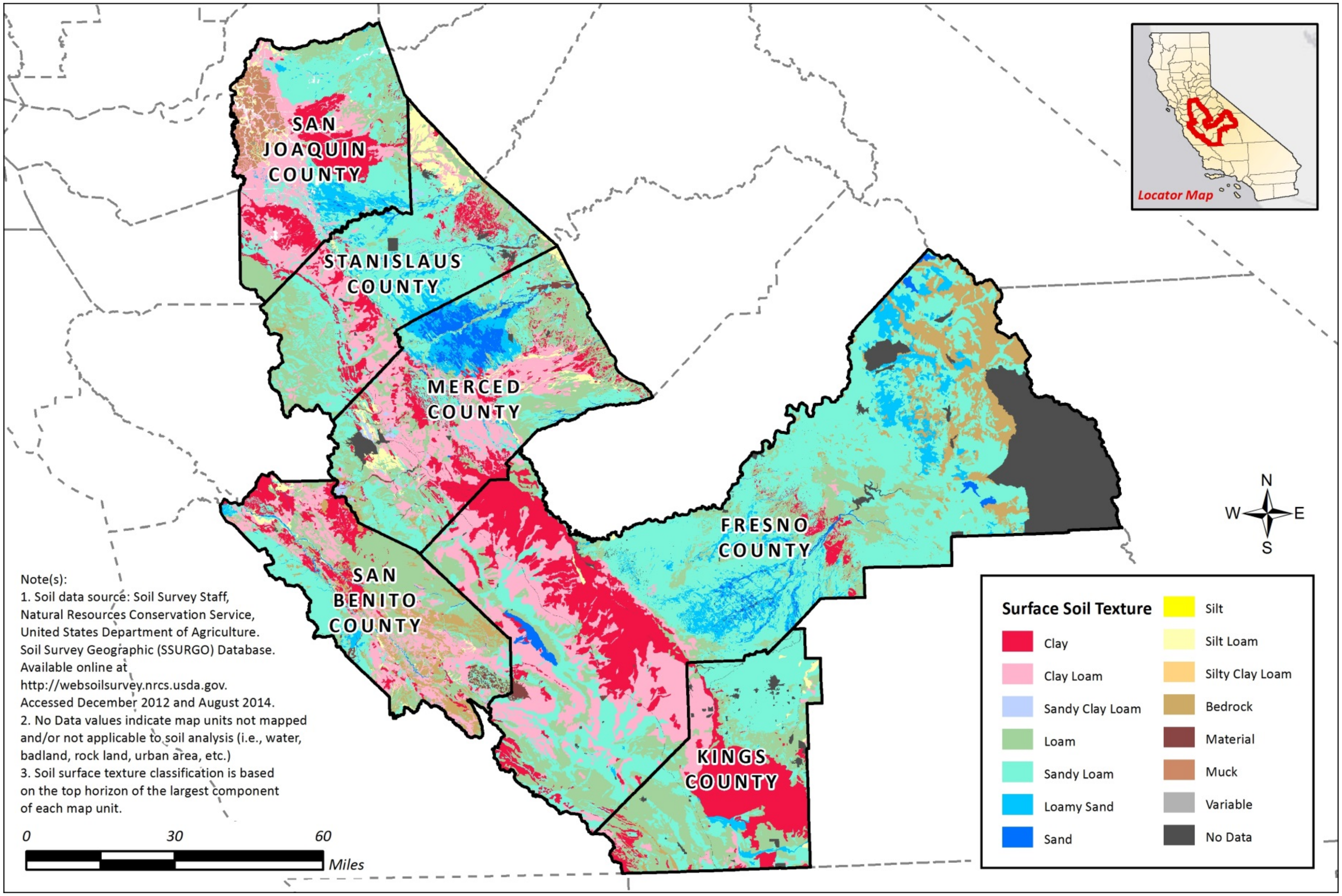

Figure 3.4-5. Soil Surface Texture – Buyer Service Area

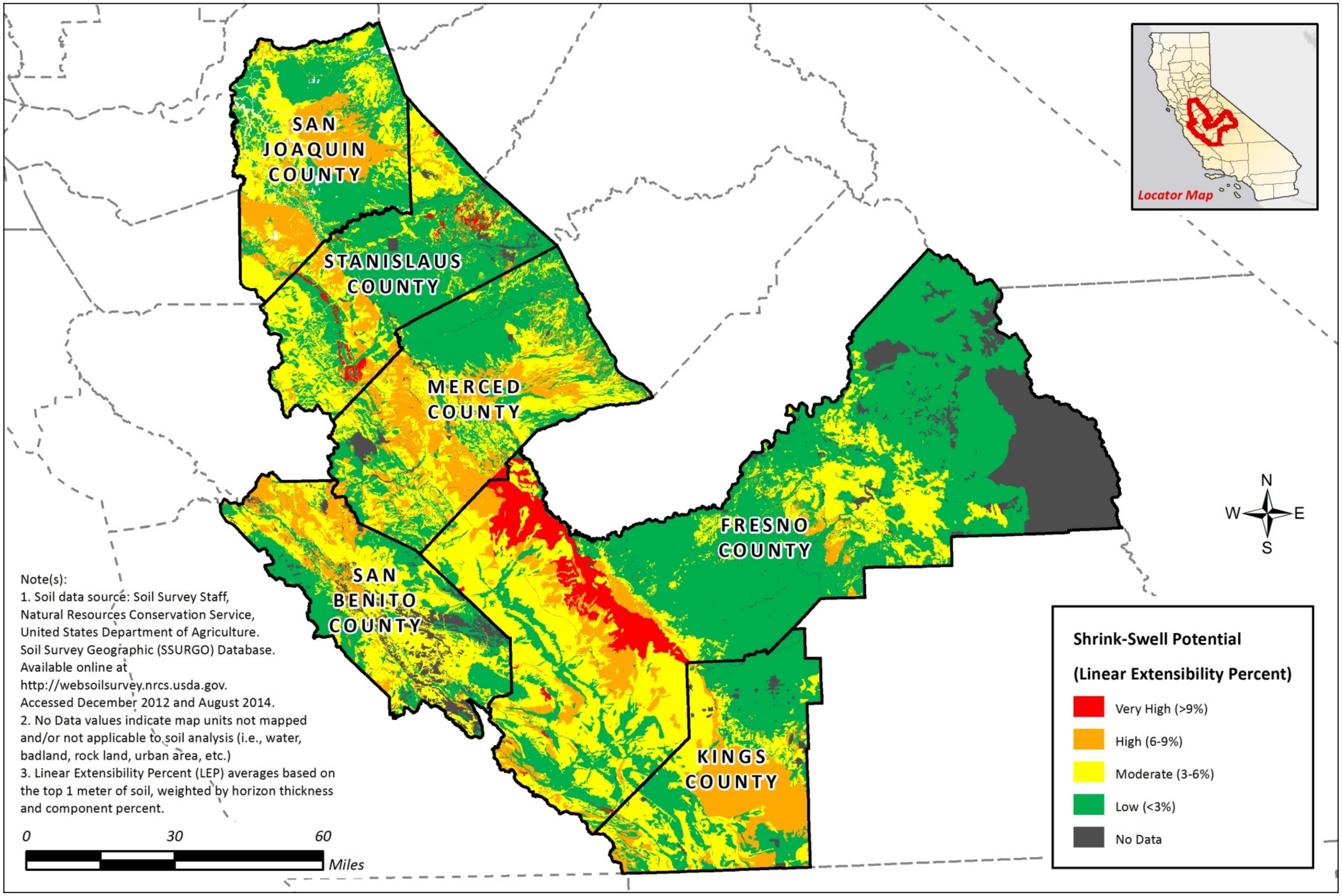

Figure 3.4-6. Shrink-Swell Potential – Buyer Service Area

of the county is defined by the Coast Ranges and consists mainly of clay loam, gravelly clay loam, loam, sandy loam, and silty clay loam (USDA NRCS 2006). The alluvial fans extending eastward into the valley are comprised of clay, clay loam, and sandy loam soils. Lands adjacent to the San Joaquin River include soils with clay and clay loam textures (USDA NRCS 2006).

San Benito County

Soils in the eastern part of the county are mainly comprised of clay, silty clay, and gravelly loam. These soils have low erodibility and low to moderate shrink-swell potentials. Soils in the northeastern part of the county have moderate to high shrink-swell potentials. In the central part of the county, the dominant soil textures are clay, clay loam, and bedrock. These soils have low erodibility and moderate shrink-swell potentials. The western part of the county is characterized by sandy clay loam and sandy loam soils. These soils have mid-range erodibility and low to high shrink-swell potentials.

Kings County

The northeastern part of the county is characterized by fine sandy loam, clay loam, and very fine sandy loam soils. These soils have high erosion potentials and low shrink-swell potential (USDA NRCS 2009h; 2009i; 2009j). Moving south, there is a band of loam soils that border the clay area of the Tulare Lake bed. These soils have low erodibility and low to high shrink-swell potentials. The northwestern edge of the county is predominantly comprised of clay loam soils with low erosion potential and moderate shrink-swell potential. The southwestern area of the county is largely loam with some areas of gravelly sandy loam, sandy loam, and coarse sandy loam. The areas of sandy loam and loam are characterized by mid-range erodibility and low shrink-swell potential. The loam, gravelly sandy loam, and coarse sandy loam areas in the southwestern corner of the county have low erodibility and low to high shrink-swell potential (USDA NRCS 2009h; 2009i; 2009j).

3.4.2 Environmental Consequences/Environmental Impacts

The following sections present the assessment methods to evaluate geology and soils effects and describe the environmental consequences/environmental impacts associated with the No Action/No Project Alternative and action alternatives.

3.4.2.1 Assessment Methods

Cropland idling is the only water transfer method with the potential to affect geology and soils. Cropland idling would create bare fields that could result in the following effects:

- Erosion of soils from wind blowing over fields with no vegetative cover.

- Changes in soil moisture and resulting shrinking and swelling from different irrigation patterns.

The potential for erosion and expansion are assessed qualitatively based on the general distribution of soil textures and the corresponding erosion and expansion properties related to the various soil textures. As described in more detail above in Section 3.4.1.2.1, soils become more erosive as their content of fine sand increases. Soils that contain greater percentages of larger diameter particles are less susceptible to erosion. This trend is somewhat reversed when it comes to the expansiveness of soils. Soils with more sands and gravel components are less affected by changes in moisture content, and therefore, do not expand as greatly as soils with higher silt and clay content.

3.4.2.2 Significance Criteria

Impacts related to geology and soils would be considered potentially significant if implementation of the alternative would:

- Result in substantial soil erosion.

- Result in a substantial risk to life or property due to location on an expansive soil.

This project does not involve construction of new structures; therefore, it does not include geology and soils significance criteria related to that type of construction (such as criteria related to seismic risk, landslides, or unstable soil).

3.4.2.3 Alternative 1: No Action/No Project

There would be no changes to soil erosion under the No Action/No Project Alternative. There would be no cropland idling transfers originating in the Seller Service Area; therefore, potential for soil erosion in the Seller Service Area would be the same as existing conditions.

Under the No Action/No Project Alternative, agricultural water users in the Buyer Service Area may increase the amount of land idled during the crop season in response to Central Valley Project (CVP) shortages, which would leave soils susceptible to erosion. Figure 3.4-5 shows surface soil textures in the counties in the Buyer Service Area. Agricultural lands in these counties are largely composed of clays and clay loam soils, which have low erodibility. Smaller areas also consist of loams, sandy loam, and loamy sand. These soils are slightly more erodible than clays.

Under normal farming practices, farmers leave fields idle during some cropping cycles and manage potential soil erosion impacts to avoid substantial loss of soils and to protect soil quality. Some examples include surface roughening tillage to produce clods, ridges, and depressions to reduce wind velocity and trap drifting soil; establishment of barriers at intervals perpendicular to wind direction; or, application of mulch (USDA NRCS 2009). Farmers would likely apply these same approaches to any increased crop acreage idled under the No Action/No Project Alternative to protect the soil quality and reduce erosion for future planting.

Since there would be no water transfers under the No Action/No Project Alternative, there would be no changes to streamflows and no impacts to stream and river bank erosion.

There would be no changes to shrinking or swelling of soils under the No Action/No Project Alternative. There would be no cropland idling transfers originating in the Seller Service Area; therefore, potential risks of soils shrinking and swelling in the Seller Service Area would be the same as existing conditions.

Under the No Action/No Project Alternative, there is a possibility for increased land idling in the Buyer Service Area as a result of CVP shortages. Figure 3.4-6 shows the shrink-swell potentials of soils in San Joaquin, Stanislaus, Merced, San Benito, Fresno, and Kings counties. Shrink-swell potential in these counties ranges from low to very high; however, the majority of soils have moderate shrink-swell potential.

Soil movement through shrinking and swelling can cause damage to structures and/or roads built on or near the expansive soils. Under existing conditions, agricultural soils shrink and swell in response to winter rains and irrigation cycles (soils are irrigated, then left to dry out, then irrigated again). Therefore, agricultural lands are subject to normal swelling and shrinkage during growing and harvesting cycles and structures and roads in the vicinity of the cropland are also subject to these changes. Thus, the shrinking and swelling of soils as a result of increased idling under the No Action/No Project Alternative would not damage structures or pose a risk to life or property.

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

Cropland idling transfers in the Seller Service Area could result in temporary conversion of lands from cropland to bare fields, which could increase soil erosion. Table 3.4-2 shows potential maximum annual acreage for cropland idling in the Sellers Service Area.

Table 3.4-2. Maximum Annual Cropland Idling under the Proposed Action (Acres)

Region	Rice	Alfalfa[1]/ Sudan Grass	Corn	Tomatoes	Total
Sacramento River Region	40,704	1,400	400	400	42,904
Feather River Region	10,769	600	800	400	12,569
Delta Region	-	3,000	1,500	-	4,500
Total	**51,473**	**5,000**	**2,700**	**800**	**59,973**

[1] Alfalfa cannot be idled within the legal boundaries of the Delta

Rice fields are proposed for idling in Colusa, Glenn, Butte, Yolo, and Sutter counties. Rice is typically grown on clay soils that are less susceptible to erosion than sandy soils. The rice crop cycle also reduces the potential for erosion. The process of rice cultivation includes incorporating the residual rice straw into the soils after harvest. The fields are then flooded during the winter to aid in decomposition of the straw. If no irrigation water is applied to the fields after this point, the soils would remain moist until approximately mid-May. Once dried, the combination of the decomposed straw and clay soils produces a hard, crust-like surface. This surface texture would remain until the following winter rains if not disturbed. In contrast to sandy topsoil, this surface type would not be conducive to soil loss from wind erosion. Therefore, idled rice fields would not be conducive to soil loss from wind erosion.

Transfers could also include crops other than rice (Table 3.4-2) that have different cropping practices and can be planted on different soil types than clay. For purposes of this analysis, it is assumed that alfalfa, tomatoes, and corn are representative of the non-rice crops that could be idled for long-term water transfers.

As shown in Figures 3.4-3a and 3.4-3b, the soils in the Seller water district areas in~~Central Valley agricultural areas in~~ Glenn, Colusa, Butte, Sutter, Solano, and Yolo counties are primarily clay and clay loam with ~~minor~~ smaller portions of silt loam, loam, sandy loam, and ~~sandy~~ clay loam. In general, soils that contain some percentage of clay content, such as the predominant soils in counties in the Sellers Service Area, are less susceptible to erosion.

In the Sacramento River Region (Glenn, Colusa, and Yolo counties), there could be a combined maximum of 2,200 acres of alfalfa, corn, or tomato cropland idled. The sellers that expressed interest in participating in cropland idling transfers in these counties are located mainly on clay and clay loam soils that have low erodibility~~. The northeastern part of Glenn County has silt loam, loam, and sandy loam soils (~~(Figures 3.4-3a and 3.4-3b). ~~Areas of loam and silt loam also exist along the eastern edge of Colusa County. The majority of the southeastern corner of Colusa County and the northeastern corner of Yolo County are composed of clay with small patches of loam, silt loam, and sand soils (Figure 3.4-3).~~ It is possible that some idling could occur on the more erodible soil textures such as loam and silt loam. While these soils are more susceptible to wind erosion, the amount of potential acres idled is small, with a maximum of 2,200 acres of alfalfa, corn, and tomatoes in the three counties. Idling of this amount of crop acreage on sandy soils would not likely result in substantial soil erosion.

In the Feather River Region (Butte and Sutter counties), there is also potential for idling to occur on some of the loam or loamy sand soils located in south-central areas (Figures 3.4-3a and 3.4-3b). Idling in the Feather River Region is proposed for a maximum of 1,800 acres of non-rice crops. Because of the predominance of clay soils, it is likely that some of these crops included in a cropland idling transfer would be planted on clay soils. Idling of additional crops up to the maximum acreage on sandy soils would not likely result in substantial soil erosion.

Under the Proposed Action, idling of corn and sudan grass could occur on up to 4,500 acres in the Delta Region (northeastern Solano County). Soils in this area are mostly clay and clay loam; therefore, they are not susceptible to wind erosion.

Due to the primary clay soil textures in counties in the Seller Service Area as well as relatively small acreages of non-rice crops proposed for idling, substantial soil erosion as a result of idling non-rice crops is not expected. The acreages of corn, tomato, and alfalfa crops identified for idling in Table 3.4-3 represent maximum areas that would be idled; it is not likely that all of these fields would be idled at the same time or in each year.

Under normal farming practices, farmers leave fields fallow during some cropping cycles in order to make improvements such as land leveling and weed abatement or to reduce pest problems and build soils. As described under the No Action/No Project Alternative, farmers manage potential soil erosion impacts to avoid substantial loss of soils and to protect soil quality (USDA NRCS 2009). While farmers would not be able to engage in management practices that result in a consumptive use of water on an idled field, they could continue such erosion control techniques as surface roughening tillage to produce clods, ridges, and depressions to reduce wind velocity and trap drifting soil; establishment of barriers at intervals perpendicular to wind direction; or, application of mulch (USDA NRCS 2009). Therefore, cropland idling under the Proposed Action would not result in substantial soil erosion. Impacts would be less than significant.

Cropland idling water transfers could cause expansive soils to shrink due to the reduction in applied irrigation water. Under the Proposed Action, cropland idling transfers could occur in Glenn, Colusa, Butte, Yolo, Solano, and Sutter counties. As shown in Figure 3.4-4, these counties are largely characterized by moderate to high shrink-swell potentials with some smaller areas of low and very high shrink-swell potentials. Cropland idling may increase the extent of soil shrinkage due to lack of irrigation. As described under the No Action/No Project Alternative, because the proposed lands that could be idled are agricultural, they are subject to swelling and shrinkage under normal agricultural growing cycles. Thus, structures and roads in the vicinity of irrigated fields are subject to these changes in soils on a regular basis. The shrinking and swelling of soils due to cropland idling would not result in adverse effects on these structures or roads and would not pose a substantial risk to life or property. Therefore, potential impacts from soil instability under the Proposed Action would be less than significant.

Changes in streamflows in the Sacramento and San Joaquin Rivers and their tributaries as a result of water transfers could result in increased soil erosion. As described in Section 3.17, Flood Control, water transfers in the Proposed Action could increase flows in rivers and in the Delta during the period when water transfers are conveyed from the sellers to the buyers (April through October for East Bay MUD, July through September for transfers conveyed through the Delta). Table 3.17-2 in Section 3.17, Flood Control, shows changes in river flows on the major waterways in the Seller Service Area (Sacramento, Feather, American and Merced rivers). While there would be flow increases compared to the No Action/No Project Alternative, these increases would only be during the dry season of dry and critical years. Flows during these years are below normal and the increase resulting from water transfers would not increase streamflow to a level that would result in soil erosion impacts to stream and river banks. The impact would be less than significant.

Use of water from transfers on agricultural fields in the Buyer Service Area could reduce soil erosion. Water transfers to agricultural users in San Joaquin, Stanislaus, Merced, San Benito, Fresno, and Kings counties would reduce the amount of land idled relative to the No Action/No Project Alternative. Crop plantings would reduce the potential for soil erosion that occurs from winds blowing over bare fields. This would be a benefit of the Proposed Action. Farming practices would resume, which would cause some soil loss from discing, harvesting, and movement of farm equipment. These practices are normal on agricultural lands in the Buyer Service Area and would not result in significant soil erosion.

Use of water from transfers on agricultural fields in the Buyer Service Area could affect soil movement. Irrigation of previously idled fields in San Joaquin, Stanislaus, Merced, San Benito, Fresno, and Kings counties could result in soil swelling. These fields were irrigated in the past and soils have undergone shrinkage and swelling due to normal farming practices and land fallowing. Thus, structures and roads in the vicinity of irrigated fields are subject to these changes in soils on a regular basis. Irrigation as a result of water transfers would not change soil movement relative to what the land has experienced in the past. As a result, there would be no impacts to roads and structures from soil movement.

3.4.2.5 Alternative 3: No Cropland Modifications

Effects in the Buyer Service Area would be the same as the Proposed Action.

There would be no cropland idling under Alternative 3; therefore, there would be no ~~geology and soils~~ impacts in the Seller Service Area from cropland idling. ~~Effects in the Buyer Service Area would be the same as the Proposed Action.~~

Changes in streamflows in the Sacramento and San Joaquin Rivers and their tributaries as a result of water transfers could result in increased soil erosion. As described in Section 3.17, Flood Control, water transfers in Alternative 3 could increase flows in rivers and in the Delta during the period when water transfers are conveyed from the sellers to the buyers (April through October for East Bay MUD, July through September for transfers conveyed through the Delta). Table 3.17-4 in Section 3.17, Flood Control, shows changes in river flows on the major waterways in the Seller Service Area (Sacramento, Feather, American and Merced rivers). While there would be flow increases compared to the No Action/No Project Alternative, these increases would only be during the dry season of dry and critical years. Flows during these years are below normal and the increase resulting from water transfers would not increase streamflow to a level that would result in soil erosion impacts to stream and river banks. The impact would be less than significant.

3.4.2.6 Alternative 4: No Groundwater Substitution

Effects in the Buyer Service Area would be the same as the Proposed Action.

Cropland idling transfers in the Seller Service Area could result in temporary conversion of lands from cropland to bare fields, which could increase soil erosion. Table 3.4-3 shows the acreage and types of crops proposed for idling in each county in the Seller Service Area. Cropland idling transfers under Alternative 4 could idle up to 51,473 acres of rice, 5,000 acres of alfalfa, 2,700 acres of corn, and 800 acres of tomatoes in counties in the Seller Service Area.

Table 3.4-3. Maximum Annual Cropland Idling Acreages under Alternative 4

Region	Rice	Alfalfa[1]/ Sudan Grass	Corn	Tomatoes	Total
Sacramento River Region	40,704	1,400	400	400	42,904
Feather River Region	10,769	600	800	400	12,569
Delta Region	-	3,000	1,500	-	4,500
Total	**51,473**	**5,000**	**2,700**	**800**	**59,973**

[1] Alfalfa cannot be idled within the legal boundaries of the Delta

The potential land idling in Alternative 4 would be the same as analyzed in the Proposed Action. This analysis found that the low potential for erosion and small amounts of idling would reduce the potential for erosion. Therefore, cropland idling under Alternative 4 would not result in substantial soil erosion. Impacts would be less than significant.

Cropland idling water transfers could cause expansive soils to shrink due to the reduction in applied irrigation water. Impacts related to expansive soils would be the same as those described under the Proposed Action. The shrinking and swelling of soils due to cropland idling would not have adverse effects on structures or roads in the area of analysis and would not pose a substantial risk to life or property. Therefore, potential impacts from soil instability under Alternative 4 would be less than significant.

Changes in streamflows in the Sacramento and San Joaquin Rivers and their tributaries as a result of water transfers could result in increased soil erosion. As described in Section 3.17, Flood Control, water transfers in Alternative 3 could increase flows in rivers and in the Delta during the period when water transfers are conveyed from the sellers to the buyers (April through October for East Bay MUD, July through September for transfers conveyed through the Delta). Table 3.17-6 in Section 3.17, Flood Control, shows changes in river flows on the major waterways in the Seller Service Area (Sacramento, Feather, American and Merced rivers). While there would be flow increases compared to the No Action/No Project Alternative, these increases would only be during the dry season of dry and critical years. Flows during these years are below normal and the increase resulting from water transfers would not increase streamflow to a level that would result in soil erosion impacts to stream and river banks. The impact would be less than significant.

3.4.3 Comparative Analysis of Alternatives

Table 3.4-4 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 3.4-4. Comparative Analysis of Alternatives

Potential Impact	Alternatives	Significance	Proposed Mitigation	Significance after Mitigation
Land idling that temporarily converts cropland to bare fields in response to CVP shortages in the Buyer Service Area could increase soil loss from wind erosion.	1	LTS	None	LTS
Cropland idling transfers in the Seller Service Area that temporarily convert cropland to bare fields could increase soil erosion.	2, 4	LTS	None	LTS
Land idling in response to CVP shortages in the Buyer Service Area could cause expansive soils to shrink due to the reduction of applied irrigation water.	1	LTS	None	LTS
Cropland idling water transfers could cause expansive soils in the Seller Service Area to shrink due to the reduction in applied irrigation water.	2, 4	LTS	None	LTS
Use of transfer water on agricultural fields in the Buyer Service Area could increase soil erosion.	2, 3, 4	LTS	None	LTS
Use of transfer water on agricultural fields in the Buyer Service Area could increase soil movement.	2, 3, 4	LTS	None	LTS

Potential Impact	Alternatives	Significance	Proposed Mitigation	Significance after Mitigation
Changes in streamflows in the Sacramento and San Joaquin Rivers and their tributaries as a result of water transfers could result in increased soil erosion.	2, 3, 4	LTS	None	LTS

Key:
LTS – less than significant

3.4.3.1 No Action/No Project Alternative

There would be no changes to geology and soils in the Seller Service Area relative to existing conditions. In the Buyer Service Area, increased land idling could occur in response to CVP shortages, which could affect soil erosion and soil stability. Farmers would continue to manage idled fields to control soil erosion impacts and protect the quality of soils for future plantings. Agricultural lands typically undergo shrinking and swelling with a normal planting and harvesting schedule. Thus, potential soil shrinkage under the No Action/No Project Alternative would not result in damage to nearby roads or properties.

3.4.3.2 Alternative 2: Full Range of Transfers – Proposed Action

Cropland idling transfers under the Proposed Action could increase soil erosion and affect soil stability that could damage nearby structures. Cropland idling transfers under the Proposed Action could idle up to 51,473 acres of rice, 5,000 acres of alfalfa, 2,700 acres of corn, and 800 acres of tomatoes in counties in the Seller Service Area. Soils in the area are largely composed of clays, which are less erodible soils. For rice crops, the natural crop cycle and field preparation involved in cultivation also reduces the probability of soil erosion when rice fields are idled (see Sections 3.4.2.3 and 3.4.2.4). Idling of maximum acreages of non-rice crops that may be planted on more sandy soils would not result in substantial soil erosion relative to the No Action/No Project Alternative. Further, farmers would continue to manage idled fields to control soil erosion impacts. Because agricultural lands typically undergo shrinking and swelling with a normal planting and harvesting schedule, there would not be risks to structures as a result of soil instability. Potential effects on expansive soils and soil erosion in the Seller Service Area under the Proposed Action would be greater than the No Action/No Project Alternative; however, impacts would still be less than significant. The Proposed Action would increase water supplies to agricultural users in the Buyer Service Area which would reduce potential soil erosion and effects to soil stability relative to the No Action/No Project Alternative.

3.4.3.3 Alternative 3: No Cropland Modification

The No Cropland Modification Alternative does not include cropland idling or crop shifting transfers. The potential effects on expansive soils and soil erosion from these actions as described under the Proposed Action would not occur under the No Cropland Modification Alternative.

3.4.3.4 Alternative 4: No Groundwater Substitution

As in the Proposed Action, cropland idling transfers could affect soil erosion and soil stability, but these effects would be less than significant. Effects in the Buyer Service Area would be the same as the Proposed Action.

3.4.4 Environmental Commitments/Mitigation Measures

There would be no significant impacts to geology and soils from implementation of the No Action/No Project Alternative or the action alternatives. Therefore, no environmental commitments/mitigation measures are proposed.

3.4.5 Potentially Significant Unavoidable Impacts

None of the action alternatives would result in potentially significant unavoidable impacts on geology and soils.

3.4.6 Cumulative Effects

The timeframe for the geology and soils cumulative effects analysis extends from 2015 through 2024, a ten-year period. The cumulative effects area of analysis for geology and soils is the same as shown in Figure 3.4-1. This section analyzes cumulative effects using the project method, which is further described in Chapter 4.

The projects considered for the cumulative condition are the State Water Project (SWP) water transfers, ~~and~~ CVP Municipal and Industrial Water Shortage Policy (WSP), and refuge transfers, which are described in more detail in Chapter 4. SWP transfers could utilize cropland idling in the area of analysis and could therefore affect soils on agricultural fields. 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 would not substantially change relative to existing conditions. A portion of refuge transfers could come from cropland idling transfers in the San Joaquin Valley near the Buyers Service Area. Idling fields for these transfers could affect soils on agricultural fields, but these changes would be very small and not directly within the Buyers Service Area.

The following sections describe potential geology and soils cumulative effects for each of the proposed alternatives.

3.4.6.1 Alternative 2: Full Range of Transfers

Cropland idling in the Seller Service Area under the Proposed Action in combination with other cumulative projects would contribute to existing soil *erosion in the region.* SWP transfers would include water made available through cropland idling; however, most of the transfers would originate in Butte County, where only minor actions could occur under the Proposed Action. Some SWP cropland idling transfers could also occur in Sutter County. SWP cropland idling would include similar crops as the Proposed Action.

The rice crop cycle and soil texture in which rice is planted reduces the potential for erosion, and a hard crust usually develops over the surface of the field. Idled rice fields would not be conducive to soil loss from wind erosion. The Proposed Action and SWP transfers would not result in significant cumulative soil erosion effects from idling rice.

Cropland idling under the Proposed Action could also occur on corn, tomato, and alfalfa fields. SWP transfers could also involve idling of these crops. However, it is likely that the majority of SWP cropland idling transfers would be rice fields and the amounts of non-rice crops to be idled would be similar to those in the Proposed Action. Farmers participating in cropland idling would manage their fields to reduce erosion and protect soil quality. Given the soil textures in the Sacramento Valley and their low to mid-range erodibility, soil erosion as a result of idling non-rice crops would be low, and would be minimized further by implementing normal soil erosion measures. Potential reductions in agricultural deliveries under the WSP would have minor effects on soil erosion in the Seller Service Area. Therefore, the Proposed Action in combination with other cumulative projects would not result in a cumulative significant impact on soil erosion.

Cropland idling in the Seller Service Area under the Proposed Action could cause expansive soils to shrink. Similar to the cropland idling under the Proposed Action, cropland idling as a result of SWP transfers would also occur on agricultural lands. As these agricultural lands undergo shrinking and swelling as part of the normal cropping cycle, shrinkage as a result of cropland idling would not result in substantial risk to life or property. The combination of idling under the Proposed Action with cropland idling under the SWP transfers would not increase the potential for damage to life or property from expansive soils. Therefore, the Proposed Action in combination with other cumulative projects would not result in a cumulative significant impact associated with the shrinkage of expansive soils.

Use of water from transfers on agricultural fields in the Buyer Service Area could reduce soil erosion. SWP transfers would increase water supply in the Buyer Service Area and reduce soil erosion. The WSP could reduce agricultural water supplies in dry and critical years, which could increase cropland idling and soil erosion. Similarly, refuge transfers could increase cropland idling in areas near the Buyers Service Area. However, CVP water transfers would offset some of these effects. The Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact related to soil erosion in the Buyer Service Area.

Use of water from transfers on agricultural fields in the Buyer Service Area could affect soil movement. SWP transfers would increase water supply in the Buyer Service Area. The WSP and Proposed Action would change agricultural water supplies and potentially affect soil movement. However, agricultural lands are typically subject to shrinking and swelling under normal farming practices. Roads and structures in the vicinity are also subject to this effect. The Proposed Action and WSP would not substantially change soil movement in the Buyer Service Area relative to normal farming practices. Therefore, the Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact related to soil movement in the Buyer Service Area.

3.4.6.2 Alternative 3: No Cropland Modification

Since there would be no cropland idling under Alternative 3, there would be no cumulative impacts to expansive soils or soil erosion in the Seller Service Area. Cumulative effects in the Buyer Service Area would be the same as the Proposed Action.

3.4.6.3 Alternative 4: No Groundwater Substitution

Cumulative impacts under Alternative 4 would be the same as those described under the Proposed Action.

3.4.7 References

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Section 3.5 Air Quality

This section presents the existing setting in relation to air quality within the area of analysis and discusses potential effects on air quality from the proposed alternatives. Appendix F, Air Quality Emission Calculations, provides detailed emission calculations.

Groundwater substitution and cropland idling transfers would affect air quality in the area of analysis. Implementation of conservation or stored reservoir purchase transfers would not affect air quality and are not further discussed in this section. Although some crops may be more energy intensive than others, crop shifting is a regular practice in the Seller and Buyer Service Areas and a quantitative analysis was not conducted for this transfer method.

3.5.1 Affected Environment/Environmental Setting

The following paragraphs provide a brief explanation of the regulatory setting for air quality. Sections 3.5.1.1 through 3.5.1.3 describe the factors that influence pollutant levels on a regional level, including geographical location, weather patterns, and pollutant sources.

3.5.1.1 Area of Analysis

The area of analysis for air quality includes counties where cropland idling could occur in the Seller Service Area, counties overlying groundwater basins where groundwater substitution transfers could occur, and counties where transferred water would be used for agricultural purposes in the Buyer Service Area. Figure 3.5-1 shows the air quality area of analysis.

Figure 3.5-1. Air Quality Area of Analysis

3.5.1.2 Regulatory Setting

Air quality management and protection responsibilities exist in federal, state, and local levels of government. The federal Clean Air Act (CAA) and California Clean Air Act (CCAA) are the primary statutes that establish ambient air quality standards and establish regulatory authorities to enforce regulations designed to attain those standards.

3.5.1.2.1 Federal

The U.S. Environmental Protection Agency (USEPA) is responsible for implementation of the CAA. The CAA was enacted in 1955 and was amended in 1963, 1965, 1967, 1970, 1977, 1990, and 1997. Under authority of the CAA, USEPA established National Ambient Air Quality Standards (NAAQS) for the following criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), inhalable particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM_{10}), fine particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and sulfur dioxide (SO_2).

Table 3.5-1 presents the current NAAQS for the criteria pollutants. Ozone is a secondary pollutant, meaning that it is formed in the atmosphere from reactions of precursor compounds under certain conditions. Primary precursor compounds that lead to formation of O_3 include volatile organic compounds (VOC) and nitrogen oxides (NOx). $PM_{2.5}$ can be emitted directly from sources (e.g., engines) or can form in the atmosphere from precursor compounds. $PM_{2.5}$ precursor compounds in the area of analysis include sulfur oxides (SOx), NOx, VOC, and ammonia.

The Federal CAA requires states to classify air basins (or portions thereof) as either “attainment” or “nonattainment” with respect to criteria air pollutants, based on whether the NAAQS have been achieved, and to prepare State Implementation Plans (SIPs) containing emission reduction strategies to maintain the NAAQS for those areas designated as attainment and to attain the NAAQS for those areas designated as nonattainment. Table 3.5-2 summarizes the air basins and counties included in the area of analysis. Figure 3.5-2 identifies the air basins that would be affected by the alternatives.

Table 3.5-1. National Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS Primary	NAAQS Secondary
O_3	8 Hour	0.075 ppm (147 µg/m^3)	Same as Primary Standard
PM_{10}	24 Hour	150 µg/m^3	Same as Primary Standard
$PM_{2.5}$	24 Hour	35 µg/m^3	Same as Primary Standard
$PM_{2.5}$	Annual	12 µg/m^3	15 µg/m^3
CO	1 Hour	35 ppm (40 mg/m^3)	N/A
CO	8 Hour	9 ppm (10 mg/m^3)	N/A
NO_2	1 Hour	100 ppb[1] (188 µg/m^3)	N/A
NO_2	Annual	53 ppb (100 µg/m^3)	Same as Primary Standard
SO_2	1 Hour	75 ppb[2] (196 µg/m^3)	N/A
SO_2	3 Hour	N/A	0.5 ppm (1,300 µg/m^3)
SO_2	24 Hour	0.14 ppm (366 µg/m^3)[3]	N/A
SO_2	Annual	0.030 ppm (79 µg/m^3)[3]	N/A
Pb	Rolling 3-Month Average	0.15 µg/m^3	Same as Primary Standard

Source: California Air Resources Board (CARB) 2013a.

Notes:

[1] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 parts per billion (ppb).

[2] To attain this standard, the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations must not exceed 75 ppb.

[3] On June 22, 2010, the 24-hour and annual primary SO_2 NAAQS were revoked (75 Federal Register [FR] 35520). The 1971 SO_2 NAAQS (0.14 parts per million [ppm] and 0.030 ppm for 24-hour and annual averaging periods) remain in effect until one year after an area is designated for the 2010 1-hour primary standard. CARB recommended that all of California be designated attainment for the 1-hour SO_2 NAAQS (CARB 2011a). Although the USEPA designated as nonattainment most areas in locations where existing monitoring data from 2009-2011 indicated violations of the 1-hour SO_2 NAAQS, they deferred action on all other areas. As a result, the USEPA has not yet finalized area designations for California (78 FR 47191).

Key:

µg/m^3 = micrograms per cubic meter; CAAQS = California Ambient Air Quality Standard; mg/m^3 = milligrams per cubic meter; N/A = not applicable; NAAQS = National Ambient Air Quality Standard; ppb = parts per billion; ppm = parts per million

Table 3.5-2. Area of Analysis – Air Basins

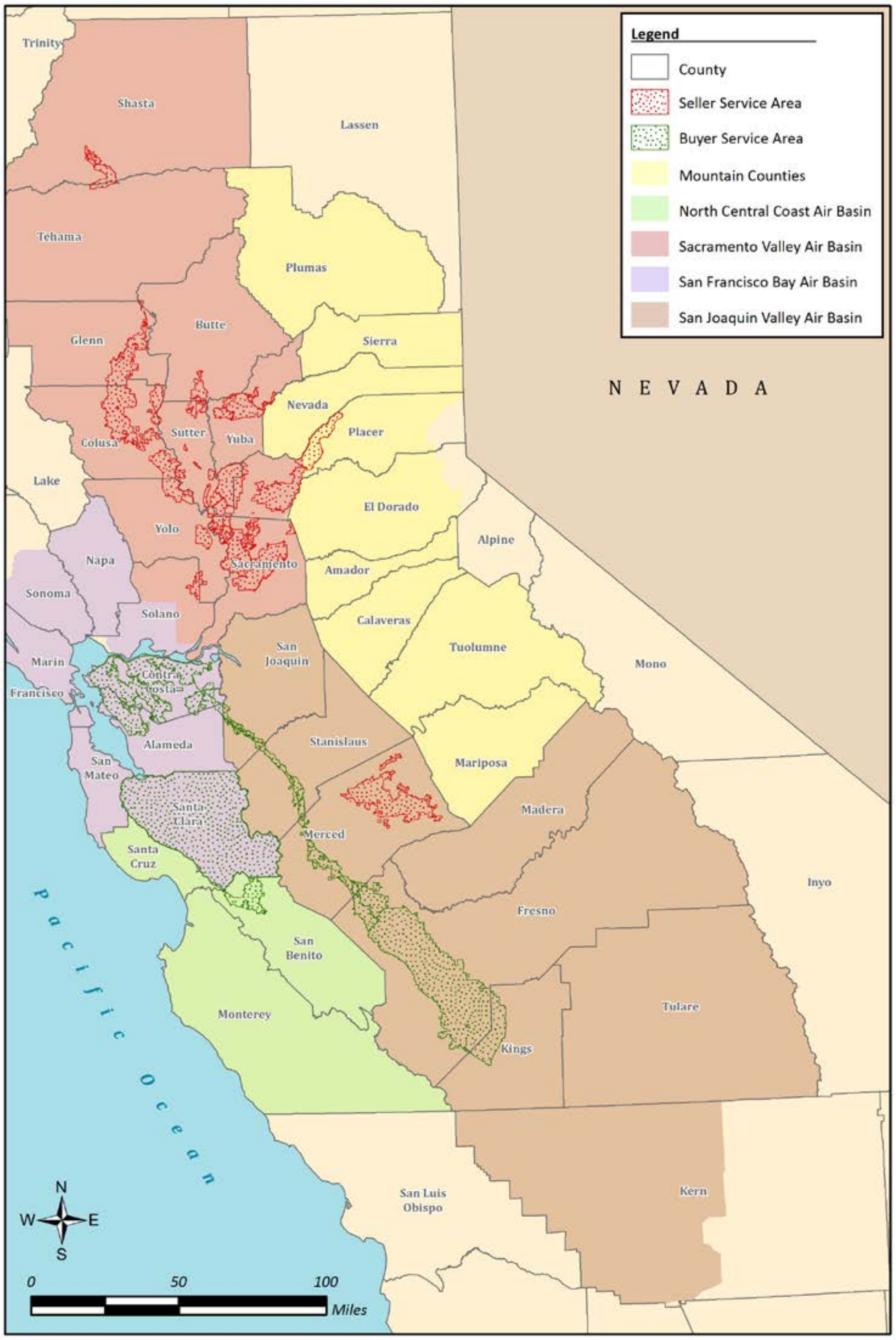
Agency Type	Air Basin	County
Sellers	Mountain Counties	Placer[1]
Sellers	Sacramento Valley	Butte
Sellers	Sacramento Valley	Colusa
Sellers	Sacramento Valley	Glenn
Sellers	Sacramento Valley	Placer[2]
Sellers	Sacramento Valley	Sacramento
Sellers	Sacramento Valley	Shasta
Sellers	Sacramento Valley	Solano[3]
Sellers	Sacramento Valley	Sutter
Sellers	Sacramento Valley	Tehama
Sellers	Sacramento Valley	Yolo
Sellers	Sacramento Valley	Yuba
Sellers	San Joaquin Valley	Merced
Buyers	North Central Coast	San Benito
Buyers	San Francisco Bay	Alameda
Buyers	San Francisco Bay	Contra Costa
Buyers	San Francisco Bay	Santa Clara
Buyers	San Joaquin Valley	Fresno
Buyers	San Joaquin Valley	Kings
Buyers	San Joaquin Valley	Merced
Buyers	San Joaquin Valley	San Joaquin
Buyers	San Joaquin Valley	Stanislaus

Notes:

[1] The portion of Placer County included in the Mountain Counties Air Basin is defined as “all of Placer County except that portion in the Lake Tahoe Air Basin, as defined in Section 60113(b), and that portion included in the Sacramento Valley Air Basin, as defined in Section 60106(k)” (17 California Code of Regulations [CCR] 60111(i)).

[2] The portion of Placer County included in the Sacramento Valley Air Basin is defined as “that portion of Placer County which lies west of Range 9 east, M.D.B. & M” (17 CCR 60106(k)).

[3] The portion of Solano County included in the Sacramento Valley Air Basin is generally defined as the eastern portion of the county. The full description is included in 17 CCR 60106(j).



Source: CARB 2010.

Figure 3.5-2. California Air Basins

General Conformity Section 176 (c) of the CAA (42 U.S. Code [USC] 7506(c)) requires any entity of the federal government that engages in, supports, or in any way provides financial support for, licenses or permits, or approves any activity to demonstrate that the action conforms to the applicable SIP required under Section 110 (a) of the Federal CAA (42 USC 7410(a)) before the action is otherwise approved. In this context, conformity means that such federal actions must be consistent with a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of those standards. Each federal agency must determine that any action proposed that is subject to the regulations implementing the conformity requirements will, in fact, conform to the applicable SIP before the action is taken. Long-term water transfers are subject to the general conformity rule because a federal agency, the Bureau of Reclamation, is approving Central Valley Project (CVP)-related transfers.

On April 5, 2010, the USEPA revised the general conformity regulations at 40 Code of Federal Regulations (CFR) 93 Subpart B for all federal activities except those covered under transportation conformity (75 Federal Register [FR] 17254). The revisions were intended to clarify, streamline, and improve conformity determination and review processes, and to provide transition tools for making conformity determinations for new NAAQS. The revisions also allowed federal facilities to negotiate a facility-wide emission budget with the applicable air pollution control agencies, and to allow the emissions of one precursor pollutant to be offset by the emissions of another precursor pollutant. The revised rules became effective on July 6, 2010.

The general conformity regulations apply to a proposed federal action in a nonattainment or maintenance area if the total of direct and indirect[1] emissions of the relevant criteria pollutants and precursor pollutants caused by the proposed action equal or exceed certain de minimis amounts, thus requiring the federal agency to make a determination of general conformity. A Federal agency can indirectly control emissions by placing conditions on Federal approval or Federal funding.

Table 3.5-3 presents the de minimis amounts for the area of analysis.

[1] Direct emissions are those that are caused or initiated by the Federal action, and occur at the same time and place as the Federal action. Indirect emissions are reasonably foreseeable emissions that are further removed from the Federal action in time and/or distance, and can be practicably controlled by the Federal agency on a continuing basis (40 CFR 93.152).

Table 3.5-3. General Conformity De Minimis Thresholds

Pollutant	Area	Federal Status	De Minimis (tpy)
VOC (as O_3 precursor)[1]	San Joaquin Valley Air Basin	Nonattainment (Extreme)	10
VOC (as O_3 precursor)[1]	Sacramento Valley Air Basin	Nonattainment (Severe)	25
VOC (as O_3 precursor)[1]	San Francisco Bay Air Basin	Nonattainment (Marginal)	100
NOx (as O_3 precursor)[2]	San Joaquin Valley Air Basin	Nonattainment (Extreme)	10
NOx (as O_3 precursor)[2]	Sacramento Valley Air Basin	Nonattainment (Severe)	25
NOx (as O_3 precursor)[2]	San Francisco Bay Air Basin	Nonattainment (Marginal)	100
CO	San Joaquin Valley Air Basin	Maintenance[3]	100
CO	Sacramento Valley Air Basin	Maintenance[4]	100
CO	San Francisco Bay Air Basin	Maintenance[5]	100
PM_{10}	San Joaquin Valley Air Basin	Maintenance	100
PM_{10}	Sacramento County	Maintenance	100
$PM_{2.5}$	San Joaquin Valley Air Basin	Nonattainment	100
$PM_{2.5}$	Sacramento Valley Air Basin[6]	Nonattainment	100
$PM_{2.5}$	San Francisco Bay Air Basin	Nonattainment	100
SO_2 (as $PM_{2.5}$ precursor)	See Footnote[7]	Attainment	100

Source: CARB 2011b; USEPA 2013a; 40 CFR 93.153.

Notes:

[1] As a precursor to $PM_{2.5}$, VOC also has a threshold of 100 tons per year (tpy). Because the thresholds for VOC as an O_3 precursor are more conservative, those values are used in the analysis.

[2] As a precursor to both NO_2 and $PM_{2.5}$, NOx also has a threshold of 100 tpy. Because the thresholds for NOx as an O_3 precursor are more conservative, those values are used in the analysis.

[3] Includes the urbanized portions of Fresno (Fresno County), Modesto (Stanislaus County), and Stockton (San Joaquin Valley); however, no water agencies are located in these areas.

[4] Includes the Chico Urbanized Area (Butte County) and the Sacramento area (portions of Placer, Sacramento, and Yolo County). No water agencies are located in the Chico Urbanized Area or the urbanized area of Yolo County, near the City of Davis.

[5] Includes the San Francisco-Oakland-San Jose urbanized area, which includes San Francisco County and portions of Alameda, Contra Costa, Marin, Napa, San Mateo, Santa Clara, Solano, and Sonoma Counties.

[6] Includes the Sacramento area (Sacramento County and portions of El Dorado, Placer, Solano, and Yolo Counties), the Yuba City-Marysville area (Sutter County and a portion of Yuba County), and the Chico Urbanized Area (Butte County). No water agencies are located in the Chico Urbanized Area.

[7] Although the area of analysis is an attainment area for SO_2, any precursors to nonattainment pollutants are also subject to de minimis thresholds; therefore, since SO_2 is a precursor to $PM_{2.5}$, which is in nonattainment for certain regions, it is subject to the given emissions threshold.

Key:

CO = carbon monoxide; NOx = nitrogen oxides; O_3 = ozone; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; SO_2 = sulfur dioxide; tpy = tons per year; VOC = volatile organic compounds

The general conformity regulations incorporate a stepwise process, beginning with an applicability analysis. According to USEPA guidance (USEPA 1994), before any approval is given for a proposed action to go forward, the regulating federal agency must apply the applicability requirements found at 40 CFR 93.153(b) to the proposed action. The guidance states that the applicability analysis can be (but is not required to be) completed concurrently with any analysis required under the National Environmental Policy Act (NEPA). If the regulating federal agency determines that the general conformity regulations do not apply to the proposed action (meaning the project emissions do not exceed the de minimum thresholds), no further analysis or documentation is required.

If the general conformity regulations apply to the proposed action, the regulating federal agency must next conduct a conformity evaluation in accord with the criteria and procedures in the implementing regulations, publish a draft determination of general conformity for public review, and then publish the final determination of general conformity. For a required action to meet the conformity determination emissions criteria, the total of direct and indirect emissions from the action must be in compliance or consistent with all relevant requirements and milestones contained in the applicable SIP (40 CFR 93.158(c)), and in addition must meet other specified requirements, such as:

- For any criteria pollutant or precursor, the total of direct and indirect emissions from the action is specifically identified and accounted for in the applicable SIP's attainment or maintenance demonstration (40 CFR 93.158(a)(1)); or

- For precursors of O_3, NO_2, or particulate matter, the total of direct and indirect emissions from the action is fully offset within the same nonattainment (or maintenance) area through a revision to the applicable SIP or a similarly enforceable measure that effects emission reductions so that there is no net increase in emissions of that pollutant (40 CFR 93.158(a)(2)); or

- For O_3 or NO_2, the total of direct and indirect emissions from the action is determined and documented by the State agency primarily responsible for the applicable SIP to result in a level of emissions which, together with all other emissions in the nonattainment (or maintenance) area, would not exceed the emissions inventory specified in the applicable SIP (40 CFR 93.158(a)(5)(i)(A)); or

- For O_3 or NO_2, the total of direct and indirect emissions from the action (or portion thereof) is determined by the State agency responsible for the applicable SIP to result in a level of emissions which, together with all other emissions in the nonattainment (or maintenance) area, would exceed the emissions inventory specified in the applicable SIP and the State Governor or the Governor's designee for SIP actions makes a written commitment to USEPA for specific SIP revision measures reducing emissions to not exceed the emissions inventory (40 CFR 93.158(a)(5)(i)(B)).

3.5.1.2.2 State

The CCAA substantially added to the authority and responsibilities of the State's air pollution control districts (APCDs). The CCAA establishes an air quality management process that generally parallels the Federal process. The CCAA, however, focuses on attainment of the California Ambient Air Quality Standards (CAAQS) that, for certain pollutants and averaging periods, are typically more stringent than the comparable NAAQS. The CAAQS are included in Table 3.5-4.

Table 3.5-4. California Ambient Air Quality Standards

Pollutant	Averaging Time	CAAQS
O_3	1 Hour	0.09 ppm (180 µg/m^3)
O_3	8 Hour	0.070 ppm (137 µg/m^3)
PM_{10}	24 Hour	50 µg/m^3
PM_{10}	Annual	20 µg/m^3
$PM_{2.5}$	Annual	12 µg/m^3
CO	1 Hour	20 ppm (23 mg/m^3)
CO	8 Hour	9.0 ppm (10 mg/m^3)
NO_2	1 Hour	0.18 ppm (339 µg/m^3)
NO_2	Annual	0.030 ppm (57 µg/m^3)
SO_2	1 Hour	0.25 ppm (655 µg/m^3)
SO_2	24 Hour	0.04 ppm (105 µg/m^3)
Pb	30-Day Average	1.5 µg/m^3

Source: CARB 2013a.
Key:
µg/m^3 = micrograms per cubic meter; CAAQS = California Ambient Air Quality Standard; mg/m^3 = milligrams per cubic meter; ppm = parts per million

The CCAA requires that the CAAQS be met as expeditiously as practicable, but does not set precise attainment deadlines. Instead, the act established increasingly stringent requirements for areas that will require more time to achieve the standards.

The air quality attainment plan requirements established by the CCAA are based on the severity of air pollution problems caused by locally generated emissions. Upwind APCDs are required to establish and implement emission control programs commensurate with the extent of pollutant transport to downwind districts.

