Long-Term Water Transfers

Revised Environmental Impact Report/Supplemental Environmental Impact Statement

Draft

Prepared by

United States Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

San Luis & Delta-Mendota Water Authority

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Revised Draft Environmental Impact Report/ Supplemental Draft Environmental Impact Statement

Lead Agencies: U.S. Department of the Interior, through the Bureau of Reclamation (Reclamation) and the San Luis & Delta-Mendota Water Authority (SLDMWA)

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ABSTRACT

This Long-Term Water Transfers Revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS) evaluates the potential impacts of alternatives to help address Central Valley Project (CVP) water supply shortages. SLDMWA Participating Members and other CVP water contractors in the San Francisco Bay Area experience severe reductions in CVP water supplies during dry hydrologic years and due to operations resulting from regulatory requirements. A number of entities upstream from the Sacramento-San Joaquin Delta have expressed interest in transferring water to reduce the effects of CVP shortages to these agencies. The alternatives evaluated in this RDEIR/SDEIS include transfers of CVP and non CVP water or transfers from north of the Delta to CVP contractors south of the Delta that require the use of CVP and SWP facilities. Water would be made available for transfer through groundwater substitution, cropland idling, crop shifting, reservoir release, and conservation. This RDEIS/SDEIS evaluates potential impacts of water transfers from 2019 through 2024.

This RDEIR/SDEIS has been prepared according to requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). Direct, indirect, and cumulative impacts resulting from the project alternatives on the physical, natural, and socioeconomic environment of the region are addressed.

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Executive Summary

Hydrologic conditions, climatic variability, consumptive use within the watershed, and regulatory requirements for operation of water projects commonly affect water supply availability in California. This variability strains water supplies, making advance planning for water shortages necessary and routine. In the past decades, water entities have been implementing water transfers to supplement available water supplies to serve existing demands.

The United States Department of the Interior, Bureau of Reclamation (Reclamation) manages the Central Valley Project (CVP), which includes storage in reservoirs (such as Shasta, Folsom, and Trinity reservoirs) and diversion pumps in the Sacramento-San Joaquin Delta (Delta) to deliver water to users in the San Joaquin Valley and San Francisco Bay area. When these users experience water shortages, they may look to water transfers to help reduce potential impacts of those shortages.

Transfers are allowed under California State law and under Federal law. Water users have been encouraged to seek alternative sources of water through willing buyer/willing seller agreements. The purpose of this Revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS), which was previously circulated and has now been revised with new information and analysis presented herein, is to address the effects of transfers between listed buyers and sellers (i.e., the Proposed Action/Proposed Project referred to as Proposed Action in this document) that will streamline the environmental review process and make transfers more implementable relative to National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) requirements, especially when hydrologic conditions and available pumping capacity are unknown until right before the transfer season.

A water transfer involves an agreement between a willing seller and a willing buyer, and available infrastructure capacity to convey water between the two parties. To make water available for transfer, the willing seller must take an action to reduce the consumptive use of water (such as idle cropland or pump groundwater in lieu of using surface water) or release additional water from reservoir storage. This water would be conveyed to the buyers' service area for beneficial use. Water transfers would only be used to help meet existing demands and would not serve any new demands in the buyers' service areas. The proposed water transfers would not directly or indirectly affect growth beyond what is already planned.

Reclamation and the San Luis & Delta-Mendota Water Authority (SLDMWA) previously completed a joint EIS/EIR for the Proposed Action pursuant to NEPA and CEQA for water transfers through 2024. The Draft Long-Term Water Transfers EIS/EIR (2014 Draft EIS/EIR) was completed in 2014 and a Final Long-Term Water Transfers EIS/EIR (2015 Final EIS/EIR) was completed in 2015. The 2015 Final EIS/EIR was challenged in United States District Court for the Eastern District of California in the case *AquAlliance, et al., v. U.S. Bureau of Reclamation, et al*. On July 5, 2018, the District Court entered judgment, vacating SLDMWA's decisions to approve the Final Long-Term Water Transfers EIS/EIR and approve the Proposed Action, vacating the 2015 Final EIS/EIR, and vacating the U.S. Fish and Wildlife Service's biological opinion. As a result, Reclamation and SLDMWA are hereby revising the Long-Term Water Transfers EIS/EIR to address the specific issues identified in the ruling. The Long-Term Water Transfers EIS/EIR, as revised with the additional information and analysis presented in this Long-Term Water Transfers Revised Draft EIR/Supplemental Draft EIS (RDEIR/SDEIS), evaluates water transfers conducted by CVP contractors located south of the Delta or in the San Francisco Bay Area. The water would be conveyed through the Delta using CVP or State Water Project (SWP) pumps, or facilities owned by other agencies in the San Francisco Bay Area.

Reclamation serves as the Lead Agency under NEPA and SLDMWA is the Lead Agency under CEQA for this RDEIR/SDEIS. Reclamation would facilitate transfers proposed by buyers and sellers. The SLDMWA, consisting of federal and exchange water service contractors in western San Joaquin Valley, San Benito, and Santa Clara counties, helps negotiate transfers in years when the member agencies could experience shortages.

The RDEIR/SDEIS addresses the transfer of water to CVP contractors from CVP and non-CVP sources of supply that must be conveyed through the Delta using CVP, SWP, and local facilities. These transfers require approval from Reclamation and/or the Department of Water Resources (DWR), which necessitates compliance with NEPA and CEQA. Other transfers not included in this RDEIR/SDEIS could occur during the same time period, subject to their own environmental review (as necessary). Non-CVP transfers are analyzed in combination with the Action Alternatives in the cumulative analysis.

ES.1 Purpose and Need/Project Objectives

The purpose and need statement (under NEPA) and project objectives (under CEQA) describe the underlying need for and purpose of a Proposed Action. The purpose and need statement and objectives are a critical part of the environmental review process because they are used to identify the range of reasonable alternatives and focus the scope of analysis.

ES.1.1 Purpose and Need

The purpose of the Proposed Action is to approve and facilitate voluntary transfers of water from willing CVP and non-CVP sellers upstream of the Delta to CVP water users south of the Delta and in the San Francisco Bay Area. Water users have the need for immediately implementable and flexible supplemental water supplies to alleviate impacts resulting from shortages of water supplies.

ES.1.2 Project Objectives

SLDMWA has developed the following objectives for long-term water transfers through 2024:

- Develop supplemental water supply for member agencies during times of CVP shortages to meet existing demands.

- Meet the need of member agencies for a water supply that is immediately implementable and flexible and can respond to changes in hydrologic conditions and CVP allocations.

Because shortages in water supplies are expected due to hydrologic conditions, climatic variability, and regulatory requirements, transfers are needed to meet water demands.

ES.2 Study Area

The Study Area for potential transfers encompasses the potential buyers and sellers that could participate, which are shown in Figure ES-1.

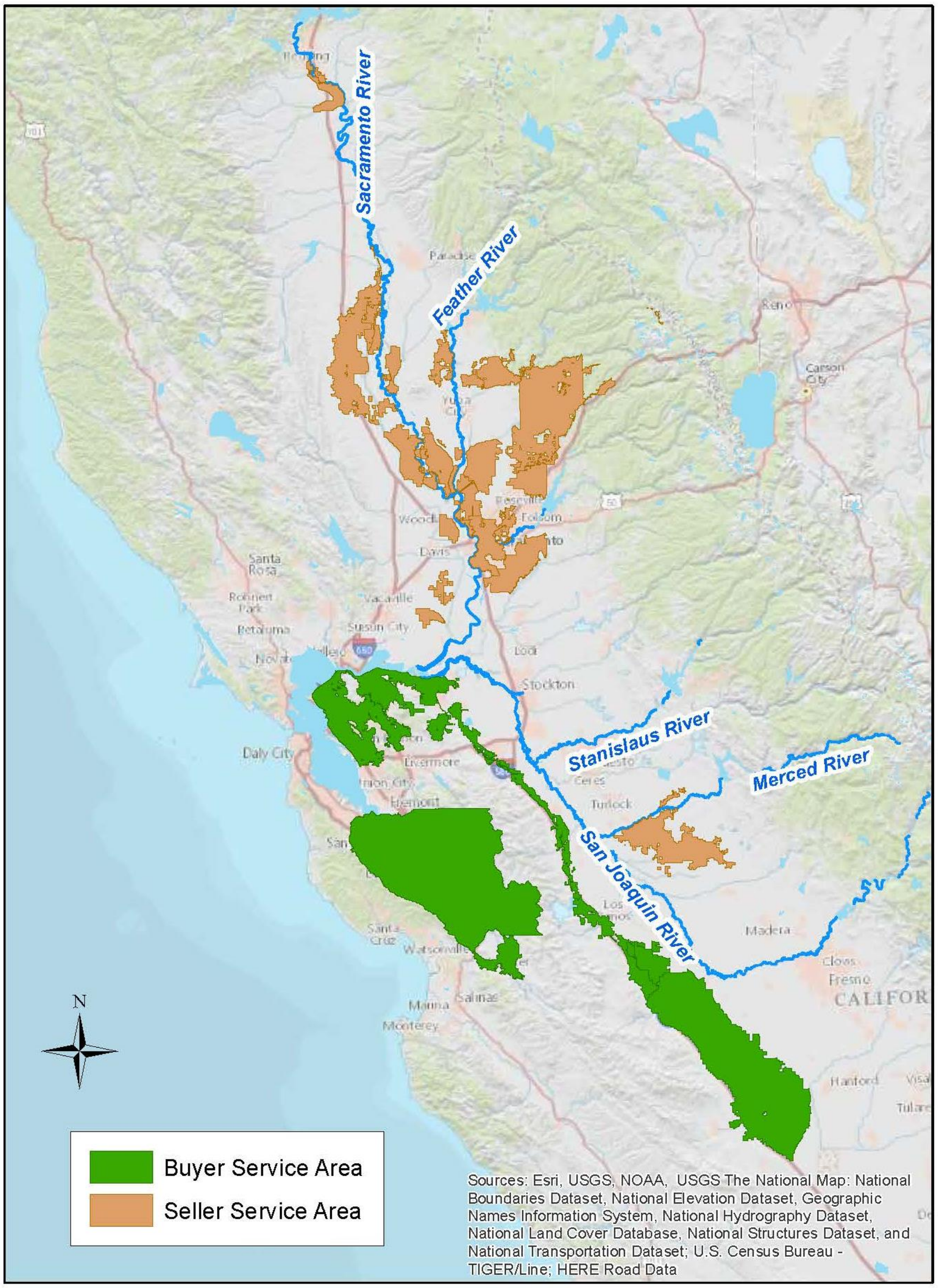

Figure ES-1.
Potential sellers would transfer water to buyers in the Central Valley or Bay Area

ES.2.1 Potential Buyers

A number of CVP contractors have identified interest in purchasing transfer water to reduce potential water shortages and have requested to be included in this RDEIR/SDEIS; these agencies are shown in Table ES-1.

**Table ES-1.
Potential Buyers**

San Luis & Delta-Mendota Water Authority Participating Members
Byron-Bethany Irrigation District
Del Puerto Water District
Eagle Field Water District
Mercy Springs Water District
Pacheco Water District
Panoche Water District
San Benito County Water District
San Luis Water District
Santa Clara Valley Water District
Westlands Water District
Contra Costa Water District
East Bay Municipal Utility District

ES.2.2 Potential Willing Sellers

Table ES-2 lists the agencies that have expressed interest in selling water for transfer and the potential maximum quantities available for sale. Actual purchases could be less, depending on hydrology, the amount of water the seller is interested in selling in any particular year, the interest of buyers, and compliance with Central Valley Project Improvement Act (CVPIA) transfer requirements, among other possible factors. Because of the uncertainty of hydrologic and operating conditions in the future, it is likely that only a portion of the potential transfers identified in Table ES-2 would occur. Buyers have identified that their demand is up to 250,000 acre-feet of water in any one year, which is less than the available supplies listed in Table ES-2.

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

Water Agency	Maximum Potential Transfer (acre-feet per year)[1]
Sacramento River Area of Analysis	
Anderson-Cottonwood Irrigation District	5,225
Burroughs Farms	2,000
Conaway Preservation Group	35,000
Cranmore Farms	8,000
Eastside Mutual Water Company	2,230
Glenn-Colusa Irrigation District	91,000
Giusti Farms	1,000
Henle Family Limited Partnership	700

Water Agency	Maximum Potential Transfer (acre-feet per year)[1]
Lewis Ranch	2,310
Natomas Central Mutual Water Company	30,000
Pelger Mutual Water Company	3,750
Pleasant Grove-Verona Mutual Water Company	18,000
Princeton-Codora-Glenn Irrigation District	13,200
Provident Irrigation District	19,800
Reclamation District 108	55,000
Reclamation District 1004	27,175
River Garden Farms	16,000
Sutter Mutual Water Company	36,000
Sycamore Mutual Water Company	20,000
Te Velde Revocable Family Trust	7,094
American River Area of Analysis	
City of Sacramento	5,000
Placer County Water Agency	47,000
Sacramento County Water Agency	15,000
Sacramento Suburban Water District	30,000
Yuba River Area of Analysis	
Browns Valley Irrigation District	8,100
Cordua Irrigation District	12,000
Feather River Area of Analysis	
Butte Water District	17,000
Garden Highway Mutual Water Company	14,000
Gilsizer Slough Ranch	3,900
Goose Club Farms and Teichert Aggregates	10,000
Nevada Irrigation District	15,000
South Sutter Water District	15,000
Tule Basin Farms	7,320
Merced River Area of Analysis	
Merced Irrigation District	30,000
Delta Region Area of Analysis	
Reclamation District 2060	6,000
Reclamation District 2068	7,500
Pope Ranch	2,800
Yolo Ranch	8,000

Note:
[1] The total transfers would be limited to be less than 250,000 acre-feet in any one year, based on the buyers' demands for transfers. The transfers in Table 2-2 add to more than this amount, but the buyers would not purchase transfers from all of these parties for the full amount.

ES.3 Development and Screening of Preliminary Alternatives

NEPA and CEQA require an EIS and EIR, respectively, to identify a reasonable range of alternatives and provide guidance on the identification and screening of such alternatives. Both NEPA and CEQA include provisions that alternatives reasonably meet the purpose and need/project objectives and be potentially feasible. For this RDEIR/SDEIS, the Lead Agencies followed a structured, documented process to identify and screen alternatives for inclusion in the EIS/EIR. Appendix A from the 2014 Draft EIS/EIR describes this process and the alternatives considered in more detail.

The process led to the development of the following measures that were carried forward from the scoping and screening process for alternative formulation:

- Agricultural Conservation (Seller Service Area)
- Cropland Idling Transfers - rice, field crops, grains
- Cropland Idling Transfers - alfalfa
- Groundwater Substitution
- Crop Shifting
- Reservoir Release

These measures were combined into three Action Alternatives that were selected to move forward for analysis in the 2014 Draft EIS/EIR and this RDEIR/SDEIS (in addition to the No Action/No Project Alternative).

ES.4 Water Transfer Methods

A water transfer moves a volume of water from a willing seller to a willing buyer. To make water available, the seller must take an action to reduce consumptive use or use water in storage. Water transfers must be consistent with State and Federal law, as discussed in Appendix B of this RDEIR/SDEIS. Transfers involving water diverted through the Delta are governed by existing water rights, applicable Delta pumping limitations, reservoir storage capacity and regulatory requirements. All transfer must be consistent with the guidance provided in the most recent version of the DRAFT Technical Information for Preparing Water Transfer Proposals (Reclamation and DWR 2015). The biological opinions (BOs) on the Coordinated Operations of the CVP and SWP (United States Fish and Wildlife Service [USFWS] 2008; National Oceanic and Atmospheric Administration Fisheries Service [NOAA Fisheries] 2009) analyze water deliveries through the Delta including deliveries through water transfers. Through Delta water transfers from July to September are up to 600,000 acre-feet in critical years and dry years (following dry or critical years). For all other year types, the maximum transfer amount is up to 360,000 acre-feet. The transfers included in Alternative 2 would be up to 250,000 acre-feet per year, so they would be less than that which was included in the BOs. The transfer volumes analyzed in the BO are inclusive of the volumes discussed in this document. Through Delta transfers would be limited to the period when USFWS and NOAA Fisheries find transfers to be acceptable, typically July through September, unless a change to the transfer window is made in a particular water year based on concurrence from USFWS and NOAA Fisheries.

This RDEIR/SDEIS analyzes transfers of water to CVP contractors. These transfers could be conveyed through the Delta using either CVP or SWP facilities, depending on availability. CVP sellers could transfer either Base Supply[1] or Project Water[2], or both, under their CVP contracts. Some transfers may not involve CVP contractors as sellers, but they may use CVP facilities. Any non-CVP water that would use CVP facilities would need a Warren Act[3] contract, which is subject to NEPA compliance. This document also analyzes the impacts of conveying or storing non-CVP water in CVP facilities to address compliance needs for transfers facilitated by execution of a contract pursuant to the Warren Act of February 21, 1911 (36 Stat. 925).

ES.4.1 Groundwater Substitution

Groundwater substitution transfers occur when sellers choose to pump groundwater in lieu of diverting surface water supplies, thereby making the surface water available for transfer. Sellers making water available through groundwater substitution actions are agricultural and municipal and industrial users. Groundwater substitution would decrease levels in groundwater basins near the participating wells. Water produced from wells initially comes from groundwater storage. Groundwater storage would refill (or "recharge") over time, which affects surface water sources. Groundwater pumping captures some groundwater that would otherwise discharge to streams as baseflow and can also induce recharge from streams. Once pumping ceases, this stream depletion continues, replacing the pumped groundwater slowly over time until the depleted storage fully recharges.

ES.4.2 Reservoir Release

Buyers could acquire water by purchasing surface water stored in reservoirs owned by non-Project entities (not part of the CVP or SWP). To ensure that purchasing this water would not affect downstream users, Reclamation would limit transferred water to what would not have otherwise been released downstream absent the transfer.

When the willing seller releases stored reservoir water for transfer, these reservoirs are drawn down to levels lower than they would have been without the water transfer. To refill the reservoir, a seller must capture some flow that would have otherwise gone downstream. Sellers must refill the storage at a time when downstream users would not have otherwise captured the water, either in downstream reservoirs or at the CVP and SWP (collectively "the Projects") or non-Project pumps in the Delta. Additionally, refill cannot occur at times when the water would have been used to meet downstream flow or water quality standards.

ES.4.3 Cropland Idling

Cropland idling makes water available for transfer that would have been used for agricultural production. Water would be made available on the same pattern throughout the growing season

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[1] Article 1(b) of the Sacramento River Settlement Contract defines Base Supply as the quantity of Surface Water established in Articles 3 and 5 which may be diverted by the Contractor from its Source of Supply each month during the period April through October of each Year without payment to the United States for such quantities diverted.

[2] Article 1(n) of the Sacramento River Settlement Contract defines Project water as all Surface Water diverted or scheduled to be diverted each month during the period April through October of each Year by the Contractor from its Source of Supply which is in excess of the Base Supply.

[3] The Warren Act of February 21, 1911 authorized the United States to execute contracts for the conveyance and storage of non-project water in Federal facilities when excess capacity exists.

as it would have otherwise been consumed had a crop been planted. The irrigation season generally lasts from April or May through September for most crops in the Sacramento Valley.

ES.4.4 Crop Shifting

For crop shifting transfers, water is made available when farmers shift from growing a higher water use crop to a lower water use crop. The difference in the accepted ETAW values between the two crops would be the amount of water that can be transferred.

ES.4.5 Conservation

Conservation transfers must include actions to reduce the diversion of surface water by the transferring entity by reducing irrecoverable water losses. The amount of reduction in irrecoverable losses determines the amount of transferrable water. Irrecoverable losses include water that would not be usable because it currently flows to a salt sink, to an inaccessible or degraded aquifer, or escapes to the atmosphere.

ES.5 Proposed Action and Alternatives

The following sections describe the Action Alternatives under evaluation in this RDEIR/SDEIS. Transfers of water would only occur when the Delta is in a balanced condition (when releases from upstream reservoirs plus unregulated flow approximately equals the water supply needed to meet Sacramento Valley in-basin uses plus exports).

ES.5.1 Alternative 1: No Action/No Project Alternative

Under the No Action/No Project Alternative, CVP-related water transfers through the Delta would not occur during the period 2019-2024. However, other transfers that do not involve CVP water or facilities could occur under the No Action/No Project Alternative. Additionally, transfers of CVP water within basins could continue and would still require Reclamation’s approval. Some CVP entities may decide that they are interested in selling water to buyers in export areas under the No Action/No Project Alternative; however, they would need to complete individual environmental compliance for each transfer to allow Reclamation to complete the evaluation of the transfer for approval.

Under the No Action/No Project Alternative, some agricultural and urban water users may face potential shortages in the absence of water transfers. These potential shortages will likely be met by increasing groundwater pumping, idling cropland, reducing landscape irrigation, land retirement, or rationing water.

ES.5.2 Alternative 2: Full Range of Transfers (Proposed Action)

Alternative 2 would include making water available for transfer through all four methods: groundwater substitution, cropland idling/shifting, stored reservoir release, and conservation. Table ES-2 shows the potential sellers under Alternative 2. Buyers would be the same as those shown in Table ES-1, and transfers from Browns Valley Irrigation District (ID) would not be included in the Proposed Project for CEQA. The upper limit for transfers in any one year would be 250,000 acre-feet and up to 60,693 acres of cropland could be idled.

ES.5.3 Alternative 3: No Cropland Modifications

Alternative 3 would include making water available for transfer through groundwater substitution, stored reservoir release, and conservation actions. It would not include any cropland idling or crop shifting actions as methods of making water available for transfer. The sellers in Table ES-2 that would make water available for transfer through groundwater substitution, stored reservoir release, and conservation actions are included as part of Alternative 3. Buyers would be the same as those shown in Table ES-1, and transfers from Browns Valley ID would not be included in the Proposed Project for CEQA. The upper limit for water made available for transfer in any one year would be 250,000 acre-feet.

ES.5.4 Alternative 4: No Groundwater Substitution

Alternative 4 would include making water available for transfer through cropland idling, crop shifting, stored reservoir release, and conservation actions. It would not include any transfers of water made available through groundwater substitution actions. The sellers in Table ES-2 that would make water available for transfer through cropland idling, crop shifting, stored reservoir release, and conservation actions are included as part of Alternative 4. Buyers would be the same as those shown in Table ES-1, and transfers from Browns Valley ID would not be included in the Proposed Project for CEQA. The upper limit for water made available for transfer in any one year would be 250,000 acre-feet and up to 60,693 acres of cropland could be idled.

ES.6 Environmental Consequences/Environmental Impacts

A summary of the environmental impacts identified for the action alternative (including beneficial effects pursuant to NEPA) is presented in Appendix C, Impacts Summary of the RDEIR/SDEIS. The No Action/No Project Alternative considers the potential for changed conditions during the 2019-2024 period when transfers could occur. The potential for changed conditions for this period was found to be insubstantial and the analysis did not identify changes from existing conditions. Alternative 1 is therefore not included in the tables.

ES.7 Impact Summary

This section summarizes key impacts for the Action Alternatives in this RDEIR/SDEIS.

ES.7.1 Alternative 2: Full Range of Transfers (Proposed Action)

Impacts associated with water transfers are related to the method of making water available for transfer or conveyance of transferred water from seller to buyer. Stored reservoir release and water conservation are structured such that they have minor effects associated with making water available. The discussions below focus on cropland idling, groundwater substitution, and water conveyance, which is related to all methods of making water available for transfer.

Cropland Idling/Crop Shifting

Transfers of water made available from cropland idling actions would require idling fields that were previously farmed; and transfers of water made available from crop shifting actions would require shifting from a higher water-use crop to a lower water-use crop. Cropland idling could include a variety of crops but idling in upland areas would be within the historic range of variation and would have less than significant effects on natural communities and special-status species.

Idling of seasonally flooded agricultural fields (primarily rice) could affect species that rely on flooded crops or related infrastructure (such as delivery and drainage ditches). Idling seasonally flooded agricultural fields could cause habitat fragmentation, inhibit normal wildlife migration and dispersal of individuals, and potentially dissociate habitats for roosting from those for foraging. These impacts would be detrimental to individual fitness and be potentially significant effects to wildlife. For species that migrate into the area seasonally (mainly birds), effects would be minor because the fields would already be idled when they arrive, and they would select suitable habitat in other locations. For year-round residents (i.e., pond turtle, giant garter snake) the potential impacts would be greater (see Section 3.8.2.4.1 of the RDEIR/SDEIS). These effects are mitigated through measures discussed in Section 3.8.4 of the RDEIR/SDEIS, that maintain water in ditches which support these species and avoid priority habitat areas.

Cropland idling could affect land categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the Farmland Mapping and Monitoring Program (FMMP), but this effect would be mitigated by avoiding idling that would result in changes to FMMP land use classifications. Cropland idling could also reduce farm income, which would affect farm employment and farm-related businesses.

Groundwater Substitution

Transfers of water made available from groundwater substitution pumping actions would involve growers using groundwater instead of surface water supplies; and would result in a reduction in stored groundwater. The storage would be filled over time from surface water, which would reduce flow in streams. In major water bodies, the CVP and SWP would release more water from storage to maintain flows as needed, which could affect their operations. This effect would be mitigated by applying a streamflow depletion factor to transfers to account for the groundwater/surface water interactions.

Depleting water in small streams could affect natural communities or special-status species in some waterways, including Cache Creek and Stony Creek (see Section 3.8.2.4.1 of the RDEIR/SDEIS for detailed discussion of impacts River and Creeks in the Seller Service Area). These impacts would be reduced by monitoring groundwater near those areas to avoid changing groundwater levels that could affect stream flows or riparian vegetation.

Water made available for transfer from groundwater substitution pumping actions would reduce groundwater levels near the participating wells, which could affect surrounding third parties or potentially cause subsidence. These effects would be reduced through monitoring and mitigation plans. If groundwater levels fall below local Basin Management Objectives or historic low groundwater levels, transfer pumping would stop until groundwater levels recover. This requirement would avoid potential groundwater pumping related-land subsidence, which could occur when groundwater levels fall below historic low levels. The mitigation plan discussed in Section 3.3.4 of the RDEIR/SDEIS, includes measures to account for potential impacts to third parties (such as increased pumping costs at nearby wells or the requirements to deepen a pump).

Groundwater wells in the Sacramento Valley have multiple sources of power, including electric, diesel, and natural gas engines. Increased pumping, particularly with older diesel engines, could increase emissions of criteria pollutants. These emissions would exceed criteria within the Feather River Air Quality Management District area, and the emissions would need to be reduced by either pumping more of the transferred water with electric engines or transferring less water.

Water Conveyance

Conveying water for made available for transfer would increase flows in the river upstream from the Delta during the transfer period (July through September). Water made available for transfer would also increase Delta inflows and Delta exports. After water made available for transfer has been conveyed, water flows in rivers and the Delta could decrease as the groundwater aquifer (for transfers based on groundwater substitution actions) and surface storage (for transfers based on stored reservoir release) are refilled. Surface storage could only be refilled during wetter periods when it would not otherwise affect downstream users or the ability to meet water quality or flow standards. Groundwater storage could refill at any time, but when the Delta is in balance (Delta inflows are equal to Sacramento Valley in-basin needs, Delta outflows, and Delta exports), the CVP and SWP would maintain flows as required under the operational plans. During wetter conditions, when the Delta is in excess conditions, Delta inflows and outflows may decrease because of storage refills. However, these changes would be insubstantial and take place only during wetter conditions, at times when the changes would not affect resources in the rivers or the Delta (see Section 3.7.6.1 of the RDEIR/SDEIS for detailed discussion of impacts on Delta resources).

ES.7.2 Alternative 3: No Cropland Modifications

Alternative 3 includes making water available for transfer through groundwater substitution, stored reservoir release, and water conservation actions. The effects of Alternative 3 are described in the Alternative 2 summary of impacts associated with making water available for transfer through groundwater substitution actions and associated water conveyance.

ES.7.3 Alternative 4: No Groundwater Substitution

Alternative 4 includes making water available for transfer through cropland idling, crop shifting, stored reservoir release, and water conservation actions. The effects of Alternative 4 are described in the Alternative 2 summary of impacts associated with making water available for transfer through cropland idling/crop shifting actions and associated water conveyance.

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Chapter 1 Introduction

Hydrologic conditions, climatic variability, consumptive use within the watershed, and regulatory requirements for operation of water projects commonly affect water supply availability in California. This variability strains water supplies, making advance planning for water shortages necessary and routine. In the past decades, water entities have been implementing water transfers to supplement available water supplies to serve existing demands.

The United States Department of the Interior, Bureau of Reclamation (Reclamation) manages the Central Valley Project (CVP), which includes storage in reservoirs (such as Shasta, Folsom, and Trinity reservoirs) and diversion pumps in the Delta to deliver water to users in the San Joaquin Valley and San Francisco Bay area. When these users experience water shortages, they look to water transfers to help reduce potential impacts of those shortages.

Transfers are allowed under California State law and under Federal law. Water users have been encouraged to seek alternative sources of water through willing buyer/willing seller agreements. This Revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS) updates a Draft Environmental Impact Report/ Environmental Impact Statement (EIS/EIR) that was previously circulated in 2014 and has now been revised with new information and analysis presented herein. The purpose of the EIS/EIR is to address the effects of transfers between listed buyers and sellers (i.e., the Proposed Action) that will streamline the environmental review process and make transfers more implementable relative to National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) requirements, especially when hydrologic conditions and available pumping capacity are unknown until right before the transfer season.

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As further described below in Section 1.2, Reclamation and San Luis & Delta-Mendota Water Authority (SLDMWA) previously completed a joint EIS/EIR for the Proposed Action pursuant to NEPA and CEQA for water transfers through 2024, and revisions to the 2014 Draft EIS/EIR are presented herein. Reclamation serves as the Lead Agency under NEPA and SLDMWA is the Lead Agency under CEQA. Reclamation would facilitate transfers proposed by buyers and sellers. The SLDMWA, consisting of federal and exchange water service contractors in western San Joaquin Valley, San Benito, and Santa Clara counties, negotiates and purchases transfers in years when the member agencies could experience shortages.

The RDEIR/SDEIS evaluates water transfers to CVP contractors located south of the Delta or in the San Francisco Bay Area. The water would be conveyed through the legal Delta[1] using CVP or State Water Project (SWP) pumps, or facilities owned by other agencies in the San Francisco Bay Area. The RDEIR/SDEIS addresses the transfer of water to CVP contractors from CVP and non-CVP sources of supply that must be conveyed through the Delta using CVP, SWP, and local facilities. These transfers require approval from Reclamation and/or the Department of Water Resources (DWR), which necessitates compliance with NEPA and CEQA. Other transfers not included in this RDEIR/SDEIS could occur during the same time period, subject to their own environmental review (as necessary). Non-CVP transfers are analyzed in combination with the potential alternatives in the cumulative analysis.

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The purpose and need statement (under NEPA) and project objectives (under CEQA) describe the underlying need for and purpose of a Proposed Action. Appendix B of the RDEIR/SDEIS includes additional background on the project, the CVP, and the potential buyers.

1.1.1 Purpose and Need

The purpose of the Proposed Action is to approve and facilitate voluntary transfers of water from willing CVP and non-CVP sellers upstream of the Delta to CVP water users south of the Delta and in the San Francisco Bay Area. Water users have the need for immediately implementable and flexible supplemental water supplies to alleviate impacts resulting from shortages of water supplies.

1.1.2 Project Objectives

SLDMWA has developed the following objectives for long-term water transfers through 2024:

- Develop supplemental water supply for member agencies during times of CVP shortages to meet existing demands.
- Meet the need of member agencies for a water supply that is immediately implementable and flexible and can respond to changes in hydrologic conditions and CVP allocations.

Because shortages in water supplies are expected due to hydrologic conditions, climatic variability, and regulatory requirements, transfers are needed to meet water demands.

1.2 Long-Term Water Transfers History

Reclamation and SLDMWA completed the 2014 Draft EIS/EIR in 2014 and a Final EIS/EIR in 2015. The agencies issued a Record of Decision (under NEPA) and Notice of Determination (under CEQA), also in 2015. Additionally, SLDMWA issued an Addendum in 2017 that considered new potential sellers and changed amounts for the existing sellers. The Addendum

[1] The legal Delta is roughly defined as the waterways within the “triangular area” demarcated by Freeport on the Sacramento River on the north, to Vernalis on the San Joaquin River on the south, and Antioch at the confluence of the two rivers on the west.

found that the changes to the project description did not alter the conclusions in the 2015 Final EIS/EIR.

The 2015 Final EIS/EIR was challenged in United States District Court for the Eastern District of California in the case *AquAlliance, et al., v. U.S. Bureau of Reclamation, et al*. On July 5, 2018, the District Court entered judgment, vacating SLDMWA's decisions to approve the Final Long-Term Water Transfers EIS/EIR and approve the Proposed Action, vacating the 2015 Final EIS/EIR, and vacating the U.S. Fish and Wildlife Service's biological opinion. As a result, Reclamation and SLDMWA are hereby revising the Long-Term Water Transfers EIS/EIR to address the specific issues identified in the ruling. The additional information and associated analysis is being recirculated, as described in CEQA Guidelines Section 15088.5. As described in Section 15088.5(c):

> *If the revision is limited to a few chapters or portions of the EIR, the lead agency need only recirculate the chapters or portions that have been modified.*

Under NEPA, this document represents a supplemental statement to the Draft EIS, as defined in 40 Code of Federal Regulations (CFR) 1502.9 (c):

> *Agencies shall prepare supplements to either draft or final environmental impact statement if… there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts.*

This RDEIR/SDEIS includes revised sections to address the specific areas of the Final EIS/EIR requiring further discussion and clarification as determined by the court. These sections include:

- Project Description: updated to reflect new seller information and overall quantity of transfers. Removed environmental commitments related to protection of biological species from the project description and moved them to mitigation measures in the Vegetation and Wildlife chapter.
- Groundwater: revised affected environment to describe changes that have occurred since completion of the 2014 Draft EIS/EIR and revised Mitigation Measure GW-1.
- Vegetation and Wildlife: updated analysis to reflect project description without environmental commitments and include appropriate mitigation measures.
- Water Quality: updated cumulative analysis to provide more detail on water quality effects associated with changes in Delta outflow.
- Fisheries Resources: revised cumulative analysis to provide more detail on effects to fisheries associated with changes in Delta outflow.
- Climate Change: added impact analysis to describe potential impacts of climate change on the project.
- Appendices: included additional information regarding these analyses. In addition to appendices referenced in the following chapters, Appendix A includes the list of preparers, acronyms, and references, and Appendix D includes the regulatory setting for Groundwater, Vegetation and Wildlife, and Climate Change.

The Project Description, Groundwater, and Vegetation and Wildlife sections represent complete sections within this RDEIR/SDEIS. The Water Quality, Fisheries Resources, and Climate Change sections add analysis to the 2014 Draft EIS/EIR. These sections do not include the entire text of these sections, but only include the new text that has been added as part of the RDEIR/SDEIS.

The remaining sections from the 2014 Draft EIS/EIR do not have changes resulting from the Court's ruling and are not included in this RDEIR/SDEIS; however, the 2014 Draft EIS/EIR is still available to the public for informational purposes, as described below in Section 1.6. After public review of this RDEIR/SDEIS, Reclamation and SLDMWA will consider public comments received, respond in writing to any significant environmental issues raised, and develop a Final Long-Term Water Transfers EIS/EIR that incorporates the 2014 Draft EIS/EIR (and responses to comments on that document) and the material in this RDEIR/SDEIS. Figure 1-1 illustrates the document structure of these documents and provides a document road map.

The 2014 Draft EIS/EIR analyzed transfers of up to 511,094 acre-feet, but this amount of water is substantially greater than the buyer demand or the amounts that actually have been historically transferred. After Reclamation and SLDMWA completed the Long-Term Water Transfers EIS/EIR process, the only year with transfers that occurred under that document was in 2015. In 2015, SLDMWA purchased 164,153 acre-feet, and East Bay Municipal Utility District purchased 13,268 acre-feet (Reclamation 2018). The buyers have considered their demand for transfers between 2019 and 2024 and have determined that their demand is less than what was included in the 2014 Draft EIS/EIR. This RDEIR/SDEIS presents (and analyzes) transfers from multiple sellers, but all transfers (combined) in a year would be limited so as not to exceed 250,000 acre-feet. This change could decrease effects to some resource analyses, but the changes would not represent a material change to the analysis.

1.3 Water Transfers Included in the Long-Term Water Transfers EIS/EIR and Roles of Participating Agencies

The 2014 Draft EIS/EIR evaluates out-of-basin water transfers from willing sellers upstream from the Delta to buyers south of the Delta and in the San Francisco Bay Area. Alternatives considered in the RDEIR/SDEIS only analyze transfers to CVP contractors that require use of CVP or SWP facilities. SWP contractors located south of the Delta may also purchase water made available for transfer that originates north of the Delta. The cumulative analysis evaluates potential SWP transfers, but they are not part of the action alternatives for the RDEIR/SDEIS.

For each transfer, buyers and sellers are responsible for identifying one another, initiating discussions, and negotiating the terms of the transfers, including amount of water available for transfer, method making water available, and price. Sellers, who are CVP contractors, must prepare transfer proposals for submission to Reclamation. Sellers that are not CVP contractors would work with the buyers to submit information to Reclamation. The transfer proposals and must provide required transfer information as defined by Reclamation, including information required under the Mitigation Measures identified in the Groundwater Resources and Vegetation and Wildlife chapters. All transfer proposals must be consistent with the guidance provided in the most recent version of the DRAFT Technical Information for Preparing Water Transfer

Proposals. Proposals must also be submitted to DWR if the transfers require use of DWR facilities or the transfers involve a seller with a settlement agreement with DWR.

Reclamation reviews transfer proposals to ensure they are in accordance with NEPA, the Central Valley Project Improvement Act (CVPIA), and California State law, as well as to ensure they are consistent with the analysis and mitigation measures identified and adopted through the NEPA and CEQA process. Reclamation also determines if a Warren Act Contract is necessary (if non-CVP water would be stored or conveyed through CVP facilities). If a transfer is approved, and subject to available capacity in CVP facilities, Reclamation moves the water through CVP facilities at the specified time of transfer to the buyer's service area. DWR may also be involved in conveying water made available for transfer and is interested in verifying that water made available for transfer does not compromise SWP water supplies. For water conveyed through the SWP system, DWR must also determine if the transfer can be made without injuring any legal user of water and without unreasonably affecting fish, wildlife, or other instream beneficial uses and without unreasonably affecting the overall economy or environment of the county from which the water is being transferred. Because of DWR's role in water transfers, DWR is a Responsible Agency under CEQA for the Long-Term Water Transfers EIS/EIR.

1.4 Decision to be Made and Uses of the Long-Term Water Transfers EIS/EIR

SLDMWA will use the Final Long-Term Water Transfers EIS/EIR as the environmental analysis for a decision on whether to implement water transfers through 2024 that must be conveyed through the Delta using CVP or SWP facilities. Other buyers (Contra Costa WD and East Bay MUD) will also use this document as the basis for decision-making on whether to transfer water. Reclamation will use the subject document to decide whether or not to approve and facilitate transfers of water under contract with the United States of America, or non-CVP supplies that require use of CVP facilities and ensure that water transfers are implemented with measures incorporated to minimize environmental effects.

When proposing or approving a specific water transfer in the future, the Lead Agencies and/or Responsible Agencies will consider whether the proposed transfer was analyzed in the Final Long-Term Water Transfers EIS/EIR. If so, the Lead Agencies can rely on the analysis in the Final Long-Term Water Transfers EIS/EIR. If it is not covered or there have been significant changes, the Lead Agencies may need to supplement the Final Long-Term Water Transfers EIS/EIR.

1.5 Issues of Known Controversy

Federal, State, and local agencies, and other parties have participated in the NEPA and CEQA process leading to the development of the alternatives presented in the Long-Term Water Transfers EIS/EIR. During January 2011, public scoping sessions on the development of the Long-Term Water Transfers EIS/EIR were held in Chico, Los Banos, and Sacramento. In October 2014, Reclamation and SLDMWA conducted public meetings on the 2014 Draft

EIS/EIR in the same locations. These meetings and public comments indicated some issues of known controversy:

- Water transfers could result in long-term impacts to groundwater, by decreasing groundwater levels, adversely affecting groundwater users that are not participating in transfers, and potentially causing subsidence.
- The cumulative effects analysis must include all water transfers and programs that result in additional groundwater pumping in the Sacramento Valley region.
- Water transfers could result in impacts to adjacent water users, local economies, and fish and wildlife.
- Water transfers that idle croplands could affect the giant garter snake, and the measures considered to reduce those effects may not be sufficiently protective.

1.6 RDEIR/SDEIS Availability and Processing

The RDEIR/SDEIS is available for public review on Reclamation's website: https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=18361. Copies are also available in county libraries within the area of analysis and the offices of Reclamation and SLDMWA.

Only the new information and revised analysis prepared to address specific areas of the 2015 Final EIS/EIR requiring further discussion and clarification are being circulated for public review and comment, pursuant to the applicable requirements of NEPA and CEQA. The 2015 Final EIS/EIR is also available at the same weblink provided above. These sections of the analysis are provided for informational purposes only and are not being recirculated for public comment. Comments on the 2015 document will not be accepted by Reclamation or SLDMWA; only comments specific to the RDEIR/SDEIS will be accepted. Reclamation and SLDMWA will then prepare written responses to comments received on the RDEIR/SDEIS, which will be included in the Final Long-Term Water Transfers EIS/EIR.

2014 DRAFT EIS/EIR

Content:

- ES Executive Summary
- 1 Introduction
- 2 Proposed Action and Description of the Alternatives
- 3 Affected Environment/Environmental Consequences
  - 3.1 Water Supply
  - 3.2 Water Quality
  - 3.3 Groundwater Resources
  - 3.4 Geology and Soils
  - 3.5 Air Quality
  - 3.6 Climate Change
  - 3.7 Fisheries
  - 3.8 Vegetation and Wildlife
  - 3.9 Agricultural Land Use
  - 3.10 Regional Economics
  - 3.11 Environmental Justice
  - 3.12 Indian Trust Assets
  - 3.13 Cultural Resources
  - 3.14 Visual Resources
  - 3.15 Recreation
  - 3.16 Power
  - 3.17 Flood Control
- 4 Cumulative Effects Methodology
- 5 Other Required Disclosures
- 6 Consultation and Coordination
- 7 List of Preparers and Contributors

APPENDICES

- A Alternatives Development
- B Water Operations Assessment
- C Delta Conditions Assessment
- D Groundwater Model Documentation
- E Groundwater Model Results
- F Air Quality Emission Calculations
- G Climate Change Analysis Emission Calculations
- H Biological Regulatory Setting
- I Special-Status Animals and Plants
- J Comments and Responses
- K Mitigation Monitoring and Reporting Program
- L Groundwater Existing Conditions
- M SACFEM2013 Manual
- N Index
- O Comment Letters
- P Distribution List

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2018 DRAFT Supplemental EIS/ Revised EIR

Content:

- ES Executive Summary
- 1 Introduction
- 2 Proposed Action and Description of the Alternatives
  - 3.2.4 Water Quality Cumulative Effects
  - 3.2 Groundwater Resources
  - 3.6.2 Climate Change Environmental Consequences/Environmental Impacts
  - 3.7.6 Fisheries Cumulative Effects
  - 3.8 Vegetation and Wildlife

APPENDICES

- A Supplemental Material
- B Background
- C Impact Summary
- D Regulatory Settings
- E Groundwater Existing Conditions
- F Groundwater Modeling Results
- G Natural Communities Descriptions
- H Special-Status Plant and Wildlife Species
- I Methods for Assessing Impacts on Natural Communities and Special-Status Plants and Wildlife
- J Tables Summarizing the Screening Evaluation and Average Monthly Flows using the Groundwater Model for Smaller Streams
- L Climate Change Technical Appendix

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Final Long-Term Water Transfers EIS/EIR

Content:

- ES Executive Summary
- 1 Introduction
- 2 Proposed Action and Description of the Alternatives
  - 3.2.4 Water Quality Cumulative Effects
  - 3.3 Groundwater Resources
  - 3.6.2 Climate Change Environmental Consequences/Environmental Impacts
  - 3.7.6 Fisheries Cumulative Effects
  - 3.8 Vegetation and Wildlife

APPENDICES

- A Supplemental Material
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- H Special-Status Plant and Wildlife Species
- I Methods for Assessing Impacts on Natural Communities and Special-Status Plants and Wildlife
- J Tables Summarizing the Screening Evaluation and Average Monthly Flows using the Groundwater Model for Smaller Streams
- L Climate Change Technical Appendix
- M 2014 Draft EIS/EIR Errata Sheets
- N Responses to Public Comments
- O Monitoring and Mitigation Plan (MMRP)
- P Comment Letters

Figure 1-1.
Document Road Map

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Chapter 2 Proposed Action and Description of the Alternatives

This chapter includes a description of the alternatives formulation process to select a reasonable range of alternatives and a description of the Proposed Action and its alternatives.

