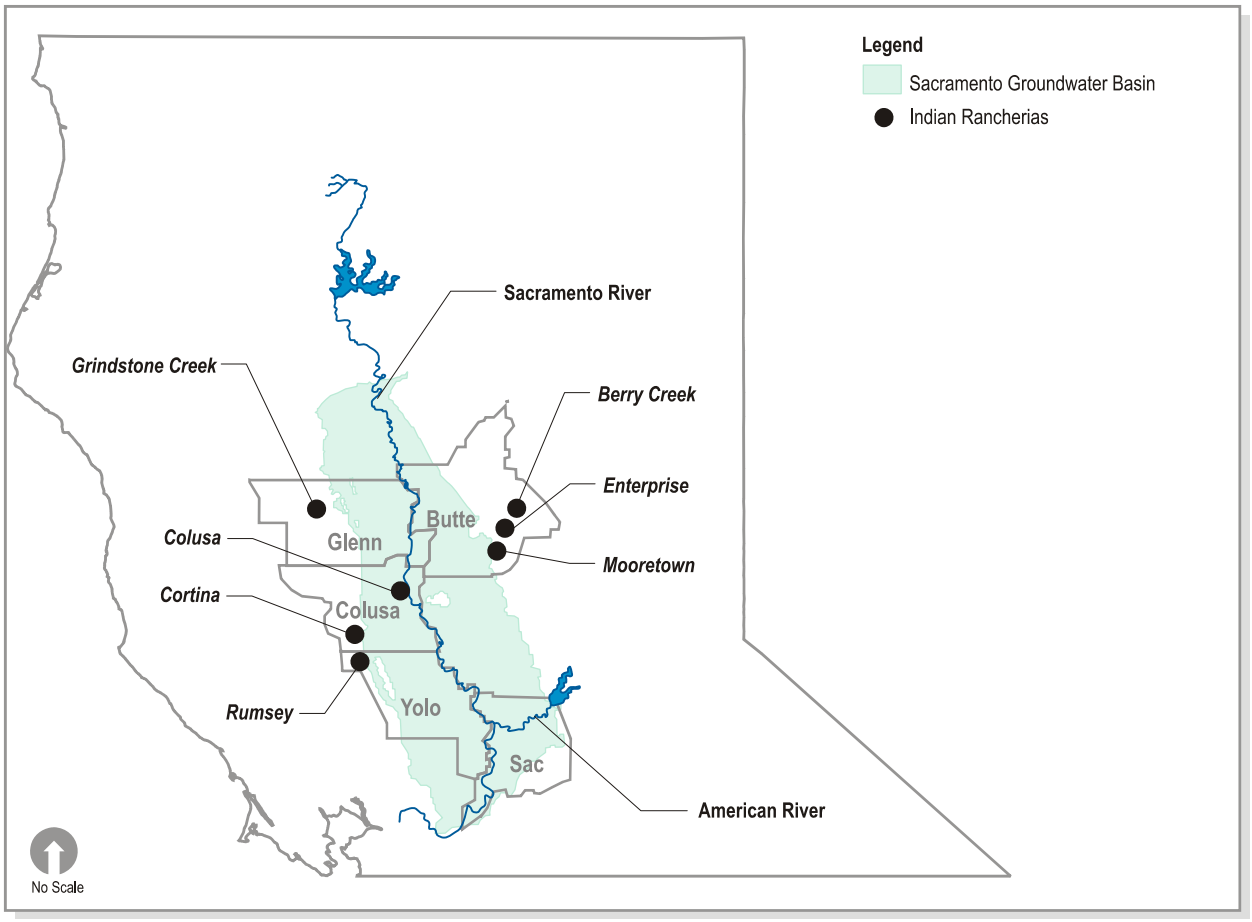



**Figure 3.13-1. Indian Lands Affected by Groundwater Substitution**

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

## 3.13.2 Environmental Consequences

### *3.13.2.1 No Action*

Under the No Action Alternative, the 2010-2011 Water Transfer Program would not occur; therefore, there would be no effects on ITAs. Other water transfers would occur that would need to evaluate impacts to ITAs and consult with Bureau of Indian Affairs, if necessary. Water transfers from existing groundwater storage basins would continue to respect the integrity of Federally-protected lands, minerals, hunting and fishing rights, water rights, and in-stream flows associated with Indian lands. Under the No Action Alternative, farmers might pump more groundwater in years of reduced water supply reliability than they otherwise would. Increased pumping could affect groundwater levels and ITAs; however, ITAs would remain protected and intact through current legislation.

### *3.13.2.2 Proposed Action*

Potential effects on ITAs consider if the Proposed Action would affect Indian trust lands and Federally-reserved hunting, fishing, gathering, water, or other rights. Cropland idling could produce fugitive dust that may affect adjacent land uses. Rainfall, crop production practices, environmental commitments, and minimization measures outlined in previous sections would reduce potential effects to ITAs from cropland idling/crop shifting transfers. Groundwater substitution could result in increased depth to groundwater in neighboring vicinities and/or increasing costs of groundwater pumping.

*Groundwater substitution transfers could interfere with Federally-reserved water rights and 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 (BIA) 2000 Indian Trust Lands map was used to identify reservations and rancherias throughout California. (U.S. Department of the Interior, Bureau of Indian Affairs 2000)

2) The map was overlaid with county borders and the boundaries of groundwater substitution basins.

Figure 3.13-1 shows Indian lands falling within the boundaries of groundwater substitution basins, and therefore potentially affected by potential groundwater substitution actions. These include:

- Colusa Rancheria
- Cortina Rancheria
- Rumsey Rancheria

The exact amounts of groundwater to be pumped and locations of associated groundwater wells for each potential sellers involved in groundwater substitution are unknown. It is possible that fewer tribes and Indian lands than shown in the figure could be affected by groundwater substitution. Tribes in the vicinity of a groundwater substitution transfer could experience well drawdown relative to the No Action Alternative, which could increase costs of pumping water or potentially dry out wells, resulting in a potentially adverse effect.

In order for Reclamation to execute Federal trust responsibilities, Reclamation would evaluate each groundwater substitution well proposed by a seller, regardless of its distance from Indian trust land, for its potential to adversely affect ITAs. Reclamation's policy is to protect and avoid adverse impacts whenever possible (Reclamation 2000).

Sellers would provide the Reclamation with groundwater well and transfer information as discussed the Technical Information for Water Transfers in 2010 (Reclamation and DWR 2009). In general, the transfer proposal would include the location and characteristics of the wells that will be pumped, the volume and schedule of transfer-related groundwater pumping, and a monitoring plan designed to assess the effects of the transfer.

Transfers should:

- Assure that use of extraction wells minimizes risks to surface and groundwater quality;
- Incorporate an adequate monitoring program; and
- Proceed only after appropriate tribal consultation.

If Reclamation identifies potential impacts to ITAs, tribal consultation will then precede any groundwater transfer in the vicinity of the identified tribes. Government–to-government consultation shall take place to determine interests, concerns, effects, and appropriate minimization measures. Consultation may involve the Reclamation, BIA, the Regional Solicitor's Office, and DWR. The agencies will discuss appropriate avoidance and/or minimization strategies on a government-to-government basis. Separate minimization 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 measures as appropriate for reducing effects:

- More frequent groundwater monitoring;
- More detailed pre-purchase groundwater evaluation;
- Estimates of potential interference with Indian wells; and

- Discontinuation of water transfer-related groundwater pumping if groundwater levels are drawn down to a level of concern.

Measures necessary to reduce effects to will be developed in consultation with the affected Federally recognized tribe(s) before implementation. Other measures will be used as determined appropriate through tribal consultation. Consultation and minimization measures would reduce potential adverse effects to ITAs.

# 3.14 Environmental Justice

## 3.14.1 Affected Environment

The concept of environmental justice embraces two principles: 1) fair treatment of all people regardless of race, color, nation of origin, or income, and 2) meaningful involvement of people in communities potentially affected by program actions. The 1994 Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires all Federal agencies to conduct "programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under, such programs, policies, and activities, because of their race, color, or national origin." Section 1-101 of the Order requires Federal agencies to identify and address "disproportionately high and adverse human health or environmental effects" of programs on minority and low-income populations (Executive Order 1994). The concept of environmental justice as applied here is that minority and low-income people should not be disproportionately affected by economic and quality of life effects from the 2010-2011 Water Transfer Program. Cropland idling and crop shifting could affect farm labor employment by temporarily reducing the amount of agricultural land in production or the number of farm workers needed to work existing land. The area of analysis for environmental justice effects is the counties in which cropland idling and crop shifting could take place.

### *3.14.1.1 Demographics*

Table 3.14-1 presents ethnic composition in Butte, Colusa, Glenn, Sutter, and Yolo counties.

**Table 3.14-1. Ethnicities in Counties Potentially Affected by Cropland idling/Shifting (2009) [1]**

| County | Hispanic | White | Asian | Pacific Islander | African American | American Indian | Multirace |
|---|---|---|---|---|---|---|---|
| Butte | 13% | 78% | 3% | 0% | 1% | 2% | 2% |
| Colusa | 51% | 44% | 1% | 0% | 0% | 2% | 1% |
| Glenn | 33% | 59% | 3% | 0% | 0% | 2% | 2% |
| Sutter | 30% | 53% | 13% | 0% | 2% | 1% | 2% |
| Yolo | 30% | 53% | 11% | 0% | 2% | 1% | 3% |

Source: California Department of Finance 2007

Notes: [1] Data is from Baseline 2006 population projections for each county in the year 2009

Table 3.14-2 presents the most recent data on population, employment and poverty in the counties potentially affected by cropland idling and crop shifting.

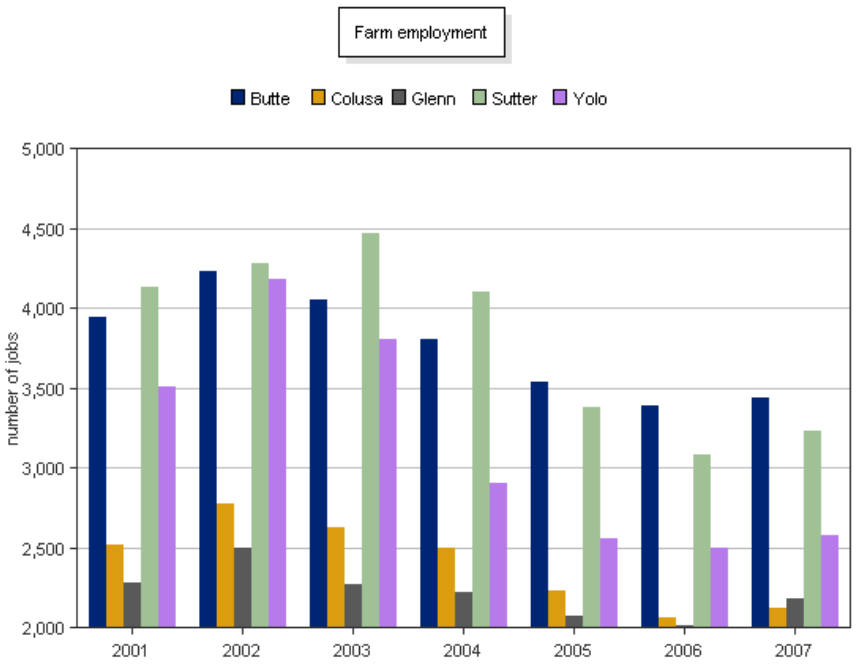
**Table 3.14-2. Demographic Characteristics of Counties Potentially Affected by Cropland idling/Shifting**

| County | Population[1] | Farm Employment[2],a | Number of Farm workers[b] | Unemployment Rate[3], [c] | Persons Below Poverty[4] |
|---|---|---|---|---|---|
| Butte | 226,819 | 3,436 | 2,859 | 12.2 | 17.1% |
| Colusa | 23,305 | 2,123 | 1,766 | 14.5 | 12.7% |
| Glenn | 30,411 | 2,186 | 1,819 | 13.8 | 15.8% |
| Sutter | 100,044 | 3,232 | 2,689 | 15.1 | 12.2% |
| Yolo | 202,673 | 2,584 | 2,150 | 10.9 | 14.5% |
| **California** | **38,688,293** | **239,255** | **199,060** | **12.0** | **13.3%[5]** |

Sources:
[1] California Department of Finance 2007.
[2] U.S. Bureau of Economic Analysis 2007a.
[3] California Employment Development Department 2009.
[4] U.S. Census Bureau 2007.
[5] U.S. Census Bureau 2008.

Notes:
[a] The U.S. Bureau of Economic Analysis defines Farm Employment as: the number of workers engaged in the direct production of agricultural commodities, either livestock or crops; whether as a sole proprietor, partner, or hired laborer.
[b] Farm worker employment shown is 83.2 percent of reported total farm employment.
[c] Unemployment rate numbers are not seasonally adjusted.