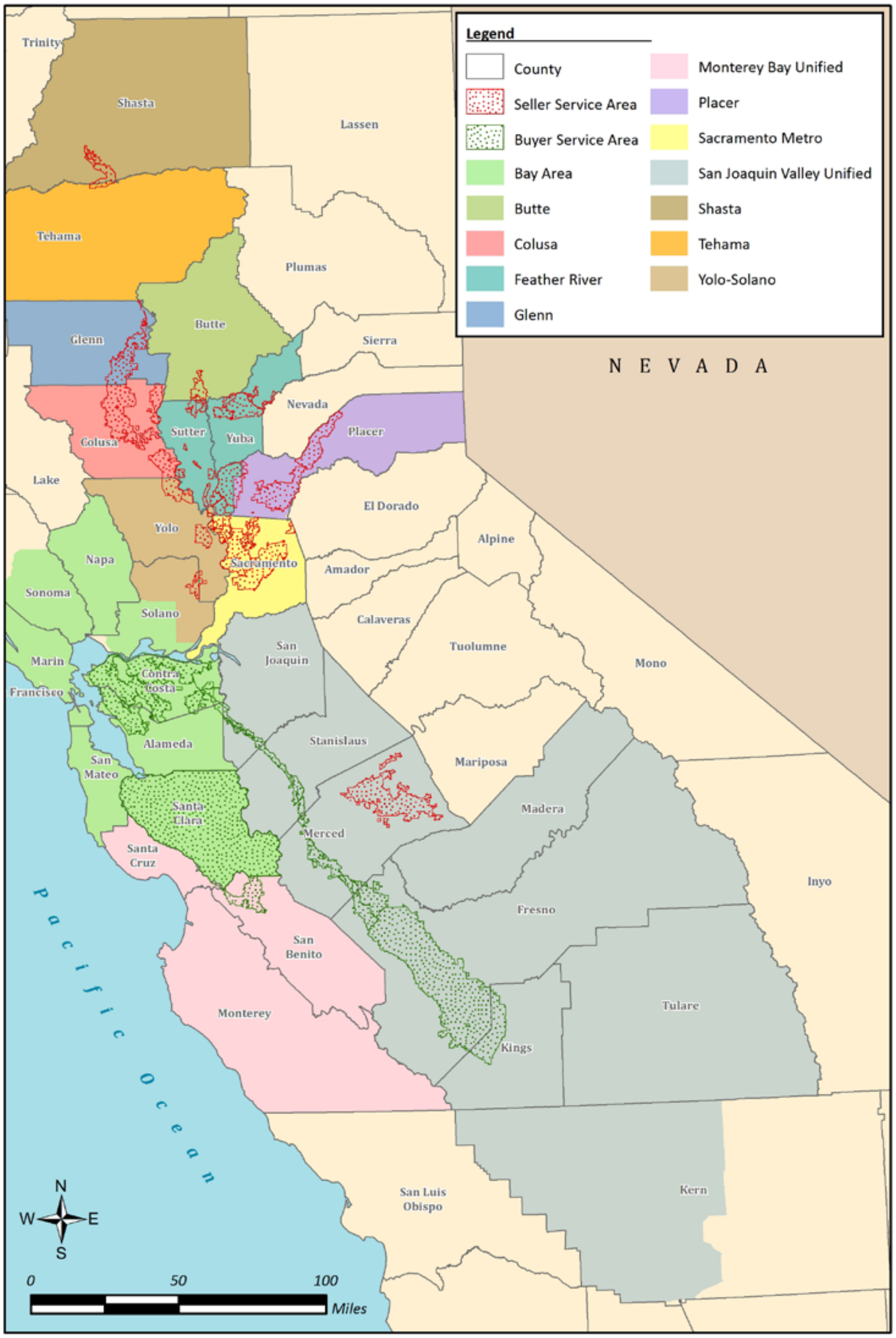
The California Air Resources Board (CARB) is responsible for developing emission standards for on-road motor vehicles and some off-road equipment in the state. In addition, CARB develops guidelines for the local districts to use in establishing air quality permit and emission control requirements for stationary sources subject to the local air district regulations.

3.5.1.2.3 Regional/Local

Multiple air quality management districts (AQMDs) and APCDs have jurisdiction over the O_3, PM_{10}, and $PM_{2.5}$ nonattainment areas. The following APCDs/AQMDs regulate air quality within the area of analysis:

- Bay Area AQMD
- Butte County AQMD
- Colusa County APCD
- Feather River AQMD
- Glenn County APCD
- Monterey Bay Unified APCD
- Placer County APCD
- Sacramento Metropolitan AQMD
- San Joaquin Valley APCD
- Shasta County AQMD
- Tehama County APCD
- Yolo-Solano APCD

Figure 3.5-3 depicts the location of each air district in relation to the Seller and Buyer Service Areas.



Source: CARB 2010.

Figure 3.5-3. Locations of APCDs and AQMDs

Air Toxic Control Measure Agricultural engines are subject to CARB's Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines (17 California Code of Regulations [CCR] 93115). The ATCM contains emissions limits on diesel engines greater than 50 brake-horsepower (bhp), particularly for diesel particulate matter (DPM), based on the size and use of the engine. In addition to requiring the use of CARB diesel fuel[2] or an alternative fuel like biodiesel, the ATCM also contains schedules of required emission reductions that phase-in depending on engine use (e.g., agriculture, emergency, etc.) size (horsepower [hp]), and calendar year. In addition, the individual air districts may have their own rules and regulations governing implementation of the ATCM that must be followed. Rules adopted by the various APCDs and AQMDs related to the ATCM and permitting of stationary agricultural diesel engines are summarized below.[3]

Butte County AQMD

- Rule 441 – Registration Requirements for Stationary Compression Ignition Engines Used in Agricultural Operations
- Rule 1001 – ATCM for Stationary Compression Ignition Engines Used in Agricultural Operations

Colusa County APCD

- No additional rules

Feather River AQMD

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

Glenn County APCD

- No additional rules

Placer County APCD

- No additional rules

Sacramento Metropolitan AQMD

- No additional rules

[2] "CARB diesel fuel" is defined as diesel fuel that meets the specifications of vehicular diesel fuel, namely meeting a 15 parts per million (ppm) sulfur standard.
[3] Because only buyers are under the jurisdiction of the Bay Area AQMD and the Monterey Bay Unified APCD, the rules and regulations associated with these two air districts are not discussed further in this section because they do not participate in groundwater substitutions associated with the Proposed Action and alternatives.

San Joaquin Valley APCD

- No additional rules

Shasta County AQMD

- No additional rules

Tehama County APCD

- No additional rules

Yolo-Solano AQMD

- Rule 11.3 – Agricultural Engine Registrations

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

For other counties, the emission rates specified in Table 3.5-5 for Noncertified ("Tier 0") Engines and in Table 3.5-6 for Tier 1- and 2-Certified Engines[4] are applicable. The different tables reflect the certification status of existing engines and the emission standard that must be met by the respective compliance dates. The ATCM generally requires that any new engines used for agricultural operations meet the current Tier 3 standard, which must then be subsequently replaced with Tier 4 engines at certain compliance dates.[5] As of 2010, any engines manufactured prior to 1996 (Tier 0 or noncertified engines) cannot continue to be operated unless they meet the emission standards summarized in Table 3.5-5 (equivalent to Tier 3 engines). Tier 1 or Tier 2 certified engines must meet the emission standards required for Tier 4 engines (see Table 3.5-6) starting in 2014 or by 12 years after the installation of the engine, whichever is later. Engines may either be retrofit or replaced to meet the applicable emission standards.

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

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[4] A certified engine is defined as "a CI engine that is certified to meet the Tier 1, Tier 2, Tier 3, or Tier 4 Off-Road CI Certification Standards as specified in title 13, California Code of Regulations, section 2423." New engines must be certified by CARB for emission compliance before they are legal for sale, use, or registration in California. Certification is granted annually to individual engine families and is good for one model year.

[5] Existing engines may also retrofit with a Verified Diesel Emission Control Strategy to meet the applicable emission limits.

Table 3.5-5. Emission Standards for Noncertified Compression Ignition Agricultural Engines > 50 BHP

BHP Range	Compliance Date	DPM Not to Exceed (g/bhp-hr)[1,2]
50<hp<75	2011	0.30
75≤hp<100	2011	0.30
100≤hp<175	2010	0.22
175≤hp<750	2010	0.15
hp>750	2014	0.075

Source: 17 CCR 93115

Notes:

1 The diesel PM standard indicates the emission limit that existing noncertified engines must meet by the given compliance date. The emission rates in the table reflect Tier 3 emission limits (13 CCR 2423). In other words, existing noncertified engines must be replaced with Tier 3 engines (or retrofit, if feasible) by the compliance date.

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

Key:

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

Table 3.5-6. Emission Standards for Tier 1- and 2-Certified Compression Ignition Engines > 50 BHP

BHP Range	Compliance Date	DPM Not to Exceed (g/bhp-hr)[1,2]
50<hp<75	2015 [3]	0.02
75≤hp<175	2015 [3]	0.01
175≤hp<750	2014 [3]	0.01
hp>750	2014 [3]	0.075

Source: 17 CCR 93115.

Notes:

1 The diesel PM standard indicates the emission limit that existing Tier 1- or 2-certified engines must meet by the given compliance date. The emission rates in the table reflect Tier 4 emission limits (13 CCR 2423). In other words, existing Tier 1- or 2-certified engines must be replaced with Tier 4 engines (or retrofit, if feasible) by the compliance date.

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

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

Key:

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

3.5.1.3 Existing Conditions

The following sections describe the air basins within the Long-Term Water Transfers area of analysis, including CARB's estimated annual average daily emissions for agricultural sources. Emissions categories include farming operations (harvesting and tilling), fugitive windblown dust (non-pasture agricultural lands), agricultural burning, agricultural equipment, and irrigation pumps. Although there are other agricultural emissions categories that CARB includes in its inventories, only those categories that could be affected by the Proposed Action and alternatives were summarized. This section also summarizes existing monitoring data for the area of analysis.

The entire area of analysis is in attainment of the PM_{10}, NO_2, SO_2, CO[6], and Pb NAAQS. Table 3.5-7 summarizes the federal attainment status of counties in the area of analysis. Table 3.5-8 summarizes the attainment status for the CAAQS. The entire area of analysis has attained the CO, NO_2, SO_2, and Pb CAAQS.

Figure 3.5-4 shows the federal maintenance areas for the CO standard; Figure 3.5-5 shows the federal nonattainment areas for the 8-hour O_3 standard; Figure 3.5-6 shows the federal nonattainment areas for $PM_{2.5}$; and Figure 3.5-7 shows the federal maintenance areas for PM_{10}.

[6] Portions of the area of analysis are listed as maintenance areas of the CO NAAQS, meaning that they were previously in nonattainment, but have since been redesignated as attainment areas. The Sacramento Census Bureau Urbanized Area (portions of Placer, Sacramento, and Yolo Counties) is designated as a maintenance area for CO; however, no water agencies are located in the maintenance area in Yolo County (near the City of Davis). Additionally, the Chico Urbanized Area in Butte County is designated maintenance, but no water agencies are located in this area. The San Francisco-Oakland-San Jose Urbanized Area (portions of Alameda, Contra Costa, Marin, Napa, San Mateo, Santa Clara, Solano, and Sonoma Counties and all of San Francisco County) is also a maintenance area for CO.

Table 3.5-7. Federal Attainment Status for the Area of Analysis

Air Basin	County	O_3	PM_{10}	$PM_{2.5}$
Sacramento Valley	Butte	N[1]	A	N
	Colusa	A	A	A
	East Solano	N[2]	A	N
	Glenn	A	A	A
	Placer	N	A	N
	Sacramento	N[2]	M[5]	N
	Shasta	A	A	A
	Sutter (Sacramento Metro[3])	N[2]	A	N
	Tehama	A	A	A
	Yolo	N[3]	A	N
	Yuba	A	A	N
San Joaquin Valley	Fresno	N[4]	M	N
	Kings	N[4]	M	N
	Merced	N[4]	M	N
	San Joaquin	N[4]	M	N
	Stanislaus	N[4]	M	N
San Francisco Bay	Alameda	N[1]	A	N
	Contra Costa	N[1]	A	N
	Santa Clara	N[1]	A	N
North Central Coast	San Benito	A	A	A

Source: CARB 2011b; USEPA 2013a; 40 CFR 81.

Notes:

[1] 8-Hour O_3 classification = marginal

[2] 8-Hour O_3 classification: Severe 15

[3] The Sacramento Metro Area portion of Sutter County is defined as “portion south of a line connecting the northern border of Yolo County to the southwest tip of the Yuba County and continuing along the southern Yuba County border to Placer County.” (40 CFR 81).

[4] 8-Hour O_3 classification: Extreme

[5] On October 23, 2013, the USEPA approved the *PM_{10} Implementation/Maintenance Plan and Redesignation Request for Sacramento County* (October 28, 2010) and redesignated the area as maintenance for PM_{10} (78 FR 59261).

[6] PM_{10} classification: Moderate

Key:

O_3 = ozone; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; N = nonattainment; A = attainment; M = maintenance

Table 3.5-8. State Attainment Status for the Area of Analysis

Air Basin	County	O_3	PM_{10}	$PM_{2.5}$
Sacramento Valley	Butte	N	N	N
	Colusa	A	N	A
	East Solano	N	N	A
	Glenn	A	N	A
	Placer	N	N	A
	Sacramento	N	N	A
	Shasta	N	N	A
	Sutter	N-T[1]	N	A
	Tehama	N	N	A[2]
	Yolo	N	N	A
	Yuba	N-T[1]	N	A
San Joaquin Valley	Fresno	N	N	N
	Kings	N	N	N
	Merced	N	N	N
	San Joaquin	N	N	N
	Stanislaus	N	N	N
San Francisco Bay	Alameda	N	N	N
	Contra Costa	N	N	N
	Santa Clara	N	N	N
North Central Coast	San Benito	N	N	A

Source: CARB 2014a; CARB 2011b; 17 CCR 60200-60210.

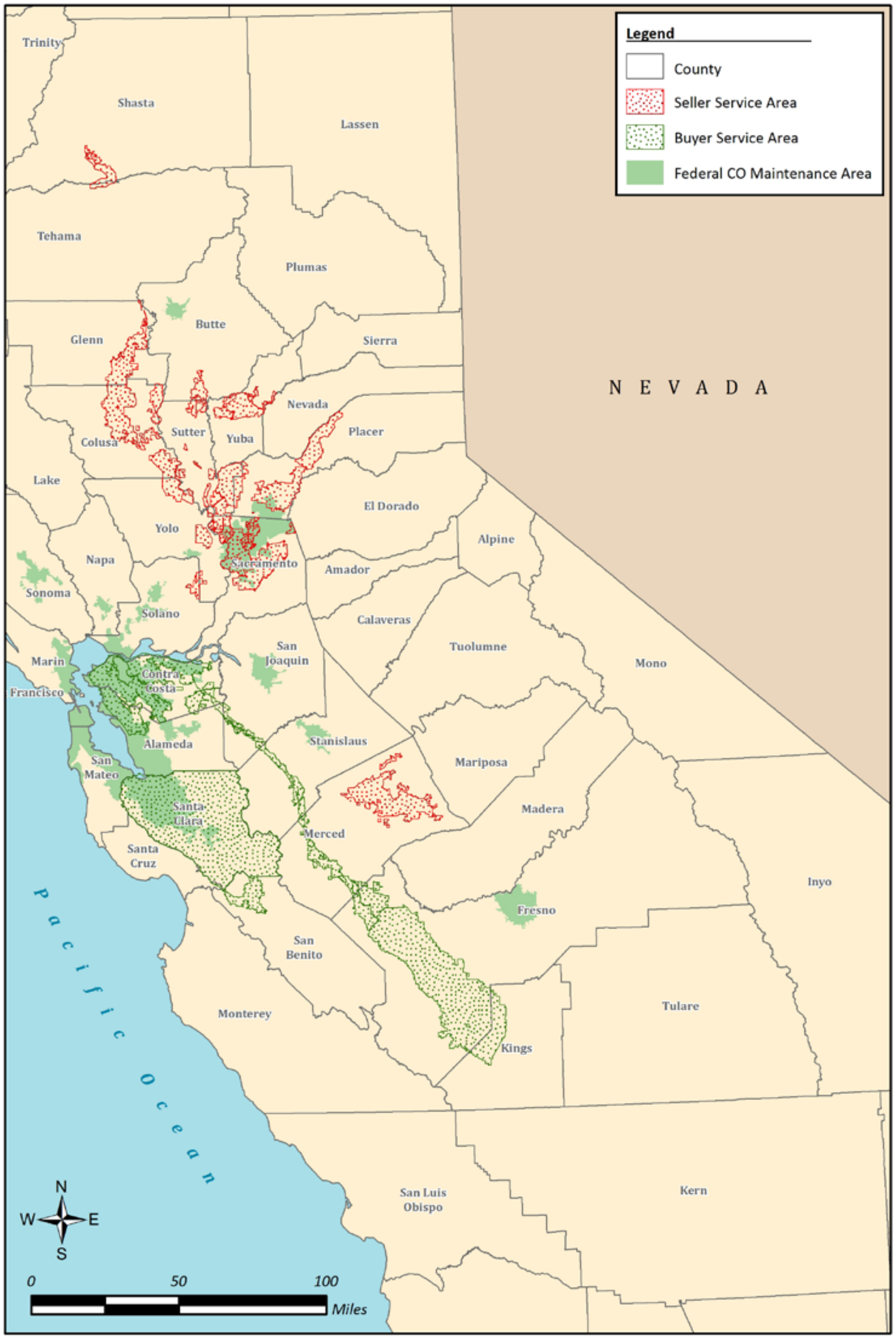
Notes:

[1] Nonattainment/transitional areas are defined as those areas that during a single calendar year, the State standards were not exceeded more than three times at any monitoring location within the district.

[2] Tehama County is "unclassified" for the $PM_{2.5}$ CAAQS, which generally means that insufficient monitoring data is available to make a designation. Such areas are typically treated as attainment areas.

Key:

O_3 = ozone; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; N = nonattainment; N-T = nonattainment-transitional; A = attainment

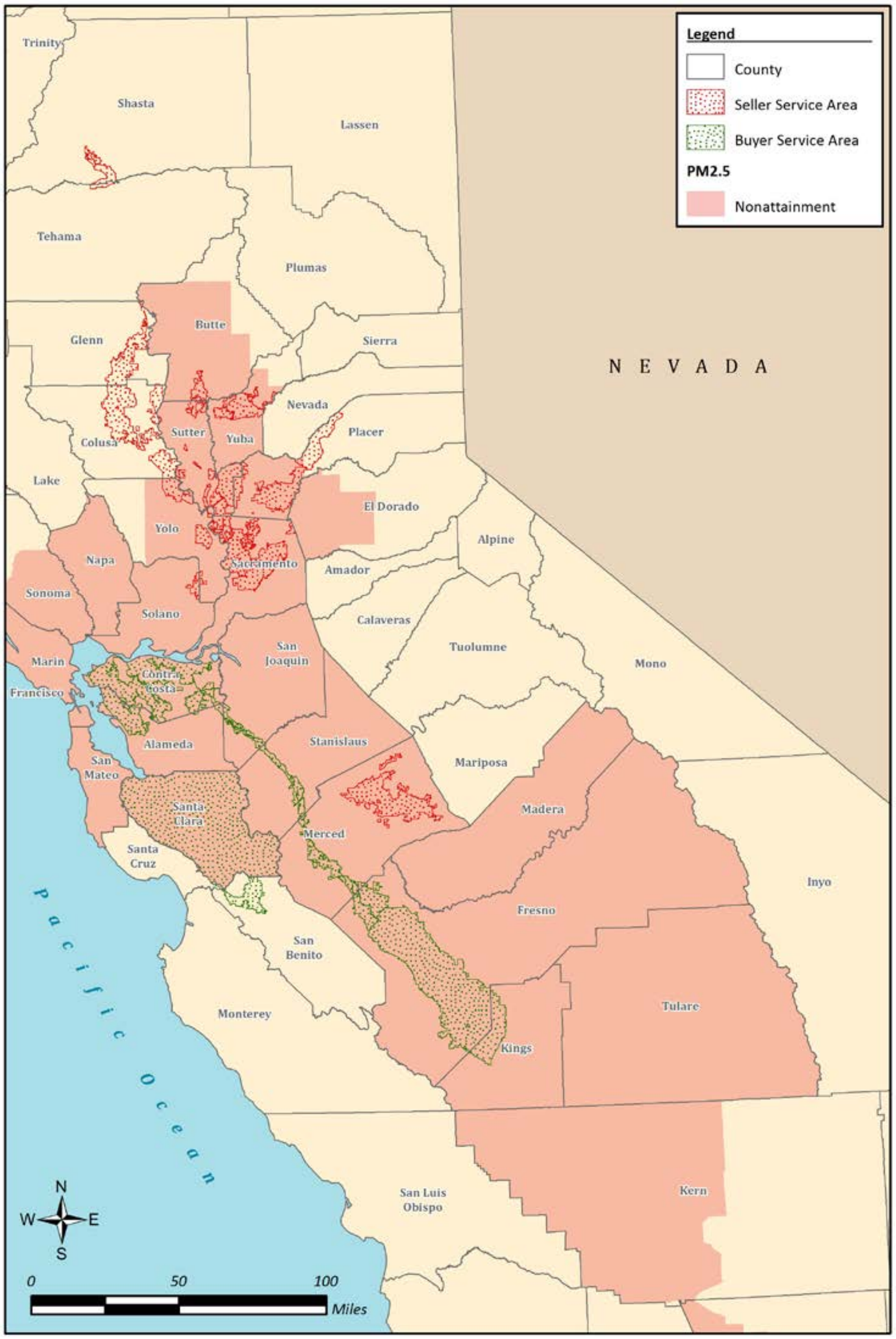


Source: USEPA 2013b.

Figure 3.5-4. Federal CO Maintenance Areas

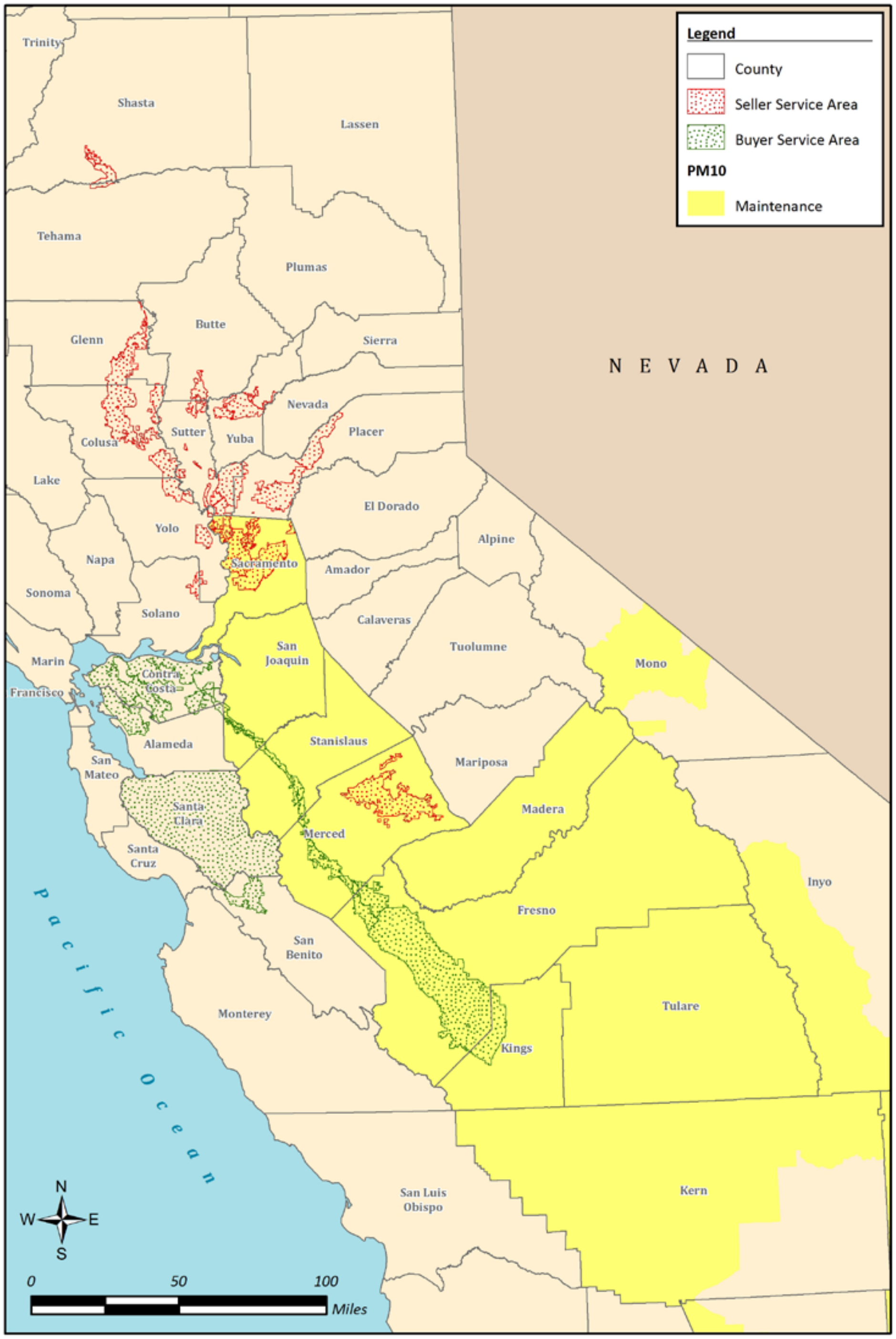
Source: USEPA 2013b.

Figure 3.5-5. Federal 8-Hour O_3 Nonattainment Areas



Source: USEPA 2013b.

Figure 3.5-6. Federal $PM_{2.5}$ Nonattainment Areas



Source: USEPA 2013b.

Figure 3.5-7. Federal PM_{10} Maintenance Areas

3.5.2 Environmental Consequences/Environmental Impacts

These sections present the assessment methods and significance criteria and describe the environmental consequences/environmental impacts associated with each alternative.

3.5.2.1 Assessment Methods

Groundwater substitution could increase air emissions in the Seller Service Area by increased exhaust emissions from groundwater pumping or by increased fugitive dust emissions by cropland idling. Cropland idling transfers could reduce vehicle exhaust emissions but increase fugitive dust emissions. This analysis estimates emissions using available emissions data and models and information on fuel type, engine size (hp), and annual transfer amounts included in the proposed alternatives. Existing emissions models used for the analysis include:

- Diesel engine emission standards established in 17 CCR 93115.8 and 13 CCR 2423
- Diesel engine emission factors from the USEPA's *Compilation of Air Pollutant Emission Factors* (AP-42), specifically from the following chapters:
  - Chapter 3.2: Natural Gas-Fired Reciprocating Engines (USEPA 2000)
  - Chapter 3.3: Gasoline and Diesel Industrial Engines (USEPA 1996)
- CARB Emission Inventory Documentation for the following categories:
  - Section 7.4: Agricultural Land Preparation (CARB 2003a)
  - Section 7.5: Agricultural Harvest Operations (CARB 2003b)
  - Section 7.12: Windblown Dust – Agricultural Lands (CARB 1997)
- CARB Size Fractions for particulate matter (CARB 2012)

All engines operated by the water agencies would operate in compliance with the ATCM, including any necessary retrofits or repowering. The emission standards applicable to a given engine's size and model year were used in this analysis. If the model year of an engine was not known, then the engine was assumed to be "noncertified" as defined by the ATCM. Appendix F details the assumptions (e.g., size, emissions tier, pump rate, and emission factors) used for each engine.

To estimate reduction in vehicle exhaust as a result of cropland idling transfers, this analysis uses available information in "Comparison of Summertime Emission Credits from Land Fallowing Versus Groundwater Pumping" (Byron Buck & Associates 2009). The study compared the relative reduction in emissions due to cropland idling activities versus groundwater substitution. Byron Buck & Associates (2009) estimated the gallons of fuel consumed by farm equipment that would be reduced per acre idled and the average quantity of fuel consumed by groundwater pumping. It was assumed that an agency would need 4.25 acre-feet (AF) of water produced by idling to offset the equivalent emissions of one AF of groundwater pumped (Byron Buck & Associates 2009). Using this ratio, the expected reductions in vehicular exhaust emissions from cropland idling were estimated. This ratio reflects the best information available to estimate emission reductions from cropland idling.

Appendix F presents the detailed calculations that were used to estimate the reduced vehicular exhaust emissions from cropland idling (see Table F-69). Specifically, ratios between emissions from individual water agencies and Pelger MWC were calculated to estimate the overall emissions reductions. Pumping emissions from Pelger MWC were selected because the engines used by the water agency are most reflective of those discussed in Byron Buck & Associates 2009.

This analysis summarizes emissions by air district and county. Analyzing air quality emissions is a complex undertaking and the specific sub-region in which emissions must be analyzed and the appropriate unit varies based on the subject matter. For example, local air districts typically have significance thresholds with units in pounds per day (lbs/day). Emissions must be assessed for the entire air district, which may be a multi-county area.

For the purposes of general conformity, the nonattainment or maintenance area is defined as an area designated as nonattainment or maintenance under section 107 of the CAA and described in 40 CFR 81.305 for California. The nonattainment area varies by pollutant and the area's designation and classification. The nonattainment and maintenance areas included in this analysis for the Sellers Service Area (defined in 40 CFR 81.305) are summarized below:

- CO Maintenance Area (Sacramento Census Bureau Urbanized Area): Parts of Placer, Sacramento, and Yolo Counties.
- PM_{10} Maintenance Area
  - Sacramento County
  - San Joaquin Valley: Includes Merced County

- 8-Hour O_3 Nonattainment Area
  - Sacramento Metro (Severe-15 Classification): Sacramento and Yolo Counties and parts of El Dorado, Placer, Solano, and Sutter Counties.
  - San Joaquin Valley (Extreme Classification): Includes Merced County
- $PM_{2.5}$ Nonattainment Areas
  - San Joaquin Valley (Annual and 24-Hour Averages): Includes Merced County
  - Sacramento Area (24-Hour Average): Sacramento County and parts of El Dorado, Placer, Solano, and Yolo Counties
  - Yuba City/Marysville (24-Hour Average): Sutter County and part of Yuba County.

Detailed calculations are provided in Appendix F, Air Quality Emission Calculations.

3.5.2.2 Significance Criteria

For California Environmental Quality Act (CEQA), impacts on air quality would be considered potentially significant if the transfers would:

- Conflict with or obstruct implementation of the applicable air quality plan.
- Violate any ambient air quality standard or contribute substantially to an existing or projected violation of any ambient air quality standard.
- Result in a cumulatively considerable net increase of any criteria pollutant for which the area of analysis is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for O3 precursors).
- Expose sensitive receptors to substantial pollutant concentrations.
- Create objectionable odors affecting a substantial number of people.

Changes in air quality are determined relative to existing conditions (for CEQA) and to the No Action/No Project Alternative (for NEPA). In addition to the general criteria provided above, individual air districts may establish significance criteria that would also be applicable. Additional significance criteria by air district are provided below. Significance criteria are only provided for the sellers in the area of analysis where potential air quality impacts from groundwater substitution and cropland idling transfers could occur.

3.5.2.2.1 Butte County AQMD

The Butte County AQMD has jurisdiction over facilities in Butte County. Water agencies subject to Butte County AQMD rules and regulations include the following:

1. Butte Water District (WD)[7]

The Butte County AQMD's *CEQA Air Quality Handbook* (2008) contains a thresholds table for evaluating significance from operational or construction impacts. The table contains various thresholds depending on the type of environmental document being prepared. In the case of an Environmental Impact Report (EIR), NOx, reactive organic gases (ROG),[8] or PM_{10} would be significant if emissions exceeded 137 lbs/day for either pollutant during operations.

3.5.2.2.2 Colusa County APCD

The Colusa County APCD has jurisdiction over facilities in Colusa County. Water agencies subject to Colusa County APCD rules and regulations include the following:

1. Eastside Mutual Water Company (MWC)
2. Glenn-Colusa Irrigation District (ID)[9]
3. Reclamation District (RD) 108[10]
4. RD 1004[11]
5. Sycamore MWC

The Colusa County APCD does not have significance thresholds for CEQA. As discussed previously, a criterion for determining significance is whether a proposed action or alternative could violate any air quality standard. The

[7] A portion of Butte WD is also located in Sutter County; therefore, only the portion of the water authority located in Butte County would be subject to the rules and regulations of the Butte County AQMD.
[8] CARB uses the term "reactive organic gases," which is similar to the term "volatile organic compounds" used by the USEPA, but with different exempt compounds (CARB 2009). For this analysis, the terms are used interchangeably.
[9] A portion of the Glenn-Colusa ID is located in Glenn County; therefore, only irrigation pumps or idled croplands located in Colusa County are subject to the Colusa County APCD's significance thresholds.
[10] A portion of RD 108 is located in Yolo County; therefore, only irrigation pumps or idled croplands located in Colusa County are subject to the Colusa County APCD's significance thresholds.
[11] Portions of RD 1004 are located in Glenn and Sutter Counties; therefore, only irrigation pumps or idled croplands located in Colusa County are subject to the Colusa County APCD's significance thresholds.

threshold used to define a "major source" in the CAA (100 tons per year [tpy]) was used to evaluate significance.

3.5.2.2.3 Feather River AQMD

The Feather River AQMD has jurisdiction over facilities in Sutter and Yuba counties. Water agencies implementing cropland idling and/or groundwater substitution transfers subject to Feather River AQMD rules and regulations include the following:

1. Butte WD[12]
2. Cordua ID
3. Cranmore Farms
4. Garden Highway MWC
5. Gilsizer Slough Ranch
6. Goose Club Farms and Teichert Aggregates
7. Natomas Central MWC[13]
8. Pelger MWC
9. Pleasant Grove-Verona MWC
10. RD 1004[14]
11. Tule Basin Farms

The Feather River AQMD published *Indirect Source Review Guidelines* (2010) to assess the air quality impact of land use projects under CEQA. The Feather River AQMD has significant impact thresholds of 25 lbs/day for NOx and VOC and 80 lbs/day for PM_{10} (Feather River AQMD 2010). Although the significant impact thresholds are geared towards indirect source emissions (i.e., development projects that produce emissions from vehicular traffic to the site, rather than by direct emissions from the facility), the thresholds are assumed to be applicable to stationary source projects as well.

[12] A portion of Butte WD is also located in Butte County; therefore, only the portion of the water authority located in Sutter County would be subject to the rules and regulations of the Feather River AQMD.
[13] A portion of Natomas Central MWC is also located in Sacramento County; therefore, only the portion of the water authority located in Sutter County would be subject to the rules and regulations of the Feather River AQMD.
[14] Portions of RD 1004 are also located in Colusa and Glenn Counties; therefore, only the portion of the water authority located in Sutter County would be subject to the rules and regulations of the Feather River AQMD.

3.5.2.2.4 Glenn County APCD

The Glenn County APCD has jurisdiction over facilities in Glenn County. Water agencies subject to Glenn County APCD rules and regulations include the following:

1. Glenn-Colusa ID[15]
2. RD 1004[16]

As with the Colusa County APCD, the Glenn County APCD does not publish its own quantitative significance thresholds for air quality impacts. As a result, the major source permitting threshold of 100 tpy was also used to determine significance for each pollutant.

3.5.2.2.5 Sacramento Metropolitan AQMD

The Sacramento Metropolitan AQMD has jurisdiction over facilities in Sacramento County. Water agencies subject to Sacramento Metropolitan AQMD rules and regulations include the following:

1. City of Sacramento
2. Natomas Central MWC[17]
3. Sacramento County Water Agency
4. Sacramento Suburban WD

The Sacramento Metropolitan AQMD's *Guide to Air Quality Assessment in Sacramento County* (2009) contains a thresholds table for evaluating significance from operational or construction impacts. The thresholds table indicates that emissions of NOx and ROG would be significant if emissions exceeded 65 lbs/day for either pollutant during operations.

3.5.2.2.6 San Joaquin Valley APCD

The San Joaquin Valley APCD has jurisdiction over facilities in the San Joaquin Valley Air Basin. Water agencies subject to San Joaquin Valley APCD rules and regulations include the following:

1. Merced ID

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[15] A portion of the Glenn-Colusa ID is located in Colusa County; therefore, only the portion of the water authority located in Glenn County would be subject to the rules and regulations of the Glenn County APCD.

[16] Portions of RD 1004 are also located in Colusa and Sutter counties; therefore, only the portion of the water authority located in Glenn County would be subject to the rules and regulations of the Glenn County APCD.

[17] A portion of Natomas Central MWC is also located in Sutter County; therefore, only the portion of the water authority located in Sacramento County would be subject to the rules and regulations of the Sacramento Metropolitan AQMD.

The San Joaquin Valley APCD's *Guide for Assessing and Mitigating Air Quality Impacts* (GAMAQI) (2002) contains provisions for evaluating significance under CEQA. The GAMAQI establishes O_3 precursor (ROG and NOx) emissions thresholds for project operation of 10 tpy for each O_3 precursor pollutant.

3.5.2.2.7 Shasta County AQMD

The Shasta County AQMD has jurisdiction over facilities in Butte County. Water agencies subject to Shasta County AQMD rules and regulations include the following:

1. Anderson-Cottonwood ID[18]

The *Shasta County General Plan (As Amended Through September 2004)* contains a thresholds table for evaluating significance from operational or construction impacts. The *Shasta County General Plan* has two significance threshold levels, Level "A" thresholds and Level "B" thresholds, with the Level "B" thresholds equal to 137 lbs/day for NOx, ROG, and PM_{10}. If the Level "A" thresholds are exceeded, then Standard Mitigation Measures and Best Available Mitigation Measures (BAMM) must be applied and special BAMM must be applied if Level "B" thresholds are exceeded. The Level "A" thresholds are 25 lbs/day for NOx and ROG and 80 lbs/day for PM_{10}. Because the Level "A" thresholds are the minimum levels are which mitigation would not be required, they were used as the significance threshold in this analysis.

3.5.2.2.8 Tehama County APCD

The Tehama County APCD has jurisdiction over facilities in Tehama County. Water agencies subject to Tehama County APCD rules and regulations include the following:

1. Anderson-Cottonwood ID[19]

The Tehama County APCD's *Planning & Permitting Air Quality Handbook* (2009) contains a thresholds table for evaluating significance from operational or construction impacts. The table contains various thresholds depending on the type of environmental document being prepared. In the case of an EIR, NOx, ROG, or PM_{10} would be significant if emissions exceeded 137 lbs/day for either pollutant during operations.

[18] A portion of Anderson-Cottonwood ID is also located in Tehama County; therefore, only the portion of the water authority located in Shasta County would be subject to the rules and regulations of the Shasta County AQMD.
[19] A portion of Anderson-Cottonwood ID is also located in Shasta County; therefore, only the portion of the water authority located in Tehama County would be subject to the rules and regulations of the Tehama County APCD.

3.5.2.2.9 Yolo-Solano AQMD

The Yolo-Solano AQMD has jurisdiction over facilities in Yolo County and the eastern portion of Solano County. Water agencies subject to Yolo-Solano AQMD rules and regulations include the following:

1. Conaway Preservation Group
2. Pope Ranch
3. RD 108[20]
4. RD 2068
5. River Garden Farms
6. Te Velde Revocable Family Trust

The Yolo-Solano AQMD's *Handbook for Assessing and Mitigating Air Quality Impacts* (2007) contains thresholds for determining the significance of project operations. The thresholds for ROG and NOx are 10 tpy each and the threshold for PM_{10} is 80 lbs/day.

3.5.2.3 Alternative 1: No Action/No Project

Cropland idling and groundwater pumping in the Buyer Service Area as a result of CVP water shortages could increase emissions. Under the No Action/No Project Alternative, agricultural water users in the Buyer Service Area would continue to face CVP shortages, similar to existing conditions. In response, farmers would leave some crops idle, which would leave bare soils susceptible to fugitive dust emissions from windblown dusts. Farmers would also continue to pump groundwater for irrigation, which releases emissions if diesel pumps are used. These actions in response to CVP shortages are similar to those that occur under existing conditions; therefore, there would be no change to emissions under the No Action/No Project Alternative.

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

As described above, the Proposed Action would have three main effects to emissions:

1. Increased exhaust emissions from groundwater substitution;
2. Decreased fugitive dust and farm equipment engine exhaust emissions from reduced land preparation and harvesting activities; and

[20] A portion of RD 108 is also located in Colusa County; therefore, only the portion located in Yolo County is subject to the rules and regulations of the Yolo-Solano AQMD.

3. Increased fugitive dust emissions from wind erosion during crop idling activities.

This section evaluates each of these effects separately and combined.

3.5.2.4.1 Sellers Service Area

Increased groundwater pumping for groundwater substitution transfers would increase emissions of air pollutants in Sellers Service Area. Increased emissions from diesel- and natural gas-fired engines would occur within the area of analysis as pump activity for groundwater substitution transfers.

The only water agencies located in the Placer County APCD are the Placer County Water Agency and the South Sutter WD. Neither water agency is proposing to participate in groundwater substitution or cropland idling. There would be no air quality impacts associated with groundwater pumping and cropland idling in the Placer County APCD.

Merced ID is the only water agency located in the San Joaquin Valley APCD; additionally, Anderson-Cottonwood ID is the only water agency located in the Shasta County and Tehama County APCDs. Merced ID is only proposing stored reservoir water transfers that would not increase emissions. Anderson-Cottonwood ID exclusively operates electric engines; therefore, there would be no local criteria pollutant emissions resulting from the combustion of fossil fuels. Additionally, these water agencies are not proposing to participate in cropland idling or crop shifting. There would be no air quality impacts associated with groundwater pumping and cropland idling in the San Joaquin Valley, Shasta County, and Tehama County APCDs.

Although the Butte WD operates in Butte and Sutter Counties, the agency is only proposing to use wells located in Sutter County for groundwater pumping. As a result, because wells in Butte County would not be used, there would be no air quality impacts associated with groundwater pumping in the Butte County AQMD.

Engine exhaust emissions were estimated using AP-42 emission factors and diesel emission standards as summarized in Section 3.5.2.1, Assessment Methods. Estimated emissions from groundwater pumping that would occur in the Colusa County APCD, Feather River AQMD, Glenn County APCD, Sacramento Metropolitan AQMD, and Yolo-Solano AQMD are provided in Table 3.5-9 through Table 3.5-13. Significance was determined for individual water agencies. Detailed calculations are provided in Appendix F, Air Quality Emission Calculations.

Table 3.5-9. Annual Emissions from Groundwater Pumping for the Colusa County APCD (tpy)

Water Agency[1,2]	VOC	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Eastside MWC	<1	2	2	1	<1	<1
RD 1004	1	13	5	1	<1	<1
Significance Threshold	100	100	100	100	100	100
Significant?	No	No	No	No	No	No

Notes:
[1] Glenn-Colusa ID is not included in the table because no engines would operate in Colusa County.
[2] RD 108 and Sycamore MWC are not included on the table because only electric engines would operate in these water agencies and there would be no local criteria pollutant emissions.
Key:
CO = carbon monoxide; NOx = nitrogen oxides; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; SOx = sulfur oxides; VOC = volatile organic compounds

Table 3.5-10. Peak Daily Emissions from Groundwater Pumping for the Feather River AQMD (lbs/day)

Water Agency[1,2]	VOC	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Gilsizer Slough Ranch	10	**119**	26	8	2	2
Pelger MWC	1	17	23	6	1	1
Pleasant Grove-Verona MWC	**33**	**285**	126	31	8	8
Tule Basin Farms	4	**128**	10	<1	<1	<1
Air District Threshold	25	25	n/a	n/a	80	n/a
Significant?	**Yes**	**Yes**	n/a	n/a	No	n/a

Notes:
[1] Butte WD, Cordua ID, Cranmore Farms, Garden Highway MWC, Goose Club Farms and Teichert Aggregates, and Natomas Central MWC are not included on the table because only electric engines would operate in these water agencies and there would be no local criteria pollutant emissions.
[2] RD 1004 is not included in the table because no engines would operate in Sutter County.
Key:
CO = carbon monoxide; lbs/day = pounds per day; NOx = nitrogen oxides; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; SOx = sulfur oxides; VOC = volatile organic compounds

Table 3.5-11. Annual Emissions from Groundwater Pumping for the Glenn County APCD (tpy)

Water Agency[1]	VOC	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
RD 1004	<1	2	<1	<1	<1	<1
Air District Threshold	100	100	100	100	100	100
Significant?	No	No	No	No	No	No

Notes:
[1] Glenn-Colusa ID is not included on the table because only electric engines would operate in these water agencies and there would be no local criteria pollutant emissions.
Key:
CO = carbon monoxide; NOx = nitrogen oxides; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; SOx = sulfur oxides; VOC = volatile organic compounds

Table 3.5-12. Peak Daily Emissions from Groundwater Pumping for the Sacramento Metropolitan AQMD (lbs/day)

Water Agency	VOC	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Sacramento Suburban WD	23	**788**	61	<1	2	2
Air District Threshold	65	65	n/a	n/a	n/a	n/a
Significant?	No	**Yes**	n/a	n/a	n/a	n/a

Notes:
[1] City of Sacramento, Natomas Central MWC, and Sacramento County Water Agency not included on the table because only electric engines would operate in these water agencies and there would be no local criteria pollutant emissions.
Key:
CO = carbon monoxide; lbs/day = pounds per day; NOx = nitrogen oxides; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; SOx = sulfur oxides; VOC = volatile organic compounds

Table 3.5-13. Peak Daily Emissions from Groundwater Pumping for the Yolo-Solano AQMD (lbs/day)

Water Agency[1]	VOC	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Peak Daily Emissions (lbs/day)						
Conaway Preservation Group	13	148	125	25	6	6
Air District Threshold	n/a	n/a	n/a	n/a	80	n/a
Significant?	n/a	n/a	n/a	n/a	No	n/a
Annual Project Emissions (tpy)						
Conaway Preservation Group	1	8	7	1	<1	<1
Air District Threshold	10	10	n/a	n/a	n/a	n/a
Significant?	No	No	No	No	No	No

Notes:
[1] Pope Ranch, RD 108, RD 2068, River Garden Farms, and Te Velde Revocable Family Trust are not included on the table because only electric engines would operate in these water agencies and there would be no local criteria pollutant emissions.
Key:
CO = carbon monoxide; lbs/day = pounds per day; NOx = nitrogen oxides; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; SOx = sulfur oxides; VOC = volatile organic compounds

As shown in the tables, criteria pollutant emissions would not exceed the significance criteria for the Colusa County APCD (Table 3.5-9), Glenn County APCD (Table 3.5-11), and Yolo-Solano AQMD (Table 3.5-13). Air quality impacts from groundwater pumping in these air districts would be less than significant.

As shown in Table 3.5-10, VOC emissions would exceed the significance criteria in Pleasant Grove-Verona MWC and NOx emissions would exceed the significance criteria in Gilsizer Slough Ranch, Pleasant Grove-Verona MWC, and Tule Basin Farms. As a result, groundwater pumping in the Feather River AQMD would result in a significant impact. Implementation of mitigation measure AQ-1 would reduce VOC and NOx emissions to less than significant. Table 3.5-24 summarizes mitigated emissions from groundwater pumping.

As shown in Table 3.5-12, NOx emissions exceed the significance criteria for the Sacramento Metropolitan AQMD. As a result, NOx emissions that would occur from groundwater pumping in Sacramento County would result in a significant impact under CEQA. Implementation of mitigation measures AQ-1 and AQ-2 would reduce emissions to less than significant. Table 3.5-20 summarizes mitigated emissions from groundwater pumping.

Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the Sellers Service Area. Cropland idling reduces use of farm equipment that reduces criteria pollutant emissions from vehicle exhaust. Reduced vehicle exhaust emissions were estimated based on the proposed acreages of croplands that would be idled and consequently the amount of equipment that would be idled during the Proposed Action. Emissions were estimated for the upper limit of cropland that could be idled as part of the Proposed Action. It is likely that the individual water agencies would not choose to idle the upper limits proposed as part of the Proposed Action in every year; therefore, these reductions are a maximum reduction and would likely not occur in every year.

Table 3.5-14 summarizes daily emissions that would not occur from vehicle exhaust (i.e., emission reductions) in the area of analysis, while Table 3.5-15 summarizes annual emissions.

Table 3.5-14. Maximum Reduction in Daily Emissions from Vehicle Exhaust (Cropland Idling) (lbs/day)[1]

Water Agency	VOC	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Butte WD	(1)	(13)	(17)	(4)	(1)	(1)
Conaway Preservation Group	(1)	(23)	(31)	(8)	(2)	(2)
Cranmore Farms	(<1)	(3)	(4)	(1)	(<1)	(<1)
Glenn-Colusa ID	(4)	(72)	(95)	(24)	(6)	(6)
Goose Club Farms and Teichert Aggregates	(1)	(11)	(14)	(4)	(1)	(1)
Pelger MWC	(<1)	(3)	(4)	(1)	(<1)	(<1)
Pleasant Grove-Verona MWC	(1)	(10)	(13)	(3)	(1)	(1)
RD 108	(1)	(22)	(29)	(7)	(2)	(2)
RD 1004	(1)	(11)	(14)	(4)	(1)	(1)
RD 2068	(<1)	(8)	(11)	(3)	(1)	(1)
Sycamore MWC	(1)	(11)	(14)	(4)	(1)	(1)
Te Velde Revocable Family Trust	(<1)	(8)	(10)	(3)	(1)	(1)
Total	**(10)**	**(195)**	**(256)**	**(64)**	**(15)**	**(15)**

Notes:
[1] Emission reductions (beneficial impacts) are shown in parentheses.
Key:
CO = carbon monoxide; NOx = nitrogen oxides; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; SOx = sulfur oxides; VOC = volatile organic compounds

Table 3.5-15. Maximum Reduction in Annual Emissions from Vehicle Exhaust (Cropland Idling) (tpy)[1]

Water Agency	VOC	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Butte WD	(<0.1)	(0.8)	(1.1)	(0.3)	(0.1)	(0.1)
Conaway Preservation Group	(0.1)	(1.6)	(2.0)	(0.5)	(0.1)	(0.1)
Cranmore Farms	(<0.1)	(0.2)	(0.2)	(0.1)	(<0.1)	(<0.1)
Glenn-Colusa ID	(0.3)	(4.8)	(6.3)	(1.6)	(0.4)	(0.4)
Goose Club Farms and Teichert Aggregates	(<0.1)	(0.7)	(1.0)	(0.2)	(0.1)	(0.1)
Pelger MWC	(<0.1)	(0.2)	(0.2)	(0.1)	(<0.1)	(<0.1)
Pleasant Grove-Verona MWC	(<0.1)	(0.7)	(0.9)	(0.2)	(0.1)	(0.1)
RD 108	(0.1)	(1.5)	(1.9)	(0.5)	(0.1)	(0.1)
RD 1004	(<0.1)	(0.7)	(1.0)	(0.2)	(0.1)	(0.1)
RD 2068	(<0.1)	(0.5)	(0.7)	(0.2)	(<0.1)	(<0.1)
Sycamore MWC	(<0.1)	(0.7)	(1.0)	(0.2)	(0.1)	(0.1)
Te Velde Revocable Family Trust	(<0.1)	(0.5)	(0.7)	(0.2)	(<0.1)	(<0.1)
Total	**(0.7)**	**(12.9)**	**(17.0)**	**(4.2)**	**(1.0)**	**(1.0)**

Notes:
[1] Emission reductions (beneficial impacts) are shown in parentheses.
Key:
CO = carbon monoxide; NOx = nitrogen oxides; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; SOx = sulfur oxides; VOC = volatile organic compounds

As shown in the tables, cropland idling would result in reduced vehicle exhaust emissions for all pollutants, although the actual reduction would likely be less than indicated in the tables because the full amount of cropland idling would not occur every year. Air quality impacts from vehicle exhaust that would not occur during cropland idling in the area of analysis would be beneficial.

Water transfers via cropland idling would decrease fugitive dust emissions associated with land preparation and harvesting, but also increase fugitive dust emissions from wind erosion of bare fields in the Sellers Service Area. Cropland idling could result in reduced fugitive dust (PM_{10} and $PM_{2.5}$) emissions from land preparation and harvesting activities. Barren land, on the other hand, could consequently result in an increase in particulate matter emissions.

CARB has published emission inventory documentation that specifies the expected particulate matter emissions for land preparation and harvesting activities that would occur for various crops (CARB 2003a; CARB 2003b). Under cropland idling transfers, land preparation and harvesting activities would not occur; therefore, fugitive dust emissions would not be released. CARB also provides emission inventory documentation for windblown dust for agricultural lands (CARB 1997). These emissions would occur if the fields are left barren and subject to causing windblown dust. $PM_{2.5}$ emissions were estimated from PM_{10} emissions using CARB's published PM size fractions for agricultural tilling dust (profile no. 417) and agricultural windblown dust (profile no. 411) (CARB 2012). Table 3.5-16 summarizes daily fugitive dust emissions that would occur from cropland idling in the area of analysis while Table 3.5-17 summarizes annual fugitive dust emissions.