2.1 Alternatives Development

NEPA and CEQA require an EIS and EIR, respectively, to identify a reasonable range of alternatives and provide guidance on the identification and screening of such alternatives. Both NEPA and CEQA include provisions that alternatives reasonably meet the purpose and need/project objectives and be potentially feasible. For the 2014 Draft EIS/EIR, the Lead Agencies followed a structured, documented process to identify and screen alternatives for inclusion in the EIS/EIR. Appendix A of the 2014 Draft EIS/EIR describes this process and the alternatives considered in more detail.

The Lead Agencies started by identifying the purpose and need/project objectives and conducting public scoping. The Lead Agencies reviewed the purpose and need/project objectives statement, public scoping comments, and previous studies in their initial effort to develop conceptual alternatives. This process identified an initial list of more than 27 measures that could, in part, contribute to the purpose and need/project objectives. The Lead Agencies then developed and applied a set of screening considerations to determine which measures should move forward for further analysis and be considered as Action Alternatives.

The Lead Agencies determined that they would screen the alternatives based on their ability to meet key elements of the purpose and need/basic project objectives:

- Immediate: the term proposed for this RDEIR/SDEIS is 2019 to 2024. This period is relatively short, and measures need to be able to provide some measurable benefit within this time period.

- Flexible: project participants need water in some years, but not in others. They need measures that have the flexibility to be used only when needed.

- Provide Water: project participants need measures that have the capability of providing additional water to regions that are experiencing shortages.

Measures had to satisfy these key elements in order to move forward to the alternatives formulation phase. These measures, and their performance, are documented in Appendix A of the 2014 Draft EIS/EIR. The measures remaining after the initial screening were combined into three action alternatives that were selected to move forward for analysis in the 2014 Draft EIS/EIR and this RDEIR/SDEIS (in addition to the No Action/No Project Alternative).

2.2 Proposed Action and Alternatives

The following sections describe the alternatives under evaluation in this RDEIR/SDEIS. Transfers of water would only occur when the Delta is in a balanced condition (i.e., when Delta inflows are equal to Sacramento Valley in-basin needs, Delta outflows, and Delta exports).

2.2.1 Alternative 1: No Action/No Project Alternative

The No Action Alternative (under NEPA) may be described as the future circumstances without the Proposed Action and can also include predictable actions by persons or entities, other than the federal agency involved in a project action, acting in accordance with current management direction or level of management intensity. The No Project Alternative (under CEQA) also describes the future without the project, and may include some reasonably foreseeable changes in existing conditions and changes that would reasonably be expected to occur in the foreseeable future if the project were not approved.

Under the No Action/No Project Alternative, CVP related water transfers through the Delta would not occur during the period 2019-2024. However, other transfers that do not involve CVP Project water or facilities could occur under the No Action/No Project Alternative. Additionally, transfers of CVP water within basins could continue and would still require Reclamation's approval. Some CVP entities may decide that they are interested in selling water to buyers in export areas under the No Action/No Project Alternative; however, they would need to complete individual environmental compliance for each transfer to allow Reclamation to complete the evaluation of the transfer.

Under the No Action/No Project Alternative, some agricultural and urban water users may face potential shortages in the absence of water transfers. To the extent water is not made available for transfer, there would be demand that would be unmet by surface water. Demand will likely be met by increasing groundwater pumping, idling cropland, reducing landscape irrigation, land retirement, or rationing water.

2.2.2 Alternative 2: Full Range of Transfers (Proposed Action)

This section describes potential transfer participants, potential transfer methods and operations for Alternative 2. Alternative 2 would involve transfers from potential sellers upstream from the Delta to buyers in the Central Valley or Bay Area (see Figure 2-1) when the Delta is in balanced conditions[1]. The total amount of water transferred under Alternative 2 would not exceed 250,000 acre-feet, based on the demands and requirements of the buyers listed in this document.

[1] The Delta is declared to be "Balanced" by Reclamation and DWR when it is agreed that releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley inbasin uses, plus exports (Reclamation and DWR 1986).

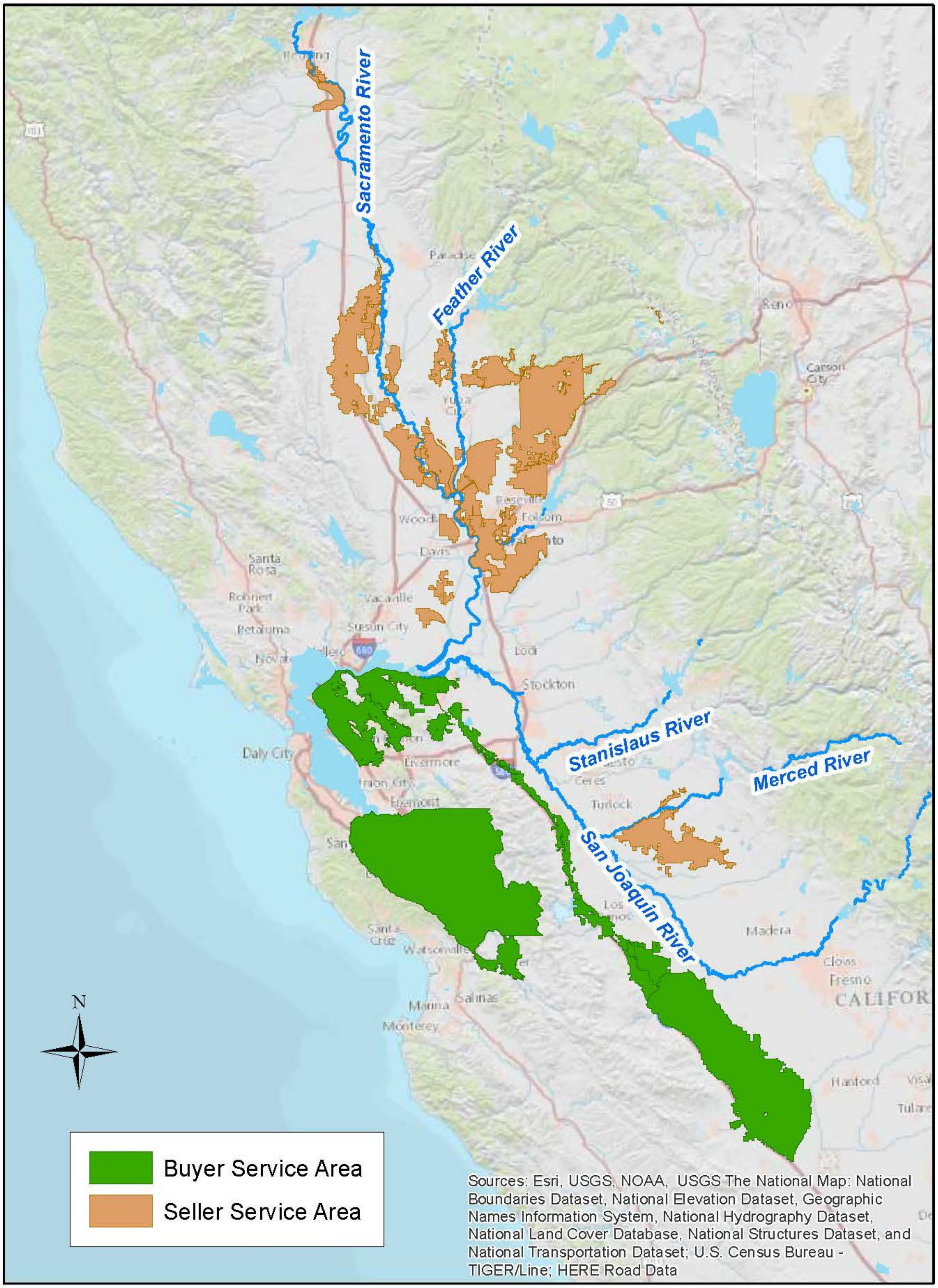

Figure 2-1.
Potential sellers would transfer water to buyers in the Central Valley or Bay Area

2.2.2.1 Potential Water Transfer Methods

A transfer of water temporarily moves water from a willing seller to a willing buyer. To make water available, the seller must take an action to reduce consumptive use or use water in storage. Water transfers must be consistent with State and Federal law, as discussed in Appendix B of the RDEIR/SDEIS. Transfers involving water diverted through the Delta are governed by existing water rights, applicable Delta pumping limitations, reservoir storage capacity and regulatory requirements.

The biological opinions (BOs) on the Coordinated Operations of the CVP and SWP (United States Fish and Wildlife Service [USFWS] 2008; National Oceanic and Atmospheric Administration Fisheries Service [NOAA Fisheries] 2009) analyze transfers through the Delta from July to September that are up to 600,000 acre-feet in critical years and dry years (following dry or critical years). For all other year types, the maximum transfer amount is up to 360,000 acre-feet. The transfers included in Alternative 2 would be up to 250,000 acre-feet per year, so they would be less than that which was included in the BOs. The transfer volumes analyzed in the BO are inclusive of the volumes discussed in this document. Through Delta transfers would be limited to the period when USFWS and NOAA Fisheries find transfers to be acceptable, typically July through September, unless a change is made in a particular water year based on concurrence from USFWS and NOAA Fisheries. Because this document only analyzes the environmental effects associated with a July through September transfer window, supplemental environmental documentation will be prepared to address the effects of expanding the transfer window if such a shift were to occur.

This RDEIR/SDEIS analyzes transfers of water to CVP contractors. These transfers could be conveyed through the Delta using either CVP or SWP facilities, depending on availability. CVP sellers could transfer either Base Supply[2] or Project Water[3], or both, under their CVP contracts. Some transfers may not involve CVP contractors as sellers, but they may use CVP facilities. Any non-CVP water that would use CVP facilities would need a Warren Act[4] contract, which is subject to NEPA compliance. This document also analyzes the impacts of conveying or storing non-CVP water in CVP facilities to address compliance needs for transfers facilitated by execution of a contract pursuant to the Warren Act of February 21, 1911 (36 Stat. 925).

Some transfers may be facilitated through forbearance agreements rather than transfers that require approval by the State Water Resources Control Board (SWRCB). Under such agreements, a CVP seller would forbear (i.e., temporarily suspend) the diversion of some of its Base Supply, which in the absence of forbearance, would have been diverted for use on lands within the CVP seller's service areas. This forbearance would be undertaken in a manner that allows Reclamation to deliver the forborne water supply to a purchasing CVP water agency as

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[2] Article 1(b) of the Sacramento River Settlement Contract defines Base Supply as the quantity of Surface Water established in Articles 3 and 5 which may be diverted by the Contractor from its Source of Supply each month during the period April through October of each Year without payment to the United States for such quantities diverted.

[3] Article 1(n) of the Sacramento River Settlement Contract defines Project water as all Surface Water diverted or scheduled to be diverted each month during the period April through October of each Year by the Contractor from its Source of Supply which is in excess of the Base Supply.

[4] The Warren Act of February 21, 1911 authorized the United States to execute contracts for the conveyance and storage of non-project water in Federal facilities when excess capacity exists.

Project water. A forbearance agreement would not change the method of making water available for transfer, conveyed to buyers, or used by the buyers; therefore, it would not change the environmental effects of the transfer.

Groundwater Substitution

Groundwater substitution transfers occur when sellers choose to pump groundwater in lieu of diverting surface water supplies, thereby making the surface water available for transfer. Sellers making water available through groundwater substitution actions are agricultural and municipal and industrial users. Water could be made available for transfer by the agricultural users during the irrigation season of April through September. If there are issues related to water supply availability or conveyance capacity at the Delta, sellers could shorten the window when transfer water is available by switching between surface water supplies and groundwater pumping for irrigation or municipal and industrial use.

Groundwater substitution would temporarily decrease levels in groundwater basins near the participating wells. Water produced from wells initially comes from groundwater storage. Groundwater storage would refill (or "recharge") over time, which affects surface water sources. Groundwater pumping captures some groundwater that would otherwise discharge to streams as baseflow and can also induce recharge from streams. Once pumping ceases, this stream depletion continues, replacing the pumped groundwater slowly over time until the depleted storage fully recharges.

Reservoir Release

Buyers could acquire water by purchasing surface water stored in reservoirs owned by non-Project entities (not part of the CVP or SWP). To ensure that purchasing this water would not affect downstream users, Reclamation would limit transferred water to that which would not have otherwise been released downstream absent the transfer.

When the willing seller releases stored reservoir water for transfer, these reservoirs are drawn down to levels lower than they would have been without the water transfer. To refill the reservoir, a seller must capture some flow that would have otherwise gone downstream. Sellers must refill the vacated storage at a time when downstream users would not have otherwise captured the water, either in downstream reservoirs or at the CVP and SWP (collectively "the Projects") or non-Project pumps in the Delta. Typically, refill can only occur during excess conditions in the Delta, defined by the Coordinated Operations Agreement (COA) as "periods when it is agreed that releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley in basin uses, plus exports," or when any downstream reservoirs are in flood control operations. Additionally, refill cannot occur at times when the water would have been used to meet downstream flow or water quality standards. Refill of the storage vacated for a transfer may take more than one season if the above conditions are not met in the wet season following the transfer. Each reservoir release transfer would include a refill agreement between the seller and Reclamation (developed in coordination with DWR) to prevent impacts to downstream users following a transfer.

Some entities that could transfer water through reservoir release are upstream of CVP reservoirs and could request to store water temporarily in the CVP reservoirs. These entities may have restrictions on the pattern that they could release water from their reservoirs, and the pattern may not match the availability of export capacity in the Delta. The seller could request that Reclamation store the non-CVP water in the CVP reservoir until Delta capacity is available, which would require a contract entered into pursuant to the Warren Act of 1911. Reservoir levels would temporarily increase while water was stored. Reclamation would only release non-CVP water for transfer from CVP reservoirs when the non-CVP water is actually being made available for transfer.

Cropland Idling

Cropland idling makes water available for transfer that would have been used for agricultural production. Water would be made available on the same pattern throughout the growing season as it would have otherwise been consumed had a crop been planted. The irrigation season generally lasts from April or May through September for most crops in the Sacramento Valley.

The quantity of water made available for transfer through cropland idling would be calculated based on the evapotranspiration of applied water (ETAW). ETAW is the portion of applied surface water that is used by the crop and evaporated from the soil and plant surfaces. Not all crops would be considered for participation in a transfer. Mixed grasses, orchard and vineyard, and alfalfa in the Delta region would not be considered due to factors that make it difficult to determine water savings, such as a lack of authoritative ETAW values and variability in cultural practices. Table 2-1 shows the ETAW of crops currently accepted by Reclamation and DWR that would be potentially involved in transfers. These values were developed using the conceptual model and data in DWR Bulletin 113-3 (DWR 1975).

Table 2-1.
Estimated ETAW Values for Various Crops Suitable for Idling or Shifting Transfers

Crop	ETAW (acre-feet/acre)
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
Sudan Grass	3.0
Sugar Beets	2.5
Sunflower	1.4
Tomato	1.8
Vine Seed/ Cucurbits	1.1
Wild Rice	2.0

Source: Department of Water Resources and Reclamation 2015
Notes:
[1] Only alfalfa grown in the Sacramento Valley floor north of the American River will be allowed for transfers. Fields must be disced on, or prior to, the start of the transfer period. A higher ETAW may apply if the transfer water is exported through a facility not limited to the transfer export window of July – September or if the transfer water can be stored prior to the start of the transfer window. Alfalfa acreage in the foothills or mountain areas is not eligible for transfer.

Consistent with the provisions contained in Water Code Section 1018, potential sellers are encouraged to incorporate measures into their cropland idling transfer to protect habitat value in the area to be idled. Idled land cannot be irrigated during the transfer season, but vegetation that is supported only through precipitation or that has begun to senesce may remain on the idled fields. Excessive vegetation supported by seepage from irrigation supplies or shallow groundwater would result in a decrease in the amount of water made available as a result of cropland idling.

Crop Shifting

For crop shifting transfers, water is made available when farmers shift from growing a higher water use crop to a lower water use crop. The difference in the accepted ETAW values between the two crops would be the amount of water that can be transferred. Water made available for transfer that is generated by crop shifting is difficult to account for. Farmers generally rotate between several crops to maintain soil quality, so water agencies may not know what type of crop would have been planted in a given year absent a transfer.

Conservation

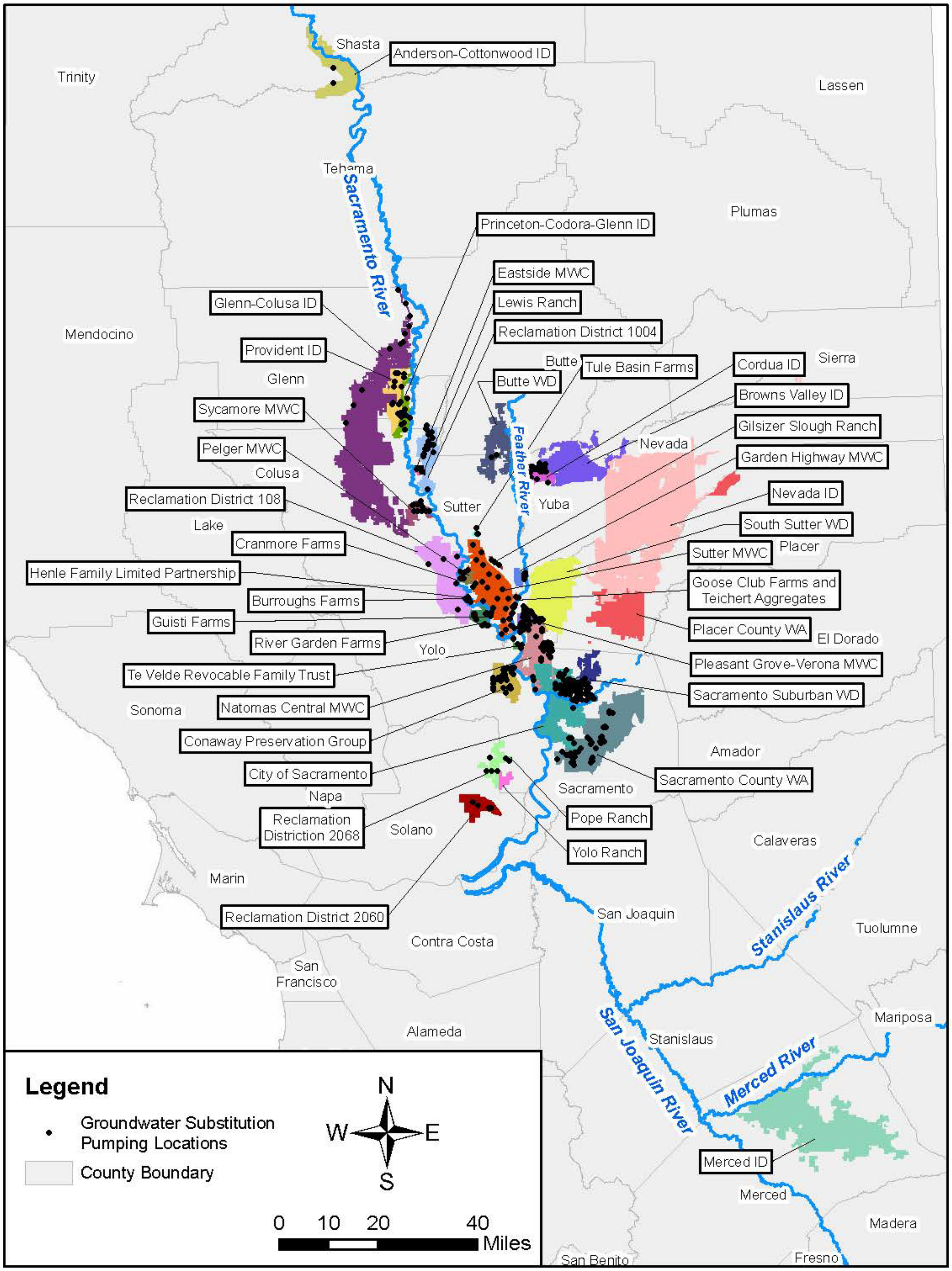
Conservation transfers must include actions to reduce the diversion of surface water by the transferring entity by reducing irrecoverable water losses. The amount of reduction in irrecoverable losses determines the amount of transferrable water. Conservation measures may be implemented on the water-district and individual user scale. These measures must reduce the irrecoverable losses at a site without reducing the amount of water that otherwise would have been available for downstream beneficial uses. Irrecoverable losses include water that would not be usable because it currently flows to a salt sink, to an inaccessible or degraded aquifer, or escapes to the atmosphere.

2.2.2.2 Potential Transfer Participants

The sections below identify potential sellers and buyers for the range of potential transfers that are analyzed in this RDEIR/SDEIS. Figure 2-2 shows the locations of sellers.

Sellers

Table 2-2 lists the agencies that have expressed interest in selling water for transfers and the potential maximum quantities available for sale. Table 2-3 shows the potential upper limit of available water for transfer by each agency for each method of making water available for transfer; however, actual purchases would be less, depending on hydrology, the amount of water the seller is interested in selling in any particular year, the interest of buyers, and compliance with CVPIA transfer requirements, among other possible factors. Additionally, these transfers would not occur every year, but only years when there is demand from buyers and pumping capacity available to convey the water made available for transfer (generally dry and critical years). Using hydrology from 1970-2003, modeling analysis indicates that transfers could occur in 12 of the 33 years.



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2 **Figure 2-2.**
3 **Locations of Potential Sellers**

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

Water Agency	Maximum Potential Transfer (acre-feet per year)[1]
Sacramento River Area of Analysis	
Anderson-Cottonwood Irrigation District	5,225
Burroughs Farms	2,000
Conaway Preservation Group	35,000
Cranmore Farms	8,000
Eastside Mutual Water Company	2,230
Glenn-Colusa Irrigation District	91,000
Giusti Farms	1,000
Henle Family Limited Partnership	700
Lewis Ranch	2,310
Natomas Central Mutual Water Company	30,000
Pelger Mutual Water Company	3,750
Pleasant Grove-Verona Mutual Water Company	18,000
Princeton-Codora-Glenn Irrigation District	13,200
Provident Irrigation District	19,800
Reclamation District 108	55,000
Reclamation District 1004	27,175
River Garden Farms	16,000
Sutter Mutual Water Company	36,000
Sycamore Mutual Water Company	20,000
Te Velde Revocable Family Trust	7,094
American River Area of Analysis	
City of Sacramento	5,000
Placer County Water Agency	47,000
Sacramento County Water Agency	15,000
Sacramento Suburban Water District	30,000
Yuba River Area of Analysis	
Browns Valley Irrigation District	8,100
Cordua Irrigation District	12,000
Feather River Area of Analysis	
Butte Water District	17,000
Garden Highway Mutual Water Company	14,000
Gilsizer Slough Ranch	3,900
Goose Club Farms and Teichert Aggregates	10,000
Nevada Irrigation District	15,000
South Sutter Water District	15,000
Tule Basin Farms	7,320
Merced River Area of Analysis	
Merced Irrigation District	30,000
Delta Region Area of Analysis	
Reclamation District 2060	6,000
Reclamation District 2068	7,500
Pope Ranch	2,800
Yolo Ranch	8,000

Note:
[1] The total transfers would be limited to be less than 250,000 acre-feet in any one year, based on the buyers' demands for transfers. The transfers in Table 2-2 add to more than this amount, but the buyers would not purchase transfers from all of these parties for the full amount.

Because of the uncertainty of hydrologic and operating conditions in the future and buyer demand, only a portion of the potential transfers identified in Table 2-2 would occur. Buyers have identified that their demand is up to 250,000 acre-feet of water in any one year, which is less than the quantities listed in Table 2-2. Many agencies are uncertain about whether they would make water available through groundwater substitution or cropland idling/crop shifting actions. They have included their potential upper limit for both methods of making water available for transfer, but they would not sell the maximum amount of water made available through both methods in the same year. The maximum amount for each agency would not exceed the amount shown in Table 2-2. Table 2-3 shows the potential quantities of water that could be made available from April through June and July through September; the quantities available in April, May, and June would be able to be transferred if storage is available.

The total quantity of water made available through cropland idling action, listed in Table 2-3, is 265,172 acre-feet of water. However, the Endangered Species Act consultation on Long-Term Water Transfers also includes upper limits for cropland idling, and these limits cannot be exceeded. These limits affect the potential rice idling that could occur as part of Alternative 2. The proposed action for the BO includes an annual upper limit for rice idling of 60,693 acres (or 200,287 acre-feet of water), with 49,924 acres in the Sacramento River region and 10,769 acres in the Feather River region.

Table 2-3.
Alternative 2 Transfers Types (Upper Limits)

Water Agency	April-June Groundwater Substitution (acre-feet)	April-June Cropland Idling/ Crop Shifting (acre-feet)	April-June Stored Reservoir Release (acre-feet)	April-June Conservation (acre-feet)	July-Sep Groundwater Substitution (acre-feet)	July-Sep Cropland Idling/Crop Shifting (acre-feet)	July-Sep Stored Reservoir Release (acre-feet)	July-Sep Conservation (acre-feet)
Sacramento River Area of Analysis								
Anderson-Cottonwood Irrigation District	2,613				2,613			
Burroughs Farms	1,000				1,000			
Conaway Preservation Group	21,550	7,899			13,450	13,450		
Cranmore Farms	5,140	925			2,860	1,575		
Eastside Mutual Water Company	1,067				1,163			
Glenn-Colusa Irrigation District	12,500	24,420			12,500	41,580		
Giusti Farms	500				500			
Henle Family Ltd. Partnership	425				275			
Lewis Ranch		855				1,455		
Natomas Central Mutual Water Company	15,000				15,000			
Pelger Mutual Water Company	2,151	939			1,599	1,599		
Pleasant Grove-Verona Mutual Water Company	8,000	3,330			10,000	5,670		
Princeton-Codora-Glenn Irrigation District	2,500	2,442			4,100	4,158		
Provident Irrigation District	4,000	3,663			6,000	6,237		
Reclamation District 108	7,500	14,800			7,500	25,200		
Reclamation District 1004		7,400			7,175	12,600		
River Garden Farms	5,000	3,700			5,000	6,300		
Sutter Mutual Water Company	8,000	6,660			10,000	11,340		
Sycamore Mutual Water Company	7,500	3,700			7,500	6,300		
Te Velde Revocable Family Trust	2,700	2,581			4,394	4,394		
American River Area of Analysis								
City of Sacramento					5,000			
Placer County Water Agency							47,000	

Water Agency	April-June Groundwater Substitution (acre-feet)	April-June Cropland Idling/ Crop Shifting (acre-feet)	April-June Stored Reservoir Release (acre-feet)	April-June Conservation (acre-feet)	July-Sep Groundwater Substitution (acre-feet)	July-Sep Cropland Idling/Crop Shifting (acre-feet)	July-Sep Stored Reservoir Release (acre-feet)	July-Sep Conservation (acre-feet)
Sacramento County Water Agency					15,000			
Sacramento Suburban Water District	15,000				15,000			
Yuba River Area of Analysis								
Browns Valley Irrigation District							5,000	3,100
Cordua Irrigation District					12,000			
Feather River Area of Analysis								
Butte Water District	2,750	5,750			2,750	5,750		
Garden Highway Mutual Water Company	6,500				7,500			
Gilsizer Slough Ranch	1,500				2,400			
Goose Club Farms and Teichert Aggregates	4,000	3,700			6,000	6,300		
Nevada Irrigation District							15,000	
South Sutter Water District							15,000	
Tule Basin Farms	3,800				3,520			
Merced River Area of Analysis								
Merced Irrigation District							30,000	
Delta Region Area of Analysis								
Reclamation District 2060	1,110	1,110			1,890	1,890		
Reclamation District 2068	2,250	2,775			2,250	4,725		
Yolo Ranch		2,960				5,040		
Pope Ranch	1,400				1,400			
Area of Analysis (all areas)								
Total[1]	145,456	99,609	0	0	187,339	165,563	112,000	3,100

Note:

[1] These totals cannot be added together. Agencies could make water available through groundwater substitution, cropland idling, or a combination of the two; however, they will not make the full quantity available through both methods. Table 2-2 reflects the total upper limit for each agency. The total amount of water transferred under Alternative 2 would not exceed 250,000 acre-feet.

Buyers

Table 2-4 identifies potential buyers who may be interested in purchasing water made available for transfer. Not all of these potential buyers may end up actually purchasing water. For some potential buyers, purchase decisions would depend on the need and the ability to move the purchased water through the Delta to the buyer's service area.

Table 2-4.
Alternative 2 Potential Buyers

San Luis & Delta-Mendota Water Authority Participating Members
Byron-Bethany Irrigation District
Del Puerto Water District
Eagle Field Water District
Mercy Springs Water District
Pacheco Water District
Panoche Water District
San Benito County Water District
San Luis Water District
Santa Clara Valley Water District
Westlands Water District
Contra Costa Water District
East Bay Municipal Utility District

2.2.2.3 Water Transfer Operations

Water transfer operations are discussed by geographic region. Transfer operations could affect river flows and timing of flows upstream or downstream from the point of diversion. The following sections describe how potential transfers would operate on rivers.

Sellers Service Area

Water made available for transfer that must be conveyed through the Delta are limited to periods when capacity at C.W. "Bill" Jones Pumping Plant (Jones Pumping Plant) or Harvey O. Banks Pumping Plant (Banks Pumping Plant) is available, typically from July through September, and only after Project needs are met. Reclamation and DWR must also declare that the Delta is in "balanced conditions" under the terms of the COA (USFWS 2008, see footnote 1 above). Transfer of CVP water that would be pumped and conveyed at Banks Pumping Plant could occur under a Wheeling Agreement with DWR for use of Banks Pumping Plant.   The Delta pumping restrictions do not apply to East Bay Municipal Utility District (MUD) diversions at Freeport.

Carriage water (a portion of the transfer that is not diverted in the Delta and becomes Delta outflow) is a required component of water transfers that is used to maintain water quality in the Delta. Carriage water is calculated to reflect conveyance losses as the water moves from the point at which it is made available for transfer, to the Delta export pumps, and is conveyed from the Delta to buyers. Carriage water is represented as a percent of the transfer that does not reach the buyer, and this percent is calculated during the transfer based on real-time monitoring information in the Delta. Typical carriage water amounts range from 20 to 30 percent for water made available transfer from the Sacramento Valley, and about 10 percent for water made available for transfer from the San Joaquin Valley.

The timing of water made available for transfer by potential agricultural sellers upstream from the Delta through groundwater substitution, cropland idling, and crop shifting actions would be dictated by the irrigation season. While land owners may be able to postpone groundwater substitution actions until adequate capacity is available at the Delta pumps, water made available for transfer from crop idling/shifting actions would be made available on the same pattern as it would have otherwise been used for irrigation. At the start of the irrigation season, usually April, the Delta pumps cannot pump water made available for transfer because the current BOs on CVP and SWP operations typically only allow for conveyance of water made available for transfer from July through September. Water made available for transfer prior to July would either bypass the pumps or may be stored in upstream reservoirs if Project operations can account for the storage. However, as described in subsequent sections, Shasta Reservoir is operated to meet mandated temperature and flow requirements in the Sacramento River, which limits its ability to store water to support transfers.

Sacramento River

Potential sellers on the Sacramento River could make water available for transfer through groundwater substitution or crop shifting/idling actions. Potential sellers receive CVP Project water that is stored upstream from their service areas in Shasta Reservoir, a CVP facility. Releases from Shasta Reservoir may be routed through or around the Shasta Power Plant to the Sacramento River, where flows are re-regulated by Keswick Dam.

Conveyance capacity in the Delta would be available when conditions for sensitive species are acceptable to NOAA Fisheries and USFWS, typically from July through September, but water made available through groundwater substitution and cropland idling/crop shifting actions would be available from April through September. Storing water in Shasta Reservoir from April through June would help facilitate these types of transfers; however, Shasta Reservoir has a very limited opportunity to store water made available for transfer during the April through June period because of downstream temperature requirements. Reclamation is required by SWRCB Water Rights Orders 90-05/91-01 to meet average daily temperature requirements as far downstream as practical when temperatures could affect fish. To meet these requirements, Reclamation must carefully manage the cold water pool in Shasta Reservoir by releasing larger quantities of water earlier in the season; larger flows maintain cooler temperatures for a longer distance downstream. Reducing releases to hold water made available for transfer in storage could affect Reclamation’s ability to meet these downstream temperature requirements, either during the time of the release or later in the season (if the changes in releases affect management of the coldwater pool in Shasta Reservoir). Reclamation would only consider storing water made available for transfer if it would not affect releases for temperature, or if it could be “backed up” into another reservoir (by reducing releases from that reservoir). Backing up water may be possible if the Delta is in balanced conditions (see footnote 1 above) and instream standards are being met. The decision to back up water made available for transfer would be made on a case-by-case basis, but storage is analyzed in this RDEIR/SDEIS so that the analysis is complete in the event Reclamation determines that storage is possible in a specific year.

Proposed sellers divert water from various locations along the Sacramento River or the Sutter Bypass. If a seller shifts from using surface water to groundwater to make water available for transfer, river flows would not decrease from Shasta Reservoir to the seller’s point of diversion;

however, river flow would increase from the seller's point of diversion downstream to the buyer's point of diversion because water is not diverted for use until it reaches the Delta.

If Reclamation determines that it can store water in Shasta Reservoir, the flows in the Sacramento River between Shasta Reservoir and the point of diversion of transfer water would decrease in comparison to the No Action/No Project Alternative. These reductions would occur during the April through June period when water made available for transfer cannot be exported in the Delta. Flows downstream of the point of diversion would not change during this period.

American River

Multiple potential sellers on the American River system could make water available for transfer through groundwater substitution actions. Placer County Water Agency could make additional water available for transfer through the release of stored water from Hell Hole and French Meadows Reservoirs, which are upstream from Folsom Reservoir on the Rubicon River and Middle Fork American River. Folsom Reservoir is the primary storage and flood control reservoir on the American River. Releases from Folsom Reservoir are re-regulated at Nimbus Dam, which is about seven miles downstream from Folsom Dam.

Use of excess storage capacity in Folsom Reservoir is not as restricted as Shasta Reservoir, but Reclamation generally cannot guarantee such use in Folsom Reservoir prior to the transfer season because operational complexities may require water releases.

The sellers on the American River divert water from the lower American River or Folsom Reservoir. When transferring water made available through groundwater substitution actions, the sellers would take less surface water, leaving the water in storage in Folsom Reservoir. This water may be able to be stored in Folsom Reservoir before being conveyed south-of-Delta, depending on year-to-year operational restrictions on the export pumps. Storing water in Folsom Reservoir would likely be possible because this water would not otherwise have been released to the river absent the transfer.

Placer County Water Agency would release stored surface water from Hell Hole and French Meadows Reservoirs. It would time release of water to coincide with the availability of Delta export capacity, generally starting in July. Placer County Water Agency's release schedule would be influenced by power generation, so it may wish to release water before July continuing through September to generate power and reregulate that water in Folsom Reservoir until the water can be conveyed through the Delta export pumps. Non-Project water in Folsom Reservoir for greater than 30 days requires a Warren Act Contract for storage. Placer County Water Agency would release water that would otherwise have remained in storage; therefore, this water would increase flows downstream along the Middle Fork of the American River to Folsom Reservoir, and downstream of Folsom Reservoir from July through September. The water releases would leave additional storage capacity in the reservoirs that would be refilled during the following wet seasons (at times that it would not affect downstream users). Refilling the empty storage would decrease flows downstream of the reservoirs; therefore, a refill agreement would be required as part of any transfer.

Yuba River

Browns Valley Irrigation District (ID) and Cordua ID are the potential sellers on the Yuba River. Browns Valley ID generates water for transfer through conservation efforts or stored reservoir release. Browns Valley ID makes water available for transfer from conservation; and such water may be generated through the Upper Main Water Conservation Project. This project was initiated in 1990 to terminate use of the Upper Main Canal, a Gold Rush Era water conveyance facility that served facilities downstream of Collins Lake. The Canal experienced substantial losses during conveyance due to excessive vegetation along the Canal system. The conservation project replaced the Canal with a pipeline and reduced associated losses to vegetation, thereby making water available for transfer.

Browns Valley ID could also make water available for transfer by releasing water from Merle Collins Reservoir that otherwise would have remained in storage. Release of this water would increase flows downstream in Dry Creek and in the Yuba River downstream of the confluence with Dry Creek. Similar to stored reservoir release transfers from Placer County Water Agency, refilling the reservoir would decrease flows downstream of the reservoir; therefore, a refill agreement would be required for the transfer.

Cordua ID would transfer water made available through groundwater substitution actions. This transfer would increase flows on the Yuba River downstream of Cordua ID's point of diversion in comparison to No Action/No Project Alternative during the transfer period.

Feather River

Potential sellers on the Feather River could make water available for transfer through groundwater substitution, cropland idling/crop shifting, or stored reservoir release actions.

Butte Water District (WD) is a member agency of the Joint Water Districts Board (Joint Board). The Joint Board has a settlement agreement with DWR and the water supply under that agreement is distributed among the four member agencies of the Joint Board. DWR approval would be required for a transfer from Butte WD. DWR makes releases from Lake Oroville to Thermalito Afterbay for diversion by Butte WD. Changes in diversion from Thermalito Afterbay would result in changes in DWR's releases to the Afterbay but would not change Feather River flows. An increase in flows in the Feather River would result when the water made available for transfer is released by DWR to the Feather River. The timing of releases could change from the timing of diversions by Butte WD from Thermalito Afterbay, absent the transfer action.

Garden Highway Mutual Water Company (MWC) has a settlement agreement with DWR to divert water from the Feather River for irrigation use. A transfer from Garden Highway MWC must be approved by DWR. A reduction in diversions from Garden Highway MWC would result in higher flows in the Feather River downstream of the existing point of diversion.

Goose Club Farms and Teichert Aggregates divert water from the Feather River and Sacramento Slough for irrigation. For a transfer from either of these entities, surface water would not be diverted, which would result in higher flows in the Feather River downstream of the points of diversion during the transfer period.

Gilsizer Slough Ranch diverts water from the East Canal of the Sutter Bypass, Gilsizer Slough, and a drainage canal. Tule Basin Farms diverts water from the West Canal of the Sutter Bypass. Transfers from these entities would increase flows downstream of their points of diversion absent the transfer, which would increase flows in the Sutter Bypass canals and downstream in the Sacramento River.

DWR operates Lake Oroville on the Feather River, which is upstream from the diversion locations for these entities. At times, DWR has the ability to retain water in Lake Oroville that would have been released for diversion by Butte WD and Garden Highway MWC during April through June until the Delta export pumps have capacity to convey the water. Any transfer agreement with DWR for Butte WD or Garden Highway MWC would need to include approval to store water in Lake Oroville before DWR could provide storage for the transfer. DWR cannot approve storage in Lake Oroville if it would affect SWP operations. The transfer water would be the first water spilled if Lake Oroville reaches flood capacity. River flows would increase downstream of the sellers' points of diversion (compared to the No Action/No Project Alternative) when the stored transfer water is released.

South Sutter WD and Nevada ID could provide water through stored reservoir release. Stored reservoir releases would be from Camp Far West Reservoir (for South Sutter WD) or Rollins Reservoir (for Nevada ID) in the Bear River system. During the transfer period, these reservoirs would be slightly lower than conditions without the transfer until the reservoir is refilled. River flows downstream of the reservoirs on the Bear River, Feather River, and Sacramento River would increase during the release period. The reservoirs would refill as water was available in the Bear River and when the Delta is in excess conditions, which would decrease flows downstream from the reservoir relative to non-transfer conditions. A refill agreement would be required for this transfer to avoid affects to downstream water users.

Merced River

Merced ID could provide water through stored reservoir release from Lake McClure. During the transfer period, water elevations in Lake McClure would be slightly lower than conditions without the transfer until the reservoir is refilled. Lake McClure would refill as water was available in the Merced River and when the Delta is in excess conditions, which would decrease flows downstream from the reservoir relative to non-transfer conditions.

The water made available for transfer by Merced ID's could be conveyed to the Buyers Service Area in several ways:

- Water could flow down the Merced River, through the San Joaquin River, and be diverted through the Jones or Banks Pumping Plants in the Delta.
- Water could flow down the Merced River into the San Joaquin River and be diverted through existing facilities within Banta Carbona ID, West Stanislaus ID, or Patterson ID (see Figure 2-3). These agencies would either convey the water through their districts to the Delta-Mendota Canal, or they would use the water diverted from the San Joaquin River in exchange for their CVP water from the Delta-Mendota Canal.

- Water would enter the Merced River and be diverted into the Eastside Canal before reaching the San Joaquin River confluence. Water could be delivered for exchange to San Luis Canal Company, which would reduce its use of water from the Delta-Mendota Canal.

- Water would be diverted from Lake McClure for delivery through Merced ID's internal conveyance facilities to one of the refuges in the San Luis unit for exchange. The refuge would reduce its use of water from the Delta-Mendota Canal. This delivery mechanism would not change flows in any surface water body and could therefore be used year-round.

The timing of these transfers would depend on the limitations at the diversion point. Transfers through Jones and Banks Pumping Plants would be during periods in compliance with regulatory requirements, including the 2008 and 2009 USFWS and NOAA Fisheries BOs, typically from July through September. The other delivery methods could be used throughout the irrigation season (April through September). A stored reservoir release transfer from Merced ID would require a refill agreement to clarify how the reservoir would be refilled after the transfer. Additionally, buyers would require a Warren Act Contract with Reclamation to provide for conveyance of non-CVP water through CVP facilities.