Figure 3.14-1 depicts total farm employment in potentially affected counties measured over seven years by the U.S. Bureau of Economic Analysis (2007b). Farm worker employment is about 83.2 percent of reported total farm employment. During 2001 to 2007, farm worker employment has fluctuated. These changes are likely because farmers idle land temporarily under existing conditions, while other farmers place previously idled land back into production.




Source: U.S. Bureau of Economic Analysis 2007b.

**Figure 3.14-1: Farm Employment – Potentially Affected Counties**

The California Employment Development Department makes projections of employment by industry throughout the state. The most recent farm employment projections were made in 2006 and projections go up to 2016 (California Employment Development Department 2006). Table 3.14-3 summarizes this data.

**Table 3.14-3. Total Farm Employment Projections**

| County | Total Farm Employment 2006 | Total Farm Employment 2016 | Percent Employment Change |
|---|---|---|---|
| Butte | 2,500 | 2,200 | -12% |
| Colusa and Glenn[1] | 5,160 | 5,000 | -3.1% |
| Sutter | 4,500 | 4,500 | 0.0% |
| Yolo[3] | 7,500 | 8,200 | 9.3% |

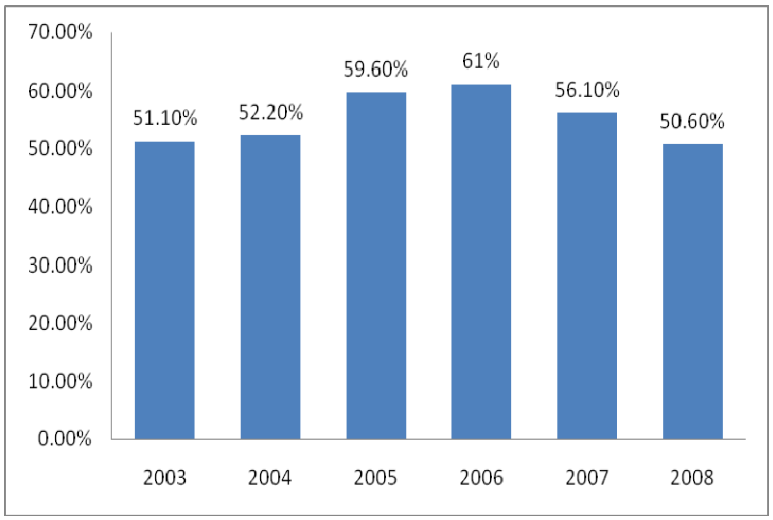
Source: California Employment Development Department 2006.

Notes: [1] Glenn and Colusa are reported as part of the North Valley Region.
[2] Sutter County data is grouped with Yuba into the Yuba City Metropolitan Statistical Area.
[3] Yolo County is reported as part of the Sacramento-Arden Arcade-Roseville MSA

### *3.14.1.2 Farm Worker Profiles*

The 2008 Agricultural Employment Report (California Employment Development Department 2008a) states that Hispanics made up more than two-

thirds (67.9 percent) of the state's agricultural labor force that year. Other races, including African Americans and Asians, made up much smaller percentages with only 1.3 percent and 1.0 percent, respectively. Additionally, over half (52.1 percent) of the agricultural labor force in the state in 2008 was classified as "foreign-born, not a U.S. citizen," in contrast to the less than one-fifth (18.6 percent) of the non-agricultural labor force that was identified as "foreign-born, not a U.S. citizen." Figure 3.14-3 summarizes the percentage of foreign-born noncitizens in the agricultural workforce 2003–2008.




Source: California Employment Development Department 2008a.

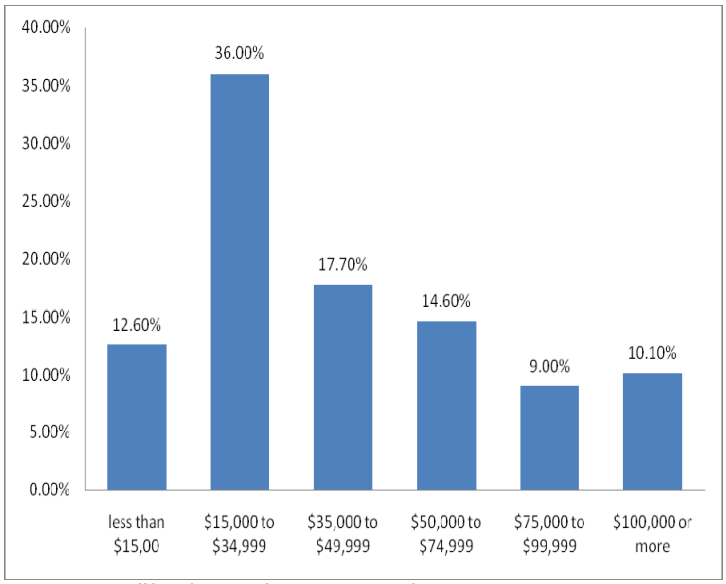
**Figure 3.14-3: Percentage of Foreign-Born Noncitizen Agricultural Workers, 2003–2008**

The average farm worker hourly income[11] in the Sacramento Valley Region (including potentially affected counties) in 2008 was $10.99. In comparison, the average farm worker hourly income in the San Joaquin Valley Region in 2008 was $10.48 and $10.90 in the Central Coast Region (California Employment Development Department 2008b).

The unemployment rate among agricultural workers in California in 2008 was 14 percent. This is an increase from 8.5 percent in 2007 (10.9 percent in 2006). The agricultural worker unemployment rate is also higher than the unemployment rates for nonagricultural workers throughout the state, which was 6.4 percent in 2008, 4.7 percent in 2007, and 4.3 percent in 2006 (California Employment Development Department 2008a). In 2008, close to half of the state's agricultural workers reported an annual family income of less than $35,000. One out of every eight agricultural workers reported an annual

[11] Annual Earnings are computed by the California Employment Development Department for Total Agriculture, Total Production, and Total Crop Production. The averages listed here are for Total Crop Production only.

family income of less than $15,000. Figure 3.14-4 shows the annual family income distribution of agricultural workers in the state in 2008.




Source: California Employment Development Department 2008a.

**Figure 3.14-4: Family Income Distribution for Agricultural Workers in 2008**

## 3.14.2 Environmental Consequences

### *3.14.2.1 No Action*

Under the No Action Alternative, Reclamation would not approve the proposed transfers of CVP water to buyers in 2010 and 2011. Because other transfers might occur under the No Action Alternative, cropland idling could still happen in counties upstream from the Delta in response to potential water shortages. In addition, farmers would continue to idle some land temporarily under normal farm practices. At the same time, other farmers would place previously idled land back into production. As described in Section 3.5.1, several government-sponsored programs would also likely retire land for restoration and habitat purposes. These actions would take agricultural land out of production permanently. This would be a permanent, but likely small, effect to environmental justice.

In the Export Service Area, some agricultural land would be taken out of production due to water shortages. Other transfers would provide some water, but would not likely relieve the total water shortage. Agricultural uses are often the first to be cut in a water shortage, which would reduce farm labor opportunities. The size of employment reductions would depend on the length and severity of the shortage. If long-term, there would be an adverse impact to

environmental justice populations under the No Action Alternative as low income and minority populations would lose job opportunities.

#### *3.14.4.2 Proposed Action*

*Cropland idling/crop shifting transfers could result in disproportionate effects to low-income and minority populations.* The maximum amount of water made available by cropland idling/crop shifting would be 90,400 acre feet in Colusa, Glenn, Sutter, and Yolo counties. It is assumed that the majority of cropland idled would be rice fields. If only rice fields were idled, the maximum acreage from idling from CVP sellers would be about 27,400 acres. The acreage would increase if farmers choose to idle other field crops because they offer less water available for transfer than rice. Because of the farm worker profile, cropland idling could have disproportionate effects on low income and minority farm workers.

The farm labor effects of cropland idling actions would be similar to the effects described in the 2004 Final EWA EIS/EIR; however, cropland idling transfers included in the Proposed Action are less than those analyzed for the EWA. The 2004 Final EWA EIS/EIR calculated that cropland idling would decrease farm worker jobs; however, the majority of job losses due to cropland idling would affect other labor categories, such as administrative jobs and jobs related to agriculture related businesses (Reclamation 2004, pg. 19-10). The analysis indicated that less than 3 percent of total county farm labor would be affected by water transfers. As part of the water transfer approval process, Reclamation will follow the Environmental Commitment that would limit cropland idling to no more than 20 percent of the eligible crops in any county in one year. Therefore, cropland idling would not result in a disproportionate effect on minority and low-income employment.

In general, crop shifting would have smaller labor effects than cropland idling because farmers would continue to produce a crop and would still hire farm labor. Crop shifting would result in no disproportionate effect on minority and low-income employment.

*Water transfers to agricultural areas in the Export Service Area could affect environmental justice.* Water transfers under the Proposed Action would provide water to agricultural users in the Export Service Area. Increased water supply in agricultural areas would allow farmers increase irrigation and possibly put previously idled land back into production. Increased irrigation could increase farm employment as farmers produce more crops. This would be a beneficial effect to environmental justice populations.

# 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 2007). 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 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 Project operations by increasing the need for operations to repulse salt water intruding into the Delta. Such effects have not been examined because of the lack of existing tools for analysis. Climate change is unlikely to make a noticeable difference in operations during the two year period of this EA; therefore, this EA does not try to analyze those changes.

The CARB finalized the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (17 CCR 95100) for major sources of greenhouse gases (GHG). The regulation requires any facility with stationary combustion sources to report if emissions are greater than or equal to 25,000 metric tons per year of $CO_2$.

## 3.15.2 Environmental Consequences

### *3.15.2.1 No Action*

The No Action Alternative would have no effect on climate change.

### *3.15.2.2 Proposed Action*

*Use of diesel-fueled engines for groundwater pumping for groundwater substitution transfers could increase greenhouse gas emissions.* The Proposed Action would have no construction element and would use existing facilities within the range of normal operations; however, emissions of greenhouse gases could increase through the use of diesel-fueled engines for groundwater pumping.

A quantitative analysis was completed to evaluate the impacts of GHG emissions. Emissions of GHG that form as a result of combustion, carbon dioxide ($CO_2$), methane ($CH_4$), and nitrous oxide ($N_2O$), were estimated based on the maximum volume of water used for groundwater substitution. Emissions of carbon dioxide equivalent ($CO_2e$) were estimated using the global warming potential, or the heat-trapping ability of a gas, used by CARB in its Regulation for the Mandatory Reporting of Greenhouse Gases (17 CCR 95100). Table 3.15-1 provides a summary of GHG emissions.

Since emissions of $CO_2$ are less than 25,000 metric tons per year, the threshold used by CARB in its mandatory reporting rule, the Proposed Action would not result in substantial adverse effects to climate change.

**Table 3.15-1. Emissions Inventory for Greenhouse Gases**

| Water Agency | County | CO2e Emissions (metric tons per year) | | | |
|---|---|---|---|---|---|
| | | CO2 | CH4 | N2O | Total |
| Sacramento River Area of Analysis | | | | | |
| Colusa Indian Community Council/Cachil Dehe Band of Wintun Indians | Colusa | 78 | 0 | 1 | 80 |
| Conaway Preservation Group | Yolo | 2,105 | 13 | 39 | 2,157 |
| Cranmore Farms (Pinnacle Land Ventures, LLC or Broomieside Farms) | Sutter | 1,566 | 10 | 29 | 1,605 |
| Dunnigan WD | Yolo | 235 | 1 | 4 | 241 |
| Glenn-Colusa Irrigation District | Glenn and Colusa | 3,132 | 19 | 57 | 3,209 |
| Meridian Farms | Sutter | 313 | 2 | 6 | 321 |
| Natomas Central MWC | Sutter and Sacramento | 1,566 | 10 | 29 | 1,605 |
| Pelger MWC | Sutter | 271 | 2 | 5 | 278 |
| Pleasant Grove-Verona MWC | Sutter | 1,509 | 9 | 28 | 1,546 |
| Reclamation District 108 | Colusa and Yolo | 783 | 5 | 14 | 802 |
| Reclamation District 1004 | Glenn and Colusa | 1,566 | 10 | 29 | 1,605 |
| River Garden Farms | Yolo | 1,253 | 8 | 23 | 1,284 |
| Sacramento River Ranch | Yolo | 504 | 3 | 9 | 517 |
| Sycamore MWC | Colusa | 1,566 | 10 | 29 | 1,605 |
| American River Area of Analysis | | | | | |
| City of Sacramento | Sacramento | 470 | 3 | 9 | 481 |
| Placer County Water Agency | Placer | 0 | 0 | 0 | 0 |
| **Total** | | **16,919** | **105** | **310** | **17,335** |

# 3.16 Visual Resources

## 3.16.1 Affected Environment

The affected environment for visual resources includes Colusa, Glenn, Sutter, Sacramento, and Yolo counties where cropland idling and groundwater substitution transfers could occur. The general area 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. The northern border for this region is the border of Glenn County in the Central Valley. 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.