As shown in the tables, the combined effect of reduced dust emissions from absence of land preparation and harvesting with increased dust emissions from windblown dust would cause net PM_{10} and $PM_{2.5}$ emissions to be negative for all crops. As a result, fugitive dust emissions occurring from cropland idling in the area of analysis would be beneficial.

Table 3.5-16. Daily Fugitive Dust Emissions from Cropland Idling (lbs/day)[1]

Water Agency	PM_{10} Land Preparation/ Harvesting	PM_{10} Erosion	PM_{10} Total	$PM_{2.5}$ Land Preparation/ Harvesting	$PM_{2.5}$ Erosion	$PM_{2.5}$ Total
Butte WD	(158)	6	(152)	(24)	1	(22)
Conaway Preservation Group	(245)	18	(227)	(37)	4	(33)
Cranmore Farms	(65)	1	(64)	(10)	<1	(9)
Glenn-Colusa ID	(1,646)	416	(1,230)	(247)	83	(164)
Goose Club Farms and Teichert Aggregates	(260)	6	(254)	(39)	1	(38)
Pelger MWC	(66)	1	(65)	(10)	<1	(10)
Pleasant Grove-Verona MWC	(234)	5	(229)	(35)	1	(34)
RD 108	(371)	75	(296)	(56)	15	(41)
RD 1004	(253)	44	(209)	(38)	9	(29)
RD 2068	(46)	5	(41)	(7)	1	(6)
Sycamore MWC	(256)	66	(190)	(38)	13	(25)
Te Velde Revocable Family Trust	(80)	6	(74)	(12)	1	(11)
Total	**(3,680)**	**651**	**(3,029)**	**(552)**	**130**	**(421)**

Notes:
[1] Emission reductions (beneficial impacts) are shown in parentheses.
Key:
PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter

Table 3.5-17. Annual Fugitive Dust Emissions from Cropland Idling (tpy)[1]

Water Agency	PM_{10} Land Preparation/ Harvesting	PM_{10} Erosion	PM_{10} Total	$PM_{2.5}$ Land Preparation/ Harvesting	$PM_{2.5}$ Erosion	$PM_{2.5}$ Total
Butte WD	(14)	1	(14)	(2)	<1	(2)
Conaway Preservation Group	(22)	2	(20)	(3)	<1	(3)
Cranmore Farms	(6)	<1	(6)	(1)	<1	(1)
Glenn-Colusa ID	(148)	37	(111)	(22)	7	(15)
Goose Club Farms and Teichert Aggregates	(23)	1	(23)	(4)	<1	(3)
Pelger MWC	(6)	<1	(6)	(1)	<1	(1)
Pleasant Grove-Verona MWC	(21)	<1	(21)	(3)	<1	(3)
RD 108	(33)	7	(27)	(5)	1	(4)
RD 1004	(23)	4	(19)	(3)	1	(3)

Water Agency	PM_{10} Land Preparation/ Harvesting	PM_{10} Erosion	PM_{10} Total	$PM_{2.5}$ Land Preparation/ Harvesting	$PM_{2.5}$ Erosion	$PM_{2.5}$ Total
RD 2068	(4)	<1	(4)	(1)	<1	(1)
Sycamore MWC	(23)	6	(17)	(3)	1	(2)
Te Velde Revocable Family Trust	(7)	1	(7)	(1)	<1	(1)
Total	**(331)**	**59**	**(273)**	**(50)**	**12**	**(38)**

Notes:
[1] Emission reductions (beneficial impacts) are shown in parentheses.
Key:
PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter

3.5.2.4.2 Buyer Service Area

Use of water from transfers on agricultural fields in the Buyer Service Area could reduce windblown dust. Water transfers to agricultural users in Merced, San Benito, Fresno, and Kings Counties would reduce the amount of land idled relative to the No Action/No Project Alternative. Crop plantings would reduce the potential for fugitive dust emissions that occurs from winds blowing over bare fields. The air quality impacts in the Buyer Service Area would be beneficial.

3.5.2.4.3 General Conformity

Water transfers via groundwater substitution and cropland idling could exceed the general conformity de minimis thresholds. Counties located in federal nonattainment or maintenance areas must also demonstrate compliance with the general conformity provisions in 40 CFR 93 Subpart B. Glenn and Colusa counties are designated as attainment areas for all NAAQS and are therefore not considered further in terms of general conformity. Furthermore, several water agencies are not within the federal 8-hour O_3 attainment area of Sutter County and their emissions are excluded from the general conformity applicability analysis. The excluded water agencies are summarized below:

- Cranmore Farms
- Garden Highway MWC
- Gilsizer Slough Ranch
- Pelger MWC
- Pleasant Grove-Verona MWC
- Tule Basin Farms

Because the CEQA-related mitigation measures are fully enforceable under Cal. Pub. Res. Code §21081.6 and would be a requirement of project implementation, mitigated emissions for the Proposed Action were compared to the general conformity de minimis thresholds. Although sellers may be initially proposing to use both groundwater substitution and cropland idling, it is possible that they could opt to use only one method in the future. Because cropland idling would reduce criteria pollutant emissions, only emissions from groundwater substitution were compared to general conformity de minimis thresholds to provide a worst-case estimate of impacts. Table 3.5-18 summarizes the general conformity applicability analysis.

Mitigated emissions would be less than the general conformity de minimis thresholds; therefore, no further action would be required under general conformity. Detailed calculations are provided in Appendix F.

Table 3.5-18. General Conformity Applicability Evaluation for the Proposed Action (Annual Emissions, tons per year)

County/ Nonattainment Area	Sacramento Metro[1,5]	Sacramento Metro[1,5]	Sacramento Area[2]	Sacramento[3,4]	Yuba City-Marysville[6]	Sacramento Co.	Sacramento[4]	Yuba City-Marysville[6]
Pollutant	VOC	NOx	CO	SOx	SOx	PM_{10}	$PM_{2.5}$	$PM_{2.5}$
Classification	Severe	Severe	Maintenance	$PM_{2.5}$ Precursor	$PM_{2.5}$ Precursor	Maintenance	Nonattainment	Nonattainment
Sacramento	0.1	4.9	0.4	0.001	--	0.01	0.01	--
Solano[7]	0	0	--	--	--	--	--	--
Sutter	0.3	3.6	--	--	3.1	--	--	0.5
Yolo	0.7	7.9	--	--	--	--	--	--
Yuba[7]	--	--	--	--	0.0	--	--	0.0
Total	1.2	16.3	0.4	0.001	3.1	0.01	0.01	0.5
De Minimis Threshold (tpy)	25	25	100	100	100	100	100	100
Exceed Threshold?	No	No	No	No	No	No	No	No

Notes:

1 The Sacramento Metro 8-hour O_3 nonattainment area consists of Sacramento and Yolo Counties and parts of El Dorado, Placer, Solano, and Sutter Counties. Emissions occurring within the attainment area of these counties are excluded from the total emissions.

2 The Sacramento Area CO maintenance area is based on the Census Bureau Urbanized Area and consists of parts of Placer, Sacramento, and Yolo Counties. The general conformity applicability evaluation is based on emissions that would occur within the entire county to be conservative.

3 All counties are designated as attainment areas for SO_2; however, because SO_2 is a precursor to $PM_{2.5}$, its emissions must be evaluated under general conformity.

4 The 24-hour $PM_{2.5}$ nonattainment area for Sacramento includes Sacramento County and parts of El Dorado, Placer, Solano, and Yolo Counties. The general conformity applicability analysis assumes that all emissions that could occur within each county would occur within the Sacramento nonattainment area to be conservative.

5 VOC and NOx emissions are excluded from Sutter County for Cranmore Farms, Garden Highway MWC, Gilsizer Slough Ranch, Pelger MWC, RD 1004, and Tule Basins Farms because they are located in areas designated as attainment for the federal 8-hour O_3 NAAQS.

6 The Yuba City-Marysville $PM_{2.5}$ nonattainment area consists of all of Sutter County and part of Yuba County.

7 Only electric-powered engines are proposed to operate in this county for groundwater substitution; therefore, emissions are equal to zero.

Key:

CO = carbon monoxide; n/a = not applicable; NOx = nitrogen oxides; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; SO_2 = sulfur dioxide; VOC = volatile organic compounds

3.5.2.5 Alternative 3: No Cropland Modifications

Alternative 3 would include transfers through groundwater substitution, but would not include any cropland idling or crop shifting transfers.

Increased groundwater pumping for groundwater substitution transfers would increase emissions of air pollutants. Groundwater substitution transfers that would occur under Alternative 3 would be identical to those that would occur under the Proposed Action. As a result, air quality impacts in the Colusa County APCD, Glenn County APCD, and Yolo-Solano AQMD and the would be less than significant (see Table 3.5-9, Table 3.5-11, and Table 3.5-13). Air quality impacts in the Feather River AQMD would be less than significant for NOx and VOC after implementation of mitigation measure AQ-1 (see Table 3.5-10). Air quality impacts in the Sacramento Metropolitan AQMD would be less than significant with implementation of mitigation measures AQ-1 and AQ-2 (see Table 3.5-12). There would be no air quality impacts in Placer County APCD, San Joaquin Valley APCD, Shasta County AQMD, and Tehama County APCD because groundwater pumping would use electric engines or would not occur in these areas.

Water transfers via groundwater substitution could exceed the general conformity de minimis thresholds. The general conformity evaluation was completed as described in Section 3.5.2.4.3 General Conformity. Since cropland idling would not be completed in Alternative 3, any emission reductions that would result from reduced land preparation and harvesting activities would not occur. Because the general conformity analysis for the Proposed Action only analyzed emissions from groundwater substitution, the impacts in Alternative 3 would be the same as those analyzed in the Proposed Action. As shown in Table 3.5-18 mitigated emissions would be less than the de minimis thresholds and no further action is required under general conformity.

3.5.2.6 Alternative 4: No Groundwater Substitution

Alternative 4 would include transfers through cropland idling and crop shifting, but would not include any groundwater substitution transfers.

Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the area of analysis. Cropland idling reduces use of farm equipment that reduces criteria pollutant emissions from vehicle exhaust. The proposed acreages of cropland that would be idled during Alternative 4 would be the same as that idled during the Proposed Action. As a result, impacts would be the same as those shown in Table 3.5-14 and Table 3.5-15. Air quality impacts from reduced vehicle exhaust during cropland idling would be beneficial.

Water transfers via cropland idling would increase fugitive dust emissions from wind erosion of bare fields and decrease fugitive dust emissions associated with *land preparation and harvesting in the area of analysis.* Cropland idling could result in reduced fugitive dust (PM_{10} and $PM_{2.5}$) emissions from land preparation and harvesting activities. Barren land, on the other hand, could consequently result in an increase in particulate matter emissions. The proposed acreages of cropland that would be idled during Alternative 4 would be the same as that idled during the Proposed Action. As a result, impacts would be the same as those shown in Table 3.5-16 and Table 3.5-17. Air quality impacts from changes in fugitive dust emissions during cropland idling would be beneficial.

3.5.3 Comparative Analysis of Alternatives

Table 3.5-19 summarizes the effects of the action alternatives. The following text supplements the table by describing the magnitude of the effects under the action alternative and No Action/No Project Alternative.

Table 3.5-19. Comparison of Alternatives

Potential Impact	Alternatives	Significance	Proposed Mitigation	Significance After Mitigation
Cropland idling that temporarily converts cropland to bare fields from inadequate water supplies could increase fugitive dust emissions	1	NCFEC	None	NCFEC
Increased groundwater pumping for groundwater substitution transfers would increase emissions of air pollutants in the Sellers Service Area.	2, 3	S	AQ-1, AQ-2	LTS
Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the Sellers Service Area.	2, 4	B	None	B
Water transfers via cropland idling would increase fugitive dust emissions from wind erosion of bare fields and decrease fugitive dust emissions associated with land preparation and harvesting in the Sellers Service Area.	2, 4	B	None	B
Use of water from transfers on agricultural fields in the Buyer Service Area could reduce windblown dust.	2, 3, 4	B	None	B
Water transfers via groundwater substitution and cropland idling could exceed the general conformity de minimis thresholds.	2, 3, 4	LTS	None	LTS

Key:
B = beneficial
LTS = less than significant
NCFEC = no change from existing conditions
S = significant

3.5.3.1 No Action/No Project Alternative

There would be no changes to the agricultural lands in the Seller Service Area relative to existing conditions. In the Buyer Service Area, increased land idling could occur in response to water shortages, which could then increase windblown dust emissions.

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

Increased groundwater pumping could increase criteria pollutant emissions from engine exhaust. Cropland idling would increase fugitive dust emissions from wind blowing on bare fields. These emission increases would then be partially offset by reduced farm equipment exhaust and fugitive dust emissions from land preparation and harvesting activities that would no longer occur under the Proposed Action. Mitigation measures would reduce significant impacts to less than significant in the Feather River AQMD and the Sacramento Metropolitan AQMD.

3.5.3.3 Alternative 3: No Cropland Modification

The No Cropland Modification Alternative does not include cropland idling or crop shifting transfers. Impacts associated with groundwater pumping would be the same as those identified for the Proposed Action.

3.5.3.4 Alternative 4: No Groundwater Substitution

The No Groundwater Substitution Alternative does not include groundwater pumping to enable water transfers. Impacts associated with cropland idling would be the same as those identified for the Proposed Action.

3.5.4 Environmental Commitments/Mitigation Measures

Implementation of the various engine control measures (AQ-1) would substantially reduce NOx emissions; however, the extent of the reduction would vary based on the size (hp) and age of the existing engine. For example, a 250 hp engine may have different NOx emission standards than a 100 hp engine. As a result, the same emission reduction between the two different engines may not occur. Table 3.5-20 summarizes the expected daily emissions after mitigation for groundwater substitution. The following mitigation measures would reduce the severity of the air quality impacts.

Table 3.5-20. Mitigated Peak Daily Emissions from Groundwater Pumping (lbs/day)

Air District	VOC	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Feather River AQMD						
Gilsizer Slough Ranch	1	24	31	8	2	2
Pleasant Grove-Verona MWC	2	23	48	14	1	1
Tule Basin Farms	4	19	10	<1	<1	<1
Significance Threshold	25	25	n/a	n/a	80	n/a
Significant?	No	No	n/a	n/a	No	n/a
Sacramento Metropolitan AQMD						
Sacramento Suburban WD	2	54	4	<1	<1	<1
Significance Threshold	65	65	n/a	n/a	n/a	n/a
Significant?	No	No	n/a	n/a	n/a	n/a

Notes:
[1] Emission reductions (beneficial impacts) are shown in parentheses.
Key:
CO = carbon monoxide; lbs/day = pounds per day; NOx = nitrogen oxides; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; SOx = sulfur oxides; VOC = volatile organic compounds

Following mitigation, VOC and NOx emissions would be reduced to less than significant under CEQA.

3.5.4.1 Mitigation Measure AQ-1: Reduce Pumping at Diesel or Natural Gas Wells to Reduce Pumping Below Significance Levels

Selling agency would reduce pumping at diesel or natural gas wells to reduce emissions to below the thresholds. If an agency is transferring water through cropland idling and groundwater substitution in the same year, the reduction in vehicle emissions can partially offset groundwater substitution pumping at a rate of 4.25 AF of water produced by idling to one acre-foot of groundwater pumped. Agencies may also decide to replace old diesel or natural gas wells to reduce emission below the thresholds.

Any selling agencies with potentially significant emissions, as determined by this EIS/EIR, will be required to maintain recordkeeping logs that document the specific engine to be used for groundwater substitution transfers, the power rating (hp), and applicable emission factors. Emission calculations for daily emissions will be completed for comparison to the significance thresholds determined for each selling agency. The recordkeeping logs will be sent to Reclamation monthly for verification that emissions are within the allowable limits.

Reclamation will also work with the water agencies to inform individual growers of incentive funding available through the Natural Resources Conservation Service's Environmental Quality Incentives Program. Funded conservation practices including the replacement of internal combustion engines in irrigation pumps; therefore, the program may be used by growers to further reduce criteria pollutant emissions.

3.5.4.2 Mitigation Measure AQ-2: Operate Dual-Fired Wells as Electric Engines

Any engines operating in the area of analysis that are capable of operating as either electric or natural gas engines would only operate with electricity during any groundwater transfers. Any selling agencies with these dual engines will be required to maintain recordkeeping logs that document that only electricity is used for groundwater substitution transfers. The recordkeeping logs will be sent to Reclamation monthly for verification that the engines are operating in compliance with the mitigation measure.

3.5.5 Potentially Significant Unavoidable Impacts

None of the action alternatives would result in potentially significant unavoidable impacts on air quality.

3.5.6 Cumulative Effects

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

Increased groundwater pumping for groundwater substitution transfers would increase criteria pollutant emissions from engine operation in the air districts. All counties affected by the Proposed Action are located in areas designated nonattainment for the PM_{10} CAAQS. Additionally, all counties are designated nonattainment for the O_3[21] CAAQS except Butte and Glenn Counties; Butte County, the San Joaquin Valley Air Basin, and the San Francisco Bay Air Basin are also designated nonattainment for the $PM_{2.5}$ CAAQS. Nonattainment status represents a cumulatively significant impact within the area. Because no single project determines the nonattainment status of a region, individual projects would only contribute to the area's designation on a cumulative basis.

The significance thresholds developed by the air districts serve to evaluate if a proposed project could either 1) cause or contribute to a new violation of a CAAQS or NAAQS in the area of analysis or 2) increase the frequency or severity of any existing violation of any standard in the area. Air districts recognize that air quality violations are not caused by any one project, but are a cumulative effect of multiple projects. Therefore, the air districts (including the Sacramento Metropolitan AQMD) have developed guidance that indicates a proposed project would be cumulatively considerable if the air quality impacts are individually significant.

[21] O_3 is a secondary pollutant, meaning that it is formed in the atmosphere from reactions of precursor compounds under certain conditions. Primary precursor compounds that lead to O_3 formation include VOCs and NOx; therefore, the significance thresholds established by the air districts for VOC and NOx are intended to maintain or attain the O_3 CAAQS and NAAQS.

Implementation of mitigation measures would reduce the Proposed Action's individual impacts to less than significant. Therefore, the Proposed Action's contribution to air quality impacts would not be cumulatively considerable.

Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the different air districts. As described previously, counties affected by the Proposed Action are located in areas designated nonattainment for the O_3, PM_{10}, and $PM_{2.5}$ CAAQS. Because no single project determines the nonattainment status of a region, the nonattainment status represents a cumulatively significant impact within the area of analysis. Based on guidance published by the air districts, a proposed project would be cumulatively considerable if the air quality impacts are individually significant.

Cropland idling activities would reduce vehicle exhaust emissions from reduced operations, which would be a beneficial impact to air quality. As a result, the Proposed Action's contribution to air quality impacts would not be cumulatively considerable.

Water transfers via cropland idling could increase fugitive dust emissions from wind erosion of bare fields and decrease fugitive dust emissions associated with land preparation and harvesting in the different air districts. As described previously, counties affected by the Proposed Action are located in areas designated nonattainment for the O_3, PM_{10}, and $PM_{2.5}$ CAAQS. Because no single project determines the nonattainment status of a region, the nonattainment status represents a cumulatively significant impact within the area of analysis. Based on guidance published by the air districts, a proposed project would be cumulatively considerable if the air quality impacts are individually significant.

Cropland idling activities would have a net reduction in fugitive dust emissions from reduced operations, which would be a beneficial impact to air quality. As a result, the Proposed Action's contribution to air quality impacts would not be cumulatively considerable.

3.5.6.2 Alternative 3: No Cropland Modification

Cumulative effects under Alternative 3 would be the same as the groundwater pumping impacts described in the Proposed Action.

3.5.6.3 Alternative 4: No Groundwater Substitution

Cumulative effects under Alternative 4 would be the same as the cropland idling impacts described in the Proposed Action.

3.5.7 References

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Section 3.6
Climate Change

This section presents the existing setting in relation to greenhouse gas (GHG) emissions within the area of analysis and discusses potential effects in relation to climate change from the proposed alternatives. Appendix G, Climate Change Analysis Emission Calculations, provides detailed emission calculations.

GHG emissions associated with groundwater substitution and cropland idling transfers are evaluated in relation to climate change in the area of analysis. The effects of climate change on the alternatives were also analyzed. Implementation of conservation or stored reservoir purchase transfers would not affect GHG emissions in relation to climate change and are not further discussed in this section. Although some crops may be more energy intensive than others, crop shifting is a regular practice in the Seller and Buyer Service Areas and a quantitative analysis was not conducted for this practice.

3.6.1 Affected Environment/Environmental Setting

The United Nations Intergovernmental Panel on Climate Change (IPCC) predicts that changes in the earth's climate will continue through the 21st century and that the rate of change may increase significantly in the future because of human activity (IPCC 2013). Many researchers studying California's climate believe that changes in the earth's climate have already affected California and will continue to do so in the future. Climate change may seriously affect the State's water resources. Temperature increases could affect water demand and aquatic ecosystems. Changes in the timing and amount of precipitation and runoff could occur. Sea level rise could adversely affect the Delta and coastal areas of the State.

Climate change is identified in the 2009 update of the California Water Plan (Bulletin 160-09) as a key consideration in planning for the State's future water management (California Department of Water Resources 2009). The 2009 Water Plan update qualitatively describes the effects that climate change may have on the State's water supply. It also describes efforts that should be taken to evaluate climate change effects quantitatively for the next Water Plan update.

3.6.1.1 Area of Analysis

The area of analysis for climate change includes counties where cropland idling could occur in the Seller Service Area, counties overlying groundwater basins where groundwater substitution transfers could occur, and counties where transferred water would be used for agricultural purposes in the Buyer Service Area. Figure 3.6-1 shows the climate change area of analysis.

Figure 3.6-1. Climate Change Area of Analysis

3.6.1.2 Regulatory Setting

GHG emissions and global climate change are governed by several federal and state laws and policies described below.

3.6.1.2.1 Federal

Department of the Interior

In 2009, the Department of Interior (DOI) issued a Secretarial Order on climate change that expands DOI bureaus' responsibilities in addressing climate change (amended on February 22, 2010). The purpose of Secretarial Order No. 3289 is to provide guidance to bureaus and offices within the DOI on how to provide leadership by developing timely responses to emerging climate change issues. This Order replaces Secretarial Order No. 3226, signed on January 19, 2001, entitled "Evaluating Climate Change Impacts in Management Planning." It reaffirms efforts within DOI that are ongoing with respect to climate change. Among the requirements of the Order is one that requires each bureau and office of DOI to "consider and analyze potential climate change impacts when undertaking long-range planning exercises, setting priorities for scientific research and investigations, and/or when making major decisions affecting DOI resources."

The Reclamation *National Environmental Policy Act (NEPA) Handbook* (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 in regards to Reclamation actions: 1) Reclamation's action is a potentially significant contributor to climate change and 2) climate change could affect a Reclamation proposed action. The *NEPA Handbook* recommends considering different aspects of climate change (e.g., relevance of climate change to the proposed action, timeframe for analysis, etc.) to determine the extent to which it should be discussed under NEPA.

Additionally, DOI Department Manual 523 (effective December 20, 2012) states that it is DOI policy to use best available science in decision-making water management planning including integrating adaptation strategies. It also states that climate change be considered in developing or revising management plans. Section B further states that "the Department will promote existing processes and when necessary, institute new processes to: 1) Conduct assessments of vulnerability to anticipated or current climate impacts, 2) Develop and implement comprehensive climate change adaptation strategies based on vulnerability and other factors, and 3) Include measurable goals and performance metrics."

Prevention of Significant Deterioration (PSD) and Title V GHG Tailoring Rule

On June 3, 2010, the U.S. Environmental Protection Agency (USEPA) issued a final rule to amend the applicability criteria that determine when new and modified stationary sources are subject to PSD and Title V permitting programs for GHG[1] emissions (75 Federal Register [FR] 31514). The tailoring rule applies a threshold for obtaining these permits for GHG emissions of 75,000 to 100,000 short tons per year (tpy) of carbon dioxide equivalent (CO_2e). [2]

The key elements of the tailoring rule were phased in starting on January 2, 2011. During that phase, only stationary sources that would already be subject to PSD permitting requirements were required to permit GHG emissions. Permitting was required for new sources that would emit 75,000 tpy CO_2e or for existing major stationary sources that had an emissions increase of 75,000 tpy CO_2e. During that phase of permitting, no source was subject to PSD

[1] For purposes of the tailoring rule, GHG is defined as the aggregate group of carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

[2] CO_2e emissions are calculated by multiplying the mass amount of emissions for each pollutant (e.g., N_2O) by the gas's associated global warming potential (ratio of the time-integrated radiative forcing from the instantaneous release of one kilogram of a trace substance relative to that of one kilogram of the reference gas, CO_2 defined by 40 CFR 98 (Mandatory GHG Reporting).

permitting solely because of its GHG emissions. Beginning July 1, 2011, permitting is required for new stationary sources or for modifications that would increase CO_2e emissions by 100,000 tpy. This second phase of permitting applies to both PSD and Title V permitting programs.

NEPA

While there is currently no federal regulation in place to govern the effects of climate change and GHG emissions, the Council on Environmental Quality (CEQ) provided a draft memorandum in February 2010 that outlines how Federal agencies may better consider the effects of GHG emissions and climate change in their evaluation of NEPA documents. In that draft guidance, CEQ proposes the consideration of opportunities to reduce GHG emissions and adapt the actions to climate change impacts throughout the NEPA process.

In the context of NEPA, CEQ proposes that the following climate change issues be considered:

1. The GHG emissions effects of a proposed action and alternative actions; and

2. The relationship of climate change effects to a proposed action or alternatives, including the relationship to proposal design, environmental impacts, mitigation and adaptation measures.

For the GHG emission analysis, the CEQ draft guidance outlines when to evaluate GHG emissions and offers a protocol on how to evaluate GHG emissions. The draft NEPA guidance states that if a proposed action causes direct emissions of 25,000 metric tons or more of CO_2e emissions on an annual basis, then a quantitative and qualitative assessment should be completed in an Environmental Impact Statement (EIS). The draft CEQ guidance suggests that the following steps be taken to evaluate the effects of GHG emissions:

- Quantify cumulative emissions over the life of the project
- Discuss measures to reduce GHG emissions, including consideration of reasonable alternatives
- Qualitatively discuss the link between such GHG emissions and climate change

In the draft memorandum, CEQ recognizes that the discussion of climate change effects in NEPA documents may be discussed in varying detail depending on available data.

3.6.1.2.2 State

California Executive Order S-3-05
On June 1, 2005, former California Governor Arnold Schwarzenegger signed Executive Order S-3-05. This executive order established the following GHG emission reduction targets for California:

- By 2010, reduce GHG emissions to 2000 levels.
- By 2020, reduce GHG emissions to 1990 levels.
- By 2050, reduce GHG emissions to 80 percent below 1990 levels.

The order also requires the Secretary of the California Environmental Protection Agency (Cal/EPA) to report to the Governor and the State Legislature biannually on progress made toward meeting the GHG emission targets, commencing in January 2006. The Secretary of the Cal/EPA is also required to report about climate change impacts on water supply, public health, agriculture, the coastline, and forestry; mitigation and adaptation plans to combat these impacts must also be developed.

California GHG emissions were estimated to be 453.06 million tonnes of CO_2e in 2010, compared to 466.32 million tonnes of CO_2e in 2000 (California Air Resources Board [CARB] 2014). The GHG emissions inventory indicates that emissions decreased by over 13 million tonnes over the decade, representing a 3 percent decrease in statewide emissions. As a result, the State was successful in meeting the first milestone of S-3-05.

California Assembly Bill (AB) 32
California AB 32, the Global Warming Solutions Act of 2006, codifies the state’s GHG emissions targets by requiring the state’s global warming emissions to be reduced to 1990 levels by 2020 and directs the CARB to enforce the statewide cap that would begin phasing in by 2012. Former Governor Schwarzenegger signed and passed AB 32 into law on September 27, 2006. Key AB 32 milestones are as follows (CARB n.d.):

- January 1, 2009 – Scoping Plan adopted indicating how emissions will be achieved from significant sources of GHGs via regulations, market mechanisms, and other actions.

- During 2009 – CARB staff drafted rule language to implement its plan and held a series of public workshops on each measure (including market mechanisms).

- January 1, 2010 – Early action measures took effect.

- During 2010 – CARB conducted series of rulemakings, after workshops and public hearings, to adopt GHG regulations including rules governing market mechanisms.

- January 1, 2011 – Completion of major rulemakings for reducing GHGs including market mechanisms.

- January 1, 2012 – GHG rules and market mechanisms (e.g., cap-and-trade regulation) adopted by CARB took effect and are legally enforceable.

- December 31, 2020 – Deadline for achieving 2020 GHG emissions cap.

CARB has been proactive in its implementation of AB 32 and has met each of the milestones identified above that have already passed and is on track to meet the last milestone.

California Environmental Quality Act (CEQA) Guidelines

On March 18, 2010, the California Natural Resources Agency adopted amendments to CEQA Guidelines to include provisions for evaluating the significance of GHG emissions. The amended guidelines give the lead agency leeway in determining whether GHG emissions should be evaluated quantitatively or qualitatively, but requires that the following factors be considered when assessing the significance of impacts from GHG emissions (14 California Code of Regulations 15064.4):

- The extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting.

- Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project.

- The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions.

The amended CEQA Guidelines also suggest measures to mitigate GHG emissions, including implementing project features to reduce emissions, obtaining carbon offsets to reduce, or sequestering GHG. The CEQA Guidelines also require energy use and conservation measures to be discussed, which are summarized in Section 3.16, Power.

3.6.1.2.3 Regional/Local

The following air pollution control districts (APCDs) and air quality management districts (AQMDs) regulate air quality within the area of analysis:

- Bay Area AQMD
- Butte County AQMD
- Colusa County APCD
- Feather River AQMD

- Glenn County APCD
- Monterey Bay Unified APCD
- Placer County APCD
- Sacramento Metropolitan AQMD
- San Joaquin Valley APCD
- Shasta County AQMD
- Tehama County APCD
- Yolo-Solano APCD

Section 3.5, Air Quality, depicts the location of each air district in the Seller and Buyer Service Areas. Although these air districts do not regulate GHG emissions directly, they may have GHG-specific significance criteria in their respective CEQA guidelines.

3.6.1.3 Existing Conditions

This section presents projections of the foreseeable affected environment for use as the basis against which the incremental effects of the alternatives are compared in Section 3.6.2 and to indicate the likely effect of climate change on the alternatives.

3.6.1.3.1 California Climate Trends and Associated Impacts

This discussion describes the data sources used for the analysis, the projected climate changes, and the associated impacts of those changes for the state of California and the study area.

Data Sources

Four reports were used as the main data sources for projected changes in climate for this evaluation. Each report is based on different global climate models (GCMs) and emission scenarios, as described below. Because each GCM/emission scenario pair has related uncertainty, it is important to consider results from various models to understand the possible outcomes (California Climate Change Center [CCCC] 2009a). For this analysis, the ranges of projected changes published in each report are presented.

- **"Climate Change Scenarios and Sea Level Rise Estimates for the California 2009 Climate Change Scenarios Assessment" (CCCC 2009a) –** This report provides projected climate data for California, including monthly temperature data, monthly precipitation data and snow water equivalent (the amount of water contained in snowpack). In addition to the report, the data is available through a series of interactive, web-based tools provided by the California Energy Commission (CEC). Four GCMs were used in the report; the National Center for Atmospheric Research (NCAR) Parallel Climate Model (PCM), the National Oceanic and Atmospheric Administration Geophysical Fluids Dynamics

Laboratory (GFDL) model (Version 2.1), the NCAR Community Climate System Model (CCSM), and the French Centre National de Recherches Meteorologiques (CNRM) models. Two emission scenarios from the IPCC Fourth Assessment were used; a low emissions scenario involving substantial reductions in emissions after 2050 (B1) and a medium-high emissions scenario assuming continued increased in emissions (A2). Two downscaling methods were used: 1) constructed analogues and 2) bias correction and spatial downscaling.

- **"Climate Change Impacts on Water Supply and Agricultural Water Management in California's Western San Joaquin Valley, and Potential Adaptation Strategies" (CCCC 2009b) –** This report provides estimated watershed runoff and agricultural and urban water demand projections for the Sacramento River basin and the Delta export region of the San Joaquin Valley. The Water Evaluation and Planning modeling system was used in conjunction with six GCMs: CNRM, GFDL, PCM, CCSM, the Center for Climate System Research, and the Max Planck Institute. Two emissions scenarios, B1 and A2, were evaluated.

- **"Climate Change Impacts in the United States: The Third National Climate Assessment" (Melillo, Richmond, and Yohe 2014) –** This report assesses current scientific findings about observed and projected impacts of climate change in the United States. The report draws from a large body of scientific peer-reviewed research published or in press by March 1, 2012.

- **"Global Climate Change Impacts in the United States" (Karl, Melillo, and Peterson 2009) –** This report was prepared by the United States Global Change Research Program, a consortium of 13 federal departments and agencies authorized by Congress in 1989 through the Global Change Research Act of 1990 (Pub. L. 101-606, 104 Stat. 3096, codified as amended at 15 U.S. Code [USC] 2921), and serves as the basis for "The Second National Climate Assessment." The foundation for this report is a set of 21 Synthesis and Assessment Products, as well as other peer-reviewed scientific assessments, including those of the IPCC, the United States Climate Change Science Program, the United States National Assessment of the Consequences of Climate Variability and Change, the Arctic Climate Impact Assessment, the National Research Council's Transportation Research Board report on the Potential Impacts of Climate Change on United States Transportation, and a variety of regional climate impact assessments.

Projected Changes in Climate

The projected changes in climate conditions are expected to result in a wide variety of impacts in the state of California and San Joaquin River area. In general, estimated future climate conditions include changes to:

- Annual temperature
- Extreme heat
- Precipitation
- Sea level and storm surge
- Snowpack and streamflow

These projected changes are discussed in detail in the following paragraphs.

Annual Temperature. GCM data exhibit warming across California under both a low emission scenario and medium-high emission scenario (CCCC 2009a). While the data contain variability, there is a steady, linear increase over the 21st century (CCCC 2009a). Projected increases are shown in Table 3.6-1.

Table 3.6-1. Projected Changes in Temperature Compared to the Historical Average (1961 to 1990)

Region	Mid-21st Century	End of 21st Century
California	+1.8 to 5.4°F	+3.6 to 9.0°F
Sacramento Area, California	---	+3.6 to 6.3°F

Sources: CCCC 2009a, CEC 2011.
Key:
--- = no data available
°F = degrees Fahrenheit

On a seasonal basis, the models project substantial warming in the spring and greater warming in the summer than in the winter. Summer (July to September) temperature changes range from 2.7 to 10.8 °F and winter (January to March) temperature changes range from 1.8 to 7.2 °F at the end of the 21st century when compared to the historical average (1961 to 1990) (CCCC 2009a). In addition, the models suggest that, during the summer, warming of interior land surfaces will be greater than that observed along the coast (CCCC 2009a).

Extreme Heat. The climate model results consistently show increases in frequency, magnitude and duration of heat waves when compared to historical averages (1961 to 1990). Historically, extreme temperatures typically occur in July and August. With climate change, these occurrences are likely to begin in June and continue through September (CCCC 2009a). Occurrences lasting five days or longer are projected to become 20 times or more prevalent in the last 30 years of the 21st century (CCCC 2009a).

For Sacramento, the closest area to the San Joaquin River for which data is available, GCM results show a more-than-threefold increase in the frequency of extreme heat and a significant increase in the intensity of hot days (CCCC 2009a). By 2100, the data show as many as 100 days per year with temperatures greater than 95°F in Sacramento (CEC 2011).

*Precipitation***.** On average, the climate model projections show little change in total annual precipitation in California (CCCC 2009a). Specifically, the Mediterranean seasonal precipitation pattern is expected to continue, with most precipitation falling between November and March from North Pacific storms and the prevalence of hot, dry summers (CCCC 2009a). In addition, past trends show a large amount of variability from month to month, year to year, and decade to decade. This high degree of variability is expected to continue in the next century (CCCC 2009a).

For Sacramento, several model simulations indicate a drying trend when compared to the historical average (1961 – 1990). Under the low emissions scenario, the 30-year mean precipitation is projected to be more than five percent drier by mid-21st century and 10 percent drier by late-21st century (CCCC 2009a). The model results showing the drying trend indicate a decline in the frequency of precipitation events, but do not show a clear correlation in the precipitation intensity (CCCC 2009a).

In the western San Joaquin Valley, model simulations suggest that there is a generally decreasing trend in precipitation as the 21st century progresses (CCCC 2009b). In addition, model results indicate that water shortages may be felt more acutely in the western San Joaquin Valley as Delta exports become more constrained (CCCC 2009b).

Sea Level and Storm Surge. By 2050, sea level rise is projected to be between 30 and 45 centimeters (cm) (12 to 18 inches), compared to 2000 levels (CCCC 2009a). Global models indicate that California may see up to a 140 cm (55 inch) rise in sea level by the end of the 21st century (CEC 2011). Combined with high tides and winter storms, sea level rise is projected to result in an increased rate of extreme high sea level events (CCCC 2009a).

Snowpack and Streamflow. Snowpack and streamflow amounts are projected to decline because of less late winter precipitation falling as snow and earlier snowmelt (Melillo, Richmond, and Yohe 2014). In California, snow water equivalent (the amount of water held in a volume of snow) is projected to decrease by 16 percent by 2035, 34 percent by 2070, and 57 percent by 2099, as compared to measurements between 1971 and 2000 (Melillo, Richmond, and Yohe 2014). By the end of the century, late spring streamflow could decline by up to 30 percent (CEC 2011).

Associated Impacts
The combined changes in climate result in various impacts for California and the study area. Potential impacts include changes to wildfire hazards, water supply and demand, natural resources, infrastructure, agriculture and livestock, and human health. Descriptions of the associated impacts are included below.

Wildfire Hazards. Prolonged periods of higher temperatures combined with associated drought will drive larger and more frequent wildfires in California (Melillo, Richmond, and Yohe 2014). The wildfires are projected to start earlier in the summer and last longer into the fall. In California, the risk of wildfire is projected to increase by up to 55 percent, depending on the level of emission reductions that can be achieved globally (CEC 2011). Changes to temperature and precipitation are also projected to change vegetation types and increase the spread of invasive species that are more fire-prone that, when coupled with more frequent and prolonged periods of drought, increase the risk of fires and reduce the capacity of native species to recover (CEC 2011).

Water Supply and Demand. The projected changes in climate will increase pressure on California's water resources, which are already fully utilized by the demands of a growing economy and population (CEC 2011). Although significant changes in annual precipitation are not projected, increasing temperatures, decreasing snowmelt and changes to spring streamflows will decrease the reliability of water supplies and increase the likelihood of more frequent short-term and long-term droughts and water shortages (Melillo, Richmond, and Yohe 2014). Water is also an important resource for creating hydroelectric power, which may be impacted by decreased supply (Karl, Melillo, and Peterson 2009).

Increasing temperatures will result in increased competition for water among agricultural, municipal, and environmental uses. Larger agricultural demands may lead to increased stress on the management of surface water resources and, potentially, the over exploitation of groundwater aquifers (CCCC 2009b). Agricultural areas could be significantly impacted, with California farmers losing as much as 25 percent of the water supply they need (CEC 2011).

Water supplies are also at risk from rising sea levels. An influx of saltwater would degrade California's estuaries, wetlands, and groundwater aquifers. In particular, saltwater intrusion would threaten the quality and reliability of the major state fresh water supply that is pumped from the southern edge of the Sacramento and San Joaquin River Delta (Delta) (CEC 2011). In addition, the entire Delta region is now below sea level, protected by more than a thousand miles of levees and dams, and catastrophic failure of those dams from an extreme high sea level event would greatly affect this resource (Karl, Melillo, and Peterson 2009).

Projected changes in the timing and amount of river flow, particularly in winter and spring, is estimated to more than double the risk of Delta flooding events by mid-century, and result in an eight-fold increase before the end of the century (Karl, Melillo, and Peterson 2009). Taking into account the additional risk of a major seismic event and increases in sea level due to climate change over this century, the California Bay–Delta Authority has concluded that the Delta and Suisun Marsh are not sustainable under current practices (Karl, Melillo, and Peterson 2009).

Natural Resources. Climate change will continue to affect natural ecosystems, including changes to biodiversity, location of species and the capacity of ecosystems to moderate the consequences of climate disturbances such as droughts (Melillo, Richmond, and Yohe 2014). In particular, species and habitats that are already facing challenges will be the most impacted by climate change (Melillo, Richmond, and Yohe 2014). Other impacts to natural resources include:

- Changing water quality of natural surficial water bodies, including higher water temperatures, decreased and fluctuating dissolved oxygen content, increased cycling of detritus, more frequent algal blooms, increased turbidity, increased organic content, color changes, and alkalinity changes (Karl, Melillo, and Peterson 2009).

- Decreased tree growth and habitat change in low- and mid-elevation forests from increased temperature and drought (Karl, Melillo, and Peterson 2009).

- Increased frequency and intensity of insect attacks due to increased temperatures and shorter winters (Melillo, Richmond, and Yohe 2014).

- Disruption of the coordination between predator-prey or plant-pollinator life cycles that may lead to declining populations of many native species (Karl, Melillo, and Peterson 2009).

- Changes in the tree canopy that affect rainfall interception, evapotranspiration, and infiltration of precipitation, affecting the quantity of runoff (Karl, Melillo, and Peterson 2009).

- Reduced ability to respond to flooding and increased stress on species populations due to changes in wetland and riparian zone plant communities and hydraulic roughness (Karl, Melillo, and Peterson 2009).

- Shifting distribution of plant and animal species on land, with some species becoming more or less abundant (Karl, Melillo, and Peterson 2009).

- Rare or endangered species may become less abundant or extinct (Melillo, Richmond, and Yohe 2014).

- Decreased recreation and tourism opportunities from ecosystems degradation (Karl, Melillo, and Peterson 2009).

Infrastructure. Existing infrastructure were designed based on past, stable climate trends and may not have the capacity to respond to rapid changes in climate that are projected for the future (Melillo, Richmond, and Yohe 2014). Impacts to infrastructure include:

- Changes to soil moisture (Karl, Melillo, and Peterson 2009), which may led to soil subsidence under structures.
- Increased energy demand for cooling, refrigeration and water transport (Karl, Melillo, and Peterson 2009).
- Buckling of pavement or concrete structures (Karl, Melillo, and Peterson 2009).
- Decreased lifecycle of equipment or increased frequency of equipment failure (Karl, Melillo, and Peterson 2009).
- Accelerated erosion when stormwater infrastructure capacity is exceeded (Melillo, Richmond, and Yohe 2014).

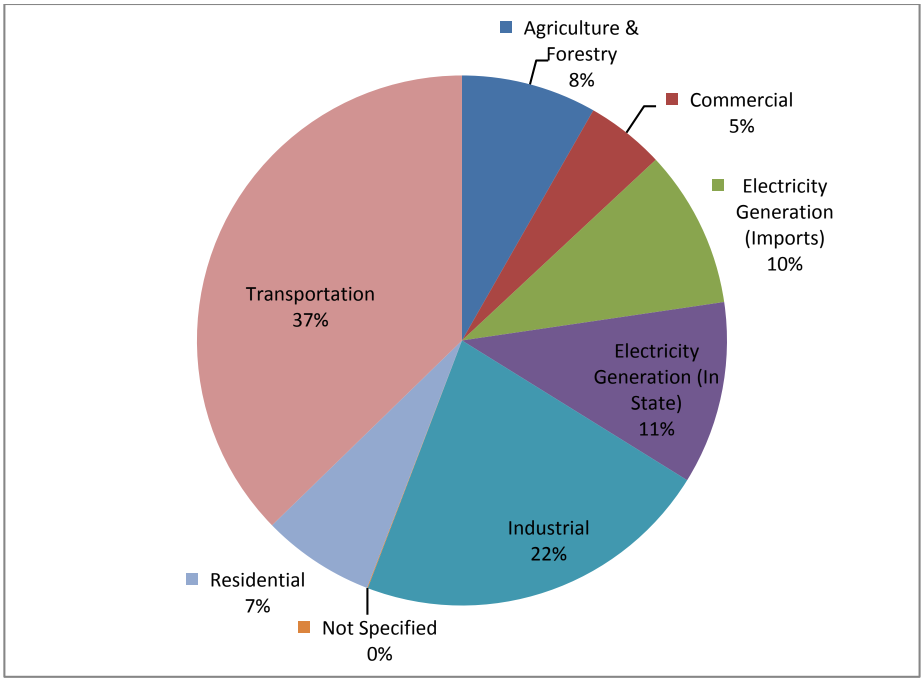
Agriculture and Livestock. Increased temperatures are projected to lengthen the growing season, although disruptions from extreme heat, drought, and changes to insects are also expected (Melillo, Richmond, and Yohe 2014). With adaptive actions, agriculture in the United States is expected to be resilient in the near-term, but yields of crops are expected to decline mid-century and late-century due to increased extremes in the climate (Melillo, Richmond, and Yohe 2014). California produces a large portion of the nation's high-value specialty crops, which are irrigation dependent and vulnerable to extreme changes in temperature and moisture (Melillo, Richmond, and Yohe 2014). Increased frequency and duration of heat waves would also put stress on livestock.

Human Health. Extreme heat events, increased wildfires, decreased air quality caused by rising temperatures, and diseases transmitted by insects, food and water that are impacted by climate change are a threat to human health and well-being (Melillo, Richmond, and Yohe 2014).

3.6.1.3.2 GHG Emissions Sources and Inventory

California is the second highest emitter of GHG emissions in the states, only behind Texas; however, from a per capita standpoint, California has the 45th lowest GHG emissions among the states. Worldwide, California is the 20th largest emitter of carbon dioxide (CO_2) if it were a country; on a per capita basis, California would be ranked 38th in the world (CARB 2014a). As shown in Figure 3.6-2, transportation is responsible for 37 percent of the State's GHG emissions, followed by the industrial sector (22 percent), electricity generation

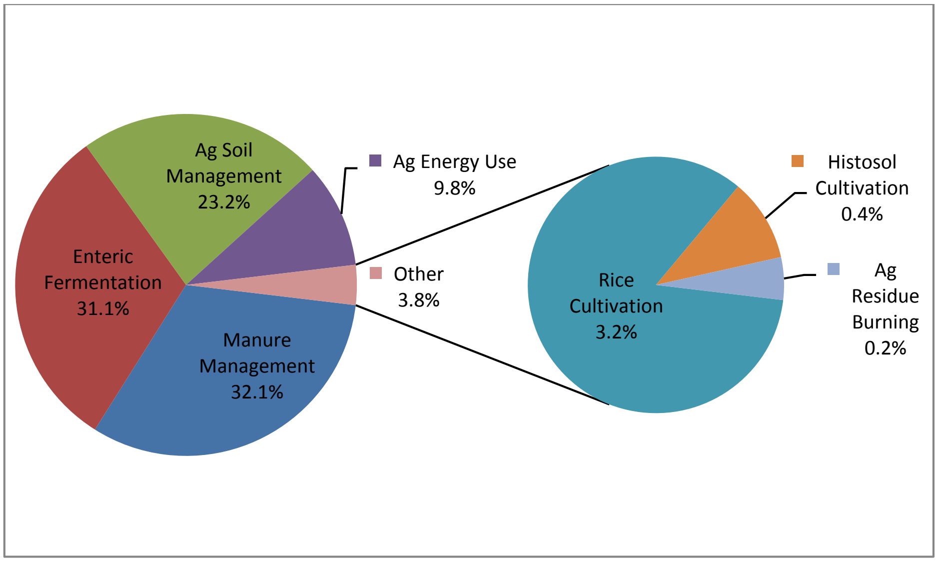
(21 percent), commercial and residential (12 percent), agriculture and forestry (8 percent) and other sources (0.04 percent). Emissions of CO_2 and nitrous oxide (N_2O) are largely byproducts of fossil fuel combustion. Methane (CH_4), a highly potent GHG, results largely from off-gassing associated with agricultural practices and landfills. California gross GHG emissions in 2012 (the last year inventoried) totaled approximately 459 million metric tons CO_2e (CARB 2014b).



Source: CARB 2014b.

Figure 3.6-2. California GHG Emissions in 2012

Agricultural emissions represented approximately 8 percent of California's emissions in 2012. Agricultural emissions represent the sum of emissions from agricultural energy use (from pumping and farm equipment), agricultural residue burning, agricultural soil management (the practice of using fertilizers, soil amendments, and irrigation to optimize crop yield), enteric fermentation (fermentation that takes place in the digestive system of animals), histosols (soils that are composed mainly of organic matter) cultivation, manure management, and rice cultivation. Agricultural emissions are shown in Figure 3.6-3.



Source: CARB 2014b.

Figure 3.6-3. California Agricultural GHG Emissions in 2012

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 analysis estimates CO_2, CH_4, and N_2O emissions that would occur from groundwater substitution transfers and cropland idling transfers. The other two pollutant groups commonly evaluated in various GHG reporting protocols, hydrofluorocarbons and perfluorocarbons, are not expected to be emitted in large quantities as a result of the alternatives and are not discussed further in this section.

This analysis estimates emissions using available emissions data and information on fuel type, engine size (horsepower [hp]), and annual transfer amounts included in the proposed alternatives. Existing emissions data used in the analysis includes:

- Diesel and natural gas fuel emission factors from The Climate Registry (TCR 2014a)
- Electric utility CO_2 emission factors from TCR (2014b)
- Emissions & Generation Resource Integrated Database (eGRID) CH_4 and N_2O emission factors from USEPA (USEPA 2014)

- "Comparison of Summertime Emission Credits from Land Fallowing Versus Groundwater Pumping" (Byron Buck & Associates 2009)

In 2009, Byron Buck & Associates completed a comparison of the relative reduction in emissions due to cropland idling activities versus groundwater substitution. Byron Buck & Associates estimated the gallons of fuel consumed by farm equipment that would be reduced per acre idled and the average quantity of fuel consumed by groundwater pumping. It was assumed that an agency would need 4.25 acre-feet (AF) of water produced by idling to offset the equivalent emissions of one AF of groundwater pumped (Byron Buck & Associates 2009). Using this ratio, the expected reductions in vehicular exhaust emissions from cropland idling were estimated.

Each GHG contributes to climate change differently, as expressed by its global warming potential (GWP). GHG emissions are discussed in terms of CO_2e emissions, which express, for a given mixture of GHG, the amount of CO_2 that would have the same GWP over a specific timescale. CO_2e is determined by multiplying the mass of each GHG by its GWP.

This analysis uses the GWP from the IPCC Fourth Assessment Report (Forster et al. 2007) for a 100-year time period to estimate CO_2e. This approach is consistent with the federal GHG Reporting Rule (40 Code of Federal Regulations [CFR] 98), as effective on January 1, 2014 (78 FR 71904) and California's 2000-2012 GHG Inventory Report (CARB 2014a). The GWPs used in this analysis are 25 for CH_4 and 298 for N_2O.

Annual emissions were summarized by water agency. Detailed calculations are provided in Appendix G, Climate Change Analysis Emission Calculations.

3.6.2.2 Significance Criteria

The significance criteria described below were developed consistent with the CEQA Guidelines to determine the significance of potential impacts on climate change that could result from implementation of the alternatives. Individual air districts develop their own criteria for evaluating significance. Since climate change is a cumulative issue, GHG emissions were not separated by individual water agencies, counties, or air districts to evaluate significance. Rather, emissions that would occur as a result of the entire alternative were evaluated.

To determine the appropriate significance level to use, the GHG significance criteria for various air districts were evaluated. The review of the CEQA Guidelines was not restricted to only those counties that would be affected by the alternatives. Instead the CEQA Guidelines for air districts with known quantitative or qualitative guidance for GHG emissions were reviewed. Many of the air districts included in the area of analysis do not have published significance thresholds for GHG emissions and climate change. These air districts include the Butte County AQMD, Colusa County APCD, the Glenn

County APCD, Shasta County AQMD, Tehama County APCD and the Yolo-Solano AQMD.

Table 3.6-2 summarizes the various emissions thresholds used by air districts throughout California.

Table 3.6-2. Air District GHG Significance Thresholds

Air District	GHG Significance Threshold
Antelope Valley AQMD and Mojave Desert AQMD	Direct and indirect emissions in excess of 100,000 tpy or 548,000 pounds per day CO_2e
Bay Area AQMD	None[1]
Sacramento Metropolitan AQMD	Thresholds of significance for GHG emissions should be related to AB 32's GHG reduction goals.[2]
San Joaquin Valley APCD	Compliance with Best Performance Standards
San Luis Obispo County APCD	Consistency with a Qualified GHG Reduction Plan OR 1,150 metric tons CO_2e/year[3] OR 4.9 CO_2e/service population[4]/year
Santa Barbara County APCD	10,000 metric tons CO_2e/year (proposed)
South Coast AQMD	10,000 metric tons CO_2e/year[5]

Sources: Antelope Valley AQMD 2011; Bay Area AQMD 2012; Mojave Desert AQMD 2011; Sacramento Metropolitan AQMD 2011; San Joaquin Valley APCD 2009; San Luis Obispo County AQMD 2012; Santa Barbara County APCD 2011; and South Coast AQMD 2008.