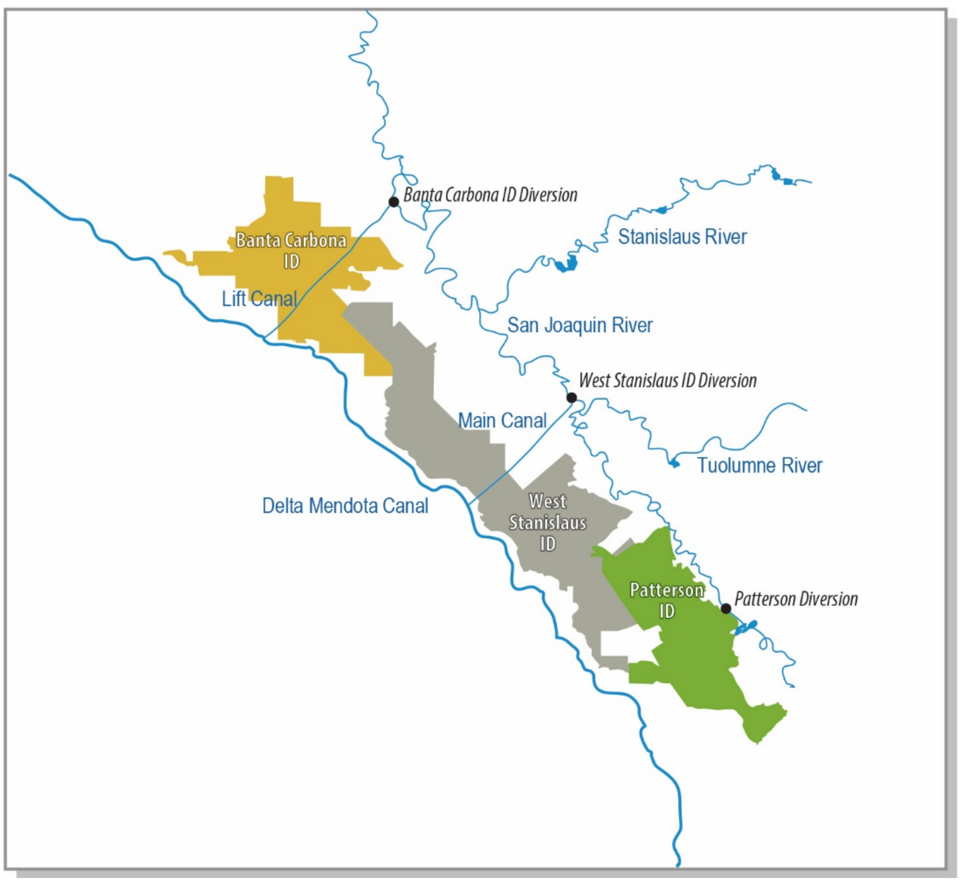

Figure 2-3.
Diversion Facilities for Banta Carbona ID, West Stanislaus ID, and Patterson ID

Delta Region

The Sacramento and San Joaquin rivers join at the Sacramento-San Joaquin Delta. Potential sellers could transfer water made available through groundwater substitution and crop idling/shifting actions.

Transfers from potential sellers in the Delta have several challenges, including:

- Variability in ETAW values make calculating water savings from crop idling/shifting difficult, and idling cropland could generate less water than shown in Table 2-1;
- High groundwater table results in high evapotranspiration rates and excessive weed growth on fields idled to make water available for transfer;
- Water made available outside the transfer window cannot be exported or stored in Delta; and,
- The status of many underlying water rights can be difficult to verify.

These challenges make it difficult to determine consumptive use and export water made available for transfer. More extensive monitoring may be required throughout the transfer season, compared to that which would be required for other locations, to account for potential weed growth and evaporation from bare fields. Excessive weed growth or evaporation results from groundwater near the ground surface. If groundwater is used by weeds (or evaporates), it depletes the groundwater, which is refilled by surface water because of the interconnectedness of groundwater and surface water in this region. Surface water depletion would reduce the amount of water made available for transfer. Additionally, transfer proponents must obtain concurrence from the SWRCB that the estimated reduction in consumptive use can be accounted for separately in meeting flow related compliance objectives.

Buyers Service Area

Multiple buyers could purchase water made available for transfer; this RDEIR/SDEIS addresses transfers of water to the SLDMWA, Contra Costa WD, and East Bay MUD. These entities diverted water from the Delta or its tributaries. The points of diversion in the Delta are shown on Figure 2-4. Diversions could also be made along the San Joaquin River (as shown in Figure 2-3), from the Merced River, or from Lake McClure.

SLDMWA

SLDMWA consists of 28 member agencies representing water service contractors and San Joaquin River Exchange Contractors. The SLDMWA service area consists primarily of agricultural lands on the west side of the San Joaquin Valley. Agricultural water use occurs on approximately 850,000 irrigated acres. Water for habitat management occurs on approximately 120,000 acres of refuge lands, which receive approximately 250,000 to 300,000 acre-feet of water per year. Relative to agricultural uses, there is limited municipal and industrial (M&I) water use in the San Joaquin Valley area. The majority of the M&I use in the SLDMWA service area occurs in the San Felipe Division, primarily the Santa Clara Valley WD. From 2001 to 2010, average annual M&I water use in the San Joaquin Valley area was about 22,000 acre-feet and approximately 86,000 acre-feet in the San Felipe Division.

The SLDMWA operates some CVP facilities and represents its member agencies' interests related to water supply issues. The SLDMWA does not directly supply water, but it would participate in negotiations to assist its participating members to secure transfers when needed and would assist with scheduling and managing the transferred water. Water made available for transfer to agencies within the SLDMWA would be pumped through the Jones or Banks pumping plants, or would be delivered and /or stored in San Luis Reservoir. This water would then be conveyed through SWP or CVP canals and aqueducts and local irrigation canals to the purchasing agencies.

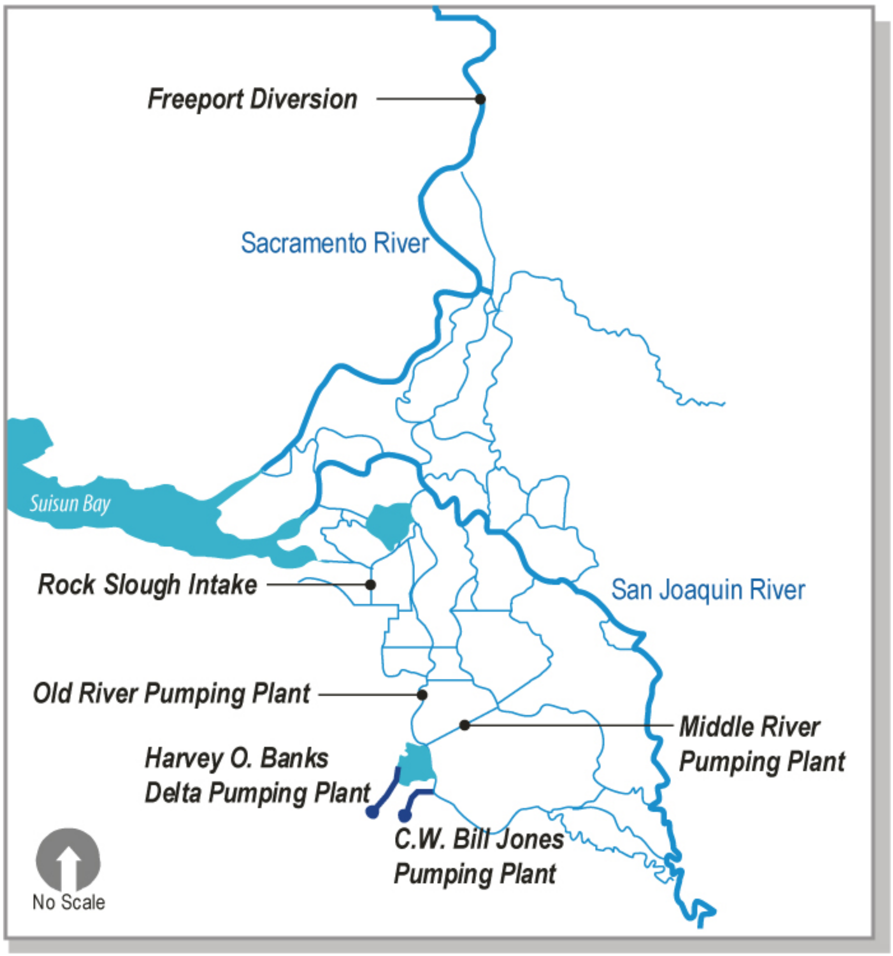

Figure 2-4.
Delta Transfer Diversion Locations

Contra Costa WD

Contra Costa WD encompasses more than 214 square miles and provides M&I water supply to a population of approximately 500,000 people in Central and East Contra Costa County. Contra Costa WD is almost entirely dependent on diversions from the Delta, Contra Costa WD is an in-Delta water user and diverts both CVP water pursuant to its water service contract with Reclamation and water under its own water rights from Delta drinking water intakes located at

Rock Slough, Old River near Highway 4, Victoria Canal, and Mallard Slough. Contra Costa WD is interested in purchasing water made available for transfer to augment dry year supplies.

East Bay MUD
East Bay MUD provides M&I water to approximately 1.4 million people over a 332 square mile area in Alameda and parts of Contra Costa counties. Ninety percent of East Bay MUD's water supply comes from the Mokelumne River watershed in the Sierra Nevada. East Bay MUD has a CVP water service contract with Reclamation to divert water from the Sacramento River for M&I purposes. Water transfers to the East Bay MUD would be diverted at the Freeport Regional Water Authority's intake on the Sacramento River near Freeport, at the northern end of the Delta. The water made available for transfer would not pass through the Delta and therefore would not be subject to constraints on through Delta pumping. Once diverted from the Sacramento River, water made available for transfer to East Bay MUD would travel eastward through 16 miles of underground pipeline to the Folsom South Canal. After flowing 14 miles to the southern end of the canal, the water would be pumped via 18 miles of pipeline to East Bay MUD's Mokelumne Aqueducts, which cross the Delta and deliver the water to East Bay MUD's service area in the East Bay.

2.2.2.5 Transfer Quantities
Table 2-2 provides a list of entities that could potentially make water available for transfer and sale in the future. The table also includes maximum quantities that each agency could make available through different methods. Adding these maximum quantities produces a total of a little over 713,000 acre-feet, which is greater than the 250,000 acre-foot upper limit included in this EIS/EIR. Multiple other factors may limit the quantity of water made available for transfer to a number that is likely less than this total. Transfers of water to East Bay MUD and Contra Costa WD are limited by available pumping capacity at the Freeport intake and Contra Costa WD's Delta intakes, respectively, as well as other system constraints such as service area demand and available storage. Transfers of water to south-of-Delta water districts, which account for the majority of proposed transfers, are typically pumped through the CVP and SWP south Delta export facilities. The capacity to pump the water at Banks and Jones Pumping Plants would limit the overall volume of water transferred to south-of-Delta water districts. Factors that affect capacity available for transfers of water to south-of-Delta water districts include:

- Water availability: many potential sellers are listed as making water available by both cropland idling/shifting and groundwater substitution actions; however, they would not transfer the full amount made available by both methods or the same amount in all years. The decision to transfer water is often a complex business decision made by individual landowners in a district. Each landowner weighs the economic value of irrigating land with surface water, selling the surface water and idling a field, or selling the surface water and irrigating with pumped groundwater. The economic value of any of these decisions is highly variable and depends on unpredictable trends in agricultural and water markets.

- BOs: the BOs on the long-term operations of the CVP and SWP reduce exports from December through June and potentially in some fall seasons for the protection of special-status species. Historically, the CVP and SWP pumped significant amounts of water during these months for Project purposes because flows are usually high. Project water pumped during this period is typically stored in San Luis Reservoir or DWR's southern California reservoirs for use during the following summer. With current Delta pumping restrictions, the CVP and SWP now pump more water during the late summer period for Project purposes than they did historically, which is the same period when the BOs allow transfer water to be pumped (typically July through September). The increased CVP and SWP pumping leaves less remaining pumping capacity for water made available for transfer.

- Increased Streamflows: During certain years, much of the capacity to pump water made available for transfer from the Delta is available in September. In some years, the Delta pumps have no capacity available until September. September capacity would be more challenging to use because increasing streamflows in the Sacramento, Feather, American, and San Joaquin rivers downstream of Project reservoirs during September could create a requirement for higher flows in October so that fish do not experience a dramatic flow change that would dewater areas where fish have laid eggs. Higher flows in October would correspond to higher reservoir releases at a time when the Delta pumping would be restricted. Reclamation and DWR may not be able to capture the additional releases at the Delta pumps.

- Outages: Any planned or unplanned outages at pumping plants could reduce available capacity to pump water made available for transfer.

- Competition: Most of the available pumping capacity would be at the Banks Pumping Plant except in very dry years. Banks is an SWP facility, so SWP-related transfers would have priority. Agreements with DWR would be required for use of SWP facilities to facilitate transfers of water.

Figure 2-5 shows an exceedance plot of the available export pumping capacity in the Projects' south Delta pumping facilities during periods when buyers may want to transfer water (when SWP allocations are less than 60 percent). An exceedance plot shows how often capacities are exceeded. For example, the July and August capacity curve shows that the capacity is above zero only about 35 percent of the time. In other words, the pumps have no available capacity to pump water made available for transfer in 65 percent of the months during the transfer period (July through September). The figure includes July and August capacity separately from the capacity of all three months (July through September) because September pumping capacity may be more difficult to use and including that capacity makes the available capacity look much larger. This figure is from the CalSim modeling of the future conditions without transfers. Figure 2-5 shows that available capacity will limit the amount of water transferred in most years to less than the quantities shown in Table 2-2.

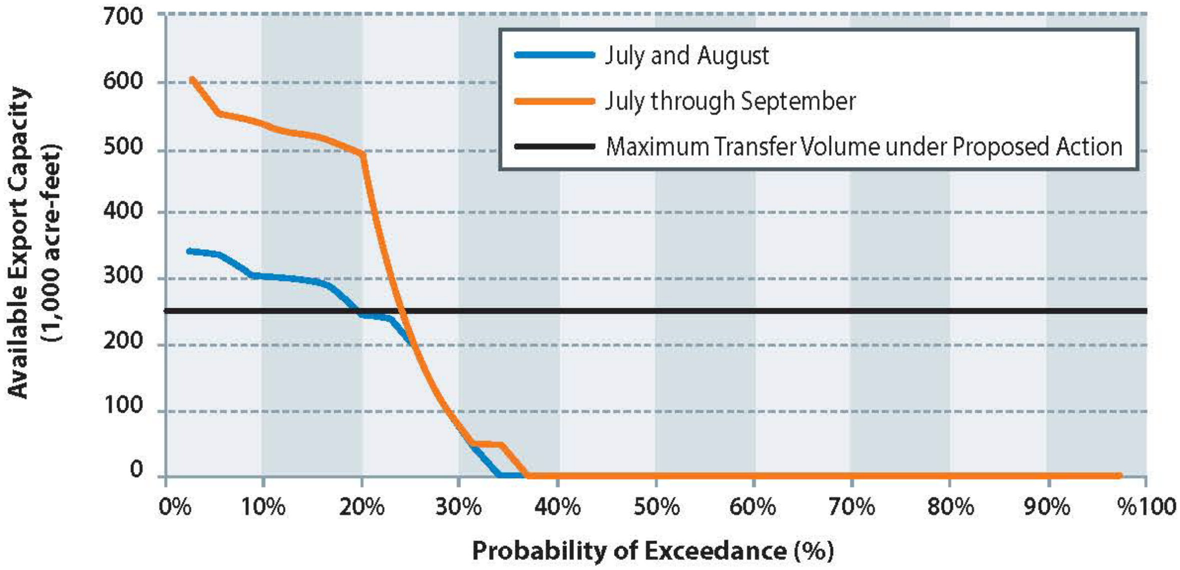

Figure 2-5.
Available Delta Pumping Capacity for Transfers

2.2.2.6 Risk and Uncertainty

Transferring water from north of the Delta to south of the Delta would involve uncertainty and risk. The CVP and SWP would convey water made available for transfer using the Jones and Banks Pumping Plants, but the CVP and SWP must first meet regulatory requirements and the needs of their users. CVP and SWP operations are governed by the criteria contained in SWRCB Decision 1641 (D-1641), the 2008 USFWS and 2009 NOAA Fisheries BOs, and all other regulatory restrictions governing operations.

Buyers and sellers often negotiate agreements for the transfer of water, during the wet season before hydrologic conditions are clear. Late season precipitation could increase the amount of available water for CVP and SWP purposes and reduce or eliminate available capacity for transfers of water. The CVP and SWP will not know the available capacity in advance and cannot guarantee transfers; any risk associated with uncertainty regarding capacity would rest with the buyers and sellers.

Water made available for transfers, particularly made available through cropland idling actions, could be heavily affected by this uncertainty. Growers would need to idle crops at the beginning of the growing season, which typically occurs in April or May. The possibility exists that buyers and sellers would negotiate an agreement to transfer of water made available through crop idling actions prior to the transfer period beginning April, the seller would leave fields idle, and late-season rains could reduce excess capacity at the Delta pumps and prevent this water from being exported. This risk would typically fall on the buyers after the water purchase agreements are negotiated.

2.2.2.7 Transfer Length

Buyers and sellers may negotiate transfer agreements that last one year or multiple years. Sellers and buyers would typically negotiate the terms of a single year transfer during the wet season and could finalize an agreement after the hydrologic conditions are understood well enough to establish available pumping capacity.

Sellers and buyers could also negotiate terms of a multi-year transfer. In this type of transfer, a long-term agreement would generally give the buyer the first right of refusal for water that a seller makes available for transfer. The buyer could pay the seller a fee every year to reserve the water, whether the buyer purchases it or not in any one year. In years where adequate capacity exists to convey water through the Delta, the buyer would have priority to buy the water at an established price. If the buyer does not want the water in a year when capacity is available, the seller could potentially negotiate a one-year transfer with another buyer or decide not to transfer water.

2.2.2.8 CEQA Coverage Under Alternative 2

All transfers in this document are analyzed under NEPA, but the transfer from Browns Valley ID is not part of the CEQA Proposed Project. This transfer has already been analyzed in a separate CEQA document (Browns Valley ID 2009). The effects of the Proposed Project are considered in context with these transfers, but these transfers are part of the Proposed Action and their effects are included in the analysis.

The 2014 Draft EIS/EIR specified that transfers to East Bay MUD and Contra Costa WD were not considered to be part of the Proposed Project, but they are included in Alternative 2 for this document for analysis under CEQA. This change does not affect the details of the analysis because the impacts have been fully analyzed as part of the Proposed Action (for NEPA).

2.2.3 Alternative 3: No Cropland Modifications

Alternative 3 would include making water available for transfer through groundwater substitution, stored reservoir release, and conservation actions. It would not include any cropland idling or crop shifting actions as methods of making water available for transfer. Table 2-5 shows the potential sellers under Alternative 3. Buyers would be the same as those shown in Table 2-4, and transfers from Browns Valley ID would not be included in the Proposed Project for CEQA, as described for Alternative 2. The upper limit for water made available for transfer in any one year would be 250,000 acre-feet, as described for Alternative 2.

2.2.4 Alternative 4: No Groundwater Substitution

Alternative 4 would include making water available for transfer through cropland idling, crop shifting, stored reservoir release, and conservation actions. It would not include any transfers of water made available through groundwater substitution actions. Table 2-6 shows the potential sellers under Alternative 4. Buyers would be the same as those shown in Table 2-4, and transfers from Browns Valley ID would not be included in the Proposed Project for CEQA, as described for Alternative 2. The upper limit for water made available for transfer in any one year would be 250,000 acre-feet and up to 60,693 acres of cropland could be idled, as described for Alternative 2.

Table 2-5.
Alternative 3 Transfers Types (Upper Limits)

Water Agency	April –June			July – September		
	Groundwater Substitution (acre-feet)	Stored Reservoir Release (acre-feet)	Conservation (acre-feet)	Groundwater Substitution (acre-feet)	Stored Reservoir Release (acre-feet)	Conservation (acre-feet)
Sacramento River Area of Analysis						
Anderson-Cottonwood Irrigation District	2,613			2,613		
Burroughs Farms	1,000			1,000		
Conaway Preservation Group	21,550			13,450		
Cranmore Farms	5,140			2,860		
Eastside Mutual Water Company	1,067			1,163		
Glenn-Colusa Irrigation District	12,500			12,500		
Giusti Farms	500			500		
Henle Family Ltd. Partnership	425			275		
Natomas Central Mutual Water Company	15,000			15,000		
Pelger Mutual Water Company	2,151			1,599		
Pleasant Grove-Verona Mutual Water Company	8,000			10,000		
Princeton-Codora-Glenn Irrigation District	2,500			4,100		
Provident Irrigation District	4,000			6,000		
Reclamation District 108	7,500			7,500		
Reclamation District 1004				7,175		
River Garden Farms	5,000			5,000		
Sycamore Mutual Water Company	7,500			7,500		
Te Velde Revocable Family Trust	2,700			4,394		
American River Area of Analysis						
City of Sacramento				5,000		
Placer County Water Agency					47,000	
Sacramento County Water Agency				15,000		
Sacramento Suburban Water District	15,000			15,000		

Water Agency	April –June			July – September		
	Groundwater Substitution (acre-feet)	Stored Reservoir Release (acre-feet)	Conservation (acre-feet)	Groundwater Substitution (acre-feet)	Stored Reservoir Release (acre-feet)	Conservation (acre-feet)
Yuba River Area of Analysis						
Browns Valley Irrigation District					5,000	3,100
Cordua Irrigation District				12,000		
Feather River Area of Analysis						
Butte Water District	2,750			2,750		
Garden Highway Mutual Water Company	6,500			7,500		
Gilsizer Slough Ranch	1,500			2,400		
Goose Club Farms and Teichert Aggregates	4,000			6,000		
Nevada Irrigation District					15,000	
South Sutter Water District					15,000	
Tule Basin Farms	3,800			3,520		
Merced River Area of Analysis						
Merced Irrigation District					30,000	
Delta Region Area of Analysis						
Reclamation District 2060	1,110			1,890		
Reclamation District 2068	2,250			2,250		
Pope Ranch	1,400			1,400		
Total	145,456	0	0	187,339	112,000	3,100

Table 2-6.
Alternative 4 Transfers Types (Upper Limits)

Water Agency	April – June			July - September		
	Cropland Idling/Crop Shifting (acre-feet)	Stored Reservoir Release (acre-feet)	Conservation (acre-feet)	Cropland Idling/Crop Shifting (acre-feet)	Stored Reservoir Release (acre-feet)	Conservation (acre-feet)
Sacramento River Area of Analysis						
Anderson-Cottonwood Irrigation District						
Conaway Preservation Group	7,899			13,450		
Cranmore Farms	925			1,575		
Eastside Mutual Water Company						
Glenn-Colusa Irrigation District	24,420			41,580		
Lewis Ranch	855			1,455		
Natomas Central Mutual Water Company						
Pelger Mutual Water Company	939			1,599		
Pleasant Grove-Verona Mutual Water Company	3,330			5,670		
Princeton-Codora-Glenn Irrigation District	2,442			4,158		
Provident Irrigation District	3,663			6,237		
Reclamation District 108	14,800			25,200		
Reclamation District 1004	7,400			12,600		
River Garden Farms	3,700			6,300		
Sutter Mutual Water Company	6,660			11,340		
Sycamore Mutual Water Company	3,700			6,300		
Te Velde Revocable Family Trust	2,581			4,394		
American River Area of Analysis						
Placer County Water Agency					47,000	
Yuba River Area of Analysis						
Browns Valley Irrigation District					5,000	3,100
Feather River Area of Analysis						
Butte Water District	5,750			5,750		
Goose Club Farms and Teichert Aggregates	3,700			6,300		
Nevada Irrigation District					15,000	
South Sutter Water District					15,000	

Water Agency	April – June			July - September		
	Cropland Idling/Crop Shifting (acre-feet)	Stored Reservoir Release (acre-feet)	Conservation (acre-feet)	Cropland Idling/Crop Shifting (acre-feet)	Stored Reservoir Release (acre-feet)	Conservation (acre-feet)
Tule Basin Farms						
Merced River Area of Analysis						
Merced Irrigation District					30,000	
Delta Region Area of Analysis						
Reclamation District 2060	1,110			1,890		
Reclamation District 2068	2,775			4,725		
Yolo Ranch	2,960			5,040		
Total	99,609	0	0	165,563	112,000	3,100

2.3 Environmentally Superior Alternative

As shown in the 2014 Draft EIS/EIR and confirmed in this RDEIR/SDEIS, the Proposed Action would not have any significant, unavoidable adverse impacts. Similarly, none of the alternatives have significant, unavoidable adverse impacts, although some of the alternatives could have less of an impact on some resources in comparison to Proposed Action:

- Alternative 3, No Cropland Modifications, would reduce the environmental effects associated with cropland idling. Alternative 3 would not have the potential to affect vegetation and wildlife, particularly the giant garter snake, by idling rice fields and reducing habitat. It would also reduce effects to agricultural land use and economic effects to non-transferring parties.

- Alternative 4, No Groundwater Substitution, would reduce the environmental effects associated with groundwater substitution transfers. Alternative 4 would reduce effects to groundwater levels, quality, and land subsidence. It would also reduce effects associated with streamflow depletion, including potential effects to fisheries, vegetation and wildlife, and water supply.

While the alternatives would affect different resources in different ways, none of the alternatives is considered to be the environmentally superior alternative. There are no unavoidable significant impacts associated with the Proposed Action that would otherwise be avoided or substantially reduced by an alternative, and each of the alternatives has its own unique set of environmental impacts which, on balance, would be a "trade-off" of environmental impacts in selecting any one alternative over another.

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Chapter 3 Affected Environment/Environmental Consequences

This chapter includes revised sections to address the specific areas of the Final EIS/EIR requiring further discussion and clarification as determined by the court. The sections of this chapter, by resource area, are as follows:

- 3.2 Water Quality *(cumulative analysis only)*
- 3.3 Groundwater Resources *(complete section)*
- 3.6 Climate Change *(analysis of impacts of climate change to the project only)*
- 3.7 Fisheries *(cumulative analysis only)*
- 3.8 Vegetation and Wildlife *(complete section)*

Section 3.2, Water Quality, and Section 3.7, Fisheries, describe the incremental impacts of the action alternatives described in Chapter 2, when added to other past, present, and reasonably foreseeable future actions. Chapter 3.6, Climate Change, includes additions to the Environmental Consequences section that focus on the potential effects of climate change on the project. Section 3.3, Groundwater Resources, and Section 3.8, Vegetation and Wildlife, describe the affected environment and environmental consequences that would result from the No Action/No Project Alternative or implementation of the action alternatives.

The remaining sections from the 2014 Draft EIS/EIR do not have changes resulting from the Court's ruling and are not included in this RDEIR/SDEIS. The remaining sections of the 2014 Draft EIS/EIR are still available to the public for informational purposes here: https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=18361

These remaining sections of the 2014 Draft EIS/EIR are provided for informational purposes only and are not being recirculated for public comment.

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Section 3.2 Water Quality

3.2.4 Cumulative Effects

The timeframe for the water quality cumulative effects analysis extends from 2019 through 2024, a six-year period. The projects considered for the water quality cumulative condition are the SWP water transfers, the CVP M&I Water Shortage Policy (WSP), the Lower Yuba River Accord, refuge transfers, and the San Joaquin River Restoration Program. SWP transfers and the Lower Yuba River Accord could involve transfers in the Seller Service Area and, therefore, could affect water quality resources. The WSP could reduce agricultural water deliveries and increase land idling in the Buyer Service Area. Effects of the WSP in the Seller Service Area would be minor as agricultural water supplies to the sellers (who are primarily Sacramento River Settlement Contractors) would not substantially change relative to existing conditions. Refuge transfers could increase cropland idling in the San Joaquin Valley near the Buyer Service Area to make water available for transfer, and a small portion of the transferred water could flow through the Delta. The San Joaquin River Restoration Program could increase flows and affect water quality in the San Joaquin River system.

In addition to these cumulative projects, the Central Valley Salinity Alternatives for Long-Term Sustainability initiative (CV-SALTS) could affect water quality in the Central Valley. CV-SALTS is a stakeholder-driven effort to manage salinity and nitrates in the Central Valley, and it includes efforts to implement the total maximum daily load (TMDL) for salinity. This effort has not yet reached decision points about projects to implement that would affect water quality. The State Water Resources Control Board is considering new water quality standards throughout the Central Valley, but these standards have not yet met the criteria to be considered reasonably foreseeable and included in the cumulative analysis because a decision has not yet been made on whether to implement the revised standards.

The following sections describe potential water quality cumulative effects for each of the Action Alternatives.

3.2.4.1 Alternative 2: Full Range of Transfers (Proposed Action)

Changes in Delta outflows could result in water quality impacts. As described in in Section 3.2.1.3 of the 2014 Long-Term Water Transfers Draft EIS/EIR summarizing the existing conditions, the Delta has a number of water quality constituents of concern.

Past and current projects, including SWP transfers, refuge transfers, and the Yuba Accord, have affected Delta outflows and degraded water quality in the Delta. These effects on Delta outflow would generally be insubstantial but would be increasing outflow during dry periods of the year. SWP transfers and the Yuba Accord could also decrease Delta outflow during other times of year, but these times are generally during wet parts of the year when the decrease would not affect water quality. Because of existing degraded water quality conditions in the Delta, the combination of cumulative actions is considered to have significant impacts on water quality in the Delta.

The range of potential water transfers that constitute the Proposed Action would increase Delta outflows slightly during the transfer period because carriage water would become additional Delta outflow, which would not adversely affect Delta water quality. During other times of the year, transfers of water analyzed under this RDEIR/SDEIS could decrease Delta outflows. Table 3.2-1 shows the changes in Delta outflow for Alternative 2 compared to existing conditions. The decreases to Delta outflow could only occur during wetter periods when the Delta is in excess conditions[1]. During balanced conditions[2], the CVP would be required to release additional flow to maintain the standards in the Central Valley Water Quality Control Plan, so the Delta outflows would not change.

Table 3.2-1.
CALSIM Model Outputs of Delta Outflow for Existing Conditions and Alternative 2

Existing Conditions: Delta Outflow (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	500	1,432	2,929	5,594	5,552	5,782	2,909	2,282	1,416	823	373	1,119	30,712
AN	302	462	966	4,044	4,241	3,094	1,780	1,540	682	546	246	699	18,602
BN	437	750	361	1,031	1,509	1,646	967	911	434	473	249	232	9,000
D	363	633	604	1,117	972	1,461	864	604	382	311	264	208	7,783
C	284	400	348	729	875	810	568	371	296	253	242	179	5,355
All	393	867	1,490	3,260	3,312	3,278	1,753	1,381	816	546	297	638	18,031

Alternative 2: Delta Outflow (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	500	1,432	2,921	5,585	5,543	5,779	2,906	2,280	1,414	822	372	1,119	30,672
AN	302	462	960	4,018	4,213	3,070	1,775	1,531	673	546	247	699	18,497
BN	437	750	361	1,028	1,502	1,644	965	910	434	473	249	232	8,985
D	363	631	601	1,109	968	1,448	854	602	382	324	279	212	7,774
C	284	400	347	725	865	801	564	369	296	283	261	188	5,382
All	393	867	1,485	3,250	3,300	3,268	1,748	1,378	813	554	303	641	18,000

[1] Excess conditions are when inflows into the Delta are greater than what is required to meet in-Delta needs and Delta outflows (Reclamation and DWR 1986), so Delta outflow is greater than required by applicable standards.

[2] Balanced conditions are when inflows into the Delta are equal to the flow required to meet in-Delta needs and Delta outflows (Reclamation and DWR 1986). Typically, these conditions occur when Reclamation and/or DWR are releasing flows from upstream storage to meet standards within the Delta or for Delta outflow.

Difference (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	-0.5	-0.6	-7.5	-9.1	-9.1	-3.8	-2.9	-2.0	-2.5	-0.9	-0.8	-0.3	-40.0
AN	0.0	-0.3	-6.4	-25.9	-28.6	-23.8	-4.9	-9.1	-8.7	0.7	0.7	0.5	-105.8
BN	0.0	0.0	0.0	-2.6	-6.6	-2.4	-2.0	-1.5	0.0	0.0	0.0	0.0	-15.1
D	0.0	-2.1	-3.2	-7.3	-4.2	-13.0	-10.0	-1.9	0.0	13.1	14.4	4.8	-9.4
C	0.0	0.0	-1.7	-4.3	-10.1	-8.7	-3.9	-1.8	-0.7	30.8	18.6	9.2	27.4
All	-0.2	-0.6	-4.9	-10.4	-11.7	-9.9	-4.7	-3.2	-2.6	8.4	6.2	2.7	-30.9

Percent Difference (%)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	-0.1	-0.04	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	-0.03	-0.1
AN	0.0	-0.1	-0.7	-0.6	-0.7	-0.8	-0.3	-0.6	-1.3	0.1	0.3	0.1	-0.6
BN	0.0	0.0	0.0	-0.3	-0.4	-0.1	-0.2	-0.2	0.0	0.0	0.0	0.0	-0.2
D	0.0	-0.3	-0.5	-0.7	-0.4	-0.9	-1.2	-0.3	0.0	4.2	5.4	2.3	-0.1
C	0.0	0.0	-0.5	-0.6	-1.1	-1.1	-0.7	-0.5	-0.2	12.2	7.7	5.1	0.5
All	0.0	-0.1	-0.3	-0.3	-0.4	-0.3	-0.3	-0.2	-0.3	1.5	2.1	0.4	-0.2

Because the changes in Delta outflow associated with the potential water transfers are insubstantial and occur only during wetter conditions, the Proposed Action's incremental contribution to potentially significant cumulative water quality impacts would not be cumulatively considerable.

Changes in Delta inflows, outflows, and exports could affect Delta salinity. As discussed in Section 3.2.1.3 of the 2014 Long-Term Water Transfers Draft EIS/EIR summarizing the existing conditions, salinity is a concern in the Delta because it can adversely affect municipal, industrial, agricultural, and recreational uses. Numerous projects and operations, including CVP and SWP operations, urban discharges, and agricultural discharge affect salinity in the Delta. SWP transfers, refuge transfers, and the Yuba Accord would increase Sacramento River Delta inflow and increase Delta exports; these two actions have opposite effects on Delta salinity. Other programs, such as CV-SALTS, are working to improve water quality in the tributaries to the Delta. These programs would decrease salinity in Delta inflow, which would improve conditions within the Delta in the future. While the end results of these programs may not achieve the desired benefits, it is likely that gradual improvements would occur.

Because of existing salinity concerns in the Delta, the combination of past, present, and future cumulative actions is considered to have significant impacts on salinity in the Delta. As shown in the water quality modeling, the Proposed Action would result in nominal decreases in Delta outflows and changes in the position of X2. Decreased water quality conditions (associated with decreased Delta outflow and downstream movement of the X2 position) would occur only during wetter periods because the CVP is required to maintain conditions during periods when the Delta is in balanced conditions. During balanced conditions, the CVP must release flow from upstream reservoirs to provide adequate flows to meet in-Delta water supply needs and standards for water quality and flow (see footnote 2, above). Because the changes in Delta outflow associated with the potential water transfers are insubstantial and occur only during wetter conditions, the Proposed Action's incremental contribution to potentially significant cumulative salinity impacts in the Delta would not be cumulatively considerable.

3.2.4.2 Alternative 3: No Cropland Modification

Cumulative effects would be the same or less than those described for the Proposed Action in the Seller and Buyer Service Areas.

3.2.4.3 Alternative 4: No Groundwater Substitution

Cumulative effects would be the same or less than those described for the Proposed Action in the Seller and Buyer Service Areas.

Section 3.3 Groundwater Resources

This section presents the existing conditions of groundwater resources within the area of analysis and discusses potential effects of the Proposed Action and Action Alternatives on groundwater levels, land subsidence, and groundwater quality.

The descriptions and analyses presented in this section focus primarily on the effects on groundwater resources of surface water made available for transfer through groundwater substitution and cropland idling actions. Other methods of making water available for transfer discussed in Chapter 2 (stored reservoir releases, crop shifting, and conservation actions) would not adversely affect groundwater resources in the area of analysis.

3.3.1 Affected Environment/Existing Conditions

This section presents the area of analysis (Section 3.3.1.1), describes the regulatory setting pertaining to groundwater resources in the area of analysis (Section 3.3.1.2), and describes the existing hydrologic and groundwater characteristics in the area of analysis (Sections 3.3.1.3).

3.3.1.1 Area of Analysis

The area of analysis extends from Shasta County in the northern portion of the Sacramento Valley to Kings County in the southern portion of the San Joaquin Valley and extends as far west as Santa Clara County. The area of analysis consists of the following groundwater basins and subbasins:

- Redding Area Groundwater Basin: Anderson subbasin
- Sacramento Valley Groundwater Basin: Colusa subbasin, West Butte subbasin, Sutter subbasin, Yolo subbasin, Solano subbasin, North and South American subbasins
- San Joaquin Valley Groundwater Basin: Merced subbasin and Westside subbasin
- Santa Clara Valley Groundwater Basin: Santa Clara subbasin
- Gilroy-Hollister Valley Groundwater Basin: Llagas subbasin

Figure 3.3-1 shows the area of analysis and the groundwater basins. The groundwater area of analysis is divided into Seller Service Area and Buyer Service Area.

The Seller Service Area for this resource section includes water districts that have groundwater pumping capabilities and have expressed an interest in making surface water available for transfer through groundwater substitution actions. Selling agencies (listed in Table 2-3) forego their surface water supplies and instead pump and use groundwater within the Central Valley groundwater basins. The volume of groundwater pumped is higher than the total volume of surface water transferred to account for the streamflow depletion losses and carriage water. See Section 2.2.2.3 for detailed discussion of carriage water.

The Buyer Service Area represents water districts that have expressed interest in purchasing water made available for transfer for purposes of this RDEIR/SDEIS. Interested districts include East Bay MUD, Contra Costa WD, and Participating Members of the SLDMWA. See Table 2-4 for a detailed list of interested buyers.

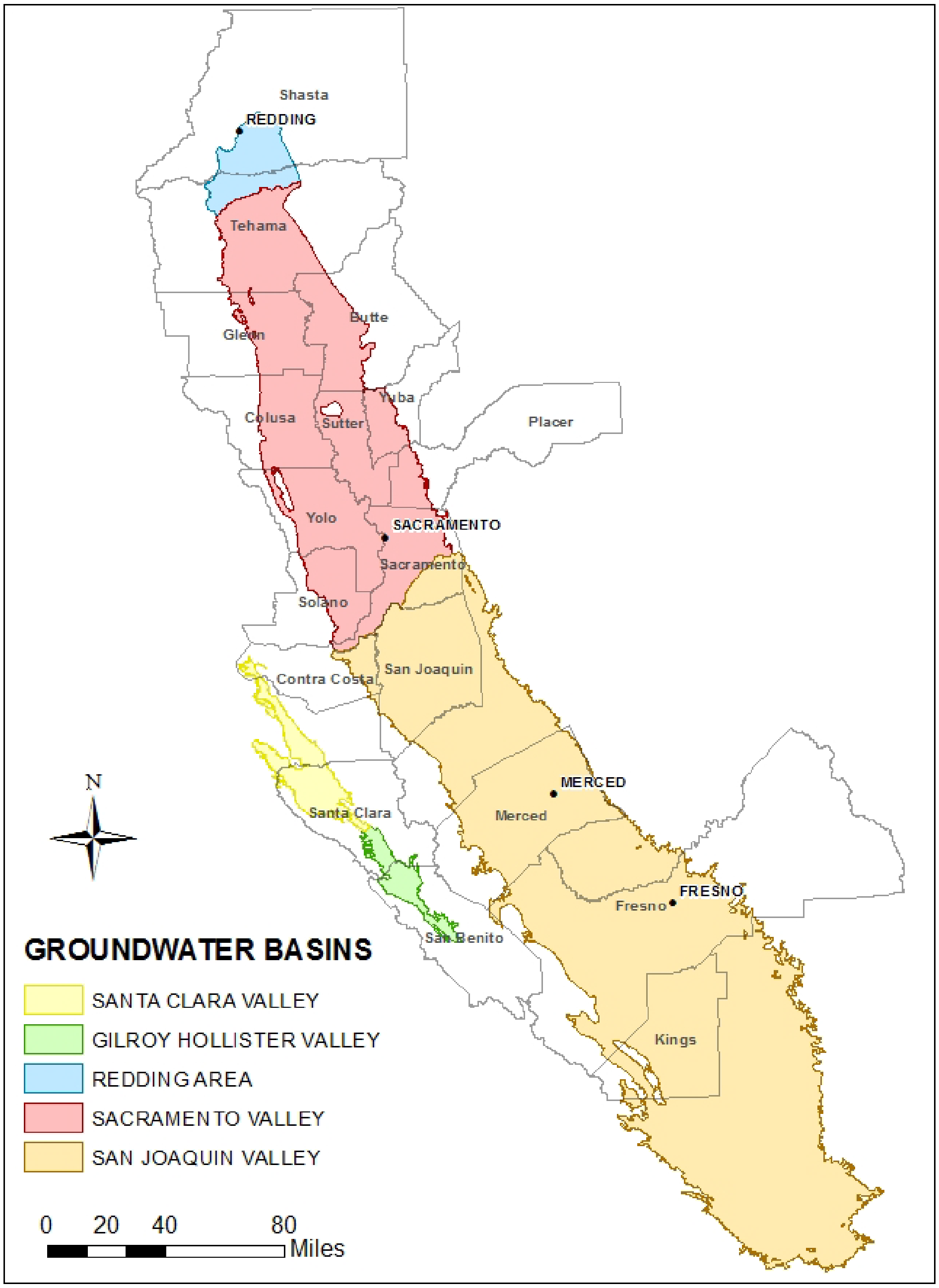


Figure 3.3-1.
Groundwater Resources Area of Analysis

3.3.1.2 Affected Environment

This section summarizes the affected environment for groundwater resources. Appendix E of the RDEIR/SDEIS includes more detail.

3.3.1.2.1 Redding Area Groundwater Basin

Historically, groundwater levels have remained stable within the Redding Area Groundwater Basin. Seasonal fluctuations in groundwater levels are generally less than five feet and can be up to 16 feet during drought years (Anderson-Cottonwood ID 2011). During the recent drought from 2011 to 2015, water levels in the Redding Area Groundwater Basin, and in particular the Anderson subbasin, decreased up to 18 feet. Groundwater levels have shown some recovery during recent wet conditions in water year (WY) 2017 in the Anderson subbasin (see Figures E-2 through E-9 in Appendix E of the RDEIR/SDEIS). Groundwater levels in the Anderson subbasin have recovered to spring 2016 levels but not to pre-drought levels, (i.e., spring 2011 levels). It should be noted that groundwater level declines discussed above were due to five consecutive drought years and only partial recovery from one wet year is consistent with historic patterns of drawdown and recovery.

Over the last four years the quantity of groundwater pumped annually from the Redding Area Groundwater Basin was approximately 40,000 acre-feet with pumping increasing to 44,000 acre-feet in 2015. This magnitude of pumping represents approximately 15 to 35 percent of the average annual groundwater recharge volume due to precipitation and the remaining 70 to 75 percent of recharged groundwater was discharged to surface streams (Shasta County Department of Public Works 2017).

The storage capacity for the entire Redding Area Groundwater Basin is estimated to be 5.5 million acre-feet for 200 feet of saturated thickness over an area of approximately 510 square miles (Pierce 1983 as cited in Bulletin 118; DWR 2003).