Because the nature of landscape analysis is very subjective, visual resource analyses are generally qualitative. Assessment methods are guided by the Scenery Management System developed by the United States Department of Agriculture, Forest Service in 1995. Visual resources are characterized as Class A, B, or C, as described below (United States Department of Agriculture, Forest Service 1995).

- Class A - "distinctive": Areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide unusual, unique, or outstanding scenic quality. These landscapes have strong positive attributes of variety, unity, vividness, mystery, intactness, order, harmony, pattern, and balance.
- Class B - "typical": Areas where features combine to provide ordinary or common scenic quality. These landscapes generally have positive, yet common, attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.
- Class C – "indistinctive": Areas where land use has low scenic quality. Often forms of any consequence are missing in Class C landscapes, which have weak or missing attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

Class A and B resources typically include state or Federal parks, recreation, or wilderness areas. Rivers and reservoirs are typically considered Class A or B visual resources. Class C resources generally include areas that have low scenic quality and contain more common landscapes, such as agricultural lands.

Historical changes from grasslands, floodplains, and extensive riparian areas to cropland, rice fields, and orchards have altered the visual variety in the Sacramento Valley. The valley floor is primarily irrigated agriculture that is

Class C – the least visually distinctive category. Important (Class A or B) visual resources on the valley floor include the Sacramento National Wildlife Refuge (NWR) Complex, which contains the Sacramento NWR, Colusa NWR, Delevan NWR, Sacramento River NWR, Sutter NWR, and Butte Sink NWR.

Reservoirs in the region have the greatest level of scenic attractiveness when 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 flow regulations in place. Flow requirements for the various rivers and streams may be found in SWRCB water right permits or licenses, Federal Energy Regulatory Commission hydropower licenses, and interagency agreements. 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. 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

### *3.16.2.1 No Action Alternative*

Under the No Action Alternative, reservoirs would be operated similar to historic conditions and water levels would increase and decrease according to normal operations. River flows would also remain similar to existing conditions. Farming practices would not change from existing conditions, as farmers would

continue to temporarily take land out of production and place other land back into production. The No Action Alternative would have no effects on visual resources.

#### *3.16.2.2 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 be no permanent visual effects associated with transfers under the Proposed Action. The Proposed Action could, however, result in temporary or seasonal changes in the visual landscape.

*Cropland idling water transfers would result in temporary conversion of lands from planted crops to dry fields during the summer growing season, which could change the visual landscape.* As discussed in Section 2.2.3.2, rice provides the highest water yield per acre and is the mostly likely crop that would be idled. A portion of this area's rice acreage, near Interstate 5 and Highway 99, is visible to large numbers of viewers. The specific locations where rice farmland idling would occur are unknown, so it is also unknown whether the idled land would be visible to the general public. Rice acreage is generally considered a Class C visual resource. Each year, some portions of the existing rice acres are idled, creating a patchwork of flooded and dry fields. 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 on 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, when the fields are flooded for rice decomposition. 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. Cropland idling is not a permanent practice, and any visual effects of reduce wildlife viewing would be temporary. Wildlife viewing opportunities at refuges would not change under the Proposed Action.

*Groundwater substitution and cropland idling/shifting water transfers could change Sacramento River flows.* Transfer of water via groundwater substitution and cropland idling/shifting could decrease flows in the Sacramento River if water is retained in Shasta Reservoir until Delta pumping availability in the July through September transfer period. The reduction would represent a minimal decrease in 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.

Sacramento River flows downstream from Shasta Reservoir or the point of diversion would increase July through September relative to the No Action Alternative. Flow increases would not change the character of the landscape; therefore, there would be no adverse effect on visual resources.

*Groundwater substitution and cropland idling/shifting water transfers could change the timing of releases from Shasta Reservoir.* Reclamation would strive to retain surface water made available in upstream storage facilities until the Delta export pumps have the capacity to convey water south. If water is retained in the reservoir, water levels would be higher during those months. The water level would then decline faster in July and August, and September as water for transfers is released; however, levels at the end of the pumping period would be the same as under the No Action Alternative. The same total amount of surface water would be released with water transfer actions as without the water transfers. Differences in water levels from the Proposed Action would not change the character of the landscape or scenic attractiveness (Class A or B) of Shasta Reservoir. The existing "bathtub" ring would be large enough that an additional minor drop 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.

If water is not retained in Shasta Reservoir, there would be no change to visual resources under the Proposed Action because water would be released under the same pattern as the No Action Alternative.

*Groundwater substitution water transfers would increase flows in the lower American River downstream from Folsom Reservoir from July through September.* Releases would increase relative to the No Action Alternative as transferred water is released for pumping through the Delta. Given the limited amount of water available for transfer through groundwater substitution on the American River (up to 3,000 acre feet), flow increases would not change the character of the landscape; therefore, there would be no adverse effect.

*Groundwater substitution water transfers would change surface water elevations in Folsom Reservoir.* During July and August, the surface water elevation at Folsom Reservoir would be lower than under the No Action Alternative as water is released for Delta pumping. Water levels at the end of September would be the same as under the No Action Alternative because the same total amount of surface water would be released by the end of September with water transfer actions as without the water transfers. The small changes in surface water elevation from releases of transfer water (up to 3,000 acre feet under the Proposed Action) would have little effect on Class A or B visual resources of Folsom Reservoir; therefore, any visual effect would be minor.

## 3.17 Growth Inducing Impacts

Sections 1502.16(b) and 1508.8(b) of the CEQ NEPA Regulations require analysis of direct and indirect impacts of growth-inducing effects. Growth-inducing effects under NEPA are a subset of indirect effects, which are defined as effects "which are caused by the action and occur later in time or are farther removed in distance, but are still reasonably foreseeable" (40 Code of Federal Regulations 1508.8(b)).

Direct growth-inducing impacts generally stem from the construction of new housing, businesses, or infrastructure. Indirect growth inducement could result if a project establishes substantial new permanent employment opportunities or if it would remove obstacles hindering population growth such as the expansion or the provision of urban services and infrastructure in an undeveloped area. Induced growth is generally considered to be a substantial impact only if it directly (or indirectly) affects the ability of agencies to provide needed public services, or if it can be demonstrated that the potential growth substantially affects the environment.

The Proposed Action would only be implemented for two years and would not be a permanent water supply. Water transfers would not directly alter or induce growth within the agencies jurisdictions beyond what has already been planned. Buyers would use the water transferred under the Proposed Action for existing demand subject to certain needs criteria. Water transfers would not induce agricultural growth because transfer water must be used on fields that have been irrigated the past three years. The Proposed Action would have no growth inducing impacts.

## 3.18 Cumulative Effects

This section describes cumulative effects of the 2010-2011 Water Transfer Program for each resource area. The Council on Environmental Quality (CEQ) NEPA regulations require an analysis of direct and indirect effects and define "effects" as "… ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative" (40 CFR [Code of Federal Regulations] 1508.8). NEPA defines a cumulative effect as " the impact of the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR 1508.7).

### 3.18.1 Projects in the Cumulative Analysis

The cumulative analysis considers other potential water transfers that could occur in the 2010 and 2011 transfer season, including non-CVP water transfers and other existing water transfer programs. Table 3.18-1 lists entities have indicated interest in providing non-CVP water for transfer. With CVP sellers, the cumulative total amount potentially transferred from all sources would be up to about 392,000 acre feet. As previously described for potential CVP sellers, the numbers presented in Table 3.18-1 are estimates and do not necessarily reflect the amount of water that would be available. These estimates reflect the potential upper limit of available water in order to include the maximum extent of potential transfers in the environmental analysis.

Reservoir re-operation is an available transfer method that is not proposed for CVP sellers in 2010 and 2011, but may be used by other non-CVP sellers. Under this transfer, sellers would sell water available from local storage reservoirs. Programs that allow stored reservoir transfers typically require sellers 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. Conservation is another potential water transfer method included in the cumulative analysis. Sellers would reduce consumptive water use and sell conserved water to buyers.

As previously mentioned, other transfers may occur in 2010 and 2011, including water transferred under the Lower Yuba River Accord. Local projects involving groundwater may be implemented, such as the Stony Creek Fan Aquifer Performance Testing Plan and further investigations of the Lower Tuscan Aquifer. The Sacramento Valley Water Management Program (SVWMP) has identified short-term and long-term projects to protect Northern California water rights, including groundwater planning and monitoring projects, providing for unmet demands in the Sacramento Valley, system improvement and water use efficiency measures, conjunctive management and surface water re-operation projects.

It is anticipated that groundwater use may increase in 2010 and 2011, given the current hydrologic forecast and anticipated shortages in surface water supplies. Cropland idling actions would also likely continue as part of routine crop rotation practices and in response to hydrologic conditions. Farmers may also continue to use groundwater to supplement surface water supplies.

**Table 3.18-1 Potential Non-CVP Sellers (Upper Limits)**

| (Acre feet) | | | | |
|---|---|---|---|---|
| **Water Agency** | **Stored Reservoir Water** | **Groundwater Substitution** | **Cropland idling/ Substitution** | **Other** |
| **Sacramento River Area of Analysis** | | | | |
| Tule Basin Farms, LLC (Sutter) | | 6,400 | 6,400 | |
| **Feather River Area of Analysis** | | | | |
| Brown's Valley ID (Yuba) | 7,000 | | | 3,100 conserved water |
| Butte WD (Butte and Sutter) | | 5,000 | 10,000 | |
| Garden Highway MWC (Sutter) | | 7,500 | | |
| Goose Club Farms (Sutter) | | | 6,000 | |
| Richvale ID (Butte) | | | 12,000 | |
| South Sutter WD (Sutter and Placer) | 10,000 | | | |
| Plumas Mutual Water Company (Yuba) | | 2,800 | 1,750 | |
| Sutter Extension WD (Sutter) | | 4,000 | 11,000 | |
| Western Canal WD (Butte and Glenn) | | | 30,000 | |
| **American River Area of Analysis** | | | | |
| City of Folsom (Sacramento) | 2,000 | | | |
| Placer County WA (Placer) | 20,000 | | | |
| Sacramento County WA (Sacramento) | | 10,000 | | |
| Sacramento Suburban WD (Sacramento) | | 12,000 | | |
| **Merced/San Joaquin River Area of Analysis** | | | | |
| Merced ID (Merced) | 15,000 | | | |
| **Delta Area of Analysis** | | | | |
| Reclamation District 2068 (Solano) | | 1,000 | 7,000 | |
| Samra Family Trust (Sacramento) | | | 2,000 | |
| Smith Farms (Yolo) | | | 3,960 | |
| **Total** | 54,000 | 48,700 | 90,110 | 3,100 |

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

### 3.18.2 Surface Water

Other water transfer programs in the cumulative condition would create additional changes in the timing and quantity of water released from reservoirs, altering river flows.

Cropland idling would reduce the water supply for users who rely on return flows from fields that would be idled under the water transfer. Cropland idling under the Proposed Action and other cumulative programs could reduce return flows and result in a cumulative impact. However, under the Proposed Action, sellers will be required to maintain flows at the downstream end of their distribution system to minimize potential water supply effects to neighboring and downstream water users. Downstream users' water use would not be affected by implementation of water transfers. The Proposed Action would not contribute to a cumulative impact to water supply.

The Proposed Action does not include stored reservoir water transfers and would not result in cumulative effects to surface water from stored reservoir transfers.

### 3.18.3 Groundwater

The reduction in recharge due to the decrease in precipitation and runoff in the past years in addition to the increase in groundwater transfers would lower groundwater levels. Multi-year groundwater acquisition under cumulative programs operating in similar areas of the Sacramento Valley could further reduce groundwater levels. Groundwater levels may not fully recover following a transfer and may experience a substantial net decline in groundwater levels over several years. This would be a substantial cumulative effect.

Reclamation and DWR require well review, monitoring, and mitigation to reduce effects to third party groundwater users for approval of transfers. Requirements are detailed in the Technical Information for Water Transfers in 2010. Only wells that meet the well acceptance criteria will be allowed to participate in a transfer. Reclamation and DWR will not approve transfers if appropriate monitoring and mitigation does not occur. Monitoring and mitigation programs would reduce cumulative groundwater effects. Reclamation and DWR will perform field checks to ensure that monitoring and mitigation are appropriately implemented and groundwater effects do not occur. Coordination of groundwater programs in the Sacramento Valley would also minimize and avoid the potential for cumulative effects to groundwater resources. DWR is involved in multiple groundwater programs in the Sacramento Valley, including monitoring programs and SVWMP. Reclamation will work with DWR to track program activities, collect and combine data, and assess potential groundwater effects. Because of the required groundwater

monitoring and mitigation for transfer approval and agency coordination, the Proposed Action would not contribute to cumulative effects to groundwater.