Notes:

1 The Bay Area AQMD previously recommended a GHG significance threshold of 10,000 metric tons CO_2e/year for industrial sources. On March 5, 2012, the Alameda County Superior Court issued a judgment finding that the Bay Area AQMD had failed to comply with CEQA when it adopted the thresholds. The Bay Area AQMD consequently struck the significance thresholds from its CEQA Guidelines (2012) and no longer recommends significance thresholds.

2 For example, a possible significance threshold could be to determine whether a project's emissions would substantially hinder the State's ability to attain the goals identified in AB 32 (i.e., reduction of statewide GHG emission to 1990 levels by 2020). Additionally, another strategy is to determine if the project is consistent with the State's strategy to achieve the 2020 GHG emissions limit as outlined in the Scoping Plan (CARB 2008).

3 Construction emissions are amortized and combined with operational emissions. The project life is assumed to be 50 years for residential projects and 25 years for commercial projects. This threshold would be most applicable to an industrial (i.e., stationary source) project.

4 The service population is defined as the sum of residents and employees.

5 Construction emissions are amortized and combined with operational emissions. Project lifetime is assumed to be 30 years if not known.

Although several air districts have a significance threshold of 10,000 metric tons per year (MT/yr), the threshold is specific to industrial, stationary source emissions. A “stationary source” is generally defined as “any building, structure, facility, or installation that emits or may emit any regulated air pollutant or any pollutant listed under section 112(b) of the [CAA]” (40 CFR 70.2). A facility can be further defined as any stationary equipment located on one or more contiguous or adjacent properties under common ownership and control (40 CFR 98.6). The stationary source threshold used by multiple air districts (i.e., 10,000 MT/yr) is not intended to cover stationary source emissions owned and operated by multiple parties; rather, it is applicable to individual pieces of equipment, or at most, an individual facility, rather than all equipment affected by the action alternatives. Because multiple facilities and owners are affected by the action alternatives, using the stationary source threshold as the significance threshold for the action alternatives would be overly onerous and is not recommended.

The significance threshold proposed by the Antelope Valley AQMD and the Mojave Desert AQMD (100,000 tons CO_2e per year) is identical to the PSD permitting threshold described previously. Because the intent of the PSD permitting program is to prevent the deterioration of air quality, the 100,000 tpy threshold is appropriate for evaluating significance for the proposed alternatives and was used for this analysis.

3.6.2.3 Alternative 1: No Action/No Project

Combined emissions from groundwater substitution and cropland idling transfers could increase emissions of GHG emissions. There would be no groundwater substitution transfers originating in the Seller Service Area; therefore, the potential for GHG emissions from engine exhaust would be the same as existing conditions.

Cropland idling and groundwater pumping in the Buyer Service Area as a result of Central Valley Project (CVP) water shortages could affect emissions. Under the No Action/No Project Alternative, agricultural water users in the Buyer Service Area would continue to face CVP shortages, similar to existing conditions. In response, farmers would leave some crops idle, which would reduce vehicle exhaust from farm equipment. Farmers would also continue to pump groundwater for irrigation, which releases emissions if diesel pumps are used. These actions in response to CVP shortages would continue under the No Action/No Project Alternative. There would be no change to emissions relative to existing conditions.

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

3.6.2.4.1 Seller Service Area

Increased groundwater pumping for groundwater substitution transfers could increase emissions of GHGs. Table 3.6-3 summarizes direct annual emissions, as CO_2e that would occur from groundwater pumping by each water agency.

Table 3.6-3. Annual GHG Emissions from Groundwater Substitution Transfers (Proposed Action), metric tons CO_2e per year

Water Agency	CO_2	CH_4	N_2O	Total
Anderson-Cottonwood Irrigation District	164	<1	1	165
Butte Water District	356	1	1	358
City of Sacramento	483	1	2	485
Conaway Preservation Group	2,360	3	8	2,371
Cordua Irrigation District	496	1	2	499
Cranmore Farms	272	<1	1	274
Eastside Mutual Water Company	392	<1	1	394
Garden Highway Mutual Water Company	452	1	2	454
Gilsizer Slough Ranch	441	1	1	443
Glenn-Colusa Irrigation District	785	1	3	789
Goose Club Farms and Teichert Aggregates	341	1	1	342
Natomas Central Mutual Water Company	376	1	1	378
Pelger Mutual Water Company	283	<1	1	285
Pleasant Grove-Verona Mutual Water Company	1,890	2	6	1,898
Pope Ranch	119	<1	<1	120
Reclamation District 108	642	1	3	646
Reclamation District 1004	900	1	2	903
Reclamation District 2068	184	<1	1	185
River Garden Farms	326	1	1	327
Sacramento County Water Agency	1,427	2	5	1,434
Sacramento Suburban Water District	4,379	4	10	4,393
Sycamore Mutual Water Company	490	1	2	493
Te Velde Revocable Family Trust	202	<1	1	203
Tule Basin Farms	374	<1	1	375
Total (MT/yr)	18,134	23	57	18,215
Total (tpy)	**19,989**	**26**	**63**	**20,078**

Key:
< = less than
CH_4 = methane
CO_2 = carbon dioxide
MT/yr = metric tons per year
$MTCO_2e/yr$ = metric tons carbon dioxide equivalent per year
N_2O = nitrous oxide
tpy = short tons per year

As shown in Table 3.6-3, GHG emissions would not exceed the significance criterion of 100,000 tpy and emissions would be less than significant.

Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the study area. Reduced vehicle exhaust emissions were estimated based on the proposed acreages of rice that would be idled during the Proposed Action, as described in Section 3.6.2.1. Table 3.6-4 summarizes annual emissions, as CO_2e that would not occur from vehicle exhaust by water agency.

Table 3.6-4. Annual GHG Emissions Reductions from Cropland Idling Transfers (Proposed Action), metric tons CO_2e per year

Water Agency[1,2]	CO_2	CH_4	N_2O	Total
Butte Water District	205	<1	1	205
Conaway Preservation Group	380	<1	1	381
Cranmore Farms	44	<1	<1	45
Glenn-Colusa Irrigation District	1,174	1	3	1,178
Goose Club Farms and Teichert Aggregates	178	<1	1	179
Pelger Mutual Water Company	45	<1	<1	45
Pleasant Grove-Verona Mutual Water Company	160	<1	<1	161
Reclamation District 108	356	<1	1	357
Reclamation District 1004	178	<1	1	179
Reclamation District 2068	133	<1	<1	134
Sycamore Mutual Water Company	178	<1	1	179
Te Velde Revocable Family Trust	124	<1	<1	125
Total (MT/yr)	3,154	4	9	3,167
Total (tpy)	**3,477**	**4**	**10**	**3,490**

Notes:
1 The reduction in emissions due to cropland idling is shown.
2 The actual water agencies to participate in cropland idling may not be the water agencies shown in the table; however, these agencies were selected as representative agencies in the applicable counties.

Key:
< = less than
CH_4 = methane
CO_2 = carbon dioxide
MT/yr = metric tons per year
$MTCO_2e$/yr = metric tons carbon dioxide equivalent per year
N_2O = nitrous oxide
tpy = tons per year

As shown in Table 3.6-4, GHG emissions, as CO_2e, would not exceed the significance criterion. Additionally, if groundwater substitution emissions and cropland idling emissions occurred in the same year, then the reduced emissions occurring from cropland idling would offset the expected increase from groundwater substitution. As a result, the Proposed Action would result in a less than significant impact.

Changes to the environment from climate change could affect the Proposed Action. As described in the Section 3.6.1.3, changes to annual temperatures, extreme heat, precipitation, sea level rise and storm surge, and snowpack and streamflow are expected to occur in the future because of climate change. Because of the short-term duration of the Proposed Action (10 years), any effects of climate change on this alternative are expected to be minimal. Impacts to the Proposed Action from climate change would be less than significant.

3.6.2.4.2 Buyer Service Area

Use of water from transfers on agricultural fields in the Buyer Service Area could affect emissions. Water transfers to agricultural users in Alameda, Contra Costa, Fresno, Kings, Merced, San Benito, San Joaquin, Stanislaus and Santa

Clara Counties could temporarily reduce the amount of land idled relative to the No Action/No Project Alternative. This would increase use of farm equipment, which would increase vehicle exhaust emissions. Farmers may also pump less groundwater for irrigation, which would reduce emissions from use of diesel pumps. The total amount of agricultural activity in the Buyer Service Area relative to GHG emissions would not likely change relative to existing conditions and the impact would be less than significant.

3.6.2.5 Alternative 3: No Cropland Modifications

3.6.2.5.1 Seller Service Area

Increased groundwater pumping for groundwater substitution transfers could increase emissions of GHGs. Groundwater substitution transfers that would occur under Alternative 3 would be identical to those that would occur under the Proposed Action (Table 3.6-3). As a result, GHG impacts associated with groundwater substitution would be the same as those discussed for the Proposed Action. As a result, groundwater pumping would result in a less than significant impact.

Changes to the environment from climate change could affect Alternative 3. As described in the Section 3.6.1.3, changes to annual temperatures, extreme heat, precipitation, sea level rise and storm surge, and snowpack and streamflow are expected to occur in the future because of climate change. Because of the short-term duration of Alternative 3 (10 years), any effects of climate change on this alternative are expected to be minimal. Impacts to this alternative from climate change would be less than significant.

3.6.2.5.2 Buyer Service Area

Use of water from transfers on agricultural fields in the Buyer Service Area could affect emissions. Water transfers to agricultural users in Alameda, Contra Costa, Fresno, Kings, Merced, San Benito, San Joaquin, Stanislaus, and Santa Clara Counties could temporarily reduce the amount of land idled relative to the No Action/No Project Alternative. This would increase use of farm equipment, which would increase vehicle exhaust emissions. Farmers may also pump less groundwater for irrigation, which would reduce emissions from use of diesel pumps. The total amount of agricultural activity in the Buyer Service Area relative to GHG emissions would not likely change relative to existing conditions and the impact would be less than significant.

3.6.2.6 Alternative 4: No Groundwater Substitution

3.6.2.6.1 Seller Service Area

Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the study area. Reduced vehicle exhaust emissions were estimated based on the proposed acreages of croplands that would be idled during Alternative 4, as described in Section 3.6.2.1. The proposed acreage of land to be idled in Alternative 4 would be equal to those proposed under the

Proposed Action (see Table 3.6-4). As a result, cropland idling would result in a less than significant impact.

Changes to the environment from climate change could affect Alternative 4. As described in the Section 3.6.1.3, changes to annual temperatures, extreme heat, precipitation, sea level rise and storm surge, and snowpack and streamflow are expected to occur in the future because of climate change. Because of the short-term duration of Alternative 4 (10 years), any effects of climate change on this alternative are expected to be minimal. Impacts to this alternative from climate change would be less than significant.

3.6.2.6.2 Buyer Service Area

Use of water from transfers on agricultural fields in the Buyer Service Area could affect emissions. Water transfers to agricultural users in Alameda, Contra Costa, Fresno, Kings, Merced, San Benito, San Joaquin, Stanislaus, and Santa Clara Counties could temporarily reduce the amount of land idled relative to the No Action/No Project Alternative. This would increase use of farm equipment, which would increase vehicle exhaust emissions. Farmers may also pump less groundwater for irrigation, which would reduce emissions from use of diesel pumps. The total amount of agricultural activity in the Buyer Service Area relative to GHG emissions would not likely change relative to existing conditions and the impact would be less than significant.

3.6.3 Comparative Analysis of Alternatives

Table 3.6-5 summarizes the effects of the action alternatives. The following text supplements the table by describing the magnitude of the effects under the action alternative and No Action/No Project Alternative.

Table 3.6-5. Climate Change Comparison of Alternatives

Potential Impact	Alternatives	Significance	Proposed Mitigation	Significance After Mitigation
Combined emissions from groundwater substitution and cropland idling transfers could increase emissions of GHG emissions.	1	NCFEC	None	NCFEC
Cropland idling and groundwater pumping in the Buyer Service Area as a result of CVP water shortages could affect emissions.	1	NCFEC	None	NCFEC
Increased groundwater pumping for groundwater substitution transfers could increase emissions of GHGs.	2, 3	LTS	None	LTS
Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the study area.	2, 4	LTS	None	LTS

Potential Impact	Alternatives	Significance	Proposed Mitigation	Significance After Mitigation
Changes to the environment from climate change could affect the action alternatives.	2, 3, 4	LTS	None	LTS
Use of water from transfers on agricultural fields in the Buyer Service Area could affect emissions.	2, 3, 4	LTS	None	LTS

Key:
LTS = Less than Significant
NCFEC = no change from existing conditions

3.6.3.1 No Action/No Project Alternatives

There would be no changes to emissions in the Seller Service Area relative to existing conditions.

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

Increased groundwater pumping could increase GHG emissions from engine exhaust. These emission increases would then be partially offset by reduced farm equipment exhaust emissions from land preparation and harvesting activities that would no longer occur under the Proposed Action. The effects associated with groundwater pumping and cropland idling would be less than significant.

3.6.3.3 Alternative 3: No Cropland Modifications

The No Cropland Modification Alternative does not include cropland idling or crop shifting transfers. Impacts associated with groundwater pumping would be the same as those identified for the Proposed Action.

3.6.3.4 Alternative 4: No Groundwater Substitution

The No Groundwater Substitution Alternative does not include groundwater pumping to enable water transfers. Alternative 4 would include cropland idling up to the same upper limits for acreage as the Proposed Action, but idling may occur more frequently because there are fewer other transfer types for buyers to choose from. Reductions in emissions as a result of cropland idling would be larger than reductions in emissions under the Proposed Action.

3.6.4 Environmental Commitments/Mitigation Measures

There would be no significant impacts to climate change from implementation of the No Action/No Project Alternative or the action alternatives. Therefore, no environmental commitments/mitigation measures are proposed.

3.6.5 Potentially Significant Unavoidable Impacts

None of the action alternatives would result in potentially significant unavoidable impacts on GHG emissions or energy use in relation to potential contributions to climate change.

3.6.6 Cumulative Effects

The timeframe for the Long-Term Water Transfers cumulative analysis extends from 2015 through 2024, a ten-year period.

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

Combined emissions from groundwater substitution and cropland idling transfers in combination with other cumulative projects could increase emissions of GHG emissions. By its very nature, climate change is a cumulative impact from various global sources of activities that incrementally contribute to global GHG concentrations. Individual projects provide a small addition to total concentrations, but contribute cumulatively to a global phenomenon. The goals of AB 32 require GHG emission reductions from existing conditions. As a result, cumulative GHG and climate change impacts must be analyzed from the perspective of whether they would impede the state's ability to meet its emission reduction goals. As shown in Figure 3.6-2, transportation is responsible for 37 percent of the State's GHG emissions, followed by the industrial sector (22 percent), electricity generation (21 percent), commercial and residential (12 percent), agriculture and forestry (8 percent) and other sources (0.04 percent). It is reasonable to expect that these sectors would continue to contribute to GHG emissions in the future. Climate change therefore represents a significant cumulative effect for the entire State and could have a variety of meteorological and hydrologic implications.

Under the Proposed Action, increased groundwater pumping would increase GHG emissions from engine exhaust. These emissions would be partially offset by reductions in farm equipment exhaust emissions from cropland idling activities. GHG emissions that would occur under the Proposed Action are substantially less than the threshold of significance and would not result in a cumulatively considerable impact.

3.6.6.2 Alternative 3: No Cropland Modifications

Cumulative effects under Alternative 3 would be the same as the groundwater pumping impacts described in the Proposed Action.

3.6.6.3 Alternative 4: No Groundwater Substitution

Emissions from cropland idling transfers in combination with other cumulative projects could increase emissions of GHG emissions. Cumulative effects under Alternative 4 would be similar to those described in the Proposed Action. Cropland idling transfers would result in a reduction in emissions. GHG emissions that would occur under Alternative 4 would not result in a cumulatively considerable impact.

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Section 3.7
Fisheries

This section presents a description of the fishery resources within the study area. It includes a comparison of the impacts of the alternatives; ~~a description of environmental commitments and mitigation measures that will be implemented to avoid, minimize and mitigate any impacts identified; a description of any remaining potentially significant, unavoidable impacts;~~ and an evaluation of the cumulative effects of the project considering other existing and reasonably foreseeable actions within the area of analysis. The types of transfers most likely to affect fisheries resources (fish and their habitat) are groundwater substitution transfers, which may affect flows on small streams, and stored reservoir water transfers that may affect the value of fish habitat in the reservoirs supplying this water and affect flows on the rivers downstream of those reservoirs. Rice fields and upland crops do not provide suitable habitat for fish species of management concern. Conservation and cropland idling transfers would not likely affect fisheries resources because neither would substantially affect flows in natural waterways; therefore, they are not further discussed in this chapter.

3.7.1 Affected Environment/Environmental Setting

This section provides an overview of the area where the action alternatives have the potential to affect fishery resources, including special-status fish species. Vegetation and terrestrial wildlife species are discussed in Section 3.8.

3.7.1.1 Area of Analysis

The area of analysis includes the Seller Service Area and Sacramento San Joaquin Delta (Figure 3.7-1). Fisheries Resources in the Buyer Service Area would not be affected as described below.

3.7.1.1.1 Seller Service Area

This region includes potential seller lands within the Sacramento River and San Joaquin watersheds and downstream areas.

The action alternatives could affect major watersheds and numerous minor watersheds within the Sacramento River Basin that include the following water bodies:

- Sacramento River from Shasta Reservoir to the Sacramento San Joaquin Delta (Delta);

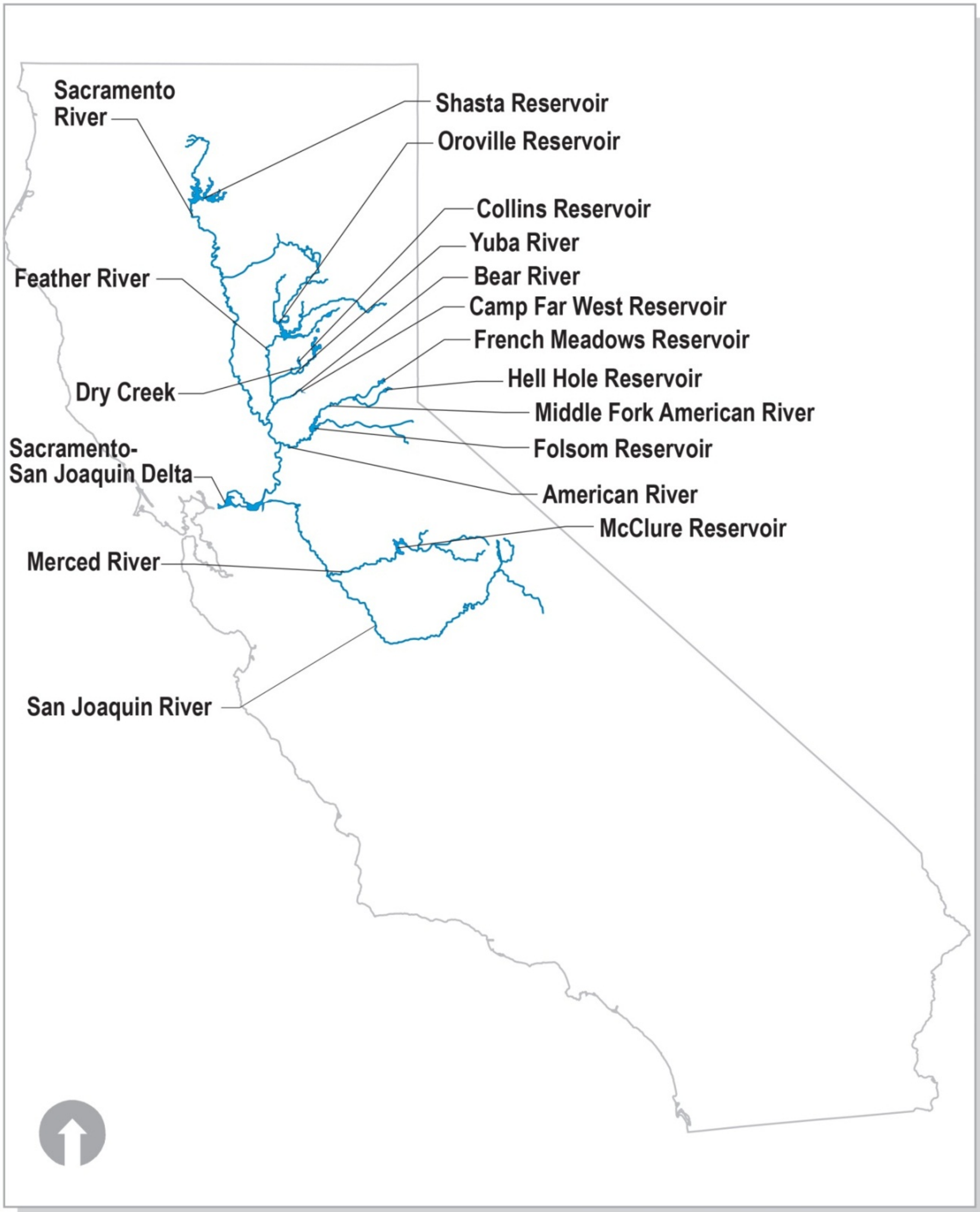


Figure 3.7-1. Major Rivers and Reservoirs in the Area of Analysis

- Feather River, including and downstream of Lake Oroville and its tributaries, the Yuba River including and downstream of New Bullards Bar Reservoir (although fish species evaluated here cannot access the river upstream of Englebright Dam), and the Bear River including and downstream of Camp Far West Reservoir;

- American River including and downstream of Folsom Reservoir and Lake Natoma (although fish species evaluated here cannot access the river upstream of Nimbus Dam);

- Middle Fork American River downstream of Hell Hole and French Meadows Reservoirs (although fish species evaluated here cannot access the river upstream of Nimbus Dam); and

- Numerous small tributaries to the Sacramento River, Feather River, Yuba River, and Bear River.

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

- San Joaquin River downstream of the Merced River; and
- Merced River including and downstream of Lake McClure.

As described below, water transfer actions would not affect other tributaries of the San Joaquin watershed in the Seller Service Area.

Water transfers made under the alternatives would move through the Sacramento-San Joaquin Delta (Delta), and so resources within the Delta could be affected.

3.7.1.1.2 Buyer Service Area

The Buyer Service Area includes portions of Contra Costa County, Northwestern Alameda County, Santa Clara County, northwestern San Benito County, a small area of San Joaquin and Stanislaus counties, a small portion of western Merced County, and extends through western Fresno County into northwest Kings County. Water diversions from the Delta through the Banks and Jones Pumping Plants would be subject to the existing biological opinions (BOs) on the long-term operations of the Central Valley Project (CVP) and State Water Project (SWP), which included transfers in excess of the size considered in the alternatives in this Environmental Impact Statement/Environmental Impact Report (EIS/EIR).

San Luis Reservoir is the only water body in the Buyer Service Area that could be affected by the water transfers. San Luis Reservoir is an artificial environment and does not support a naturally evolved aquatic community. Fish species in San Luis Reservoir have either been directly introduced or transported into the reservoir via the California Aqueduct or Delta-Mendota Canal. It does not support primary populations of the fish species of management concern (see Section 3.7.1.3.2), nor does it support these species in downstream areas.

For Contra Costa Water District (WD) and East Bay Municipal Utility District (MUD), diversions would be subject to the BOs associated with their pumping stations and diversions. Water would be moved through existing conveyance facilities and would not affect natural water bodies.

As the project would not affect the fish species of primary management concern in the Buyer Service Area, the Buyer Service Area is not included in the area of analysis for fisheries resources.

3.7.1.2 Regulatory Setting

There are a number of federal, state and local regulations and policies that apply to fisheries resources within the area of analysis. Applicable requirements are discussed in greater detail in Appendix H, and include:

- Federal Endangered Species Act (ESA);
- Fish and Wildlife Coordination Act;
- Magnuson-Stevens Fisheries Act of 2006;
- Executive Order 11990 (Protection of Wetlands);
- California Endangered Species Act (CESA);
- California Natural Community Conservation Planning Act;
- Requirements of the 1995 Bay/Delta Plan Water Quality Control Plan and Decision 1641;
- California Water Code;
- Central Valley Project Improvement Act;
- Existing Natural Community Conservation Plans (NCCPs) and Habitat Conservation Plans (HCPs);
- Requirements stipulated in the various CVP water contracts between Reclamation and the various buyers and sellers, and their associated BOs of the United States Fish and Wildlife Service (USFWS) and

National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries). These documents specify the amount of water each contract holder can receive from the CVP and provide the terms and conditions about the delivery and use of that water, that are intended to protect fish and wildlife resources. Transfers made under long-term water transfer actions would adhere to these requirements;

- Requirements stipulated in previous consultations, BOs of USFWS and NOAA Fisheries Service, and subsequent and ongoing legal proceedings regarding the Long-Term Operations of the CVP and the SWP. These opinions provide various operating standards for the CVP and SWP, to which Reclamation and the California Department of Water Resources (DWR), respectively, must adhere, to minimize impacts to listed species.

3.7.1.3 Existing Conditions

The following section describes the fisheries resources, including special-status fish species, within the different regions of the area of analysis.

3.7.1.3.1 Seller Service Area

Riverine Habitats

The area of analysis lies within the Sacramento-San Joaquin Province[1], as described in Moyle (2002). Within this province, the action alternatives have the potential to affect fish assemblages occurring in the Central Valley sub-province.

In the Central Valley sub-province, the action alternatives have the potential to affect the California roach, pikeminnow-hardhead-sucker, and deep-bodied fish (e.g., tule perch [*Hysterocarpus traskii*]) assemblages. These assemblages are defined by areas at different elevations within the sub-province that are characterized by different flow, temperature and geomorphological characteristics and have a group of species that are typically located in these areas. These assemblages may overlap geographically at different times of years in response to changes in flow and temperature.

The California roach assemblage occurs in small, warm tributaries to larger streams that flow through open foothill woodlands of oak and foothill pine. These streams are usually intermittent during the summer months, and fish are often restricted to pools where temperatures may exceed 30 degrees Celsius (°C). In the winter and spring, flows in these streams can be high, resulting in high water velocities. The dominant native fish in this assemblage is California roach (*Hesperoleucus symmetricus*) due to their small size and tolerance of low

[1] A province, as used by Moyle (2002), is a geographic region that is geographically isolated from other geographic regions and in which an endemic assemblage of species has evolved. These provinces can be subdivided into sub-provinces, which have become isolated in the nearer term or which may have a lesser degree of isolation, and may contain one or more endemic species or sub-species.

oxygen levels and high temperatures. Sacramento suckers (*Catostomus occidentalis occidentalis*), Sacramento pikeminnow (*Ptychocheilus grandis*), and other native minnows may use these streams for spawning in the winter and spring (Moyle 2002). Predatory green sunfish (*Lepomis cyanellus*) have replaced California roach in some areas.

The pikeminnow-hardhead-sucker assemblage occurs in streams with average summer flows of more than ten cubic feet per second (cfs); deep, rocky pools; and wide, shallow riffles. These streams range in elevation from about 90 to over 1,500 feet in elevation. Streams within the pikeminnow-hardhead-sucker assemblage are generally characterized by high water quality (i.e., high clarity, low conductivity, high dissolved oxygen, and summer temperatures between 19 and 22°C) and high habitat complexity created by stream meanders and riparian vegetation (Moyle 2002). Some streams may become intermittent during the summer, concentrating fish in isolated pools, which may experience elevated water temperatures (greater than 25°C). Sacramento pikeminnows and Sacramento suckers tend to be the most abundant fishes in this assemblage. Hardhead (*Mylopharodon conocephalus*) are often confined to cooler waters in reaches with deep, rock-bottomed pools. However, they are abundant where they are found (Moyle 2002). Other native fishes occurring in these areas are tule perch-, speckled dace (*Rhinichthys osculus*), California roach, riffle sculpin (*Cottus gulosus*), and rainbow trout (*Oncorhynchus mykiss*). The cooler upstream areas of streams within this zone may support spawning and rearing of anadromous and resident salmonids.

The deep-bodied fish assemblage historically occupied the warm waterways of the valley floor, including slow moving river channels, oxbow and floodplain lakes, swamps, and sloughs (Moyle 2002). These habitat types have been substantially modified by human activities in the last 200 years by numerous dams, diversions, channelization with levees, filling of wetlands, elimination of riparian forests, and introduction of non-native fish species. The fish species that historically resided in this zone include deep-bodied fishes such as Sacramento perch (*Archoplites interruptus*), thicktail chub (*Siphatales crassicauda*), and tule perch, which used backwater habitats, and hitch (*Lavinia exilicauda*), Sacramento blackfish (*Orthodon microlepidotus*), and Sacramento splittail (*Pogonichthys macrolepidotus*), which used the main channel habitats. Human-induced modification of the habitat types used by this assemblage and the introduction of many exotic species has resulted in extirpation or reduction of native fish populations. Consequently, in many, but not all, locations in the Area of Analysis, dominant fishes currently occurring in these habitat types are now introduced species, including largemouth bass (*Micropterus salmoides*), white and black crappie (*Pomoxis annularis* and *P. nigromaculatus*), bluegill (*Lepomis macrochirus*), threadfin shad (*Dorosoma petenense*), striped bass (*Morone saxatilis*), bigscale logperch (*Percina macrolepida*), red shiner (*Cyprinella lutrensis*), inland silverside (*Menidia beryllina*), white catfish (*Ameiurus catus*), black and brown bullhead (*A. melas* and *A. nebulosus*), and common carp (*Cyprinus carpio*) (Moyle 2002). This area serves as a migration corridor for native anadromous fish salmonids moving between the ocean and their freshwater spawning and rearing habitats. Dominance by native versus non-native fish species in this assemblage is mediated by many factors, including flow regime, water temperature, and time of year (Brown and Bauer 2009, Kiernan et al. 2012, Sommer et al. 2014). For example, native fishes predominate early in the season on the Cosumnes River floodplain and Yolo Bypass when flooded, but is dominated by non-native species later in the season as water temperatures warm (Moyle et al. 2007, Sommer et al. 2014).

Fish species of primary management concern in the Seller Service Area include winter-, spring-, and fall-/late fall-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley steelhead (*O. mykiss*), Sacramento splittail, American shad (*Alosa sapidissima*), striped bass, white sturgeon (*Acipenser transmontanus*), and green sturgeon (*A. medirostris*). These species are further described in Section 3.7.1.3.2.

Central Valley Reservoirs

All of the major rivers and many of their tributaries have dams and reservoirs intended to provide for water supply, power generation, and flood control. CVP and SWP reservoirs (Shasta, Oroville, and Folsom reservoirs) may be affected by water transfers due to additional water storage, reductions in downstream supply due to streamflow depletions, changes in project operations required to meet the requirements of the various contracts, regulations, and BOs associated with the operation of the projects when transfer water is being moved from Sellers to Buyers. Under all circumstances, the CVP and SWP will be operated in accordance with these requirements. The non-CVP/SWP project reservoirs (Camp Far West, Collins, French Meadows, Hell Hole, and McClure) would provide water stored in these reservoir for transfer. The non-project reservoirs operate under their own sets of operating requirements to provide for water supply, flood control and environmental needs, including the maintenance of flow and temperature in the rivers downstream of these reservoirs, and would be operated in accordance with those requirements.

Reservoirs operate within a wide range of storage volumes and associated water surface elevations and surface areas, as water is stored in the reservoirs during the wet portion of the year and released from the reservoir during the dry portion of the year. Reservoirs are typically drawn down by tens and often more than 100 feet each year. Most of the reservoirs that will be affected by the project are in the foothills just upstream of the valley floor, within the elevations typically associated with the pikeminnow-hardhead-sucker assemblage. French Meadows and Hell Hole Reservoirs are at higher elevations than the other reservoirs, in the elevation of rainbow trout assemblage.

With the exception of Hell Hole and French Meadows reservoirs, the remaining reservoirs often support warmwater fishes in the surface waters and around the edges of the reservoirs, and coldwater fishes in the deeper, cooler portions of the reservoir. Reservoirs are generally stocked with trout to support recreational fisheries. Introduced bass, sunfish, catfish, carp, and other species that were introduced to create recreational fisheries generally dominate these reservoirs. Native species may include Sacramento sucker, Sacramento pikeminnow, hardhead, hitch, and Tui chub (*Gila bicolor*). The populations of these native species have been greatly reduced or extirpated by the non-native fish in many reservoirs. Hell Hole and French Meadows reservoirs, which are at higher elevation than the other reservoirs, support populations of rainbow trout, brown trout (*Salmo trutta*), lake trout (*Salvelinus namaycush*), kokanee salmon (*Oncorhynchus nerka*), Tui chub, and Sacramento sucker (Placer County Water Agency 2011). None of the reservoirs support listed fish species or anadromous fish, as downstream dams create impassible barriers to the migration of these species. Consequently, any impacts of long-term water transfers on conditions in the reservoirs described above would not affect listed fish species. Most of the reservoirs discussed above (again with the exception of Hell Hole and French Meadows reservoirs), are operated in part to support special-status fish species in the downstream rivers and the Sacramento – San Joaquin Delta (Delta).

Sacramento – San Joaquin Delta

The Delta is a series of interconnected channels and islands lying near and upstream of the confluence of the Sacramento and San Joaquin rivers, near Antioch. The legal Delta is a triangular area extending from Freeport in the north to Vernalis in the south, to Antioch in the west. The waterways within the Delta are highly channelized by the levees protecting farms, homes, and towns on the islands. The Delta is strongly influenced by the tides, with water elevations and current direction being determined by the interaction of inflow, exports and tides. It serves as the hub of the State's water system and flow patterns through the Delta have been highly altered from historical patterns. The Delta includes a variety of habitats for fish including the mainstem rivers, sloughs, canals, natural and managed wetlands, and flooded islands. These habitats are affected by water diversions (both by the CVP and SWP as well as thousands of smaller local diversions), introduced fish, invertebrates, and plants, and environmental toxins from urban, municipal and farms.

Dozens of fish species use the Delta during some portion of their life. Six of these species are listed under federal or state ESAs. These include winter-run and spring-run Chinook salmon, Central Valley steelhead, and green sturgeon, all of which migrate through the Delta on their way to upstream spawning and rearing habitats, and when their offspring migrate to the ocean from these upstream habitats. Most of these species may rear for some period of time in the Delta on their way to the ocean, with this duration depending on the species and conditions in the Delta. Delta smelt (*Hypomesus transpacificus*) are endemic (they are not found anywhere else) to the Delta and spend their entire lives in the Delta or Suisun Bay. The longfin smelt (*Spirinchus thaleichthys*), a state-, but not federally-, listed fish species spawns in the Delta and rears in Suisun, San Pablo and San Francisco bays and nearshore marine ecosystems. A few of the non-listed native species that use the Delta include fall-run Chinook salmon, white sturgeon, and Sacramento splittail. A large number of non-native species also live in the Delta, including striped bass, largemouth bass, various sunfish and catfish, inland silversides, and threadfin shad.

3.7.1.3.2 Fish Species of Management Concern

Species of primary management concern were analyzed for impacts based upon legal status and their commercial and recreational importance (Table 3.7-1). Two types of species were analyzed: special-status species and other species of management concern. For the purposes of this document, special-status fish species are defined as those listed under the ESA or CESA. The federally-listed species within the area of analysis include winter-run Evolutionarily Significant Unit (ESU) and spring-run ESU Chinook salmon, Central Valley Distinct Population Segment (DPS) steelhead, southern DPS green sturgeon, delta smelt, and longfin smelt. The life history information for federally listed fish species is included in Section 3.7.1.3.3. Species listed by the State of California include: white sturgeon, Sacramento splittail, the fall/late-fall run ESU of Chinook salmon, and hardhead. Other species of management concern include non-listed recreationally or commercially important species: American shad and striped bass.

For native species described above that may be present in the affected area, but are not considered fish species of management concern, any impacts to the species would be less than significant under CEQA because they are not listed under California or federal Endangered Species Acts nor do they have recreational or commercial importance.

Table 3.7-1. Fish Species of Management Concern

Type	Species	Location (Area of analysis)	Primary Management Consideration[1]
Special- Status	Winter-run Chinook Salmon	Upstream and Delta areas	FE,SE
	Spring-run Chinook Salmon	Upstream and Delta areas	FT,ST
	Central Valley Steelhead	Upstream and Delta areas	FT, Recreation
	Green sturgeon	Upstream and Delta areas	FT,
	Delta smelt	Delta area	FT, SE
	Longfin smelt	Delta area	FC, ST
	Hardhead	Upstream and Delta areas	SSC
	Sacramento splittail	Upstream and Delta areas	SSC
	Fall/late-fall Chinook Salmon	Upstream and Delta areas	SSC, Commercial, Recreation
Other	Striped bass	Upstream and Delta areas	Recreation
	American shad	Upstream and Delta areas	Recreation
	White sturgeon	Upstream and Delta areas	Commercial, Recreation

[1] FE = federally endangered; SE = state endangered; FT = federally threatened; ST = state threatened; FC = federal candidate species; SSC = state species of concern

The spatial distribution of habitat use by these species in waters potentially affected by long-term water transfer actions is shown in Table 3.7-2 and discussed below. Fish species of management concern do not occur in reservoirs within the area of analysis, except as noted in Table 3.7-2. No field sampling information is available regarding the presence of special-status fish species in the following waterways: Seven Mile Creek, Elder Creek, Spring Valley Creek, North Fork Walker Creek, and Wilson Creek. Without further information, it was assumed that these streams could support special-status fish species and, therefore, further biological analyses were conducted in these waterways.

A review of field sampling data and reports in the following waterways indicates that there is no evidence of the presence of special-status fish species in the following waterways: ~~Seven Mile Creek,~~ Walker Creek, ~~North Fork Walker Creek, Wilson Creek,~~ French Creek, Willow Creek, South Fork Willow Creek, Funks Creek, Stone Corral Creek, Lurline Creek, ~~Spring Valley Creek,~~ Cortina Creek, Sand Creek, Sycamore Slough (Colusa County), Wilkins Slough Canal, Honcut Creek, North Honcut Creek, South Honcut Creek, and Dry Creek (tributary of Bear River). As a result, no further biological analysis was conducted in these waterways.

Table 3.7-2. Habitat Use by Fish Species of Management Concern within the Area of Analysis

Water Body	Listed Species						Other Evaluation Species					
	Winter-run Chinook Salmon	Spring-run Chinook Salmon	Central Valley Steelhead	Green Sturgeon	Delta Smelt	Longfin Smelt[1]	Fall/late-fall –run Chinook Salmon	Striped bass	American shad	Hardhead	Splittail	White sturgeon
Reservoirs												
Shasta Reservoir										S,R		R
Keswick Reservoir										S,R		
Lake Oroville										R,M		R
French Meadows Reservoir[2]												
Hell Hole Reservoir[2]												
Folsom Reservoir										R,M		
Lake Natoma[2]												
New Bullards Bar Reservoir										R,M		
Camp Far West Reservoir										R,M		
Lake McClure										R,M		
Rivers and Creeks												
Sacramento River Watershed												
Sacramento River from Keswick to Red Bluff	S,R,M	S,R,M	S,R,M	S,R,M			S,R,M	R	S,M	S,R		
Sacramento River from Red Bluff to the Delta	M	M	M	S,R,M	S,R,M	S,R,M	S,R,M	S,R,M	S,R,M	S,R	S,R	S,R,M
Deer Creek (Tehama County)		S,R,M	S,R,M				S,R,M			S,R		
Antelope Creek		S,R,M	S,R,M							S,R	S,R	
Paynes Creek										S,R	S,R	
Elder Creek[3]												
Mill Creek (Tehama County)		S,R,M	S,R,M				S,R,M			S,R	S,R	
Thomes Creek			S,R,M				R			S,R	S,R	
Mill Creek (tributary to Thomes Creek)										S,R		
Stony Creek		S,R,M	S,R,M				S,R,M			S,R		

Water Body	Listed Species						Other Evaluation Species					
	Winter-run Chinook Salmon	**Spring-run Chinook Salmon**	**Central Valley Steelhead**	**Green Sturgeon**	**Delta Smelt**	**Longfin Smelt[1]**	**Fall/late-fall –run Chinook Salmon**	**Striped bass**	**American shad**	**Hardhead**	**Splittail**	**White sturgeon**
Butte Creek		S,R,M	S,R,M				S,R,M			S,R		
Cache Creek							S,R,M			S,R		
Eastside/Cross Canal			R,M				R,M					
Auburn Ravine			S,R,M				S,R,M			S,R		
Coon Creek			S,R,M				S,R,M					
Colusa Basin Drain		R,M	R,M				R,M				S,R,M	
Freshwater Creek			S,R,M									
Putah Creek							S,R,M					
Big Chico Creek		S,R,M	S,R,M				S,R,M	S,R,M		S,R	S,R	
Little Chico Creek		S,R,M	S,R,M				R			S,R		
Salt Creek			S,R,M							S,R		
Feather River d/s of Lake Oroville		S,R,M	S,R,M	S,R,M			S,R,M	S,R,M	S,R,M	S,R		S,R,M
Yuba River		S,R,M	S,R,M				S,R,M	S,R,M	S,R,M	S,R		S,R,M
Bear River				S,R,M			S,R,M			S,R		S,R,M
American River d/s of Nimbus Dam	R	R	S,R,M	R			S,R,M	S,R,M	S,R,M		R,M	S,R,M
San Joaquin River Watershed												
Merced River			S,R,M				S,R,M	S,R,M		S,R		
San Joaquin River d/s of Merced River		M	S,R,M		S,R,M	S,R,M	R,M	S,R,M	S,R,M		S,R	S,R,M
Delta and Bays												
Delta	R,M	R,M	R,M	R,M	S,R,M	S,R,M	R,M	R,M	R,M		S,R	R,M
Suisun Bay	R,M	R,M	R,M	R,M	R	R,M	R,M	R,M	R,M		S,R	R,M
Suisun Marsh	R,M	R,M	R,M	R,M	S,R ,M	S,R,M	R,M	R,M	R,M		S,R	R,M

S = Spawning habitat; R = Rearing habitat; M = Migration corridor

[1] Longfin smelt is a federal candidate species and a state threatened species.

[2] There is no evidence that special-status fish species are found in this waterway.

[3] There is no information on the presence of special-status fish species in this stream, but critical habitat has been designated for Central Valley steelhead. Therefore, the stream was included for further analysis.

3.7.1.3.3 Federally and State Listed Fish Species Potentially Affected

Winter-Run Chinook Salmon

Winter-run Chinook salmon is federally-listed as endangered (59 Federal Register [FR] 440; 70 FR 37160) and state-listed as endangered (California Department of Fish and Game [CDFG] 2012). This ESU includes all naturally spawned populations of winter-run Chinook salmon in the Sacramento River and its tributaries in California and is represented by a single extant population (NOAA Fisheries 2008a).

Critical habitat for winter-run Chinook salmon has been designated within the Sacramento River from Keswick Dam to Chipps Island, and all waters between Chipps Island and the Golden Gate Bridge and to the north of the San Francisco and Oakland Bay Bridge (57 FR 36626). The lower reaches of the Sacramento River, the Delta, and the San Francisco Bay serve as migration corridors for both upstream migration of adults and downstream migration of juveniles (Table 3.7-2; NOAA Fisheries 2014). Juveniles may also spend some time rearing in these areas during emigration.

Adult winter-run Chinook salmon immigration occurs from December through July, peaking in March (Moyle 2002). They primarily spawn from late-April to early August, with the peak generally occurring from May through June (Moyle 2002). Spawning currently occurs on the mainstem of the Sacramento River upstream of Red Bluff Diversion Dam, although spawning historically occurred in the tributaries upstream of Shasta Reservoir. This is also the primary rearing area for fry and juveniles prior to emigration to the ocean. Emigration occurs between September and June (NOAA Fisheries 2014), with fish leaving their primary rearing areas and moving downstream. The Sacramento River downstream of Red Bluff Diversion Dam, the Delta, and the San Francisco Bay serve primarily as migration corridors for both upstream migration of adults and downstream emigration of juveniles (NOAA Fisheries 2014), although some rearing occurs in these areas during emigration. Winter-run Chinook salmon may use the lowest reaches of tributary streams for short periods as holding areas during emigration, but do not spend extensive time there.

Water transfers, which would occur from July through September, would coincide with the spawning period of winter-run Chinook salmon. However, spawning occurs upstream of the areas potentially affected by the transfers. Due in part to elevated water temperatures in these downstream areas during this period, ~~emigration~~ spawning and egg incubation would be complete before water transfers commence in July.

Water transfers could affect the timing of releases from Shasta Reservoir throughout the year, which could positively or negatively alter instream flows in the upper Sacramento River and, therefore, affect winter-run Chinook salmon spawning and rearing habitat. These potential effects are evaluated below.

Spring-Run Chinook Salmon

The Central Valley spring-run Chinook salmon ESU is listed as threatened by both the state of California and the federal government (65 FR 42422). This species' range historically included any accessible reach in the headwaters of all major river systems in the Central Valley (Yoshiyama et al. 1996). Today, because dams block most of the upper reaches of these river systems, this ESU exists only in the Sacramento River and its tributaries (Moyle 2002). Three extant natural viable populations persist on Mill, Deer, and Butte Creeks. The listed population also includes fish from Feather River Hatchery production (NOAA Fisheries 2008b). Spawning also occurs in small numbers and intermittently in several other rivers and smaller waterways throughout the Sacramento River watershed (Table 3.7-2). Spring-run Chinook salmon do not currently spawn in the San Joaquin River or its tributaries, as this run was extirpated by development throughout the watershed (NOAA Fisheries 2008b), although the USFWS released 54,000 hatchery produced juvenile spring-run Chinook salmon into the San Joaquin River in April 2014 (San Joaquin River Restoration Program [SJRRP] 2014). In their final rule, NOAA Fisheries designated these fish as a nonessential experimental population under the ESA and established take exceptions for particular activities, including CVP/SWP exports (78 FR 79622).

Designated critical habitat for Central Valley spring-run Chinook salmon ESU includes 1,158 miles of stream habitat in the Sacramento River basin and 254 square miles of estuary habitat in the San Francisco-San Pablo-Suisun Bay complex (70 FR 52488). Tributaries used by spring-run Chinook salmon for spawning and rearing include Deer, Butte, and Mill creeks, and the Feather River, all of which are located in the Seller Service Area upstream of the Delta (Table 3.7-2).

Upstream migration of adult spring-run Chinook salmon occurs from March through September with peak migration occurring from May through June (Moyle 2002). The fish occur in the Sacramento River upstream of the valley floor during the summer and spawn in suitable habitat adjacent to these areas from late August through October, with spawn peaking in mid-September (Moyle 2002). Eggs are deposited in gravel where fry remain until they emerge between November and March to seek shallow water with low velocity (Moyle 2002). After emergence, juveniles display two very distinct emigration patterns: some remain in the stream and others emigrate immediately to the Delta and the ocean beyond. Those that remain display a classic stream-type life history pattern until they emigrate the following year, typically during November and December (Moyle 2002). Stream flow changes and/or turbidity increases in the upper Sacramento River watershed are thought to stimulate juvenile emigration (Kjelson et al. 1982; Brandes and McLain 2001).

Water transfers, which would occur from July through September, would coincide with the spawning period of spring-run Chinook salmon. However, spawning occurs upstream of the areas potentially affected by the transfers. The bulk of upstream migration (March-September, peaking May-June) and emigration (November-June) would be complete before water transfers commence in July. After their reintroduction, spring-run Chinook salmon would occur on the San Joaquin River upstream of the Merced River during their spawning period (August-October), and consequently, would not be affected by water transfers during their spawning period. They would not be present in the area downstream for the Merced during the period when water transfers would occur, as temperatures would be too warm during that time of year. As described for spring-run Chinook salmon occurring on the Sacramento River, the bulk of upstream migration and emigration of spring-run reintroduced to the San Joaquin River system would be complete before water transfers commence in July.

Water transfers could affect the timing of reservoir releases throughout the year, which could positively or negatively alter instream flows below these reservoirs and, therefore, affect spring-run Chinook salmon spawning and rearing habitat. These potential effects are evaluated below.

Central Valley Steelhead

The Central Valley steelhead DPS (Central Valley [CV] steelhead) is federally listed as threatened (71 FR 834; 76 FR 50447). The DPS includes all naturally spawned populations of steelhead below natural and manmade impassable barriers in the Sacramento and San Joaquin rivers and their tributaries, including the Sacramento-San Joaquin Delta (63 FR 13347). Steelhead from San Francisco and San Pablo Bays and their tributaries, as well as two artificial propagation programs (the Coleman National Fish Hatchery and Feather River Hatchery steelhead hatchery programs) are excluded from the listing. Critical habitat was designated for this DPS on September 2, 2005 (70 FR 52488).

CV steelhead was historically well distributed throughout the Sacramento and San Joaquin rivers (Busby et al. 1996). Steelhead occur anywhere in the Central Valley where water temperatures are suitable, and where they can physically access habitat (i.e., where rivers are not blocked by dams and other obstacles). Spawning and rearing occurs on the upper Sacramento River and its major tributaries (e.g., Putah Creek, Little Chico Creek, and Cow Creek) (McEwan and Jackson 1996). Small self-sustaining populations also occur in the Stanislaus, and other streams previously thought to be devoid of steelhead in the San Joaquin River basin (McEwan 2001). Incidental catches and observations of steelhead juveniles also have occurred on the Tuolumne and Merced rivers, indicating that steelhead are widespread, throughout accessible rivers and creeks in the Central Valley (Table 3.7-2; Good et al. 2005).

CV steelhead are considered winter-run steelhead (ocean-maturing), though summer-run steelhead may have been present in this geographic region prior to construction of large dams (Moyle 2002). Winter-run steelhead enter streams from the ocean when winter rains provide large amounts of cold water for migration and spawning (Moyle 2002). These fish enter the Delta as early as

August, with a peak in late September to October. Migration to the main channels and tributaries for spawning occurs from December through April. They may remain in the main channels of the rivers until flows are high enough in tributaries to enter for spawning (Moyle 2002). Adult immigration in the San Joaquin River generally occurs until April (Moyle 2002).

In California, most steelhead spawn from December through April (McEwan and Jackson 1996). Spawning takes place in small, cool, well-oxygenated streams where water remains year-round. Eggs are laid in gravel and hatch in three to four weeks. The fry remain in the gravels for another two to three weeks before emerging (Moyle 2002). Juvenile steelhead may remain in freshwater habitats for one or more years before emigrating to the ocean to mature. Some fish may mature in streams, adopting a resident life history. Juveniles can be found in cool, clear, fast-flowing permanent rivers and creeks where there is a predominance of riffles, overhanging vegetation or banks, and ample invertebrate prey (Moyle 2002).

Steelhead may begin emigrating in the late fall, but the primary period of emigration is from December to May (Snider and Titus 2000; NOAA Fisheries Service 2004). CV steelhead use the lower reaches of the Sacramento River and the Bay-Delta for rearing and as a migration corridor to the ocean.

Summer rearing of CV steelhead would overlap with water transfers occurring in the Seller Service Area (~~July~~April-September), both in the Sacramento and San Joaquin River and their tributaries (see specific tributaries listed above). Thus water transfers have the potential to affect steelhead. The majority of rearing, however, would occur in the cooler sections of rivers and creeks (McEwan 2001)~~ above the influence for the water transfers~~.

Water transfers could affect the timing of reservoir releases throughout the year, which could positively or negatively alter instream flows below these reservoirs and, therefore, affect steelhead spawning and rearing habitat. These potential effects are evaluated below.

Green Sturgeon

The Southern DPS (consisting of coastal and Central Valley populations south of Eel River) of North American green sturgeon are listed as federally threatened (71 FR 17757-17766). Critical habitat was designated for this DPS on October 9, 2009 (74 FR 52300). Like other sturgeon, green sturgeon spawn in fresh water. However, they are one of only a few anadromous species of sturgeon.

Green sturgeon range from Mexico to Alaska in marine waters, and forage and migrate in estuaries and bays from the San Francisco Bay north to British Colombia (NOAA Fisheries 2012). The Southern DPS are believed to spawn regularly in the Rogue River, Klamath River Basin, and the Sacramento River

(NOAA Fisheries 2012), and they are not believed to use the San Joaquin River or its tributaries (71 FR 17757).

Adults migrate upstream between late February and late July (Moyle 2002). Spawning occurs upstream of the Delta, predominately in the upper Sacramento River and Feather River (71 FR 17757 17766), from March through July, with peak activity occurring from April to June (Moyle et al. 1995). Green sturgeon spend multiple years in freshwater prior to emigrating to the ocean (71 FR 17757 17766). During this rearing and holding period, they are found in the Sacramento, Feather, and Lower American rivers, and throughout the Delta, where they may be affected by water transfers (Table 3.7-2).