Groundwater Pumping-Related Land Subsidence

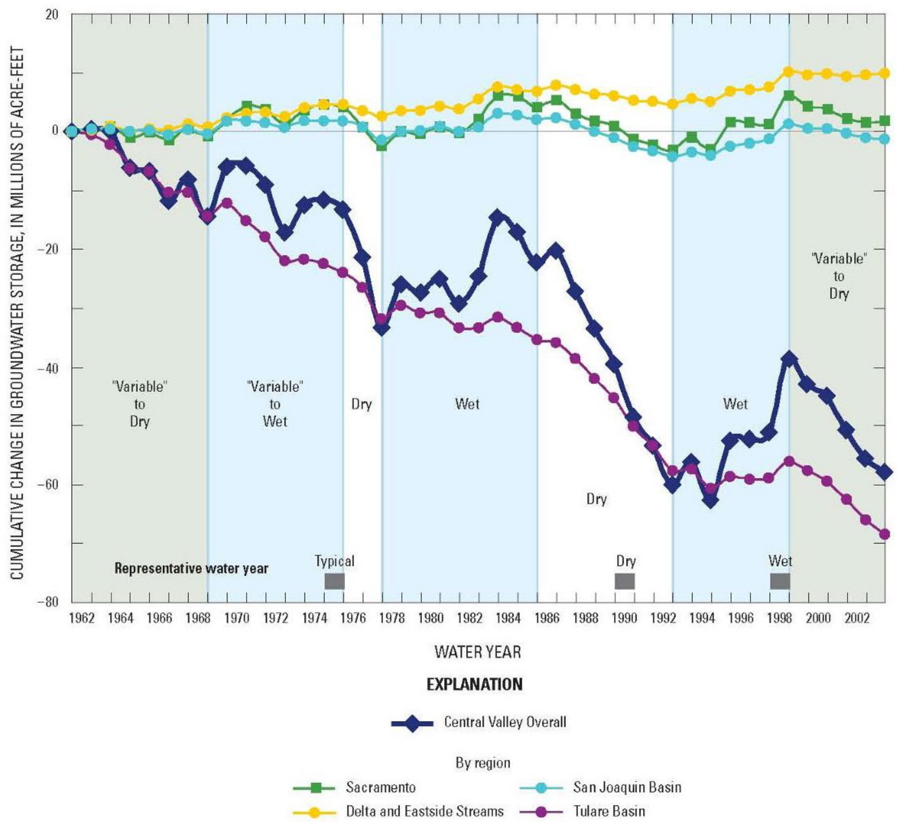
Land subsidence has not been monitored in the Redding Area Groundwater Basin. However, there would be potential for subsidence in some areas of the basin if groundwater levels decline below historic low levels. The groundwater basin west of the Sacramento River is composed of the Tehama Formation. This formation has exhibited subsidence in Yolo County and the similar hydrogeologic characteristics in the Redding Area Groundwater Basin could be conducive to land subsidence.

Groundwater Quality

Groundwater in the Redding Area Groundwater Basin is typically of good quality, as evidenced by its low total dissolved solids (TDS) concentrations, which range from 70 to 360 milligrams per liter (mg/L). Areas of high salinity (poor water quality), are generally found on the western basin margins, where the groundwater is derived from marine sedimentary rock. Elevated levels of iron, manganese, nitrate, and high TDS have been detected in some areas. Localized high concentrations of boron have been detected in the southern portion of the basin (DWR Northern District 2002).

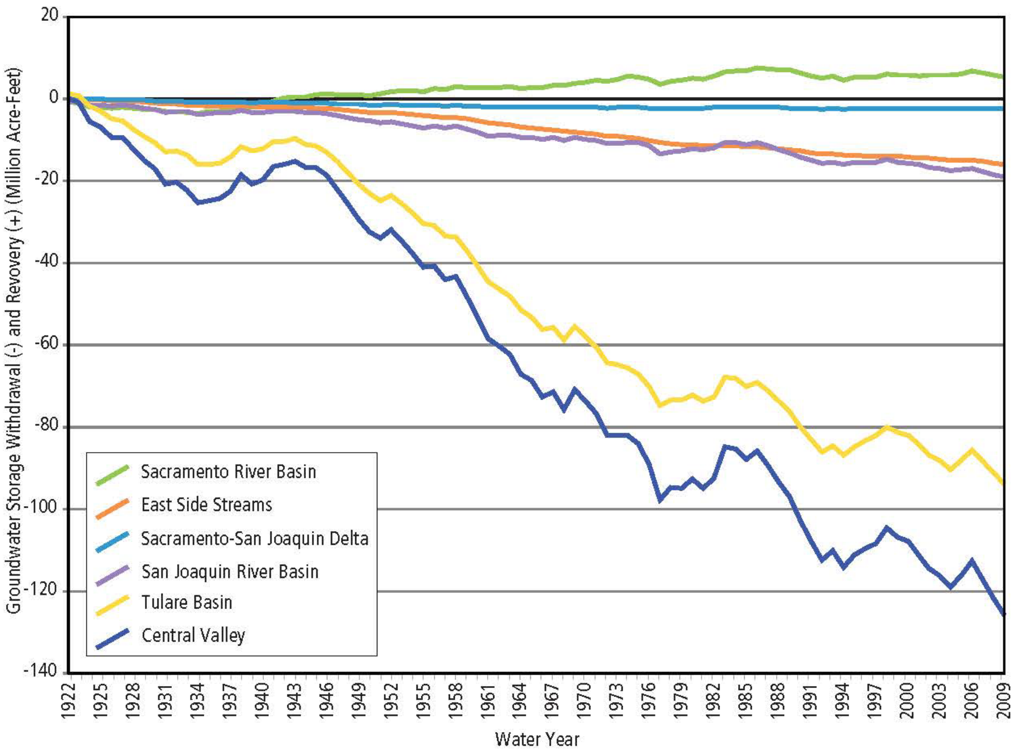
3.3.1.2.2 Sacramento Valley Groundwater Basin

The Sacramento Valley Groundwater Basin includes portions of Tehama, Glenn, Butte, Yuba, Colusa, Placer, Sutter, Solano, Sacramento and Yolo Counties. Under normal hydrologic conditions, groundwater accounts for less than 30 percent of the annual supply used for agricultural and urban purposes within the Sacramento Valley. Urban pumping in the Sacramento Valley increased from approximately 250,000 acre-feet annually in 1961 to more than 800,000 acre-feet annually in 2003 (Faunt 2009). As shown in Figures 3.3-2 and 3.3-3, respectively, the U.S. Geological Survey's (USGS's) Central Valley Hydrologic Model (CVHM) and DWR's Central Valley Groundwater-Surface Water Simulation Model (C2VSim) show groundwater storage in the Sacramento Valley Groundwater Basin has been relatively constant over the long term. Storage tends to decrease during dry years and increase during wetter periods.



Source: Faunt 2009

Figure 3.3-2.
Cumulative Annual Change in Storage as Simulated by the USGS's Central Valley Hydrologic Model



Source: Brush et al 2013

Figure 3.3-3.
Cumulative Annual Change in Storage as simulated by DWR's California Central Valley Groundwater-Surface Water Simulation Model

Groundwater levels in the northern Sacramento Valley Groundwater Basin have declined over the last decade or so (spring 2004 to spring 2017). On average, in the shallow, intermediate, and deep aquifer zones, groundwater levels have declined 4.8, 9.3, and 10.6 feet, respectively (see Plates Figure E-46, Figure E-49, and Figure E-52 in Appendix E of the RDEIR/SDEIS). These decreases in groundwater levels have caused wells to go dry in parts of the valley, particularly during the driest years of 2014 and 2015. Table 3.3-1 below summarizes the number of wells reported dry in these years. Persistent dry weather conditions since 2006 have been partially responsible for these steep declining trends. Water Year 2017 was classified as one of the wettest years on record since 1983. On average, spring 2017 groundwater levels across the state have recovered in comparison to spring 2016 levels. About 5.4 percent of the monitored wells showed an increase of greater than 25 feet between spring 2016 and spring 2017, and approximately 56.7 percent of the wells showed a change of less than 5 feet (includes increase or decrease) between spring 2016 and spring 2017 (DWR 2017a). Approximately 7.3 percent of the wells showed a continued decline in groundwater levels between spring 2016 and spring 2017; this decline is attributed to changes in irrigation practices and land use trends in the valley. Groundwater levels in the northern Sacramento Valley Groundwater Basin show an increase of 4.1, 4.7, and 5.9 feet in the shallow, intermediate, and deep aquifer zones, respectively, between spring 2016 and spring 2017 (see Figure E-48, Figure E-51 and Figure E-54 in Appendix E of the RDEIR/SDEIS). Changes in groundwater levels between spring 2011 and spring 2017 show a decline of 2.6, 5.2 and 5.8 feet in the shallow, intermediate and deep aquifer zones, respectively (see Figure E-47, Figure E-50 and Figure E-53 in Appendix E of the RDEIR/SDEIS). In summary, groundwater levels in the Sacramento Valley Groundwater Basin have recovered to better than spring 2016 levels but have not improved to pre-drought levels (prior to 2011) It should be noted that groundwater level declines discussed above were due to five consecutive drought years and only partial recovery from one wet year is consistent with historic patterns of drawdown and recovery. Past groundwater trends are indicative of groundwater levels declining during extended droughts and recovering to pre-drought levels after subsequent wet periods. Appendix E of the RDEIR/SDEIS includes groundwater well monitoring data to further characterize groundwater levels in the Sacramento Valley Groundwater Basin near the potential selling entities.

**Table 3.3-1.
Summary of Dry Wells Reported in 2014 and 2015**

Counties	Number of wells reported dry in 2014 and 2015	Information received as of:
Shasta	3	9/16/2014
Tehama	34	7/22/2015
Glenn	28	8/28/2015
Butte	70	7/28/2015
Colusa	8	7/7/2014
Sutter	Data not available	Data not available
Yuba	Data not available	Data not available
Solano	2	10/22/2015
Yolo	5	8/11/2015
Sacramento	1	10/16/2014

Source: Data collected by University of California Davis
*Number of dry wells reported are cumulative starting January 2014

Groundwater Pumping-Related Land 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. Due to groundwater withdrawal over several decades, as much as four feet of land subsidence has occurred east of the town of Zamora. In Yolo County within Conaway Ranch, DWR observed land subsidence estimated at approximately 0.2 foot from 2012 to 2013 and an additional 0.6 foot from 2013 to 2014 (DWR 2017b). In comparison, slightly less than 0.1 foot of subsidence occurred over the previous 22 years (1991-2012). Ground surface elevations have reverted to pre-2012 trends at this station since 2014 and approximately 0.03 feet of subsidence has been recorded since 2015 (DWR 2017b). The area between Zamora, Knights Landing, and Woodland has been most affected (Yolo County 2012). Subsidence in this region is generally related to groundwater pumping and subsequent consolidation of loose 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, groundwater quality is influenced by stream flow and recharge from the surrounding Coast Range and Sierra Nevada. Runoff from the Sierra Nevada is generally of higher quality than runoff from the Coast Range because of the presence of marine sediments in the Coast Range.

From 1994 to 2000, water quality data from 1,356 public supply water wells 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 exceedances included 33 percent for nitrates, 32 percent for volatile organic compounds (VOCs) and semi-VOCs (mostly tetrachloroethylene, trichloroethylene, and benzene), 26 percent for inorganic compounds (mostly manganese and iron), five percent for radiological compounds (gross alpha 4), and four percent for pesticides (di(2-ethylhexyl)phthalate) (DWR 2003).

The Sacramento Valley has 481 active clean-up program sites, 234 leaking underground tank (UST) sites, 54 Military sites (includes military privatized UST sites), and one land disposal site as of August 29, 2018 (SWRCB 2018), (see Figure E-55 in Appendix E of the RDEIR/SDEIS). These sites are in various stages of open investigation which includes site assessment, remediation, and/or monitoring. Most of the clean-up sites are clustered around urban areas.

3.3.1.2.3 San Joaquin Valley Groundwater Basin

Prior to the large-scale development of irrigated agriculture, groundwater in the basin generally flowed from areas of higher elevation (i.e., the edges of the basin) toward the San Joaquin River and ultimately to the Delta. Most of the water in the San Joaquin Valley moved laterally, but a small amount leaked upward through the intervening confining unit (Planert and Williams 1995). Upward vertical flow to discharge areas from the deep confined part of the aquifer system was impeded partially by the confining clay beds, particularly the Corcoran Clay. Extensive groundwater pumping and irrigation (with imported surface water) have modified local groundwater flow patterns and in some areas, groundwater depressions are evident. Groundwater flow has become more rapid and complex. Groundwater pumping and percolation of excess irrigation water has resulted in steeper hydraulic gradients as well as shortened flow paths between sources and sinks (Faunt 2009).

Irrigated agriculture in the northern portion of the San Joaquin Valley Groundwater Basin increased from about one million acres in the 1920s to more than 2.2 million acres by the early 1980s (Reclamation 1997). Two water balance subregions (12 and 13) in the USGS's CVHM, show average groundwater pumping to be 799,000 acre-feet per year from 1962 through 2003 (Faunt 2009).

Similar to the Sacramento Valley, groundwater levels in the San Joaquin Valley showed declines during the drought years extending from 2004 to 2015. In the past two years wetter conditions have improved groundwater levels throughout the state including the San Joaquin Valley. In the San Joaquin Valley approximately 75 percent of the monitored wells showed more than 5 feet of groundwater level declines between 2011 and 2017. Between 2016 and 2017, less than one percent of the wells showed more than 5 feet of decline. Therefore, groundwater level declines in San Joaquin Valley slowed because of wet conditions in 2017 but have not recovered to pre-drought levels (pre-2011 levels).

Groundwater Pumping-Related Land Subsidence

From the 1920s until the mid-1960s, the use of groundwater for irrigation of crops in the San Joaquin Valley increased rapidly, causing land subsidence throughout the west and southern portions of the valley. DWR has prioritized the western portion of the San Joaquin Valley

(Tracy, Delta-Mendota and Westside subbasins) as having a high potential for subsidence (DWR 2016). A continuous Global Position (CGPS) station near Los Banos has recorded over 0.28 feet of subsidence since 2005 (DWR 2016). NASA's InSAR study also noted up to 2 feet of subsidence in portions of the San Joaquin Valley for the period between May 2015 through September 2016 (Farr et al. 2016)

Groundwater Quality

Groundwater quality varies throughout the San Joaquin Valley Groundwater Basin. Groundwater quality in the western portion of basin (Delta Mendota subbasin) is characterized by mixed sulfates, bicarbonates and chlorides in the water. There are also localized areas of high iron, fluoride, nitrate, and boron in the subbasin (DWR 2003).

3.3.1.2.4 Santa Clara Valley Groundwater Basin (Santa Clara Valley Subbasin)

The Santa Clara Valley Groundwater Basin has been divided into four subbasins by DWR. The Santa Clara subbasin is part of the Santa Clara Valley Groundwater Basin and occupies a structural trough parallel to the northwest trending Coast Ranges. The Santa Clara subbasin is a regional groundwater basin that can be divided into two onshore subregions: the confined zone in the northern portion of the subbasin is overlain by a clay layer of low permeability and the southern portion of the subbasin is generally unconfined and contains no thick clay layers (Santa Clara Valley Water District [SCVWD] 2001). SSCVWD manages the groundwater basin with active recharge facilities and limits on annual groundwater withdrawal. The operational storage capacity of the Santa Clara Valley subbasin is estimated to be 383,000 acre-feet (SSCVWD 2001 and SCVWD 2002 as cited in SCVWD 2012). The operational storage capacity is less than the total storage capacity of the basin and accounts for available pumping capacity. Land subsidence concerns can be eliminated if total pumping in the basin stays within the operational storage capacity.

Historically, since the early 1900s through the mid-1960s groundwater level declines from groundwater pumping have induced subsidence in the Santa Clara Valley subbasin and caused degradation of the aquifer adjacent to the bay from saltwater intrusion. Prior to importing surface water via the Hetch Hetchy and South Bay Aqueducts and the introduction of an artificial recharge program, water levels declined more than 200 feet in the Santa Clara Valley (SCVWD 2000). SCVWD has also implemented various recharge programs that use local runoff and imported water deliveries to recharge groundwater through approximately 390 acres of recharge ponds and 90 miles of local creeks to stop groundwater overdraft and land subsidence (SCVWD 2001). Groundwater levels have generally increased since 1965 as a result of increased in-stream and off-stream recharge programs and decreased pumping due to increase in availability of imported surface water (SCV2001).

Groundwater Pumping-Related Land Subsidence

Historically, Santa Clara County has experienced as much as 13 feet of subsidence caused by excessive pumping of groundwater. Land subsidence since the 1980s has primarily been elastic with most of the compaction occurring in the upper aquifer (upper 250 feet of sediments) and trending over seasonal and climatic cycles (Hanson 2015). SCVWD manages its groundwater use to avoid subsidence and has established subsidence thresholds equal to the current acceptable rate of 0.01 feet per year (SCVWD 2012). DWR has categorized the Santa Clara Valley subbasin as having a low potential for future land subsidence (DWR 2016).

Groundwater Quality

DWR has prioritized the Santa Clara Valley subbasin as medium priority based on groundwater quality concerns in some wells across the basin (DWR 2016). Though groundwater in the Santa Clara Valley is typically considered "hard", the groundwater is suitable for most uses and meets drinking water standards at public supply wells without the use of treatment methods (SCVWD 2001).

3.3.1.2.5 Gilroy-Hollister Valley Groundwater Basin (Llagas Subbasin)

The Gilroy-Hollister Valley Groundwater Basin has been divided into four subbasins by DWR. The Llagas subbasin is part of the Gilroy-Hollister Groundwater Basin and occupies a northwest trending structural depression. Santa Clara Valley Water District manages the Llagas subbasin. Annual average groundwater pumping in Llagas is 20,000 acre-feet and has remained fairly constant over the years. The operational storage capacity of the Llagas subbasin is estimated to be between 150,000 and 165,000 acre-feet (SCVWD 2012).

Groundwater levels remained relatively stable over the period of record with the exception of water level declines and subsequent recovery associated with the 1976-1977 and 1987-1992 drought periods. While groundwater levels in the index well are not indicative of levels in all wells within the subbasin, it is representative of relative changes in groundwater levels within the subbasin (SCVWD 2001).

Natural groundwater recharge based on the long-term average for the Llagas subbasin is estimated to be 44,300 acre-feet per year (SCVWD 2001). Total facility recharge (Artificial Recharge) countywide is estimated to be 157,200 acre-feet (SCVWD 2001). The operational storage capacity of the Llagas subbasin is estimated to be between 150,000 and 165,000 acre-feet (SCVWD 2010). The operation storage capacity is less than the total storage capacity of the subbasin and accounts for available pumping capacity. Land subsidence concerns can be eliminated if total pumping in the basin stays within the operational storage capacity

Groundwater Pumping-Related Land Subsidence

Most of the subsidence within Santa Clara County has occurred in the Santa Clara Valley subbasin. Santa Clara Valley Water District manages its groundwater use to avoid subsidence and has established subsidence thresholds equal to the current acceptable rate of 0.01 feet per year (SCVWD 2012). DWR has categorized Llagas subbasin as having a low potential for future land subsidence (DWR 2016).

Groundwater Quality

Groundwater alkalinity in the Llagas subbasin is generally high, similar to the Santa Clara Valley subbasin. Though the water is hard, it is suitable for most uses and drinking water standards are met at public supply wells without the use of treatment methods (SCVWD 2001).

The SCVWD created a Nitrate Management Program in October 1991 to investigate and remediate increasing nitrate concentrations in the Llagas subbasin (SCVWD 2001). Median nitrate concentrations are below the drinking water standard of 10mg/L in the Llagas subbasin, but nitrate continues to be groundwater protection challenge because about 30 percent of wells tested in 2017 are above drinking water standards (SCVWD 2017). Since 1997, more than 600 wells in south Santa Clara County including the Llagas and Coyote subbasins have been tested for nitrate. The 2009 median nitrate concentration for the principal aquifer zone of the Llagas subbasin was 30 mg/L, with a maximum value of 155 mg/L (SCVWD 2010).

3.3.2 Environmental Consequences/Environmental Impacts

This section summarizes the environmental impacts of the Action Alternatives on groundwater resources within the project area of analysis. An impact would be potentially significant if implementation of groundwater substitution or cropland idling actions would result in:

- A net reduction in groundwater levels that would result in substantial adverse environmental effects or effects to non-transferring parties;
- Permanent land subsidence caused by significant groundwater level declines; or
- Degradation in groundwater quality such that it would exceed regulatory standards or would substantially impair reasonably anticipated beneficial uses of groundwater.

Impacts of Action Alternatives on groundwater levels were analyzed using a quantitative approach with a numerical groundwater model. Numerical groundwater modeling was performed using the Sacramento Valley Finite Element Groundwater Model (SACFEM2013) developed to simulate groundwater conditions in the Sacramento Valley. Appendix D, Groundwater Model Documentation of the 2014 Draft EIS/EIR includes more information about the SACFEM2013 model in this analysis.

Land subsidence and groundwater quality impacts were analyzed using a qualitative approach. For land subsidence, the modeled groundwater drawdown was compared to areas with existing subsidence to identify areas that may be susceptible to impacts. Additionally, simulated groundwater drawdown was compared to estimates of preconsolidated heads/historic low heads. Groundwater quality impacts were assessed by considering areas of known water quality concerns and determining whether modeled groundwater drawdown could cause those areas to migrate.

3.3.2.1 Alternative 1: No Action/No Project

Increased groundwater pumping unrelated to water transfers may result in groundwater level declines. . There would be no water made available for transfer through groundwater substitution pumping actions in the Seller Service Area under the No Action/No Project Alternative. Groundwater pumping, a common agricultural practice unrelated to this project, would be expected to continue on the same pattern as currently observed. Under normal hydrologic conditions, groundwater accounts for less than 30 percent of annual agricultural and urban pumping in the Sellers Service Area (Sacramento Valley). This trend is expected to continue under No Action/No Project Alternative. In the past groundwater trends in the sellers area show seasonal variation with groundwater level declines during the summer month and recovery during the winter months. Long-term declines are noticed during extended drought with recovery to recovering to pre-drought levels after subsequent wet periods. The potential for groundwater level declines in the Seller Service Area would continue the same as existing conditions.

Under the No Action/No Project Alternative, water users in the Buyer Service Area may use groundwater pumping to meet shortages, which could result in temporary groundwater level declines. Potential buyers have already taken steps to address shortages that have occurred in recent years, and several potential buyers rely heavily on groundwater to meet their water supply demands (see Table 3.3-2 for details). Groundwater pumping in these areas has the potential to lower groundwater levels (see discussion in Section 3.3.1.2.3, Section 3.3.1.2.4 and Section 3.3.1.2.5) and affect the performance of wells nearby the pumping wells. However, existing pumping activities in the Buyer Service Area already include groundwater pumping to cover existing shortages, and future shortages are anticipated to follow current annual/seasonal and long-term trends. Therefore, the potential for groundwater level declines in the Buyer Service Area would be the same as existing conditions.

Table 3.3-2.
Historic Groundwater Pumping and Groundwater Basin Safe Yields for Potential Buyers

Potential Buyer Agency	Underlying Groundwater Basin	Safe Yield of Groundwater Basin (acre-feet)	Groundwater Pumping (acre-feet/year)
Westlands WD[1]	Westside subbasin	200,000	15,000 – 600,000[2]
SCVWD[3]	Santa Clara Plain subbasin	373,000 – 383,000	93,500 - 122,300[4]
	Llagas subbasin	150,000 – 165,000	41,600 - 49,700[4]
Contra Costa WD[5]	-	-	3,000

[1] Source: Westlands WD 1996. Based on data from 1988 to 2011.
[2] Average pumping is approximately 218,600 acre-feet/year
[3] Source: SCVWD 2012
[4] Based on data from 2000 to 2009. Combined average pumping for Santa Clara Plain and Llagas subbasins is approximately 156,330 acre-feet/year
[5] Source: Contra Costa WD 2011

Groundwater pumping would not cause groundwater level declines that would lead to permanent land subsidence. In the Seller Service Area, groundwater pumping would be expected to continue on the same pattern as currently observed. Therefore, the potential for increased land subsidence in the Seller Service Area would be the same as existing conditions. In the Buyer Service Area, additional groundwater pumping may be expected during shortage periods. However, pumping activities in the Buyer Service Area already include groundwater pumping to cover shortages. Therefore, the potential for groundwater level declines that would cause permanent land subsidence in the Buyer Service Area would be the same as existing conditions.

Groundwater pumping would not cause groundwater level declines that would lead to migration of poor quality groundwater. In the Seller Service Area, groundwater pumping would be expected to continue on the same pattern as currently observed. Therefore, the potential for groundwater quality degradation in the Seller Service Area would be the same as existing conditions. In the Buyer Service Area, additional groundwater pumping may be expected during shortage periods. However, pumping activities in the Buyer Service Area already include groundwater pumping to cover shortages. Therefore, the potential for groundwater level declines that would cause migration of poor quality groundwater in the Buyer Service Area would be the same as existing conditions.

Idling cropland would not decrease applied water recharge to the local groundwater system underlying the barren (idled) fields that would result in a decline in groundwater levels. Under the No Action/No Project Alternative, agricultural water users in the Buyer Service Area may increase the amount of cropland idling to meet shortages and reduce the amount of groundwater recharge. In the Seller Service Area, cropland idling would be expected to continue on the same pattern as currently observed. Therefore, the potential for changes in groundwater levels due to cropland idling in the Seller Service Area would be the same as existing conditions. Cropland idling activities in the Buyer Service Area already include actions to cover shortages. Therefore, the potential for changes in groundwater levels due to cropland idling in the Buyer Service Area would be the same as existing conditions.

3.3.2.2 Alternative 2: Full Range of Transfers (Proposed Action)

3.3.3.3.1 Seller Service Area

Redding Area Groundwater Basin

Increased groundwater substitution pumping could affect groundwater levels and may result in temporary declines of groundwater levels. The proposed Anderson-Cottonwood ID transfer would extract up to 5,130 acre-feet/year of groundwater from production wells (see Table 3.3-3 for details on number of wells and pumping capacity).

Unlike other transfers of surface water made available through groundwater substitution actions, Anderson-Cottonwood ID's proposed transfer was not simulated in SACFEM2013 because the model area does not include the Redding Area Basin. However, Anderson-Cottonwood ID has tested operation of these wells in the past at similar production rates and has observed no substantial impacts on groundwater levels or groundwater supplies (Anderson-Cottonwood ID 2013). Based on the results of the aquifer tests and previous transfers, effects from groundwater substitution actions are likely to be less than significant. However, because of the uncertainty surrounding groundwater level changes, especially during a very dry year, Anderson-Cottonwood ID would implement the Monitoring and Mitigation Plans described in GW-1 (see Section 3.3.4 for details).

Increased groundwater pumping may lead to permanent land subsidence caused by water level declines. There is potential for subsidence in some areas of the Redding Area Groundwater Basin if groundwater levels were substantially lowered. The groundwater basin west of the Sacramento River is composed of the Tehama Formation; this formation has exhibited subsidence in Yolo County and the similar hydrogeologic characteristics in the Redding Area Groundwater Basin could allow subsidence. Therefore, the effect of potential land subsidence in the Redding Area Groundwater Basin could be significant. Mitigation Measure GW-1 (Section 3.3.4) therefore specifies monitoring and mitigation requirements for transfers of surface water made available through groundwater substitution actions. These requirements include, among other things, operating participating well(s) at the groundwater levels trigger identified under Mitigation Measure GW-1 to ensure that the effect of potential land subsidence in the Seller Service Area would be less than significant.

Changes in groundwater levels, or in the prevailing groundwater flow regime, could cause a change in groundwater quality. Additional pumping is not expected to be in locations or at rates that would cause substantial long-term changes in groundwater levels that would cause changes to groundwater quality. Changes to groundwater quality due to increased pumping would be less than significant in the Redding Area Groundwater Basin.

Sacramento Valley Groundwater Basin

Increased groundwater substitution pumping may result in temporary declines of groundwater levels. Groundwater substitution pumping would occur when the buyers have capacity to divert the water from the Sacramento River or the Delta.

Water made available for transfer through groundwater substitution actions could affect groundwater levels, land subsidence, and groundwater quality. Figure 3.3-4 shows the potential volume of water transferred through groundwater substitution through the period of analysis under the Proposed Action in the SACFEM2013 Model.

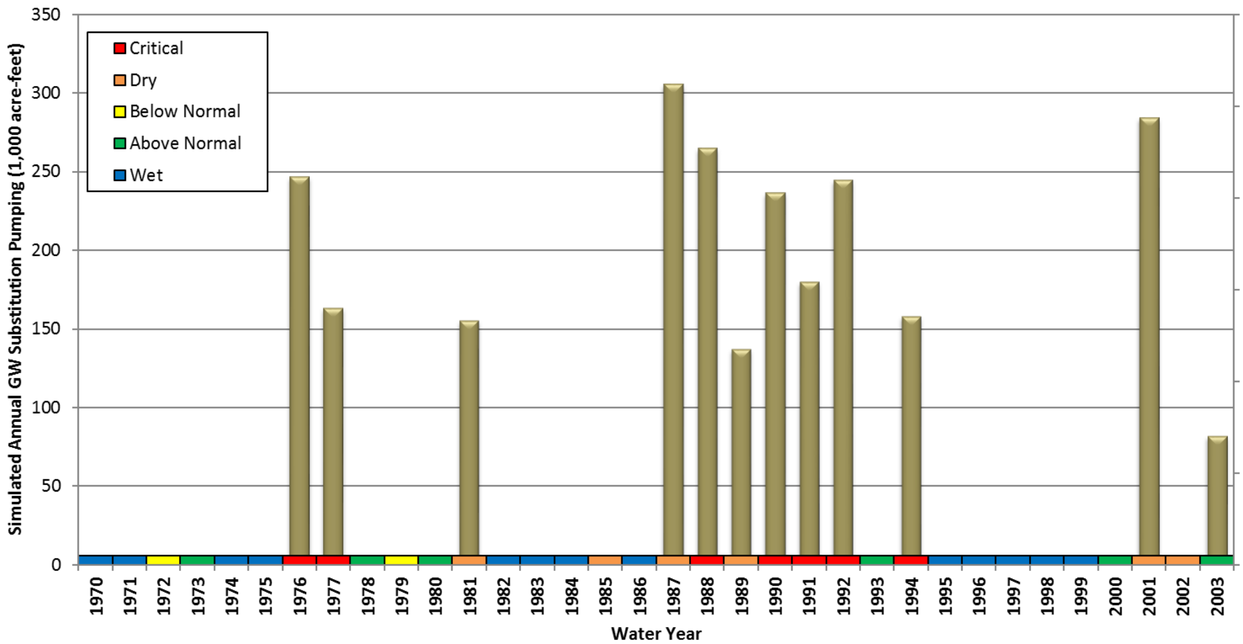


Figure 3.3-4.
Simulated Groundwater Substitution Transfers under the Proposed Action in the SACFEM2013 Model

The effects of the potential groundwater substitution shown in Figure 3.3-4 from pumping 390 wells simultaneously based on data collected from potential sellers (listed in Table 3.3-3) within the Sacramento Valley have been modeled in SACFEM2013 to estimate effects to groundwater resources. Additional information about the assignment of groundwater pumping in SACFEM2013 can be found in Appendix D, Groundwater Model Documentation of the 2014 Draft EIS/EIR. Appendix F, Groundwater Modeling Results of the RDEIR/SDEIS, show the simulated drawdown of groundwater levels under September 1976 hydrologic conditions (WY 1976 was historically a critical dry year) and September 1990 hydrologic conditions (WY 1990 was the fourth year of a multiyear drought). These drawdown figures represent the spatial impacts of groundwater substitution pumping but these results represent drawdown during a single period of time. The simulated drawdown under September 1990 hydrologic conditions show the cumulative effects of multi-year transfers as groundwater substitution pumping was simulated in 1987, 1988, 1989, and 1990. The drawdown figures show that the maximum groundwater level declines resulting from groundwater substitution actions within the Sacramento Valley Groundwater Basin range widely depending on the distance from the participating well(s) (i.e. well used in lieu of diverting surface water). The maximum groundwater level declines tend to be focused in the areas immediately surrounding the proposed groundwater substitution production wells. Seasonal groundwater level declines would be greater than the typical fluctuation when substitution pumping is included, indicating the potential for adverse effects. The potential for adverse drawdown effects would increase as the amount of extracted water increased. The potential for adverse effects would be higher during dry years, when baseline fluctuations would already be large and groundwater levels would likely be lower than normal.

Table 3.3-3.
Water Transfer through Groundwater Substitution under the Proposed Action

Groundwater Basin	Potential Seller	Number of Wells	Pumping Rate per well (gpm)	Well Depth (ft)
Redding Area Groundwater Basin	Anderson-Cottonwood ID	2	1,000-5,500	150-455
Sacramento Valley Groundwater Basin	Butte WD	2	4,000-4,200	263-580
	Burroughs Farms	3	2000-3200	320-580
	City of Sacramento	32	373-1,400	80-578
	Conaway Preservation Group	37	1,400-3,500	70-580
	Cordua ID	23	900-2,400	200-400
	Cranmore Farms	6	3,000-3,000	150-275
	Eastside MWC	1	3,800-3,800	150-240
	Garden Highway MWC	7	2,200-3,200	90-235
	Glenn-Colusa ID	11	2,389-3,305	500-1200
	Gilsizer Slough Ranch	3	2,016-2,016	150-275
	Goose Club Farms and Teichert Aggregates	13	3,000-3,000	150-275
	Giusti Farms	2	3200	160-400
	Henle Family Farms	2	2000	155-480
	Natomas Central MWC	13	5,500-5,500	150-350
	Pelger MWC	3	4,700-4,700	101-485
	Pleasant Grove-Verona MWC	32	1,500-5,000	99-300
	Pope Ranch	2	2,117-2,117	150-275
	Princeton-Codora-Glenn ID	13	1000-4000	220-380
	Provident ID	16	2000-4500	160-420
	RD 1004	20	1,000-5,800	56-430
	RD 108	5	1,700-5,900	250-680
	RD 2060	4	2500	160-300
	RD 2068	4	1,500-1,500	209-438
	River Garden Farms	8	1700-3000	365-686
	Sacramento County Water Agency	39	455-3,000	170-1368
	Sacramento Suburban WD	47	180-3,500	131-750

Groundwater Basin	Potential Seller	Number of Wells	Pumping Rate per well (gpm)	Well Depth (ft)
	Sutter MWC	20	2500-5000	160-400
	Sycamore MWC	12	2,500-3,500	256-900
	Te Velde	5	2,200-4,656	115-300
	Tule Basin Farms	3	3,050-4,850	150-275

Key:
ft = feet
gpm = gallons per minute
ID = Irrigation District
MWC = Mutual Water Company
RD = Reclamation District
WD = Water District

Groundwater level drawdown and subsequent recovery can also be viewed at a specific location through the entire 33-year simulation period. Representative hydrographs were extracted from the model results at the 34 locations shown with pink triangles in drawdown figures in Appendix F of the RDEIR/SDEIS. Appendix F, Groundwater Modeling Results, includes hydrographs for all 34 locations and seven simulated model layers (varying depths throughout the model).

Five of the 34 locations are presented here to illustrate the simulated groundwater drawdown and recovery process within the Sacramento Valley. These five locations were selected as they are spread out over the Sacramento Valley and show the largest drawdowns within the 34 representative hydrograph locations.

Location 21 is near Sycamore Mutual Water Company and is in the northwestern portion of the Sacramento Valley approximately four miles from the Sacramento River and Butte Creek intersection and two miles from the Sacramento River and Sycamore Creek intersection. Figure 3.3-5 shows the change in groundwater level between the baseline and the Proposed Action. Groundwater levels at this location return to near-baseline conditions approximately three to four years after the single year groundwater substitution transfer event in WY 1981. Recovery occurs after approximately six years following the multi-year transfer event from WY 1986 to WY 1994. Most of the recovery near the pumping zone occurs in the year following the transfer event. Recovery at the water table was more gradual. Groundwater level recovery is highly dependent on (1) hydrology in the year following the groundwater substitution transfer; (2) proximity of the pumping well to surface water; (3) pumping in the following year (i.e., if the subsequent year also includes groundwater substitution pumping to make surface water available for transfer); and (4) aquifer properties.

Location 14 is near Cordua ID in the northeastern portion of the valley and approximately three miles from the Yuba River. Figures 3.3-6 shows the simulated changes in groundwater head between the baseline and Proposed Action at Location 14. Groundwater recovery at this location takes longer than at Location 21 (see Figure 3.3-5 which plots simulated changes in groundwater head). It should be noted that Location 14 is located near the boundary of the model where the aquifer is thinner.

Location 31 is near the Sacramento County Water Agency in the southeastern portion of the Valley and approximately six miles from the American River. Figure 3.3-7 shows the change in groundwater heads at Location 31. Groundwater recovery at Location 31 is slower than at Location 21. Similar to Location 21 most of the recovery near the pumping zone occurs in the year after the transfer event. Groundwater levels return to approximately 75 percent of the baseline level five years after the single year transfer event in WY 1981 and between 50-75 percent six years after the multi-year transfer event from WY 1986 to WY1994 (see Figure 3.3-7).

Location 4 is near Butte Water District in the northeastern portion of the valley and approximately four miles from the Feather River and twelve miles from the Butte River. Figure 3.3-8 shows the simulated change in groundwater head at Location 4. Though the magnitude of drawdown at Location 4 is higher than Location 31, the recovery period is nearly identical (see Figure 3.3-8).

Location 7 is near Provident ID in the northern portion of the valley and approximately two miles north west of the confluence of the Sacramento River and Little Chico Creek. Figure 3.3-9 shows the change in simulated groundwater head at Location 7. Groundwater head at this location almost completely recovered four years after a single year transfer event and six years after a multi-year transfer event from WY-1988 to WY 1991. Most areas in the model exhibit smaller drawdown changes than those shown in the five locations discussed above.