### 3.18.4 Water Quality

Water transfers could decrease water surface elevations and storage levels in reservoirs, resulting in adverse effects to water quality, such as an increase in concentrations of constituents. All water transfers that use CVP reservoirs require Reclamation approval. Cumulative transfer would not likely be of sufficient size to alter reservoir water quality or temperature. If the potential exists, Reclamation would not approve transfers that would adversely affect reservoir quality that would affect downstream users. There would be no cumulative effects to reservoir water quality.

Cumulative programs could further reduce river flow during the summer and further increase flow in the fall. Overall, flow rates will be governed by established regulatory requirements for anadromous and riverine fish, through existing biological opinions and Delta water quality standards, which would prevent flow rates from increasing or decreasing in a manner that would be cumulatively harmful to resources.

### 3.18.5 Geology and Soils

Although erodible soils exist in the counties upstream from the Delta, 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.

### 3.18.6 Agricultural Land Use

Cropland 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 operating water transfer, subject to Project conditions. The farmers can then decide to resume planting in the subsequent season. Therefore, cropland idling would be a temporary effect and would not permanently alter any land use patterns. Water transfers 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. The Proposed Action would only be implemented for two years and would not contribute to any long-term changes in land classifications. The Proposed Action would not contribute to any potential cumulative effects to land use.

### 3.18.7 Vegetation and Wildlife

This program would be cumulative with other water transfer programs affecting the project area, including the State Water Transfer Program. These programs would be operated in a coordinated fashion to minimize impacts to the environment. Water transfer sellers must monitor rice idling transfers under the cumulative condition to ensure that a maximum of 20 percent of rice acreage would be idled in each county. In addition crop idling patterns and other conservation measures would be met by both programs. Through these commitments, the cumulative effects of these projects would not be substantial.

### 3.18.8 Fishery Resources

The 2010-2011 Water Transfer Program will be operated under the environmental commitments listed in Section 2. Environmental commitments include meeting flow and temperature requirements in the North of Delta Area rivers, minimizing the effects of groundwater pumping on streamflow, making release water flows similar to what would occur without cropland idling, making water transfers through the Delta in July through September, when most the most sensitive lifestages of the management species and particularly listed species are absent. Through these environmental commitments, the project would not adversely affect fish species of special management concern. Other water transfer programs would need to operate under similar commitments. There would be no cumulative impacts to fishery resources.

### 3.18.9 Special Status Species

The 2010-2011 Water Transfer Program includes environmental commitments to reduce potential effects to special status species. Other water transfer programs using Federal and State facilities would be required to have similar conservation measures to protect special status species. These programs would be coordinated to make sure that the combination of these programs did not result in the idling of more than 20 percent of the rice fields in any county.

The frequency and magnitude of rice land idling would likely increase through implementation of water transfer programs in the future. Increased rice idling transfers could result in chronic adverse effects to giant garter snake and their habitats and may result in long-term degradation to snake populations in the lower Sacramento Valley. The 2009 BO for the 2009 Drought Water Bank (BO) included Reasonable and Prudent Measures (RPMs), which are incorporated in the Conservation Measures described in Section 2.3, to protect GGS habitat. The USFWS concluded that the 2009 Drought Water Bank was unlikely to jeopardize the GGS population. As these measures are incorporated in the 2010-2011 Water Transfer Program, the Program would not contribute to cumulative impacts to the GGS. Conservation measures proposed for GGS in the BO would

also benefit the black tern and western pond turtle. Based on these measures, water transfers under the 2010-2011 Water Transfer Program would not contribute to cumulative impacts to the black tern.

It is likely that most cropland idling water transfers would involve rice crops. If other upland crops are idled, rather than shifted, there could be some cumulative effects to other species. The environmental measures described for the black tern and GGS such as minimizing the block size and avoiding cropland idling actions that could result in the substantial loss or degradation of suitable habitat could also be applied to upland cropland. This would reduce effects Aleutian Canada goose, California gull, greater sandhill crane, long-billed curlew, mountain plover, northern harrier, Swainson's hawk, tricolored blackbird, western burrowing owl, white-faced ibis, and white-tailed kite.

As a result of these measures, there would be no cumulative impacts to special status species. The 2010-2011 Water Transfer Program would not contribute to potential cumulative effects to special status species.

### 3.18.10 Air Quality

In the areas upstream from the Delta, 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 2010-2011 Water Transfer Program. A review of cumulative groundwater substitution transfers indicates that NOx emissions are expected to exceed 50 tons per year for all non-attainment areas, including Butte County, from the operation of the engines. Cumulative emissions would not exceed regulatory thresholds.

### 3.18.11 Power Generation

Cumulative water transfer programs would have similar impacts to power generation as the Proposed Action. Power generation would increase when stored reservoir water would be released between July and September. Power generation would decrease by the same amount during refill (December through April). It is unknown whether this shift in timing would affect the value of the hydropower generation. Altering water release patterns (power production) could produce positive or negative effects. Reclamation and DWR would likely incorporate provisions for potential decreases in revenue from power production when approving transfers. There would be no cumulative effects to power generation.

### 3.18.12 Cultural Resources

Cumulative effects analysis for cultural resources focuses on programs that potentially acquire water through stored reservoir water purchase and cropland idling. All transfers that lower reservoirs could incrementally increase the drawdown zone to beyond the historic operational levels. Reclamation would operate reservoirs so that transfers do not draw water levels below historic operating conditions; therefore, there would be no cumulative impacts to cultural resources. The Proposed Action does not include stored reservoir purchases from local reservoirs and would not contribute to any cumulative effects to cultural resources in local reservoirs.

### 3.18.13 Socioeconomics

Reclamation requires sellers to monitor other cropland idling transfers in the region, including amount of water transfers and amount of crop acres idled (Reclamation and DWR 2009). Reclamation limits the purchase of water via cropland idling to 20 percent of the irrigated acreage of a particular crop. Historic variations in crop acreage, employment and personal income in a county support the 20 percent limitation. The agricultural industry experiences normal variation in crop acreage and agricultural economies adapt to it. The economic analysis in the 2004 Final EWA EIS/EIR supports the 20 percent criteria to avoid substantial adverse effects to county economies (Reclamation 2004, pg 11-35). If cumulative cropland idling transfers exceed the 20 percent limit, Reclamation would not approve the transfer. This would limit cumulative economic effects of cropland idling in the Sacramento Valley.

### 3.18.14 Indian Trust Assets

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 2010-2011 Water Transfer Program, potential water transfers outside of the Program, and agricultural practice. It is reasonable to assume that other groundwater usage programs could evolve in the foreseeable future. Increased groundwater substitution could affect ITAs if wells dry out on tribal lands or pumping costs substantially increase. All groundwater substitution acquisitions in the Sacramento Valley require notification of the Reclamation and DWR before such acquisitions are finalized in order for the agencies to fully execute their Indian Trust responsibilities. If needed, Reclamation will deliberate with subject matter experts and consult with appropriate tribal and Bureau of Indian Affairs officials to determine appropriate minimization measures to avoid impacts to ITAs. Minimization measures would avoid cumulative effects.

### 3.18.15 Environmental Justice

Cropland idling transfers under multiple water transfer programs could adversely affect farm worker employment and result in potential environmental justice impacts to minority or low-income populations. As described above, Reclamation requires monitoring of cumulative cropland idling programs and limits cropland idling to 20 percent of the crop acreage in a county. In addition, cropland idling transfers are temporary. Farmers would presumably resume planting the next season and would hire farm laborers. Monitoring and minimization measures would limit cumulative impacts to environmental justice.

### 3.18.16 Climate Change

The threshold contained in CARB's Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (17 CCR 95100) for general stationary combustion sources (i.e., 25,000 metric tons $CO_2$ per year) was used to evaluate significance. Cumulative emissions from the diesel-fueled engines are expected to be 24,436 metric tons per year $CO_2$, which is less than regulatory thresholds.

### 3.18.17 Visual Resources

Other water transfer programs would also increase cropland idling and change the visual landscape of agricultural fields to barren fields. Agriculture is considered a Class C visual resource that does not contribute substantially to the overall visual character of the area. Changes to barren fields under crop idling transfers would not be a substantial visual effect. As a result, there would be minimal cumulative impacts to visual resources.

# Chapter 4
# Consultation and Coordination

An administrative draft of this EA has been circulated for review to staff at Reclamation, DWR, and USFWS.

## 4.1 Stakeholder Involvement

DWR and Reclamation held "roundtable discussion" meetings for all buyers and sellers interested in 2010 water transfers. The meetings were held on July 2, 2009. Discussions involved review of the 2009 Drought Water Bank and planning for the 2010-2011 Water Transfer Program.

DWR and Reclamation also developed "Issue Papers" for cropland idling and groundwater substitution transfers. The issue papers discussed various challenges and improvements to implementing cropland idling and groundwater substitution transfers and proposed temporary solutions for the 2010-2011 Water Transfer Program. The issue papers were released for public review and comment. DWR and Reclamation held a meeting on October 9, 2009 to receive public comment on the issue papers. Written comments were also accepted. DWR and Reclamation incorporated comments into the Draft Technical Information for Water Transfers in 2010, which was released to the public on November 6, 2009. The document can be found on DWR's website at http://www.water.ca.gov/drought/transfers/#.

Reclamation and DWR continue to work with interested buyers and sellers to implement the 2010-2011 Water Transfer Program. Reclamation and DWR have contacted sellers to indicate if they are interested in selling water and through what transfer mechanism. Tables 2-1, 2-2, and 3.17-1 are the result of coordination with potential sellers and buyers.

Reclamation is also participating in development of the GGS Conservation Strategy with DWR, USFWS, and CDFG.

## 4.2 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 and has determined that the Proposed Action

is not likely to adversely affect the San Joaquin kit fox; and may adversely affect GGS. Reclamation is conducting Endangered Species Act Section 7 formal consultation with USFWS. Reclamation will complete formal consultation with USFWS prior to finalizing this EA.

Critical habitat for GGS and San Joaquin kit fox has not been designated and so would not be affected. Critical habitat occurs within the project area for Winter-run and Spring-run Chinook salmon (*Oncorhynchus tshawytcha*) and Central Valley steelhead (*O. mykiss*), but would not be affected because of environmental commitments to operate under regulatory requirements for operation of the CVP to meet flow and temperature targets.

## 4.3 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (1976, amended in 1996) governs marine fisheries management in U.S. federal waters through Fishery Management Plans. Essential Fish Habitat (EFH) was established under the 1996 amendments to the Magnuson-Stevens Act to identify and protect commercially valuable marine and anadromous fish habitat. All Federal Action agencies which fund, permit, or carry out activities which may adversely affect EFH are required to consult with NMFS regarding the potential effect of their actions on EFH. In addition, NMFS is required to give input on any state agency activities that might impact EFH. For any Federal action that may adversely affect EFH, the Federal agency must provide NMFS with a written assessment of the effects of that action on EFH (50 CFR 600.920 (e)(1)). NMFS then provides EFH Conservation Recommendations (305 (b)(4)(A) of Magnuson-Stevenson Act) and the Federal agency responds in writing to these recommendations.

EFH is defined in the Magnuson-Stevens Act as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The following important components of EFH must be adequate for spawning, rearing, and migration:

- Substrate composition
- Water quality
- Water quantity, depth, and velocity
- Channel gradient and stability
- Food
- Cover and habitat complexity
- Space

- Access and passage
- Habitat connectivity

NMFS issued a final rule on October 15, 2008 (73 FR 60987) to implement EFH identifications and descriptions for Pacific salmon included in Amendment 14 to the Pacific Salmon FMP (including Chinook, coho, and pink salmon ). The Pacific Coast salmon fishery EFH extends along the Pacific coast from Washington to Point Conception in California. Freshwater EFH includes all habitats currently and historically accessible to salmon, and which provides suitable habitat for Chinook salmon. The area of analysis includes habitat that has been designated as EFH for fall-run/late fall-run Chinook salmon, a major contributor to Pacific Coast salmon fisheries. Under the Proposed Action, all regulatory requirements to provide flow and temperature for the Sacramento River and its tributaries would continue to be met. In addition, participants would be required to continue to provide flows to meet the needs of downstream water users, including refuges, which may support salmonids rearing during some portions of the year. Therefore, the Proposed Action would not substantially affect Essential Fish Habitat and therefore, consultation with NMFS is not required.

## 4.4 California Environmental Quality Act

DWR is requiring sellers to complete CEQA analysis for proposed water transfers in 2010 and 2011. Project proponents will also comply with California ESA under California Fish and Game Code Section 2080.1 or 2081.

## 4.5 Public Review

The Draft EA and Finding of No Significant Impact (FONSI) were released for a 15-day public review period beginning January 5, 2010 and ending January 19, 2010. The documents were posted on Reclamation's website. A press release was issued on January 4, 2010 by the Bureau of Reclamation's Mid-Pacific Regional Public Affairs Office.