Delta Smelt

The delta smelt is a federally listed threatened species (58 FR 12854-12864); a petition to elevate the status of delta smelt from threatened to endangered under the federal ESA was warranted but precluded by other higher priority listing actions (75 FR 17667). The delta smelt is also listed as endangered by the State of California. Delta smelt are endemic to the upper San Francisco Estuary and occur from western San Pablo Bay and the Napa River landward to the freshwater reaches of the Bay-Delta (Bennett 2005). They occur in the Delta primarily below Isleton on the Sacramento River side and below Mossdale on the San Joaquin River side. A small proportion of individuals are found in the Cache slough area throughout the year (Sommer et al. 2011). They are found seasonally throughout Suisun Bay and in small numbers in larger sloughs of Suisun Marsh. Locations of the fish are dependent upon life cycle stage, salinity, and turbidity (Table 3.7-2; Feyrer et al. 2007).

Delta smelt inhabit open surface waters and shoal areas within the western Delta and Suisun Bay for the majority of their life span (59 FR 65256). They are primarily an annual species and most adult smelt die after spawning. Spawning occurs from January through June in sloughs and shallow, edge-waters of channels in the upper Delta. Larvae and juveniles are generally present in the Delta from March through June. Delta smelt have typically moved downstream towards Suisun Bay by July because elevated water temperatures and low turbidity conditions in the Delta are less suitable than those downstream (Nobriga et al. 2008). Some delta smelt reside year-round in and around Cache Slough (Sommer et al. 2011). Delta smelt in Suisun Bay and Cache Slough would be outside of the influence of the export facilities.

Longfin Smelt

The San Francisco Bay-Delta DPS of longfin smelt is a candidate species for listing under the Federal ESA (77 FR 19756) and the DPS is listed as threatened under CESA (CDFG 2009a). Environmental groups have petitioned the USFWS and the California Department of Fish and Wildlife (CDFW) to list the San Francisco Bay-Delta Population of longfin smelt as endangered citing their population decline over the last 20 years (Bay Institute, et al. 2007). The

USFWS has determined that listing is warranted but currently precluded by higher priority listing actions (77 FR 19756).

Longfin smelt are a short-lived fish species that live primarily in the San Francisco Bay and the Delta, but can sometimes be found in the nearshore ocean. Their primary habitat is open waters of estuaries, both in seawater and freshwater areas, and individuals are most abundant in San Pablo and Suisun bays (Moyle 2002).

Longfin smelt spend the early summer in San Pablo and San Francisco bays, generally moving into Suisun Bay in August. They migrate to suitable spawning habitat in estuaries between January and March and spawn in the Delta, downstream of Rio Vista (Moyle et al. 1995). Most spawning occurs from January through May (Moyle 2002) in fresh or slightly brackish water. After hatching, longfin smelt disperse widely throughout the estuary and some are swept downstream into more brackish parts of the estuary. The majority of adults die after spawning. Indices of longfin smelt abundance from the CDFW fall Midwater trawl sampling during January through June correlate positively with Delta outflow, although the mechanism(s) driving this correlation is(are) unknown (Kimmerer et al. 2009). Larvae are generally present in the Delta from February through May, while juveniles are present in March through June. Based on their life history timing, longfin smelt are unlikely to be present during water transfers.

3.7.2 Environmental Consequences/Environmental Impacts

3.7.2.1 Assessment/Evaluation Methods

This section describes the assessment methods used to identify and assess the potential environmental impacts to fisheries resources, including habitat and fish species of management concern that could potentially result from implementation of the long-term water transfer actions, including groundwater substitution and stored reservoir release. Specific species' biology and distribution, as described in Section 3.7.1 Affected Environment/Environmental Setting, are considered herein at a watershed level (i.e., the analysis assumes that if transfers affect conditions within a watershed, then transfers could affect any species that occurs within the watershed, unless the life history traits of a species indicate that the species would not be affected).

Development of the impact analysis involved literature review, review of known occurrences of special-status species based on the California Natural Diversity Database (CNDDB), USFWS regional species lists, information from NOAA Fisheries website, stream flow and biological monitoring data from previous years, and results of hydrologic modeling, as detailed below.

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

The assessment methods specific to each transfer type are described below, followed by the assessment process for different habitat and species.

3.7.2.1.1 Groundwater Substitution Transfers

Under the action alternatives, there would be an increased use of groundwater to irrigate crops instead of diversion of water from rivers and creeks. This would entail increased groundwater pumping compared to the No Action/No Project Alternative to substitute for water usually provided from CVP supplies. This additional use of groundwater would reduce stream flows during and after a transfer as the groundwater aquifer refills. Increased subsurface drawdown would potentially affect fish habitats, such as riverine, riparian, seasonal wetland, and managed wetland habitats, which are reliant on groundwater for all or part of their water supply. Decreased amounts of surface water in these habitats could affect fish species of management concern. This change in the availability of surface water also could result in changes in flows in the Delta and could require some minor modifications in the operation of the CVP and SWP, including Shasta, Oroville and Folsom reservoirs, to meet various regulatory requirements.

Groundwater substitution transfers were modeled using the SACFEM2013 groundwater model to assess potential changes to groundwater and surface water. Groundwater substitution pumping was simulated as an additional pumping stress on the system, above the baseline pumping volume. The annual volume of transfers was determined by comparing the supply in the seller service area to the demand in the buyer service area. The availability of supplies in the seller service area was determined based on data provided by the potential sellers. The demand was estimated using demand data provided by East Bay MUD and Contra Costa WD as well as the available capacity at the Delta export pumps to convey transfers. The available export capacity was determined from CalSim II model results. The CalSim II model currently only simulates conditions through WY 2003. The available capacity for south of delta exports was typically more limiting than the south of delta water supply demand. Because CalSim II results are only available through 2003, the SACFEM2013 model simulation was truncated at the end of WY 2003.

The analysis of supply and demand resulted in the potential to export groundwater substitution pumping transfers through the Delta during 12 of the years from 1970 through 2003 (33 years, SACFEM2013 simulation period). Each of the 12 annual transfer volumes was included in a single model simulation. Including each of the 12 years of transfer pumping in one simulation rather than 12 individual simulations allows for the potential compounding effects from pumping from prior years. Appendix D, Groundwater Model Documentation, includes more information about the use of SACFEM2013 in this analysis.

The results of the SACFEM2013 analysis estimated streamflow depletion from groundwater substitution throughout the Sacramento Valley. These estimates were included in Transfer Operations Model simulations of the action alternatives. The Transfer Operations Model results are the basis for the determination of potential effects to fish and their habitats. Appendix B, Water Operations Assessment, includes more details about the transfer operations model.

3.7.2.1.2 Reservoirs

Water would be made available for transfers from Camp Far West, Collins, Hell Hole, French Meadows, and McClure reservoirs. These reservoirs would continue to operate in accordance with their existing regulatory requirements and other commitments. Water transfers from these reservoirs would result in decreasing their storage and associated elevation and surface area, during the period when transfers would be made (July through September), and the ongoing reduction in storage until the reservoirs are refilled. Shasta, Oroville, and Folsom reservoirs would not directly provide water for transfer, but their release patterns may be affected by the project because flows may be modified at compliance points in the mainstem rivers downstream of these reservoirs or in the Delta. This may result in more or less water being released from these reservoirs at different times of year. 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.

Reservoirs do not provide the primary habitat for the fish species of management concern. The approach to evaluating impacts as the result of changes in reservoir operations on downstream habitats is described in the next section.

3.7.2.1.3 Rivers and Creeks

As discussed in the preceding sections, water transfer actions would affect flows in the rivers and creeks within the Seller Service Area adjacent to and downstream of the areas where these activities would occur.

The analysis of potential impacts to stream flow focused on the frequency and magnitude of changes in mean monthly flow rates by water year types (wet, above normal, below normal, dry, and critically dry), as compared to existing conditions, based on the modeling results. For the purposes of this analysis, it is assumed that water temperatures vary inversely with flow rates in rivers and creeks, such that, at lower flows, water temperatures would be higher. This assumption was not used for in-Delta water temperatures, for which Wagner et al. (2011) found no relationship (maximum R^2=0.07) with Sacramento River flows and a low relationship (R^2=0.14) with San Joaquin River flows.

For smaller tributaries, the impact analysis compared modeled groundwater depletion flow rates to available mean monthly flow rates for the historical period of record and identified changes in flow rates that would result from water transfer actions. As described there, not every water body could be evaluated in the groundwater model; therefore, smaller water bodies adjacent to those modeled are assumed to respond in a similar way, with similar changes in flow magnitude and timing. Potential impacts to biological resources in these adjacent water bodies would be similar to those of the modeled streams. For the Full Range of Transfers and No Cropland Idling/Shifting alternatives, a screening analysis was conducted for smaller waterways for which groundwater modeling data were available to eliminate the need for biological analyses for streams in which substantial reductions in stream flow did not occur.

Historical stream flow information from the U.S. Geological Survey or the California Data Exchange Center (2012) for these streams were gathered where available and used as the measure of baseline flow. For locations for which historical flow data were limited or unavailable, a quantitative analysis was not possible; thus a qualitative discussion of potential impacts is included for these locations. No impacts would occur to groundwater in the No Action/No Project and No Groundwater Substitution alternatives and, therefore, this screening analysis did not apply.

For rivers and their major tributaries, including the Sacramento, American, Feather, Yuba, Bear, San Joaquin, and Merced rivers, transfer operations model outputs were used to assess impacts to surface water flows.

An action alternative could have an adverse impact on fish habitat if it resulted in decreased flows to a degree that would substantially affect riverine, riparian, or wetland habitats (as described in Section 3.8) in a river or stream, or interfere with fish movement or access to or from areas where the fish spawns. This degree of decreased flow is measured as both a ten percent change in mean flow by water year type and a minimum change in flow of one cfs where quantitative flow data were available. A qualitative assessment was applied in instances where quantitative data were not available.

The ten percent threshold was used to determine measurable flow changes based on several major legally certified environmental documents in the Central Valley related to fisheries (Trinity River Mainstem Fishery Restoration Record of Decision, December 19, 2000; San Joaquin River Agreement Record of Decision in March 1999; Freeport Regional Water Project Record of Decision, January 4, 2005; Lower Yuba Accord EIR/EIS). In these documents, there is consensus that differences in modeled flows of less than ten percent would be within the noise of the model outputs and beyond the ability to measure actual changes.

The one cfs minimum flow threshold was used as a conservative measure of detectability by a fish. The threshold was applied to each month during the entire modeled period, such that, if a change of greater than one cfs occurred in any one month during the modeled period, the waterway would be examined further for biological effects.

Combined, these two thresholds were used as an initial screening evaluation to determine whether further analyses were warranted to assess biological significant impacts because these two thresholds may not always translate into a significant biological effect on fisheries resources. Therefore, these further biological analyses included consideration of other physical and biological factors in addition to absolute and relative flow changes, including presence and timing of life stages of fish species, size of the waterway, timing of flow changes, and water year type.

3.7.2.1.4 Sacramento-San Joaquin Delta

The changes described above for rivers and streams would also apply downstream into the Delta. Additionally exports would vary in timing and magnitude with implementation of water transfers. These changes were modeled using the water transfer model. To assess the potential impacts of these changes on vegetation and wildlife resources in the Delta, the difference in Delta outflow and the location of X2, defined as the distance (in kilometers) up the axis of the estuary to the daily averaged near-bottom 2-practical salinity units (psu) isohaline (Jassby et al. 1995), were considered. Changes in these parameters were used to qualitatively assess the impacts of long-term water transfers on natural communities and special-status species. Diversions would be made using the same conditions imposed upon these facilities by the various contracts, agreements and BOs for these facilities and thus would not have additional impacts to fish species. Modeled changes in Delta outflow or X2 relative to existing conditions were considered substantial and required further analysis if they were greater than ten percent.

3.7.2.1.5 Species Impacts Assessment

The species impacts analysis includes an assessment of the direct and indirect impacts of implementing the action alternatives on fish species of management concern. The assessment evaluated the permanent and temporary impacts on fish species of management concern and is based on impacts to the aquatic habitats that the species use within the area of analysis, the timing of those impacts, and the species' geographic and temporal distribution.

For special-status fish species, species-habitat associations were developed and defined (see Appendix I) based on literature review and review of species databases, including the CNDDB and USFWS species lists. Fish use different areas for different parts of their life cycle (migration, spawning, rearing). Hydrologic impacts on fish habitat were assessed qualitatively based on extrapolation of groundwater and surface water modeling results, described above, to the species habitat requirements.

Direct and indirect impacts on fish species of management concern may include habitat degradation or removal, displacement of individuals, and habitat fragmentation leading to disruption of spawning, migrating, and/or rearing behaviors.

3.7.2.2 Significance Criteria

Consistent with the provisions of the California Environmental Quality Act (CEQA) and the CEQA Guidelines, an alternative would have a significant impact on fisheries resources if it would:

- Cause a substantial reduction in the amount or quality of habitat for target species.
  - Have a substantial adverse effect, such as a reduction in area or geographic range, on any riverine, riparian, or wetland habitats, or other sensitive aquatic natural community, or significant natural areas identified in local or regional plans, policies, regulations, or by CDFW, NOAA Fisheries, or USFWS that may affect fisheries resources;
  - Conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan;
- Cause a substantial adverse effect to any special-status species,
  - Have a substantial adverse effect, either directly or through habitat modifications, on any endangered, rare, or threatened species, as listed in Title 14 of the California Code of Regulations (sections 670.2 or 670.5) or in Title 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, NOAA Fisheries, or USFWS, including substantially reducing the number or restricting the range of an endangered, rare, or threatened species;
  - Cause a substantial reduction in the area or habitat value of critical habitat areas designated under the federal ESA or essential fish habitat as designated under the Magnusson Stevens Fisheries 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 (Fish & 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; or
- Substantially fragment or isolate habitats or block movement corridors.

The significance criteria described above apply to fish habitats and fish species of management concern 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 the National Environmental Policy Act).

3.7.2.3 Alternative 1: No Action/No Project Alternative

The assessment evaluates the effects of the No Action/No Project Alternative on fisheries resources (fish habitat and fish species of management concern) and separately for special-status fish species by including likely future conditions in the absence of the long-term water transfer and identifies a range of impacts associated with the No Action/No Project Alternative in comparison with existing conditions.

3.7.2.3.1 Fisheries Resources and Special-Status Fish Species

Reservoirs

The No Action/No Project Alternative would not affect reservoir storage and reservoir surface area. Under the No Action/No Project Alternative, storage volumes, reservoir surface area, and downstream releases from reservoirs would be the same as under existing conditions. Future climate change is not expected to alter conditions in any reservoir under the No Action/No Project Alternative because there will be limited climate change predicted over the ten year project duration (see Section 3.6, Climate Change/Greenhouse Gas).

Impacts on Fisheries Resources: The No Action/No Project Alternative would have no impact on fisheries resources in reservoirs, as reservoirs do not support primary populations of the fish species of management concern, including special-status fish species, and conditions would be the same as under existing conditions.

Impacts on Special-Status Fish Species: The No Action/No Project Alternative would have no impact on special-status fish species, as reservoirs do not support primary populations of special-status fish species, and conditions would be the same as under existing conditions.

Rivers and Creeks

The No Action/No Project Alternative would not cause flows of rivers and creeks in the Sacramento and San Joaquin river watersheds to be lower than under existing conditions. Under the No Action/No Project Alternative, the rate and timing of flows in rivers and creeks in the Sacramento and San Joaquin river watersheds would be similar to existing conditions. Future climate change is not expected to alter conditions in any river or creek under the No Action/No Project Alternative because there will be limited climate change predicted over the ten year project duration (see Section 3.6, Climate Change/Greenhouse Gas).

Impacts on Fisheries Resources: The No Action/No Project Alternative would have no impact on fisheries resources in rivers and creeks, as conditions would be the same as under existing conditions.

Impacts on Special-Status Fish Species: The No Action/No Project Alternative would have no impact on special-status fish species in rivers and creeks, as conditions would be the same as under existing conditions.

Delta

The No Action/No Project Alternative would not alter flows through the Delta compared to existing conditions. Under the No Action/No Project Alternative, flows into the Delta and diversions from the Delta would be the same as under existing conditions. All existing regulatory requirements would continue and would provide similar levels of protection to natural resources. Future climate change is not expected to alter conditions in the Delta under the No Action/No Project Alternative because there will be limited climate change predicted over the ten year project duration (see Section 3.6, Climate Change/Greenhouse Gas).

Impacts on Fisheries Resources: The No Action/No Project Alternative would have no impact on fisheries resources in the Delta, as conditions would be the same as under existing conditions.

Impacts on Special-Status Fish Species: The No Action/No Project Alternative would have no impact on special-status fish species in the Delta, as conditions would be the same as under existing conditions.

3.7.2.3.2 Special-Status Species Habitat

Under the No Action/No Project Alternative, conditions would be same as under existing conditions in terms of groundwater pumping, farming practices, reservoir operations, and river and stream flows. The No Action/No Project Alternative would not result in changes to existing water transfer practices. Special-status species habitat would not be impacted as a result of the No Action/No Project Alternative.

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

3.7.2.4.1 Fisheries Resources and Special-Status Fish Species

Under the Proposed Action, water transfers could directly affect fisheries resources by changing the timing and volume of flows within rivers and creeks, or storage volumes in reservoirs. These changes are detailed in Section 3.8.2.4. This section summarizes changes to stream flows and reservoir operations, which are evaluated in the context of impacts to fisheries resources (fish habitat and fish species of management concern) and separately for special-status fish species.

Reservoirs

The Proposed Action could impact reservoir storage and reservoir surface area. Under the Proposed Action, modeled storage volumes, reservoir elevations and surface areas would change as described in Section 3.8.2.4.1. All reservoirs would continue to be operated according to their existing requirements and within their current range of operations. These reservoirs do not support primary populations of the fish species of management concern, including special-status fish species.

Impacts on Fisheries Resources: The Proposed Action would have no impact on fisheries resources in reservoirs, as reservoirs do not support primary populations of the fish species of management concern, including special-status fish species.

Impacts on Special-Status Fish Species: Proposed Action would have no impact on special-status fish species, as reservoirs do not support primary populations of special-status fish species.

Rivers and Creeks

Sacramento River Watershed

The Proposed Action could cause flows in rivers and creeks to be lower than under the No Action/No Project Alternative. 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. Therefore, the effects of the Proposed Action on fisheries in these rivers would be less than significant. Existing regulatory requirements protecting fisheries resources (flow magnitude and timing, temperature, and other water quality parameters) would continue to be met. Among larger rivers, only Bear River flows would be reduced by more than ten percent by the Proposed Action and, therefore is discussed in detail below.

In addition, an initial screening evaluation was conducted on flows in several smaller creeks with special-status fish species (see Section 3.7.2.1 for details). The evaluation concluded that impacts in the following waterways are less than significant: Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Auburn Ravine, Freshwater Creek, Colusa Basin Drain, Putah Creek, and ~~Wilson~~ Big Chico Creek (Table 3.7-3).

Table 3.7-3. Screening Evaluation Results for Smaller Streams in the Sacramento River Watershed for Detailed Fisheries Impact Analysis for the Proposed Action.

Waterway	>1 cfs reduction?	>10% reduction?	Data Source
Deer Creek (Tehama County)	N	-	N/A
Antelope Creek	N	-	N/A
Paynes Creek	N	-	N/A
Elder Creek	N	-	N/A
Mill Creek (Tehama County)	N	-	N/A
Thomes Creek	N	-	N/A
Mill Creek (tributary to Thomes Creek)	N	-	N/A
Stony Creek	Y	Y	USGS Gage #11388000; Water Years 1976-2003
Butte Creek	Y	N	USGS Gage # 11390000; Water Years 1976-2003
Cache Creek	Y	Y	USGS Gage # 11452500; Water Years 1975-2013
Eastside/Cross Canal	Y	U	N/A
Auburn Ravine	N	-	N/A
Coon Creek	Y	Y	Bergfeld personal communication 2014
Colusa Basin Drain	Y	N	DWR Gage # WDL A02976; Water Years 1976-2003
Freshwater Creek	N	-	N/A
Putah Creek	Y	N	USGS Gage # 11454000; Water Years 1976-2003
Big Chico Creek	N	-	N/A
Little Chico Creek	Y	Y	DWR Gage # WDL A04280; Water Years 1976-1996
Salt Creek	Y	U	N/A

Y = Yes; N = No; U = Unknown; N/A = Not applicable

Note: Darkened rows indicate that a detailed analysis was not conducted because both criteria were not met.

Flows in Cache, Stony, Coon, and Little Chico Creeks would meet both criteria (Table 3.7-3) and the effects of the Proposed Action on fisheries in these creeks therefore are discussed in detail below.

Historical flow data was limited or not available for Eastside/Cross Canal, and Salt Creek. These streams have the potential for impacts on special-status fish species due to flow reductions under the Proposed Action although no data were available to determine the proportional reduction of base flows. Generally, these waterways are not immediately adjacent to groundwater substitution transfers, and other nearby small waterways are not experiencing flow decreases that are causing significant impacts to aquatic resources. ~~In addition, flow~~

~~reductions as the result of groundwater declines would be observed at monitoring wells in the region and adverse effects on riparian vegetation 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.~~ Therefore, the impacts to fisheries resources would be less than significant in these streams.

Impacts on Fisheries Resources: Long-term water transfer actions under the Proposed Action would have a less than significant impact on fisheries resources in the following rivers and creeks within the Sacramento River Watershed: Sacramento River, Feather River, Yuba River, American River, ~~Butte Creek, Putah Creek, Colusa Basin Drain,~~ Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Auburn Ravine, Freshwater Creek, Colusa Basin Drain, Putah Creek, Big Chico Creek, Eastside/Cross Canal, and Salt Creek. As modeled, flow changes in these streams would be small and no substantial effect on water quality would result from implementing the Proposed Action.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status fish species in the following waterways within the Sacramento River Watershed: Sacramento River, Feather River, Yuba River, American River, ~~Butte Creek, Putah Creek, Colusa Basin Drain,~~ Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Auburn Ravine, Freshwater Creek, Colusa Basin Drain, Putah Creek, Big Chico Creek, Eastside/Cross Canal, and Salt Creek. Flow changes would be small, and the habitat for these species would not be substantially affected by the Proposed Action, as described above.

As modeled, Cache Creek, Stony Creek, Coon Creek, Little Chico Creek, and the Bear River may experience a greater than ten percent change in mean monthly flows in at least one water year type and month of the year. Potential fisheries impacts in these waterways are discussed individually below.

Cache Creek

Groundwater substitution under the Proposed Action could cause Cache Creek flows to be lower than under the No Action/No Project Alternative. As detailed in Section 3.8.2.4, 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, but would be greater than ten percent lower in individual water year types within months between May and November. 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 (0.61 cfs) in critical water years during November. Because these flow changes exceed the ten percent screening criterion, they could affect fisheries resources.

Historical evidence indicates that Chinook salmon and steelhead spawned in Cache Creek (Shapovalov 1947 as cited in Yoshiyama et al. 1996). However, since 1947, there has been only one account of Chinook salmon, likely a fall-run individual, spawning in Cache Creek (in November 2000; Moyle and Ayers 2000) despite systematic fish surveys in the creek (e.g., Marchetti and Moyle 1998, Stillwater Sciences 2008). This is likely because of damming and agricultural diversions in the valley floor reaches over the past few decades combined with the natural porous geology of Cache Creek that has limited connection of the creek to the Sacramento River. Connectivity for migration of Chinook salmon only occurs in wet years (Stillwater Sciences 2008). In most years, Cache Creek dries out above the Cache Creek Settling Basin, precluding access by salmonids. Groundwater modeling results indicate that no substantial (greater than ten percent) changes to instream flows in Cache Creek would occur in wet years when Chinook salmon could be present. Therefore, there would be no effect of the Proposed Action on fall-run Chinook salmon.

Hardhead were reported in Cache Creek by Marchetti and Moyle (1998) but were not observed at any locations by Stillwater Sciences (2008). If hardhead are present in the creek, instream flow reductions may reduce hardhead habitat. However, because recent information indicates that hardhead are no longer present, this potential impact is unlikely. Therefore, the impacts would be less than significant.

Impacts on Fisheries Resources: Long-term water transfer actions under the Proposed Action would have a less than significant impact on fisheries resources within Cache Creek, as occurrence of fish species of management concern, including special-status fish species, is unlikely in this stream.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status fish species in Cache Creek, because occurrence of special-status fish species is unlikely in this stream.

Stony Creek

Groundwater substitution under the Proposed Action could cause Stony Creek flows to be lower than under the No Action/No Project Alternative. Modeling results indicate that there would be one water year in one month (critical water years during October) in which flows would be reduced by 10.0 percent (3.3 cfs) under the Proposed Action. Spring-run and fall-/late fall-run Chinook salmon, steelhead, and hardhead reside in Stony Creek. Because spring-run and fall-/late fall-run Chinook salmon are not present in the creek during October, there would be no effects to these races. Stony Creek is used opportunistically by steelhead for spawning; spawning is possible only in years in which attraction flows are present, which are the wettest water years (H.T. Harvey & Associates et al. 2007). Because the 10.0 percent reduction occurs only in critical water years, steelhead would not likely be in Stony Creek. ~~Juvenile steelhead and h~~

Hardhead could be present in the river and experience this reduction in flows. It is unknown exactly what the biological effect of a flow reduction of 10 percent on hardhead could be, but mortality of all or a substantial proportion of fish during this one water year type and month is very unlikely. Two potential impact mechanisms involve habitat availability and water temperatures.

There have been no studies to develop habitat-flow relationships for hardhead in Stony Creek. We assumed in this analysis that a reduction in flow would degrade conditions for these fish, although it is common to find that increased flow actually reduces usable salmonid habitat in Central Valley rivers along at least part of the flow range (e.g., USFWS 1997, Payne and Allen 2004, 2005, Gard 2009). Therefore, there is uncertainty in whether the 10.0 percent reduction would have adverse effects to habitat availability, as it is even possible that effects could be beneficial. In addition, hardhead are typically in the lower half of the water column and prefer slow moving pools (Moyle 2002). A reduction in flows would maintain the lower half of the water column and the number of slow moving pools in the river during February is not expected to decrease. Further, the frequency of the reduction would be low. Critical years would occur approximately once every five years within the period of analysis (1970-2003).

Although water temperature is a concern in Stony Creek, this concern appears to be primarily for salmonids, which are more intolerant of higher water temperatures than hardhead. Reclamation (1998), as cited in H.T Harvey and Associates et al. (2007), reported that mean water temperatures in Stony Creek below Black Butte Dam between 1975 and 1994 were 46 to 71 F. These temperatures are 7.8 F lower than the upper range of hardhead tolerance of 26 C (78.8 F) (Thompson et al. 2012). It is not likely that temperatures will rise 7.8 F due to a 10 percent reduction in flow during October of critical water years to a level that would be a concern to hardhead.

Based on the lack of evidence of effects on hardhead, this impact would be less than significant for all fish species.~~However, because this reduction occurs in only one month and one water year type in one month, it is not expected to have a substantial effect on the two species present in the creek. Therefore, it is concluded that effects to steelhead and hardhead would be less than significant.~~

Coon Creek
Groundwater substitution 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 gage 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 2003-2005. If the calculation included the high end of the range (40 cfs) for baseline flows, the reduction due to 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. As a result, it is concluded that effects of the Proposed Action to fisheries resources in Coon Creek would be less than significant.

Little Chico Creek

Groundwater substitution 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 Water Years 1976 to 199~~5~~6 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. 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 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. Low flows during these months would cause increases in water temperatures and reduced dissolved oxygen levels to levels intolerable for over-summering adult spring-run Chinook salmon. Therefore, spring-run Chinook salmon would not be present in the creek during ~~this time of year~~these months. In addition, any juvenile steelhead and hardhead in the river would experience reductions in flows under the Proposed Action that would cause flows to be within the range of flows during the July through October period (generally less than 0.5 cfs). ~~Therefore~~In conclusion, the flow reduction of greater than ten percent, although large on a relative scale, would not have a substantial effect on fisheries resources in Little Chico Creek.

Bear River

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 would occur in critical water years during

February (approximately 18 percent, or 45 cfs lower). Fish species of management concern that could be present in the Bear River during February would include fall-run Chinook salmon, green and white sturgeon, and hardhead.

An 18 percent reduction in flows in critical water years during February would not affect fall-run Chinook salmon. This reduction is limited to critical water years in one month of the year and is, therefore, infrequent (approximately 20 percent of years). More importantly, the timing of the reduction would be during a period that would least likely affect fall-run Chinook salmon. Water temperatures during February are typically well below critical temperature thresholds such that a reduction in flows would not likely increase water temperatures to a level that is stressful to fall-run Chinook salmon.

Green and white sturgeon are not typically found in the Bear River but are thought to enter the river during spring of most wet years and some normal years (USFWS 1995). There is no evidence of species presence in the Bear River during critical water years. Because substantial flow reductions would only be in critical years, no sturgeon are expected to be in the Bear River during reduced flow conditions. Therefore, the impact of reduced flows on green and white sturgeon in the Bear River would be less than significant.

The reduction in flows under the Proposed Action during critical years in February is not expected to have a substantial effect on hardhead habitat for several reasons. First, hardhead are typically in the lower half of the water column and prefer slow moving pools (Moyle 2002). A reduction in flows would maintain the lower half of the water column and the number of slow moving pools in the river during February is not expected to decrease. Second, the frequency of the reduction would be low. Critical years would occur approximately once every five years within the period of analysis (1970-2003). Third, due to a lack of flow-habitat relationships for hardhead in the Bear River and because it is common for flow reductions to increase habitat availability for at least part of the flow range (e.g., USFWS 1997, Payne and Allen 2004, 2005, Gard 2009), there is uncertainty in whether a flow reduction would have adverse effects to habitat availability, as it is even possible that effects could be beneficial. Fourth, the timing of the reduction would be during a period that would least likely affect hardhead. Water temperatures during February are already low such that a reduction in flows would not likely increase water temperatures to a level that is stressful to hardhead. In addition, hardhead typically spawn and fry are present during April through May, possibly later in smaller streams (Moyle 2002). Therefore, only juvenile and adult hardhead, the least sensitive life stages, are present in the Bear River during February. For these reasons, the impact to hardhead in the Bear River would be less than significant.

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 increases during the summer months could be beneficial to fish species present.

Impacts on Fisheries Resources: Long-term water transfer actions under the Proposed Action would have a less than significant impact on fisheries resources within Bear River for the reasons stated above.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status fish species in Bear River for the reasons stated above.

San Joaquin River Watershed

San Joaquin River

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 in the San Joaquin River would be reduced by less than two percent relative to the No Action/No Project Alternative. Based on the screening level criteria, these flow changes would not be considered substantial.

Impacts on Fisheries Resources: Long-term water transfer actions under the Proposed Action would have a less than significant impact on fisheries resources occurring in the San Joaquin River, as flow reductions would be small and would continue to meet existing requirements established to protect fish.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status fish species, occurring in the San Joaquin River, as flow reductions would be small and would continue to meet existing requirements established to protect fish.

Merced River

The Proposed Action could cause Merced River flows to be lower than under the No Action/No Project Alternative. Under the Proposed Action, flows from McClure Reservoir would be released under existing agreements. Under the Proposed Action, flows would generally be similar to or greater than flows under the No Action/No Project Alternative. Flow reductions would not exceed ten percent in any water year type or month. Flows would be higher compared to the No Action/No Project Alternative during April and May. The greatest relative increase in flow under the Proposed Action would occur in dry water years during April (approximately 38 percent, 85 cfs higher than existing conditions). Increased flows during April and May could be beneficial to biological resources, particularly in dry and critically dry water years.

Impacts on Fisheries Resources: Long-term water transfer actions under the Proposed Action would have a beneficial effect on fisheries resources occurring in the Merced River, because flows would be higher than under the No Action/No Project Alternative.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the Proposed Action would have a beneficial effect on special-status fish species occurring in the Merced River, as flows would generally be higher than under the No Action/No Project Alternative.

Delta

Delta Exports

The Proposed Action could cause Delta exports to be higher than under the No Action/No Project Alternative. Changes in mean monthly Delta exports under the Proposed Action relative to the No Action/No Project Alternative would generally be very small (less than five percent), except in the summer to fall months of dry and critically dry water years. At the CVP diversion facilities (Jones Pumping Plant), changes in exports would be less than three percent, except in July through September of dry and critical water years when transfers are being pumped (ranging from a three to 38 percent increase in exports, or 9,000 to 72,000 acre-feet [AF] per month). At the SWP diversion facilities (Banks Pumping Plant), changes in exports would be less than ten percent, except in dry and critical water years during July and August (ranging from a five to 55 percent increase in exports, or 10,000 to 30,000 AF per month).

Mean monthly exports at Contra Costa WD diversions would be similar in all water year types and months except dry and critical water years during July through September (12.7 to 32.3 percent increase or 2,500 to 4,300 AF per month).

Model outputs indicate that, at the East Bay MUD diversion facilities at Freeport, fairly substantial proportional increases in mean monthly exports would occur throughout the year under the Proposed Action relative to the No Action/No Project Alternative (up to 75.3 percent increase). However, flows in the Sacramento River at Freeport would not be reduced in any month or water year type by more than 422 cfs (0.8 percent). Regardless, all of these facilities would continue to be operated in accordance with their existing or future regulatory requirements and the terms and conditions specified in their BOs. Both BOs contain a Reasonable and Prudent Alternative (RPA) that, when implemented, would avoid jeopardy of ESA listed fish species. In addition, the State Water Resources Control Board's (SWRCB's) Water Rights Decision-1641 imposes flow and water quality objectives in the 1995 Bay-Delta Plan upon the SWP and CVP operations to assure protection of beneficial uses in the Delta. The SWP and CVP must comply with these and other regulatory requirements in order to operate. Because changes in flows in Delta channels are predicted to be small and there are additional protections for fisheries and aquatic resources already in place under the ESA and D-1641, these impacts would be less than significant.

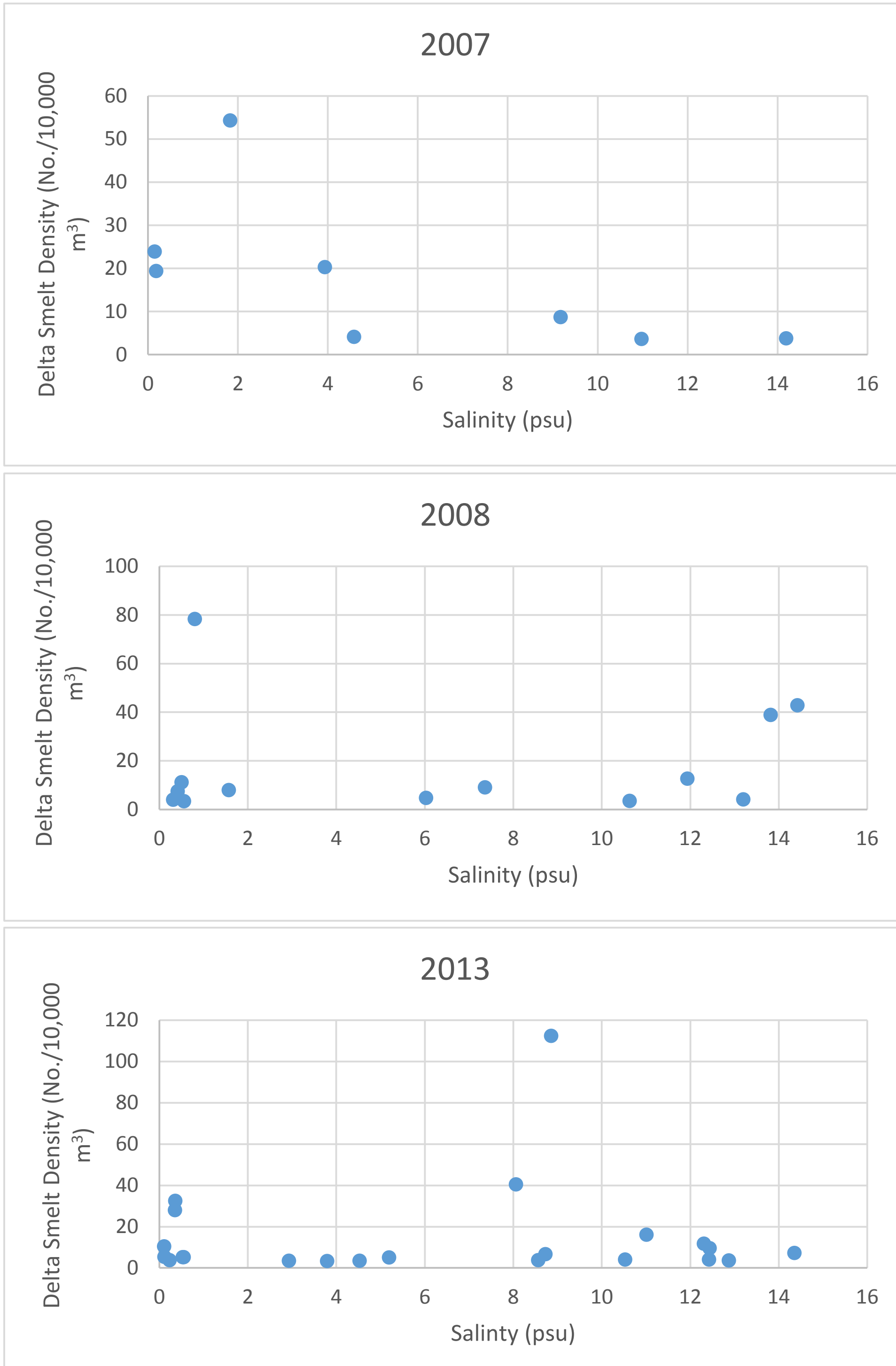
Collectively, the largest changes in Delta diversions relating to long-term water transfers would primarily occur from July through September. This is the period when through-Delta water transfers are allowed because it is the least sensitive period for fisheries resources. Longfin smelt are typically found in the bays and nearshore ocean during this time of year (Rosenfield 2010) and would be unaffected by the Proposed Action. Delta smelt have typically moved downstream towards Suisun Bay by this time of year because elevated water temperatures and low turbidity conditions in the Delta are less suitable than those downstream (Nobriga et al. 2008), although some delta smelt reside year-round in and around Cache Slough (Sommer et al. 2011) outside of the influence of the export facilities. An evaluation of CDFW summer tow net surveys in July and August of recent dry (2007, 2013) and critical (2008) water years supports the claim that delta smelt are not near the export facilities during these months[2] (CDFW 2014). There is no consistent pattern in delta smelt density relative to salinity (Figure 3.7-2), suggesting that there is no salinity range preference for the low salinity zone (~2 psu) by delta smelt juveniles during these months in these dry and critical water years. There is, however, a general lack of delta smelt caught in tows with water temperatures above ~22°C, indicating that the fish avoid areas with higher water temperatures (Figure 3.7-3). This suggests that the delta smelt, a species that is subject to the wide range of physical conditions typical of an estuary, will move to more suitable (lower) water temperature conditions despite being in a less suitable physiological habitat that is not the low salinity zone.

Delta outflow would not be reduced and, therefore, X2 location would not increase, during these months under the Proposed Action (see “Delta Outflow” section below). In fact, Delta outflow would increase under the Proposed Action in dry and critical years during July through September, although X2 location would change minimally (less than 1.3 percent). Consequently, potential increases in exports during this period would have limited, if any, effects on delta smelt.

Green and white sturgeon are rarely observed (only sporadically in low numbers; DWR and Reclamation unpublished salvage data) at the diversion facilities and, therefore, are not likely to be affected by these changes. The vast majority of juvenile Chinook salmon and steelhead would have emigrated from the Delta region by the end of June (NOAA Fisheries 2014) and are, therefore, unlikely to be affected by increases in exports. In addition, fish screens and monitoring at the East Bay MUD (currently conducted December through June when sensitive fish species are present) and Contra Costa WD (currently conducted year-round) facilities, as well as year-round fish salvage monitoring at SWP and CVP facilities, would further ensure that special-status fish species or other fish species of management concern are not affected by any increases in exports at their facilities. Reclamation is consulting frequently with USFWS

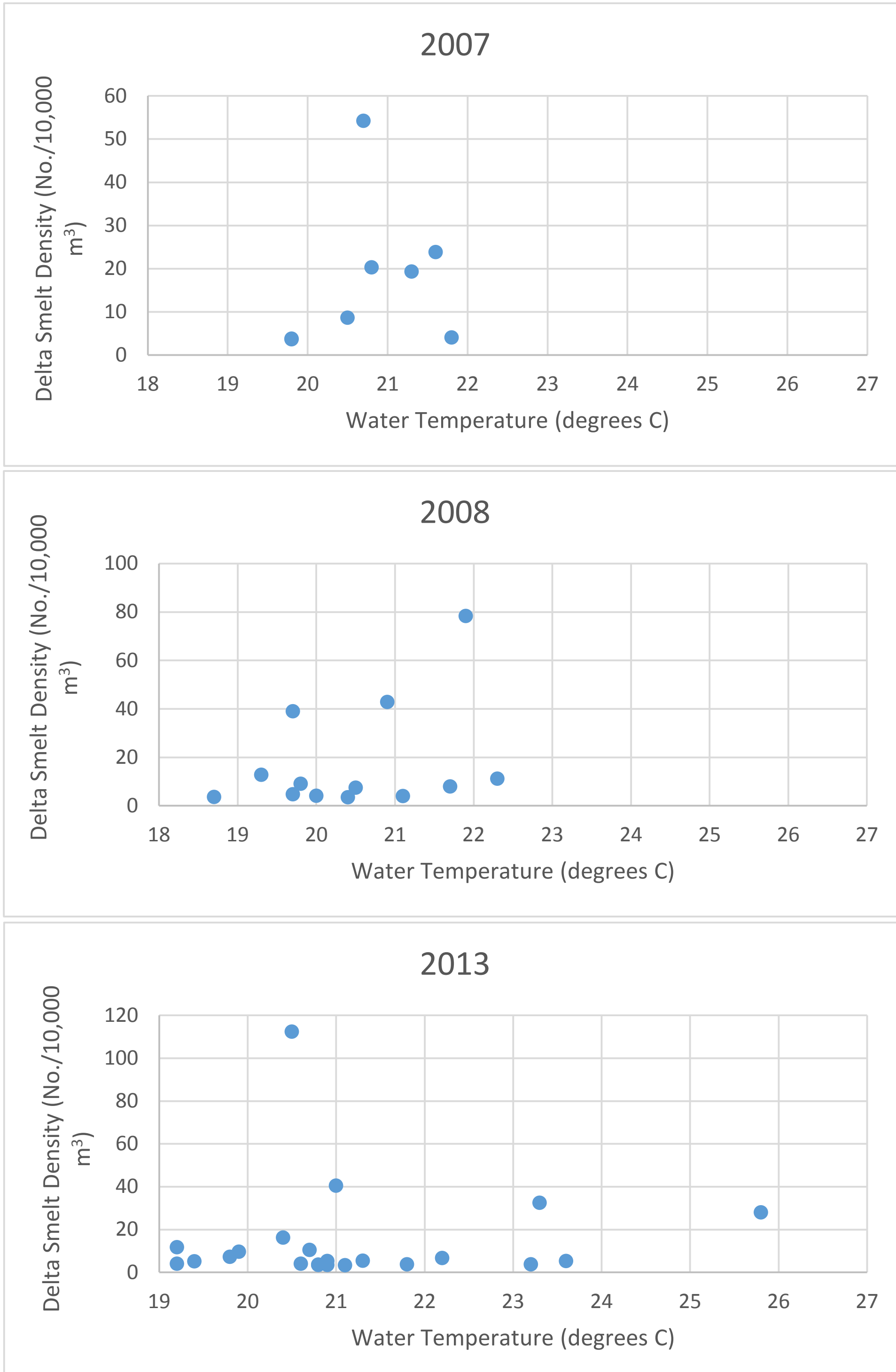
[2] Includes only tows in which fish were caught

and NOAA Fisheries on CVP and SWP operations relative to the BOs and special-status fish species in the Delta.



Source: CDFW 2014

Figure 3.7-2. Density of delta smelt as a function of salinity in recent dry and critical water years: 2007 (dry), 2008 (critical), and 2013 (dry).



Source: CDFW 2014

Figure 3.7-3. Density of delta smelt as a function of water temperature in recent dry and critical water years: 2007 (dry), 2008 (critical), and 2013 (dry).

Impacts on Fisheries Resources: Long-term water transfer actions under the Proposed Action would have a less than significant impact on fisheries resources that are influenced by Delta exports because occurrence of these species would be unlikely during the period of increased exports, species that are present are rarely observed at diversion facilities, and fish screens and monitoring at export facilities would further ensure that there would not be a substantial increase in the number of fish of a special-status species.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status fish species that are influenced by Delta exports because occurrence of these species would be unlikely during the period of increased exports, species that are present are rarely observed at diversion facilities, and fish screens and monitoring at export facilities would further ensure that there would not be a substantial increase in the number of fish of a special-status species.

Delta Outflow

The Proposed Action could cause Delta Outflows to be lower than under the No Action/No Project Alternative. Under the Proposed Action, modeled mean Delta outflows would not be more than 1.3 percent (147 cfs) lower than flows under the No Action/No Project Alternative in any month or water year type. Outflow would be 12.2 percent (500 cfs) higher during July in critically dry water years. The maximum mean monthly upstream shift in X2 location would be 0.1 km (0.2 percent) upstream during periods of decreased flow, and 1.9 km (1.0 percent) downstream during periods of increased flow. Average daily fluctuations in outflow, and therefore X2 position, at Chipps Island due to tides are 170,000 cfs (DWR 1995). Therefore, a change of 500 cfs in Delta outflow would be 0.3 percent of the daily tidal change experienced in this area. These changes to Delta outflow, and resultant changes in X2 position, due to the Proposed Action would not have a substantial adverse impact on biological resources because either outflow reductions would be minimal (less than 1.3 percent) or the potential outflow increase of 12.2 percent could be beneficial.

Impacts on Fisheries Resources: Long-term 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 reductions in Delta outflow and increases in X2 location would be small (less than1.3 percent) in all months and water year types and would therefore not cause a substantial reduction in the number of fish of a special-status species. In addition, Delta outflow would increase by 12.2 percent under the Proposed Action in critical years during July, which could benefit fisheries resources.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status fish species that may be influenced by Delta outflow, as reductions in Delta outflow and increases in X2 location would be small (less than 1.3 percent) in all months and water year types and would therefore not cause a substantial reduction in the number of fish of a special-status species. In addition, Delta outflow would increase by 12.2 percent under the Proposed Action in critical years during July, which could benefit special-status fish species.

3.7.2.4.2 Special-Status Species Habitat

The impacts of long-term water management actions on special-status species (listed or candidate species under the ESA, CESA or listed as a species of concern by the State of California), including winter-, spring-, and fall-/late fall-run Chinook salmon, Central Valley steelhead, delta smelt, longfin smelt, green sturgeon, hardhead, and Sacramento splittail were evaluated based on the impacts of these actions on fisheries habitats, specifically reservoirs, mainstem rivers, small tributaries to the Sacramento River, and the Delta. The distribution of special-status fish species is within these habitat types is provided in Table 3.7-2.

As described in the preceding sections, long-term water transfer actions would be carried out such that that all facilities would be operated consistent with their existing or future regulatory requirements. The most current flow and temperature requirements established by various regulating agencies including the USFWS, NOAA Fisheries, Federal Energy Regulatory Commission (FERC), and SWRCB, for the protection of downstream resources, including fish, would be met.

Reservoirs

Special-status fish species do not occupy the reservoirs that would be affected by long-term water transfer actions. These reservoirs are operated to maintain environmental conditions on the downstream rivers, as discussed in the next section.

Mainstem Rivers

~~Environmental Commitments would require that facilities affected by long-term water transfer actions continue to provide the existing protections for fish dependent on the mainstem rivers including the Sacramento, Feather, American, Yuba, Bear, Merced, and San Joaquin rivers~~Each of the special-status fish species use mainstem rivers, including the Sacramento, Feather, American, Yuba, Bear, Merced, and San Joaquin rivers, as habitat~~s~~ for some portion of their life history, with the exception of delta and longfin smelt, which use only those portions of the mainstream rivers in the Delta. Spawning, rearing, holding and migration habitat on these rivers would be maintained. While minor changes in flows and temperatures would occur, these would be within the normal ranges that would occur under the No Action/No Project Alternative.

Impacts to Special-Status Fish Species: The Proposed Action would have a less than significant impact on special-status fish species in mainstem rivers. Flows in all mainstem rivers would remain within their normal ranges and, therefore, there would be no substantial reduction in spawning, rearing, or migration habitat of special-status species.

Small Tributaries to the Sacramento River

Small tributaries to the Sacramento River could be impacted by groundwater substitution, which could reduce flows in these streams due the hydrologic connectivity between groundwater tables and these streams. The groundwater model results indicate that the effects of groundwater substitution on stream flow would be most pronounced during July through September when special-status fish species are unlikely to occur in the streams. In addition, these flow reductions would not be frequent or large enough to have a substantial effect on special-status fish species in the small tributaries during this period.

Impacts to Special-Status Fish Species: Groundwater substitution actions under the Proposed Action would have a less than significant impact on special-status fish species that could occur in small tributaries to the Sacramento River because there would be no substantial reduction in spawning, rearing, or migration habitat of special-status species.

Delta

All of the special-status fish species use the Delta for some portion of their life history. As previously described, the transfer operations model indicates that there would be very minor reductions in Delta outflow (less than 1.3 percent) as a result of the long-term water transfer actions and Delta outflow would improve by 12.2 percent in critical water years during July. Therefore, there would be no substantial reduction in spawning, rearing, or migration habitat of special-status species.

Impacts to Special-Status Fish Species: The Proposed Action would have a less than significant impact on special-status fish species in the Delta because there would be no substantial reduction in spawning, rearing, or migration habitat of special-status species. The transfer operations model indicates that there would be very minor reductions in Delta outflow (less than 1.3 percent) as a result of the long-term water transfer actions and Delta outflow would improve by 12.2 percent in critical water years during July.

3.7.2.5 Alternative 3: No Cropland Modifications Alternative

3.7.2.5.1 Fisheries Resources and Special-Status Fish Species

Under this alternative, water would not be made available through cropland idling or crop shifting. Water would be made available for transfer through groundwater substitution, stored reservoir releases, and conservation. The amount of water made available from each of these sources would be at the same levels as described for the Proposed Action. No additional water would be made available from these sources to offset the loss of water that would not be available from cropland idling/shifting.

Reservoirs

The No Cropland Modifications Alternative could impact reservoir storage and reservoir surface area. Under the No Cropland Modifications Alternative, modeled storage volumes, reservoir elevations and surface areas would change as described in Section 3.7.2.6.1. All reservoirs would continue to be operated according to their existing requirements and within their current range of operations. These reservoirs do not support primary populations of the fish species of management concern, including special-status fish species.

Impacts on Fisheries Resources: The No Cropland Modifications Alternative would have no impact on fisheries resources in reservoirs, as reservoirs do not support primary populations of the fish species of management concern, including special-status fish species.

Impacts on Special-Status Fish Species: The No Cropland Modifications Alternative would have no impact on special-status fish species, as reservoirs do not support primary populations of special-status fish species.

Rivers and Creeks

Sacramento River Watershed

The No Cropland Modifications Alternative could cause Sacramento River flows to be lower than under the No Action/No Project Alternative. As detailed in Section 3.7.2.6, 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. Therefore, the effects of the No Cropland Modifications Alternative on fisheries in these rivers would be less than significant. Existing regulatory requirements protecting fisheries resources (flow magnitude and timing, temperature and other water quality parameter) would continue to be met. Among larger rivers, only Bear River flows would be reduced by more than ten percent by the No Cropland Modifications Alternative and therefore is discussed in detail below.

Flows in smaller streams are only affected by an alternative through changes to groundwater. Because the effects of Alternative 3 involve transfers through groundwater substitution only, impacts of Alternative 3 to smaller streams would be the same as the Proposed Action.

Impacts on Fisheries Resources: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on fisheries resources in the following rivers and creeks within the Sacramento River Watershed: Sacramento River, Feather River, Yuba River, American River, ~~Butte Creek, Putah Creek, Colusa Basin Drain,~~ Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Cache Creek, Auburn Ravine, Freshwater Creek, Colusa Basin Drain, Putah Creek, Stony Creek, Eastside/Cross Canal, Coon Creek, Big Chico Creek, Little Chico Creek, Salt Creek, and Willow Creek including the south fork. Flow changes in these streams would be small and no substantial effect on water quality would occur in these rivers and creeks.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on special-status fish species in the following waterways within the Sacramento River Watershed: Sacramento River, Feather River, Yuba River, American River, ~~Butte Creek, Putah Creek, Colusa Basin Drain,~~ Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Cache Creek, Auburn Ravine, Freshwater Creek, Colusa Basin Drain, Putah Creek, Stony Creek, Eastside/Cross Canal, Coon Creek, Little Chico Creek, Big Chico Creek, Salt Creek, and Willow Creek including the south fork. Flow changes would be small, and no substantial effect on water quality would result from this alternative, as described above.