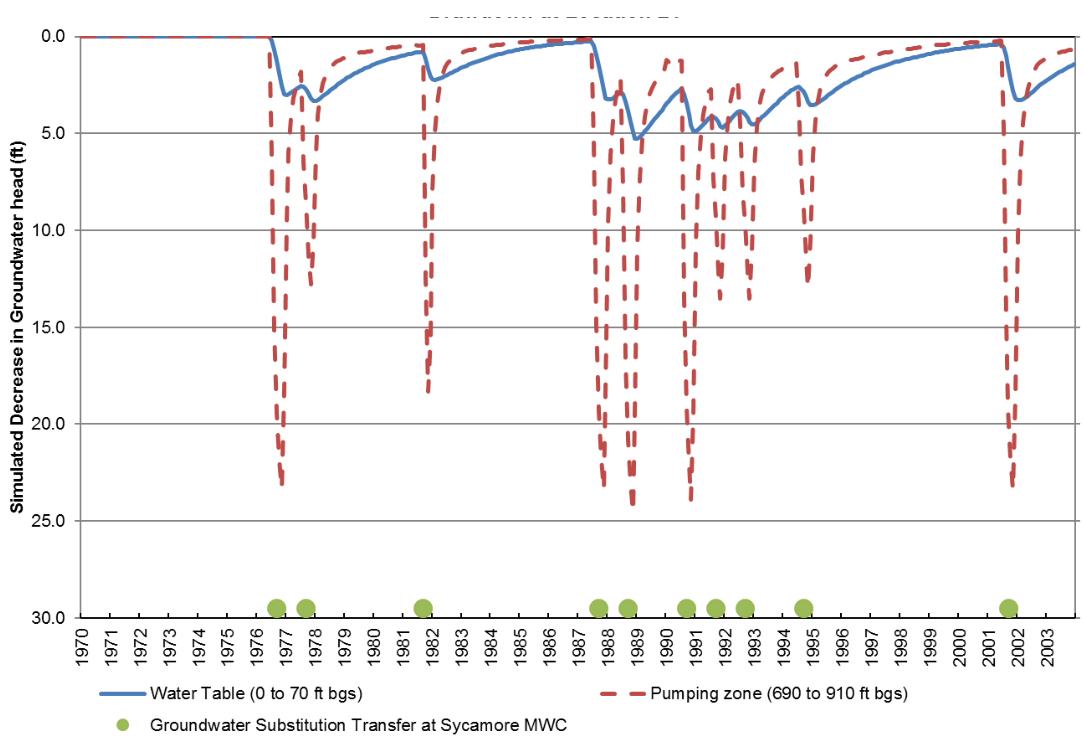


Figure 3.3-5.
Simulated Change in Groundwater Head at Location 21

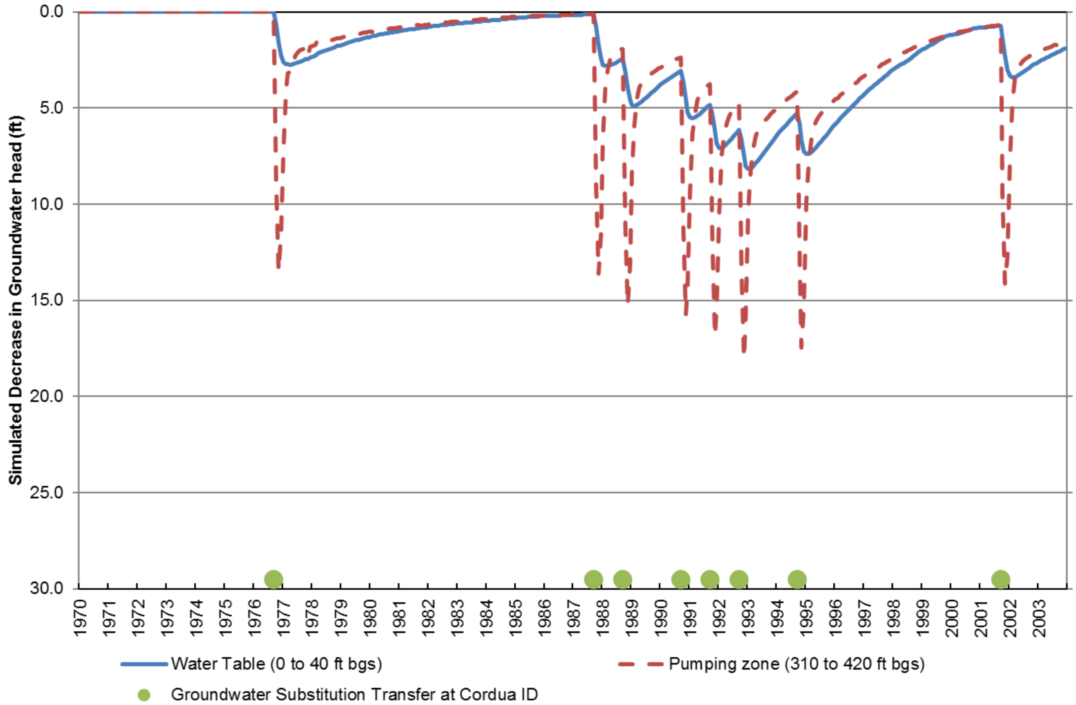


Figure 3.3-6.
Simulated Change in Groundwater Head at Location 14

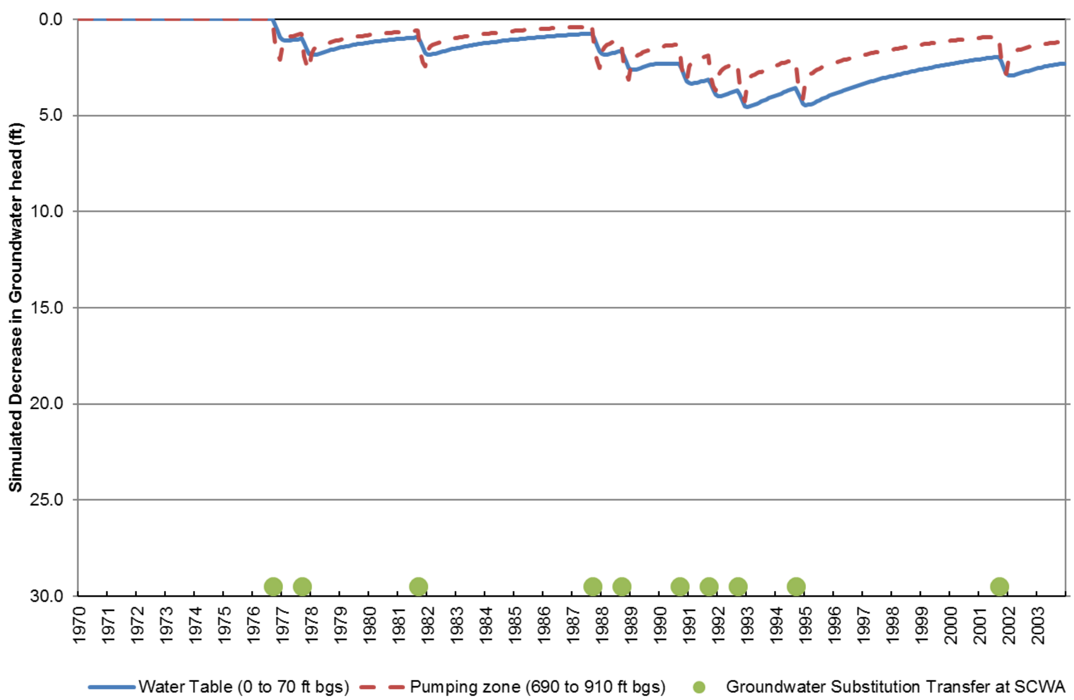


Figure 3.3-7.
Simulated Change in Groundwater Head at Location 31

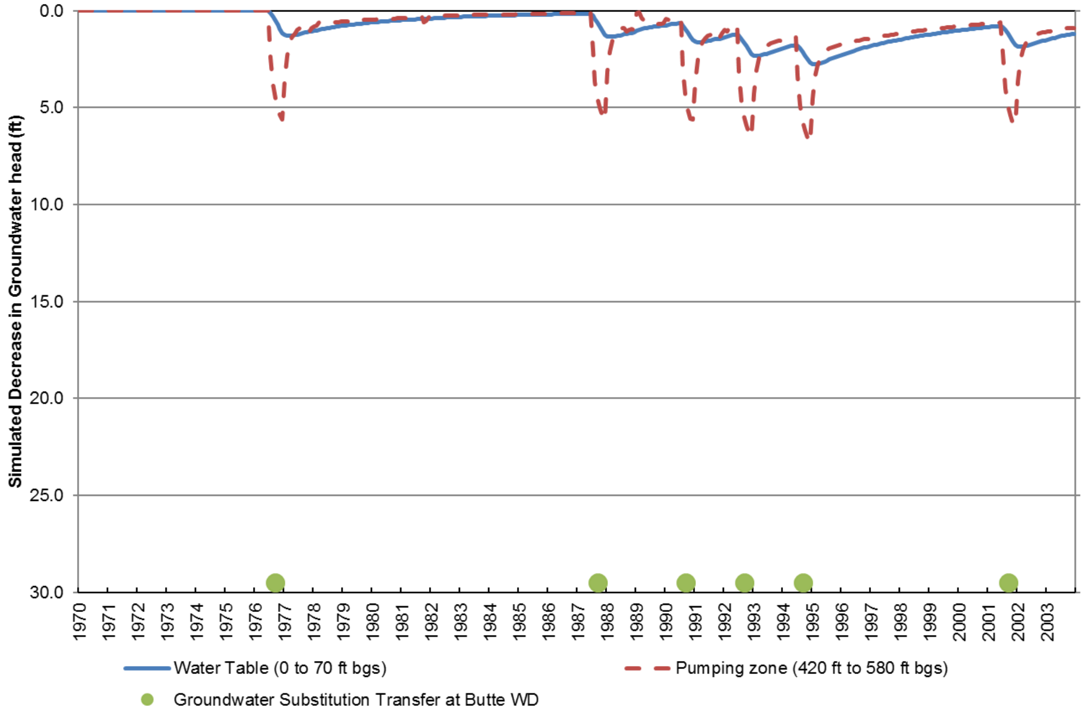


Figure 3.3-8.
Simulated Change in Groundwater Head at Location 4

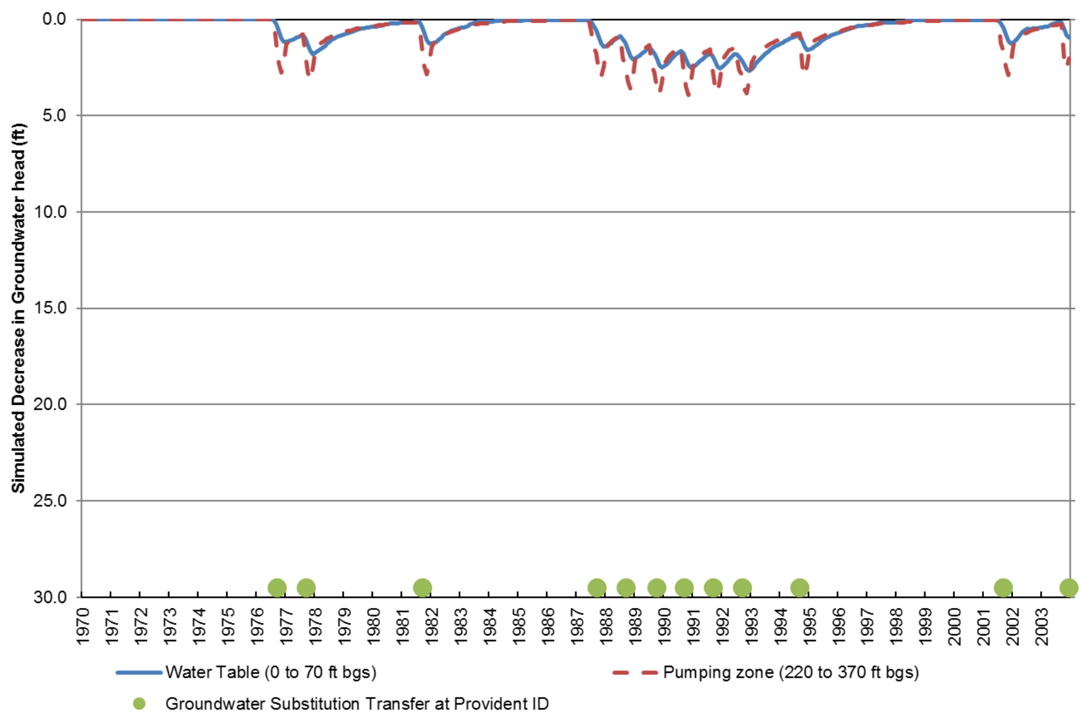


Figure 3.3-9.
Simulated Change in Groundwater Head at Location 7

Table 3.3-4 shows the depth range and average depth of domestic and irrigation wells within the areas of potential transferring agencies in the Sacramento Valley Groundwater Basin. On average, most wells in these areas are deeper than the levels that would result after potential drawdowns caused by groundwater substitution pumping; therefore, groundwater pumping would not cause them to go dry. However, groundwater level declines at the shallow wells could reduce the yield of these wells.

Groundwater substitution actions to make water available for transfer could result in groundwater declines in excess of seasonal variation and effects on wells not participating in the Proposed Action (i.e. well not participating in groundwater substitution action) could be significant. Mitigation Measure GW-1 (Section 3.3.4) therefore specifies monitoring and mitigation requirements for groundwater substitution actions taken to make surface water available for transfer, which would monitor groundwater level fluctuations within the local pumping area and require implementation measures to ensure that groundwater level declines are less than significant.

**Table 3.3-4.
Well Depths in the Sacramento Valley Groundwater Basin**

Groundwater Subbasin	Domestic Wells Depth Range (ft bgs)	Domestic Wells Average Depth (ft bgs)	Municipal/ Irrigation Wells Depth Range (ft bgs)	Municipal/ Irrigation Wells Average Depth (ft bgs)
Colusa	11 – 870	155	20 – 1,340	368
East Butte	25 – 639	101	35 - 983	285
North American	50 – 1,750	190	77 – 1,025	396
Solano	38 – 1,070	239	62 – 2,275	510
South American	87 – 575	247	41 – 1,000	372
Sutter	35 – 320	121	60 - 672	205
West Butte	15 – 680	136	40 - 920	321
Yolo	40 – 600	230	50 – 1,500	400

Source- DWR 2003
Key:
bgs = below ground surface
ft = feet

Extraction of groundwater used in lieu of diverting surface water to make surface water available for transfer would decrease groundwater levels, increasing the potential for subsidence. Most areas of the Sacramento Valley Groundwater Basin have not experienced land subsidence that has caused impacts to the overlying land. As discussed in Section 3.3.1.2, Affected Environment, portions of Colusa and Yolo counties have experienced subsidence and subsidence has also been measured at Conaway Ranch (Yolo County). Table 3.3-5 provides the simulated change in groundwater level due to pumping, in lieu of diverting surface water to make surface water available for transfer, at eight monitoring well locations within Sacramento Valley (see Figure E-10 in Appendix E of the RDEIR/SDEIS for location of monitoring wells). The historic low groundwater levels were determined based on the monitored groundwater level data. Based on the calculated historic low, groundwater levels since 2008 and the simulated change in groundwater level due to groundwater substitution pumping, there is potential for land subsidence at two of the eight monitoring wells (22N01E28J003M and 19N02W13J001M) presented in Table 3.3-5. Additionally, the change in groundwater level at Conaway Ranch would be between the Proposed Action and the No Action Alternative ranges of 2.5-12 feet (Appendix F of the RDEIR/SDEIS, Location 30 hydrograph). As a result, the effect of potential land subsidence in the Seller Service Area could be significant. Mitigation Measure GW-1 (Section 3.3.4) therefore specifies monitoring and mitigation requirements for transfers of surface water made available through groundwater substitution actions. These requirements include, among other things, operating participating well(s) at the groundwater levels trigger identified under Mitigation Measure GW-1 to reduce the effects of potential land subsidence in the Seller Service Area to be less than significant.

Table 3.3-5.
Simulated Change in Groundwater Level at Monitoring Well Locations (Feet)

Monitoring Well	Historic Low Groundwater Levels (preconsolidated heads)[1]	Date of Historic Low Groundwater Levels measurement[1]	Groundwater Levels from 2008 to Present[1]	Maximum change in GWL under Proposed Action[2]	Average change in GWL under Proposed Action[2]
20N02E28N001M	112.8	04/21/1997 08/27/1947	122.3 – 112.1	-0.08	-0.03
22N01E28J003M*	118.2	10/16/2015	145.2 – 118.2	-0.20	-0.07
19N04W12E001M	81.9	8/22/1972	163.5 – 128.3	-0.90	-0.22
19N02W13J001M*	65.2	07/02/2014	85.1 – 65.2	-0.34	-0.09
16N02W25B002M	23.4	08/05/2015	48.5 – 23.4	-1.08	-0.39
11N02E20K004M	-20.1	6/27/1977	35.7 – 13.4	-2.49	-0.69
12N05E12Q001M	22.8	08/29/1979	NA	-1.56	-0.66
11N05E32R001M	-68.4	05/19/1992	NA	-5.65	-2.03

Source: DWR 2018a
Note: NA= Data not available for period of record. GWL = Groundwater Level
* Wells with potential for land subsidence based on data presented in table
[1] Based on data from DWR Water Data Library (DWR 2018b)
[2] Based on SACFEM2013 modeling results

Extraction of groundwater used in lieu of diverting surface water to make surface water available could cause migration of reduced quality water, agricultural use of reduced quality water, or the distribution of reduced quality water.

Migration of Reduced Quality Groundwater
Inducing the movement or migration of reduced quality water into previously unaffected areas due to groundwater substitution pumping is not likely to be a concern unless groundwater levels and/or flow patterns are substantially altered for a long period of time. Groundwater substitution pumping under the Proposed Action would be limited to short-term withdrawals during the irrigation season. Effects from the migration of reduced groundwater quality would be less than significant.

On-Farm Use of Reduced Quality Groundwater
Potential sellers that may choose to make water available for transfer through groundwater substitution actions could experience changes in water quality as they switch from surface water to groundwater. Groundwater quality is good for most agricultural and municipal uses

throughout the Sacramento Valley Groundwater Basin; therefore, potential regional impacts would be insubstantial and this impact would be less than significant.

Distribution of Reduced Quality Groundwater

Groundwater extracted could be of reduced quality relative to the surface water supplies the seller districts normally receive; however, groundwater quality in the area is normally adequate for agricultural purposes. Groundwater use for municipal supply is subject to groundwater quality monitoring and quality limits prior to distribution to customers. Therefore, potential impacts to the distribution of groundwater would be insubstantial and this impact would be less than significant.

Water made available for transfer through cropland idling actions could decrease applied water recharge to the local groundwater system underlying the barren (idled) fields that could result in decline of groundwater levels. Table 3.3-6 shows potential maximum acreage of land idled through cropland idling actions.

Table 3.3-6.
Maximum Acreage of Cropland Idling under the Proposed Action

County	Rice (acres)	Alfalfa (acres)	Corn (acres)	Tomatoes (acres)	Total (acres)
Colusa, Glenn, Yolo	49,924	2,750	1,000	1,250	54,924
Butte, Sutter	10,769	700	1,300	900	13,669
Solano	-	3,900	2,500	750	7,150
Total	**60,693**	**7,350**	**4,800**	**2,900**	**75,743**

Cropland idling would eliminate the applied water on participating fields within the Seller Service Area. A portion of that applied water percolates into the groundwater aquifer; therefore, reducing applied water would result in a loss of recharge to the Sacramento Valley Groundwater Basin. Because only a small portion of the applied water would have percolated to the groundwater table, the reduction in recharge is expected to be minimal. This reduction in recharge is insubstantial and would not significantly affect the total amount of water that recharges the Sacramento Valley Groundwater Basin. Most of the total recharge to the basin occurs through precipitation and runoff over the spring and winter months and would be unaffected by cropland idling.

Of the participating crops listed in Table 3.3-6, rice is the crop most commonly fallowed and therefore equates to the greatest amount of land idled for transfers. Rice farming practices include a constant supply of irrigation water that remains on rice fields during the growing season. The land used for rice production, however, is typically underlain by soils with low permeability (such as clay). A substantial portion of the water applied to rice fields does not percolate to the underlying aquifer because of the underlying soils, but rather discharges to the farmer’s surface drainage system.

A reduction in applied water recharge because of cropland idling could have effects on groundwater recharge and levels; however, this action would not be likely to substantially reduce the amount of recharge for the basin. The potential lowering of groundwater levels due to a reduction in groundwater recharge as a result of cropland idling would be less than significant.

Water made available for transfers through cropland idling actions may cause groundwater level declines that lead to permanent land subsidence or changes in groundwater quality. As discussed earlier in the section, cropland idling would not be likely to substantially lower groundwater levels in the basin causing land subsidence or changing groundwater quality. Subsidence and groundwater quality changes because of a reduction in groundwater recharge as a result of cropland idling would be less than significant.

Mitigation Measure (See Section 3.3.4, below)
Implementation of Mitigation Measure GW-1 is required to avoid potentially significant effects on non-transferring well and land subsidence in the Seller Service Area to a less-than-significant level.

Significance of Impacts after Mitigation (Effectiveness of Mitigation Measure)
With the implementation of Mitigation Measure GW-1 (Section 3.3.4), potentially significant impacts related to groundwater levels (i.e., groundwater declines in excess of seasonal variation that could affect riparian vegetation or third parties) and land subsidence (i.e., permanent/irreversible subsidence) would be reduced to less-than-significant levels.

Mitigation Measure GW-1 implements a monitoring program, through a sufficient number of monitoring wells near the production well, required to accurately characterize fluctuations in groundwater levels in the pumping area. Mitigation Measure GW-1 also requires monitoring at the participating pumping well(s) but this monitoring cannot be used in lieu of monitoring at the suitable monitoring well(s) i.e. participating pumping well(s) that do not have a suitable monitoring well(s) will not participate in water transfer until a suitable monitoring well(s) is identified. Specific groundwater level triggers for each monitoring well will be identified based on local Basin Management Objectives (BMOs), or the historic low groundwater level for that well. BMOs represent locally-driven objectives to maintain health of the groundwater basin in each area. In areas where local BMOs are not available, historic low groundwater levels are identified as groundwater level triggers. Most of the quantitative BMOs within the Seller Service Area are tied to historic low groundwater levels. Therefore, the use of historic low groundwater levels in areas without quantitative BMOs is consistent with the approach for areas with quantitative BMOs. These groundwater level triggers are the best available tools to avoid potential impacts to the environment as well as to third parties, and to avoid irreversible subsidence. If these triggers are reached, transfer-related pumping would stop from the well(s) near the monitoring well that reached the trigger. Irreversible subsidence would only occur when groundwater levels are below historic low levels (USGS 2017); therefore, this measure would also avoid any potential irreversible (permanent) subsidence. Stopping transfer-related pumping would stabilize groundwater levels to above historic low levels and avoid any potentially significant effects related to subsidence or third-party impacts caused by transfer-related pumping. Implementation of Mitigation Measure GW-1 would avoid permanent subsidence and reduce land subsidence impacts to less than significant.

Buyer Service Area

Decreased groundwater pumping in the Buyer Service Area may result in a temporary rise in groundwater levels in the Buyer Service Area. The Proposed Action may result in a reduced use of groundwater resources during periods of shortage by supplementing water supply with transferred water. Therefore, the impact of the Proposed Action on groundwater levels in the Buyer Service Area would be beneficial.

Decreased groundwater pumping in the Buyer Service Area would cause a decrease in water level declines, thus decreasing permanent land subsidence. The Proposed Action may result in a reduced use of groundwater resources during periods of shortage by supplementing water supply with transferred water. This potential decrease in the use of groundwater resources may result in a slowing of groundwater level decline or potentially cause an increase in groundwater levels. A slowed rate of decline or an increase in groundwater levels would help to slow the rate of subsidence. Therefore, the impact of the Proposed Action on potential land subsidence in the Buyer Service Area would be beneficial.

Changes in groundwater levels, or in the prevailing groundwater flow regime, could cause a change in groundwater quality in the Buyer Service Area. The Proposed Action would result in reduced use of groundwater resources during periods of shortage by supplementing water supply with transferred water. Therefore, the impact of the Proposed Action on groundwater quality in the Buyer Service Area would be beneficial.

Mitigation Measure

Making water available for transfer through groundwater substitution actions under the Proposed Action would not result in significant groundwater declines in the Buyer Service Area. No mitigation is required.

Significance of Impacts after Mitigation (Effectiveness of Mitigation Measure)

As discussed previously, impacts associated with groundwater levels in the Buyer Service Area would be less than significant without mitigation. Therefore, effectiveness of Mitigation Measure GW-1 is not discussed in this section.

3.3.2.3 Alternative 3: No Cropland Modifications

Alternative 3 involves making surface water available for transfer through groundwater substitution actions and no cropland idling. The impacts associated with making surface water available for transfer through groundwater substitution actions would be the same as the Proposed Action.

3.3.2.4 Alternative 4: No Groundwater Substitution

Alternative 4 involves making surface water available for transfer through cropland idling actions and no groundwater substitution. The impacts associated with making surface water available for transfer through cropland idling actions would be the same as the Proposed Action.

3.3.3 Comparative Analysis of Alternatives

Table 3.3-7 summarizes the effects of the Action Alternatives and Proposed Action.

Table 3.3-7.
Comparison of Alternatives

Potential Impact	Alternative(s)	Significance	Proposed Mitigation	Significance after Mitigation
Making surface water available for transfer through groundwater substitution actions could cause a reduction in groundwater levels in the Seller Service Area.	2, 3	S	GW-1	LTS
Groundwater pumping within the Buyer Service Area in response to shortages could cause reduction in groundwater levels.	1	NCFEC	None	NCFEC
Water transfers could reduce groundwater pumping during shortages in the Buyer Service Area, which could increase groundwater levels, decrease current rate of subsidence, and improve groundwater quality.	2, 3, 4	Beneficial	None	Beneficial
Making surface water available for transfer through groundwater substitution actions could cause subsidence in the Seller Service Area.	2, 3	S	GW-1	LTS
Groundwater pumping within the Buyer Service Area in response to shortages could cause subsidence.	1	NCFEC	None	NCFEC
Making surface water available for transfer through groundwater substitution actions could cause changes to groundwater quality in the Seller Service Area.	2, 3	LTS	None	LTS
Groundwater pumping within the Buyer Service Area in response to shortages could cause changes to groundwater quality.	1	NCFEC	None	NCFEC
Making surface water available for transfer through cropland idling actions could cause a reduction in groundwater levels in the Seller Service Area due to decreased applied water recharge.	2, 4	LTS	None	LTS
Land idling that temporarily converts cropland to bare fields in response to shortages in the Buyer Service Area could cause a reduction in groundwater levels due to decreased applied water recharge.	1	NCFEC	None	NCFEC

Key:
NCFEC: No change from existing conditions
S: Significant
LTS: Less than Significant
Note:
Alternative 1 is the No Action/No Project alternative
Alternative 2 is the Full Range of Transfers alternative
Alternative 3 is the No Cropland Modifications alternative
Alternative 4 is the No Groundwater Substitution Transfers alternative

3.3.4 Environmental Commitments/Mitigation Measures

Mitigation Measure GW-1: Monitoring Program and Mitigation Plan

The objective of Mitigation Measure GW-1 is to avoid potentially significant adverse environmental effects from groundwater level declines such as (1) impacts to other legal users of water; (2) land subsidence; (3) adverse effects to groundwater-dependent vegetation and or (4) migration of reduced quality groundwater. The mitigation measure also requires prompt corrective action so that impacts discussed previously will be reduced to less than significant in the event unanticipated effects occur. The measure accomplishes this by monitoring groundwater levels and land subsidence in the period during which groundwater is being pumped in lieu of diverting the surface water. Additionally, the mitigation plan identifies necessary preventative action measures if monitoring shows that identified trigger points are reached during transfer-related pumping

Reclamation will verify that sellers implement the monitoring program and mitigation plan to avoid potentially significant adverse effects of transfer-related groundwater extraction. In addition, each entity making surface water available for transfer through groundwater substitution actions must confirm that the proposed groundwater pumping will be compatible with state and local regulations and Groundwater Management Plans (GMPs). As Groundwater Sustainability Plans (GSPs) are developed by Groundwater Sustainability Agencies, potential sellers must confirm that the proposed pumping and the following Monitoring Program and Mitigation Plan verified by Reclamation is compatible with applicable GSPs.

3.3.4.1 Well Review Process

Potential sellers must submit well data for Reclamation and, where appropriate, DWR review, as part of the transfer approval process. Required information will be detailed in the most current version of the *DRAFT Technical Information for Preparing Water Transfer Proposals* (Reclamation and DWR 2014).

3.3.4.2 Monitoring Program

Potential sellers must complete and implement a monitoring program subject to Reclamation's approval that shall include, at a minimum, the following components:

Monitoring Well Network

The monitoring program shall incorporate a sufficient number of monitoring wells, as determined by Reclamation, to accurately characterize groundwater levels from the appropriate aquifers and their response in the area before, during, and after transfer pumping takes place. Depending on local conditions, additional groundwater level monitoring may be required near ecological resource areas. It should be noted that monitoring well networks have been established for some of the participating pumping wells that have participated in water transfers in previous years. For wells that have not participated in water transfers previously, the sellers would identify suitable monitoring wells as defined below for review and approval by Reclamation prior to transfer. If a suitable monitoring well(s) is not identified for a participating pumping well, the participating pumping well will not be allowed to participate in water transfer until a suitable monitoring well(s) is identified.

The monitoring well network would include the participating pumping well and a suitable groundwater level monitoring well(s) in the vicinity of the participating pumping well(s). Suitable monitoring well(s) would: (1) be within a two-mile radius of the seller's transfer pumping well; (2) be located within the same Bulletin 118 subbasin as the pumping well; and (3) have a screen depth(s) in the same aquifer level (shallow, intermediate, or deep) as the pumping well. Wells with short historic records could be considered, but short records (that do not extend to 2014 or earlier) could limit the transfer because the historic low would not reflect the persistent dry weather from 2011 to 2015. In this situation, the lowest groundwater level for the short period of record would be used, but because the groundwater level would likely be higher than the historic low during the prior drought period, the groundwater level triggers (described below) would be more restrictive (i.e., the lowest recorded groundwater level could be reached more quickly during transfer-related pumping than occurred in the short period of record when groundwater levels were higher.

Monitoring requirements at the participating pumping well and suitable monitoring well(s) would detect impacts to third parties and land subsidence. Monitoring and mitigation for impacts to groundwater dependent deep-rooted vegetation and migration of reduced quality groundwater are discussed below under Other Monitoring.

Groundwater Level Monitoring

Sellers will collect measurements of groundwater levels in both the participating wells (those wells being used in lieu of diverting surface water that is being made available for transfer) and monitoring wells. Groundwater level measurements will be used to identify potential concerns for both third party impacts and irreversible subsidence based on the identified trigger points. Groundwater level monitoring will include measurements before, during, and after transfer-related substitution pumping. The seller will measure groundwater levels as follows:

- Prior to transfer: Groundwater levels will be measured in both the participating pumping well(s) and the monitoring well(s) monthly from March in the year of the proposed transfer-related substitution pumping until the start of the transfer. Monitoring will also be conducted on the day that the transfer-related substitution pumping begins, prior to the pump being turned on.

- During transfer-related substitution pumping: Groundwater levels will be measured in both the participating pumping well(s) and the monitoring well(s) weekly throughout the transfer-related substitution pumping period.

- Post-transfer pumping: Groundwater levels will be measured in both the participating well(s) and the monitoring well(s) weekly for one month after the end of transfer-related substitution pumping, after which groundwater levels will be measured monthly through March of the year following the transfer.

Groundwater Level Triggers

Groundwater Level Triggers

The primary criteria used to identify potentially significant impacts to groundwater levels are the BMOs set by GMPs. In the Sacramento Valley, Shasta, Tehama, Glenn, Butte, Colusa, Sutter, Yuba, Nevada, Placer, Sacramento and Yolo counties have established GMPs to provide guidance in managing the resource.

In areas where quantitative BMO groundwater level triggers exist, sellers will manage groundwater levels to these triggers and initiate the mitigation plan (discussed below) if groundwater levels reach the trigger. In areas where quantitative BMOs do not exist, sellers will manage groundwater levels to maintain them above the identified historic low groundwater level (trigger) and will initiate the mitigation plan (discussed below) if groundwater levels reach the trigger. Most of the quantitative BMOs within the Seller Service Area are tied to historic low groundwater levels. Therefore, the use of historic low groundwater levels in areas without quantitative BMOs is consistent with the approach for areas with quantitative BMOs. As part of a seller's transfer proposal subject to Reclamation's review and approval, the seller will need to identify the monitoring wells and the specific groundwater level trigger for each well (established through the local BMO or the historic low groundwater level for that well).

Groundwater level declines due to pumping occur initially at the pumping well and then propagate outward from that location. The magnitude of groundwater level decline caused by pumping also decreases with increasing distance from the pumping well. Therefore, groundwater level declines caused by transfer pumping would be measured first at the pumping well and subsequently at the monitoring well. The decline would be greatest at the pumping well and lower at the monitoring well. Therefore, it is likely that groundwater levels in the pumping well would decline to the historic low level sooner than at the monitoring well(s). The monitoring well(s) would provide information surrounding the well to avoid potential cumulative impacts.

Other Monitoring

Groundwater Quality

For municipal sellers, the comprehensive water quality testing requirements of Title 22 are considered sufficient for the water transfer monitoring program. Agricultural sellers shall measure specific conductance in samples from each participating production well. Samples shall be collected when the seller first initiates pumping, monthly during the transfer pumping period, and at the termination of transfer pumping.

Groundwater Pumping Measurements

All wells pumping to replace surface water made available for transfer shall be configured with a permanent instantaneous and totalizing flow meter capable of accurately measuring well discharge rates and volumes. Flow meter readings will be recorded just prior to initiation of transfer related pumping and no less than monthly throughout the duration of the transfer, as close as practical to the last day of the month. Readings will also be recorded just after cessation of transfer-related pumping. Flow meter installation and calibration, in accordance with recommendation by manufacturer, will be submitted by the seller.

Shallow Groundwater Level Monitoring for Deep Rooted Vegetation

To avoid significant effects to vegetation and allow sellers to modify actions before significant effects occur, sellers will monitor groundwater level data to verify that significant adverse effects to deep-rooted vegetation are avoided. This monitoring is only required in areas with deep-rooted vegetation (i.e. oak trees and riparian trees that would have tap roots greater than 10 feet deep) within a one-half mile radius of the participating pumping well and areas where groundwater levels are between 10 to 25 feet below ground surface prior to starting the transfer of surface water made available from groundwater substitution actions. This monitoring is not required in areas with no deep-rooted vegetation (i.e., oak trees and riparian trees that would have tap roots greater than 10 feet deep) within one-half mile of the participating wells or in areas where vegetation is located along waterways or irrigated fields that will continue to have water during the period of transfer.

The seller would be required to identify if monitoring for deep rooted vegetation is required in their transfer proposal to Reclamation and DWR. Existing resources such as DWR's groundwater dependent ecosystem maps (https://gis.water.ca.gov/app/NCDatasetViewer/) or any existing biological survey data in the area could be used to identify deep rooted vegetation near the participating pumping well.

If deep rooted vegetation is identified near the participating pumping well, a groundwater level monitoring well with the following requirements would need to be identified and monitored: (1) monitoring well is within a one-half mile radius of the deep-rooted vegetation; (2) monitoring well would measure shallow groundwater level changes (within the interval between 10 to 25 feet below ground surface). The participating production well can function as the monitoring well if previously mentioned requirements are met. If monitoring data at the well indicate that groundwater levels have dropped below root zones (i.e., more than 10 feet, where groundwater was 10 to 25 feet below ground surface prior to starting the transfer of surface water made available from groundwater substitution actions), the seller must implement actions set forth in the mitigation plan. If historic data show that groundwater levels in the area where actions are being taken to make water available for transfer have typically varied by more than this amount annually during the proposed transfer period, then the transfer may be allowed to proceed.

If no monitoring wells with the requirements discussed in the previous paragraph exist, monitoring would be based on visual observations by a qualified biologist of the health of these areas of deep-rooted vegetation until it is feasible to obtain or install shallow groundwater monitoring. If significant adverse impacts to deep-rooted vegetation (that is, loss of a substantial percentage of the deep-rooted vegetation as determined by Reclamation based on site-specific circumstances in consultation with a qualified biologist) occur as a result of the transfer despite the monitoring efforts and implementation of the mitigation plan, the seller will prepare a report documenting the result of the restoration activity to plant, maintain, and monitor restoration of vegetation for 5 years to replace the losses.

Coordination Plan

The monitoring program will include a plan to coordinate the collection and organization of monitoring data. This plan will describe how input from third parties (i.e. groundwater wells not participating in water transfers) will be incorporated into the monitoring program and will include a plan for communication with Reclamation as well as other decision makers and third parties.

Additionally, Reclamation, SLDMWA, and potential seller(s) will coordinate closely with potentially affected third parties to collect and monitor groundwater data. If a third party expects that it may be affected by a proposed transfer, that party should contact Reclamation and the seller with its concern. The burden of collecting groundwater data will not be the responsibility of the third party. If warranted, additional groundwater level monitoring to address the third-party's concern may be incorporated in the monitoring and mitigation plans required by Mitigation Measure GW-1.

Evaluation and Reporting

The monitoring program will describe the method of reporting monitoring data. At a minimum, sellers will provide data summary tables to Reclamation, both during and after transfer-related substitution pumping. Post-transfer reporting will continue through March of the year following the transfer. Sellers will provide a final summary report to Reclamation evaluating the effects of the water transfer. The final report will identify transfer-related effects on groundwater and surface water (both during and after pumping), and the extent of effects, if any, on local groundwater users. It shall include groundwater level contour maps for the area in which transfer related pumping action is located, showing pre-transfer groundwater levels, groundwater levels at the end of the transfer period, and recovered groundwater levels in March of the year following the transfer. Groundwater level contour maps for different aquifer depths should also be included where data is available. The summary report shall also identify the extent of transfer-related effects, if any, to ecological resources such as fish, wildlife, and vegetation resources.

3.3.4.3 Mitigation Plan

Potential sellers must complete and implement a mitigation plan to avoid potentially significant groundwater impacts and ensure prompt corrective action in the event unanticipated effects occur. If groundwater level triggers are reached at the participating pumping well(s) or the suitable monitoring well (s) (either BMO triggers or historic low groundwater levels), transfer-related pumping would stop from the participating pumping well that reached the trigger. Transfer related pumping would be stopped when the trigger is first reached at either the participating pumping well(s) or the suitable monitoring well(s). Transfer-related pumping could not continue from this well (in the same year or a future year) until groundwater levels recovered to above the groundwater level trigger. Implementation of the mitigation plan thus avoids any potentially significant groundwater impacts. Other corrective actions could include:

- Lowering of pumping bowls in non-transferring wells affected by substitution pumping.
- Reimbursement to non-transferring third parties for significant increases in their groundwater pumping costs due to the groundwater substitution pumping action, as compared with their costs absent the transfer.
- Reimbursement to non-transferring third parties for modifications to infrastructure that may be affected.
- Other appropriate actions based on local conditions.

3.3.5 Potentially Significant Unavoidable Impacts

None of the Action Alternatives would result in potentially significant unavoidable impacts after mitigation.

3.3.6 Cumulative Effects

The timeframe for the groundwater resources cumulative effects analysis extends from 2019 through 2024, a six-year period. The cumulative effects area of analysis for groundwater resources is the same as shown in Figure 3.3-1 above.

The projects considered for the groundwater resources cumulative condition are the SWP water transfers, Northern Sacramento Valley Integrated Regional Water Management Plan (NSV IRWMP), Tuscan Aquifer Investigation, Glenn-Colusa ID's Supplemental Supply Program, Davis-Woodland Water Supply Project and CVP M&I Water Shortage Policy (WSP), described in more detail in Chapter 4 of the 2014 Draft EIS/EIR. SWP transfers could involve making water available for transfer through groundwater substitution actions in the Seller Service Area and, therefore, could affect groundwater resources. The NSV IRWMP may also involve making water available for transfer through groundwater substitution actions in the Seller Service Area. The WSP could reduce agricultural water deliveries and increase land idling in the Buyer Service Area. Effects of the WSP in the Seller Service Area would be minor as agricultural water supplies to the sellers (who are primarily Sacramento River Settlement Contractors) would not substantially change relative to existing conditions.

The following sections describe potential groundwater resources cumulative effects for each of the Action Alternatives and Proposed Action.

3.3.6.1 Alternative 2: Full Range of Transfers (Proposed Action)

3.3.6.1.1 Seller Service Area

Making water available for transfer through groundwater substitution pumping and cropland idling actions in the Seller Service Area under the Proposed Action in combination with other cumulative projects would contribute to groundwater level declines in the region. SWP transfers would include groundwater substitution actions, but the quantities of water made available for transfer through groundwater substitution actions are very small (approximately 6,800 acre-feet) in relation to overall transfers from the Seller Service Area. Some water made available for transfer through groundwater substitution actions by SWP contractors could occur in Sutter County, which is included in the area of analysis for the Proposed Action. It is possible that these transfers would compound the declines in groundwater levels in Sutter County.

The NSV IRWMP is a project that aims to provide a regional perspective to planning for water use in the northern Sacramento Valley, including Butte, Colusa, Glenn, Shasta, Sutter, and Tehama Counties. The plan was developed and adopted in 2014 and will help to provide management objectives that would be protective of the groundwater resources in the northern Sacramento Valley.

The Tuscan Aquifer Investigation project, conducted by the Butte County Department of Water and Resource Conservation, included numerous field data collection activities to allow for a more complete understanding of the Tuscan Aquifer. This project included the drilling of groundwater monitoring wells and the gaging of several streams in the Sierra Nevada foothills. Aquifer performance testing (i.e., pumping tests) was also performed at three existing production wells. The pumping associated with this project has been completed and would not contribute to cumulative effects. Information collection was primarily within Butte County, but the information about the Tuscan Aquifer could provide useful information about aquifer properties that would be useful in the other counties that are over the same aquifer (Glenn, Colusa, and Tehama Counties).

Glenn-Colusa ID's Supplemental Supply program proposes to operate ten groundwater wells (five existing wells and five proposed wells) to augment surface water diversions for use within Glenn-Colusa ID. These wells will be operated on an as needed basis during dry and critically dry water years and with an annual pumping volume not exceeding 28,500 acre-feet. Glenn-Colusa ID's supplemental supply program and Glenn-Colusa ID's groundwater substitution pumping to make surface water available for transfer are not expected to occur simultaneously (Thad Bettner, Personal Correspondence January 2014).

The Davis-Woodland Water Supply Project is reducing the City of Davis, City of Woodland and University of California Davis's reliance on regional groundwater supplies as a municipal water supply source. The project diverts up to 45,000 acre-feet of water per year from the Sacramento River in accordance with a water right granted in March 2011 and is subject to conditions imposed by the state. The project also purchased more senior water rights for 10,000 acre-feet from the Conaway Preservation Group to provide a water supply during the June through September period when conditions are such that the limitations in the Woodland-Davis Clean Water Agency water right are in effect.

Groundwater substitution pumping associated with the Proposed Action could result in significant effects to groundwater resources. Implementation of Mitigation Measure GW-1 will avoid any potentially significant effects on groundwater resources, however, and reduce impacts from transfer-related pumping water to less than significant. With implementation of Mitigation Measure GW-1, the Proposed Action's incremental contribution to groundwater resources impacts is insubstantial and would not be cumulatively considerable.

The increased pumping under the Proposed Action in combination with other cumulative projects could cause land subsidence. Groundwater substitution pumping associated with the SWP transfers would occur in an area that is historically not subject to significant land subsidence. In the overall area of analysis, land subsidence is occurring in several areas, as described in Section 3.3.1.2, Affected Environment. This subsidence may be part of normal cropping cycles, when the soils below agricultural lands undergo shrinking and swelling. This subsidence would not likely result in substantial risk to life or property; however, the existing subsidence along with future increases in groundwater pumping in the cumulative condition could cause potentially significant cumulative effects. Implementation of Mitigation Measure GW-1 will avoid any potentially significant effects associated with land subsidence, however, and reduce impacts from transfer-related pumping to less than significant. With implementation of Mitigation Measure GW-1, the Proposed Action's incremental contribution to land subsidence impacts is insubstantial and would not be cumulatively considerable.

Groundwater levels in the Seller Service Area may change under the Proposed Action in combination with other cumulative projects and cause the movement or mobilization of poorer quality groundwater into existing wells. SWP transfers and the Tuscan Aquifer Investigation Project would increase pumping within (or near) the Seller Service Area. However, as discussed in the Proposed Action, most of the Seller Service Area has high quality groundwater and changes in groundwater flow patterns should not cause migration of poor quality groundwater. Therefore, the Proposed Action in combination with other cumulative actions would not result in a cumulatively significant impact related to groundwater quality.

3.3.6.1.2 Buyer Service Area

The Proposed Action in combination with other cumulative past, present, and future projects could affect groundwater levels, land subsidence, and groundwater quality in the Buyer Service Area. As described in Section 3.3.1.2, Affected Environment, groundwater pumping in the San Joaquin Valley has created some groundwater depressions over time. Additionally, some areas of the region have poor quality groundwater and have experienced land subsidence. The long-term historic pumping in the basin has contributed to locally significant cumulative impacts. The Proposed Action, however, would partially offset this cumulative impact by reducing groundwater pumping during shortages. Therefore, the Proposed Action's incremental contribution to potentially significant cumulative groundwater impacts would not be cumulatively considerable.

3.3.6.2 Alternative 3: No Cropland Modification

The cumulative impacts of Alternative 3 would be the same as described for groundwater substitution in the Proposed Action in the Seller Service Area. Additionally, the cumulative effects of Alternative 3 in the Buyer Service Area would be the same as the Proposed Action.

3.3.6.3 Alternative 4: No Groundwater Substitution

Alternative 4 would not include groundwater substitution pumping; therefore, the contribution of this alternative to the groundwater cumulative condition would not be cumulatively considerable. The cumulative effects of Alternative 4 in the Buyer Service Area would be the same as the Proposed Action.

Section 3.6 Climate Change

The DOI, Reclamation *NEPA Handbook* (Reclamation 2012) recommends that climate change be considered, as applicable, in every NEPA analysis. The *NEPA Handbook* acknowledges that there are two interpretations of climate change related to Reclamation actions: 1) Reclamation's action may be a potentially significant contributor to climate change and 2) climate change could affect Reclamation's Proposed Action.

This section discusses effects of climate on the Action Alternatives. How the Action Alternatives could contribute to climate change is discussed in Section 3.6, Climate Change of the 2014 Draft EIS/EIR. The RDEIR/SDEIS augments the impact analysis of that section regarding the analysis of effects of climate change on the No Action/No Project and Action Alternatives.

3.6.2 Environmental Consequences/Environmental Impacts

These sections describe the environmental consequences/environmental impacts associated with each alternative.

3.6.2.1 Assessment Methods

This climate change analysis assesses the effects of potential future climatic conditions, incorporating uncertainties, on the Action Alternatives. The analysis relies upon information and technical analyses developed as part of the Sacramento and San Joaquin Rivers Basin Study (Basin Study) (Reclamation 2016a and 2016b). Model results from the Basin Study were used to quantify the potential effects of future uncertainties related to climate change on water transfers. A 34-year period of historical hydrology (WY 1970 through 2003) was selected from the CalLite-CV model because it is consistent with the period of record used in the 2014 Draft EIS/EIR. This historical simulation period represents mid to late-century[1] climate change effects in the Basin Study. Therefore, the effects of climate change illustrated in these results is more than what the Basin Study would indicate should be expected during the period of the Proposed Action (2019 through 2024). Therefore, the effects of climate change on the Action Alternatives discussed in this chapter are likely overstated since the effects of climate change analyzed in this chapter are far greater than what is expected to occur during the period of this project. Appendix J, Climate Change Modeling for the RDEIR/SDEIS, documents the modeling assumptions and results in this climate change analysis.

[1] Modeling performed for the Basin Study estimated the effects of climate change by perturbing the historical hydrology. Historical hydrology covered the period from water year (WY) 1926 through 2010 with 1926 historical hydrology representing the first year of simulation of 2015. Perturbing of historical hydrology was done in three parts, the period of record from 1926-1954 was perturbed the least (early century), period from 1954-1982 was perturbed to a higher extent (midcentury) and the period from 1982-2010 was perturbed the most (late century) to simulate the compounding effects of climate change.