# Chapter 5
# List of Preparers

This chapter lists the authors of this document and those who contributed to the development of this document.

**Table 5.1. List of Preparers**

| | | |
|---|---|---|
| **Tim Rust**<br>Bureau of Reclamation<br>Program Manager | 28 years experience in water resources in the public and private sectors | Program Manager |
| **Brad Hubbard**<br>Bureau of Reclamation<br>Natural Resource Specialist | 15 years experience in natural and water resources planning and compliance | Project Manager |
| **Carrie Buckman**<br>CDM<br>Water Resources Engineer | 14 years experience in water resources planning and environmental compliance | Project Manager,<br>Technical Direction, Document Preparation, and Review |
| **John Wondolleck**<br>CDM<br>Associate | 33 years of experience in resource development, toxic substance releases, and environmental planning | Technical Direction, Document Review |
| **Anthony Skidmore**<br>CDM<br>Vice President | 30 years experience in NEPA/CEQA compliance | Technical Direction, Document Review |
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| **Michelle Wilen**<br>CDM<br>Environmental Planner | 8 years experience in water resource planning and environmental compliance | Surface Water |
| **Andria Loutsch**<br>CDM<br>Environmental Planner | 11 years experience in water resource planning and environmental compliance | Power, Visual Resources, ITAs |

| | | |
|---|---|---|
| **Chris Park**<br>CDM<br>Environmental Planner | 4 years of experience in water resources planning and environmental compliance | Water Quality, Graphics |
| **Gwen Pelletier**<br>CDM<br>Environmental Scientist | 8 years of experience working on air quality projects and compliance | Air Quality, Climate Change |
| **Alexandra Kleyman**<br>CDM<br>Environmental Planner | 2 years of experience in environmental planning and NEPA/CEQA analyses | Environmental Justice, Land Use, Geology and Soils |
| **Larry Wise**<br>Entrix<br>Biologist | 20 years of experience in fisheries and terrestrial biology | Vegetation and Wildlife, Fishery Resources, Special Status Species |
| **John Holson**<br>Pacific Legacy<br>Cultural Specialist | 30 years of experience in cultural resources management | Cultural Resources |
| **Julie Hinchcliff**<br>CDM<br>Administrative Assistant | 30 years of word processing and production experience | Word Processing and Production |
| **Teren Correnti**<br>CDM<br>Lead Graphic Designer | 20 years of experience in graphic design | Graphics |

# Chapter 6
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# Appendix A
# Environmental Commitments and Minimization Measures

# Appendix A
# Environmental Commitments and Minimization Measures

This appendix summarizes environmental commitments and minimization measures for the 2010-2011 Water Transfer Program. Section 2 of the EA presents environmental commitments and Section 3 of the EA includes an evaluation of environmental effects and associated minimization measures.

## A.1 Environmental Commitments

- 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 or any restrictions in place the time the transfer occurs.
- Sellers will be required to maintain flows at the downstream end of their distribution system under the Proposed Action to minimize potential water supply effects to neighboring and downstream water users.
- Water transfers under the Proposed Action will be implemented in accordance with meeting flow and temperature requirements on the Sacramento River.
- 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. Reclamation and DWR have published draft technical information related to cropland idling/shifting and groundwater substitution transfers titled Draft Technical Information for Water Transfers in 2010. This information is available at http://www.water.ca.gov/drought/transfers/.
- Carriage water will be used to maintain water quality standard concentrations in the Delta.
- The water transfers in 2010 and 2011 will adopt the cropland idling conservation measures in the 2009 Drought Water Bank Biological Opinion, with some modifications. These measures are designed to

minimize effects from crop idling water transfers. As part of the approval process, Reclamation 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 giant garter snake (GGS) are being implemented. Measures include:

- 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. 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). Reclamation will work with DWR to document compliance.

- Reclamation, with DWR's assistance, will provide a map(s) to the U.S. Fish and Wildlife Service (USFWS) in June of each year showing the parcels of riceland that are idled for the purpose of transferring water in 2010 and 2011. These maps will be prepared to comport to Reclamation's GIS standards.

- Parcels participating in cropland idling will not include:

  - 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 during the two previous years (water may be purchased from the same parcel in successive years).

- As part of a Giant Garter Snake Baseline Monitoring and Research Strategy for the development of a GGS Conservation Strategy, Reclamation and DWR 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.
- In order to limit reduction in the amount of over-winter forage for migratory birds, including greater sandhill crane, transfers 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 part of the review process for the identification of areas acceptable for cropland idling, Reclamation will review current species distribution/occurrence information from the Natural Diversity Database and other sources (including rookeries, breeding colonies, and concentration areas). Reclamation will then use the information to make decisions that will avoid cropland 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 will also benefit the black tern.
- To ensure effects of cropland 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.
- To minimize effects to the kit fox, water transferred will only be used to irrigate lands/crops that were under irrigation over the 3-year period prior to the transfer to ensure it is applied only to currently-cultivated lands.
- To minimize socioeconomic effects on local areas and to minimize effects on special status species, Reclamation will not approve water transfers via cropland idling if more than 20 percent of recent harvested crop acreage in the county for each eligible crop, including rice, would be idled.

## A.2 Minimization Measures

### Groundwater

The seller will be responsible for assessing and minimizing or avoiding adverse effects resulting from the transfer within the source area of the transfer. Each district will be required to confirm that the proposed groundwater pumping will be compatible with state and local regulations and groundwater management plans. Reclamation and DWR will verify that sellers adopt minimization measures to minimize the potential for adverse effects related to groundwater extraction. Required information is detailed in the Draft Technical Information Papers for Water Transfers in 2010 for groundwater substitution transfers.

**Well Review Process** Potential sellers will be required to submit well data for Reclamation and DWR review as part of the transfer approval process.

**Monitoring Plan** Potential sellers will be required to complete and implement a monitoring plan that must include the following components: (1) a network of monitoring wells to characterize groundwater levels before, during, and after transfer; (2) periodic flow meter readings at the extraction pumps; (3) periodic measurements of groundwater levels; (4) groundwater quality testing; (5) means to detect land subsidence or a credible analysis demonstrating that subsidence is unlikely; and (6) a coordinated means to collect data and cooperate with other monitoring efforts in the area.

**Mitigation Plan** Potential sellers will also be required to complete and implement a mitigation plan that must include the following components: (1) procedure for the seller to receive reports of potential impacts and to report that information to Reclamation; (2) procedure for investigating reported effect; (3) development of mitigation options, in cooperation with the affected party; (4) assurances that adequate financial resources are available to cover reasonably anticipated mitigation needs; and (5) commitment to avoid or mitigate such effects during future transfers.

## Air Quality

If transfers result $NO_x$ emissions exceeding local thresholds, then Reclamation, DWR, and willing sellers will work together to implement one, or a combination, of the following mitigation measures that is appropriate. The minimization measures will be implemented within the willing seller's air district.

1. Reclamation and DWR 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.

2. Reclamation and DWR 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 cropland 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.

# Appendix B
# Special Status Wildlife Species with Potential to Occur

# Appendix B. Special Status Wildlife Species with Potential to Occur.

| **Common Name** *Scientific Name* | **Special Status*** | | **Distribution** | **Habitat Association** | **Seasonal Occurrence** | **Potential Impact** |
|---|---|---|---|---|---|---|
| | **Federal** | **State** | | | | |
| **Invertebrates** | | | | | | |
| **California fairy shrimp** *Linderiella occidentalis* | **C** | -- | Most of the length of California's Central Valley, from the Millville Plains and Stillwater Plains in Shasta County to Pixley in Tulare County with disjunct populations in the Santa Rosa Plateau near Rancho Santa California in Riverside County. | Found in a variety of natural and artificial seasonally ponded habitat types including: vernal pools, swales, ephemeral drainages, stock ponds, reservoirs, ditches, backhoe pits, and ruts caused by vehicular activities. | Has been collected from early December to early May. | Suitable habitat may occur within the project area. Low potential for occurrence due to predators (i.e. fish). |
| **Conservancy fairy shrimp** *Branchinecta conservation* | **E, X** | -- | Northern two-thirds of the Central Valley. It ranges from Vina Plains of Tehama County; Sacramento NWR in Glenn County; Jepson Prairie Preserve and surrounding area east of Travis Air Force Base, Solano County; Mapes Ranch west of Modesto, Stanislaus County. | Inhabits the ephemeral water of swales and vernal pools. It is most commonly found in grass or mud bottomed swales, earth sump, or basalt flow depression pools in unplowed grasslands. | Has been collected from early December to early May. | There is a CNDDB occurrence and suitable habitat may exist in the project area, however this species is not likely to occur on the site due to predators (i.e. fish). |
| **Delta green ground beetle** *Elaphrus viridis* | **T, X** | -- | Has only been found in the greater Jepson Prairie area of south central Solano County. | Open habitats in a grassland-playa pool matrix. Adults may occur in surrounding grasslands. | February to mid-May. | Not likely to occur in rice fields, no suitable habitat present (i.e. grasslands). |
| **Lange's metalmark butterfly** *Apodemia mormo langei* | **E** | -- | Restricted to sand dunes along the southern bank of the Sacramento-San Joaquin River, and is currently found only at Antioch Sand Dunes in Contra Costa County. | Found only in the Antioch sand dunes. | Breeding season is August -September, Larvae hatch during rainy months. | There is a CNDDB occurrence In Sacramento County, however this species is located outside the project area and no suitable habitat is present (i.e. sand dunes). |
| **Longhorn fairy shrimp** *Branchinecta longiantenna* | **E, X** | -- | Restricted to northern, central, and portions of southern California; populations along the eastern margin of the Central Coast Mountains from Concord, Contra Costa County south to Soda Lake in San Luis Obispo County; the Kellogg Creek watershed; the Altamont Pass area; the western and northern boundaries of Soda Lake on the Carrizo Plain; and Kesterson National Wildlife Refuge in the Central Valley. | Found in ephemeral freshwater habitats, such as vernal pools and swales. | Has been observed from late December until late April | No CNDDB occurrences; not likely to occur due to lack of suitable habitat (i.e. vernal pools). |
| **Mid-valley fairy shrimp** *Branchinecta mesovallensis* | **Under review** | -- | Counties within the Great Central Valley, including Sacramento, Solano, Merced, Madera, San Joaquin, Fresno, and Contra Costa Counties. | Found in vernal pools, seasonal wetlands that fill with water during fall and winter rains | Has been collected from early December to early May. | Suitable habitat may occur within the project area. Low potential for occurrence due to predators (i.e. fish). |
| **Valley elderberry longhorn beetle** *Desmocerus californicus dimorphus* | **T, X** | -- | Central Valley and surrounding foothills below 3,000 feet elevation. | Dependent on elderberry shrubs (host plant) as a food source. Potential habitat is shrubs with stems 1 inch in diameter within Central Valley. | Year round for host plant and exit holes; March-June for adults | Elderberry shrubs will not be impacted, therefore no impact to beetles will occur. |
| **Vernal pool fairy shrimp** *Branchinecta lynchi* | **T, X** | -- | Endemic to the Central Valley, Central Coast Mountains, and South Coast Mountains of California. It ranges from the Vina Plains in Tehama County, through the Central Valley, and south along the Central Coast to northern Santa Barbara County. | Inhabits the ephemeral water of swales and vernal pools. It is most commonly found in grassed or mud bottomed swales, earth sump, or basalt flow depression pools in unplowed grasslands. | Has been collected from early December to early May. | Suitable habitat may occur within the project area. Low potential for occurrence due to predators (i.e. fish). |