Bear River would potentially experience a greater than ten percent change in mean monthly flows in at least one water year type and month of the year. The potential fisheries impacts in these waterways are discussed individually below.

Bear River

The No Cropland Modifications Alternative could cause Bear River flows to be lower than under the No Action/No Project Alternative. Under the No Cropland Modifications 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. Fish species of management concern that could be present in the Bear River during February would include fall-run Chinook salmon, green and white sturgeon, and hardhead.

An 18 percent reduction in flows in critical water years during February would not affect fall-run Chinook salmon. This reduction is limited to critical water years in one month of the year and is, therefore, infrequent (approximately 20 percent of years). More importantly, the timing of the reduction would be during a period that would least likely affect fall-run Chinook salmon. Water temperatures during February are typically well below critical temperature thresholds such that a reduction in flows would not likely increase water temperatures to a level that is stressful to fall-run Chinook salmon.

Green and white sturgeon are not typically found in the Bear River but are thought to enter the river during spring of most wet years and some normal years (USFWS 1995). There is no evidence of species presence in the Bear River during critical water years. Because flows would be reduced only in critical years, no sturgeon are expected to be in the Bear River during reduced flow conditions. Therefore, the impact to green and white sturgeon in the Bear River would be less than significant.

The reduction in flows under the No Cropland Modifications Alternative during critical years in February is not expected to have a substantial effect on the habitat for several reasons. First, hardhead are typically in the lower half of the water column and prefer slow moving pools (Moyle 2002). A reduction in flows would maintain the lower half of the water column and the number of slow moving pools is not expected to decrease. Second, the frequency of the reduction would be low. Critical years would occur approximately once every five years within the period of analysis (1970-2003). Third, the timing of the reduction would be during a period that would least likely affect hardhead. Water temperatures during February are already low such that a reduction in flows would not likely increase water temperatures to a level that is stressful to hardhead. In addition, hardhead typically spawn and fry are present during April through May, possibly later in smaller streams (Moyle 2002). Therefore, only juvenile and adult hardhead, the least sensitive life stages, are present in the Bear River during February. As a result of these reasons, the impact to hardhead in the Bear River would be less than significant.

Average monthly flows under the No Cropland Modifications Alternative would be higher than flows under the No Action/No Project Alternative in critical water years during July and August (203 percent, 49 cfs and 88 percent, nine cfs, respectively), and dry years during August and September (219 percent, 27 cfs and 27 percent, 12 cfs, respectively) when water is released from Camp Far West Reservoir for transfer. These flow increases during the summer months may be beneficial to fish species present.

Impacts on Fisheries Resources: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on fisheries resources in the Bear River for the reasons stated above.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on special-status fish species in Bear River for the reasons stated above.

San Joaquin River Watershed

San Joaquin River

The No Cropland Modifications Alternative could cause San Joaquin River flows to be lower than under the No Action/No Project Alternative. Under the No Cropland Modifications Alternative, flows on the San Joaquin River would be reduced by less than two percent relative to the No Action/No Project Alternative. Based on the screening level criteria, these flow changes would not be considered substantial.

Impacts on Fisheries Resources: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on fisheries resources in the San Joaquin River, as flow reductions would be small and would not substantially reduce the number of fish of special-status species.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on special-status fish species in the San Joaquin River, as flow reductions would be small and would not substantially reduce the number of fish of special-status species.

Merced River

The No Cropland Modifications Alternative could cause Merced River flows to be lower and higher than under the No Action/No Project Alternative. Under the No Cropland Modifications Alternative, flow reductions on the Merced River would not exceed ten percent in any water year type or month. 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). Increased flows during April and May could be beneficial to biological resources, particularly in dry and critically dry water years. The flow reductions on the Merced River would not have a significant impact on fisheries resources.

Impacts on Fisheries Resources: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on fisheries resources in the Merced River. Reductions in river flow would be small relative to the No Action/No Project Alternative and would not substantially reduce the number of fish of special-status species.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on special-status fish species in the Merced River, as flow reductions would be small and would not substantially reduce the number of fish of special-status species.

Delta

Delta Exports

The No Cropland Modifications Alternative could cause Delta exports to be higher than under the No Action/No Project Alternative. Changes in Delta exports under the No Cropland Modifications Alternative relative to the No Action/No Project Alternative would generally be very small (less than five percent), except in the summer to fall months of dry and critically dry water years. At the CVP diversion facilities (Jones Pumping Plant), changes in exports would be less than five percent, except during July through September in dry (three to 15 percent increase in exports, or 6,600 to 33,800 AF per month) and critically dry (11 to 29 percent increase in exports, or 15,200 to 54,500 AF per month) water years. At the SWP diversion facilities (Banks Pumping Plant), changes in exports would be less than five percent, except during the transfer period of dry and critical water years (four to 21 percent increase in exports, or 8,100 to 20,900 AF per month).

Exports at Contra Costa WD diversions would be similar in all water year types and months except dry and critical water years during July and August (12.7-32.3 percent increase, or 2,500 to 4,300 AF per month).

At the East Bay MUD diversion facilities at Freeport, fairly substantial proportional increases in exports would occur throughout the year under the No Cropland Modifications Alternative relative to the No Action/No Project Alternative (up to 75 percent increase). However, flows in the Sacramento River at Freeport would not be reduced in any month or water year type by more than 422 cfs (0.8 percent). Regardless, all of these facilities would continue to be operated in accordance with their existing or future regulatory requirements and the terms and conditions specified in their BOs. Both BOs contain a Reasonable and Prudent Alternative (RPA) that, when implemented, would avoid jeopardy of ESA listed fish species. In addition, the SWRCB's Water Rights Decision-1641 imposes flow and water quality objectives in the 1995 Bay-Delta Plan upon the SWP and CVP operations to assure protection of beneficial uses in the Delta. The SWP and CVP must comply with these and other regulatory requirements in order to operate. Because changes in flows in Delta channels are predicted to be small and there are additional protections for fisheries and aquatic resources already in place under the ESA and D-1641, these impacts would be less than significant.

Collectively, the largest changes in Delta diversions relating to long-term water transfers would primarily occur from July through September. This is the period when through-Delta water transfers are allowed because it is the least sensitive period for fisheries resources.

Longfin smelt are typically found in the bays and nearshore ocean during this time of year (Rosenfield 2010) and would be unaffected by the Proposed Action. Delta smelt have typically moved downstream towards Suisun Bay by this time of year because elevated water temperatures and low turbidity conditions in the Delta are less suitable than those downstream (Nobriga et al. 2008), although some delta smelt reside year-round in and around Cache Slough (Sommer et al. 2011) outside of the influence of the export facilities. An evaluation of CDFW summer tow net surveys in July and August of recent dry (2007, 2013) and critical (2008) water years indicates that the delta smelt, a species that is subject to the wide range of physical conditions typical of an estuary, will move to more suitable (lower) water temperature conditions despite being in a less suitable physiological habitat that is not the low salinity zone (see discussion under Section 3.7.2.4 and Figure 3.7-2 and 3.7-3).

Delta outflow would not be reduced and, therefore, X2 location would not increase, during these months under Alternative 3 (see "Delta Outflow" section below). In fact, Delta outflow would increase under Alternative 3 in dry and critical years during July through September, although X2 location would change minimally (less than 1.3 percent). Consequently, potential increases in exports during this period would have limited, if any effects on delta or longfin smelt.

Green and white sturgeon are rarely observed (only sporadically and in low numbers; DWR and Reclamation unpublished salvage data) at the diversion facilities and, therefore, are not likely to be affected by these changes. The vast majority of juvenile Chinook salmon and steelhead would have emigrated from the Delta region by the end of June (NOAA Fisheries 2014) and are, therefore, unlikely to be affected by increases in exports. In addition, fish screens and monitoring at the East Bay MUD (currently conducted December through June when sensitive fish species are present) and Contra Costa WD (currently conducted year-round) facilities would further ensure that special-status fish species are not affected by any increases in exports at their facilities. Reclamation is consulting frequently with USFWS and NOAA Fisheries on CVP and SWP operations relative to the BOs and special-status fish species in the Delta.

Impacts on Fisheries Resources: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on fisheries resources that are influenced by Delta exports because occurrence of these species would be unlikely during the period of increased exports, species that are present are rarely observed at diversion facilities, and fish screens and monitoring at export facilities would further ensure that there would not be a substantial increase in the number of fish of a special-status species.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on special-status fish species that are influenced by Delta exports occurrence of these species would be unlikely during the period of increased exports, species that are present are rarely observed at diversion facilities, and fish screens and monitoring at export facilities would further ensure that there would not be a substantial increase in the number of fish of a special-status species.

Delta Outflow

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 (147 cfs) 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. Average daily fluctuations in outflow, and therefore X2 position, at Chipps Island due to tides are 170,000 cfs (DWR 1995). Therefore, a change of 500 cfs in Delta outflow would be 0.3 percent of the daily tidal change experienced in this area. These changes to Delta outflow, and resultant changes in X2 position, due to Alternative 3 would not have a substantial impact on biological resources because the change is minimal (less than ten percent).

Impacts on Fisheries Resources: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on fisheries resources that may be influenced by Delta outflow, as reductions in Delta outflow and increases in X2 location would be small (less than 1.3 percent) in all months and water year types and would therefore not cause a substantial reduction in the number of fish of a special-status species.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on special-status fish species that may be influenced by Delta outflow, as reductions in Delta outflow and increases in X2 location would be small (less than 1.3 percent) in all months and water year types and would therefore not cause a substantial reduction in the number of fish of a special-status species.

3.7.2.5.2 Special-Status Species Habitat

As described in the preceding sections, long–term water transfer actions would be carried out such that that all facilities would be operated consistent with their existing or future regulatory requirements. The most current flow and temperature requirements established by various regulating agencies including the USFWS, NOAA Fisheries, FERC, and SWRCB, for the protection of downstream resources, including fish, would be met.

Reservoirs

Special-status fish species do not occupy the reservoirs that would be affected by long-term water transfer actions. These reservoirs are operated to maintain environmental conditions on the downstream rivers, as discussed in the next section.

Mainstem Rivers

~~Environmental Commitments would require that facilities affected by long-term water transfer actions continue to provide the existing protections for fish dependent on the mainstem rivers including the Sacramento, Feather, American, Yuba, Bear, Merced and San Joaquin rivers~~Each of the special-status fish species use mainstem rivers, including the Sacramento, Feather, American, Yuba, Bear, Merced and San Joaquin rivers, as habitat~~s~~ for some portion of their life history, with the exception of delta and longfin smelt, which use only those portions of the mainstream rivers in the Delta. Spawning, rearing, holding and migration habitat on these rivers would be maintained. While minor changes in flows and temperatures would occur, these would be within the normal ranges that would occur under the No Action/No Project Alternative.

Impacts to Special-Status Fish Species: The No Cropland Modifications Alternative would have a less than significant impact on special-status fish species in mainstem rivers. Flows in all mainstem rivers would remain within their normal ranges and, therefore, there would be no substantial reduction in spawning, rearing, or migration habitat of special-status species.

Small Tributaries to the Sacramento River

Small tributaries to the Sacramento River could be impacted by groundwater substitution, which could reduce flows in these streams due the hydraulic connectivity between groundwater tables and these streams. The groundwater model results indicate that the effects of groundwater substitution on stream flow would be most pronounced during July through September when special-status fish species are unlikely to occur in the streams. In addition, these flow reductions would not be frequent or large enough to have a substantial effect on special-status fish species in the small tributaries during this period.

Impacts to Special-Status Fish Species: Groundwater substitution actions under the No Cropland Modifications Alternative would have a less than significant impact on special-status fish species that could occur in small tributaries to the Sacramento River.

Delta

All of the special-status fish species use the Delta for some portion of their life history. As previously described, the transfer operations model indicates that there would be very minor reductions in Delta outflow (less than two percent) as a result of the long-term water transfer actions. Therefore, there would be no substantial reduction in spawning, rearing, or migration habitat of special-status species.

Impacts to Special-Status Fish Species: The No Cropland Modifications Alternative would have a less than significant impact on special-status fish species in the Delta, because there would be no substantial reduction in spawning, rearing, or migration habitat of special-status species.

3.7.2.6 Alternative 4: No Groundwater Substitution

3.7.2.6.1 Fisheries Resources and Special-Status Fish Species

Reservoirs

The No Groundwater Substitution Alternative could impact reservoir storage and reservoir surface area. Under the No Groundwater Substitution Alternative, storage volumes, reservoir elevations and surface areas would change, but all reservoirs would continue to be operated according to their existing requirements and within their current range of operations. These reservoirs do not support primary populations of the fish species of management concern, including special-status fish species.

Impacts on Fisheries Resources: The No Groundwater Substitution Alternative would have no impact on fisheries resources in reservoirs, as reservoirs do not support primary populations of the fish species of management concern, including special-status fish species.

Impacts on Special-Status Fish Species: The No Groundwater Substitution Alternative would have no impact on special-status fish species, as reservoirs do not support primary populations of special-status fish species.

Rivers and Creeks

The following section provides a discussion of the impacts to fisheries resources of flow changes (timing and magnitude) for rivers, streams, and associated tributaries under the No Groundwater Substitution Alternative. These flow changes are detailed in Section 3.8.2.6. Alternative 4 does not include groundwater substitution; therefore, the flow decreases to rivers and creeks due to groundwater substitution do not occur. The modeled changes in the No Groundwater Substitution Alternative are caused by storing and moving transfer water made available through cropland idling/crop shifting, stored reservoir release, and conservation.

Sacramento River Watershed

The No Groundwater Substitution Alternative could cause flows in rivers and creeks 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 regulatory requirements protecting fisheries resources (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 fisheries in these rivers would be less than significant. Among larger rivers, only Bear River flows would be reduced by more than ten percent by the No Groundwater Substitution Alternative and therefore is discussed in detail below.

Smaller streams in the Sacramento River watershed in which special-status fish species are present (see Table 3.7-3 for list of streams) would not be impacted by transfers under the No Groundwater Substitution Alternative because groundwater substitution would not occur. Therefore, there would be no impacts of the No Groundwater Substitution Alternative on fisheries in these smaller streams in the Sacramento River watershed.

Impacts on Fisheries Resources: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on fisheries resources in the Sacramento, Feather, Yuba, and American rivers and no impact on fisheries resources in smaller streams in the Sacramento River watershed.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on fisheries resources in the Sacramento, Feather, Yuba, and American rivers no impact on special-status fish species occurring in small streams in the Sacramento River watershed.

Bear River

The No Groundwater Substitution Alternative could cause Bear River flows to be lower and higher 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. Fish species of management concern that could be present in the Bear River during February would include green and white sturgeon and hardhead.

Green and white sturgeon are not typically found in the Bear River but are thought to enter the river during spring of most wet years and some normal years (USFWS 1995). There is no evidence of species presence in the Bear River during critical water years. Because flows would be reduced only in critical years, no sturgeon are expected to be in the Bear River during reduced flow conditions. Therefore, the impact to green and white sturgeon in the Bear River would be less than significant.

An 18 percent reduction in flows during critical years in February is not expected to have a substantial effect on hardhead habitat for several reasons. First, hardhead are typically in the lower half of the water column and prefer slow moving pools (Moyle 2002). A reduction in flows would maintain the lower half of the water column and may increase the number of slow moving pools. Second, the frequency of the reduction would be low. Critical years would occur approximately once every five years within the period of analysis (1970-2003). Third, the timing of the reduction would be during a period that would least likely affect hardhead. Water temperatures during February are already low such that a reduction in flows would not likely increase water temperatures to a level that is stressful to hardhead. In addition, hardhead typically spawn and fry are present during April through May, possibly later in smaller streams (Moyle 2002). Therefore, only juvenile and adult hardhead, the least sensitive life stages, are present in the Bear River during February. As a result of these reasons, the impact to hardhead in the Bear River would be less than significant.

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 (52 percent, 38 cfs and 22 percent, three cfs, respectively) when water is released from Camp Far West Reservoir for transfer. These flow increases during the summer months could be beneficial to fish species present.

Impacts on Fisheries Resources: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on fisheries resources within Bear River for the reasons stated above.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on special-status fish species in Bear River for the reasons stated above.

San Joaquin River Watershed

San Joaquin River
The No Groundwater Substitution Alternative could cause San Joaquin River flows to be lower and higher 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, the 15 percent increase in flows in dry water years during July may benefit fisheries resources.

Impacts on Fisheries Resources: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on fisheries resources occurring in the San Joaquin River, as flow reductions would be small and all facilities would continue to meet all environmental requirements governing their operation.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on special-status fish species occurring in the San Joaquin River, as flow reductions would be small and all facilities would continue to meet all environmental requirements governing their operation.

Merced River
The No Groundwater Substitution Alternative could cause Merced River flows to be lower and higher than under the No Action/No Project Alternative. Under the No Groundwater Substitution Alternative, flow releases from McClure Reservoir would be operated under existing agreements. 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. Flows would be 124 percent (163 cfs) and 59 percent (70 cfs) higher compared to the No Action/No Project Alternative in dry and critical water years, respectively, during July. Increased flows during July could be beneficial to biological resources, particularly in dry and critically dry water

years. The flow reductions on the Merced River would not have a significant impact on biological resources.

Impacts on Fisheries Resources: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on fisheries resources occurring in the Merced River. Reductions in river flow would be small relative to the No Action/No Project Alternative and all facilities would continue to meet all environmental requirements governing their operation.

Impacts on Special-Status Fish Species: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on special-status fish species occurring in the Merced River, as flow reductions would be small and all facilities would continue to meet all environmental requirements governing their operation.

Delta

Delta Exports

The No Groundwater Substitution Alternative could cause Delta exports to be higher than under the No Action/No Project Alternative. Changes in Delta exports under the No Groundwater Substitution Alternative relative to the No Action/No Project Alternative and the No Action/No Project Alternative would generally be very small (less than five percent), except in the summer to fall months of dry and critically dry water years. At the CVP diversion facilities (Jones pumping plant), changes in exports would be less than 2.6 percent, except in critical water years during July (27.7 percent, 52,500 AF) and August (11.9 percent, 22,500 AF). At the SWP facilities (Banks pumping plant), changes in exports would be less than less ten percent, except in dry water years during August (28.5 percent increase in exports).

Changes in exports would generally not occur at the Contra Costa WD diversion facilities under the No Groundwater Substitution Alternative, except during July through September in dry and critical water years (8.5 to 32.3 percent increase).

At the East Bay MUD diversion facilities at Freeport, fairly substantial proportional increases in exports would occur throughout the year under the No Groundwater Substitution Alternative relative to the No Action/No Project Alternative (up to 73.1 percent increase). However, flows in the Sacramento River at Freeport would not be reduced in any month or water year type by more than 234 cfs (0.4 percent).

All of these facilities would continue to be operated in accordance with their existing or future regulatory requirements and the terms and conditions specified in their BOs. Both BOs contain a Reasonable and Prudent Alternative (RPA) that, when implemented, would avoid jeopardy of ESA listed fish species. In addition, the SWRCB's Water Rights Decision-1641 imposes flow and water quality objectives in the 1995 Bay-Delta Plan upon the SWP and CVP operations to assure protection of beneficial uses in the Delta. The SWP and CVP must comply with these and other regulatory requirements in order to operate. Because changes in flows in Delta channels are predicted to be small and there are additional protections for fisheries and aquatic resources already in place under the ESA and D-1641, these impacts would be less than significant.

Collectively, the largest changes in Delta diversions relating to long-term water transfers would primarily occur from July through September. Through Delta water transfers are allowed at that time because it is the least sensitive period for fisheries resources.

Longfin smelt are typically found in the bays and nearshore ocean during this time of year (Rosenfield 2010) and would be unaffected by the Proposed Action. Delta smelt have typically moved downstream towards Suisun Bay by this time of year because elevated water temperatures and low turbidity conditions in the Delta are less suitable than those downstream (Nobriga et al. 2008), although some delta smelt reside year-round in and around Cache Slough (Sommer et al. 2011) outside of the influence of the export facilities. An evaluation of CDFW summer tow net surveys in July and August of recent dry (2007, 2013) and critical (2008) water years indicates that the delta smelt, a species that is subject to the wide range of physical conditions typical of an estuary, will move to more suitable (lower) water temperature conditions despite being in a less suitable physiological habitat that is not the low salinity zone (see discussion under Section 3.7.2.4 and Figure 3.7-2 and 3.7-3).

Delta outflow would not be reduced and, therefore, X2 location would not increase, during these months under Alternative 3 (see “Delta Outflow” section below). In fact, Delta outflow would increase under Alternative 3 in dry and critical years during July through September, although X2 location would change minimally (less than 1.3 percent). Consequently, potential increases in exports during this period would have limited, if any effects on delta or longfin smelt.

Green and white sturgeon are rarely observed (only sporadically in low numbers; DWR and Reclamation unpublished salvage) at the diversion facilities and, therefore, are not likely to be affected by these changes. The vast majority of juvenile Chinook salmon and steelhead would have emigrated from the Delta region by June (NOAA Fisheries 2014) and are, therefore, unlikely to be affected by increases in exports. In addition, fish screens and monitoring at the East Bay MUD (currently conducted December through June when sensitive fish species are present) and Contra Costa WD (currently conducted year-round) facilities would further ensure that special-status fish species are not affected by any increases in exports at their facilities. Reclamation is consulting frequently with USFWS and NOAA Fisheries on CVP and SWP operations relative to the BOs and special-status fish species in the Delta.

Impacts on Fisheries Resources: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on fisheries resources that are influenced by Delta exports.

Impac**ts on Special-Status Fish Species:** Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on special-status fish species that are influenced by Delta exports.

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 0.6 km (0.5 percent) downstream during periods of increased flow. Average daily fluctuations in outflow, and therefore X2 position, at Chipps Island due to tides are 170,000 cfs (DWR 1995). Therefore, a change of 500 cfs in Delta outflow would be 0.3 percent of the daily tidal change experienced in this area. These changes to Delta outflow, and resultant changes in X2 position, due to Alternative 4 would not have a substantial impact on biological resources because the change is minimal (less than one percent).

Impacts on Fisheries Resources: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on fisheries resources that are influenced by Delta outflow, as reductions in Delta outflow and increases in X2 location would be small (less than one percent) in all months and water year types and would therefore not cause a substantial reduction in the number of fish of a special-status species. .

Impacts on Special-Status Fish Species: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on special-status fish species that may be influenced by Delta outflow, as reductions in Delta outflow and increases in X2 location would be small (less than one percent) in all months and water year types and would therefore not cause a substantial reduction in the number of fish of a special-status species.

3.7.2.6.2 Special-Status Species Habitat

As described in the preceding sections, long–term water transfer actions would be carried out such that that all facilities would be operated consistent with their existing or future regulatory requirements. The most current flow and temperature requirements established by various regulating agencies including the USFWS, NOAA Fisheries, FERC, and SWRCB, for the protection of downstream resources, including fish, would be met.

Reservoirs

Special-status fish species do not occupy the reservoirs that would be affected by long-term water transfer actions. These reservoirs are operated to maintain environmental conditions on the downstream rivers, as discussed in the next section.

Mainstem Rivers

~~Environmental Commitments would require that facilities affected by long-term water transfer actions continue to provide the existing protections for fish dependent on the mainstem rivers including the Sacramento, Feather, American, Yuba, Bear, Merced and San Joaquin rivers~~Each of the special-status fish species use mainstem rivers, including the Sacramento, Feather, American, Yuba, Bear, Merced and San Joaquin rivers, as habitat~~s~~ for some portion of their life history, with the exception of delta and longfin smelt, which use only those portions of the mainstream rivers in the Delta. Spawning, rearing, holding and migration habitat on these rivers would be maintained. While minor changes in flows and temperatures would occur, these would be within the normal ranges that would occur under the No Action/No Project Alternative.

Impacts to Special-Status Fish Species: The No Groundwater Substitution Alternative would have a less than significant impact on special-status fish species in mainstem rivers. Flows in all mainstem rivers would remain within their normal ranges and, therefore, there would be no substantial reduction in spawning, rearing, or migration habitat of special-status species.

Small Tributaries to the Sacramento River

As no groundwater substitution would occur under this alternative, the small tributaries to the Sacramento River would not be impacted by the No Groundwater Substitution Alternative.

Impacts to Special-Status Fish Species: The No Groundwater Substitution Alternative would have no impact on special-status fish species that could occur in small tributaries to the Sacramento River, as flows in these streams would not change and, therefore, there would be no substantial reduction in spawning, rearing, or migration habitat of special-status species.

Delta

As previously described, the transfer operations model indicates that there would be very minor changes in flow in the Delta (less than one percent) as a result of the long-term water transfer actions.

Impacts to Special-Status Fish Species: The No Groundwater Substitution Alternative would have a less than significant impact on special-status fish species in the Delta, as reductions to Delta outflow and increases in X2 positions would be minimal (less than one percent) and would not result in a substantial reduction in spawning, rearing, or migration habitat of special-status species.

3.7.3 Comparative Analysis of Alternatives

Table 3.7-4 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~~ relative to the No Action/No Project Alternative.

Table 3.7-4. Comparative Analysis of Alternatives

Potential Impact	Alternatives	Significance[1]		Proposed Mitigation	Significance After Mitigation
		Fisheries Resources	Special-Status Fish Species		
Groundwater substitution could reduce stream flows supporting fisheries resources in small streams	2, 3	LTS	LTS	None	LTS
Transfer actions could alter flows in ~~large~~ rivers and creeks supporting fisheries resources in the Sacramento and San Joaquin river watersheds.~~, altering habitat availability and suitability associated with these rivers~~	2, 3, 4	LTS	LTS	None	LTS
Transfer actions could affect reservoir storage and reservoir surface area in reservoirs supporting fisheries resources	2, 3, 4	LTS	LTS	None	LTS
Transfer actions could alter hydrologic conditions in the Delta, altering associated habitat availability and suitability	2, 3, 4	LTS	LTS	None	LTS
Transfer actions could affect the habitat of special-status species associated with mainstem rivers, tributaries, and the Delta.	2, 3, 4	Not applicable	LTS	None	LTS

[1] LTS = Less than significant

3.7.3.1 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, increased land idling could occur in response to CVP 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.

3.7.3.2 Alternative 2: Proposed Action

The Propose Action would include g~~G~~roundwater substitution and stored reservoir release transfers as mechanisms for transferring water. The analysis of this alternative indicates that there would be less than significant impacts to both fisheries resources and special-status species. ~~could affect the availability of water in the Seller Service Area and the availability and suitability of habitat. This could affect conditions for fisheries resources and special-status fish species relative to the No Action/No Project Alternative, but the effects with the implementation of the Environmental Commitments would be less than significant.~~ The Proposed Action would increase water supplies to agricultural users in the Buyer Service Area, but the amount of water would remain within the amount allowed under the Buyers CVP contract and the effects of using the water would be within that considered under that contract and its associated environmental documentation and BOs.

3.7.3.3 Alternative 3: No Cropland Modifications Alternative

The No Cropland Modifications Alternative would not include cropland idling/shifting as a mechanism for transferring water. Effects would continue to occur from groundwater substitution and stored reservoir release transfers at the same levels described for the Proposed Action, although this would result in less than significant impacts to both fisheries resources and special-status fish species. The No Cropland Modifications Alternative would increase water supplies to agricultural users in the Buyer Service Area, but the amount of water would remain within the amount allowed under the Buyers CVP contract and the effects of using the water would be within that considered under that contract and its associated environmental documentation and BOs.

3.7.3.4 Alternative 4: No Groundwater Substitution Alternative

The No Groundwater Substitution Alternative would not include groundwater substitution as a mechanism for transferring water. Effects would continue to occur from reservoir storage transfers at the same levels considered for the Proposed Action, although this would result in ~~. The effects of this alternative with the implementation of the Environmental Commitments would be~~ less than significant impacts to both fisheries resources and special-status fish species. The No Groundwater Substitution Alternative would increase water supplies to agricultural users in the Buyer Service Area, but the amount of water would remain within the amount allowed under the Buyers CVP contract and the effects of using the water would be within that considered under that contract and its associated environmental documentation and BOs.

3.7.4 Environmental Commitments/Mitigation Measures

Because impacts to fisheries resources and special-status species were found to be less than significant for all alternatives, no environmental commitments or mitigation measures are necessary.~~The environmental commitments described in Section 2.3.2.4 incorporated into the project will reduce or eliminate significant impacts to fisheries resources and fish species of management concern. No additional mitigation is required.~~

3.7.5 Potentially Significant Unavoidable Impacts

None of the action alternatives would result in potentially significant unavoidable impacts on fisheries.

3.7.6 Cumulative Impacts

The timeframe for the cumulative effects analysis extends from 2015 through 2024, a 10-year period. The cumulative effects area of analysis for fisheries is the same as the area of analysis shown in Figure 3.7-1 above. This section analyzes cumulative effects using the project method, which is further described in Chapter 4.

The projects considered for the fisheries cumulative condition are the SWP water transfers, CVP Municipal and Industrial (M&I) Water Shortage Policy (WSP), Lower Yuba River Accord, 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 AF of water per year would be made available for purchase by Reclamation and DWR for fish and environmental purposes. The long-term water transfer project would not affect the ability of the Accord to provide a benefit to environmental resources within its action area. Both efforts, 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 proposed alternatives.

3.7.6.1 Alternative 2: Proposed Action

3.7.6.1.1 Fisheries Resources and Special-Status Fish Species

The Proposed Action could, in combination with other cumulative projects, cause flows in rivers and creeks in the Sacramento River watershed to be lower than under the No Action/No Project Alternative. The SWP transfers would make water available to transfer to a variety of sellers as described in Section 4.3. Up to 6,800 AF would be made available through groundwater substitution and up to 86,930 AF would be made available through cropland idling. 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 Long-Term Water Transfers.

The M&I 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 shortages. 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 would not substantially change relative to existing conditions.

As modeled, Cache Creek, Stony Creek, Coon Creek, Little Chico Creek, and the Bear River may experience a greater than ten percent change in mean monthly flows in at least one water year type and month of the year. Fish species of management concern and special status fish species would not likely be present in these streams when flows would be reduced. In addition, historical flow data was limited or not available for Eastside/Cross Canal, and Salt Creek. Generally, these waterways are not immediately adjacent to groundwater substitution transfers, and other nearby small waterways are not experiencing flow decreases that are causing significant impacts to aquatic resources. ~~In addition, flow reductions as the result of groundwater declines would be observed at monitoring wells in the region and adverse effects on riparian vegetation 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.~~ Therefore, the impacts to fisheries resources would be less than significant in these streams.

~~With implementation of Mitigation Measure GW-1, the~~The Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact related to groundwater quality.

The Proposed Action could, in combination with other cumulative projects, cause San Joaquin River flows to be lower than under the No Action/No Project Alternative. Under the Exchange Contractors 25-Year Water Transfers the

Exchange Contractors in the San Joaquin Valley would sell up to 150,000 AF to willing buyers, including many of the Buyers for the long-term water transfers. These transfers could include a small amount of groundwater pumping; however, this pumping would not be adjacent to the San Joaquin River. The SJRRP would increase flows and improve fisheries resources on the San Joaquin River; this program would have a beneficial effect. Refuge transfers, similarly, could have a beneficial effect on flows if transfers from Merced ID are conveyed to refuges by flowing down the San Joaquin River to the Delta.

Long-term water transfer actions under the Proposed Action would reduce flows by a small amount during reservoir refill, but this would occur during very wet periods when it would not likely affect fisheries resources. Therefore, the Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact on fisheries resources occurring in the San Joaquin River.

The Proposed Action could in combination with other cumulative projects cause Delta exports to be higher than under the No Action/No Project Alternative. All cumulative water operations projects affecting Delta exports would be required to meet Delta water quality standards (e.g., D-1641) and meet the requirements of the BOs and other current and future regulatory requirements for the long-term coordinated operations of the CVP and SWP. In addition, during the period of increased exports because of the Proposed Action, species that are present are rarely observed at diversion facilities, and fish screens and monitoring at export facilities would further ensure that there would not be a substantial increase in the number of fish of a special-status species. The Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact to fisheries resources associated with changing Delta exports.

The Proposed Action in combination with other cumulative projects could cause Delta outflows to be lower than under the No Action/No Project Alternative. Long-term 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 changes in Delta outflow and X2 location would be small (less than three percent) in all months and water year types. In addition, all cumulative water operations projects affecting Delta exports would be required to meet 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. Because changes in Delta outflow and X2 location are predicted to be small and there are additional protections for fisheries and aquatic resources already in place under the ESA and D-1641, these impacts would be less than significant. The Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact on fisheries resources related to changes in Delta outflow and X2 location.

3.7.6.1.2 Special-Status Species Habitat

All water operations related to SWP transfers, WSP, Yuba Accord, the SJRRP, refuge transfers, and the Exchange Contractors 25-Year Water Transfers would be carried out such that all facilities would be operated consistent with their existing or future regulatory requirements. The most current flow and temperature requirements established by various regulating agencies including the USFWS, NOAA Fisheries, FERC, and SWRCB, for the protection of downstream resources, including fish, would be met. Under the Proposed Action all these regulatory criteria would also be met and thus the Proposed Action would have a less than significant cumulative impact on special-status fish species in mainstem rivers because its effects would not be cumulatively considerable. Flows in all mainstem rivers would remain within their normal ranges and, therefore, there would be no substantial reduction in spawning, rearing, or migration habitat of special-status species.

Small tributaries to the Sacramento River could be affected by SWP water transfers, WSP, and the Proposed Action groundwater substitution transfers, which could reduce flows in these streams due the hydrologic connectivity between groundwater tables and these streams. The groundwater model results indicate that the Proposed Action’s effects of groundwater substitution on stream flow would be most pronounced during July through September. During this time, flows in these small streams on the valley floor where flow reductions would occur are generally quite low and water temperatures are quite high. Thus, coldwater fish species, including salmon and steelhead, are unlikely to occur in these portions of the stream during these months. The Proposed Action’s effects on flow-related special status fish habitat in small streams would not be cumulatively considerable, and the cumulative effect would be less than significant.

3.7.6.2 Alternative 3: No Cropland Modifications Alternative

The cumulative impacts of Alternative 3 would be the same as for groundwater substitution 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 the Proposed Action 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 crop idling/shifting 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 the Proposed Action would not be cumulatively considerable.

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Section 3.8
Vegetation and Wildlife

Vegetation and wildlife resources within the area of analysis could be affected by any of the proposed water transfer types: groundwater substitution, reservoir release, cropland idling, crop shifting, and conservation transfers.

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

Long-term transfers could affect portions of the Central Valley, the Sacramento-San Joaquin Delta (Delta), and portions of Contra Costa, Alameda, Santa Clara, and San Benito counties. 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);

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

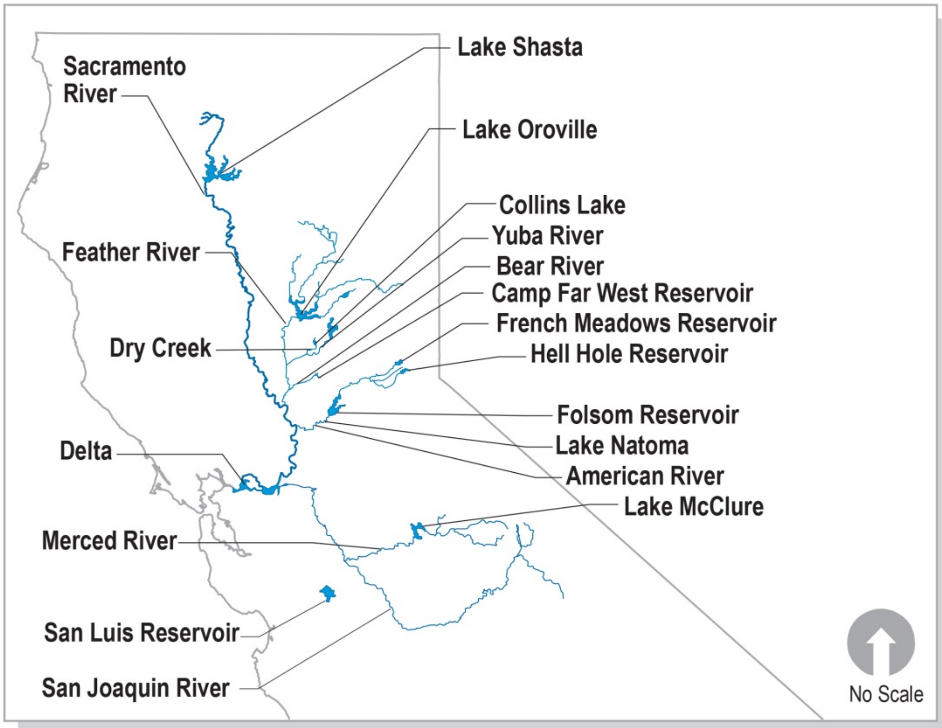

Figure 3.8-2. Vegetation and Wildlife Area of Analysis Major Rivers and Reservoirs

- 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.

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 transfers made under the alternatives would move through the legal Delta, 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, 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 Regulatory Setting

There are various federal, state and local regulations and policies that apply to vegetation and wildlife resources that occur within the area of analysis. Applicable requirements are itemized below and discussed in greater detail in Appendix H.

- Federal Endangered Species Act (ESA) of 1973;
- Fish and Wildlife Coordination Act of 1958;
- Federal Migratory Bird Treaty Act of 1972;
- Executive Order 11990 (Protection of Wetlands) (1977);
- California Endangered Species Act (CESA) of 1984;
- Fully Protected Species under the California Fish and Game Code;
- Protection of Birds and Raptors under the California Fish and Game Code;
- California Native Plant Protection Act (CNPPA) of 1977;
- California Natural Community Conservation Planning Act of 2003;
- California Water Code;
- Requirements stipulated in the various Central Valley Project (CVP), Sacramento River Settlement Contracts, and Water Service Contracts between Reclamation and the various buyers and sellers, and their associated biological opinions (BOs) with U.S. Fish and Wildlife Service (USFWS) and National Oceanic Atmospheric Administration Fisheries Service;

- Requirements stipulated in previous Consultations and USFWS BOs regarding the CVP Improvement Act and the State Water Project (SWP); and

- Existing Natural Community Conservation Plans (NCCPs) and Habitat Conservation Plans (HCPs).

3.8.1.3 Existing Conditions

The following section describes the natural communities present in the different regions of the area of analysis, followed by a discussion of the special-status plant and wildlife species with potential to be affected by long-term water transfers. The descriptions of the natural communities are generally based on the California Wildlife Habitat Relationships (CWHR) System (California Department of Fish and Game [CDFG] 2008) and Terrestrial Vegetation of California (Barbour et al. 2007), as well as those previously developed for other water system Environmental Impact Reports (EIRs).

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), USFWS species lists for the counties within the area of analysis, and active HCPs in the vicinity of the area of analysis. The complete list of special-status species evaluated is provided in Tables I-1 (fish and wildlife) and I-2 (plants) contained within Appendix I. Figure 3.8-3 shows Federal national wildlife refuges (NWRs) and State wildlife management areas in the area of analysis.

3.8.1.3.1 Natural Communities and Agricultural Habitats in the Seller Service Area

This section describes the natural communities in the Seller Service Area that could be affected by long-term water transfers. The Seller Service Area includes the Sacramento and San Joaquin rivers watershed. Although the Central Valley is dominated by agricultural land, remnant grassland, oak woodlands, riparian and wetland habitats remain (Central Valley Joint Venture 2006; Point Reyes Bird Observatory 2005).

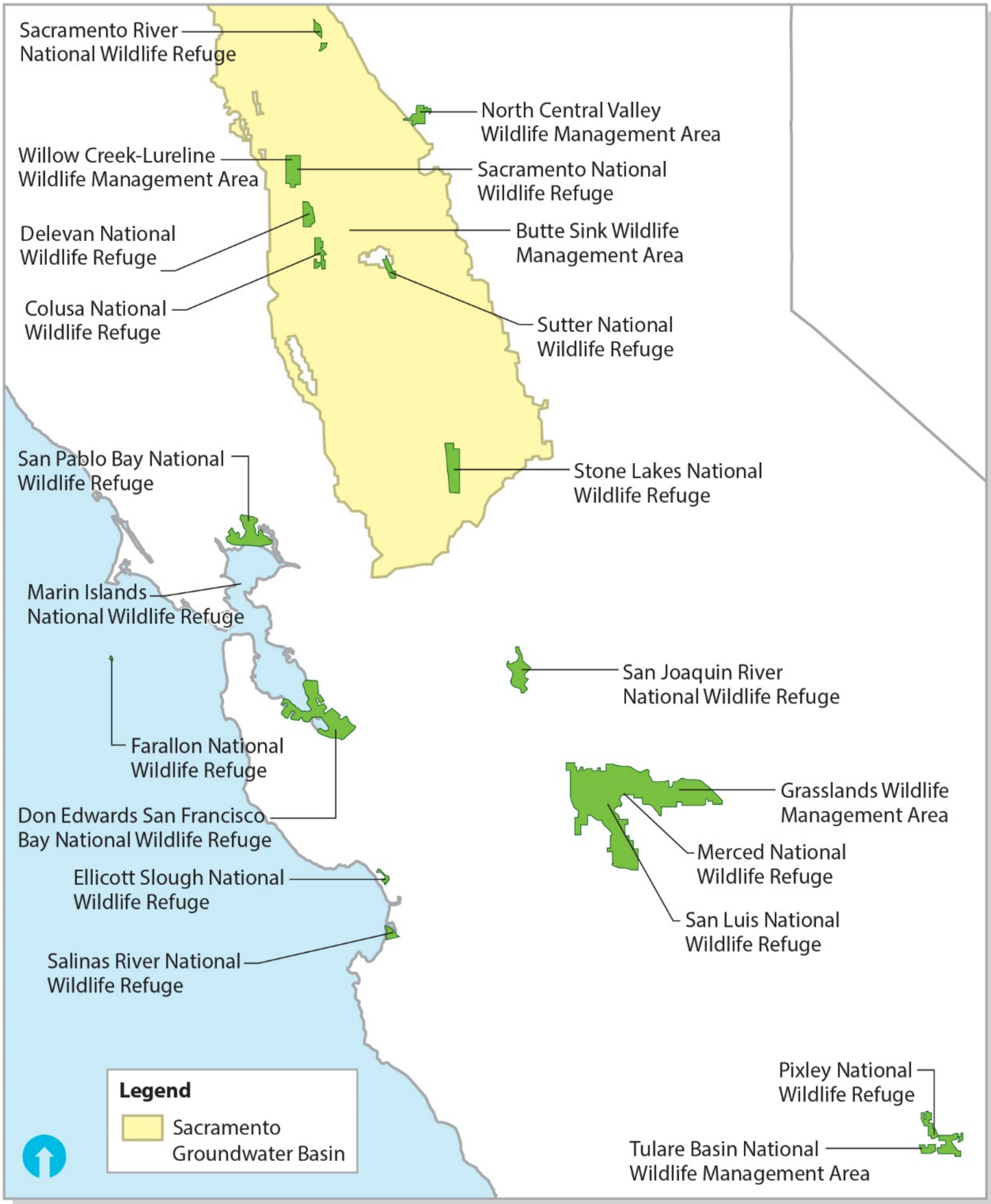

Figure 3.8-3. Federal NWRs and State Wildlife Management Areas

Tidal Perennial Aquatic Natural Community

The tidal perennial aquatic natural community is defined as deepwater aquatic (greater than ten feet deep from mean lower low water[1]), shallow aquatic (less than or equal to ten feet deep from mean lower low water), and unvegetated intertidal (tideflats) zones of estuarine bays, river channels, and sloughs.

Tidal perennial aquatic natural community occurs in open water including sloughs and channels in the Bay Delta and bays. Deep, open water areas are largely unvegetated; beds of aquatic plants occur in shallower open-water areas. Over 50 species of fish use tidal perennial aquatic habitat at some stage of their life cycle, and many spend their entire lives within this natural community. Shorebirds, wadingbirds, waterfowl, river otters (*Lutra canadensis*), and beavers (*Castor canadensis*) are some of the terrestrial species that use this natural community.

Saline Emergent Wetland Natural Community

Portions of San Francisco, San Pablo, and Suisun Bays and the Delta support emergent salt-tolerant or brackish-tolerant wetland plant species, collectively considered saline emergent wetland. This natural community is typically located within the intertidal zone or on lands such as diked wetlands that historically experienced tidal exchange (Reclamation and Department of Water Resources [DWR] 2004). Cordgrass (*Spartina* sp.), pickleweed (*Salicornia* sp.), bulrush (*Schoenoplectus* spp.), saltgrass *(Distichlis spicata*), arrowgrass (*Triglochin* sp.), seablite (*Suaeda* sp.), hairgrass (*Deschampsia* sp.), cattails (*Typha* spp.), common reed (*Phragmites australis*), and algae are common dominant plant species in this natural community.

Over 25 species of birds and mammals have been documented in saline emergent wetlands (CALFED 2000a). Over 220 species of birds, 45 species of mammals, 16 species of amphibians and reptiles, and over 40 fish species inhabit the Suisun Marsh environs (CDFG, USFWS, Reclamation 2011). Herons, egrets, ducks, hawks, and rodents are representative wildlife that occur in saline emergent wetlands.

Tidal Fresh Emergent Wetland Natural Community

The tidal fresh emergent wetland natural community includes portions of the intertidal zones of the Delta that support emergent wetland plant species that are not tolerant of saline or brackish conditions. Tidal fresh emergent wetlands and brackish-water emergent marsh natural communities occur on in-stream islands and along mostly unleveed, tidally influenced waterways. Tidal emergent marsh provides habitat for many special-status species. The dominant vegetation in the tidal freshwater emergent natural community includes California bulrush (*Schoenoplectus californicus*), river bulrush (*Bolboschoenus*

[1] Mean lower low water is the average height of the lowest tide recorded at a tide station each day during the recording period.

fluviatilis), big bulrush (*S. mucronatus*), tules (*Schoenoplectus acutus* var. *occidentalis*), cattails, and common reed.

Freshwater emergent wetlands are among the most productive wildlife habitats in California. They provide food, cover, and water for more than 160 species of birds as well as numerous mammals, reptiles, and amphibians (CDFG 2008). Over 50 species of birds, mammals, reptiles, and amphibians use freshwater emergent wetlands in the Delta (CALFED 2000a).

Non-tidal Fresh Emergent Wetland Natural Community

Non-tidal fresh emergent wetlands are scattered along the Sacramento River, typically in areas with slow-moving backwaters. Substantial portions of this natural community occur at the Colusa, Sutter, and Tisdale Bypasses, the Butte Sink, and at the Fremont Weir. Non-tidal fresh emergent wetland also occurs on the landward side of levees in the Delta, often in constructed waterways and ponds within agricultural lands. This natural community often occurs where soils are inundated or saturated for all or most of the growing season, such as around backwater areas.

Non-tidal fresh emergent wetland consists of permanent wetlands comprised of vegetation that is not tolerant of salt or brackish water, such as meadows (Barbour et al. 2007). These areas may be natural or managed. The dominant vegetation for this natural community includes thingrass (*Agrostis pallens*), spikerush (*Eleocharis* sp.), big leaf sedge (*Carex amplifolia*), bulrush, redroot nutgrass (*Cyperus erythrorhizos*), tules, cattails, common reed, and water grass (*Echinochloa oryzoides*).

Many wildlife species depend on non-tidal fresh emergent wetland for the entirety of their life cycles. In addition this natural community is seasonally important to migratory species. Over 50 species of birds, mammals, reptiles, and amphibians use this natural community in the Delta (CALFED 2000a). Examples of amphibians that occur within this natural community type include bullfrogs (*Rana catesbeiana*), western toads (*Bufo boreas*), and Pacific tree frogs (*Pseudacris regilla*). Birds typically found in non-tidal fresh emergent wetlands include herons, egrets, bitterns, mergansers, wood ducks (*Aix sponsa*), and yellow warblers (*Dendroica petechia*) (CDFG 2008).

Natural Seasonal Wetland Natural Community

The natural seasonal wetland natural community can be found scattered along the Sacramento and American Rivers, typically in areas with slow-moving backwaters. Substantial portions of these natural communities occur at the Colusa, Sutter, and Tisdale Bypasses, the Butte Sink, and at the Fremont Weir. Seasonal wetlands, including vernal pools, are interspersed with other natural communities throughout Merced County.

Natural seasonal wetlands encompass non-managed systems with natural hydrologic connections. Typically, ponded water or saturated soils are present for an extended period of time in these natural communities, supporting obligate or facultative herbaceous wetland species (Reclamation and DWR 2004). Dominant vegetation in this natural community type includes big leaf sedge, bulrush, and redroot nutgrass.

Shorebirds and waterfowl such as killdeer (*Charadrius vociferus*), western sandpiper (*Calidris mauri*), greater yellow-legs (*Tringa melanoleuca*), American coot (*Fulica americana*), American widgeon (*Anas americana*), gadwall (*Anas strepera*), mallard (*Anas platyrhynchos*), canvasback (*Aythya valisineria*), and common moorhen (*Gallinula chloropus*) utilize natural seasonal wetlands. These birds prey extensively on invertebrates in the wetlands. This natural community also supports large mammals as well as several species of reptiles and amphibians. Many special-status wildlife species are associated with natural seasonal wetlands, including vernal pool species, which have substantially declined due to impacts of various land practices (e.g., development, invasion of non-native species, flood control activities restricting water movement, and lowered groundwater levels (Barbour et al. 2007). Special-status species are discussed in greater detail in Section 3.8.1.3.3.

Managed Seasonal Wetland Natural Community

The managed seasonal wetland natural community occurs west of the Sacramento Deep Water Ship Channel, on the west side of the Sacramento River, between Willows and Dunnigan along the Colusa Basin Drain. Substantial portions of this natural community also occur at the Colusa, Sutter (including the Sutter Bypass Wildlife Area), Tisdale, and Yolo (including the Yolo Bypass Wildlife Area) Bypasses, at the Fremont Weir, and as a part of the Sacramento NWR Complex (six refuges totaling 38,486 acres). Privately managed wetlands occur in the Suisun Bay area, with water supplies provided by landowners' riparian or appropriative rights distributed by diversion from Delta channels and tributaries. Managed seasonal wetland natural communities on the east side of the Sacramento River generally occur along Butte Creek (Upper Butte Basin Wildlife Area) and along Angel Slough north of Butte City (Llano Seco Rancho Wildlife Area).

Managed seasonal wetland includes wetland areas that are flooded and drained by land managers in order to enhance habitat for wildlife species. Wetlands dominated by native or non-native herbaceous plants, as well as associated ditches and drains, are encompassed by this natural community type, excluding farmed croplands (California Waterfowl Association 2011).

The dominant vegetation in managed seasonal wetlands is comparable to that found in natural seasonal wetlands. Managed seasonal wetland natural communities are often managed for waterfowl such as mallards, northern pintails (*Anas acuta*), American widgeon, and Canada goose (*Branta canadensis*) and other geese. These natural communities also support a variety of wading birds and shorebirds, such as herons, egrets, terns, and gulls. Managed seasonal wetlands are of great importance to migratory waterfowl and shorebird populations during fall, winter, and spring, when bird populations in the Delta increase dramatically (USFWS 2007, California Waterfowl Association 2011). Many special-status species also utilize this natural community (CDFG 2008).

Lacustrine Natural Community

The lacustrine natural community consist of permanent or intermittent lakes and ponds, and may also include dammed river channels and large reservoirs (Grenfell Jr. 1988a, 1988b, 1988c,1988d). Low-lying areas historically supported this natural community, and some additional areas have been created due to dam, dike and levee construction. Dead end sloughs, forebays, and flooded islands are other examples of the lacustrine natural community that can be found throughout the Delta. The lacustrine natural communities in the Seller Service Area that would be potentially impacted by the alternatives include the following reservoirs: Shasta, Oroville, New Bullards Bar, Camp Far West, Collins, Folsom, Hell Hole, French Meadows, and McClure. Unlike lakes and ponds, the reservoirs have been designed for water supply, flood control, and/or hydroelectric power production, although not all reservoirs serve all of these functions. Reservoirs are characterized by fluctuations in water surface elevation each year.

A wide variety of birds, mammals, reptiles and amphibians use the margins of reservoirs for reproduction, food, water, and cover resources. Fish-eating terns, grebes, cormorants, herons, waterfowl, beaver, river otter, and muskrat (*Ondatra zibethicus*) are some of the resident species (CALFED 2000a; CDFG 2008).

Valley/Foothill Riparian Natural Community

Valley/foothill riparian natural community generally occurs along river and stream corridors on the east side of the Sacramento Valley and is found in narrow bands within the upper reach of the San Joaquin River. Historically, the Merced River likely also supported this habitat type (Barbour et al. 2007). Riparian vegetation is also scattered throughout the Delta on islands, along levees, in backwater areas and sloughs, and in thin bands along river channels. This habitat type is associated with low-gradient reaches of non-tidal streams and rivers (generally below an elevation of 300 feet) and is comprised of the successional stages of woody vegetation within the active and historical floodplains and may be associated with gravel bars and bare cut banks, shady vegetated banks, and sheltered wetlands such as sloughs, side channels, and oxbow lakes (Sacramento River Advisory Council 2001). Trees typically associated with the valley/foothill riparian natural community include willows (*Salix* spp.), Fremont cottonwood (*Populus fremontii*), valley oak (*Quercus lobata*), and western sycamore (*Platanus racemosa*) (Barbour et al. 2007). Shaded riverine aquatic, pool, riffle, run, unvegetated channel, sloughs, backwaters, overflow channels, and flood bypasses with hydrologic connection to stream and river channels are the aquatic habitats associated with the valley/foothill riparian natural community type (Barbour et al. 2007).