Hydrologic modeling was completed to evaluate how climate change could affect available transfer supply and transfer demand. Climate change modeling included modeling of the with and without climate change scenarios. Under the without climate change modeling, two scenarios were analyzed: (1) without climate change supplies from the CalSim II baseline modeling that was used in the 2014 Draft EIS/EIR water supply impacts analysis; and (2) CalLite-CV modeling that serves as the baseline for the with climate change analysis (see detailed discussion of the without climate change scenarios in Appendix J, Section J.6.2). For modeling with climate change, the Central Tendency, Hot-Dry and Warm-Wet scenarios were modeled. The Hot-Dry and Warm-Wet scenarios serve as the "bookends" to the climate change analysis and the Central Tendency scenario is in the middle of the range of all the projected temperatures and precipitations. The following parameters were applied to transfer water supplies to simulate climate change:

1. Perturbed (i.e. adjusted for climate change) Lake McClure storage, inflows to Bullards Bar Reservoir, and inflows to Folsom Lake from CalLite-CV model were used to analyze stored reservoir releases from Merced ID, Browns Valley ID, South Sutter WD, Nevada ID, and Placer County WA under the three climate change scenarios.
2. Water supplies made available for transfer through groundwater substitution and cropland idling actions were determined based on the CVP/SWP allocations the sellers would receive under the three climate change scenarios. During alternatives development, each seller identified how their availability of water for transfer would change under various water shortage scenarios. Available supplies were determined by considering water deliveries under the climate change scenarios and limiting supplies under shortage conditions.
3. Frequency of all methods of transfers were limited by the occurrence of Shasta Critical Years. Potential sellers under the Proposed Action have specified their actions during Shasta Critical Years, and the actions varied for each seller. Sellers indicated that they would reduce the transfer volume during Shasta Critical Years, stop the transfer, or continue transferring in the first Shasta Critical Year but reduce (or stop) transfers in consecutive critical years. This seller-specific preference for transfers during Shasta Critical Years have been includes in this analysis.
4. Transfer supplies and demands were constrained by Delta conveyance capacity similar to the without climate change modeling results analyzed in Section 3.1, Water Supply, of the 2014 Draft EIS/EIR. The estimates of available export capacity from CalLite-CV modeling results are coarse compared to CalSim II. The available export capacity and the transfer demands vary under the climate change scenarios depending on CVP and SWP allocations and several other discretionary operating criteria used to operate the CVP and the SWP. Demands were also constrained by the upper limit of 250,000 acre-feet analyzed in this RDEIR/SDEIS.

3.6.2.3 Alternative 1: No Action/No Project

Changes to the environment from climate change could affect the Proposed Action by altering transfer supply and demand. Under the No Action/No Project Alternative, agricultural water users in the Buyer Service Area would continue to face CVP water shortages. CVP Delta exports are a significant water supply source for south-of-Delta water users. Given the projected changes in rainfall, snowpack, and associated runoff patterns, south-of-Delta exports are likely to be affected by climate change. Table 3.6-1 summarizes projected South-of-Delta CVP water deliveries under the three climate change scenarios in comparison to existing conditions. As shown in Table 3.6-1, CVP water shortages are expected to increase in magnitude under the No Action/No Project Alternative with climate change under the Hot-Dry and Central Tendency scenarios. CVP shortages could increase between 55 to 771 thousand acre-feet in comparison to existing conditions. Water transfer supply would not be available to help address these water shortages. In response to the shortages, farmers would leave some crops idle and pump groundwater for irrigation of the remainder, similar to existing conditions. These actions would continue under the No Action/No Project Alternative.

Table 3.6-1.
CVP South-of-Delta Deliveries

Sacramento Valley Index	Existing Conditions	Hot-Dry		Warm-Wet		Central Tendency	
	1,000 acre-feet	1,000 acre-feet	Change (1,000 acre-feet)	1,000 acre-feet	Change (1,000 acre-feet)	1,000 acre-feet	Change (1,000 acre-feet)
Wet	2716	2254	-461	2828	113	2602	-113
Above Normal	2360	1589	-771	2593	233	2220	-141
Below Normal	2265	1678	-587	2493	228	2169	-96
Dry	1919	1301	-618	2370	451	1815	-104
Critical	1441	1101	-340	1741	299	1386	-55
All Years	2134	1586	-549	2408	274	2032	-102

[1] Change calculated as difference from existing conditions i.e. without climate change scenario

3.6.2.4 Alternative 2: Full Range of Transfers (Proposed Action)

Changes to the environment from climate change could affect the Proposed Action by altering transfer supply or demand. In the Seller Service Area, effects of climate change could affect the amount of available transfer supply or frequency of transfers. Transfer water under the Proposed Action is made available through one of four methods: reservoir release of stored water, water conservation, groundwater substitution, or crop idling. Climate change could increase the frequency of water delivery reductions in the Seller Service Area, which would decrease the amount of water that sellers would want to made available for transfer. However, because many of the sellers are Sacramento River Settlement Contractors with senior water rights, their deliveries are only reduced during Shasta Critical years (and not during other dry or below normal years).

In the Buyer Service Area, effects of climate change could affect transfer demand. SLDMWA demands are assumed to be equal to Delta conveyance capacity from the CalLite-CV model, up to a combined upper limit with East Bay MUD and Contra Costa WD of 250,000 acre-feet. Demands for East Bay MUD and Contra Costa WD are the same as analyzed in the 2014 Draft EIS/EIR and do not account for effects of climate change on their demand. Climate change could affect SLDWMA demands because it could change the available capacity at the CVP and SWP Delta export pumps. If climate change decreases water availability in a given year, less CVP and SWP water would be exported, so more capacity would be available to pump and convey water made available for transfer. Conversely, wetter years could reduce available capacity at the Delta export pumps, which would result in decreased demand for water made available for transfer.

Table 3.6-2 summarizes the frequency and annual average transfer demand and supply under the without climate change scenario and the three with climate change scenarios. Figure 3.6-1 compares transfer supply with and without climate change, and Figure 3.6-2 shows demand with and without climate change. While the analysis without climate change included two scenarios, Table 3.6-2, Figure 3.6-1, and Figure 3.6-2 only report the without climate change scenario from the CalLite-CV model because these results can be directly compared to the three climate change scenarios that also use the CaLite-CV model results. The available supplies consider if water is available to meet demand (plus carriage water and streamflow depletion factors, as applicable). The available supplies are slightly higher than the demands to account for these factors, but they do not reflect the entire available supply if it is substantially greater than demand.

As shown in Table 3.6-2 and Figure 3.6-2, the transfer demand increases slightly under the Central Tendency scenario and varies more under the bookend scenarios. The demand increases slightly because climate change reduces available CVP and SWP supplies for export from the Delta and results in increased capacity available for water made available for transfer. There is a correspondingly small increase in transfer supplies and frequency of transfers under the with climate change scenario (Central Tendency) in comparison to existing conditions. This slight increase in supplies occurs in 1973 and 1993, both above normal water year types when there is a reduction in overall CVP allocation and an increase in Delta conveyance capacity primarily due to reduced south-of-Delta exports. Transfer demands and supplies are substantially higher under the Hot-Dry scenario and substantially lower under the Warm-Wet scenario in comparison to the without climate change scenario. These results indicate that transfer demands and supplies under with climate change scenarios are largely influenced by Delta conveyance capacity. While the changes described under the Hot-Dry scenario reflect changes of a greater magnitude, this is a bookend scenario and reflects a longer climate change horizon than the next six years. The effects are more likely to be similar to those described under the Central Tendency scenario, which represents a middle of the range projected climate change scenario more consistent with expected changes in the next six years. Therefore, impacts to the Proposed Action from climate change would be less than significant, since the annual demands, supplies and frequency of transfers do not change much under the without climate and with climate change (Central tendency) scenarios.

Table 3.6-2.
Summary of Transfer Demand, Supply, and Frequency for Assumptions on Maximum Annual Demand and Climate Change

	Average Annual Transfer Demand (1,000 acre-feet)	Annual Average Transfer Supply (1,000 acre-feet)	Years with Potential Transfers
Proposed Action under Existing Conditions[1]	61	71	15
Proposed Action with Climate Change (Hot-Dry)[2]	121	144	22
Proposed Action with Climate Change (Warm-Wet)[2]	24	26	12
Proposed Action with Climate Change (Central Tendency)[2]	75	87	18

[1] Existing conditions denotes no climate change modeled in CalLite-CV model
[2] With climate change scenarios were modeled in the CalLite-CV model using the Sacramento-San Joaquin Basin Study assumptions on impacts of climate change to CVP/SWP operations

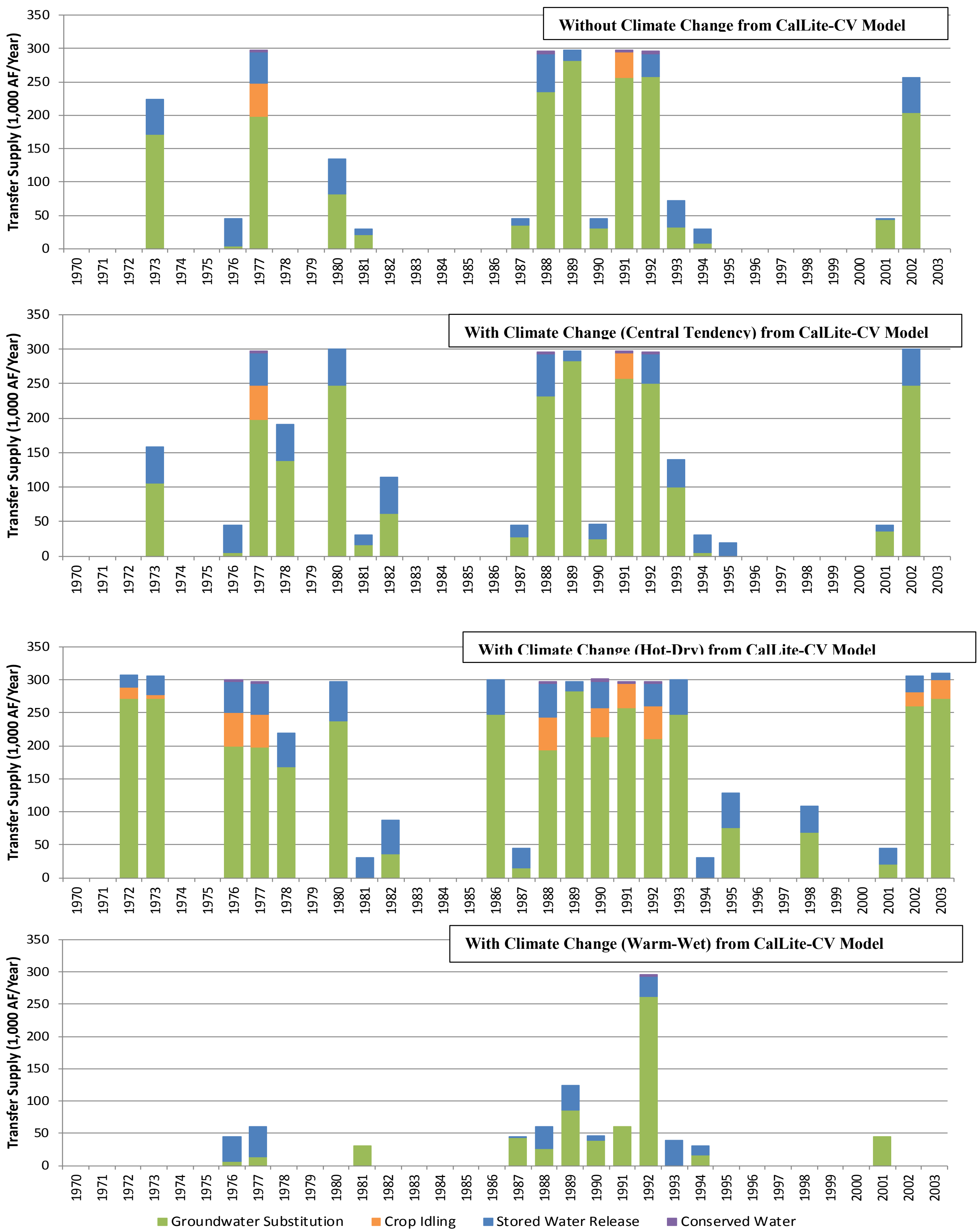


Figure 3.6-1.
Annual Available Water Transfer Supply

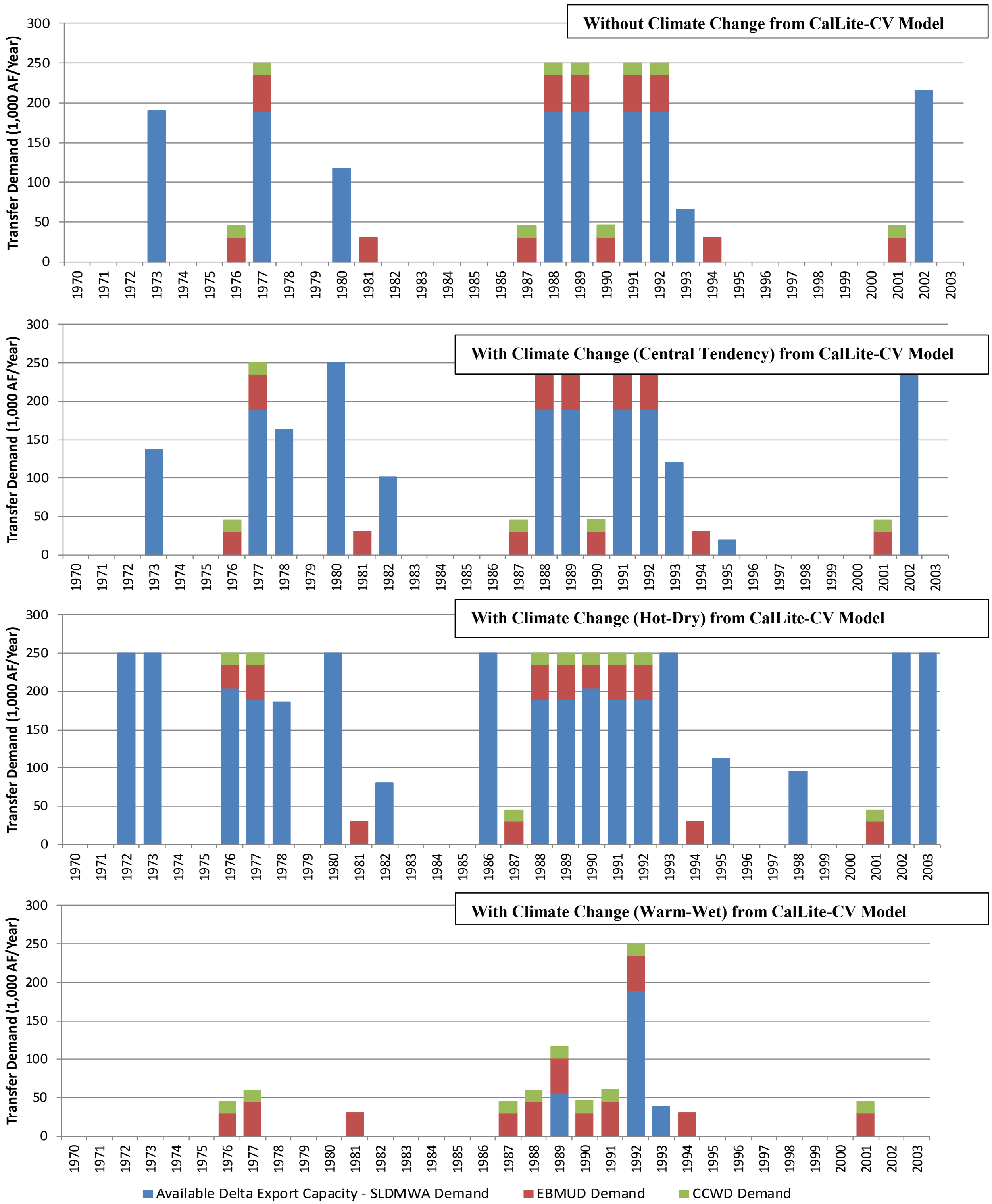


Figure 3.6-2.
Annual Available Water Transfer Demand

3.6.2.5 Alternative 3: No Cropland Modifications

Alternative 3 involves making water available for transfer through groundwater substitution actions and no cropland idling. The upper limit for transfers in any one year would be 250,000 acre-feet, the same as under the Proposed Action. Water that would otherwise be made available through cropland idling actions would be made available through other transfer mechanisms. Impacts of climate change on transfers under Alternative 3 would be similar to the Proposed Action since transfers are largely constrained by Delta export capacity which would be the same under all Action Alternatives.

3.6.2.6 Alternative 4: No Groundwater Substitution

Alternative 4 involves making water available for transfer through cropland idling actions and no groundwater substitution actions. The upper limit for transfers in any one year would be 250,000 acre-feet and up to 60,693 acres of cropland could be idled, as described for Alternative 2. Impacts of climate change on transfers under Alternative 4 would be the same as the Proposed Action since transfers are largely constrained by Delta conveyance capacity which would be the same under all Action Alternatives.

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Section 7 Fisheries

3.7.6 Cumulative Impacts

The timeframe for the cumulative effects analysis extends from 2019 through 2024, a 6-year period. The projects considered for the fisheries cumulative condition are the SWP water transfers, CVP Municipal and Industrial M&I WSP, Lower Yuba River Accord, San Joaquin River Restoration Program (SJRRP), refuge transfers, and Exchange Contractors 25-Year Water Transfers.

The set of agreements of the Lower Yuba River Accord is designed to provide additional water to meet fisheries needs in the lower Yuba River. In addition, up to 60,000 acre-feet of water per year would be made available for purchase by Reclamation and DWR for fish and environmental purposes. The Proposed Action would not affect the ability of the Accord to provide a benefit to environmental resources within its action area. Both efforts combined, however, could affect Delta exports.

The SJRRP would increase flows and improve habitat conditions in and along the San Joaquin River to support spring-run and fall-run Chinook salmon, steelhead and other native fish. The SJRRP would create additional habitat for fisheries resources by increasing flows and expanding floodplains.

The following sections describe potential fisheries resources cumulative effects for each of the Action Alternatives.

3.7.6.1 Alternative 2: Proposed Action

The Proposed Action in combination with other cumulative projects could cause Delta outflows to be lower than under the No Action/No Project Alternative. Water transfer actions under the Proposed Action would have a less than significant impact on fisheries resources that may be influenced by Delta outflow, as mean changes in Delta outflow would be small (1.2 percent or lower than baseline depending on month and water year type) in all months and water year types (Table 3.7-1). All cumulative water operations projects affecting Delta exports would be required to meet existing Delta water quality standards (e.g., D-1641) and meet the requirements of the USFWS and NOAA Fisheries BOs for the long-term coordinated operations of the CVP and SWP.

Water transfers under the Proposed Action would only occur under balanced conditions[1], as explained in Chapter 2, Proposed Action and Description of the Alternatives. During these balanced conditions, Delta outflows under the Proposed Action would increase compared to existing conditions because of the carriage water required as an element of each transfer (Table 3.7-1).

The nominal reductions in Delta outflow that could occur as a result of refilling reservoir and groundwater storage (after stored reservoir water and groundwater substitution transfers under the Proposed Action) are insubstantial and would only occur during excess conditions[2]. Refill for stored reservoir water transfers would need to follow the refill agreement that limits refill to periods that would not affect downstream users. During excess conditions, Delta inflows (from upstream reservoir releases and unregulated inflows) exceed what is needed to meet Delta standards and support targeted Delta export pumping. Potential effects to fisheries and aquatic resources would be limited because of these higher flow conditions. In addition, all Delta exports must comply with any changes in Bay-Delta Water Quality Control Plan standards for Delta outflow and X2 that may, in the opinion of the State Water Resources Control Board, be required for reasonable protection of fish and aquatic resources[3]. Because changes in Delta outflow and X2 location are insubstantial and there are additional protections for fisheries and aquatic resources in place under the ESA and D-1641, as well as any updates to Delta outflow or X2 requirements that may be included in the updated Bay-Delta Water Quality Control Plan which the Proposed Action will be required to meet, impacts associated with reductions in Delta outflow would be less than significant.

As indicated in Section 3.1.6.1.1 of the 2014 Draft EIS/EIR, SWP transfers, the Yuba Accord, and refuge transfers could affect Delta operations during July through September of drier water years. However, this is a period when the Delta outflow increase is associated with carriage water under the Proposed Action (Table 3.7-1). Therefore, the Proposed Action, in combination with other cumulative actions, would not result in a cumulatively significant impact on fisheries resources related to changes in Delta outflow and X2 location.

[1] Balanced conditions are when inflows into the Delta are equal to the flow required to meet in-Delta needs and Delta outflows (Reclamation and DWR 1986). Typically, these conditions occur when Reclamation and/or DWR are releasing flows from upstream storage to meet standards within the Delta or for Delta outflow.

[2] Excess conditions are when inflows into the Delta are greater than what is required to meet in-Delta needs and Delta outflows (Reclamation and DWR 1986), so Delta outflow is greater than required by applicable standards.

[3] The State Water Resources Control Board's (2017) *Scientific Basis Report in Support of New and Modified Requirements for Inflows from the Sacramento River and its Tributaries and Eastside Tributaries to the Delta, Delta Outflows, Cold Water Habitat, and Interior Delta Flows* concluded that declines in population size of some native estuary-dependent fish species (i.e., Delta Smelt, Longfin Smelt, and Sacramento Splittail) suggest that the current Bay-Delta Water Quality Control Plan as implemented in D-1641 is not sufficiently protective for these species and that additional actions are required to recover the species; the report includes proposed new and modified narrative and numeric Delta outflow objectives to protect native fish rearing in and migrating through the Delta. As shown in some comments on this report (https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/phii_input/), there is disagreement and uncertainty regarding the importance of Delta outflow in explaining species status under existing conditions relative to other stressors (see, for example, comments by the State Water Contractors).

Table 3.7-1.
CALSIM Model Outputs of Delta Outflow for Existing Conditions and Alternative 2

Existing Conditions: Delta Outflow (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	500	1,432	2,929	5,594	5,552	5,782	2,909	2,282	1,416	823	373	1,119	30,712
AN	302	462	966	4,044	4,241	3,094	1,780	1,540	682	546	246	699	18,602
BN	437	750	361	1,031	1,509	1,646	967	911	434	473	249	232	9,000
D	363	633	604	1,117	972	1,461	864	604	382	311	264	208	7,783
C	284	400	348	729	875	810	568	371	296	253	242	179	5,355
All	393	867	1,490	3,260	3,312	3,278	1,753	1,381	816	546	297	638	18,031

Alternative 2: Delta Outflow (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	500	1,432	2,921	5,585	5,543	5,779	2,906	2,280	1,414	822	372	1,119	30,672
AN	302	462	960	4,018	4,213	3,070	1,775	1,531	673	546	247	699	18,497
BN	437	750	361	1,028	1,502	1,644	965	910	434	473	249	232	8,985
D	363	631	601	1,109	968	1,448	854	602	382	324	279	212	7,774
C	284	400	347	725	865	801	564	369	296	283	261	188	5,382
All	393	867	1,485	3,250	3,300	3,268	1,748	1,378	813	554	303	641	18,000

Difference (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	-0.5	-0.6	-7.5	-9.1	-9.1	-3.8	-2.9	-2.0	-2.5	-0.9	-0.8	-0.3	-40.0
AN	0.0	-0.3	-6.4	-25.9	-28.6	-23.8	-4.9	-9.1	-8.7	0.7	0.7	0.5	-105.8
BN	0.0	0.0	0.0	-2.6	-6.6	-2.4	-2.0	-1.5	0.0	0.0	0.0	0.0	-15.1
D	0.0	-2.1	-3.2	-7.3	-4.2	-13.0	-10.0	-1.9	0.0	13.1	14.4	4.8	-9.4
C	0.0	0.0	-1.7	-4.3	-10.1	-8.7	-3.9	-1.8	-0.7	30.8	18.6	9.2	27.4
All	-0.2	-0.6	-4.9	-10.4	-11.7	-9.9	-4.7	-3.2	-2.6	8.4	6.2	2.7	-30.9

Percent Difference (%)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	-0.1	-0.04	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	-0.03	-0.1
AN	0.0	-0.1	-0.7	-0.6	-0.7	-0.8	-0.3	-0.6	-1.3	0.1	0.3	0.1	-0.6
BN	0.0	0.0	0.0	-0.3	-0.4	-0.1	-0.2	-0.2	0.0	0.0	0.0	0.0	-0.2
D	0.0	-0.3	-0.5	-0.7	-0.4	-0.9	-1.2	-0.3	0.0	4.2	5.4	2.3	-0.1
C	0.0	0.0	-0.5	-0.6	-1.1	-1.1	-0.7	-0.5	-0.2	12.2	7.7	5.1	0.5
All	0.0	-0.1	-0.3	-0.3	-0.4	-0.3	-0.3	-0.2	-0.3	1.5	2.1	0.4	-0.2

3.7.6.2 Alternative 3: No Cropland Modifications Alternative

The cumulative impacts of Alternative 3 would be the same as for making water available for transfer through groundwater substitution actions under the Proposed Action in the Seller Service Area. Additionally, the cumulative effects of Alternative 3 in the Buyer Service Area would be the same as the Proposed Action. The effects of Alternative 3 would not be cumulatively considerable.

3.7.6.3 Alternative 4: No Groundwater Substitution

The cumulative impacts of Alternative 4 would be the same as for making water available for transfer through crop idling/shifting actions under the Proposed Action in the Seller Service Area. The cumulative effects of Alternative 4 in the Buyer Service Area would be the same as the Proposed Action. The effects of Alternative 4 would not be cumulatively considerable.

Section 3.8 Vegetation and Wildlife

Vegetation and wildlife resources within the area of analysis could be affected by any of the proposed methods of making water available for transfer: groundwater substitution, reservoir release, cropland idling, crop shifting, and conservation transfers. These potential effects are discussed below.

3.8.1 Affected Environment/Environmental Setting

This section describes the terrestrial natural communities, special-status species and their habitats occurring in the area of analysis with potential to be affected by water transfers.

3.8.1.1 Area of Analysis

The Proposed Action could affect portions of the Central Valley, the Sacramento-San Joaquin Delta, and portions of Contra Costa, Alameda, Santa Clara, and San Benito counties. These areas are collectively referred to in this document as the area of analysis. Figure 3.8-1 shows the counties in the Seller Service Area and Buyer Service Area and the Sacramento Valley Groundwater Basin. Figure 3.8-2 shows major rivers and reservoirs in the Seller Service Area.

3.8.1.1.1 Seller Service Area

The Seller Service Area includes potential seller lands within the Sacramento River and San Joaquin watersheds. The Sacramento River watershed includes the Sacramento, Feather, Yuba, Bear, and American rivers, as well as numerous smaller tributaries to the Sacramento River including Deer, Mill, Butte, Putah, Cache, Stony, Stone Corral and other smaller creeks. The portion of the San Joaquin River watershed considered in this analysis includes the Merced and San Joaquin Rivers. Water transfer actions would not affect other tributaries in the Seller Service Area of the San Joaquin watershed.

The alternatives could affect watersheds within the Sacramento River Basin that include the following water bodies:

- Sacramento River from Shasta Reservoir to the Sacramento–San Joaquin Delta (Delta);
- Feather River and its tributaries, including and downstream of Lake Oroville, the Yuba River including and downstream of New Bullards Bar Reservoir, and the Bear River including and downstream of Camp Far West Reservoir;
- American River, including and downstream of Folsom Reservoir and Lake Natoma;
- Middle Fork American River downstream of Hell Hole and French Meadows Reservoirs; and
- Numerous small tributaries to the Sacramento River, Feather River, Yuba River, and Bear River.

Figure 3.8-1.
Vegetation and Wildlife Area of Analysis Counties and Sacramento Valley Groundwater Basin

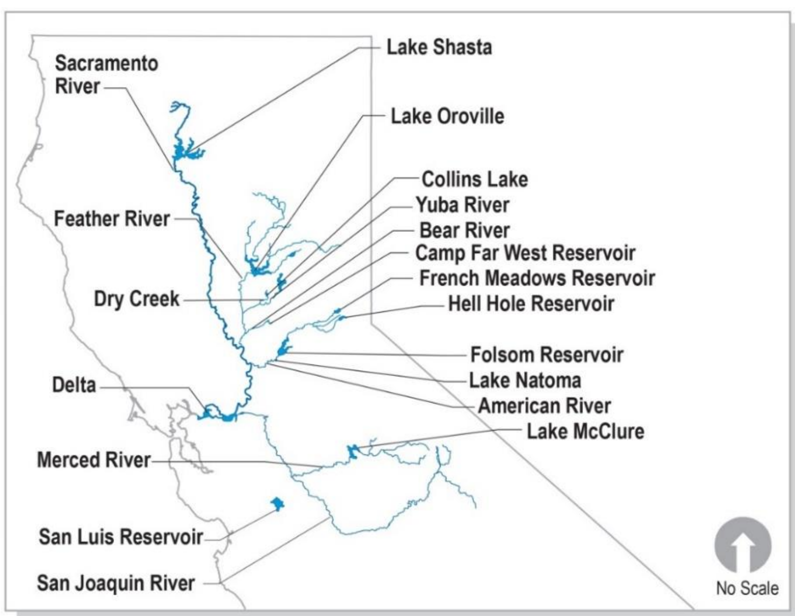

Figure 3.8-2.
Vegetation and Wildlife Area of Analysis Major Rivers and Reservoirs

Within the San Joaquin River watershed, potentially affected water bodies in the Seller Service Area include the:

- San Joaquin River from the Merced River to the Delta; and
- Merced River, including and downstream of Lake McClure.

Water made available for transfer under the alternatives would move through the legal Delta and could affect vegetation and wildlife resources in the Delta.

3.8.1.1.2 Buyer Service Area

The Buyer Service Area includes portions of Contra Costa County, northwestern Alameda County, Santa Clara County, northwestern San Benito County, small portions of Merced, San Joaquin, and Stanislaus counties, and extends through western Fresno County into northwest Kings County.

Water transfers to the Buyer Service Area could potentially affect the San Luis Reservoir in Merced County.

3.8.1.2 Existing Conditions

A variety of upland and aquatic vegetation communities are present within the area of analysis. A description of natural communities and agricultural habitats present within the different regions of the area of analysis are provided in Appendix G of the RDEIS/SDEIS.

The list of special-status species considered for analysis was based on a search of the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB), U.S. Fish and Wildlife Service (USFWS) species lists for the counties within the area of analysis, and active Habitat Conservation Plans (HCPs) in the vicinity of the area of analysis. The complete list of special-status species evaluated within the area of analysis is provided in Tables I-1 (fish and wildlife) and I-2 (plants) contained within Appendix I of the 2014 Draft EIS/EIR along with species accounts. Figure 3.8-3 shows Federal national wildlife refuges (NWRs) and State wildlife areas in the area of analysis.

3.8.2 Environmental Consequences/Environmental Impacts

Within each alternative, the analysis focuses on biological resources of concern: natural communities and special-status wildlife and plant species. Terrestrial biological resources associated with streams and reservoirs upstream of the area of analysis are not discussed in this section because the Proposed Action would not affect terrestrial biological resources in those areas.

3.8.2.1 Assessment/Evaluation Methods

The effects analysis assumes that if transfers affect the natural community, then transfers could affect any species associated with that community, unless the life history traits of a species indicate that the species would not be affected.

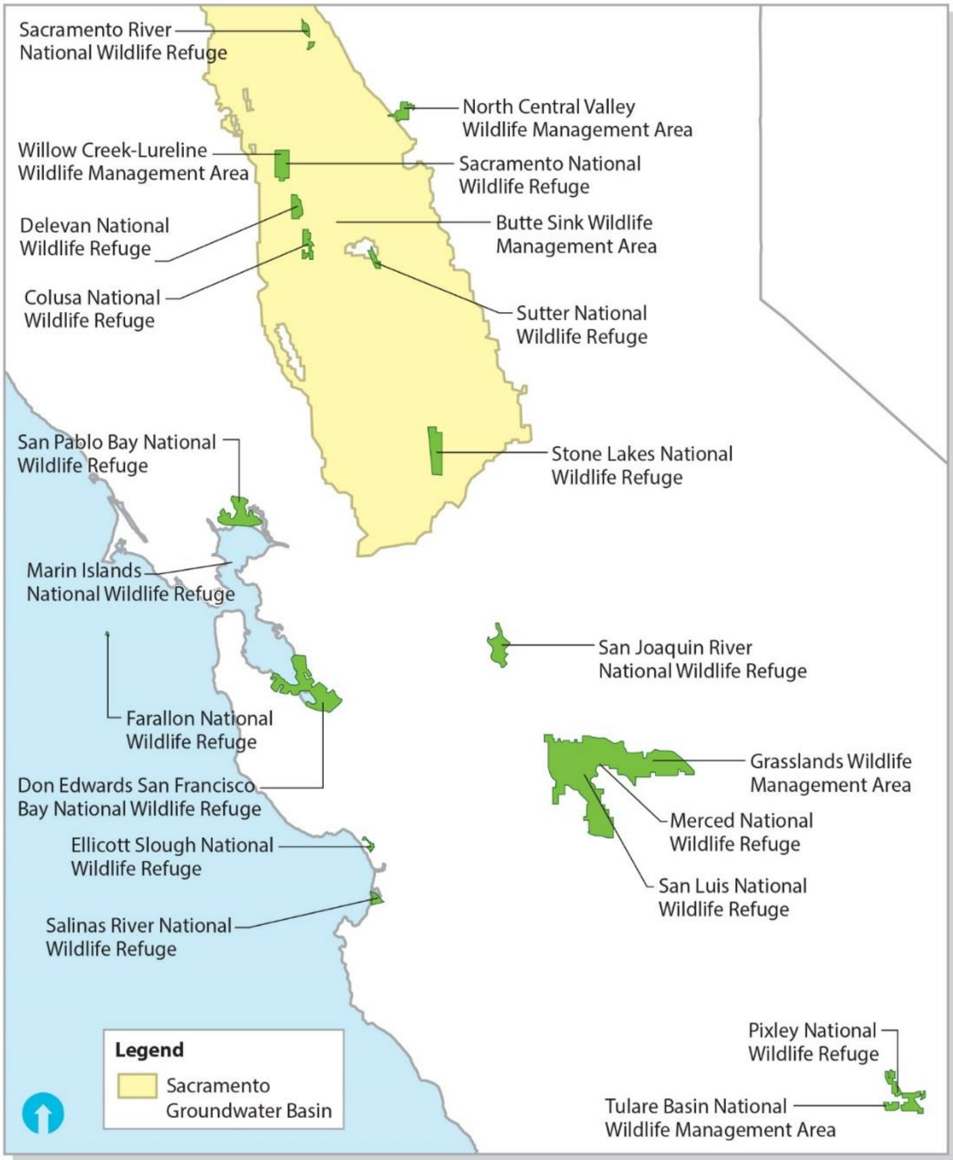

Figure 3.8-3.
Federal NWRs and State Wildlife Management Areas

Development of the Proposed Action impact analysis involved literature review, review of known occurrences of special-status species based on CNDDB, California Native Plant Society Inventory records, USFWS regional species list, California Wildlife Habitat Relationships, review of information obtained from Reclamation and species experts, and results of hydrologic modeling, as detailed below and in Appendix H of the RDEIR/SDEIS.

Each alternative, including the No Action/No Project Alternative, is discussed in terms of potential impacts on sensitive biological resources in the Seller Service Area (including the Delta Region) and Buyer Service Area.

A detailed discussion of the methods for assessing impacts on natural communities and special-status plants and wildlife is contained in Appendix H of the RDEIR/SDEIS. Appendix H of the RDEIR/SDEIS also contains a description of impact mechanisms specific to each transfer type.

3.8.2.2 Significance Criteria

Consistent with CEQA and the CEQA Guidelines, an alternative would have a significant impact on terrestrial biological resources if it would:

- Cause a substantial reduction in the size or distribution of any natural community.
  - Have a substantial adverse effect, such as a reduction in area or geographic range, on any riparian natural community, other sensitive natural community, or significant natural areas identified in local or regional plans, policies, regulations, or by CDFW or USFWS;
  - Substantially adversely affect federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) either individually or in combination with the known or probable impacts of other activities through direct removal, filling, hydrological interruption, or other means;
  - Substantially decrease the size of important native upland wildlife habitats or wildlife use areas;
  - Conflict with the provisions of an adopted HCP, Natural Community Conservation Plans (NCCP), or other approved local, regional, or state habitat conservation plan.
- Cause a substantial adverse effect on any special-status species.
  - Cause a substantial adverse effect on, either directly or through habitat modifications, any endangered, rare, or threatened species, as listed in 14 California Code of Regulations Sections 670.2 or 670.5; or in 50 Code of Federal Regulations. A significant impact is one that affects the population of a species as a whole, not individual members;
  - Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS, including substantially reducing the number or restricting the range of an endangered, rare, or threatened species;
  - Cause a reduction in the area or habitat value of critical habitat areas designated under the federal Endangered Species Act;
  - Conflict substantially with goals set forth in an approved recovery plan for a federally listed species, or with goals set forth in an approved State Recovery Strategy (California Fish and Game Code Section 2112) for a state listed species;
  - Conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan;

- Substantially fragment or isolate wildlife habitats or movement corridors, especially riparian and wetland habitats, or impede the use of wildlife nurseries.

The significance criteria described above apply to all natural communities and common and special-status plant and wildlife species that could be affected by the alternatives. Changes in habitat quality are determined relative to existing conditions (for CEQA) and the No Action/No Project Alternative (for NEPA).

3.8.2.3 Alternative 1: No Action/No Project

The assessment evaluates the No Action/No Project Alternative by including likely future conditions in the absence of the Proposed Action and identifies the impacts associated with the No Action/No Project Alternative.

3.8.2.3.1 Seller Service Area

Groundwater Levels

The No Action/No Project Alternative would not impact groundwater levels because there would be no increase in the amount of groundwater pumped for agricultural uses. Past groundwater trends in the sellers area are indicative of groundwater levels declining during extended droughts and recovering to pre-drought levels after subsequent wet periods. Therefore, there would be no permanent impacts on natural communities or associated special-status species and migratory birds that rely on groundwater.

Reservoirs

The No Action/No Project Alternative would not impact reservoir storage, elevation, and reservoir surface area. Therefore, there would be no impacts on natural communities and associated special-status species and migratory birds that occur along reservoirs within the sellers area of analysis.

Rivers and Creeks

The No Action/No Project Alternative would not change flows of rivers and creeks in the Sacramento and San Joaquin river watersheds relative to existing conditions. Therefore, there would be no impacts on the surrounding natural communities and associated special-status species and migratory birds within the sellers area of analysis.

Delta

The No Action/No Project Alternative would not alter flows through the Delta Region compared to existing conditions. Therefore, there would be no impacts on surrounding Delta natural communities and associated special-status species and migratory birds within the sellers area of analysis.

Cropland Idling/Crop Shifting

The No Action/No Project Alternative would not result in cropland idling/shifting. Agricultural land uses in the sellers area would be similar to those under existing conditions and land use practices would be similar to recent levels. The amount of rice farmed in the seller area i.e. Glenn, Colusa, Yolo, Sutter and Butte Counties was approximately 482,500 acres in 2016 and approximately 288,700 acres in 2017 (USDA 2018). Farmers would be expected to continue current practices of idling some land temporarily, depending on crop rotation patterns or soil maintenance purposes. Therefore, there would be no impacts on natural communities and associated special-status species and migratory birds that occur along and in agricultural habitats within the sellers area of analysis.

3.8.2.3.2 Buyer Service Area

Reservoirs

The No Action/No Project Alternative would not impact San Luis Reservoir storage and surface area. Storage levels in the reservoirs would be the same as under existing conditions. Therefore, there would be no impacts on natural communities and associated special-status species that occur along San Luis Reservoir within the buyers area of analysis.

Cropland Idling/Crop Shifting

The No Action/No Project Alternative would not result in cropland idling/shifting and so additional water would not be made available to for use in agricultural areas within the Buyers' area of analysis. Agricultural land uses in the Buyer Service Area would be similar to those under existing conditions and land use practices would be similar to recent levels. The amount of rice farmed in the buyer area i.e. San Joaquin Valley was approximately 7,000 acres in 2016 and approximately 6,000 acres in 2017 (USDA 2018). Farmers would be expected to continue current practices of idling some land temporarily, depending on crop rotation patterns or soil maintenance purposes. Therefore, existing habitat conditions would remain the same within upland agricultural areas and there would be no impacts on natural communities and associated special-status species that occur along and in agricultural habitats within the Buyers' area of analysis.

3.8.2.4 Alternative 2: Full Range of Transfers (Proposed Action)

3.8.2.4.1 Seller Service Area

Groundwater Substitution

Water made available for transfer through groundwater substitution actions under the Proposed Action could decrease available groundwater relative to the No Action/No Project Alternative. As a part of the Proposed Action, there would be an increased use of groundwater to irrigate crops. This would entail increased groundwater pumping compared to the No Action/No Project Alternative, which would result in a reduction in levels of groundwater in the vicinity of pumps. As discussed in the Assessment Methods (Appendix H of the RDEIR/SDEIS), if groundwater levels are more than 15 feet below ground surface, a change in groundwater levels would not likely affect overlying terrestrial resources. In a few locations in the North Delta associated with wetlands, groundwater elevations under existing conditions are less than 15 feet below ground surface and natural communities reliant on groundwater are more likely to be impacted. In these areas, modeling indicates that the maximum reductions would be 0.3 to 0.8 feet, with full recharge. These increases in subsurface drawdown would be too small to affect natural communities such as riverine, riparian, seasonal wetland, and managed wetland habitats, which rely on groundwater for all or part of their water supply. Plants within these communities would be able to adjust to the small reductions in groundwater levels because the draw down is expected to occur slowly through the growing season, allowing plants to adjust their root growth to accommodate the change.

In addition, groundwater levels are likely to be less than 15 feet below ground surface along rivers and creeks and terrestrial vegetation in these areas could be affected by changes in the groundwater and surface water interactions. Further analysis of the effects of groundwater substitution pumping on natural communities due to changes in stream flow are discussed below under Rivers and Creeks.

Impacts on natural communities and wildlife habitat associated with groundwater substitution actions that result in stream flow reductions are discussed in detail in Section 3.8.2.4.3, Impacts on Natural Communities and Special-Status Species.

Reservoirs

Reservoir release transfers under the Proposed Action could impact reservoir storage and reservoir surface area relative to the No Action/No Project Alternative. For reservoir release transfers under the Proposed Action, model output predicts that there would be no substantial (more than ten percent) decrease in end-of-month storage volume, reservoir elevation, or surface area relative to existing conditions in Shasta, Oroville, and Folsom reservoirs. As discussed in the Assessment Methods (Appendix H of the RDEIR/SDEIS), all reservoirs would continue to function under their existing operating requirements, including reservoir drawdown to targeted storage levels, and in meeting downstream flow, temperature, and other water quality requirements. Table 3.8-1 shows the modeled changes in average end-of-month storage for the non-Project reservoirs that could participate in reservoir release transfers. Storage changes in Merle Collins Reservoir and Lake McClure would be less than ten percent of the reservoir volume.