# Appendix B. Special Status Wildlife Species with Potential to Occur.

| **Common Name** *Scientific Name* | **Special Status*** | | **Distribution** | **Habitat Association** | **Seasonal Occurrence** | **Potential Impact** |
|---|---|---|---|---|---|---|
| | **Federal** | **State** | | | | |
| **Vernal pool tadpole shrimp** *Lepidurus packardi* | **E, X** | **--** | Endemic to the northern portion of the Central Valley of California. This species occurs from the Millville Plains and Stillwater Plains in Shasta County south throughout the Central Valley to Merced County. | Found in a variety of natural and artificial seasonally ponded habitat types including: vernal pools, swales, ephemeral drainages, stock ponds, reservoirs, ditches, backhoe pits, and ruts caused by vehicular activities. | Has been collected from early December to early May. | Suitable habitat may occur within the project area. Low potential for occurrence due to predators (i.e. fish). |
| **Amphibians** | | | | | | |
| **California red-legged frog** *Rana aurora draytonii* | **T, PX** | **SSC** | Northwestern California to northwestern Baja California. May now be extirpated in the southern Sierra Nevada; other Sierra Nevada foothill populations are small and highly localized. Nearly all current Central Valley sites are on the Coast Range slope of | Usually found in or near quiet permanent water of streams, freshwater marshes, or (less often) ponds and other quiet bodies of water; also damp woods and meadows some distance from water. Occurs in sites with dense vegetation (e.g., willows) close to water. | Year round | Suitable habitat is present within the project area. There are 2 CNDDB occurrences in Butte County, both outside of the project area. No impact is likely to occur. |
| **California tiger salamander** *Ambystoma californiense* | **T[1], E[2], X** | **CE, SSC** | Found in annual grassland habitat, grassy understories of valley-foothill hardwood habitats, and uncommonly along stream courses in valley-foothill riparian habitats. Occurs from near Petaluma, Sonoma Co., east through the Central Valley to Yolo and Sacramento Counties and south to Tulare Co.; and from the vicinity of San Francisco Bay south to Santa Barbara Co. | Lives in vacant or mammal-occupied burrows, occasionally other underground retreats, throughout most of the year, in grassland, savanna, or open woodland habitats. Lays eggs on submerged stems and leaves, usually in shallow ephemeral or semi permanent pools and ponds that fill during heavy winter rains, sometimes in permanent ponds; breeding takes place in fish free pools and ponds. | Migrates up to about 2 km between terrestrial habitat and breeding pond. Migrations may occur from November through April. | There is CNDDB occurrences in Butte, Sacramento, and Sutter counties. Not likely to occur in rice fields, no suitable habitat present due to predatory fish. |
| **Foothill yellow-legged frog** *Rana boylii* | **SC** | **SSC** | This species is known from the Pacific drainages from Oregon to the upper San Gabriel River, Los Angeles County, California, including the coast ranges and Sierra Nevada foothills in the United States. | This species inhabits partially shaded, rocky streams at low to moderate elevations, in areas of chaparral, open woodland, and forest. | Year round | Not likely to occur in rice fields, no suitable habitat present (i.e. rocky streams). |
| **Western spadefoot toad** *Spea hammondii* | **--** | **SSC** | This species occurs in the Central Valley and bordering foothills of California and along the Coast Ranges into northwestern Baja California, Mexico. | Lowlands to foothills, grasslands, open chaparral, pine-oak woodlands. Prefers shortgrass plains, sandy or gravelly soil. It is fossorial and breeds in temporary rain pools and slow-moving streams that do not contain bullfrogs, fish, or crayfish. | Year round | Not likely to occur in rice fields, no suitable habitat present due to predatory fish, bullfrogs, etc.. |
| **Reptiles** | | | | | | |
| **Giant garter snake** *Thamnophis gigas* | **T** | **T** | Sacramento and San Joaquin Valleys from Butte County in the north to Kern County in the south. | Primarily associated with marshes, sloughs, and irrigation ditches. Generally absent in larger rivers. | Year round | Suitable habitat is present within the project area (i.e. rice fields) and a high potential to occur. There is CNDDB occurrences throughout the project area. Conservation strategies are in place for this species. |

# Appendix B. Special Status Wildlife Species with Potential to Occur.

| **Common Name** *Scientific Name* | **Special Status*** | | **Distribution** | **Habitat Association** | **Seasonal Occurrence** | **Potential Impact** |
|---|---|---|---|---|---|---|
| | **Federal** | **State** | | | | |
| **Western pond turtle** *Actinemys marmorata* | **Under review** | **SSC** | Ranged from extreme western Washington and British Columbia to northern Baja California, mostly to the west of the Cascade-Sierra crest. | The western pond turtle occupies a wide variety of wetland habitats including rivers and streams (both permanent and intermittent), lakes, ponds, reservoirs, permanent and ephemeral shallow wetlands, abandoned gravel pits, stock ponds, and sewage treatment. | Year round | Suitable habitat occurs within the project area. High potential for occurrence due to ditches, canals, rice fields, etc. |
| **Birds** | | | | | | |
| **Aleutian Canada goose** *Branta canadensis leucopareia* | **D** | -- | Alaska to California | Found grazing in golf courses, agricultural lands, and any open ground adjacent to water. Nests in grasses and marshes. | Year round | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **American peregrine falcon** *Falco peregrinus anatum* | **D, NMBMC** | **E, FP** | Throughout California. | Breeds in woodland, forest and coastal habitats on protected cliffs and ledges. Riparian areas and coastal and inland wetlands are important habitats yearlong especially during the non-breeding season. | Year round | Not likely to occur in rice fields, no suitable habitat present (i.e. cliff habitats). |
| **Bald eagle** *Haliaeetus leucocephalus* | **D** | **E** | Throughout California. | Riparian areas near coasts, rivers, and lakes. Nesting generally occurs in large old-growth trees in areas with little disturbance. | Year round | Not likely to occur in rice fields, no suitable habitat present (i.e. rivers, lakes). |
| **Bank swallow** *Riparia riparia* | -- | **T, SSC** | A neotropical migrant found primarily in riparian and other lowland habitats in California west of the deserts during the spring-fall period. Breeding population in California occurs along banks of the Sacramento and Feather rivers in the northern Central Valley. | Requires vertical banks and cliffs with fine-textured or sandy soils near streams, rivers, ponds, lakes, and the ocean for nesting. Feeds primarily over grassland, shrub land, savannah, and open riparian areas during breeding season and over grassland, brushland, wetlands, and cropland during migration. | March-mid-September | Not likely to occur in rice fields, no suitable habitat present (i.e. cliff habitat) |
| **Black tern** *Chlidonias niger* | -- | **SSC** | Common spring and summer visitor to fresh emergent wetlands of California. | Uses fresh emergent wetlands, lakes, ponds, moist grasslands, and agricultural fields. In migration, some take coastal routes and forage offshore. | April-September | Suitable habitat is present within the project area (i.e. rice fields) and a high potential to occur. Conservation strategies are in place for this species. |
| **Black-crowned night heron** *Nycticorax nycticorax* | **SC** | -- | Resident in lowlands and foothills throughout most of California, including the Salton Sea and Colorado River areas, and very common locally in large nesting colonies. | Feeds along the margins of lacustrine, large riverine, and fresh and saline emergent habitats. Nests and roosts in dense-foliaged trees and dense emergent wetlands. | Year round | Suitable habitat present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **California black rail** *Laterallus jamaicensis coturniculus* | **SC** | **T, FP** | Rare to locally common resident in a few scattered locations throughout California including San Pablo and San Francisco Bays, some breeding in the northern central valley. | Prefers grassy, fresh, and brackish water marshes, also fresh water cattail and bullrush marshes at lower elevations. Nesting in dense vegetation above the water or on the ground. | Year round | There is CNDDB occurrences in Butte and Sacramento counties, located outside of the project area. Not likely to occur in rice fields, no suitable habitat present (i.e. dense vegetation). |

# Appendix B. Special Status Wildlife Species with Potential to Occur.

| **Common Name** *Scientific Name* | **Special Status*** | | **Distribution** | **Habitat Association** | **Seasonal Occurrence** | **Potential Impact** |
|---|---|---|---|---|---|---|
| | **Federal** | **State** | | | | |
| **California gull** *Larus californicus* | -- | **WL** | Throughout California | Along the coast of sandy beaches, mudflats, rocky intertidal, and pelagic areas of marine and estuarine habitats, as well as fresh and saline emergent wetlands. Inland, frequents lacustrine, riverine, and cropland habitats, landfill dumps, and open lawns in cities. | Year round | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **California yellow warbler** *Dendroica petechia brewsteri* | -- | **SSC** | Throughout California | Frequents open to medium-density woodlands and forests with a heavy brush understory in breeding season. In migration, found in a variety of sparse to dense woodland and forest habitats. | April-October | Not likely to occur in rice fields, no suitable habitat present (i.e. dense woodland and forest habitats). |
| **Cooper's hawk** *Accipiter cooperii* | -- | **WL** | Throughout California | Frequents landscapes where wooded areas occur in patches and groves. Often uses patchy woodlands and edges with snags for perching. Dense stands with moderate crown-depths used for nesting. | Year round | Not likely to occur in rice fields, no suitable habitat present (i.e. dense woodlands). |
| **Double-crested cormorant** *Phalacrocorax pelagicus* | -- | **WL** | Along the entire coast of California and on inland lakes, in fresh, salt and estuarine waters. | Open water with offshore rocks, islands, steep cliffs, dead branches of trees, wharfs, jetties, or even transmission lines. Requires undisturbed nest-sites beside water, on islands or mainland. Uses wide rock ledges on cliffs; rugged slopes; and live or dead trees, especially tall ones. | Year round | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **Golden eagle** *Aquila chrysaetos* | **T** | **E** | Throughout California | Riparian areas near coasts, rivers, and lakes. Nesting generally occurs in large old-growth trees in areas with little disturbance. | Year round | Not likely to occur in rice fields, no suitable habitat present (i.e. rivers, lakes, coastal areas). |
| **Great blue heron** *Ardea herodias* | -- | -- | Throughout California | Found in shallow estuaries, fresh and saline emergent wetlands, along riverine and rocky marine shores, in croplands, pastures, salt ponds, and in mountains above foothills. Nests roosts in large trees. | Year round | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **Great egret** *Ardea alba* | -- | -- | Throughout California | Feeds and rests in fresh, and saline emergent wetlands, along the margins of estuaries, lakes, and slow-moving streams, on mudflats and salt ponds, and in irrigated croplands and pastures. Nests roosts in large trees. | Year round | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **Great grey owl** *Strix nebulosa* | -- | **E** | A rarely seen resident in the Sierra Nevada from the vicinity of Quincy, Plumas Co. south to the Yosemite region. | Uses trees in dense forest stands for roosting cover. Small trees and snags in, or on edge of, meadows used for hunting perches. Breeds in old-growth red fir, mixed conifer, or lodgepole pine habitats, always in the vicinity of wet meadows. | Year round | There is a CNDDB occurrence in Glenn County, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. dense forest stands). |

# Appendix B. Special Status Wildlife Species with Potential to Occur.

| **Common Name** *Scientific Name* | **Special Status*** | | **Distribution** | **Habitat Association** | **Seasonal Occurrence** | **Potential Impact** |
|---|---|---|---|---|---|---|
| | **Federal** | **State** | | | | |
| **Greater sandhill crane** *Grus canadensis tabida* | -- | **T, FP** | Breeds only in Siskiyou, Modoc and Lassen counties and in Sierra Valley, Plumas and Sierra counties. Winters primarily in the Sacramento and San Joaquin valleys from Tehama south to Kings Counties. | In summer, this race occurs in and near wet meadow, shallow lacustrine, and fresh emergent wetland habitats. Frequents annual and perennial grassland habitats, moist croplands with rice or corn stubble, and open, emergent wetlands. It prefers relatively treeless plains. | Migration southward is September-October and northward is March-April. | Suitable habitat is present within the project area (i.e. rice fields) and a high potential to occur. There is CNDDB occurrences in Butte and Sutter Counties. Conservation strategies are in place for this species. |
| **Least bell's vireo** *Vireo bellii pusillus* | **E** | **E** | California to northern Baja. | Inhabits low, dense riparian growth along water or along dry parts of intermittent streams. Typically associated with willow, cottonwood, baccharis, wild blackberry, or mesquite in desert localities. | March-August | Not likely to occur in rice fields, no suitable habitat present (i.e. dense riparian areas). |
| **Little willow flycatcher** *Empidonax traillii brewsteri* | -- | **E** | Migrant at lower elevations, primarily in riparian habitats throughout California | Most numerous where extensive thickets of low, dense willows edge on wet meadows, ponds, or backwaters. | Spring (mid-May to early June) and fall (mid-August to early September) | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. dense willows). |
| **Long-billed curlew** *Numenius americanus* | **SC** | **WL** | Along the California coast, and in the Central and Imperial valleys. | Upland shortgrass prairies and wet meadows are used for nesting; coastal estuaries, open grasslands, and croplands are used in winter. | Winter migrant from July-April | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **Long-eared owl** *Asio otus* | -- | **SSC** | Throughout California | Frequents dense, riparian and live oak thickets near meadow edges, and nearby woodland and forest habitats. Also found in dense conifer stands at higher elevations. | Year round | Not likely to occur in rice fields, no suitable habitat present (i.e. forest and woodland habitats). |
| **Merlin** *Falco columbarius* | -- | **WL** | Occurs in most of the western half of California below 3900 ft. | Frequents coastlines, open grasslands, savannahs, woodlands, lakes, wetlands, edges, and early successional stages. Ranges from annual grasslands to ponderosa pine and montane hardwood-conifer habitats. | Winter migrant from September-May | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **Northern harrier** *Circus cyaneus* | -- | **SSC** | Throughout lowland California, concentrated in the Central Valley and coastal valleys. | Breeds in annual grasslands and wetlands. Prefers marshes and grasslands for foraging and nesting. Also uses agricultural fields for nesting and foraging, although nests may be destroyed by agricultural activities. | Year round | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **Osprey** *Pandion haliaetus* | -- | **WL** | Northern California from Cascade Ranges south to Lake Tahoe, and along the coast south to Marin County. | Associated strictly with large, fish-bearing waters, primarily in ponderosa pine through mixed conifer habitats. | Year round | Not likely to occur in rice fields, no suitable habitat present (i.e. mixed conifer forest and large fish bearing waters). |
| **Short-eared owl** *Asio flammeus* | -- | **SSC** | Endemic to marshes bordering the San Francisco, San Pablo Bays and Suisun Bay . | Open country, including grasslands, wet meadows and cleared forests. Occasionally in estuaries during breeding season. | Year round | Not likely to occur in rice fields, no suitable habitat present (i.e. meadows and cleared forest). |
| **Snowy egret** *Egretta thula* | -- | -- | Throughout California | Found along shores of coastal estuaries, fresh and saline emergent wetlands, ponds, slow-moving rivers, irrigation ditches, and wet fields. | Year round | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |

# Appendix B. Special Status Wildlife Species with Potential to Occur.

| **Common Name** *Scientific Name* | **Special Status*** | | **Distribution** | **Habitat Association** | **Seasonal Occurrence** | **Potential Impact** |
|---|---|---|---|---|---|---|
| | **Federal** | **State** | | | | |
| **Swainson's hawk** *Buteo swainsoni* | **SC, MNBMC** | **T** | Lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley. | Nests in mature trees, including valley oaks or cottonwoods in or near riparian habitats; forages in grasslands, irrigated pastures, and grain and row crop fields. | Spring and Summer; small wintering population in the Delta | There are CNDDB occurrences throughout the project area and suitable habitat is present. Low impact will occur. Can relocate to other habitats within the area. |
| **Tricolored blackbird** *Agelaius tricolor* | **--** | **SSC** | A resident in California found throughout the Central Valley and in coastal districts from Sonoma Co. south. | Breeds near fresh water, preferably in emergent wetlands with tall, dense cattails or tules, but also in thickets of willow, blackberry, wild rose, tall herbs. Feeds in grassland and cropland habitats. | Year round | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **Western burrowing owl** *Athene cunicularia hypugaea* | **--** | **SSC** | Central and southern coastal habitats, Central Valley, Great Basin, and deserts. | Open annual grasslands or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Dependent upon burrowing mammals (especially California ground squirrel) for burrows. | Year round | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. Not likely to occur in rice fields due to lack of burrows. |
| **Western snowy plover** *Charadrius alexandrinus* | **T** | **SSC** | Along the west coast states, with inland nesting taking place at the Salton Sea, Mono Lake, and at isolated sites on the shores of alkali lakes in northeastern California, in the Central Valley, and southeastern deserts. | Nests, feeds, and takes cover on sandy or gravelly beaches along the coast, on estuarine salt ponds, alkali lakes, and at the Salton Sea. | Migration is from July March (some year round populations). | There is a CNDDB occurrence in Yolo County, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. gravelly beaches). |
| **Western yellow-billed cuckoo** *Coccyzus americanus* | **SC, C** | **E** | Uncommon to rare summer resident in scattered locations throughout California. | Deciduous riparian thickets or forests with dense, low-level or understory foliage, and which abut on slow-moving watercourses, backwaters, or seeps. Willow almost always a dominant component of the vegetation. In Sacramento Valley, also utilizes adjacent orchards, especially of walnut. Nests in sites with some willows, dense low-level or understory foliage, high humidity, and wooded foraging spaces. | Summer migration is from June-September. | There is a CNDDB occurrences throughout the project area, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. dense riparian thickets). |
| **White-faced ibis** *Plegadis chihi* | **--** | **WL** | Uncommon summer resident in sections of southern California, a rare visitor in the Central Valley, and is more widespread in migration. | Feeds in fresh emergent wetlands, shallow lacustrine waters, muddy grounds of wet meadows, and irrigated or flooded pastures and croplands. Nests in dense, fresh emergent wetlands. | Present in California from April-October. | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **White-tailed kite** *Elanus leucurus* | **SC, MNBMC** | **FP** | Central Valley, coastal valleys, San Francisco Bay area, and low foothills of Sierra Nevada. | Savanna, open woodlands, marshes, partially cleared lands and cultivated fields, mostly in lowland situations (Tropical to Temperate zones). | Year round | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **Yellow-breasted chat** *Icteria virens* | **--** | **SSC** | Summer resident and migrant in coastal California and in foothills of the Sierra Nevada. | Frequents dense, brushy thickets and tangles near water, and thick understory in riparian woodland. Nests above ground in dense shrubs along streams or rivers. | | Suitable habitat is present in project area. Low impact will occur. Can relocate to other habitats within the area. |

# Appendix B. Special Status Wildlife Species with Potential to Occur.

| **Common Name** *Scientific Name* | **Special Status*** | | **Distribution** | **Habitat Association** | **Seasonal Occurrence** | **Potential Impact** |
|---|---|---|---|---|---|---|
| | **Federal** | **State** | | | | |
| **Mammals** | | | | | | |
| **California wolverine** *Gulo gulo* | **SC** | **T, FP** | A scarce resident of North Coast mountains and Sierra Nevada. Sightings range from Del Norte and Trinity cos. east through Siskiyou and Shasta cos., and south through Tulare Co. A few possible sightings occur in the north coastal region as far south as Lake Co. Habitat distribution in California is poorly known for the North Coast and northern Sierra Nevada. | In north coastal areas, has been observed in Douglas-fir and mixed conifer habitats. In the northern Sierra Nevada, have been found in mixed conifer, red fir, and lodgepole habitats, and probably use subalpine conifer, alpine dwarf-shrub, wet meadow, and montane riparian habitats. In the southern Sierra Nevada occur in red fir, mixed conifer, lodgepole, subalpine conifer, alpine dwarf-shrub, barren, and probably wet meadows, montane chaparral, and Jeffrey pine. | Year round (largely nocturnal) | Not likely to occur in rice fields, no suitable habitat present (i.e. mixed conifer habitats in the Sierra Nevada). |
| **Greater western mastiff bat** *Eumops perotis californicus* | **SC** | **SSC** | Uncommon resident in southeastern San Joaquin Valley and Coastal Ranges from Monterey Co. southward through southern California, from the coast eastward to the Colorado Desert. | Occurs in many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, annual and perennial grasslands, palm oases, chaparral, desert scrub, and urban areas. Crevices in cliff faces, high buildings, trees, and tunnels are required for roosting. | Year round (nocturnal activity) | Suitable habitat present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **Pacific fisher** *Martes pennati (pacifica) DPS* | **C** | **SSC C-T** | Northern California coastal ranges up to Oregon, and the Sierra Nevadas. | Found in mature, dense, coniferous or mixed coniferous hardwood forest with closed canopies. | Year round | Not likely to occur in rice fields, no suitable habitat present (i.e. mixed conifer habitats). |
| **Ring-tailed cat** *Brassariscus astutus* | **SC** | **FP** | Ringtails are found in a variety of habitats centered around the semi-arid to arid climates of the west and southwest. Little information available on distribution and relative abundance among habitats. | Occurs in various riparian habitats, and in brush stands of most forest and shrub habitats, at low to middle elevations. Uses hollow trees, logs, snags, cavities in talus and other rocky areas, and other recesses are for cover. | Year round (nocturnal) | Not likely to occur in rice fields. Suitable habitat present in project area. Low impact will occur. Can relocate to other habitats within the area. |
| **Riparian brush rabbit** *Sylvilagus bachmani riparius* | **E** | **E** | Isolated populations on Caswell Memorial State Park on the Stanislaus River and along an overflow channel of the San Joaquin River. | Riparian thickets | Year round | Not likely to occur in rice fields, no suitable habitat present (i.e. riparian thickets). |
| **Riparian (San Joaquin Valley) woodrat** *Neotoma fuscipes riparia* | **E** | **SSC** | Found along the lower portions of the San Joaquin and Stanislaus rivers in the northern San Joaquin Valley. Historical records for the riparian woodrat are distributed along the San Joaquin, Stanislaus, and Tuolumne rivers, and Corral Hollow, in San Joaquin, Stanislaus, and Merced Counties. | Most numerous where shrub cover is dense and least abundant in open areas. Dens are usually built in willow thickets with oak overstory. | Year round (nocturnal activity) | Not likely to occur in rice fields, no suitable habitat present (i.e. dense shrubs) |
| **San Joaquin kit fox** *Vulpes macrotis mutica* | **E** | **T** | Found only in the Central Valley area of California. Kit foxes currently inhabit suitable habitat in the San Joaquin valley and in surrounding foothills of the Coast Ranges, Sierra Nevada, and Tehachapi Mountains; from southern Kern County north to Contra Costa, Alameda, and San Joaquin counties on the west; and near La Grange, Stanislaus County on the east. | Found in annual grasslands or grassy open stages of vegetation dominated by scattered brush, shrubs, and scrub. Build dens for cover. | Year round (mostly nocturnal, but often active during daytime in cool weather) | Suitable habitat on present within the project area and a moderate potential to occur in the southern properties of the project area. Conservation strategies are in place for this species. |

# Appendix B. Special Status Wildlife Species with Potential to Occur.

| **Common Name** *Scientific Name* | **Special Status*** | | **Distribution** | **Habitat Association** | **Seasonal Occurrence** | **Potential Impact** |
|---|---|---|---|---|---|---|
| | **Federal** | **State** | | | | |
| **Sierra Nevada red fox** *Vulpes vulpes necator* | -- | E | Found only in high elevations throughout the Sierra Nevadas from Tulare County to Sierra County, and the vicinities around Mt. Lassen and Mt. Shasta. | Found in high-elevation conifer (red fir, sub-alpine conifer), mid-elevation conifer (Lodgepole pine, Sierra mixed conifer, and white fir), shrub (montane chaparral), and hardwood-herbaceous (Annual grassland, Aspen, Montane hardwood, montane riparian and wet meadow). | Year round | There is CNDDB occurrences in Butte and Glenn Counties, however this species is not likely to occur in rice fields due to lack of suitable habitat. Occurs outside of the project area. |

[1]Central CA DPS

[2]Santa Barbara and Sonoma Counties

**Green Shading: potential to be affected, further evaluated in Section 3.8**

*** Status explanations:**

**Federal**

E = listed as endangered under the federal Endangered Species Act

T = listed as threatened under the federal Endangered Species Act

MNBMC = Fish and Wildlife Service: Migratory Nongame Birds of Management Concern

SC = species of concern; formerly Category 2 candidate for federal listing

C = Candidate for listing as threatened or endangered

-- = no designations

X = critical habitat

PX = potential critical habitat

D = delisted

**State**

E = listed as endangered under the California Endangered Species Act

T = listed as threatened under the California Endangered Species Act

CE = candidate endangered under the California Endangered Species Act

FP = fully protected under the California Fish and Game Code

SSC = species of special concern

WL = Watch List

-- = no designations

# Appendix C
# Special Status Plant Species with Potential to Occur

## APPENDIX C - Special-Status Plants Species with Potential to Occur.

| **Common Name** *Scientific name* | **Special Status* (F/S/CNPS)** | **Distribution** | **Habitat Association** | **Blooming Period** | **Potential Impact** |
|---|---|---|---|---|---|
| **Ahart's dwarf rush** *Juncus leiospermus* var. *ahartii* | -/-/ 1B | Butte, Calaveras, Placer, Sacramento, Tehama, and Yuba Counties. | Valley and foothill grassland (mesic). | March-May | Not likely to occur in rice fields, no suitable habitat present. |
| **Ahart's paronychia** *Paronychia ahartii* | -/-/ 1B | Butte, Shasta, and Tehama Counties. | Cismontane woodland, valley and foothill grassland, and vernal pools. | March-June | Not likely to occur in rice fields, no suitable habitat present. |
| **Alkali milk-vetch** *Astragalus tener var. tener* | -/-/ 1B | Central western California including Yolo County. | Subalkaline flats and areas around vernal pools. | March-June | Not likely to occur in rice fields, no suitable habitat present (i.e. subalkali flats). |
| **Antioch Dunes evening-primrose** *Oenothera deltoides* ssp. *howellii* | E/E/ 1B | Found only in Contra Costa and Sacramento Counties. | Occurs in inland dunes. | March-September | Not likely to occur in rice fields, no suitable habitat present. Located outside of the project area. |
| **Brittlescale** *Atriplex depressa* | -/-/1B | Western Central Valley and valleys of adjacent foothills. | Alkali grassland, alkali meadow, alkali scrub, and vernal pools. | April-October | There is a CNDDB occurrence within Glenn, Colusa, and Yolo counties, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. alkali and vernal pools). |
| **Boggs Lake hedge-hyssop** *Gratiola hetersepela* | -/-/1B | Dispersed throughout the Sacramento and Central Valley. Also in Oregon. | Marsh's, swamps, and vernal pools (clay). | April-August | There is a CNDDB occurrence within Sacramento County. Suitable habitat is present but has low potential to occur. |
| **Butte County meadowfoam** *Limnanthes floccosa* ssp. *californica* | E/E/1B | Only located in Butte County. | Valley and foothill grassland (mesic), and vernal pools. | March-May | Not likely to occur in rice fields, no suitable habitat present. |