In California, over 225 species of birds, mammals, reptiles, and amphibians depend on riparian habitats. Cottonwood-willow riparian areas support more breeding avian species than any other comparable broad California habitat type (Sacramento River Advisory Council 2001, Stillwater Sciences 2002). Riparian habitat supports a myriad of invertebrates, such as wood-boring larvae. Woodpeckers, warblers, flycatchers, and owls are common inhabitants of this natural community, as are wintering and breeding raptors and passerines (Reclamation and San Joaquin River Group Authority 1999). Other wildlife species that use riparian habitats include western fence lizard (*Sceloporus occidentalis*), Pacific tree frog, western toad, bullfrog, western skink (*Eumeces skiltonianus*), western whiptail (*Cnemidophorus tigris*), southern alligator lizard (*Elgaria multicarinata*), racer (*Coluber constrictor*), gopher snake (*Pituophis catenifer*), king snake (*Lampropeltis* sp.), garter snake (*Thamnophis* sp.), northern Pacific rattlesnake (*Crotalus oreganus oreganus*), opossum (*Didelphis virginiana*), black-tailed jackrabbit (*Lepus californicus*), western gray squirrel (*Sciurus griseus*), ringtail (*Bassariscus astutus*), river otter, striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), beaver, mule deer (*Odocoileus hemionus*), and a number of bat species. Riparian areas serve as significant corridors for wildlife movement (Sacramento River Advisory Council 2001).

Montane Riparian Natural Community

The montane riparian natural community occurs in the floodplain of streams and rivers at elevations above approximately 300 feet (Reclamation and DWR 2004). Within the area of analysis, montane riparian natural community is found on the Yuba River northward from the Timbuctoo Bend, just upstream of Highway 20, as well as on the segment of American River located northeast of Folsom Reservoir. Montane riparian vegetation is dominated by black cottonwood (*Populus trichocarpa*) and Fremont cottonwood (at lower altitudes), white alder (*Alnus rhombifolia*), bigleaf maple (*Acer macrophyllum*), dogwood (*Cornus* sp.), box elder (*Acer negundo*), quaking aspen (*P. tremuloides*), western azalea (*Rhododendron* sp.), water birch (*Betula occidentalis*), and buttonbush (*Cephalanthus occidentalis*). Montane riparian natural community supports a diversity of wildlife species comparable to that of the valley/foothill riparian natural community.

Grassland Natural Community

Grasslands are most prevalent at the eastern and western edges of the Central Valley. Areas downstream of Lake Oroville along the Feather River and portions of the American River (Folsom Reservoir Shoreline) also contain the grassland natural community (Barbour et al. 2007). The grassland natural community occurs in many outlying areas surrounding the Delta, as well as on islands within the Delta region (Reclamation and DWR 2004). The Delta historically supported perennial grasslands associated with wetland and riparian areas, as well as in association with vernal pools at higher elevations in drier locations. Grasslands in the Delta estuary continue to decline due to land conversion, as well as invasion by non-native annual species.

Grasslands are an upland natural community often dominated by non-native annual species including wild oats (*Avena* sp.), soft chess (*Bromus hordeaceus*), brome (*Bromus* sp.), Italian ryegrass (*Festuca perennis*), mustards (Brassicaceae), foxtail (*Alopecurus* sp.), and barley *(Hordeum* sp.). Many grassland areas within the area of analysis are in active use as rangelands. Forbs commonly observed in this natural community include filarees (*Erodium* spp.), clovers (*Trifolium* spp.), popcorn flower (*Plagiobothrys* sp.), and mullein (*Verbascum* sp.). Wildlife species of the grassland natural community include western fence lizard, garter snake, rattlesnake, black-tailed jackrabbit, California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), harvest mouse (*Reithrodontomys megalotis*), California vole (*Microtus californicus*), badger (*Taxidea taxus*), and coyote (*Canis latrans*). Bird species include western meadowlark (*Sturnella neglecta*), turkey vulture (*Cathartes aura*), and American kestrel (*Falco sparverius*) (Barbour et al. 2007; CDFG 2008).

Inland Dune Scrub Natural Community

Inland dune scrub natural community consists of vegetated, stabilized sand dunes associated with river and estuarine systems, such as that at Antioch Dunes NWR and Brannan Island State Park. The Antioch-Oakley areas, Delta marshes, and small isolated dunes on the eastern edge of the Delta also historically supported inland dune scrub (Reclamation and DWR 2004).

This natural community is dominated by mostly sensitive species (see Appendix I), but also contains common plants such as primrose (*Camissonia* sp.), wallflower (*Erysimum* sp.), buckwheat (*Eriogonum* sp.), elegant clarkia (*Clarkia unguiculata*), California poppy (*Eschscholzia californica*), California croton (*Croton californicus*), gumplant (*Grindelia* sp.), deerweed (*Acmispon* sp.), telegraph weed (*Heterotheca grandiflora*), California matchweed (*Gutierrezia* sp.), and silver bush lupine (*Lupinus albifrons*). Common wildlife species known to occur within the inland dune scrub natural community include mink (*Mustela vison*), desert cottontail (*Sylvilagus audubonii*), beaver, muskrat, opossum, weasel (*Mustela* sp.), striped skunk, gopher (*Thomomys* sp.), gray fox (*Urocyon cinereoargenteus*), California ground squirrel, coyote, black-tailed jackrabbit, raccoon, Townsend's mole (*Scapanus townsendii*), weasel (*Mustela* sp.), red fox (*Vulpes vulpes*), California legless lizard (*Anniella pulchra*), sideblotched lizard (*Uta stansburiana*), coast horned lizard (*Phrynosoma coronatum*), San Joaquin whipsnake (*Masticophis flagellum ruddocki*), glossy snake (*Arizona elegans*), western whiptail lizard (*Cnemidophorus tigris*), and western fence lizard.

Upland Scrub Natural Communities

Upland scrub natural communities in the area of analysis include mixed chaparral, sage scrub, saltbush scrub, and valley sink scrub. Mixed chaparral natural community occurs on steep south-facing slopes along the Middle and Lower North Forks of the American River and portions of Folsom Reservoir also provide upland scrub natural community (Placer County Development Resources Agency 2011; California State Parks 2007). In Contra Costa County, the surroundings of Los Vaqueros Reservoir support Diablan sage scrub, chaparral, and remnants of valley sink scrub natural community (Contra Costa Water District [WD] 2005; East Contra Costa Habitat Conservancy 2006). Common plant species observed in these natural communities include buckbrush (*Ceanothus* spp.), manzanita (*Arctostaphylos* spp.), bitter cherry (*Prunus emarginata*), oaks, poison oak (*Toxicodendron diversilobum*), coffee berry (*Frangula* sp.), California buckeye (*Aesculus californica*), toyon (*Heteromeles arbutifolia*), sugar sumac (*Rhus ovata*), chamise (*Adenostoma fasciculatum*), California saltbush (*Atriplex californica*), sagebrush (*Artemisia* sp.), and creosote bush (*Larrea tridentata*) (Barbour et al. 2007).

Upland scrub natural communities support many common wildlife species. Spotted towhee (*Pipilo maculatus*), California quail (*Callipepla californica*), California thrasher (*Toxostoma redivivum*), and red-tailed hawk (*Buteo jamaicensis*) are frequently observed in upland scrub. Common mammals occurring within this habitat include brush rabbit (*Sylvilagus bachmani*), blacktailed jackrabbit, and mule deer (CDFG 2008).

Seasonally Flooded Agriculture Habitat

Seasonally flooded agriculture is concentrated in the Sacramento Valley portion of the area of analysis. The central Delta also supports small grains croplands. Lands that fall within this habitat require seasonal flooding for at least one week at a time for irrigation or pest control purposes, and may include grain, rice (*Oryza* sp.), and other crops. Grain crops are typically post-harvest flooded in the winter season, which provides habitat for waterfowl and other wildlife.

Rice fields provide particularly important foraging habitat for a variety of wildlife species. Many species forage on post-harvest waste grain and other food found within the fields (Pitkin 2011; Central Valley Joint Venture 2006). Small birds and rodents that consume rice waste grain are a food source for raptors that forage in the seasonally flooded fields. Duckweed (*Lemna* sp.) and other moist soil plants, which may grow in fields where water level manipulation allows their germination, can provide high-quality food for waterfowl (California Waterfowl Association 2011). Fish are often entrained in the irrigation canals that supply water to the rice fields. Crayfish are found in the canal banks and berms of the rice fields. Other invertebrates and their larvae may be found in very shallow water, particularly during an early to midseason drawdown. Invertebrates found in these areas (e.g., bloodworms) are particularly important to shorebirds (California Waterfowl Association 2011).

Rice fields also provide resting, nesting, and breeding habitat similar to that in natural wetlands. Irrigation ditches can contain wetland vegetation such as cattails, which provide cover habitat for rails, egrets, herons, bitterns, marsh wrens (*Cistothorus palustris*), sparrows, and common yellowthroats (*Geothlypis trichas*). Rice fields provide pair, brood, and nesting habitat for birds such as mallard duck, northern pintail, and terns (Central Valley Joint Venture 2006, CDFG 2008).

Upland Cropland Habitat

Upland cropland areas are found throughout the Sacramento and San Joaquin valleys, as well as adjacent to most leveed waterways. This habitat is considered to include agricultural lands that are not seasonally flooded. Sacramento Valley croplands are dominated by cereal rye (*Secale cereale*), barley (*Hordeum vulgare*), wheat (*Triticum aestivum*), milo (*Sorghum* sp.), corn (*Zea mays*), dry beans, safflower (*Carthamus tinctorius*), sunflower (*Helianthus annuus*), alfalfa (*Medicago sativa*), cotton (*Gossypium* sp.), tomatoes (*Lycopersicon* sp.), lettuce (*Lactuca sativa*), Bermuda grass (*Cynodon dactylon*), Italian ryegrass, tall fescue (*Festuca arundinacea*), almonds (*Prunus dulcis*), walnuts (*Juglans* sp.), peaches (*Prunus persica*), plums (*Prunus* sp.), and grapes (*Vitis* sp.) and other fruits and vegetables. Most of these crops are annuals, planted in the spring and harvested during summer or fall. Wheat and other dryland grains are planted in the fall and harvested in the late spring, early summer. Sugar beets (*Beta vulgaris*) can also be left over winter and harvested in the spring.

Wildlife use of upland crop areas varies throughout the growing season with crop type, level of disturbance, and available cover. Upland crop fields provide important foraging habitat for a variety of wildlife species. Many species forage on crops (waste and otherwise) and other food found within the fields, such as invertebrates. Typically, various birds and rodents consume the crops and invertebrates and serve as a food source for predators. Irrigation ditches associated with upland cropland can contain wetland vegetation such as cattails, which provide cover habitat for rails, egrets, herons, bitterns, marsh wrens, sparrows, and common yellowthroats.

3.8.1.3.2 Natural Communities and Agricultural Habitats in the Buyer Service Area

This section describes the natural communities, agricultural habitats and associated plant and wildlife species that are present in the Buyer Service Area. The Buyer Service Area includes portions of Contra Costa and Alameda Counties (Contra Costa WD, East Bay Municipal Utility District), Santa Clara County (Santa Clara Valley WD), and northern San Benito County (San Benito County WD). The Buyer Service Area also includes the area that extends south from San Joaquin County to northwestern Kings County, which contains potential buyers that are member agencies of San Luis & Delta-Mendota Water Authority.

Lacustrine Natural Community
The lacustrine natural community in the Buyer Service Area occurs within San Luis Reservoir on the western edge of the San Joaquin Valley.

Wildlife species that may be found within the lacustrine natural community in the Buyer Service Area include belted kingfisher (*Megaceryle alcyon*), Caspian tern (*Hydroprogne caspia*), ring-billed gull (*Larus delawarensis*), Clark's grebe (*Aechmophorus clarkii*), western grebe (*Aechmophorus occidentalis*), pied-billed grebe (*Podilymbus podiceps*), osprey (*Pandion haliaetus*), great egret (*Ardea alba*), spotted sandpiper (*Actitis macularius*), and killdeer.

Valley/Foothill Riparian Natural Community
This natural community occurs in the Buyer Service Area along many of the segments of the San Joaquin River from Friant Dam through the Central Valley into the Delta and is comprised primarily of mixed oak, cottonwood, and willow. Valley/foothill riparian natural community is present at San Luis Reservoir in the form of sparse mule fat and willow patches. In addition to the plant species previously mentioned in the other regions, riparian habitats south of the Delta may support Northern California black walnut, a species considered sensitive by CDFW.

Common species that may occur in this vegetation community and associated aquatic habitat within the Buyer Service Area include black phoebe (*Sayornis nigricans*), red-winged blackbird (*Agelaius phoeniceus*), Brewer's blackbird (*Euphagus cyanocephalus*), ash-throated flycatcher (*Myiarchus cinerascens*), northern rough-winged swallow (*Stelgidopteryx serripennis*), western scrub jay (*Aphelocoma californica*), black-headed grosbeak (*Pheucticus melanocephalus*), California quail, Nuttall's woodpecker (*Picoides nuttallii*), oak titmouse (*Baeolophus inornatus*), California towhee (*Pipilo crissalis*), Merriam's chipmunk (*Tamias merriami*), mule deer, coyote, black bear (*Ursus americanus*), mountain lion (*Puma concolor*), and raccoon.

Grassland Natural Community
Substantial areas of non-native grassland are present in Contra Costa, Santa Clara, and Merced Counties. This includes lands surrounding San Luis Reservoir. Non-native grasses in these locations intergrade with native species including purple needle grass (*Stipa pulchra*), beardless wild rye (*Elymus triticoides*), and onion grass (*Melica* sp.).

Killdeer, white-throated swift (*Aeronautes saxatalis*), ring-necked pheasant (*Phasianus colchicus*), American crow (*Corvus brachyrhynchos*), rufous-crown sparrow (*Aimophila ruficeps*), rock wren (*Salpinctes obsoletus*), western meadowlark, red-tailed hawk, American kestrel, common loon (*Gavia immer*), Barrow's goldeneye (*Bucephala islandica*), savannah sparrow (*Passerculus sandwichensis*), California vole, black-tailed jackrabbit, California ground squirrel, coyote, foxes, badgers, skunk, western rattlesnake, southern alligator lizard, two-striped garter snake (*Thamnophis hammondii*), California mountain kingsnake (*Lampropeltis zonata*), and western fence lizard are some of the species that would commonly be observed within grasslands in the Buyer Service Area.

Oak Woodland Natural Community

Scattered blue oak (*Quercus douglasii*) woodlands occur on the western shore of the San Luis Reservoir. Remnant patches are often found at the edges of agricultural lands that were converted from woodland to cultivation, and occur in larger stands leading up to the Sierra Nevada foothills. The oak woodland natural community varies with respect to the mix of hardwoods, conifers or shrubs present, and also demonstrates a range of canopy densities. Valley oak, blue oak, interior live oak (*Quercus wislizeni*), coast live oak (*Q. agrifolia*), and foothill pine (*Pinus sabiniana*) are common dominant species (Barbour et al. 2007).

Acorn woodpecker (*Melanerpes formicivorus*), northern flicker (*Colaptes auratus*), wild turkey (*Meleagris gallopavo*), oak titmouse, black-tailed jackrabbit, American crow, California quail, western fence lizard, coyote, mule deer, western bluebird (*Sialia mexicana*), white-breasted nuthatch (*Sitta carolinensis*), and American kestrel are commonly observed wildlife species in oak woodland within the Buyer Service Area (CDFG 2008).

Upland Cropland Habitat

Upland cropland areas are found throughout the San Joaquin Valley. Major crops in this area include alfalfa, almonds, corn, cotton, grapes, rice, and tomatoes (County of Fresno Department of Agriculture 2010; Merced County Department of Agriculture 2010; San Joaquin County 2010). These crops support common species, and may be important to common and sensitive wildlife, especially during irrigation periods. For example, cotton is known to harbor mourning doves (*Zenaida macroura*) and house mice (*Mus musculus*) and may also support species such as killdeer, American pipit (*Anthus rubescens*), and horned lark (*Eremophila alpestris*) (CDFG 2008). San Joaquin kit fox (*Vulpes macrotis mutica*), a federally endangered species, has been known to utilize croplands for forage as well (USFWS 1998). Ditches associated with intensive cropland are often chemically treated and therefore are less likely to serve as suitable habitat for wildlife species.

3.8.1.3.3 Special-Status Plant and Wildlife Species

Wildlife and plant species addressed in this section have been selected through the following process. First, all species identified in database records searches went through an evaluation to identify what are considered “special-status species” in relationship to the federal ESA and CESA compliance. For the purpose of this assessment, “special-status species” are those species that meet one or more of the following criteria:

- Species that are listed or proposed for listing as threatened or endangered under ESA (50 Code of Federal Regulations [CFR] 17.11

[listed animals]; 50 CFR 17.12 [listed plants]; and various notices in the Federal Register [FR]).

- Species that are candidates for possible future listing as threatened or endangered under ESA (75 FR 69222, November 10, 2010).

- Species that are listed or proposed for listing by the State of California as threatened or endangered under CESA (14 California Code of Regulations [CCR] 670.5).

- Species that meet the definitions of rare or endangered under the California Environmental Quality Act (CEQA) (State CEQA Guidelines Section 15380).

- Plants listed as rare under the CNPPA (CDFW Commission 1900 et seq.).

- Plants listed by California Native Plant Society (CNPS) as plants about which more information is needed to determine their status and plants of limited distribution, which may be included as special-status species on the basis of local significance or recent biological information.

- Animals listed as California Species of Special Concern (SSC) to the CDFW (Shuford and Gardali 2008 [birds]; Williams 1986 [mammals]; and Jennings and Hayes 1994 [amphibians and reptiles]).

- Animals that are fully protected in California (CDFW Commission 3511 [birds], 4700 [mammals], 5050 [amphibians and reptiles], and 5515 [fish]).

- Birds of Conservation Concern (USWFS 2008).

The selection process resulted in an initial list of 257 special-status plant and wildlife species. Tables I-1 and I-2 in Appendix I provide information on all 257 special-status species known from, or with potential to occur in the area of analysis, including common and scientific name, listing status (Federal, State, Global Rank, and/or State Rank), suitable habitat characteristics, distribution in California, and potential for occurrence in the area of analysis.

Not all of these species have the potential to be affected by long-term water transfers. Many of the 257 species are not expected to occur in the natural communities and agricultural habitats that would be affected by the action alternatives (e.g., riverine, riparian, natural and managed wetlands, rice fields, and irrigation/drainage channels), or impacts to those species would be avoided because of the environmental commitments that are incorporated in the alternatives. Consequently, the action alternatives have the potential to affect only a limited number of these special-status species.

For each plant and wildlife species, the likelihood that water transfers would affect the species is assigned a category in the last column and the rationale for that categorization is provided. Those species in Tables I-1 and I-2 (Appendix I) which are known to occur in the area of analysis, but would not be affected by the action alternatives are not addressed further in this analysis. Based on these considerations, the initial list of species potentially present was reduced to 14 species that could be affected. These 14 species are listed in Table 3.8-1 along with HCP/NCCPs that are adopted or in preparation which cover the species and may have additional requirements for species conservation within their plan areas. Special-status plants and terrestrial wildlife species potentially affected by the action alternatives are discussed below. Potentially affected special-status fish species are discussed separately in Section 3.7.

Table 3.8-1. Potentially Affected Special-Status Plant and Wildlife Species in the Area of Analysis

				Conservation Plan Coverage[2]										
	Status	**Species**	**Status[1]**	**BRCP**	**BDCP**	**ECCC HCP/NCCP**	**NB HCP**	**PCCP**	**SJMSCP**	**SCV HCP/NCCP**	**SMSHCP**	**SSHCP**	**YNHP**	**YS NCCP/HCP**
Plants	California Rare Plant Rank	Ahart's dwarf rush	RPR 1B.2	X				X				X		X
		Sanford's arrowhead	RPR 1B.2						X					
		Red Bluff dwarf rush	RPR 1B.1	X				X	X					
		Saline clover	RPR 1B.2											
Wildlife	State or Federally Listed	Giant garter snake	FT, ST	X	X	X	X	X	X		X	X	X	X
		San Joaquin kit fox	FE, ST		X	X			X	X				
		Greater sandhill crane	ST, FP	X	X				X			X		X
	Species of Special Concern	Black tern	SSC/WL											
		Long-billed curlew	SSC						X					
		Pacific pond turtle	SSC		X	X	X		X	X		X	X	X
		Purple martin	SSC										X	

				Conservation Plan Coverage[2]										
	Status	**Species**	**Status[1]**	**BRCP**	**BDCP**	**ECCC HCP/NCCP**	**NB HCP**	**PCCP**	**SJMSCP**	**SCV HCP/NCCP**	**SMSHCP**	**SSHCP**	**YNHP**	**YS NCCP/HCP**
		Tricolored blackbird	SSC	X	X	X	X	X	X	X	X	X	X	X
		White-faced ibis	WL				X		X					
		Yellow-headed blackbird	SSC											

[1] Status:
FE-federally listed endangered
FP-fully protected under California Fish and Game Code
FT-federally listed threatened
RPR 1B.1-California Rare Plant Rank 1B.1 = Plants rare, threatened, or endangered in California and elsewhere. Seriously threatened in California (over 80 percent of occurrences threatened / high degree and immediacy of threat)
RPR 1B.2-California Rare Plant Rank 1B.1 = Plants rare, threatened, or endangered in California and elsewhere. Fairly threatened in California (20 to 80 percent occurrences threatened / moderate degree and immediacy of threat)
ST-state-listed threatened
SSC-California Species of Special Concern
WL- species that were previously designated as SSC but no longer merit SSC status or which do not meet SSC criteria but for which there is concern and a need for additional information to clarify status.
[2] Conservation plan
BDCP – Bay-Delta Conservation Plan (under development)
BRCP – Butte Regional Conservation Plan (under development)
ECCCHCP/NCCP – East Contra Costa County HCP/NCCP (adopted)
NBHCP – Natomas Basin HCP (adopted)
PCCP – Placer County Conservation Plan (under development)
SCVHCP/NCCP – Santa Clara Valley HCP/NCCP (adopted)
SJMSCP – San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (adopted)
SMSHCP-Solano Multispecies HCP (under development)
SSHCP – South Sacramento HCP (under development)
YNHP – Yolo Natural Heritage Program (under development)
YSNCCP/HCP – Yuba-Sutter NCCP/HCP (under development)

Ahart's Dwarf Rush
Ahart's dwarf rush (*Juncus leiospermus* var. *ahartii*) is a California Rare Plant Rank (RPR) 1B.2 species known from Butte, Calaveras, Placer, Sacramento, Tehama, and Yuba counties, and previous observations exist within the Seller Service Area. This species has generally been documented at mesic locations within valley and foothill grassland between 30 and 229 meters above mean sea level (amsl). It may also occur in disturbed areas including agricultural fields and locations with gopher digging activity. Ahart's dwarf rush typically blooms between March and May. Development is the major threat to this species.

Sanford's Arrowhead
Sanford's arrowhead (*Sagittaria sanfordii*) is a California RPR 1B.2 perennial rhizomatous herb found in the Central Valley in freshwater marsh, shallow stream areas, and ditches between zero and 650 meters amsl. Previous observations exist within the Seller Service Area. Sanford's arrowhead typically blooms between May and August.

Threats to Sanford's arrowhead include grazing, development, recreational activities, non-native plants, road widening, and alteration of channels.

Red Bluff Dwarf Rush
Red Bluff dwarf rush (*Juncus leiospermus* var. *leiospermus*) is a California RPR 1B.1 species that occurs within Butte, Placer, Shasta, and Tehama counties. Red Bluff dwarf rush is known from vernally mesic sites in chaparral, valley and foothill grassland, cismontane woodlands, and vernal pools from 30 to 1,020 meters amsl. It may also be found in intermittent drainages and areas of pocket gopher and ground squirrel activity (Butte County Association of Governments 2011). The typical bloom period for Red Bluff dwarf rush is March through May. Suitable habitat for this species occurs within the area of analysis and occurrences have been documented within the Seller Service Area.

Some of the recognized threats to Red Bluff dwarf rush include: development, grazing, vehicles, industrial forestry, and agricultural activities.

Saline Clover
Saline clover (*Trifolium hydrophilum*) is a California RPR 1B.2 species known from California's central coast and Bay Area. Previous observations exist within both the Buyer and Seller Service Areas. This species has generally been documented in marshes and swamps, valley and foothill grassland, and vernal pool habitats from zero to 300 meters amsl. It is often found in mesic or alkaline areas. Saline clover blooms from April through June.

The status of many saline clover populations is not known. Development, trampling, road construction, and vehicles are considered some of the major threats to the species.

Giant Garter Snake

Giant garter snake (*Thamnophis gigas*) is listed as threatened under both the ESA and CESA (58 FR 54053). A Draft Recovery Plan for giant garter snake was completed in 1999, but no critical habitat has been designated for this species (USFWS 1999). One of the largest garter snakes, the giant garter snake reaches up to 64 inches in length, with females generally slightly longer and heavier than males (Hansen 1980).

Giant garter snake historically occupied wetlands throughout the Sacramento and San Joaquin Valleys, as far north as Chico, and as far south as Buena Vista Lake, near Bakersfield (Hansen and Brode 1980). The current known distribution of giant garter snakes is patchy, extending from near Chico, Butte County, south to Mendota Wildlife Area, Fresno County. Giant garter snakes are not known from the northern portion of the San Joaquin Valley north to the eastern fringe of the Sacramento-San Joaquin River Delta, where the floodplain of the San Joaquin River is limited to a relatively narrow trough (Hansen and Brode 1980, Federal Register 58:54053–-54066).

The giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, other waterways and agricultural wetlands such as irrigation and drainage canals and rice fields, and the adjacent uplands. Essential habitat components consist of (1) adequate water during the snake's active period (i.e., early spring through mid-fall) to provide a prey base and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat; (3) upland habitat for basking, cover, and retreat sites; and (4) higher elevation uplands for cover and refuge from flood waters (USFWS 1999). Another key requirement of the giant garter snake includes maintenance of connectivity between habitats. giant garter snake rely on canals and ditches as movement corridors. These corridors provide important habitat, and are used during daily movement within a home range. Recent work by the U.S. Geological Survey (Halstead et al. 2010) suggests that giant garter snake primarily occurs in areas with dense networks of canals among rice agriculture and wetlands. Giant garter snake are less likely to be found in areas with high stream density. More recent work suggests that giant garter snake are most likely to occur within areas of historic tule marsh, and the likelihood of encountering them drops substantially with distance from these areas of historic habitat (Halstead et al. 2014).

Giant garter snake typically forage and shelter within cattail, bulrush, or other emergent herbaceous wetland vegetation, using grassy banks and openings at the water’s edge for basking. Rice fields in particular may be important nursery and feeding habitat, providing prey that are absent from other permanent aquatic areas (USFWS 1999). Wintering habitat consists of higher elevation upland areas with vegetation, burrows or other underground refugia (Hansen 1988). Studies of marked snakes indicated that individuals typically move about 0.25 to 0.5 miles per day. Individuals have been documented to move five to eight miles over the course of a few days. Giant garter snake home range size is highly variable, with an average size of about 0.1 square miles (USFWS 2010). During the winter months, when the snakes are inactive, small mammal burrows and other soil or rock crevices may be used for hibernation, and also provide refuge from hot conditions during the snake's active season (Hansen and Brode 1993; USFWS 1999). Giant garter snake have been documented using burrows as much as 165 feet from marsh edges to shelter from heat during the active season, and up to 820 feet away during the winter (Wylie et al. 2000).

Numerous observations of giant garter snake have been documented within the Sacramento Valley portion of the Seller Service Area. Records also exist within the Buyer Service Area, including near Mendota, in the Central Valley (CNDDB 2014; Halstead et al. 2014).

San Joaquin Kit Fox

San Joaquin kit fox is federally-listed as endangered under the ESA (USFWS 1967) and state-listed as threatened under CESA (Swick 1971). No critical habitat has yet been designated for the species.

San Joaquin kit foxes occur in some areas of suitable habitat on the floor of the San Joaquin Valley and in the surrounding foothills of the Coast Ranges, Sierra Nevada, and Tehachapi Mountains from Kern County north to Contra Costa, Alameda, and San Joaquin Counties (USFWS 1998). Since 1998, the population structure has become more fragmented, with some resident satellite populations having been locally extirpated, and frequented by dispersing kit foxes rather than resident animals (USFWS 2010:15). The largest extant populations of kit fox are in Kern County (Elk Hills and Buena Vista Valley) and San Luis Obispo County in the Carrizo Plain Natural Area (USFWS 1998). Natural habitats for San Joaquin kit fox include alkali sink, alkali flat, and grasslands. San Joaquin kit foxes may use agricultural lands such as row crops, orchards, and vineyards to a limited extent but kit foxes are unable to occupy farmland on a long-term basis (USFWS 2010:19–21.) San Joaquin kit foxes usually prefer areas with loose-textured soils suitable for den excavation (Orloff et al. 1986:62) but are found on virtually every soil type (USFWS 1998:129). Where soils make digging difficult, kit foxes may enlarge or modify burrows built by other animals, particularly those of California ground squirrels (Orloff et al. 1986:63; USFWS 1998:127). Structures such as culverts, abandoned pipelines, and well casings may also be used as den sites (USFWS 1998:127).

San Joaquin kit fox are active throughout the year, and are generally active during twilight. The kit fox's home range may vary from less than 2.6 square kilometers (km^2) to 31 km^2 (Morrell 1972; Zoellick et al. 2002, Spiegel and Bradbury 1992; White and Ralls 1993). The breeding season begins during September and October when adult females begin to clean and enlarge natal or pupping dens. Mating and conception occur between late December and March, and litters of two to six pups are born between late February and late March (USFWS 1998:126).

Growth of agricultural and urban areas is cited as the primarily threat to San Joaquin kitfox. Land conversion displaces populations, may reduce preferred prey abundance, prohibits movement throughout the landscape, and may also result in direct or indirect mortality of kit foxes (Constable et al. 2009; USFWS 1998). Intensive grazing, use of pesticides and rodenticides, and predation by coyote and red fox are other notable stressors on San Joaquin kit fox populations (Bell et al. 1994; USFWS 1998).

Greater Sandhill Crane

The Central Valley population of greater sandhill crane (*Grus canadensis tabida)* is a state-listed threatened and fully protected species. This species uses a variety of habitats including non-tidal fresh emergent wetland, natural seasonal wetland, and managed seasonal wetland. They will also utilize upland habitats such as grassland and upland crop areas. As a result of the loss of a large proportion of wetlands in the Sacramento Valley, greater sandhill cranes are increasingly associated with managed seasonal wetland environments and seasonally flooded agriculture, particularly rice fields.

Formerly a common breeder in California, the species now breeds only in Siskiyou, Modoc, Lassen, Sierra Valley, Plumas and Sierra counties (Zeiner et al. 1988); during the summer, the birds are found near wet meadows, shallow lacustrine and fresh emergent wetland habitats. Greater sandhill crane is known to winter in the Sacramento and San Joaquin valleys, within the Butte Sink (from Chico in the north to the Sutter Buttes in the south and from Sacramento River in the west to Highway 99 in the east), where birds forage in annual and perennial grassland habitats, moist croplands with rice and corn stubble, and emergent wetlands. Cranes migrate to the Central Valley between September and November, and depart between March and May (Reclamation and DWR 2004); however the California breeding population winters chiefly in the Central Valley (Zeiner et al. 1988). Sandhill cranes mate for life and have high site fidelity; the pair will return to the same territory each year (USFWS 1987).

Food, cover, and nesting requirements for greater sandhill cranes are closely associated with water in the form of some type of wetland. The loss and degradation to riverine and wetland ecosystems is an important threat to sandhill crane populations. For the migratory populations, this is of greatest concern in foraging and wintering areas (USGS 2006). Additional threats include development pressures and human disturbance when nesting.

Black Tern

The black tern (*Chlidonias niger*) is designated as a California SCS. Within California, black terns typically occur as migrants and summer residents between mid-April and mid-October (Shuford and Gardali 2008) where they breed in flooded rice fields and freshwater marshes, including lakes and ponds with marsh edges (Shuford et al. 2001). In the Central Valley, black terns nest on small dirt mound-islands in rice fields (Shuford et al. 2001) and are known to build nests on masses of dead floating vegetation, or on mounds within marsh habitat (Shuford and Gardali 2008). The species may also nest on dikes or levees (Reclamation and DWR 2004). The remainder of the year, the terns migrate to bays, rivers, and pelagic waters (Reclamation and DWR 2004).

The black tern was once a common visitor to emergent wetlands of the Central Valley, but its numbers have declined due to habitat losses, especially the widespread loss of freshwater marshes. In California, the terns have been known to breed in the Central Valley, Klamath Basin, and the Modoc Plateau (Shuford et al. 2001). Due to lack of suitable freshwater habitat in most NWRs and State Wildlife Areas during the summer, black tern breeding sites in the Sacramento Valley are primarily flooded rice fields (Technology Associates 2009a). In 2001, Shuford et al. reported that rice fields supported 90 percent of the Central Valley breeding population. Surveys in the late 1990s found breeding black terns to be widespread in Sacramento Valley rice fields, with the largest concentration in the northern Colusa Basin. This species only has two known regular breeding locations in the San Joaquin Valley, in rice fields in Merced and Fresno counties (Shuford and Gardali 2008).

Black terns are considered to be an area-dependent species with specific breeding and foraging requirements. Because black terns have a limited distribution and are dependent upon flooded rice fields for breeding, conversion of rice fields to other crops, or to dry land rice, pose a threat to the migrant population (Technology Associates 2009a). Additional threats to the species include water management of rice fields (i.e. rapid lowering of water exposes nests to predators) and effects from exposure to pesticides (Technology Associates 2009a).

Pacific Pond Turtle

The Pacific pond turtle (*Actinemys marmorata*) is the only native box turtle widely distributed in the western United States, occurring from Baja California north into the State of Washington. Historically, the turtle once inhabited the vast permanent and seasonal wetlands of the Central Valley. Pacific pond turtle is considered a SSC by CDFW and its status is currently under review by USFWS.

Pacific pond turtle is associated with nontidal fresh emergent wetland, managed seasonal wetland, valley/foothill riparian, and lacustrine habitats. They may also utilize upland habitats including grassland and scrub (Holland 1994). Its preferred habitat is slow moving or quiet water, with emergent vegetation and undercuts for refuge. Protected, grassy uplands with a clay/silt soil are the preferred nesting sites. Irrigation ditches, drains, and rice fields provide suitable habitat for Pacific pond turtle foraging, with basking areas on adjacent levees. The turtles are active during the spring, summer, and fall when rice preparation, growing, and harvesting are performed, respectively.

The draining of wetlands for agriculture and urban development has greatly reduced this species' habitat. Other causes of population decline include increased predation and collecting by humans. Poor reproductive success due to predation and nest destruction also hamper the turtle's recovery. Reduced vegetative cover, such as in heavily maintained ditches, may increase predation on females and juveniles moving between aquatic habitats and nest sites between May and October (Holland 1988).

The CNDDB reports several occurrences spread throughout the area of analysis in Sacramento, San Joaquin, and Contra Costa counties.

Purple Martin

Purple martin (*Progne subis*) is a passerine bird species and is considered by the CDFW to be a SSC. Purple martin occur in eastern North America, west to the Pacific Coast and south into Central Mexico. In the arid west, its distribution is concentrated in the southern Rocky Mountains and the Sonoran Desert (Shuford and Gardali 2008). In California, purple martins are summer residents, typically observed between mid-March and mid-August (Shuford and Gardali 2008). They have been documented in forest and woodland areas, generally at lower elevations, and the most robust populations are known from conifer forests on the north coast and the foothills of the Sierra Nevada Mountains. Only a small breeding population occurs in the Central Valley.

Purple martins prefer breeding areas with numerous nesting cavities and locally sparse canopy cover. They require access to open foraging areas that support their insect prey, particularly wetlands or other water bodies. Purple martins may nest as single pairs or in larger groups.

Non-native European starlings (*Sturnus vulgaris*) compete with purple martins for nest sites. Additional threats include loss of suitable nesting sites due to habitat conversion by human activity or events such as stand-replacing fires (Shuford and Gardali 2008).

Long-Billed Curlew

The long-billed curlew (*Numenius americanus*) is designated as a CDFW Watch List species and a Bird of Conservation Concern by the USFWS (USFWS 2008). The long-billed curlew is a migratory bird that breeds east of the Cascade Mountains, including northeastern California, through the western Great Plains (Zeiner et al. 1988). It winters from Central and Imperial Valleys, coastal California to southwestern United States. and is found as a winter migrant in the San Joaquin Valley.

Long-billed curlews are found in grasslands, meadows, pastures, and fallow agricultural fields, as well as tidal flats, beaches, and salt marshes in winter. The most highly preferred habitat is natural marshes, grassland, irrigated pasture, and alfalfa fields (San Joaquin County Multi-Species Habitat Conservation and Open Space Plan 2000) and preferred winter habitat includes large coastal estuaries, upland herbaceous areas, and croplands (Zeiner et al. 1988). A small number of nonbreeders remain in coastal habitat in summer and a larger number of birds remain in some years in the Central Valley (Zeiner et al. 1988). In California, long-billed curlew nest on elevated interior grasslands and wet meadows, usually adjacent to bodies of water, such as lakes or marshes (Zeiner et al. 1988).

The conversion of natural lands to agriculture has greatly diminished available forage for wintering birds (Zeiner et al. 1988); wintering habitat in California wetlands has declined by 90 percent (Dugger and Dugger 2002). Continuing threats to long-billed curlews include habitat loss owing both to development and projected effects of climate change and effects of pesticide spraying indirectly reducing the birds' prey items (Dugger and Dugger 2002). The species has previously been proposed as a candidate for Federal Endangered status.

Tricolored Blackbird

The tricolored blackbird (*Agelaius tricolor*) is a medium-sized passerine bird, which is very similar in appearance to red-winged blackbird (*Agelaius phoeniceus*). It is designated by the CDFW as an SSC and is designated as a Bird of Conservation Concern by the USFWS (USFWS 2008). The species forms the largest colonies of any North American passerine bird, often with tens of thousands of breeding pairs (Beedy and Hamilton 1999).

Nearly all tricolored blackbird populations occur within California. While no major changes in their overall geographic distribution have been noted, large gaps in the occupied range now exist due to loss of habitat (e.g., Kings, San Joaquin, Riverside, and San Bernardino counties) and populations have significantly declined (Kyle and Kelsey 2011). Most individuals are year-round residents in the Central Valley, although some birds overwinter elsewhere, including in the Sacramento-San Joaquin Delta (Beedy 2008).

This species typically breeds in areas with access to open water and protected nesting sites, often including flooded, thorny, or spiny vegetation. Historically, tricolored blackbirds nested in freshwater marsh habitat in vegetation including tules, cattails, willows, thistles or nettles. Nests may also be concentrated in grain fields, giant reed (*Arundo donax*), and riparian scrubland and forest areas (DeHaven et al. 1975; Kyle and Kelsey 2011). Birds may forage as much as eight miles from nest sites (Beedy and Hamilton 1999) in areas that support insect prey. Pasturelands, alfalfa and rice crops, dairies, grassland, and shrubland habitats may be used in lieu of natural flooded habitat (Beedy and Hamilton 1999).

Tricolored blackbird colonies are sensitive to habitat loss, predation, and human activities. When water is withdrawn from marshes, nests become more susceptible to predation, such as by coyotes (*Canis latrans*) (Technology Associates 2009b). Chemical application in agricultural areas may reduce survivorship and disturbance associated with urbanization, including noise, pet and human presence, may result in nest abandonment (Beedy and Hamilton 1999).

White-Faced Ibis

White-faced ibis (*Plegadis chihi*) is considered a Species of Concern by USFWS and an SCC by CDFW. Historically, the ibis was a locally common summer resident in California and its breeding distribution was centered in the San Joaquin Valley. Currently, the species occurs in California as an uncommon, localized breeder and summer resident. It is a mobile species and shifts in range usually coincide with changing water levels and water quality. The ibis is found in shallow, emergent wetlands with high quality fresh and brackish water. Muddy grounds of wet meadows, irrigated or flooded pastures, flooded pond edges and shallow lacustrine water, and wet cropland such as rice fields are suitable foraging habitat. Ibises typically prefer large emergent wetlands with islands of dense emergent vegetation for nesting (CDFG 2008).

White-faced ibis is a colonial breeder and builds shallow nests in thick emergent vegetation such as tule and cattail, in shrubs, or in low trees (Ryder and Manry 1994). It breeds in scattered locations in the San Joaquin Valley, and has established breeding colonies in the Sacramento Valley. Significant breeding colonies have been reported in the Mendota Wildlife Area and the Colusa NWR (Natomas Basin HCP 2003). The species winters primarily in the San Joaquin and Imperial Valleys with a concentrated wintering population near Los Banos in Merced County (Zeiner et al. 1990a).

Populations of white-faced ibis have declined in California and stopped breeding regularly as a result of loss or deterioration of extensive marshes in the Central Valley, which are required for nesting. Elsewhere in its range, pesticides have caused decline in numbers (Zenier 1988).

Yellow-Headed Blackbird

The yellow-headed blackbird (*Xanthocephalus xanthocephalus*) is a small to medium-sized passerine which is a California SSC. This species winters in the western United States; in California it has been documented east of the Cascade Range and Sierra Nevada Mountains, within the Imperial, Colorado River, and Central Valleys, as well as localized areas of the Coast Range west of the Central Valley (Twedt *et al*. 1991). It is fairly common in winter in the Imperial Valley, but its distribution is concentrated mainly in the western portion of the valley (CDFG 2008).

Yellow-headed blackbirds forage along emergent wetland and moist, open areas near croplands and grasslands, in addition to muddy shores of lacustrine habitat (CDFG 2008). They mainly feed on seeds and cultivated grains, although aquatic insects may make up a large part of their diet during the breeding season (Twedt et al. 1991; Twedt and Crawford 1995). Rice fields near freshwater marshes often support breeding colonies (Twedt and Crawford 1995).

In California, yellow-headed blackbirds are found year-round, but breed and winter in different locations and habitat. Water levels are a very important factor in reproduction success. This species breeds in fresh emergent wetland with dense vegetation (e.g. cattails and tules) and deep water, generally along lake and pond borders (Picman et al. 1993). They only breed where large insects are abundant and nesting is timed with maximum emergence of aquatic insect prey (Zeiner et al. 1990).

Throughout its range, the primary threat to the yellow-headed blackbird is the conversion of wetlands to croplands and urban land uses. The species' population has declined in California as a result of habitat loss and competitive exclusion from great-tailed grackles (*Quiscalus mexicanus*), as well as other mammalian and avian predators. Agricultural pesticides and herbicides have also negatively affected the species (Technology Associates 2009b).

3.8.1.3.4 Migratory Birds

Managed wetlands and flooded agriculture within the Seller Service Area provide critical nesting and wintering habitat for millions of migratory birds, particularly waterfowl, that migrate to the Sacramento Valley. These open water habitats and associated vegetation provide food, cover, and resting sites for migrating birds. The Sacramento Valley is considered the most important wintering site for migratory birds on the Pacific Flyway, supporting nearly 50 percent of wintering shorebirds and over 60 percent of wintering waterfowl using the Pacific Flyway. Flooded agriculture within the Sacramento Valley accounts for approximately 57 percent of food resources available to waterfowl (Petrie and Petrick 2010). Although these species are not considered special-status wildlife species, they are protected under the Migratory Bird Treaty Act. Potential effects on migratory birds are discussed below for each Action Alternative.

3.8.2 Environmental Consequences/Environmental Impacts

Within each alternative, the analysis focuses on biological resources of concern: natural communities, vegetation and wildlife, 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 long-term water transfers 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.

Development of the long-term water transfer impact analysis involved literature review, review of known occurrences of special-status species based on

CNDDB, CNPS Inventory records, USFWS regional species list, CWHR, review of information obtained from species experts, and results of hydrologic modeling, as detailed below.

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

The assessment methods specific to each transfer type are described briefly below. This is followed by the impact assessment for different natural communities and species.

3.8.2.1.1 Groundwater Substitution Transfers

As a part of the Full Range of Transfers Alternative (Proposed Action), there would be an increased use of groundwater to irrigate crops instead of diversion of water from rivers, creeks, and other streams. This would entail increased groundwater pumping compared to existing conditions to substitute water usually obtained from surface water supplies, which could result in a reduction in levels of groundwater in the vicinity of pumps.

Modeled changes in groundwater elevations over time were used to assess the potential impacts of groundwater depletion on stream flows in small tributaries and associated natural communities. Appendix D includes more information about SACFEM2013, which was used to model groundwater substitution-related changes to groundwater and surface water. The groundwater modeling results indicate that shallow groundwater is typically deeper than 15 feet in most locations under existing conditions, and often substantially deeper. This is substantially below the rooting depth of typical vegetation associated with upland communities (e.g., grassland and scrubland habitats). Some tree species, such as valley oak, can have root depths in excess of 20 feet and upward of 80 feet, and rely on groundwater at such a depth during months of low rainfall. However, these species have further adapted to California's Mediterranean climate of wet winters and hot, dry summers by diversifying their rooting structure to take advantage of multiple sources of water. Valley oak trees, for example, typically lose their long taproot by the time they are 40 years old, having developed a complex root system that often extends nearly twice as far as the tree's dripline within the first several meters of the ground surface (Bolsinger 1988).

Riparian habitats are structurally and compositionally diverse, providing a variety of food resources and shelter not found in adjacent upland habitat (Palmer and Bennett 2006, Kirkpatrick et al. 2007). Depth of groundwater has been shown to be an important driver of riparian tree species presence, abundance, and health (Merritt et al. 2010). Merritt et al. showed that riparian tree species are more common in areas with shallow groundwater (less than 4.5 feet below surface level). The maintenance of riparian forests that support complex habitat requires perennial streamflow to maintain elevated groundwater tables during the growing season (Stromberg et al. 2007; Merritt and Poff 2010). Because of the interaction of surface flows and groundwater flows in riparian systems, including associated wetlands, enables faster recharge of groundwater, these systems are less likely to be impacted by groundwater drawdown as a result of the action alternatives.

The frequency of occurrence of riparian forest cover vegetation decreases with the lowering of groundwater levels (Merritt et al. 2010) until the vegetation transitions into communities dominated by upland species less reliant on groundwater levels. In wetland and riparian habitats, groundwater could be much shallower than 15 feet below ground surface, ranging from eight feet to just below the ground surface (Faunt, ed. 2009).

In a few locations in the North Delta, 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.

The impact of groundwater substitution on natural communities is based on impacts to upland habitats, and those dependent on stream flows. The impact assessment method for stream flow dependent species is discussed in Section 3.8.2.1.4. This impact was evaluated based on the magnitude and frequency of groundwater depletion relative to existing conditions models.

The potential impacts of groundwater substitution on natural communities in upland areas was considered potentially significant if it resulted in a consistent, sustained depletion of water levels that were accessible to overlying communities (groundwater depth under existing conditions was 15 feet or less). A sustained depletion would be considered to have occurred if the groundwater basin did not recharge from one year to the next.

In addition to changing groundwater levels, groundwater substitution transfers could affect stream flows. As groundwater storage refills during and after a transfer, it could result in reduced availability of surface water in nearby streams and wetlands. Assessing the potential effects of these changes on terrestrial resources is discussed further in Section 3.8.2.1.4.

3.8.2.1.2 Cropland Idling/Crop Shifting Transfers

Cropland idling/crop shifting would make water available for transfer that would have been used for agricultural irrigation without the transfer. Cropland idling/crop shifting transfers would occur in the Sacramento River watershed area of analysis. The irrigation season for this area generally lasts from April through September. Rice has been the crop idled most frequently in previous transfer programs. For crop shifting transfers, water is made available when farmers shift from growing higher water use crop to a lower water use crop. Cropland idling/crop shifting would potentially affect some wildlife species that depend on cropland for foraging and/or depend on habitat associated with cropland and managed agricultural lands, including surrounding supply and return water canals. Crop shifting would potentially affect habitat value for various wildlife species. These farming practices may also have an effect on downstream habitat dependent upon agricultural flow returns.

Cropland idling/shifting transfers would be done in accordance with the environmental commitments described in Section 2.3.2.4.

Croplands (except cotton) generally provide forage, resting, and nesting habitat for a variety of wildlife. Many species rely on agro-ecosystems to meet their lifecycle requirements. Vegetable crops (e.g., tomatoes, onions, melons, and sugar beets), grain crops (e.g., corn, rice, etc.), and alfalfa generally provide forage for wildlife both pre- and post-harvest. The value of a crop to wildlife as habitat and for forage varies greatly between crops (from corn and wheat—highly beneficial to wildlife; cotton—limited to no benefits to wildlife) and species to species. Seasonally flooded agriculture, specifically rice fields, and its associated uplands, drainage ditches, irrigation canals, and dikes, provide potentially suitable habitat for many species including giant garter snake, Pacific pond turtle, and a variety of water birds including, but not limited to egrets, herons, ducks, and geese. Upland crop habitat, such as wheat and corn, provide potentially suitable foraging habitat for many species, including migratory birds and San Joaquin kit fox.

Waste products (grain, fruits, or foliage) remaining in fields after harvest also serve as a food resource for wildlife species, including many special-status species associated with upland cropland (see Section 3.8.2.3.3 for further details). A reduction in the availability of waste products as forage to wildlife could result in significant effects to those species dependent upon waste grain for a large portion of their forage, primarily birds and rodents (primary consumers). These species may also provide a prey base for predators, such as hawks or foxes, and a reduction in the numbers primary consumers could affect predator condition and abundance.

Rice fields in particular provide important foraging habitat for many wildlife species found within the Seller Service Area; not only do the wildlife forage on post-harvest waste grain, but they will also forage on small fish, amphibians, small mammals, and invertebrates that live in the flooded fields. Invertebrates, such as crayfish, can be found on canal banks and berms that separate the rice patties. Shallow water also attracts aquatic insects and other invertebrates, which can provide a source of prey for many wildlife species, such as long-billed curlew. Rice fields also provide resting, nesting, and breeding habitat similar to natural wetlands.

Associated with seasonally flooded agriculture idling is the potential loss of water within adjacent agricultural irrigation and return ditches, when crops are idled/shifted. Agricultural canals and ditches can contain wetland vegetation such as cattails, which provide cover for animals, and these canals and ditches provide forage, resting, nesting habitat and movement corridors for a variety of species (e.g., Pacific pond turtle, giant garter snake, tricolored blackbird, waterfowl, and wading birds), and could serve as migration corridors for various species of wildlife. The potential reduction in flows resulting from idling or shifting of seasonally irrigated crops could reduce habitat for those species that rely on habitat dependent agricultural return flows, with potentially significant impacts on to those species.

Cropland idling would result in fallow fields, which do not provide the same type of habitat as farmed fields, nor the forage base for animals, but which do provide habitat for early successional plants and the species that depend upon them, as well as providing areas that are relatively undisturbed, providing space for nests and burrows. Studies show that fallow fields and inactive farmland may provide suitable foraging, nesting, and/or dispersal habitat for many species of birds (Woodbridge 1998; California Rice Commission 2011).

Cropland idling/shifting has the potential to contribute to fragmentation and isolation of suitable wildlife habitat. Habitat fragmentation can have a significant negative impact to wildlife, by preventing species from moving or dispersing between areas. In the case of animals, different areas may be used for different life history needs, such as trees for nesting and grain fields for foraging, which may or may not overlap in time. The ability to move between different types of habitat or from one area of habitat to another area of similar habitat, on a seasonal or daily basis, is critical to the species success.

Cropland idling/shifting under long-term water transfer would occur in addition to standard farming practices, which include rotation of crops and fallowing of fields in response to market conditions and water availability, and to maintain soils and reduce problems with pests and disease. Because crop rotation and idling are standard practices, species that reside in agricultural areas adjust to these types of activities.

The distribution of these water year types within the action period is unknown. Additionally, the exact locations of cropland idling/shifting actions would not be known until the spring of each year, when water acquisition decisions are made.

The effects of cropland idling/shifting are evaluated on a qualitative analysis based on the proportional of the total acreage idled/shifted, the frequency with which cropland idling/shifting is expected to occur, the value of that cropland to special-status species, and the degree of habitat fragmentation that would likely occur. This evaluation includes consideration of the environmental commitments which are intended to avoid or minimize the potential impacts of this activity.