Table 3.8-1.
Changes in Non-Project Reservoir Storage between the No Action/ No Project Alternative and the Proposed Action (in 1,000 acre-feet)

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Camp Far West Reservoir												
W	-0.4	-0.4	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-2.5	-2.5	-2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-2.3	-2.5
C	-3.6	-3.6	-3.6	-3.6	-1.1	-0.7	-0.7	-0.7	-0.7	-4.3	-4.3	-4.3
Merle Collins Reservoir												
W	-0.4	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-0.8	-0.8	-0.8	-0.8	-0.2	0.0	0.0	0.0	0.0	-1.1	-1.7	-1.7
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hell Hole and French Meadows Reservoirs												
W	-6.1	-6.1	-4.1	-1.8	-0.7	-0.6	-0.6	-1.2	-0.4	-0.4	-0.3	-0.1
AN	-22.3	-22.3	-22.3	-13.9	-1.8	0.2	0.2	0.2	0.2	0.2	0.1	0.1
BN	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-16.6	-16.7	-16.7	-13.4	-11.4	-7.9	-1.1	-4.9	-8.5	-12.5	-16.8	-20.4

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
C	-28.2	-28.5	-29.0	-29.0	-29.0	-29.0	-28.9	-34.5	-39.5	-44.5	-49.8	-55.2
Lake McClure												
W	-2.3	-2.3	-2.3	-2.3	0.0	0.0	-3.3	-4.8	-3.5	-2.0	-0.8	-0.2
AN	-15.0	-15.0	-15.0	-15.0	-15.0	-10.0	-17.7	-20.9	-12.8	-9.3	-6.4	-5.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	-9.1	-15.0	-15.0	-15.0	-15.0	-15.0
D	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-15.7	-21.9	-19.9	-17.8	-16.1	-15.2
C	0.0	0.0	0.0	0.0	0.0	0.0	-6.7	-10.3	-8.6	-6.6	-5.1	-4.5

Note: Negative numbers indicate that the Proposed Action would decrease reservoir storage compared to the No Action/No Project Alternative; positive numbers indicate that the Proposed Action would increase reservoir storage.
Key: Year Type = Sacramento watershed year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

At Camp Far West Reservoir, average end-of-month storage would be 4,300 acre-feet (10.8 to 21.9 percent) lower under the Proposed Action relative to existing conditions in critical water years during July through September. This change in storage would reduce reservoir elevations by up to 8.5 feet, or up to 3.8 percent relative to existing conditions, during September of critically dry years, but the reservoir would still be within the operating range experienced under existing conditions. The reduction in storage would lead to reductions in the surface area of the reservoir during critical years during August and September (a reduction of between 97.8 to 86.1 acre-feet, or 18.2 to 12.4 percent overall reduction in surface area). Surface area would change by less than ten percent during the remaining months and water year types.

Up to 47,000 acre-feet of water could be made available for transfer from PCWA's Hell Hole and French Meadows reservoirs. The reservoirs are operated under license by the Federal Energy Regulatory Commission (FERC) and associated 401 Water Quality Certification conditions by the State Water Resources Control Board and 4(e) conditions from the U.S. Forest Service. Transfers would be made under the terms and conditions of this license, which includes measures to protect natural resources within the reservoirs and in the downstream rivers. Water elevations and storage levels during transfers would occur within the normal range of operations of these reservoirs under existing conditions.

Overall, under the Proposed Action, all reservoirs would continue to be operated according to their existing requirements and within their current range of operations and would not substantially reduce natural communities or special-status plant and wildlife species habitat. Therefore, the Proposed Action will have a less than significant impact on natural communities and special-status species habitats associated with reservoir release transfers.

Rivers and Creeks

Sacramento River Watershed

Water made available through groundwater substitution actions under the Proposed Action could cause flows in rivers and creeks in the Sacramento River watershed to be lower than under the No Action/No Project Alternative. Impacts to natural communities and special-status species would be a result of changes in timing and flow rate for rivers, streams, and associated tributaries under the Proposed Action.

As discussed in the Assessment Methods (Appendix H of the RDEIR/SDEIS), the results of the SACFEM2013 groundwater model analysis estimated streamflow depletion from groundwater substitution throughout the Sacramento Valley.

Under the Proposed Action, mean monthly modeled flows would be reduced by less than ten percent on the Sacramento, Feather, Yuba, and American rivers. Based on the screening level criteria, these flow reductions are not considered substantial. Existing stream flow requirements (flow magnitude and timing, temperature, and other water quality parameters) would continue to be met. Among larger rivers, only the Bear River flows would be reduced by more than ten percent by the Proposed Action and, therefore the Bear River is discussed in detail below.

In addition, an initial screening evaluation of modeled flows in several smaller creeks was conducted (see Section 3.8.2.1 for details). The evaluation concluded that impacts to terrestrial species in the following waterways are less than significant: Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Seven Mile Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Auburn Ravine, Honcut Creek, Freshwater Creek, Colusa Basin Drain, Upper Sycamore Slough, Funks Creek, Putah Creek, Spring Valley Creek, Walker Creek, North Fork Walker Creek, Wilson Creek, Stone Corral Creek, Big Chico Creek, Little Chico Creek, and the South Fork of Willow Creek (Table I-1 in Appendix I of the RDEIR/SDEIS).

Historical flow data are limited or not available for Eastside/Cross Canal, Dry Creek (tributary to Bear River), South Fork Honcut Creek, North Fork Honcut Creek, Lower Sycamore Slough, Wilkins Slough Canal, Sand Creek, Cortina Creek, Lurline Creek, Salt Creek, and Willow Creek. The percentage change in flow in these streams due to the Proposed Action could not be determined. Therefore, the Proposed Action has the potential result in a greater than ten percent change in mean monthly flows and greater than one cubic feet per second (cfs) change in at least one water year type and month of the year for these streams. Changes in flows to individual streams for which historical data is not available could have a substantial effect on the riparian natural communities and associated wildlife habitat. Impacts from stream flow reductions within any of the aforementioned streams on riparian communities and associated nesting habitat for migratory birds is considered potentially significant and is discussed in detail in Section 3.8.2.4.3, Impacts on Natural Communities and Special-Status Species.

Under the Proposed Action, Cache Creek, Stony Creek, Coon Creek, Little Chico Creek, and the Bear River would potentially experience a greater than ten percent change in mean monthly flows and greater than one cubic foot per second (cfs) change in at least one water year type and month of the year (Table I-1 in Appendix I of the RDEIS/SDEIS). The potential impacts in these waterways are discussed individually below.

<u>Cache Creek</u>

Water made available through groundwater substitution actions under the Proposed Action could cause Cache Creek flows to be lower than under the No Action/No Project Alternative. Mean monthly flows in Cache Creek under the Proposed Action would not be greater than ten percent lower than the No Action/No Project Alternative when all water year types are combined in the mean calculation (Table I-2 in Appendix I of the RDEIR/SDEIS), but would be greater than ten percent lower in individual water year types within the months between May and

November (Table I-3 in Appendix I of the RDEIR/SDEIS). In most cases when flow reductions would exceed ten percent, reductions would be less than 20 percent (13 of 16 cases), but would be up to 31 percent (0.6 cfs) lower in critical water years during November (Table I-3 in Appendix I of the RDEIR/SDEIS). Flow reductions of this magnitude could have a substantial effect on the riparian natural communities associated with the stream.

Impacts from stream flow reductions in Cache Creek on riparian communities and associated nesting habitat for migratory birds is considered potentially significant and is discussed in detail in Section 3.8.2.4.3, Impacts on Natural Communities and Special-Status Species.

Stony Creek

Water made available for transfer through groundwater substitution actions under the Proposed Action could cause Stony Creek flows to be lower than under the No Action/No Project Alternative. According to the groundwater modeling, mean monthly flow rates in Stony Creek under the Proposed Action with all water year types combined would be less than three percent relative to the No Action/No Project Alternative (Table I-4 in Appendix I of the RDEIR/SDEIS).

Table I-5 in Appendix I of the RDEIR/SDEIS describes flow changes for different water year types. In general, flows under the Proposed Action would be similar or less than ten percent lower than those under the No Action/No Project Alternative, except in one water year type in one month (critical water years during October) in which flows would be reduced by 10.0 percent (3.3 cfs). Flow reductions of this magnitude could have a substantial effect on the riparian natural communities associated with the stream.

Impacts from stream flow reductions in Stony Creek on riparian communities and associated nesting habitat for migratory birds is considered potentially significant and is discussed in detail in Section 3.8.2.4.3 Impacts on Natural Communities and Special-Status Species.

Coon Creek

Water made available for transfer through groundwater substitution actions under the Proposed Action could cause Coon Creek flows to be lower than under the No Action/No Project Alternative. Although existing baseline data is incomplete, the comparison of modeling results to Coon Creek stream flow data from 2003 to 2005 (Bergfeld personal communication 2014) indicates that, in a worst case scenario, there would be one water year in one month (above normal water years during April) in which flows could potentially be reduced by 13.9 percent (2.8 cfs) under the Proposed Action. This calculation represents a worst case scenario because baseline flows used in this calculation are at the low end (20 cfs) of existing flow data range (20 cfs to 40 cfs) during April in 2003-2005. If the calculation included the high end of the range (40 cfs) for baseline flows, the reduction due to the Proposed Action would be 7.0 percent. Therefore, this flow reduction would likely occur less frequently than assumed. Flows in all other months and water year types would be reduced by less than ten percent of baseline flows.

Because stream flow reductions would likely be less than ten percent and would occur only during above average water years, changes in stream flow would not substantially reduce natural communities or special-status plant and wildlife species habitat. Therefore, the Proposed Action would have a less than significant impact on natural communities and special-status species habitat along Coon Creek.

Little Chico Creek

Water made available for transfer through groundwater substitution actions under the Proposed Action could cause Little Chico Creek flows to be lower than under the No Action/No Project Alternative. As modeled, flows in Little Chico Creek would be reduced by more than ten percent in multiple water year types during July through October (up to 100 percent of instream flows). It is not uncommon for Little Chico Creek flows to be very low during these months. A review of existing stream gage data from 1976 to 1996 reveals that flows would be less than 0.5 cfs during at least one month in 20 of 21 years and would be 0 cfs in 14 of 21 years. The modeled changes, while greater than 10 percent, represent a very small overall change in flow (a maximum of 0.04 cfs during these months). With the Proposed Action, there would be the same number of years with no flow or flows less than 0.5 cfs in at least one month. In fact, flows would be less than 0.5 cfs under both the No Action/No Project Alternative and Proposed Action in the exact same months of the evaluated period except one (less than 0.5 cfs under the Proposed Action in August 1993) and there would be no flow in the exact same 27 months between the No Action/No Project Alternative and Proposed Action. Therefore, the Proposed Action would not increase the frequency of these low flow events relative to the No Action/No Project Alternative.

Because flow reductions would be small and only during months when the creek is essentially dry, changes in stream flow would not substantially reduce natural communities or special-status plant and wildlife species habitat. Therefore, the Proposed Action would have a less than significant impact on natural communities and special-status species habitat along Little Chico Creek.

Bear River

Water made available for transfer through groundwater substitution actions under the Proposed Action could cause Bear River flows to be lower than under the No Action/No Project Alternative. Under the Proposed Action, the only flow reduction greater than ten percent in Bear River would occur in critical water years during February (approximately 18 percent, or 45 cfs lower). This flow change would occur during wet conditions when Camp Far West Reservoir is refilling after a reservoir release transfer. The amount of surface flow in the stream would remain within the historical range of variability observed under the No Action/No Project Alternative and would meet minimum flow requirements.

Average monthly flows would be higher, compared to the No Action/No Project Alternative, in critical water years during July (approximately 240 percent, 58 cfs), and dry years during August and September (219 percent, 27 cfs and 127 percent, 12 cfs, respectively) when water is released from Camp Far West Reservoir for transfer. These flow changes would not alter stream morphology, but may result in minor changes to habitat suitability.

Flow reductions would occur late in the year, when plants and animals are less dependent on streamflow. While flows would be reduced, they would remain within the normal range of variability experienced under the No Action/No Project condition and would occur only during critical years (approximately one year in every five), and riparian natural communities would not be substantially reduced in area or geographic range. Therefore, the Proposed Action would have a less than significant impact on natural communities and special-status species habitat along Bear River.

San Joaquin River Watershed

<u>*San Joaquin River*</u>

Water made available for transfer through groundwater substitution actions under the Proposed Action could cause San Joaquin River flows to be lower than under the No Action/No Project Alternative. Under the Proposed Action, flows on the San Joaquin River would be reduced by less than two percent on the San Joaquin River relative to the No Action/No Project Alternative in all months and water year types. This small change in flows would be within the range of flow fluctuations typical of the San Joaquin River and therefore would be too small to substantially affect vegetation communities and habitats for special-status plant and wildlife species. Therefore, the Proposed Action would have a less than significant impact on natural communities and special-status species habitat along the San Joaquin River.

<u>*Merced River*</u>

Water made available for transfer through groundwater substitution actions under the Proposed Action could cause Merced River flows to be lower than under the No Action/No Project Alternative. Under the Proposed Action, flows would generally be similar to or greater than flows under the No Action/No Project Alternative in most months. Flows would be higher compared to the No Action/No Project Alternative during April and May. The greatest relative increase in flow would occur in dry water years during April (approximately 38 percent, 85 cfs higher than existing conditions). River flows would decrease during wetter periods as the reservoir refills, but this refill would occur over longer periods of time and would have only small effects on flows. This small effect on flows would be within the range of flow fluctuations typical of the Merced River and therefore would not substantially affect vegetation communities and habitats for special-status plant and wildlife species. Therefore, the Proposed Action would have a less than significant impact on natural communities and special-status species habitat along Bear River.

Delta

Water transfers under the Proposed Action could cause changes to Delta hydrology relative to the No Action/No Project Alternative. Under the Proposed Action, Delta outflows would be less than two percent lower than flows under the No Action/No Project Alternative in any month or water year type. Outflow would be up to 10.5 percent higher in during July through September in dry and critically dry water years. The maximum mean monthly upstream shift in X2 location would be unlikely to be detected upstream during periods of decreased flow, and may be up to two km (1.0 percent) downstream during periods of increased flow. These changes to Delta outflow, and resultant changes in X2 position, would not have a substantial adverse impact on biological resources because the change is minimal and consistent with changes in annual fluctuations of X2.

The Proposed Action would have negligible effects on Delta hydrology and would not substantially affect natural communities. As changes in flow are expected to be within daily and seasonal tidal fluctuations, natural communities in the Delta would be unaffected. These changes would not substantially reduce natural communities or special-status plant and wildlife species habitat. Therefore, the Proposed Action would have a less than significant impact on natural communities and special-status species in the Delta.

Cropland Idling/Crop Shifting

Upland Cropland (Non-flooded agriculture)

Making water available for transfer through cropland idling/shifting actions under the Proposed Action could alter habitat for upland species relative to the No Action/No Project Alternative. The maximum potential acreage of upland crops that could be idled under the Proposed Action are shown in Table 3.8-2.

Table 3.8-2.
Upland Cropland Idling/Shifting under the Proposed Action

Region	Alfalfa/ Sudan Grass (acres)	Corn (acres)	Tomatoes (acres)	Total (acres)
Glenn, Colusa, Yolo Counties	2,750	1,000	1,250	5,000
Butte and Sutter Counties	700	1,300	900	2,900
Solano County	3,900	2,500	750	7,150
Total	**7,350**	**4,800**	**2,900**	**15,050**

Most forage and other habitat would still be available to wildlife species within the Sacramento Valley. Crop idling in Glenn, Colusa, and Yolo Counties could result in a two percent loss of residual feed, whereas in Sutter and Solano Counties crop idling could result in a nine percent loss in residual feed. Corn idling represents the crop with the biggest reduction of 16–20 percent depending on the County. Idling would reduce forage areas, but species would respond by looking for forage in other habitats. The bird species that would be potentially affected by idling of upland crops would be capable of dispersing to other areas or other non-idled parcels. Most species are well adapted to changes in environmental conditions such as drought and flooding, and therefore, use of specific areas can vary greatly from year to year depending on habitat conditions. Cropland idling decisions would be made early in the year before the general breeding season of most birds that have the potential to occur in the area of analysis, therefore impacts to nesting birds would not be expected.

Because of the limited amount of upland crop acreage that would be idled under this alternative and because this is within the historic range of variation for the individual crops, upland cropland idling/shifting in the Seller Service Area is not expected to significantly impact natural communities and special-status plant and wildlife species dependent on upland cropland habitat. Therefore, the Proposed Action will have a less than significant impact on natural communities and special-status wildlife species as a result of upland cropland idling/shifting.

Seasonal Flooded Agriculture (rice)

Making water available for transfer through cropland idling/shifting actions under the Proposed Action could alter the amount of wildlife habitat associated with seasonally flooded agriculture and associated irrigation waterways relative to the No Action/No Project Alternative. Based on proposed transfer quantities and sellers, the maximum amount of rice acreage that could be idled under the Proposed Action would be 60,693 acres throughout the Sacramento River valley (Table 3.8-3).

**Table 3.8-3.
Cropland Idling/Shifting for Rice under the Proposed Action**

Cropland Idling under Proposed Action	Acres (Percent of Acres Idled) in Glenn, Colusa, and Yolo Co.	Acres (Percent of Acres Idled) in Sutter and Butte Co.	Acres (Percent of Acres Idled) in Solano Co.	Total Acres (Percent of Acres Idled)
Rice	49,924 (20%)	10,769 (11%)	0 (0%)	60,693 total rice acreage (17%)

The reduction in available habitat in rice fields and the associated reduction in the availability of waste grains and prey items as forage to wildlife species that use seasonally flooded agriculture for some portion of their lifecycle, could result in potentially significant effects to those species, particularly for the millions of migratory birds that use rice fields during winter migration.

Associated with idling seasonally flooded agricultural fields is the potential for habitat fragmentation, as idling large parcels of land could impede the movement of wildlife from one area to another, inhibiting normal wildlife migration and dispersal of individuals, and potentially dissociating habitats for roosting from those for foraging. These effects would have a negative effect on individual fitness and be potentially significant effects to wildlife. The decision to idle or shift a field would be made early in the year. So, for species that migrate into the area seasonally (mainly birds), those arriving in the spring would not be impacted as they would select suitable habitat upon their arrival. For year round residents (i.e., pond turtle, giant garter snake) the potential impacts would be greater.

Impacts on natural communities and special-status wildlife species from making water available for transfer through crop idling/shifting actions in rice growing agricultural habitats is considered potentially significant and is discussed in detail in Section 3.8.2.4.3, Impacts on Natural Communities and Special-Status Species.

3.8.2.4.2 Buyer Service Area

Reservoirs

San Luis Reservoir
The Proposed Action could alter surface water elevation and reservoir storage at San Luis Reservoir relative to existing conditions and the No Action/No Project Alternative. Under the Proposed Action, CVP storage at San Luis Reservoir would be reduced by up to 25,600 acre-feet relative to the No Action/No Project Alternative in most water year types throughout the year, although these reductions would generally be less than ten percent. Exceptions include below normal water years during August (20,800 acre-feet, or 10.6 percent, lower), dry years during August and September (11,000 to 13,700 acre-feet, or 13.1 to 13.3 percent, lower) and critical years during September and October (13,300 to 18,400 acre-feet, or 10.8 to 12.0 percent, lower).

There would be small reductions (less than five percent) in SWP storage at San Luis Reservoir due to the Proposed Action relative to the No Action/No Project Alternative in all months and water year types. The largest SWP storage reduction of 15,900 acre-feet (corresponding to a 2.5 to 2.6 percent reduction) would occur in critical water years during March and April.

Changes in storage for either the CVP or SWP are generally small (less than five percent) with few exceptions. Because decreases in storage would remain within the normal range of operation for the reservoir, they would not have a substantial effect on biological resources. The most substantial changes would occur during dry and critically dry years, when the reservoir would already be at low water surface elevations, with the same types of effects as described for Camp Far West Reservoir.

At San Luis Reservoir, riparian habitat is limited to scattered patches of mule fat and occasional willows (Reclamation and DWR 2004). The water sources for riparian vegetation are dependent upon stream flows in the tributaries and would not be affected by water transfers; therefore, there would be no impacts to this habitat type. Similarly, other natural communities associated with San Luis Reservoir including freshwater emergent vegetation, upland scrub, and non-native grasslands surround San Luis Reservoir are not dependent of the reservoir for water and would not be affected by water transfers, thus wildlife associated with these habitats would not be impacted. Therefore, the Proposed Action would have no impact on natural communities and special-status species associated with the San Luis Reservoir.

Upland Cropland (Non-flooded Agriculture)

The Proposed Action could alter planting patterns and urban water use relative to the No Action/No Project Alternative. Under the Proposed Action, buyers would receive water made available through the range of potential water transfers identified in the Proposed Action. The amount of water available for purchase, the way in which water could be used, and the effects of using this water on natural resources would be within the range of existing activities under each CVP contract and associated BOs. Based on this, the Proposed Action would have no impact on natural communities or special-status species in the Buyer Service Area.

3.8.2.4.3 Impacts on Natural Communities and Special-Status Species

Potential to cause a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS

Seller Service Area

Special-Status Plants

The Proposed Action could result in impacts on special-status plants by reducing available habitat through groundwater substitution and cropland idling/shifting actions.

<u>Groundwater Substitution</u>

As discussed in Section 3.8.2.4.1, potential impacts to special-status plant species could result if changes in the composition and function of wetland and/or riparian plant communities occur as a result of actions taken to make water available for transfer. As part of the Proposed Action, there would be increased utilization of groundwater to irrigate crops. This would entail more groundwater pumping compared to the No Action/No Project Alternative to substitute for the seller's surface water supply. Due to the complex interaction between groundwater and surface water, negative impacts would result from a reduction in creek flows to downstream wetland and riparian habitats. Decreased surface flows could potentially impact downstream natural communities, such as seasonal wetland and managed wetland habitats, which are reliant on creek and river flows for all or part of their water supply.

Perennial species, such as Sanford's arrowhead, could be extirpated from any areas where non-tidal freshwater emergent wetland extent is temporarily or permanently reduced during water transfer actions.

As described in the preceding sections, the effect of groundwater substitution under the Proposed Action, as predicted by the groundwater model, would generally be less than ten percent, except in Cache Creek and Stony Creek. In addition, the Proposed Action has the potential to cause flow reductions of greater than ten percent on other small creeks where no data are available on existing streamflows to be able to determine this. The impacts of groundwater substitution on flows in small streams and associated water ways would be mitigated by implementation of Mitigation Measure GW-1 (see Section 3.3, Groundwater Resources) because it requires monitoring of wells and implementing a mitigation plan if the seller's monitoring efforts indicate that the operation of the wells for groundwater substitution pumping are causing substantial adverse impacts. The mitigation plan would include curtailment of pumping until natural recharge corrects the environmental impact.

With implementation of Mitigation Measure GW-1, potentially significant impacts from groundwater substitution pumping on special-status plants would be reduced to a less than significant level.

Cropland Idling/Shifting

An increase in cropland idling/shifting under the Full Range of Transfers Alternative (Proposed Action) would result in decreased flows in irrigation canals and return ditches adjacent to seasonally flooded agriculture (e.g., rice fields). These canals and ditches provide moderately suitable habitat for several special-status plant species including Sanford's arrowhead. This impact is potentially significant because changes in water availability within canals could substantially reduce or eliminate the limited amount of habitat for special-status plants within rice field areas. With implementation of Mitigation Measure VEG and WILD–1, water levels in major irrigation canals that contain emergent wetland, seasonal wetlands, and riparian vegetation that could support special-status plants will be maintained at by keeping at least 2 feet of water in the major irrigation and drainage canals (or no less than existing conditions), and impacts on special-status plants would be reduced to a less than significant level.

Giant Garter Snake

The Proposed Action could result in impacts on giant garter snake by reducing available aquatic habitat through cropland idling/shifting and groundwater substitution actions.

Giant garter snakes require aquatic habitat during their active phase, extending from spring until fall. During the winter months, giant garter snakes are dormant and occupy burrows in upland areas. Giant garter snakes have the potential to be affected by the Proposed Action through cropland idling/shifting and the effects of groundwater substitution on small streams and associated wetlands. Idling/shifting of upland crops, water conservation actions, and reservoir releases are not anticipated to affect giant garter snakes, as they do not provide suitable habitat for this species. Although the preferred habitat of giant garter snakes is natural wetland areas with slow moving water, giant garter snakes will use rice fields and their associated water supply and tailwater canals for foraging and escape from predators, particularly where natural wetland habitats are not available. Because of the historic loss of natural wetlands, rice fields and more importantly their associated canals and drainage ditches have become important habitat for giant garter snakes within agricultural areas.

Groundwater Substitution

Natural and managed seasonal wetlands and riparian communities often depend on interactions between surface water and groundwater for part or all of their water supply. However, managed wetland and agricultural habitats in the area of analysis that provide giant garter snake habitat do not typically depend on this interaction to maintain suitable habitat conditions. Also given the nature of soils in these environments it is unlikely that a direct linkage between the deeper groundwater basin and surface water in marshes exists. Therefore, groundwater substitution actions under the Proposed Action are not expected to have a substantial effect on natural communities, including freshwater emergent vegetation. Impacts to giant garter snake from groundwater substitution actions would be less than significant.

Cropland Idling/Shifting

The Proposed Action is expected to result in an increase in rice land idling/shifting acreage. Limited data exists on the actual distribution and occurrence of the giant garter snakes within Central Valley rice lands, and it is difficult to anticipate the level of effects the Proposed Action would have on giant garter snakes because of the challenges associated with quantifying and monitoring giant garter snake ecology. While giant garter snakes are known to use rice fields seasonally, the species is strongly associated with the canals that supply water to and drain water from rice fields; these canals provide much more stable habitat than rice fields because they maintain water longer and support marsh-like conditions for most of the giant garter snake active season (Reyes et. al. 2017). An in-depth discussion of giant garter snake use of rice lands is provided in Appendix H of the RDEIR/SDEIS. The giant garter snake active season extends approximately April through September. While flooded rice fields provide a component of aquatic habitat for giant garter snakes that occupy rice-growing regions, rice fields only provide adequate cover for the species for approximately one-third of their active season (Halstead et. al. 2016). In the Sacramento Valley, cultivated rice generally emerges from flooded fields in late May or early June, but sufficient growth that provides cover for snakes does not occur until approximately late June. Water is then drawn off the fields to allow them to dry in late August or early September.

Cropland idling/shifting transfer actions are expected to incrementally contribute to idling of rice acreage, thereby reducing available habitat for the species. The proposed cropland idling/crop shifting transfers could idle up to a maximum of approximately 60,693 acres of rice fields annually. This represents approximately 12.8 percent of the average land in rice production within the Sacramento Valley from 1992 to 2017 (U.S. Department of Agriculture [USDA], National Agricultural Statistics Service 2017). Cropland idling/crop shifting could incrementally reduce the availability of wetland areas in rice fields and canals during the transfer year.

The reduction in suitable foraging habitat within rice fields could cause some individuals to relocate away from an area that may have been their foraging area in prior years. Giant garter snakes occupying canals adjacent to fields that are fallowed in a particular year may disperse to canals that are in close proximity to active rice fields in order to obtain sufficient prey throughout their life-cycle. Although individual snakes that must relocate would be subject to greater risk of predation as they move to find new suitable foraging areas, it is likely that some individuals would be able to successfully relocate in suitable habitat elsewhere within the area. Young snakes (two years old and less) that need to relocate may be particularly vulnerable to increased predation risk. Because giant garter snakes in the Seller Service Area are within an active rice growing region that experiences variability in rice production and farming activities, they are already subject to these risks in the absence of the Proposed Action. The Proposed Action has the potential to subject more snakes to the stressors of finding new foraging areas. This potential impact would be significant.

Implementation of Mitigation Measure VEG and WILD-1 (Section 3.8.4) will reduce the potential for death or decreased fitness of individual giant garter snake due to reduced water availability by maintaining adequate water in water conveyance ditches and canals adjacent to idled/shifted fields. This measure ensures that giant garter snake movement corridors are maintained, prey species remain available in the same densities, and vegetation needed for cover during foraging and predator avoidance remains the same as it would if there were no idling/shifting transfers. Mitigation Measure VEG and WILD-1 also assures that Reclamation has the ability to verify program requirements. Therefore, aside from the absence of an active rice field, the habitat available to giant garter snake in the area of the transfers will remain stable throughout the rice production season. Mitigation Measure VEG and WILD-1 also prohibits transfers from areas with important giant garter snake populations, thereby maintaining protected habitats and movement corridors for use by several populations of giant garter snake.

Standard farm practices associated with participating in cropland idling/shifting water transfers (e.g. valve or gate operations, equipment transportation, facility maintenance), may also increase risk to giant garter snakes if they were to encounter personnel or equipment. This could result in injury, death, or decreased fitness of giant garter snakes. These risks are minimized because sellers voluntarily perform giant garter snake best management practices, including educating maintenance personnel to recognize and avoid contact with giant garter snakes, cleaning only one side of a conveyance channel per year, and implementing other measures to enhance habitat for giant garter snake. Additionally, ditch maintenance is typically done when there is no water in the canals and ditches. This means that giant garter snake adjacent to fields idled/shifted under the Proposed Action will not be affected by ditch maintenance during their active season.

Implementation of Mitigation Measure VEG and WILD-1 will ensure potential effects to individual giant garter snake are minimized by requiring that: transfers be reviewed to ensure cropland idling does not occur in or adjacent to areas with known important giant garter snake populations, by keeping at least 2 feet of water in the major irrigation and drainage canals (or no less than existing conditions), and by maintaining water in smaller drains and conveyance canals with emergent vegetation for GGS escape and foraging habitat. Ultimately, wetted canals and remaining rice fields are expected to provide sufficient habitat by providing cover and prey for the species to continue to disperse and survive throughout the seller’s area. Therefore, impacts from cropland idling/shifting transfer actions on the giant garter snake would be reduced to a less-than-significant level.

Pacific Pond Turtle

The Proposed Action could result in impacts to Pacific pond turtle by reducing available aquatic habitat through groundwater substitution, reservoir drawdowns, and cropland idling/shifting actions.

Pacific pond turtle can utilize irrigation ditches and rice fields as aquatic habitat and adjacent uplands and levees as upland habitat. They may also use small streams and reservoirs for habitat. Actions that result in the desiccation of aquatic habitat could result in the turtle migrating to new areas, which in turn puts them at an increased risk of predation. Further reduction of turtle population as a result of the Proposed Action would be considered a significant impact.

Groundwater Substitution

Groundwater substitution actions could affect Pacific pond turtle through reduction in the flows of smaller streams in the Seller Service Area. Reduced flows could negatively impact suitable habitat for this species both in the streams themselves, and the wetlands and riparian habitats associated with them.

As described in the preceding sections, the effect of groundwater substitution under the Proposed Action, as predicted by the groundwater model, would generally be less than ten percent, except in Cache Creek, Stony Creek, Coon Creek, Little Chico Creek, and Bear River. In addition, the Proposed Action has the potential to cause flow reductions of greater than ten percent. Water levels naturally fluctuate depending on year type and timing of discharge in these creeks, and sections of the creeks dry up in dry or critical years. Pacific pond turtles require permanent water and would visit these water ways temporarily when they have flow. The reduction of flow caused by the Proposed Action would not substantially reduce habitat for the Pacific pond turtle and would not substantially affect habitat connectivity, because under the No Action/No Project condition these creeks are subject to substantial variability in flow, including periodic drying of reaches, and changes in groundwater levels would have a relatively small effect on this variation and the temporary Pacific pond turtle habitat in these streams.

Groundwater substitution actions under the Proposed Action would have a less than significant impact on Pacific pond turtle because changes in flows in small streams would have a small effect on Pacific pond turtle habitat availability and would not substantially interfere with habitat connectivity.

Reservoir Drawdown

Fluctuations in water level elevation in reservoirs as a result of the Proposed Action could negatively impact habitat for Pacific pond turtle through dewatering of suitable aquatic habitat and alteration of upland nesting and refugia habitat. Lowering the water elevation could leave adult and juvenile Pacific pond turtle utilizing the reservoirs more vulnerable to predation. The decrease in storage may isolate Pacific pond turtles and impact juvenile turtles by limiting available cover and forage, as well as reproduction. Adult turtles could disperse safely, however hatchling maybe be preyed upon by a variety of predators including fish, bullfrogs, garter snakes, wading birds, and mammals. Hatchlings are also subject to rapid death by desiccation (Zeiner 1988). These impacts would be most noticeable at Camp Far West and New Bullards Bar reservoirs, both of which would experience the greatest increase in water elevation fluctuation as a result of the Proposed Action.

Normal operations at the reservoirs include annual average fluctuations in water levels ranging from 60 to 124 feet per year. Under the Proposed Action the average change in water level elevation would increase this average fluctuation by an extra one to three feet in any single year, with a maximum of four feet. Because the water level fluctuation is already so dramatic throughout the year, this increase of a maximum of four feet of water elevation drop would not significantly increase stress on individual Pacific pond turtle or affect populations of Pacific pond turtle that may be present within the reservoirs.

Changes in reservoir levels associated with the Proposed Action would have a less than significant impact on Pacific pond turtle in the Seller Service Area, as reservoirs would be operated within the same range as under the No Action/No Project Alternative. The additional change in reservoir elevation would be a small fraction of the total fluctuation experienced and would not affect the movement or survival of Pacific pond turtle in these reservoirs.

Cropland Idling/Shifting

Cropland idling/shifting actions could reduce habitat for Pacific pond turtle within irrigation canals and ditches associated with idled rice fields. As described in the giant garter snake discussion, above, cropland idling/shifting is expected to primarily affect rice acreage, with up to 60,693 acres idled under the Proposed Action, based on the crop idling/shifting simulations. There is potential for decreased water flows in irrigation and return ditches associated with seasonally flooded agriculture such as rice fields because these distribution systems would no longer be delivering water to the fields being idled. Pacific pond turtles potentially utilize these waterways and associated upland areas for forage, shelter, nesting, estivation, overwintering, and dispersal. Because the population of pond turtles in rice field landscapes is expected to use irrigation canals as their primarily habitat, impacts on the species resulting from water transfer activities that affect water availability within these canals would be significant.

Implementation of Mitigation Measure VEG and WILD-1 would ensure that adequate water is maintained in major irrigational canals that could be used by pond turtles and would prohibit crop idling of rice fields abutting established wildlife refuges that support higher quality habitat for pond turtles. With the maintenance of water within major canals where turtles could be present and restrictions on idling abutting refuges, aquatic turtle habitat necessary for foraging, cover, and movement would be retained. With implementation of these mitigation measures, impacts from cropland idling transfers on western pond turtle would be reduced to a less than significant level.

Special-Status Bird Species and other Migratory Birds

The Proposed Action could result in impacts to greater sandhill crane, black tern, purple martin, long-billed curlew, tricolored blackbird, white-faced ibis, yellow-headed blackbird, and other special-status and migratory birds by reducing available nesting, foraging, and roosting habitat through cropland idling, groundwater pumping, and reservoir drawdown actions.

Groundwater Substitution

Purple martin, tricolored blackbird, and yellow-headed blackbird may inhabit riparian areas and associated wetland habitats that could be impacted by groundwater substitution actions. As previously described, this activity has the potential to reduce flows in small streams within the Seller Service Area, which could reduce the amount or suitability of streams and associated wetland and riparian areas for special-status bird species. The reduction of suitable nesting habitat for rare birds within riparian habitats, a limited nesting resources, is considered potentially significant. Implementation of Mitigation Measure GW-1 (see Section 3.3, Groundwater Resources) that would monitor groundwater fluctuations and implement a revegetation plan for substantial vegetation loss would reduce this impact to less than significant.

Releases from Reservoir Storage

Some of the species above occur in wetlands associated with reservoirs that may be affected by the Proposed Action. As described in Section 3.8.2.4.1, the effect of water transfers on natural communities associated with these reservoirs and wetlands, would be less than significant because the elevation of the affected reservoirs fluctuates by scores of feet each year, and the additional increment of fluctuation caused by water transfers would be small and not substantial enough to significantly change nesting habitat conditions under normal operating conditions.

Cropland Idling/Shifting

Birds within the area of analysis can be associated with both upland croplands and/or seasonally flooded agriculture (e.g., rice). Greater sandhill crane and long-billed curlew are the species that would be affected by idling/shifting upland crops, although both use seasonally flooded agricultural fields, as well. Black tern, purple martin, tricolored blackbird, white-faced ibis, and yellow-headed blackbird would be affected by idling seasonally flooded agriculture. As described previously, the Proposed Action would result in the idling/shifting of up to 8,500 acres of upland crops (corn, alfalfa, tomatoes) and up to 60,693 acres of seasonally flooded agriculture (primarily rice). This corresponds to a reduction of approximately 5 and 12.8 percent, respectively, of the historically planted upland and seasonally flooded crops. Associated with this reduction in planted acreage are the potential loss of water within adjacent agricultural supply and return canals, which could affect habitats associated with these canals, as well as water supply to downstream users, including the wildlife management areas, as well as streams and wetland habitats.

Reducing seasonally flooded acreage in the Sacramento Valley would reduce summer forage for greater sandhill crane, long-billed curlew, tricolored blackbird, white-faced ibis, black tern and purple martin, yellow-headed blackbird, and other migratory birds, as well as potential nesting habitat for black terns and other migratory birds. Each of these species is discussed separately below.

Greater Sandhill Crane

One of five known greater sandhill crane populations in North America resides in the Central Valley (Littlefield et al. 1994). Though the Central Valley population does not breed within the area of analysis, the entire population winters in the Central Valley from Sacramento Valley south to the Bay-Delta (Pogson and Lindstedt 1991), roosting in areas of shallow water and foraging in adjacent areas of abundant waste rice, corn and other grains. Rice production cycle coincides with the bird’s seasonal behavior: it uses rice grain waste (and upland corn fields) for wintering and foraging habitat from October to early spring and it over winters when rice and corn are harvested (fall). Greater sandhill cranes exhibit site fidelity (Zeiner et al. 1990), typically returning to the same location each year to winter. Idling fields or crop shifting within areas that greater sandhill cranes historically return to, may affect their wintering distribution patterns due to reduced forage availability on idled or crop shifted fields. Although the birds would disperse as their main food source diminishes, crop idling and/or crop shifting could affect the timing of dispersal and could negatively affect those individuals that have not had sufficient time to prepare for winter migration (i.e., hyperphagia - dramatic increase in appetite and food consumption) (Smithsonian Institution 2012).

Although crop idling will reduce the amount of rice production by up to 12.8 percent in the area of analysis, this reduction in crops planted is not expected to affect the amount of post-harvest flooded agriculture that provides important winter forage for greater sandhill cranes. Farmers in the Sacramento Valley only flood-up a fraction of the cropland planted; typically around 60 percent in normal water years (Miller et al 2010, Central Valley Joint Venture 2006) and as little as 15 percent in critically dry years (Buttner 2014). The decision on whether to flood is not based on what was produced for the year but instead is determined by the availability of fall and winter water. Because the Proposed Action does not include transfers of rice decomposition water, it will not reduce the availability of water for post-harvest flooding and therefore is not expected to result in a reduction of winter forage for greater sandhill cranes. The location of cropland idling does have the potential to affect the use of historic roost sites, if those areas are not available to flood up because they were not planted. This impact is considered potentially significant. Implementation of Mitigation Measures VEG and WILD-1 includes avoiding crop idling near wildlife refuges and established wildlife areas that provide core wintering areas for greater sandhill crane and would reduce impacts on the crane population to a less-than-significant level.

Long-Billed Curlew

The curlew is a winter migrant in the Central Valley (Zeiner et al. 1990) where it generally forages on rice fields, upland croplands, and herbaceous plants. The Long-billed curlew breeds in elevated grasslands from April to September and returns to seasonally flooded agriculture (i.e. rice fields) during harvest (October through the end of fall). The curlew will use rice fields or other shallow open waters to forage for invertebrates from November through March. Winter curlews take advantage of seasonally flooded agricultural fields to probe for small prey items, but have been known to feed on dry fields. The idling of seasonally flooded agricultural fields would reduce foraging habitat for this species; however, birds would generally disperse to other fields to forage. Impacts to long-billed curlew would be similar to those described for greater sandhill crane as these species would forage in similar habitats. This impact is considered potentially significant.

Implementation of Mitigation Measure VEG and WILD-1 includes avoiding crop idling near wildlife refuges and established wildlife areas that provide core wintering areas for long-billed curlew and would reduce impacts on the crane population to a less-than-significant level.

Tricolored Blackbird

In the spring, Tricolored Blackbirds migrate to breeding locations in Sacramento County and throughout the San Joaquin Valley (Zeiner et al. 1990). They generally breed from March to July but have been observed breeding in the Sacramento Valley as early as October through December. The birds use breeding habitat adjacent to rice lands and will use shallow open water and rice land resources for foraging on small aquatic insects, emergent plants, and seeds. Tricolored Blackbirds also forage on cultivated grains (such as rice), on croplands and flooded fields, and forage for rice waste grain following harvest. Studies have shown that rice can constitute up to 38 percent of the annual diet of tricolored blackbirds (Zeiner et al. 1990).

Although the rice plants are not tall or sturdy enough to support nests, the seasonally flooded fields provide resources required for breeding colony locations, which consist of open access to water and suitable foraging space with insect prey. Tricolored blackbirds will use emergent vegetation in return ditches and irrigation canals associated with the seasonally flooded fields. The rice agriculture cycle provides insect forage in the flooded fields during the summer and waste grain forage over winter. Because the species has specific breeding requirements and there are limited by suitable breeding habitats, the same areas will often be used from year to year. Where changes in habitat prevent this, colonies are generally found in the vicinity of the previous year’s colony (Zeiner et al. 1990).

The primary concern for the tricolored blackbird’s association with rice fields is the use of the habitat as a source of insects and waste grain forage. Cropland idling/crop shifting would affect the population’s foraging distribution behavior and patterns and would reduce foraging and breeding habitat. Because rice idling would be dispersed throughout the Seller Service Area, the Proposed Action is not expected to substantially limit tricolored blackbird foraging habitat in the Seller Service Area. Therefore, impacts from cropland idling transfers on tricolored blackbird would be less than significant. Tricolored blackbirds would benefit from s Mitigation Measure VEG and WILD-1 that would ensure that adequate water is maintained in major irrigational canals that support insect prey and would prohibit crop idling of rice fields (source of forage) abutting established wildlife refuges where tricolored blackbird nesting potential is highest.

White-Faced Ibis

White-faced ibis is a winter migrant to the Central Valley. Important wintering locations include the Delevan-Colusa Butte Sink, northwestern Yuba County, the Yolo Bypass, Grasslands Wetlands Complex, and Mendota Wildlife Area (Zeiner et al. 1990). Central Valley breeding colonies can include the Mendota Wildlife Area and Colusa National Wildlife Refuge. White-faced ibis inhabit wetland habitat and seasonally flooded agricultural fields, including rice fields that provide abundant prey sources. Population declines are due to drainage of wetlands and loss of nesting habitat (Zeiner et al. 1990); seasonally flooded agricultural habitat have in part, replaced the lost wetland foraging habitat for this species. This species forages in seasonally flooded agricultural field during the summer, and forages in dry or flooded rice fields during the fall and winter. Cropland idling/crop shifting would reduce winter forage for this species, however, the species does not rely solely on flooded fields for foraging. Therefore, impacts from cropland idling/crop shifting actions on white-faced ibis would be less than significant. White-faced ibis would benefit from mitigation measures that are aimed at protecting giant garter snake, western pond turtle, and greater sandhill crane including Mitigation Measures VEG and WILD-1 that would ensure that adequate water is maintained in major irrigation canals that support insect prey and would prohibit crop idling of rice fields (source of forage) abutting established wildlife refuges.