## APPENDIX C - Special-Status Plants Species with Potential to Occur.

| **Common Name** *Scientific name* | **Special Status* (F/S/CNPS)** | **Distribution** | **Habitat Association** | **Blooming Period** | **Potential Impact** |
|---|---|---|---|---|---|
| **Contra Costa goldfields** *Lasthenia conjugens* | E/SSC/1B | San Francisco Bay Delta Regions, and scattered coastal areas. | Cismontane woodlands, playas, valley and foothill grasslands, and vernal pools. | March-June | No CNDDB occurrences; not likely to occur in rice fields due to lack of suitable habitat (i.e. vernal pools, playas). |
| **Colusa grass** *Neostapfia colusana* | T/E/1B | Southern Sacramento Valley, and northern San Joaquin Valley. | Vernal pools. | May-July | There is a CNDDB occurrence within Glenn and Colusa counties, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. vernal pools). |
| **Crampton's tuctoria (Solano grass)** *Tuctoria mucronata* | E/E/1B | Located only in Yolo and Solano Counties. | Valley and foothill grassland (mesic), and vernal pools. | April-August | Not likely to occur in rice fields, no suitable habitat present. |
| **Delta coyote-thistle (button celery)** *Eryngium racemosum* | -/E/1B | Calaveras, Contra Costa, Merced, San Joaquin, and Stanislaus Counties. | Riparian scrub and vernally mesic clay depressions. | June-October | Not likely to occur in rice fields, no suitable habitat present. Is not located in areas to be fallowed. |
| **Ferris' milk-vetch** *Astragalus tener* var. *ferrisae* | -/-/1B | Sacramento Valley. | Subalkaline flats and areas around vernal pools. | March-June | Not likely to occur in rice fields, no suitable habitat present. |
| **Fox sedge** *Carex vulpinoidea* | -/-/2 | Northern Sacramento Valley, including Butte County, isolated populations in San Joaquin County. | Riparian woodland, marshes and swamps. | May-June | Suitable habitat present in project area. Low potential to occur. Not likely to establish in rice fields. |
| **Greene's tuctoria** *Tuctoria greeni* | E/SSC/1B | Butte, Colusa, Fresno, Glenn, Madera, Merced, Modoc, Shasta, San Joaquin, Stanislaus, Tehama, and Tulare Counties. | Vernal pools. | May-July | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. vernal pools). |

## APPENDIX C - Special-Status Plants Species with Potential to Occur.

| **Common Name** *Scientific name* | **Special Status* (F/S/CNPS)** | **Distribution** | **Habitat Association** | **Blooming Period** | **Potential Impact** |
|---|---|---|---|---|---|
| **Hairy Orcutt grass** *Orcuttia pilosa* | E/E/1B | Northern Sacramento Valley, Pit River Valley; isolated populations in Lake and Sacramento counties. | Vernal pools. | May-September | There is a CNDDB occurrence within Butte and Glenn counties, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. vernal pools). |
| **Hartweg's golden sunburst** *Pseudobahia bahiifolia* | E/E/1B | Found in El Dorado, Fresno, Madera, Merced, Stanislaus, Tuolumne, and Yuba Counties. | Cismontane woodland, valley and foothill grassland, often acidic. | April-May | There is a CNDDB occurrence within Yolo County, however this species is not likely to occur in rice fields due to lack of suitable habitat |
| **Heartscale** *Atriplex cordulata* | -/-/1B | Western Central Valley and valleys of adjacent foothills. | Alkali grasslands, alkali meadows, and alkali scrub. | May-October | There is a CNDDB occurrence within Butte, Colusa, Yolo, and Glenn counties, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. alkali areas). |
| **Heckard's pepper-grass** *Lepidium latipes* var**.** *heckardii* | -/-/1B | Glenn, Solano, and Yolo Counties. | Valley and foothill grassland alkaline flats. | March-May | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. alkali flats). |
| **Henderson's bent grass** *Agrostis hendersonii* | - /-/ 3 | Found in Butte, Calaveras, Merced, Placer, Shasta, and Tehama counties. Also found in Oregon. | Vernal pools. | March- June | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. vernal pools). |
| **Hispid bird's beak** *Cordylanthus mollis* ssp. *hispidus* | -/-/1B | Alameda, Kern, Fresno, Merced, Placer, and Solano Counties. | Meadows and seeps, playas, valley and foothill grasslands (alkali). | June-September | Not likely to occur in rice fields, no suitable habitat present. |

## APPENDIX C - Special-Status Plants Species with Potential to Occur.

| **Common Name** *Scientific name* | **Special Status* (F/S/CNPS)** | **Distribution** | **Habitat Association** | **Blooming Period** | **Potential Impact** |
|---|---|---|---|---|---|
| **Hoover's spurge** *Chamaesyce hooveri* | T/-/ 1B | Scattered in Glenn, Butte, Colusa, Merced, Stanislaus, Tehama, and Tulare Counties. | Vernal pools. | July-September | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. vernal pools). |
| **Indian valley brodiaea** *Broiaea coronaria* ssp. *rosea* | -/E/1B | Scattered in Glenn, Lake, Colusa, and Tehama Counties. | Closed cone coniferous forest, chaparral, valley and foothill grasslands (serpentinite). | May-June | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat. |
| **Jepson's milk-vetch** *Astragalus rattanii var. jepsonianus* | -/-/1B | Colusa, Glenn, Lake, Napa, Tehama, and Yolo counties. | Chaparral, cismontane woodland, valley and foothill grassland, often serpentinite. | April-June | There is a CNDDB occurrence, however this species is not likely to occur on the site due to lack of suitable habitat. |
| **Keck's checkerbloom** *Sidalcea keckii* | E/-/1B | Colusa, Fresno, Merced, Napa, Solano, Tulare, and Yolo counties. | Cismontane woodlands, foothill and valley grasslands (serpentinite). | April-May | There is a CNDDB occurrence, however this species is not likely to occur on the site due to lack of suitable habitat. |
| **Layne's ragwort** *Packera layneae* | T/-/1B | Butte, El Dorado, Tuolumne, and Yuba Counties. | Chaparral and cismontane woodland, rocky and often serpentinite. | April-August | There is a CNDDB occurrence, however this species is not likely to occur on the site due to lack of suitable habitat. |
| **Legenere** *Legenere limosa* | SC/-/1B | Sacramento Valley and south of the North Coast Ranges. | Vernal pools. | May-June | Not likely to occur in rice fields, no suitable habitat present (i.e. vernal pools) |
| **Lesser saltscale** *Atriplex minuscula* | -/-/1B | Found in Butte, Fresno, Kern, Madera, Merced, Stanislaus, and Tulare Counties. | Chenopod scrub, playas, valley and foothill grasslands (alkali and sandy). | May-October | Not likely to occur in rice fields, no suitable habitat present (i.e. alkali, sandy) |

## APPENDIX C - Special-Status Plants Species with Potential to Occur.

| **Common Name** *Scientific name* | **Special Status* (F/S/CNPS)** | **Distribution** | **Habitat Association** | **Blooming Period** | **Potential Impact** |
|---|---|---|---|---|---|
| **Lone buckwheat** *Eriogonum apricum* var. *apricum* | E/E/1B | Found in Amador and Sacramento Counties. | Chaparral. | July-October | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat (chaparral). |
| **Marsh checkerbloom** *Sidalcea oregana* ssp. *hydrophila* | -/-/1B | Glenn, Lake, Mendocino, and Napa Counties. | Meadows and seeps, and riparian forest. | June-August | Suitable habitat present in project area. Low potential to occur. Not likely to establish in rice fields. |
| **Milo Baker's lupine** *Lupinus milo-bakeri* | -/T/1B | Glenn and Mendocino Counties. | Cismontane woodlands, foothill and valley grasslands. | June-September | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat. |
| **Northern California black walnut** *Juglans hindsii* | -/-/1B | Native stands reported in Napa and Contra Costa Counties. | Riparian woodland. | April-May | Not likely to occur in rice fields, no suitable habitat present. |
| **Palmate-bracted bird's-beak** *Cordylanthus palmatus* | E/E/1B | Found in Glenn and Colusa Counties and within the Central Valley. | Alkali meadow, alkali scrub, valley and grasslands. | May-October | Not likely to occur in rice fields, no suitable habitat present (i.e. alkali). |
| **Pincushion navarretia** *Navarretia myersii* ssp. *myersii* | -/-/1B | Alamdor, Calaveras, Merced, Placer, and Sacramento Counties. | Vernal pools (often acidic). | May | No CNDDB occurrences; not likely to occur due to lack of suitable habitat (i.e. vernal pools). |
| **Recurved larkspur** *Delphinium recurvatum* | -/-/1B | Disbursed throughout the Sacramento and Central Valley. | Chenopod scrub, cismontane, valley and foothill grasslands (alkali). | March-June | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. alkali). |

## APPENDIX C - Special-Status Plants Species with Potential to Occur.

| **Common Name** *Scientific name* | **Special Status* (F/S/CNPS)** | **Distribution** | **Habitat Association** | **Blooming Period** | **Potential Impact** |
|---|---|---|---|---|---|
| **Red mountain catchfly** *Silene campanulata* ssp. *campanulata* | -/E/1B | Found in Colusa, Glenn, Mendocino, Shasta, Tehama, and Trinity Counties. | Chaparral and lower montane coniferous forest, usually sepentinite and rocky. | April-July | There is a CNDDB occurrence in Colusa County, however this species is not likely to occur in rice fields due to lack of suitable habitat. |
| **Rose-mallow** *Hibiscus laiocarpos* | -/-/2 | Northern Sacramento County. | Marshes and swamps. | June-September | Suitable habitat present in project area. Low potential to occur. Not likely to establish in rice fields. |
| **Sacramento orcutt grass** *Orcuttia viscida* | E/E/1B | Valley grasslands and freshwater wetlands. | Vernal pools. | May-June | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. vernal pools). |
| **San Joaquin orcutt grass** *Orcuttia inaequalis* | T/E/1B | Fresno, Madera, Merced, Solano, Stanislaus, and Tulare Counties. | Vernal pools. | April-September | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. vernal pools). |
| **San Joaquin spearscale** *Atriplex joaquiniana* | -/-/1B | Western Central Valley and valleys of adjacent foothills. | Alkali grasslands, and alkali scrub. | April-September | Not likely to occur in rice fields, no suitable habitat present (i.e. alkali). |
| **Sanford's arrowhead** *Sagittaria sanfordii* | -/-/1B | Central Valley. | Freshwater marshes, shallow streams, and ditches. | May-August | Suitable habitat on present in ditches; not yet detected. Not likely to establish in rice fields. |
| **Saw-toothed lewisia** *Lewisia serrata* | -/-/1B | Eldorado and Placer Counties. | Riparian forest. | May-June | Not likely to occur in rice fields, no suitable habitat present. |

## APPENDIX C - Special-Status Plants Species with Potential to Occur.

| **Common Name** *Scientific name* | **Special Status* (F/S/CNPS)** | **Distribution** | **Habitat Association** | **Blooming Period** | **Potential Impact** |
|---|---|---|---|---|---|
| **Silky cryptantha** *Cryptantha crinita* | -/-/1B | Shasta and Tehama Counties. | Cismontane woodland, lower montane coniferous forest, riparian forest and woodland, valley foothill and grasslands. | April-May | Not likely to occur in rice fields, no suitable habitat present. Located outside of the project area. |
| **Slender Orcutt grass** *Orcuttia tenuis* | T/E/1B | Northern Sacramento Valley, Pit River Valley; isolated populations in Lake and Sacramento Counties | Vernal pools. | May-July | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. vernal pools). |
| **Soft bird's beak** *Cordylanthus mollis* ssp. *mollis* | E/SSC/1B | Located in Contra Costa, Marin, Napa, Sacramento, Solano, and Sonoma Counties. | Coastal salt marshes and swamps. | July-November | There is a CNDDB occurrence in Sacramento County, however this species is not likely to occur in rice fields due to lack of suitable habitat. |
| **Succulent owl's clover** *Castilleja campestris* ssp. *succulenta* | T/E/1B | Fresno, Madera, Merced, Mariposa, San Joaquin, and Stanislaus Counties. | Vernal pools. | April-May | There is a CNDDB occurrence, however this species is not likely to occur in rice fields due to lack of suitable habitat (i.e. vernal pools). |

***Status explanations:**

**F=Federal**
E=Endangered
T=Threatened
SC= Special Concern

**S=State**
E=Endangered
T=Threatened
SSC=Species of Special Concern

**CNPS=California Native Plant Society**
1B=Rare, threatened, or endangered in California and elsewhere
2=Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
3=Plants about which we need more information - A review list