Black Tern

Black terns were formerly a common spring and summer migrant, and despite the presence of suitable habitat in rice farming areas and croplands, black tern numbers have declined throughout its range, especially in the Central Valley (Zeiner et al. 1990). Flooded agricultural fields have, in part, replaced the lost emergent wetland breeding and foraging habitat for this species. The rice production cycle coincides with the bird’s seasonal behavior: field flooding would occur during the tern’s Central Valley breeding season (May through August) and fields are drained when the birds migrate to other habitat (September and October). During breeding season, the terns use flooded rice land and emergent vegetation for foraging (for insects and small vertebrates) and for nesting. This species constructs ground nests on dead vegetation; in rice fields, it will also nest on dikes that separate the patties.

Reduction of seasonally flooded agricultural habitat could adversely affect local populations. However, the decisions regarding cropland idling/shifting will have already been made prior to the onset of the species' breeding season, and they would be able to select appropriate nesting sites for that year. Active nest sites would not be affected by water transfer activities because decisions regarding rice idling would have already been made prior to the onset of the species' breeding season, and terns would be able to select appropriate nesting sites for that year. Therefore, impacts from cropland idling/shifting transfers on black tern would be less than significant. Black terns in the Seller Service Area would also benefit from Mitigation Measures VEG and WILD-1 that would ensure that adequate water is maintained in major irrigational canals that support insect prey and would prohibit crop idling of rice fields (source of forage) abutting established wildlife refuges where there is a higher likelihood of nesting terns.

Purple Martin

Purple martins are generally associated with valley foothill and riparian habitats and are primarily a resident of wooded areas. They may be found in a variety of open habitats during migration, including grassland, wet meadow, and fresh emergent wetlands, usually near water (Zeiner et al. 1990), and have been observed in the Seller Service Area (CDFW 2014). This species feeds on insects. Purple martin may occur in the area of analysis from March through August. This species could be impacted by a reduction in the amount of rice and wetland habitat acreage. As previously described, crop idling/shifting would reduce the amount of rice habitat by approximately 12.8 percent under the Proposed Action. Cropland idling/shifting would reduce forage for this species, however, the species does not rely solely on flooded fields for foraging. Therefore, impacts from cropland idling/shifting transfers on purple martins would be less than significant. Purple martin would benefit from Mitigation Measure VEG and WILD-1 that would ensure that adequate water is maintained in major irrigational canals that support insect prey and would prohibit crop idling of rice fields (source of forage) abutting established wildlife refuges where there is a higher likelihood of nesting purple martins.

Yellow-Headed Blackbird

The species is associated with freshwater emergent wetlands, along lakes and ponds. The yellow-headed blackbird uses these habitats for breeding, nesting, and roosting. These species have been observed in the Buyer Service Area and suitable habitat exists in both the Buyer and Seller Service Areas. Adults feed primarily on grains but eat insects during breeding season (Zeiner et al. 1990). Nesting colonies require dense emergent wetland vegetation and a large insect prey base; nesting is timed to coincide with maximum aquatic insect emergence.

Transfer actions coincide the blackbird's breeding season (mid-April to late July). This species could be impacted by a reduction in the amount of rice and wetland habitat. As previously described, cropland idling/shifting would reduce the amount of rice habitat by approximately 12.8 percent under the Proposed Action. Cropland idling/ shifting would reduce forage for this species, however, the species does not rely solely on flooded fields for foraging. Therefore, impacts from making water available for transfer through cropland idling/shifting actions on yellow-headed blackbirds would be less than significant. Yellow-headed blackbird would benefit from Mitigation Measure VEG and WILD-1 that would ensure that adequate water is maintained in major irrigational canals that support insect prey and would prohibit crop idling of rice fields (source of forage) abutting established wildlife refuges.

Mitigation Measures

With implementation of Mitigation Measures VEG and WILD – 1 (Section 3.8.4) and GW-1 (see Section 3.3, Groundwater Resources) the Proposed Action will avoid substantial adverse effects on special-status species.

Significance of Impacts after Mitigation (Effectiveness of Mitigation Measures)

With the implementation of Mitigation Measures GW-1 (see Section 3.3, Groundwater Resources) potentially significant impacts to special-status plants and migratory birds that occupy streamside habitats would be reduced to a less than significant level. With implementation of Mitigation Measure VEG and WILD-1, potentially significant impacts to giant garter snake, Pacific pond turtle, and special-status birds from potential reductions in emergent wetland communities and open water that provide habitat for these species would be reduced to a less than significant level.

With implementation of GW-1, groundwater wells within the seller's service area will be monitored by the seller with the goal of identifying whether groundwater substitution pumping is causing substantial adverse impacts on groundwater levels and associated vegetation that rely on shallow groundwater. If adverse effects on vegetation is recognized during monitoring, actions specified in the mitigation plan will be implemented immediately, which includes curtailment of pumping until natural recharge corrects the environmental impact and natural communities recover from any adverse effects of reduced flows. If actions taken to make water available for transfer result in loss of trees along streams, the seller will plant, maintain, and monitor replacement trees to ensure successful reestablishment of lost trees. Implementation of this measure would reduce significant effects on special-status plants and migratory birds that occupy streamside habitats because riparian vegetation that provides habitat to these species would recover as the result of natural groundwater recharge. VEG and WILD-1 includes measures to maintain water levels in major irrigation canals that support emergent wetland and riparian vegetation, which provides the predominant nesting substrate for migratory birds in agricultural landscapes. Retaining these habitats by continuing to supply water to these canals will prevent substantial loss of vegetation and open water for migratory birds that utilize these areas for nesting and foraging.

For potentially significant impacts to giant garter snake and Pacific pond turtle, Mitigation Measure VEG and WILD-1 will provide protection to these species with regard to cropland idling actions, including provisions for avoiding cropland idling actions in areas that could result in the substantial loss or degradation of habitats supporting important giant garter snake populations, and maintaining water levels in drainage canals to provide adequate habitat for giant garter snake. Maintaining water and suitable vegetation cover in canals and ditches abutting and connecting priority giant garter snake habitats provide opportunities for giant garter snake to relocate to or find additional foraging areas, as a result of reductions in rice cultivation from crop shifting/idling water transfers or due to typical crop rotation schedules. If water resources do become limiting for giant garter snake as a result of cropland shifting/idling, the water in these smaller drains and canals, as well as the required water in major drainage and irrigation canals, would aid movement of individuals to other foraging areas. Because Pacific pond turtles will use canals and ditches for movement corridors and foraging areas as well, this species would also benefit from these measures that aim at maintaining the primarily movement corridors for giant garter snake throughout the Seller's Service Area.

Mitigation Measure VEG and WILD-1 includes adaptive management actions that provide for an annual review with USFWS and other agencies to assess the previous years' cropland idling/shifting transfer actions, recent scientific literature and study results, and effectiveness of currently implemented conservation measures. This annual review will incorporate new research related to giant garter snake status with the sellers area and will facilitate timely implementation of adaptive management related to water transfer actions. Mitigation Measure VEG and WILD-1 also includes a requirement to identify whether the project conservation measures are effective in reducing impacts on giant garter snake to a less than significant level. The inclusion of giant garter snake research and monitoring, annual meetings and reports, and adaptive management flexibility will allow Reclamation to identify unexpected effects of the water transfer program and discuss appropriate corrective actions with USFWS and USGS in a timely manner.

Therefore, potentially significant impacts on giant garter snake and Pacific pond turtle would be reduced to a less-than-significant level in the Seller Service Area.

Buyer Service Area

Buyers would use the transferred water for agricultural or municipal and industrial purposes. This water would not interact with vegetation communities and special-status wildlife species; therefore, water made available for transfer under the Proposed Action would have no impact on special-status species within the Buyer Service Area.

Potential to cause a substantial adverse effect, such as a reduction in area or geographic range, on any riparian natural community, other sensitive natural community, or significant natural areas identified in local or regional plans, policies, regulations, or by CDFW or USFWS

Seller Service Area

<u>Cropland Idling/Shifting</u>

Actions to make water available for transfer would not alter water availability to National Wildlife Refuges and State Wildlife Areas within the Seller Service Area because these areas have dedicated water allocations. Because no direct habitat modification is proposed, no direct impacts on riparian or other sensitive natural community would result from the Proposed Action. However, transfers that result in reduced water delivery in the Seller Service Area and idled rice fields could indirectly impact wetland vegetation communities within irrigation canals. This impact is potentially significant because changes in water availability within canals could substantially reduce the amount of emergent wetland and riparian communities within rice field areas. With implementation of Mitigation Measure VEG and WILD-1, water levels in major irrigation canals that often support emergent wetland and riparian vegetation would be maintained at depths similar to depths in years without water transfers. Therefore, potentially significant impacts from water transfers on sensitive natural communities would be reduced to a less than significant level.

Groundwater Substitution

The effect of groundwater substitution actions on natural communities as it relates to reduction of stream flows could be significant, because groundwater substitution pumping would cause stream flows in Cache Creek, Stony Creek, Coon Creek, Little Chico Creek, and Bear River to be reduced by more than ten percent and greater than one cfs (Table I-1 in Appendix I of the RDEIR/SDEIS). The reduction in stream flow could result in a substantial adverse effect on riparian and wetland natural communities associated with these creeks because root zones would be dewatered to such an extent to cause die back of riparian tree and shrub foliage, branches or entire plants.

The Proposed Action would have a less than significant effect on natural communities that rely solely on ground water because increases in drawdown would be too small to cause a substantial effect on vegetation that relies on groundwater. Because groundwater modeling shows that shallow groundwater levels are more than 15 feet below ground surface in most locations that could be affected by groundwater substitution, potential impacts on natural communities are expected to be less than significant. Implementation of Mitigation Measure GW-1 (See Section 3.3, Groundwater Resources) would further minimize potential impacts to natural communities in areas where existing groundwater depths are less than 15 feet below ground surface, as described above for stream flow reduction.

Mitigation Measures

Implementation of Mitigation Measure VEG and WILD – 1 that would maintain at least 2 feet of water in the major irrigation and drainage canals (or no less than existing conditions) will also assist in avoiding substantial adverse effects on sensitive natural communities within rice growing areas because emergent wetland vegetation would continue to be supported in these areas. Implementation of Mitigation Measure GW-1 (See Section 3.3, Groundwater Resources) would further minimize potential impacts to natural communities in natural areas where existing groundwater depths are less than 15 feet below ground surface.

Significance of Impacts after Mitigation (Effectiveness of Mitigation Measures)

Implementation of Mitigation Measure GW-1 (See Section 3.3, Groundwater Resources), would reduce potentially significant impacts on natural communities (specifically mature riparian trees that rely heavily on groundwater) from ground water substitution actions to a less than significant level because it requires sellers to monitor existing groundwater wells so that they can identify areas where water levels are dropping and modify actions before significant effects occur. If monitoring data indicate that water levels have dropped below root zones of mature riparian trees (i.e., more than 10 feet, where groundwater was 10 to 25 feet below ground surface prior to starting the transfer of surface water made available from groundwater substitution actions), the seller must implement actions set forth in the mitigation plan. If historic data show that groundwater levels in the area where actions are being taken to make water available for transfer have typically varied by more than this amount annually during the proposed transfer period, then the transfer may be allowed to proceed. If no existing monitoring points exist in the shallow aquifer, monitoring would be based on visual observations by a qualified biologist of the health of these areas of deep-rooted vegetation until it is feasible to obtain or install shallow groundwater monitoring. If significant adverse impacts to deep-rooted vegetation (that is, loss of a substantial percentage of the deep-rooted vegetation as determined by Reclamation based on site-specific circumstances in consultation with a qualified biologist) occur as a result of the transfer despite the monitoring efforts and implementation of the mitigation plan, the seller will prepare a report documenting the result of the restoration activity to plant, maintain, and monitor restoration of vegetation for 5 years to replace the losses. By monitoring groundwater wells and riparian tree health to prevent riparian tree loss and mitigating any loss that occurs, Mitigation Measure GW-1 will ensure that the groundwater substitution actions do not result in significant impacts on riparian habitat.

Additionally, implementation of Mitigation Measure VEG and WILD-1 would reduce potentially significant impacts on natural communities from cropland idling/shifting actions to a less than significant level because it requires that the sellers maintain at least 2 feet of water in the major irrigation and drainage canals (or no less than existing conditions). Through these actions, emergent wetland and riparian natural communities that occur along major irrigation canals will persist during cropland idling/shifting actions.

Buyer Service Area

Buyers would use the transferred water for agricultural or municipal and industrial purposes. This water would not interact with natural communities; therefore, water made available for transfer under the Proposed Action would have no impact on natural communities within the Buyer Service Area.

Potential to interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites

Millions of waterfowl and hundreds of thousands of shorebirds, wading birds, and passerines use seasonally flooded agricultural areas in the Sacramento Valley during a portion of their winter stopover on the Pacific Flyway. Habitat use varies with rainfall, site-specific flooding cycles, post-harvest management practices, and the particular habitat requirements of each species. Waste grains provide a significant source of forage for waterfowl.

Irrigation ditches and canals and associated vegetation in the study area also provide movement corridors for a variety of resident wildlife species that occupy agricultural areas, including many species of birds, reptiles, and amphibians.

Seller Service Area

Idling fields or crop shifting may affect the wintering distribution patterns of migratory birds in agricultural areas due to reduced forage availability on idled or crop shifted fields. Although birds would disperse as their food source diminishes, crop idling and/or crop shifting could affect the timing of dispersal and could negatively affect those individuals that have not had sufficient time to prepare for winter migration (i.e., hyperphagia - dramatic increase in appetite and food consumption). Farmers in the Sacramento Valley only flood-up a fraction of the cropland planted; typically around 60 percent in normal water years (Miller et al 2010, Central Valley Joint Venture 2006) and as little as 15 percent in critically dry years (Buttner 2014). The decision on whether to flood is not based on what was produced for the year but instead is determined by the availability of fall and winter water. Because the Proposed Action does not include transfers of rice decomposition water, it will not reduce the availability of water for post-harvest flooding and therefore is not expected to result in a reduction of winter forage for migrating birds. The location of cropland idling does have the potential to affect the use of historic roost sites for certain species if those areas are not available to flood up because they were not planted. This impact is considered potentially significant.

Implementation of Mitigation Measure VEG and WILD-1 would avoid cropland idling near National Wildlife Refuges, State Wildlife Areas, and the Butte Sink that provide core wintering areas for many bird species and would minimize disruption of winter roost patterns. Implementation of Mitigation Measures VEG and WILD-1 would also maintain water levels and associated vegetation within irrigation canal and drains. Implementation of these measures would maintain potential foraging and nesting habitat in key areas and would reduce this impact to a less than significant level.

Cropland idling also has the potential to disrupt wildlife movement within irrigation and return ditches associated with rice agriculture because these distribution systems would no longer be delivering water to the fields being idled. This impact is considered potentially significant. Implementation of Mitigation Measures VEG and WILD-1 would ensure at least 2 feet of water (or no less than existing conditions) is maintained in major irrigation canals that could be used as movement and migration corridors for wildlife and would reduce this impact to a less than significant level.

Groundwater substitution pumping could reduce flows in small streams and wetlands associated with areas of groundwater withdrawal and in downstream areas. Reduced stream flows could result in stress on the riparian community and reduce riparian habitat suitability for the species and reduce the amount of available habitat. This impact is considered potentially significant. Implementation of Mitigation Measure GW-1 (see Section 3.3, Groundwater Resources) that would monitor groundwater fluctuations and implement a revegetation plan for substantial vegetation loss would reduce this impact to a less than significant level.

Mitigation Measure

Implementation of Mitigation Measure GW-1 (see Section 3.3, Groundwater Resources) would monitor groundwater fluctuations and implement a revegetation plan for substantial vegetation loss and Mitigation Measures VEG and WILD – 1 that would maintain adequate water in major irrigation and drainage canals as well as smaller drains and conveyance infrastructure. Implementation of Mitigation Measure VEG and WILD – 1 would also prohibit cropland idling of fields adjacent to National Wildlife Refuges, State Wildlife Areas, and the Butte Sink, which will also assist in avoiding substantial adverse effects on resident and migratory wildlife and established movement corridors.

<u>Significance of Impacts after Mitigation</u>

With implementation of Mitigation Measures GW-1 (see Section 3.3, Groundwater Resources), VEG and WILD-1, potentially significant impacts on resident or migratory wildlife and established movement corridors in the Seller Service Area would be reduced to a less-than-significant level.

Buyer Service Area

Buyers would use the transferred water for agricultural or municipal and industrial purposes. This water would not interact with wildlife; therefore, water made available for transfer under the Proposed Action would have no impact on resident or migratory wildlife within the Buyer Service Area.

3.8.2.5 Alternative 3: No Cropland Modifications

Under this alternative, water would not be made available through cropland idling or crop shifting actions. Water would be made available for transfer through groundwater substitution, stored reservoir releases, and conservation actions. The amount of water made available from each of these sources would be at the same levels as described for the Proposed Action.

3.8.2.5.1 Seller Service Area

Groundwater Levels

Groundwater Substitution Transfers

Groundwater substitution under the No Cropland Modifications Alternative could decrease available groundwater for natural communities relative to the No Action/No Project Alternative. The No Cropland Modifications Alternative would result in the same level of groundwater substitution pumping as the Proposed Action. Effects on natural communities and special-status plant and wildlife species are described in Section 3.8.2.4.3.

Reservoirs

The No Cropland Modifications Alternative could impact reservoir storage and reservoir surface area. Under the No Cropland Modifications Alternative, model output predicts that there would be no substantial (more than ten percent) decrease in end-of-month storage volume, reservoir elevation, or surface area relative to existing conditions in Shasta, Oroville, and Folsom reservoirs.

Changes in non-Project reservoirs participating in reservoir release transfers (Lake McClure and Camp Far West, Hell Hole, and French Meadows reservoirs) would be the same as described in the Proposed Action. Water elevations and storage levels during the transfer period would occur within the normal range of operations of these reservoirs under existing conditions. Overall, all reservoirs would continue to be operated according to their existing requirements and within their current range of operations under the No Cropland Modifications Alternative.

Impacts on Natural Communities and Special-Status Plants and Wildlife: Water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on natural communities and special-status plants and wildlife associated with reservoirs, because the changes caused by this alternative would occur within the normal range of operations for the reservoirs.

Rivers and Creeks

Sacramento River Watershed

The No Cropland Modifications Alternative could cause flows in rivers and creeks in the Sacramento River watershed to be lower than under the No Action/No Project Alternative. Under the No Cropland Modifications Alternative, mean monthly modeled flows would be reduced by less than ten percent on the Sacramento, Feather, Yuba, and American rivers. Based on the screening level criteria, these flow reductions are not considered substantial. Existing stream flow requirements (flow magnitude and timing, temperature, and other water quality parameters) would continue to be met. Among larger rivers, only the Bear River would have flows reduced by more than ten percent by the No Cropland Modifications Alternative. The effects of Alternative 3 on Bear River flows would be the same as described for the Proposed Action in Section 3.8.2.4.1.

Because smaller streams are affected only by groundwater, the effects of Alternative 3 on smaller streams would be the same as described for the Proposed Action in Section 3.8.2.4.1.

San Joaquin River Watershed

The effects to river flows in the San Joaquin and Merced rivers would be the same as those described for the Proposed Action in Section 3.8.2.4.1.

Delta

The No Cropland Modifications Alternative could cause Delta Outflows to be lower than under the No Action/No Project Alternative. Under the No Cropland Modifications Alternative, Delta outflows would not be more than 1.3 percent lower than flows under the No Action/No Project Alternative in any month or water year type. The maximum upstream shift in X2 location would be 0.1 km (0.2 percent) upstream during periods of decreased flow, and 0.6 km (0.7 percent) downstream during periods of increased flow. These flow changes would not have a significant impact on biological resources.

Impacts on Natural Communities and Special-Status Plants and Wildlife: Water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on natural communities and special-status plants and wildlife associated with Delta Outflow because this alternative would have very small effects on Delta hydrology. No impacts would be expected to occur to tidal perennial aquatic habitat, saline emergent wetland, and tidal freshwater emergent wetland, because this alternative would have very small effects on Delta hydrology.

3.8.2.5.2 Buyer Service Area

Reservoirs

San Luis Reservoir

The No Cropland Modifications Alternative could alter storage at San Luis Reservoir relative to the No Action/No Project Alternative. The effects to San Luis Reservoir storage would be the same as those described for the Proposed Action in Section 3.8.2.4.1.

3.8.2.6 Alternative 4: No Groundwater Substitution

3.8.2.6.1 Seller Service Area

Under this alternative, water would not be made available for transfer through groundwater substitution actions. Water would be made available for transfer through cropland idling or crop shifting, stored reservoir releases, and conservation actions. The amount of water made available from each of these sources would be at the same levels as described for the Proposed Action.

Groundwater Levels

Groundwater substitution pumping under the No Groundwater Substitution Alternative would not decrease available groundwater and therefore have no impacts on natural communities that rely on groundwater. Because the No Groundwater Substitution Alternative would not result in increased groundwater drawdown in relation to the No Action/No Project Alternative, no impacts to natural communities and special-status species would occur.

Reservoirs

The No Groundwater Substitution Alternative could impact reservoir storage and reservoir surface area. Under the No Groundwater Substitution Alternative, modeled storage volumes, reservoir elevations and surface areas would change. Model outputs predict that there would be no substantial (more than ten percent) decrease in end-of-month storage volume, reservoir elevation, or surface area relative to existing conditions in Shasta, Oroville, and Folsom reservoirs. Changes in non-Project reservoirs participating in reservoir release transfers (Lake McClure and Camp Far West, Hell Hole, and French Meadows reservoirs) would be the same as described in the Proposed Action in Section 3.8.2.4.1. Overall, all reservoirs would continue to be operated according to their existing requirements and within their current range of operations under the No Groundwater Substitution Alternative.

Impacts on Natural Communities and Special-Status Plants and Wildlife: Water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on natural communities and special-status plants and wildlife associated with reservoirs, because the changes caused by this alternative would occur within the normal range of operations for the reservoirs.

Rivers and Creeks

Sacramento River Watershed

The No Groundwater Substitution Alternative could cause rivers and creeks in the Sacramento River watershed to be lower than under the No Action/No Project Alternative. Under the No Groundwater Substitution Alternative, mean monthly modeled flows would be reduced by less than ten percent on the Sacramento, Feather, Yuba, and American rivers. Therefore, these flow reductions would not be considered substantial. Existing stream flow requirements (flow magnitude and timing, temperature, and other water quality parameters) would continue to be met. Therefore, the effects of the No Groundwater Substitution Alternative on terrestrial resources along these rivers would be less than significant. Among larger rivers, only the Bear River would have flows reduced by more than ten percent by the No Groundwater Substitution Alternative and, therefore, is further discussed in detail below.

Smaller streams in the Sacramento River watershed (see Table I-1 in Appendix I of the RDEIR/SDEIS for list of streams) would not be impacted by transfers under the No Groundwater Substitution Alternative because groundwater substitution would not occur.

Impacts on Natural Communities and Special-Status Plants and Wildlife: Water transfer actions under the No Groundwater Substitution Alternative would have no impact on surrounding natural communities and special-status plants and wildlife in the Sacramento, Feather, Yuba, and American rivers and in smaller streams within the Sacramento River watershed, as no changes in streamflow would occur and there would be no effect on habitat.

Bear River

The No Groundwater Substitution Alternative could cause Bear River flows to be lower than under the No Action/No Project Alternative. Under the No Groundwater Substitution Alternative, the only flow reduction greater than ten percent would occur in critical water years during February (approximately 18 percent, or 45 cfs lower). These flow reductions would occur only in one month during critical water years.

Average monthly flows would be higher, compared to the No Action/No Project Alternative, in critical water years during July (approximately 240 percent, 58 cfs), and dry years during July and August (52 percent, 38 cfs and 22 percent, three cfs, respectively) when water is released from Camp Far West Reservoir for transfer.

Impacts on Natural Communities: Flow decreases, resulting from water transfer actions under the No Groundwater Substitution Alternative, would occur in winter months, when terrestrial plants and animals are less dependent on stream flow. While flows would be reduced in some years in winter, they would remain within the normal range of variability experienced under the No Action/No Project condition and would occur only during winter critical years (approximately one year in every five). Flows would be higher in summer during dry and critically dry years, which would benefit riparian vegetation along the Bear River. Therefore, overall the flow changes that would occur on the Bear River under the No Groundwater Substitution Alternative would be beneficial to natural communities.

Impacts on Special-Status Plants and Wildlife: Water transfer actions under the No Groundwater Substitution Alternative would be beneficial to terrestrial special-status wildlife species and plants, because summer flows would be higher than under the No Action/No Project condition and flow reduction during winter in some years would not affect special-status species habitat.

San Joaquin River Watershed

San Joaquin River

The No Groundwater Substitution Alternative could cause San Joaquin River flows to be lower than under the No Action/No Project Alternative. Under the No Groundwater Substitution Alternative, flows would be reduced by less than ten percent on the San Joaquin River relative to the No Action/No Project Alternative. Based on the screening level criteria, these flow reductions would not be considered substantial. Further, there would be a 162.6 cfs (15 percent) increase in flows in dry water years during July.

These flow changes would not have a significant impact on biological resources because small reductions in flow within the San Joaquin River would be within historical fluctuations and would not have an adverse effect on natural communities or wildlife habitat.

Impacts on Natural Communities and Special-Status plants and Wildlife: Water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on natural communities and special-status plant and wildlife habitat along the San Joaquin River, because changes in flow would be small and would have little to no effect on habitat.

Merced River

The No Groundwater Substitution Alternative could cause Merced River flows to be lower than under the No Action/No Project Alternative. Under the No Groundwater Substitution Alternative, flows in the Merced River would be reduced by less than ten percent relative to the No Action/No Project Alternative in all months and water year types. Flows would be 124 percent (163 cfs) and 59 percent (70 cfs) higher under the No Groundwater Substitution Alternative compared to the No Action/No Project Alternative in dry and critical water years, respectively, during July. While these flow changes exceed the ten percent screening criterion, the flow changes on the Merced River would not have a significant impact on biological resources, as flows would remain within the range that would occur under the No Action/No Project Alternative during this time of year.

Impacts on Natural Communities and Special-Status plants and Wildlife: Water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on natural communities and special-status plants and wildlife along the Merced River, as flows would not be substantially decreased, would remain within the range of variability projected for the No Action/No Project alternative, and would have little to no effect on habitat.

Delta

Delta Outflow

The No Groundwater Substitution Alternative could cause Delta Outflows to be higher than under the No Action/No Project Alternative. Under the No Groundwater Substitution Alternative, Delta outflows would not be more than one percent lower than outflows under the No Action/No Project Alternative in any month or water year type.

The maximum upstream shift in X2 location would be 0.1 km (0.1 percent) upstream during periods of decreased flow, and 0.8 km (0.5 percent) downstream during periods of increased flow. These changes to Delta outflow, and resultant changes in X2 position, would not have a substantial impact on biological resources because the change is minimal (less than ten percent).

These flow changes would not have a significant impact on biological resources.

Impacts on Natural Communities: Water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on natural communities and special-status plants and wildlife associated within the Delta, because changes in Delta hydrology would be small and is not expected to affect special-status species habitats within the Delta. No impacts are expected to occur to tidal perennial aquatic habitat, saline emergent wetland, and tidal freshwater emergent wetland.

3.8.2.5.2 Buyer Service Area

Reservoirs

San Luis Reservoir

The No Groundwater Substitution Alternative would alter surface water elevation and reservoir storage at San Luis Reservoir relative to the No Action/No Project Alternative. Under the No Groundwater Substitution Alternative, neither CVP nor SWP storage at San Luis Reservoir would change relative to the No Action/No Project Alternative, and thus would have no effect on natural communities or special-status species associated with this reservoir.

3.8.3 Comparative Analysis of Alternatives

Table 3.8-4 summarizes the effects of each of the action alternatives. The following text supplements the table by describing the magnitude of the effects under the action alternatives and No Action/No Project Alternative.

Table 3.8-4.
Comparative Analysis of Alternatives

Potential Impact	Alternative	Significance[1]			Significance after Mitigation	
		Natural Communities	Special-Status Species	Proposed Mitigation	Natural Communities	Special-Status Species
Water made available through groundwater substitution actions could reduce groundwater levels and available groundwater for natural communities.	2, 3	LTS	LTS	None	LTS	LTS
Transfers could impact reservoir storage and reservoir surface area and alter habitat availability and suitability associated with those reservoirs.	2, 3, 4	LTS	LTS	None	LTS	LTS

Potential Impact	Alternative	Significance[1]			Significance after Mitigation	
		Natural Communities	Special-Status Species	Proposed Mitigation	Natural Communities	Special-Status Species
Transfers could reduce flows in large rivers in the Sacramento and San Joaquin River watersheds, altering habitat availability and suitability associated with these rivers.	2, 3, 4	LTS	LTS	None	LTS	LTS
Water made available through groundwater substitution actions could reduce stream flows supporting natural communities in some small streams.	2, 3	S	S	GW-1, VEG and WILD-1	LTS	LTS
Transfer actions could alter hydrologic conditions in the Delta, altering associated habitat availability and suitability.	2, 3, 4	LTS	LTS	None	LTS	LTS
Water made available through cropland idling/shifting actions could alter habitat availability and suitability for upland species.	2, 4	LTS	LTS	None	LTS	LTS
Water made available through cropland idling/shifting actions could alter the amount of suitable habitat for natural communities, special-status wildlife species, and migratory birds associated with seasonally flooded agriculture and associated irrigation waterways.	2, 4	S	S	VEG and WILD-1	LTS	LTS
Transfers could impact San Luis Reservoir storage and surface area.	2, 3, 4	LTS	LTS	None	LTS	LTS
Transfers could alter planting patterns and urban water use in the Buyer Service Area.	2, 3, 4	LTS	LTS	None	LTS	LTS
Transfers could affect wetlands that provide habitat for special status plant species.	2, 3, 4	--	S	GW-1, VEG and WILD-1	LTS	LTS
Transfers could affect giant garter snake and Pacific pond turtle by reducing aquatic habitat.	2, 3, 4	--	S	GW-1, VEG and WILD-1	LTS	LTS
Transfers could affect the San Joaquin kit fox by reducing available habitat.	2, 3, 4	--	LTS	None	LTS	LTS
Transfers could impact special status bird species and migratory birds.	2, 3, 4	--	S	GW-1, VEG and WILD-1	LTS	LTS

[1] LTS = Less than significant, S = Significant

3.8.3.1 Alternative 1: No Action/No Project Alternative

There would be no changes in agricultural use or water availability in the Seller Service Area relative to existing conditions. In the Buyer Service Area, land idling could occur in response to CVP water shortages which could affect habitat availability, but this would be similar to existing conditions. Conditions for natural communities and special-status species would remain the same as under existing conditions.

3.8.3.2 Alternative 2: Full Range of Transfers (Proposed Action)

Water made available for transfer through cropland idling, groundwater substitution, and reservoir storage release actions could affect the availability of water in the Seller Service Area and the availability and suitability of habitat. This could affect conditions for special-status species relative to the No Action/No Project Alternative, but the effects with the implementation of Mitigation Measure VEG and WILD-1 would be less than significant to both natural communities and special-status species. The Proposed Action would increase water supplies to agricultural users and M&I in the Buyer Service Area, and the effects of using the water would be within the range of existing activities under the users' water service contracts.

3.8.3.3 Alternative 3: No Cropland Modifications

The No Cropland Modifications Alternative would not include cropland idling/shifting as a mechanism for making water available for transfer. Effects would continue to occur from water made available for transfer through groundwater substitution and reservoir storage release actions at the same levels described for the Proposed Action. The effects of this alternative with implementation of Mitigation Measure VEG and WILD-1 would be less than significant to both natural communities and special-status species. The Proposed Action would increase water supplies to agricultural users and M&I in the Buyer Service Area, and the effects of using the water would be within the existing activities under the users' water service contracts.

3.8.3.4 Alternative 4: No Groundwater Substitution

The No Groundwater Substitution Alternative would not include groundwater substitution as a mechanism for making water available for transfer. Effects would continue to occur from water made available for transfer through cropland idling/shifting and reservoir storage release actions. The amount of cropland idled/shifted would be greatest under this alternative, while water made available through reservoir storage release actions would be similar to the Proposed Action. The effects of this alternative with the implementation of Mitigation Measure VEG & WILD-1 would be less than significant to both natural communities and special-status species. The Proposed Action would increase water supplies to agricultural users and M&I in the Buyer Service Area, and the effects of using the water would be within existing activities under the users' water service contracts.

3.8.4 Mitigation Measures

With implementation of Mitigation Measures VEG and WILD – 1 and GW-1 described in Section 3.3, Groundwater Resources, during years in which water transfer actions occur, the Proposed Action will avoid substantial adverse effects on special-status species.

Mitigation Measure VEG and WILD-1: Protect Existing Habitat for Terrestrial Wildlife

Mitigation Measure VEG and WILD-1 includes measures to avoid potentially significant impacts to terrestrial species associated with cropland idling transfers and reduce any potential impacts to less than significant:

1. As part of the review and approval process for proposed water transfers, Reclamation will have access to the land to verify how the water for transfer is being made available and to verify that actions to protect the giant garter snake are being implemented.
2. Movement corridors for aquatic species (including pond turtle and giant garter snake) include major irrigation and drainage canals. The water seller will keep adequate water in major irrigation and drainage canals. Canal water depths should be similar to years when transfers do not occur or, where information on existing water depths is limited, at least two feet of water will be considered sufficient.
3. Maintaining water in smaller drains and conveyance infrastructure supports key habitat attributes such as emergent vegetation for giant garter snake escape cover and foraging habitat. If cropland idling/shifting occurs, Reclamation will work with sellers to document that adequate water remains in drains and canals. Documentation may include flow records, photo documentation, or other means of documentation subject to approval by Reclamation and USFWS.
4. Fields abutting or immediately adjacent to areas with known important giant garter snake populations (Appendix H) will not be permitted to participate in cropland idling/shifting transfers. Important giant garter snake populations are defined for purposes of this mitigation measure as populations previously identified by biologists from USFWS, USGS, and possibly contract biologists. These populations of giant garter snakes were identified early on as identified in previous consultations and are in, or connected to, areas that are considered public or protected. Most of these areas have specific management plans for giant garter snakes either for mitigation or as wildlife refuges. One factor influencing the importance of these areas is that they can provide a refuge for snakes independent of rice production. Fields abutting or immediately adjacent to the following areas are considered important giant garter snake populations:
    - Little Butte Creek between Llano Seco and Upper Butte Basin Wildlife Area
    - Butte Creek between Upper Butte Basin and Gray Lodge Wildlife areas
    - Colusa Basin drainage canal between Delevan and Colusa National Wildlife Refuges
    - Gilsizer Slough
    - Colusa Drainage Canal
    - Land side of the Toe Drain along the Sutter Bypass
    - Willow Slough and Willow Slough Bypass in Yolo County
    - Hunters and Logan Creeks between Sacramento and Delevan National Wildlife Refuges
    - Lands in the Natomas Basin

5. At the end of the water transfer year, Reclamation will prepare an annual monitoring report that contains the following:
    a. Maps of rice production and all cropland idling actions within the seller district that occurred within the range of potential transfer methods analyzed in this RDEIR/SDEIS.
    b. Results of current scientific research, summary of monitoring pertinent to water transfer actions, and new giant garter snake detections.
    c. Discussion of conservation measure effectiveness.
    d. Cumulative history of crop idling and crop shifting specifically to make water available for transfers within the sellers area.

   The report will be submitted to the USFWS and CDFW no later than January 31, prior to the next year of potential transfers
6. Reclamation will establish annual meetings with the Service to discuss the contents and findings of the annual report. These meetings will be scheduled following the distribution of the monitoring report and prior to February 28.
7. If, upon Reclamation's review of monitoring reports or other scientific literature, it appears that the Project is having unanticipated effects on the giant garter snake, Reclamation will contact the Service to discuss the information available and effectiveness of Project conservation measures.
8. Reclamation will monitor the effectiveness of the conservation measures by funding giant garter snake distribution and occupancy research. The research, conducted by USGS, includes annual sampling of giant garter snake within the action area and focuses on their distribution and occupancy dynamics. The research is designed to evaluate the effectiveness of the conservation measures to maintain giant garter snake occupancy at sites transferring water via this program.

3.8.5 Potentially Significant Unavoidable Impacts

None of the alternatives would result in potentially significant unavoidable impacts on natural communities or special-status plant and wildlife species.

3.8.6 Cumulative Impacts

The timeframe for the cumulative effects analysis extends from 2019 through 2024, a six-year period. The cumulative effects area of analysis for vegetation and wildlife is the same as the area of analysis shown in Figure 3.8-1. This section analyzes cumulative effects using the methods described in Chapter 4 of the 2014 Draft EIS/EIR.

The projects considered for the vegetation and wildlife cumulative condition are the SWP water transfers, CVP Municipal and Industrial Water Shortage Policy (WSP), Lower Yuba River Accord, refuge transfers, San Joaquin River Restoration Program (SJRRP), and Exchange

Contractors 25-Year Water Transfers, described in more detail Chapter 4 of the 2014 Draft EIS/EIR. SWP transfers could involve groundwater substitution pumping in the Seller Service Area and, therefore, could affect vegetation and wildlife resources. The WSP could reduce agricultural water deliveries and increase land idling in the Buyer Service Area. Effects of the WSP in the Seller Service Area would be minor as agricultural water supplies to the sellers (who are primarily Sacramento River Settlement Contractors) would not substantially change relative to existing conditions.

The following section describes potential vegetation and wildlife resources cumulative effects for each of the proposed alternatives.

3.8.6.1 Alternative 2: Full Range of Transfers (Proposed Action)

3.8.6.1.1 Seller Service Area

Water made available for transfer through groundwater substitution and cropland idling/shifting actions under the Proposed Action in combination with other cumulative projects could decrease available groundwater for natural communities relative to the No Action/No Project Alternative. The SWP water transfers would make up to 6,800 acre-feet of water available through groundwater substitution actions for transfer and up to 89,930 acre-feet through cropland idling actions. The sellers for the SWP transfers are located in the Feather River Basin and receive water from Lake Oroville. There would be minimal geographic overlap between SWP transfers and the range of potential water transfers identified in the Proposed Action.

The WSP is primarily a policy development program and planning tool to clearly define water shortage conditions and what reductions in allocation CVP users should expect in the event of a Condition of Shortage. The WSP could reduce agricultural water deliveries and increase land idling in the Buyer Service Area. Effects of the WSP in the Seller Service Area would be minor as agricultural water supplies to the sellers (who are primarily Sacramento River Settlement Contractors) would not substantially change relative to existing conditions.

The effects of the Proposed Action on groundwater dependent natural communities would be small and local and the cumulative effect in combination with SWP water transfers and the WSP would have a less than significant cumulative effect on groundwater dependent natural communities and special-status wildlife.

The Proposed Action in combination with other cumulative projects could cause flows in rivers and creeks in the Sacramento River watershed to be lower than under the No Action/No Project Alternative. The sellers for the SWP transfers are in the Feather River Basin and receive water from Lake Oroville. There would be minimal geographic overlap between this program and the Proposed Action, and therefore their effects on the flows in rivers and creeks in the Sacramento River watershed and the vegetation and wildlife resources that depend on them.

The WSP could reduce agricultural water deliveries and increase land idling in the Buyer Service Area. Effects of the WSP in the Seller Service Area would be minor as agricultural water supplies to the sellers (who are primarily Sacramento River Settlement Contractors) would not substantially change relative to existing conditions. Therefore, changes on flows in rivers and creeks in the Sacramento River watershed and the vegetation and wildlife resources that depend on them would not be substantial.

The Lower Yuba River Accord is a set of agreements designed to provide additional water to meet fisheries needs in the lower Yuba River. In addition, up to 60,000 acre-feet of water per year would be made available for purchase by Reclamation and DWR for fish and environmental purposes. The Accord would provide a benefit to environmental resources within its action area and there would be no cumulative effect on vegetation and wildlife resources. Impacts of the Proposed Action are not cumulatively considerable with the other projects because each of the projects would have little or no impact on flows in rivers and creeks in the Sacramento River watershed or the vegetation and wildlife resources that depend on them.

The Proposed Action in combination with other cumulative projects could affect reservoir storage and reservoir surface area. Changes to reservoir storage from SWP transfers, WSP, Yuba Accord, refuge transfers, SJRRP, and Exchange Contractors 25-Year Water Transfers would be within the normal range of operations of the reservoirs. Overall, all reservoirs would continue to be operated according to their existing regulatory requirements under each of the projects. Therefore, the Proposed Action in combination with other cumulative projects would not have significant cumulative effects on vegetation and wildlife in reservoirs.

The Proposed Action in combination with other cumulative projects could cause flows in rivers and creeks in the San Joaquin River watershed to be lower than under the No Action/No Project Alternative. The SJRRP would increase flows and improve habitat conditions in and along the San Joaquin River to support spring-run and fall-run Chinook salmon, steelhead and other native fish. Portions of the Buyers service area border the area affected by the SJRRP, but do not directly overlap this area. The SJRRP would create additional habitat for sensitive vegetation and wildlife species by increasing flows and expanding floodplains. Refuge transfers could result in small increases in San Joaquin River flows if transfers from Merced ID are conveyed to refuges by flowing down the San Joaquin River to the Delta. Therefore, these actions would not be cumulatively adverse in combination with the Proposed Action and there would be no adverse cumulative effect on vegetation and wildlife resources.

The Proposed Action in combination with other projects could cause changes to Delta hydrology relative to the No Action/No Project Alternative. SWP transfers, WSP, Yuba Accord, refuge transfers, and the SJRRP would have small effects on Delta hydrology and operations of these projects, and the Proposed Action would be in compliance with applicable BOs for CVP and SWP operations. Generally, the SWP transfers, Yuba Accord, refuge transfers, and the Proposed Action would increase flows in the Delta during the dry season and decrease flows slightly during other times of year. The SJRRP would increase inflows into the Delta, and the WSP would have minimal effects on Delta flows. The Proposed Action, in combination with other cumulative projects, would have only small effects on flows in the Delta, which would not result in a cumulative significant impact related to vegetation and wildlife resources.

3.8.6.1.2 Buyer Service Area

The Proposed Action in combination with other cumulative projects could alter planting patterns and urban water use relative to the No Action/No Project Alternative. Exchange contractors would sell up to 150 thousand acre-feet to willing buyers under the Exchange Contractors 25-

Year Water Transfers, including many of the buyers for water transfers. The Exchange Contractors service area does not overlap geographically with the Seller Service Area. However, both projects could sell their water to the same buyers. No buyer would be allowed to purchase more than their maximum CVP contract amount under the combined programs, so effects of the Proposed Action in combination with those of the Exchange Contractors 25-Year Water Transfer project constitute existing activities under their CVP contracts and associated BOs. Therefore, the Proposed Action in combination with other cumulative projects would not have a significant cumulative effect on vegetation and wildlife resources.

3.8.6.2 Alternative 3: No Cropland Modification

The cumulative effects of Alternative 3 and other cumulative projects would be the same as those described for the Proposed Action.

3.8.6.3 Alternative 4: No Groundwater Substitution

Water made available for transfer through cropland idling/shifting actions under Alternative 4 would have the same effects as described in the Proposed Action; therefore, cumulative effects would be the same as effects of cropland idling/shifting actions described for the Proposed Action.

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