The effects of idling/shifting of upland crops (those crops that do not require seasonal inundation) are evaluated based on the representative crops of corn, alfalfa and tomatoes, although other upland crops could also be idled. The effects of idling/shifting seasonally flooded crops is represented by rice, which has historically been the crop most idled, but may also include other field crops that require seasonal flooding for at least one week as a management practice, or those which are flooded seasonally to enhance habitat values for a specific wildlife species (e.g., waterfowl).

For purposes of analyzing effects of cropland idling on the availability of habitat for assemblages of wildlife that are wide-ranging throughout the Sacramento Valley (i.e., migratory birds), reductions in crop production (in acres) were compared against baseline acreages for each crop type. Baseline crop acreages consisted of averages over a 5 year period (2008 – 2012) that included wet, below normal, dry, and critically dry water years.

3.8.2.1.3 Reservoirs

Water would be made available for transfers from Camp Far West, Collins, Folsom, Hell Hole, French Meadows, and McClure reservoirs. These reservoirs would continue to operate in accordance with their existing regulatory requirements and other commitments. Water transfers from these reservoirs would result in decreasing their storage and associated elevation and surface area, during the period when transfers would be made (July through September), and the ongoing reduction in storage until the reservoirs are refilled. Shasta, Oroville, New Bullards Bar, and Folsom reservoirs would not provide water for transfer, but their release patterns may be affected, in that the project may modify flows at compliance points in the mainstem rivers downstream of these reservoirs or in the Delta. Additionally, they could store water made available early in the season (April through June) before capacity is available to move the water through the Delta. Transfers could result in more or less water being released from these reservoirs at different times of year. 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.

Reservoirs are distinct from lakes and ponds in that they are artificial environments designed for use for water supply, flood control, and/or hydroelectric power production, although not all reservoirs serve all of these functions. These reservoirs are generally filled during periods of high runoff during the winter and spring, and emptied during the drier times of year to provide water for human and environmental needs. Depending on hydrologic conditions and downstream water needs, these reservoirs may not reach either their maximum storage elevation or be drawn down to their lowest allowed operating elevation (minimum pool) every year. A large proportion of the reservoirs’ volume is filled and drained each year, however, resulting in large changes in water surface elevation of tens to over a hundred feet between the spring and fall of a single year. Because the reservoir does not provide a reliable supply of water near their maximum elevations, natural communities around reservoirs typically consist of upland vegetation types that are not dependent on the reservoir for water. Species and natural communities requiring more substantial amounts of water may become established along riparian corridors tributary to the reservoirs or in areas along the margins of the reservoirs where water is retained when the reservoir water levels decline. Within the high water line of the reservoir, the annual cycle of inundation and desiccation prevents permanent vegetation from becoming established. This area may support ruderal species that can establish quickly when this habitat becomes available. This area is unlikely to support substantive cover or other habitat features suitable for wildlife immediately adjacent to the water. Wildlife that utilize reservoir habitats would typically use the nearshore areas on both the aquatic and terrestrial side of the water line. Open water areas are used infrequently and do not provide primary habitat.

The impacts of changes in reservoir storage in the Seller Service Area were evaluated based on the results of the transfer operations model which predicted changes in storage volume, elevation, and surface area on a monthly timestep. Substantial, systematic or prolonged changes in reservoir levels as a result of long-term water transfer storage and releases, particularly those that occur outside of the normal range of operation for that reservoir, could impact vegetation and wildlife species associated at or near water surface and within the drawdown zone, where water may be held longer or released sooner than it would have been under existing conditions. Changes in reservoir operations would also affect downstream riverine habitat, the effects of which are considered in Section 3.8.2.1.4.

These effects were evaluated against the existing conditions during the corresponding time period, considering the change in elevation and the value of the existing habitat to natural communities and special–status species associated with the reservoir.

3.8.2.1.4 Rivers and Creeks

As discussed in the preceding sections, water transfers would affect flows in the rivers and creeks within the Seller Service Area adjacent to and downstream of the areas where these activities would occur. There are no anticipated changes in conditions in the rivers and creeks in the Buyer Service Area. Changes in stream flows in the Seller Service Area could potentially affect natural communities, such as riverine, riparian, seasonal wetland, and managed wetland natural communities, which are reliant on groundwater for all or part of their water supply. These changes could propagate downstream and affect areas downstream of the location where pumping occurs, which may extend to the Sacramento River and Delta. To meet regulatory requirements, some minor modifications in the operation of the CVP and SWP may be required, which may affect storage and flow releases in some reservoirs within the area of analysis.

Groundwater substitution transfers were modeled using the SACFEM2013 groundwater model to assess potential changes to groundwater and surface water. Groundwater substitution pumping was simulated as an additional pumping stress on the system, above the baseline pumping volume. The annual volume of transfers was determined by comparing the supply in the seller service area to the demand in the buyer service area. The availability of supplies in the seller service area was determined based on data provided by the potential sellers. The demand was estimated using demand data provided by East Bay MUD and Contra Costa WD as well as the available capacity at the Delta export pumps to convey transfers. The available export capacity was determined from CalSim II model results. The CalSim II model currently only simulates conditions through WY 2003. The available capacity for south of delta exports was typically more limiting than the south of delta water supply demand. Because CalSim II results are only available through 2003, the SACFEM2013 model simulation was truncated at the end of WY 2003.

The analysis of supply and demand resulted in the potential to export groundwater substitution pumping transfers through the Delta during 12 of the years from 1970 through 2003 (33 years, SACFEM2013 simulation period). Each of the 12 annual transfer volumes was included in a single model simulation. Including each of the 12 years of transfer pumping in one simulation rather than 12 individual simulations allows for the potential compounding effects from pumping from prior years. Appendix D, Groundwater Model Documentation, includes more information about the use of SACFEM2013 in this analysis.

The results of the SACFEM2013 analysis estimated streamflow depletion from groundwater substitution throughout the Sacramento Valley. These estimates were included in Transfer Operations Model simulations of the action alternatives. The Transfer Operations Model results are the basis for the determination of potential effects to fish and their habitats. Appendix B, Water Operations Assessment, includes more details about the transfer operations model.

The analysis of potential impacts to stream flow in the Seller Service Area focused on the frequency and magnitude of changes in mean monthly flow rates by water year types (wet, above normal, below normal, dry, and critical), as compared to existing conditions, based on the modeling results. As discussed there, not every water body could be evaluated in the groundwater model; therefore, smaller water bodies adjacent to those modeled are assumed to respond in a similar way, with similar changes in flow magnitude and timing. Potential impacts to biological resources in these adjacent water bodies would be similar to those of the modeled streams.

For the Proposed Action and No Cropland Modifications Alternative, a screening analysis was conducted for smaller waterways for which groundwater modeling data were available to eliminate the need for biological analyses for streams in which substantial reductions in stream flow did not occur. If the flow reduction caused by implementing the transfer action would be less than one cubic feet per second (cfs) and less than ten percent change in mean flow by water year type, then no further analysis was required, because the effect was considered too small to have a substantial effect on terrestrial species.

The ten percent threshold was used to determine measurable flow changes based on several major legally certified environmental documents in the Central Valley (Trinity River Mainstem Fishery Restoration Record of Decision, December 19, 2000; San Joaquin River Agreement Record of Decision in March 1999; Freeport Regional Water Project Record of Decision, January 4, 2005; Lower Yuba Accord Final EIR/EIS). In these documents, there is consensus that differences in modeled flows of less than ten percent would be within the noise of the model outputs and beyond the ability to measure actual changes.

The one cfs minimum flow threshold was applied to each month during the entire modeled period, such that, if a change of greater than one cfs occurred in any one month during the modeled period, the waterway would be examined further for biological effects.

Combined, these two thresholds were used as an initial screening evaluation to determine whether further analyses were warranted to assess biological significant impacts because these two thresholds may not always translate into a significant biological effect on plant and wildlife species. Therefore, these further biological analyses included consideration of other physical and biological factors in addition to absolute and relative flow changes, including presence and timing of life stages of species, size of the waterway, timing of flow changes, and water year type.

Historical stream flow information from the USGS or the California Data Exchange Center for these streams were gathered where available and used as the measure of baseline flow. For locations for which historical flow data were limited or unavailable, a quantitative analysis was not possible; thus a qualitative discussion of potential impacts is included for these locations. No impacts would occur to groundwater in the No Action/No Project and No Groundwater Substitution alternatives and, therefore, this screening analysis did not apply.

For rivers and their major tributaries, including the Sacramento, American, Feather, Yuba, Bear, San Joaquin, and Merced rivers, transfer operations model outputs were used to assess impacts to surface water flows.

The evaluation of potential impacts to natural communities and special-status vegetation and wildlife considered the magnitude and frequency of streamflow depletion in small streams, both as depicted by the groundwater model. These changes are evaluated for small streams, as CVP and SWP operations could not be altered to offset any changes in these streams. The impacts of groundwater substitution on the larger rivers and CVP and SWP reservoirs are carried from the groundwater model to the transfer operations model, but this model also incorporates other changes in hydrology associated with cropland idling/shifting, reservoir releases, and water conservation, so the combined effect of all these activities are evaluated concurrently for these water bodies.

The impact analysis assumes that an action alternative would have an adverse effect on vegetation and associated wildlife within each river system if it resulted in: a substantially reduced source water for natural communities (e.g., loss of seasonal inundation of adjacent floodplain); flow changes impacting/affecting wildlife movement, foraging pattern, breeding, or predation risks; flow changes altering vegetation communities (e.g., increased in stream flow causing erosion of stream banks resulting in the loss of shaded riverine habitat); flow changes impacting/affecting vegetation recruitment or establishment, or changes in the timing of flows such that natural geomorphic processes do not occur.

3.8.2.1.5 Sacramento-San Joaquin Delta

The changes described above for rivers and streams would be also apply downstream into the Delta. Additionally, exports would vary in timing and magnitude with implementation of water transfers. These changes were modeled using the Transfers Operations Model. To assess the potential impacts of these changes on vegetation and wildlife resources in the Delta, the difference in Delta outflow and the location of X2, defined as the distance (in kilometers) up the axis of the estuary to the daily averaged near-bottom 2-practical salinity units (psu) isohaline (Jassby et al. 1995), were considered. Changes in these parameters were used to qualitatively assess the impacts of long-term water transfers on natural communities and special-status species. Modeled changes in Delta outflow or X2 relative to existing conditions were considered substantial and required further analysis if they were greater than ten percent.

3.8.2.1.6 Natural Community Impacts

The natural community impacts assessment included an analysis of impacts on wetlands and upland habitat types. Natural communities that qualify as wetlands are tidal perennial aquatic, saline emergent wetland, tidal freshwater emergent wetland, non-tidal fresh emergent wetland, natural seasonal wetland, managed seasonal wetland, natural seasonal wetland, valley/foothill riparian habitat, and montane riparian habitat. Natural upland communities include grassland, inland dune scrub, upland scrub, and upland cropland habitat.

The impacts of water transfer actions on natural communities were assessed qualitatively based on possible changes in the distribution and extent of the natural communities affected, either through conversion to other habitat types or through change in quality relative to existing conditions. This assessment was conducted by assessing the types of natural communities that would potentially occur in areas where various water transfer activities, as described above, would occur. The type, frequency, magnitude and duration of these transfer activities, as described in the preceding section, were assessed relative to the needs of those natural communities. This approach was used to assess whether these activities would be likely to fragment existing natural communities, disrupt important wildlife management areas, or reduce habitat patch size.

3.8.2.1.7 Species Impacts Assessment

The species impacts analysis includes an assessment of the direct and indirect impacts of implementing the long-term water transfer actions on terrestrial species. The assessment evaluated permanent and temporary impacts on terrestrial natural resources, including special-status species, and is based on impacts on natural communities that the species use within the area of analysis, the species' geographic distribution, and records for these species in the area of analysis maintained in the CNDDB, and from other sources. This analysis included consideration of the way in which the habitat is used by different species, e.g., breeding, foraging, or dispersal habitat. It is important to note that although wildlife species are associated with certain natural communities, it does not necessarily indicate that wildlife species are restricted to those areas. The analysis indicates that habitat areas have a higher probability of species occurrence compared with areas identified as non-habitat. The analysis does not incorporate microhabitat conditions and other site-specific variables that may further restrict a species use within a natural community.

Plant Species

For plant species, species-habitat associations were defined (Table I-2, Appendix I) and the extent of potential permanent and/or temporary impacts on individual special-status species was based upon the impacts on their associated natural community types. Plants are often associated with specific microhabitats within the natural community and generally have localized occurrences in the region and in their suitable habitat. The analysis does not analyze the impacts of long-term water transfers at the microhabitat level; any loss or alteration of a natural community associated with a plant species is assumed to be a loss of suitable habitat for the species.

Impacts to plant species were assessed qualitatively, based on predicted changes to land use or water availability that could affect species distribution. Direct and indirect impacts of implementing transfers could include the alteration of species composition, establishment of invasive species, and changes to natural communities that result in removal, conversion, or fragmentation of the community.

Wildlife Species

For wildlife species, species-habitat associations were developed and defined (Table I-1, Appendix I) based on literature and review of species databases, including CNDDB and CWHR. Wildlife species and natural communities' relationships are generally not as specific as for plant species. Wildlife species generally occur in several habitat types and move among them. Thus, where necessary, the analysis evaluates the impacts to wildlife species both on a natural community and species level. Hydrologic impacts on wildlife species were assessed qualitatively based on extrapolation of groundwater and surface water modeling results to the species habitat requirements.

Direct and indirect impacts on wildlife communities may include habitat degradation or removal, displacement of wildlife, project-related impacts on adjacent habitat (e.g., changes in hydrology in adjacent areas), and habitat fragmentation leading to disruption of breeding, dispersal, and/or foraging behaviors.

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, 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 CCR Sections 670.2 or 670.5; or in 50 CFR. 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 ESA;
- 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 long-term water transfers and identifies the impacts associated with the No Action/No Project Alternative.

3.8.2.3.1 Seller Service Area

Groundwater Levels

There would be no impacts to groundwater levels under the No Action/No Project Alternative and therefore there would be no impacts on natural communities that rely on groundwater.

Impacts on Natural Communities: Because there would be no increase in the amount of groundwater pumped for agricultural uses under the No Action/No Project Alternative, there would be no impacts to natural communities that rely on groundwater for all or part of their water supply.

Impacts on Special-Status Species: Because there would be no increase in the amount of groundwater pumped for agricultural uses under the No Action/No Project Alternative, there would be no impacts to special-status species.

Reservoirs

The No Action/No Project Alternative would not impact reservoir storage, elevation, and reservoir surface area.

Impacts on Natural Communities: The No Action/No Project Alternative would not result in changes to reservoir storage, elevation, or surface area relative to existing conditions. The No Action/No Project Alternative would have no impact on surrounding lacustrine communities along reservoirs within the area of analysis.

Impacts on Special-Status Wildlife: The No Action/No Project Alternative would have no impact on special-status wildlife species associated with lacustrine communities along these reservoirs, as there would be no impact to natural communities.

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.

Impacts on Natural Communities: The No Action/No Project Alternative would have no impact on surrounding natural communities in rivers and creeks in the Sacramento and San Joaquin river watersheds, because flows would not be changed from existing conditions.

Impacts on Special-Status Wildlife: The No Action/No Project Alternative would have no impact on special-status species that are associated with the rivers and creeks in the Sacramento and San Joaquin river watersheds, because flows would not be changed from existing conditions.

Delta

The No Action/No Project Alternative would not alter flows through the Delta Region compared to existing conditions.

Impacts on Natural Communities: The No Action/No Project Alternative would have a no impact on surrounding Delta natural communities, as there would be no change in the volume or timing of inflows or exports relative to existing conditions.

Impacts on Special-Status Wildlife: The No Action/No Project Alternative would have no impact on special-status species that are associated with Delta habitat, as there would be no change in their habitat.

Cropland Idling/Crop Shifting

There would be no cropland idling/shifting under the No Action/No Project Alternative and no effects to suitable habitat relative to existing conditions.

Impacts on Natural Communities: The No Action/No Project Alternative would have no impact on natural communities as a result of cropland idling/crop shifting, as these practices would remain the same as under existing conditions.

Impacts on Special-Status Wildlife: The No Action/No Project Alternative would have no impact on special-status species that are associated with upland cropland habitat and seasonally flooded agriculture.

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.

Impacts on Natural Communities: The No Action/No Project Alternative would have no impact on surrounding lacustrine communities or wetland habitat around San Luis Reservoir, as it would not result in changes to reservoir storage, elevation, or surface area relative to existing conditions.

Impacts on Special-Status Wildlife: The No Action/No Project Alternative would have no impact on special-status wildlife species associated with lacustrine communities and wetland habitat, as it would have no impact on natural communities.

Effects of Water Use
Cropland idling/shifting under the No Action/No Project Alternative would not decrease suitable habitat relative to existing conditions.

Upland Cropland Habitat & Seasonally Flooded Agriculture
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. Farmers would be expected to continue current practices of idling some land temporarily, depending on crop rotation patterns or soil maintenance purposes.

Impacts on Natural Communities: The No Action/No Project Alternative would have no impact on natural communities, relative to existing conditions, as land use practices would remain the same.

Impacts on Special-Status Plants and Wildlife: The No Action/No Project Alternative would have no impact on special-status species that are associated with upland cropland habitat in the Buyer Service Area.

3.8.2.3.3 Special-Status Species Habitat
The No Action/No Project Alternative would not impact special-status species in the area of analysis through modification of suitable lacustrine, wetland, riverine, and upland habitat. Under the No Action/No Project Alternative, conditions would be the same as the existing conditions in terms of groundwater pumping, farming practices, reservoir operations, and river and stream flows. Special-status species, including Pacific pond turtle, giant garter snake, greater sand hill crane, black tern, long-billed curlew, purple martin, tricolor blackbird,

white-faced ibis, yellow-headed blackbird, and San Joaquin kit fox would not be impacted as a result of the No Action/No Project Alternative.

Impacts on Special-Status Plants and Wildlife: The No Action/No Project Alternative would not result in changes to existing water transfer practices. Therefore, no impacts would occur to special-status plants and wildlife as a result of the No Action/No Project Alternative.

3.8.2.3.4 Migratory Bird Habitat

The No Action/No Project Alternative would not impact migratory birds in the area of analysis through modification of suitable lacustrine, wetland, riverine, and upland habitat. Under the No Action/No Project Alternative, conditions would be the same as the existing conditions in terms of groundwater pumping, farming practices, reservoir operations, and river and stream flows. Migratory bird habitat would not be impacted as a result of the No Action/No Project Alternative.

Impacts on Migratory Birds: The No Action/No Project Alternative would not result in changes to existing water transfer practices. Therefore, no impacts would occur to migratory birds as a result of the No Action/No Project Alternative.

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

3.8.2.4.1 Seller Service Area

Groundwater Levels

Groundwater substitution under the Proposed Action could decrease available groundwater for natural communities 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, 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, 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 shallower than 15 feet below ground 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 groundwater substitution effects on natural communities due to changes in stream flow are discussed below under Rivers and Creeks.

Impacts on Natural Communities: The Proposed Action would have a less than significant effect on natural communities because increases in drawdown would be too small to cause a substantial effect on vegetation that relies on ~~shallow~~ groundwater. Because groundwater modeling shows that shallow groundwater levels are more than 15 feet deep 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 with shallow groundwater 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.

Impacts on Special-Status Plants: Because the natural communities where special-status plants occur would not be significantly affected, impacts to special-status plants would be less than significant. Impacts to special-status wildlife as a result of groundwater substitution transfers are discussed further under Rivers and Creeks.

Impacts on Wildlife: Because the natural communities where special-status wildlife occur would not be significantly affected, impacts to special-status wildlife would be less than significant. Impacts to special-status wildlife as a result of groundwater substitution transfers are discussed further under Rivers and Creeks.

Reservoirs

The Proposed Action could impact reservoir storage and reservoir surface area. 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.

Table 3.8-2 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 3.8-2. Changes in Non-Project Reservoir Storage between the No Action/No Project Alternative and the Proposed Action (in 1,000 AF)

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
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 (AF) (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 (86.1 to 97.8 acres, or 12.4 to 18.2 percent). Surface area would change by less than ten percent during the remaining months and water year types.

Up to 47,000 AF 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.

Impacts on Natural Communities: Long-term water transfer actions under the Proposed Action would have a less than significant impact on natural communities associated with reservoirs because the changes caused would occur within the normal range of operations for the reservoirs.

Impacts on Special-Status Wildlife: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status wildlife species associated with reservoirs because the changes caused would be within the normal range of operations for the reservoirs.

Rivers and Creeks

Sacramento River Watershed

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. The following section provides the impacts to natural communities and special-status species as a result of changes in timing and flow rate for rivers, streams, and associated tributaries under the Proposed Action.

Under the Proposed Action, transfers could directly impact natural communities by changing the timing and volume of flows within rivers.

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 3.8-3).

Table 3.8-3. Screening Evaluation Results for Smaller Streams in the Sacramento River Watershed for Detailed Vegetation and Wildlife Impact Analysis for the Proposed Action

Waterway	>1 cfs reduction?	>10% reduction?	Data Source
Deer Creek (Tehama County)	N	-	N/A
Antelope Creek	N	-	N/A
Paynes Creek	N	-	N/A
Seven Mile Creek	N	-	N/A
Elder Creek	N	-	N/A
Mill Creek (Tehama County)	N	-	N/A
Thomes Creek	N	-	N/A
Mill Creek (tributary to Thomes Creek)	N	-	N/A
Stony Creek	Y	Y	USGS Gage 11388000; Water Years 1976-2003
Butte Creek	Y	N	USGS Gage #-11390000; Water Years 1976-2003
Cache Creek	Y	Y	USGS Gage #-11452500; Water Years 1975-2013
Eastside/Cross Canal	Y	U	N/A
Auburn Ravine	N	-	N/A
Coon Creek	Y	Y	Bergfeld personal communication 2014
Dry Creek (tributary to Bear River)	Y	U	N/A
Honcut Creek	N	-	N/A
South Fork Honcut Creek	Y	U	N/A
North Fork Honcut Creek	Y	U	N/A
Colusa Basin Drain	Y	N	DWR Gage # WDL A02976; Water Years 1976-2003
Lower Sycamore Slough	Y	U	N/A
Upper Sycamore Slough	N	-	N/A
Wilkins Slough Canal	Y	U	N/A
Sand Creek	Y	U	N/A
Cortina Creek	Y	U	N/A
Lurline Creek	Y	U	N/A

Waterway	>1 cfs reduction?	>10% reduction?	Data Source
Stone Corral Creek	N	Y	USGS Gage #11390672; Water Years 1976-2003
Funks Creek	N	-	N/A
Freshwater Creek	N	-	N/A
Putah Creek	Y	N	USGS Gage # 11454000; Water Years 1976-2003
Big Chico Creek	N	-	N/A
Little Chico Creek	Y	Y	DWR Gage # WDL A04280; Water Years 1976-1996
Salt Creek	Y	U	N/A
Willow Creek (nr Williams)	Y	U	N/A
South Fork Willow Creek	N	Y	USGS Gage #11390655; Water Years 1976-2003
French Creek	N	-	N/A
Spring Valley Creek	N	-	N/A
Walker Creek (Willow Creek tributary)	N	-	N/A
North Fork Walker Creek	N	-	N/A
Wilson Creek	N	-	N/A

Y = Yes; N = No; U = Unknown

Note: Darkened rows indicate that a detailed effects analysis was not conducted because both criteria were not met.

Reductions in flows in Cache, Stony, Coon, and Little Chico creeks would be greater than ten percent and greater than one cfs (Table 3.8-3) and, therefore, the effects of the Proposed Action on vegetation and wildlife along these creeks are discussed in detail below.

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. Flow reductions as the result of groundwater declines would be observed at monitoring wells in the region and adverse effects on riparian vegetation 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. Implementation of these measures would reduce potentially significant effects on vegetation and wildlife resources associated with small streams for which no historical flow data are available to less than significant.~~

Impacts on Natural Communities: Long-term water transfer actions under the Proposed Action would have a less than significant impact on surrounding natural communities (such as non-tidal fresh emergent wetlands, natural seasonal wetland, managed seasonal wetlands, valley/foothill riparian) along the Sacramento River, because changes in stream flow attributable to the Proposed Action would fall within historical ranges.

Impacts on Special-Status Wildlife: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status wildlife species that are associated with the Sacramento River because flow changes to the Sacramento River would fall within historical ranges.

Cache, Stony, Coon, and Little Chico creeks, and the Bear River would potentially experience a greater than ten percent change in mean monthly flows in at least one water year type and month of the year under the Proposed Action. The potential impacts in these waterways are discussed individually below.

Cache Creek

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 3.8-4), but would be greater than ten percent lower in individual water year types within months between May and November (Table 3.8-5). 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 3.8-5). Flow reductions of this magnitude would have a substantial effect on the riparian natural communities associated with the stream.

Impacts on Natural Communities: The effect of groundwater substitution on natural communities under the Proposed Action could be significant, because groundwater substitution pumping would cause stream flows in Cache Creek to be substantially reduced. The reduction in stream flow would result in a substantial adverse effect on riparian natural communities associated with Cache Creek because root zones would be dewatered to such an extent to cause die back of riparian tree and shrub foliage, branches or entire plants. Implementation of Mitigation Measure GW-1 (See Section 3.3, Groundwater Resources), would reduce this effect to less than significant, 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, and natural communities would recover from any adverse effects of reduced flows, and would not be substantially reduced in area or geographic range.

Impacts on Special-Status Wildlife: The Proposed Action would could a significant impact on special-status wildlife species associated with riparian natural communities along Cache Creek, because groundwater substitution pumping would cause stream flows in Cache Creek to be substantially reduced which would cause a substantial reduction in the area or habitat quality of riparian natural communities associated with the creek that provide habitat to special-status wildlife species. Implementation of Mitigation Measure GW-1, would mitigate this effect, 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. Implementation of these measures would reduce significant effects on special-status wildlife because riparian vegetation that provides habitat to these species would recover as the result of natural groundwater recharge.~~

Table 3.8-4. Average Monthly Flow in Cache Creek Under the No Action/No Project Using Historical Data and the Proposed Action using the Groundwater Model and Reduction in Flow due to the Proposed Action[1]

Month	Flow (cfs)			Percent Reduction
	No Action/ No Project[1]	Proposed Action	Reduction	
Jan	1,255.2	1,251.2	4.1	0.3
Feb	1,625.1	1,621.8	3.4	0.2
Mar	1,706.0	1,702.6	3.4	0.2
Apr	801.8	800.0	1.8	0.2
May	157.2	155.6	1.6	1.0
Jun	34.4	33.1	1.3	3.9
Jul	18.4	17.4	1.0	5.6
Aug	16.8	15.8	1.1	6.3
Sep	16.0	14.9	1.0	6.5
Oct	16.8	15.8	1.0	5.7
Nov	72.5	71.3	1.2	1.7
Dec	444.8	442.7	2.1	0.5

USGS data, streamflow gage for Cache Creek near Yolo, gage #11452500 (1975-2013). Groundwater model data (1976-2003).

Table 3.8-5. Average Monthly Flow by Water Year Type in Cache Creek Under the No Action/No Project Using Historical Data and the Proposed Action using the Groundwater Model and Reduction in Flow due to the Proposed Action[1]

Month	WYT	Flow (cfs)			Percent Reduction
		No Action/ No Project[1]	Proposed Action	Reduction	
Jan	W	2,677.3	2,673.7	3.8	0.1
	AN	1,604.0	1,595.3	8.7	0.5
	BN	634.7	630.4	4.3	0.7
	D	312.5	310.1	2.4	0.8
	C	231.5	228.7	2.8	1.2
Feb	W	3,713.8	3,711.6	2.3	0.1
	AN	1,945.8	1,941.6	4.1	0.2
	BN	1,014.2	1,009.7	4.5	0.4
	D	193.1	191.1	2.0	1.0
	C	168.2	162.9	5.3	3.2
Mar	W	4,159.3	4,157.3	2.1	0.0
	AN	1,758.1	1,754.7	3.5	0.2
	BN	805.1	802.7	2.4	0.3
	D	225.5	223.5	2.0	0.9
	C	103.1	96.6	6.5	6.3
Apr	W	2,170.1	2,168.2	1.9	0.1
	AN	589.7	586.5	3.2	0.5
	BN	337.0	334.9	2.1	0.6
	D	28.2	26.4	1.7	6.2
	C	11.0	10.4	0.7	6.1
May	W	367.2	365.3	1.9	0.5
	AN	219.3	216.5	2.8	1.3
	BN	60.9	60.1	0.8	1.3
	D	15.1	13.8	1.6	10.3
	C	3.8	3.2	0.4	11.5
Jun	W	86.6	84.8	1.8	2.1
	AN	33.4	30.9	2.5	7.4
	BN	6.5	5.3	1.2	18.9
	D	7.9	6.8	1.1	13.5
	C	0.6	0.5	0.2	27.9
Jul	W	43.0	41.2	1.8	4.1
	AN	18.1	16.9	1.2	6.4
	BN	7.6	6.4	1.2	15.8
	D	6.4	5.5	0.9	13.5
	C	0.6	0.4	0.1	21.5
Aug	W	41.1	39.4	1.7	4.1
	AN	13.8	12.6	1.2	8.4
	BN	3.2	2.8	0.4	13.0
	D	7.1	5.8	1.3	18.2
	C	0.5	0.4	0.1	18.0

Month	WYT	Flow (cfs)			Percent Reduction
		No Action/ No Project[1]	Proposed Action	Reduction	
Sep	W	37.6	35.9	1.7	4.6
	AN	16.2	14.6	1.7	10.2
	BN	1.3	1.3	0.0	0.0
	D	6.9	6.2	0.7	10.6
	C	0.9	0.8	0.1	13.4
Oct	W	29.9	28.4	1.5	5.0
	AN	16.5	15.9	0.5	3.3
	BN	2.0	2.0	0.0	0.0
	D	17.5	16.8	0.7	4.1
	C	4.0	3.1	0.9	22.8
Nov	W	197.1	195.1	2.0	1.0
	AN	11.0	10.6	0.4	3.8
	BN	7.3	7.3	0.0	0.0
	D	39.2	37.5	1.7	4.5
	C	2.0	1.4	0.6	30.5
Dec	W	963.4	961.6	1.8	0.2
	AN	399.6	396.8	2.8	0.7
	BN	170.7	170.7	0.0	0.0
	D	276.9	274.1	2.7	1.0
	C	26.8	25.1	1.8	6.7

[1] USGS data, stream gage Cache Creek near Yolo, gage #11452500 (1975-2013). Groundwater model data (1976-2003).

Stony Creek

Groundwater substitution 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 3.8-6).

Table 3.8-7 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.

Table 3.8-6. Average Monthly Flow in Stony Creek Under the No Action/No Project Using Historical Data and the Proposed Action using the Groundwater Model and Reduction in Flow due to the Proposed Action

Month	Flow (cfs)			Percent Reduction
	No Action/ No Project[1]	Proposed Action	Reduction	
Jan	1403.0	1401.9	1.1	0.1
Feb	1556.6	1555.6	1.0	0.1
Mar	891.2	890.2	0.9	0.1
Apr	168.5	167.6	0.9	0.5
May	207.1	206.5	0.7	0.3
Jun	74.5	73.8	0.7	0.9
Jul	31.0	30.3	0.6	2.0
Aug	40.9	40.3	0.6	1.5
Sep	40.5	40.0	0.5	1.2
Oct	58.8	57.2	1.6	2.7
Nov	112.8	111.7	1.1	1.0
Dec	562.4	561.4	1.0	0.2

[1] USGS data, streamflow gage for Stony Creek below Black Butte Dam, gage #11388000 (1976-2003). Groundwater model data (1976-2003).

Table 3.8-7. Average Monthly Flow by Water Year Type in Stony Creek Under the No Action/No Project Using Historical Data and the Proposed Action using the Groundwater Model and Reduction in Flow due to the Proposed Action[1]

Month	WYT	Flow (cfs)			Percent Reduction
		No Action/ No Project[1]	Proposed Action	Reduction	
Jan	W	2662.6	2661.9	0.7	0.0
	AN	1841.4	1839.9	1.6	-0.1
	BN	53.8	53.1	0.6	-1.2
	D	439.9	438.9	1.0	-0.2
	C	488.7	487.1	1.6	-0.3
Feb	W	3660.6	3659.9	0.7	0.0
	AN	1905.4	1904.5	0.9	0.0
	BN	105.0	104.3	0.6	0.6
	D	104.6	103.7	0.9	0.9
	C	54.2	52.8	1.5	2.7

Month	WYT	Flow (cfs)			Percent Reduction
		No Action/ No Project[1]	Proposed Action	Reduction	
Mar	W	2176.3	2175.6	0.7	0.0
	AN	698.9	698.1	0.8	0.1
	BN	158.0	157.4	0.6	0.4
	D	228.6	227.8	0.9	0.4
	C	48.9	47.4	1.4	2.9
Apr	W	335.7	335.1	0.6	0.2
	AN	173.0	172.3	0.8	0.5
	BN	84.7	84.1	0.6	0.7
	D	66.7	65.8	0.9	1.4
	C	49.6	48.3	1.4	2.8
May	W	449.9	449.3	0.6	0.1
	AN	201.7	201.2	0.5	0.3
	BN	55.1	54.5	0.5	1.0
	D	101.7	100.8	1.0	0.9
	C	10.8	10.2	0.6	5.6
Jun	W	177.7	177.1	0.6	0.3
	AN	47.2	46.7	0.5	1.1
	BN	30.0	29.5	0.5	1.7
	D	24.4	23.3	1.1	4.3
	C	10.5	9.9	0.5	5.0
Jul	W	47.9	47.4	0.6	1.2
	AN	46.1	45.6	0.5	1.1
	BN	26.5	26.0	0.5	1.9
	D	17.0	16.2	0.8	5.0
	C	10.9	10.3	0.5	4.9
Aug	W	80.0	79.5	0.6	0.7
	AN	47.6	47.1	0.5	1.1
	BN	23.4	22.9	0.5	2.0
	D	15.3	14.3	1.0	6.2
	C	10.2	9.6	0.5	5.4
Sep	W	64.7	64.2	0.5	0.8
	AN	66.5	66.0	0.6	0.8
	BN	13.0	12.5	0.5	3.5
	D	16.8	16.0	0.8	5.0
	C	14.9	14.8	0.1	0.9
Oct	W	108.2	107.4	0.7	0.7
	AN	44.2	43.1	1.1	2.6
	BN	27.1	26.4	0.7	2.7
	D	32.2	30.8	1.4	4.5
	C	33.0	29.7	3.3	10.0

Month	WYT	Flow (cfs)			Percent Reduction
		No Action/ No Project[1]	Proposed Action	Reduction	
Nov	W	255.8	255.1	0.7	0.3
	AN	35.3	34.5	0.8	2.2
	BN	36.7	36.0	0.7	1.9
	D	54.1	53.0	1.1	2.1
	C	45.6	43.5	2.0	4.5
Dec	W	1234.8	1234.1	0.7	0.1
	AN	367.6	366.9	0.6	0.2
	BN	53.8	52.9	0.7	1.2
	D	363.0	362.0	1.0	0.3
	C	80.7	78.9	1.8	2.2

[1.] USGS data, streamflow gage for Stony Creek below Black Butte Dam, gage #11388000 (1976-2003). Groundwater model data (1976-2003).

Impacts on Natural Communities: The effect of groundwater substitution on natural communities under the Proposed Action could be significant, because groundwater substitution pumping would cause stream flows in Stony Creek to be substantially reduced. The reduction in stream flow would result in a substantial adverse effect on riparian natural communities associated with Stony Creek because root zones would be dewatered to such an extent to cause die back of riparian tree and shrub foliage, branches or entire plants. Implementation of Mitigation Measure GW-1 (See Section 3.3, Groundwater Resources) would reduce this effect to less than significant, 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, and natural communities would recover from any adverse effects of reduced flows, and would not be substantially reduced in area or geographic range.~~

Impacts on Special-Status Wildlife: The Proposed Action would have a significant impact on special-status wildlife species associated with riparian natural communities along Stony Creek, because groundwater substitution pumping would cause stream flows in Stony Creek to be substantially reduced which would cause a substantial reduction in the area or habitat quality of riparian natural communities associated with the creek that provide habitat to special-status wildlife species. Implementation of Mitigation Measure GW-1 would mitigate this effect, 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. Implementation of these measures would reduce significant effects on special-~~

~~status wildlife because riparian vegetation that provides habitat to these species would recover as the result of natural groundwater recharge.~~

Coon Creek

Groundwater substitution 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 Alternative 2.. 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 flow reductions would likely be less than ten percent and only occur in one month during above normal water years the flow reduction would not substantially reduce natural communities or wildlife species habitat.

Impacts on Natural Communities: Long-term water transfers under the Proposed Action would have a less than significant impact on natural communities because flow reductions would likely be less than ten percent and would occur only during above average water years.

Impacts on Special-Status Wildlife: Long-term water transfers under the Proposed Action would have a less than significant impact on special status wildlife habitat because flow reductions would likely be less than ten percent and would occur only during above average water years.

Little Chico Creek

Groundwater substitution 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 ~~1995~~ 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 Project, there would be the same number of years with no flow or flows less than 0.5 cfs in at least month. In fact, flows would be less than 0.5 cfs under both the No Action/No Project Alternative and Proposed Project in the exact same months of the evaluated period except one (less than 0.5 cfs under the Proposed Project in August 1993) and there would be no flow in the exact same 27 months between the No Action/No Project Alternative and Proposed Project. Therefore, the Proposed Project 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 wildlife species habitat.

Impacts on Natural Communities: Long-term water transfers under the Proposed Action would have a less than significant impact on natural communities because flow reductions would be small and only occur during months when the creek is essentially dry.

Impacts on Special-Status Wildlife: Long-term water transfers under the Proposed Action would have a less than significant impact on special status wildlife habitat because flow reductions would be small and only occur during months when the creek is essentially dry.

Bear River

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. The flow changes that would occur on the Bear River under the Proposed Action would have a less than significant impact on natural communities.

Impacts on Natural Communities: Flow decreases, resulting from long-term water transfer actions under the Proposed Action would have a less than significant impact on natural communities. 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.

Impacts on Special-Status Wildlife: Based on the changes in flows and natural communities previously described, long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status wildlife species associated with Bear River, as natural communities that support these species would not be affected, as described above.

San Joaquin River Watershed

San Joaquin River

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 not be considered substantial.

Impacts on Natural Communities: Long-term water transfer actions under the Proposed Action would have a less than significant impact on natural communities along the San Joaquin River, including seasonal wetland, valley/foothill riparian, and grasslands, because flow reductions would be too small to substantially affect natural communities.

Impacts on Special-Status Wildlife: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status wildlife species along the San Joaquin River, because flow changes would be too small to substantially affect these species habitats and be within the natural range of variability and, thus, would not affect special-status species.

Merced River

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.

Impacts on Natural Communities: Long-term water transfer actions under the Proposed Action would have a less than significant impact on natural communities along the Merced River, as flow reductions would be too small to substantially affect natural communities.

Impacts on Special-Status Wildlife: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status wildlife species along the Merced River, because flow reductions would be too small to affect natural communities or associated special-status species.

Delta

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 11 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.

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

Impacts on Natural Communities: Long-term water transfer actions under the Proposed Action would have a less than significant impact on natural communities associated with the Delta. No impacts are expected to occur to tidal perennial aquatic habitat, saline emergent wetland, and tidal fresh emergent wetland, because the project would have negligible effects on Delta hydrology, that 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.

Impacts on Special-Status Plants and Wildlife: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status plant and wildlife species associated with the Delta, because the project would have very small effects on Delta hydrology that would be too small to substantially affect natural communities or associated special-status species.

Cropland Idling/Crop Shifting

Upland Crop Habitat

Cropland idling/shifting under the Proposed Action could alter habitat for upland species relative to the No Action/No Project Alternative. The maximum potential acreage of upland crop that could be idled under the Proposed Action would be 800 acres of tomatoes, 2,700 acres of corn, and 5,000 acres of alfalfa/sudan grass, for a total of 8,500 acres, as indicated in Table 3.8-8. The maximum allowed acreage of corn would be idled/shifted in Solano County, just less than the 1,500 acres indicated. This would leave approximately 5,900 acres in corn in Solano County, which is well within, the historical range of 2,800 to 13,700 acres.

Table 3.8-8. Upland Cropland Idling/Shifting under the Proposed Action

Region	Alfalfa/ Sudan Grass	Corn	Tomatoes	Total
Glenn, Colusa, Yolo Counties	1,400	400	400	2,200
Butte and Sutter Counties	600	800	400	1,800
Solano County	3,000	1,500	-	4,500
Total	**5,000**	**2,700**	**800**	**8,500**

Most forage and other habitat would still be available to wildlife species within the Sacramento Valley, as indicated in Table 3.8-8. Crop idling in Glen, 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 in conjunction with the environmental commitments described in Section 2.3.2.4, and because this is within the historic range of variation for the individual crops, cropland idling/shifting in the Seller Service Area is not expected to significantly impact wildlife species dependent on upland cropland habitat.

Impacts on Natural Communities: Long-term water transfer actions under the Proposed Action would have a less than significant impact on upland cropland habitat in the Seller Service Area, as the amount of cropland idled would generally be small and within the historical range of variation.

Impacts on Special-Status Plants and Wildlife: Long-term water transfer actions under the Proposed Action would have a less than significant impact on plant and wildlife species associated with upland cropland habitat because the lack of impacts on the natural communities.

Seasonal Flooded Agriculture

Cropland idling/shifting under the Proposed Action could alter the amount of suitable habitat for natural communities and special-status wildlife species 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 51,473 acres throughout the Sacramento River valley (Table 3.8-9).

Table 3.8-9. 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	40,704 (16%)	10,769 (11%)	0 (0%)	51,473 (11%)

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.

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.

Potential impacts on special-status wildlife resulting from cropland idling/shifting ~~These~~ would be minimized by the Environmental Commitments described in Section 2.3.2.4 that would preserve habitat and natural communities in canals and ditches which may serve as movement corridors and minimize cropland idling/shifting in areas with known occupancy or high probability of occurrence of special-status wildlife.

Impacts on Natural Communities: Long-term water transfer actions under the Proposed Action would have a less than significant impact on seasonally flooded agricultural habitat communities in the Seller Service Area, because Environmental Commitments limit effects on seasonally flooded agricultural fields and associated natural communities.

Impacts on Special-Status Plants and Wildlife: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status plant and wildlife species associated with seasonally flooded agriculture habitat because of the lack of impact to natural communities and maintenance of movement corridors within the landscape. Additional special-status species analysis is provided in 3.8.2.4.3 Special-Status Species.

Impacts on Migratory Birds: For the millions of birds that use rice fields during winter migration, this small reduction in crops planted is not expected to affect the amount of post-harvest flooded agriculture that provides important winter forage for migratory birds, particularly waterfowl and shorebirds. 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 project 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, particularly for Sand hill cranes, if those areas are not available to flood up because they were not planted.

Long-term water transfer actions under the Proposed Action would have a less than significant impact on migratory birds associated with seasonally flooded agriculture habitat because the maximum reduction in rice production would be within the historic range of variation, cropland idling/shifting would be minimized in known wintering areas that support high concentrations of wintering waterfowl and shorebirds, -and water transfers will not include rice decomposition water and so will not reduce the availability of post-harvest forage. Additional migratory bird analysis is provided in 3.8.2.4.3 Migratory Birds.

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.

Impacts on Natural Communities: Long-term water transfer actions under the Proposed Action would have a less than significant impact on lacustrine and other natural communities around San Luis Reservoir because the changes in storage would fall within the normal range of operations of the reservoir and would comply with all existing operational requirements, and there would not be substantially reduced in area or geographic range of lacustrine natural communities.

Impacts on Special-Status Wildlife: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status wildlife species associated with lacustrine and other natural communities around San Luis Reservoir because the changes in storage would fall within the normal range of operations of the reservoir and would comply with all existing operational requirements.

Effects of Water Use

Upland Crop Habitat

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 long-term water transfer actions. The amount of water available for purchase and the way in which water could be used, the effects of using this water on natural resources would be within the range of existing activities each CVP contract and associated BOs. Based on this, there would be no new effects on natural habitats or wildlife species in the Buyer Service Area.

Impacts on Natural Communities: Long-term water transfer actions under the Proposed Action would have a less than significant impact on natural communities in the Buyer Service Area because the effects of using the water would be within the range of existing activities under the buyers' CVP contract and associated BOs.

Impacts on Special-Status Wildlife: Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status wildlife species associated with upland crops because the water would be used on previously farmed lands and would not impact the natural communities upon which these wildlife species depend.

3.8.2.4.3 Special-Status Species

Special-Status Plant Species

The Proposed Action could impact wetlands that provide suitable habitat for Ahart's dwarf rush, Sanford's arrowhead, Red Bluff dwarf rush, and saline clover. The effects of cropland idling/shifting and groundwater substitution on the wetland habitat that special-status plant species depend on would be small and temporary as was described in the previous sections.

Seller Service Area

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.

Environmental Commitments would reduce potential impacts due to cropland idling/shifting to less than significant by ensuring canals bordering rice parcels continue to carry water even when adjacent parcels are idled.

Impacts on Special-Status Plants: With incorporation of Environmental Commitments, cropland idling/shifting actions under the Proposed Action would have a less than significant impact on special-status plant species that could occur in wetlands and waterways associated with seasonally flooded agriculture in the Seller Service Area.

Groundwater Substitution

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 transfer actions. As part of 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 CVP contract water. 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 the long-term 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, Stony, Coon, and Little Chico creeks, and the Bear River. 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. Implementation of these measures would reduce significant effects on vegetation and wildlife resources associated with streams to less than significant.~~

Impacts to Special-Status Plants: With incorporation of Mitigation Measure GW-1, groundwater substitution actions under the Proposed Action would have a less than significant impact on special-status plant species that could occur in wetlands and waterways associated with small streams in the Seller Service Area.

Giant Garter Snake

The Proposed Action could result in impacts to giant garter snake by reducing available aquatic habitat through cropland idling/shifting and groundwater substitution. 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. While the preferred habitat of giant garter snakes is natural wetland areas with slow moving water, giant garter snakes 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 their associated canals and drainage ditches have become important habitat for giant garter snakes.

The acreage to be idled/shifted under the action alternatives would be subject to the Environmental Commitments described in Section 2.3.2.4, which include measures to protect giant garter snakes. Environmental Commitments would provide additional protection to giant garter snakes with regard to cropland idling/shifting actions. These include provisions for sellers to demonstrate that any impacts to water resources needed for special-status species protection have been addressed, avoiding cropland idling actions in areas that could result in the substantial loss or degradation of habitats supporting priority giant garter snake populations, maintaining water levels in drainage canals to provide adequate movement corridors and foraging opportunities for giant garter snake, and implementing best management practices for canal maintenance activities.

Cropland Idling/Shifting

Long-term water transfers are expected to contribute a relatively small amount of rice idling/shifting acreage annually in relation to the variation in planted rice acreage resulting from drought conditions and typical farming practices. Under the Proposed Action, cropland idling/shifting transfers could idle up to a maximum of approximately 51,473 acres of rice fields (Table 3.8-9. This represents approximately 10.5 percent of the average land in rice production from 1992 to 2012 (U.S. Department of Agriculture [USDA], National Agricultural Statistics Service 2012). Any level of cropland idling/shifting would reduce the availability of stable wetland areas during a particular transfer year and may reduce suitable giant garter snake foraging habitat and increase the risk of predation on individual giant garter snakes.

Some individual giant garter snakes may have to relocate from an area that may have been their foraging area in prior years. Environmental Commitments that target priority areas that include suitable habitat with a high likelihood of giant garter snake occurrence requires that participating districts keep water in smaller drains and conveyance infrastructure such that emergent aquatic vegetation remains intact for giant garter snake escape cover and foraging. Also maintaining water in areas where occupied quality habitat occurs may limit the need for giant garter snake to relocate. If water resources do become limiting for giant garter snake, 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.

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. A reduction in available habitat and foraging opportunities compared to recent years where rice idling transfers were minimal may adversely affect foraging success and breeding condition if some individuals are unable to relocate. Young snakes would be anticipated to be at greater risk.

Information with which to estimate the size or age-class structure of the resident snake population in the area of analysis is not available. It is a product of annual fluctuation in acreage planted with rice in previous years, in combination with other physical and environmental factors. Regardless, some individual snakes would be likely to be displaced and would need to relocate elsewhere. Of these, it is expected that some will successfully relocate and some may be lost to predation or other forms of mortality caused by loss of foraging opportunities, either through competition with other individuals or loss of body condition and failure to thrive, particularly young snakes. The Proposed Action includes an environmental commitment to maintain water in major drains and canals in priority habitat areas to minimize the potential for such effects, with the assumption that proximity to water results in decreased stress on snake populations.

Impacts on Giant Garter Snake: Cropland idling/shifting actions under the Proposed Action would have a less than significant impact on giant garter snakes because a relatively small proportion (no more than 10.5 percent) of the rice acreage would be affected in any given year and the Environmental Commitments would avoid or reduce many of the potential impacts associated with this activity and the displacement of giant garter snake that could result. Individual giant garter snakes would be exposed to displacement and the associated increased risk of predation, reduced food availability, increased competition, and potentially reduced fecundity.

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, specific examples of streams and marshes with heavy clay soils and perched water tables, that typically provide giant garter snake habitat, do not typically depend on this interaction to a large degree to provide aquatic habitat. 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.

Impacts on Giant Garter Snake: Groundwater substitutions under the Proposed Action are not expected to have a substantial effect on natural communities, including freshwater emergent vegetation. Thus, impacts to giant garter snake from groundwater substitution would be less than significant.

Pacific Pond Turtle

The Proposed Action could result in impacts to Pacific pond turtle by reducing available aquatic habitat through cropland idling/shifting, groundwater substitution, and reservoir drawdowns. 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 long-term water transfer actions would be considered a significant impact.

The environmental commitments described above for the giant garter snake will also be beneficial to the protection of Pacific pond turtle. This includes a specific measure for Pacific pond turtle that ensures drainage canals will not be allowed to completely dry out.

Seller Service Area

Cropland Idling/Shifting

Cropland idling/shifting would reduce habitat for Pacific pond turtle. As described in the giant garter snake discussion, above, cropland idling/shifting is expected to primarily affect rice acreage, with up to 51,473 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, The decrease in available water could negatively impact habitat for Pacific pond turtle. The application of the Environmental Commitments would minimize these potential impacts.

Impacts to Pacific Pond Turtle: Cropland idling/shifting actions under the Proposed Action would have a less than significant impact on Pacific pond turtle, because a relatively small proportion (no more than 10.5 percent) of the seasonally flooded agriculture acreage would be affected in any year and environmental commitments in place as part of the project would limit the size and distribution of parcels that could be idled and ensure water remains in adjacent irrigation canals and return ditches.

Groundwater Substitution

Groundwater substitution 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, Stony, Coon, and Little Chico creeks. 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.

Impacts on Pacific Pond Turtle: 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 long-term water transfer actions 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.

Impacts on Pacific Pond Turtle: The Proposed Action would have a less than significant impact on Pacific pond turtle on reservoirs 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.

Buyer Service Area

Though habitat for this species occurs over much of the Buyer Service Area, no changes in that habitat are anticipated as a result of the Proposed Action. The amount of water buyers could purchase would be limited by existing contracts and agreements, and they would not be able to utilize more water than is currently allotted them. There would be no appreciable change when compared to the No Action/No Project alternative in stream flows, reservoir levels, and/or cropland idling/shifting in the Buyer Service Area.

Impacts on Pacific Pond Turtle: The Proposed Action would have no impact on Pacific pond turtle in the Buyer Service Area as buyers could not purchase more water than allowed under their CVP contract. Therefore, the effects of using the water would be within the range described under the buyers' CVP contract and associated BOs.

San Joaquin Kit Fox

The Proposed Action could result in impacts to San Joaquin kit fox by reducing available habitat ~~through cropland idling/shifting~~.

Buyer Service Area

Kit foxes prefer open annual grassland habitats with abundant small prey item food sources. The effects of using transfer water on natural resources would be within the range of existing activities within each CVP contract and existing BOs. Based on this, there would be no new effects on natural habitats or wildlife species in the Buyer Service Area.

Impacts on San Joaquin Kit Fox: Actions under the Proposed Action would have no impact on San Joaquin kit fox, as buyers could not purchase more water than allowed under their CVP contract. Therefore, the effects of using the water would be within the range of existing activities under the buyers' CVP contract and existing BOs.

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, ~~and~~ yellow-headed blackbird, and other migratory birds by reducing available nesting, ~~and~~ foraging, and roosting habitat through cropland idling, groundwater pumping, and reservoir drawdown.

Seller Service Area

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 51,473 acres of seasonally flooded agriculture (primarily rice). This corresponds to a reduction of approximately five and 11 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.

Seasonally flooded agriculture and associated canals that provide habitat for giant garter snake also provide foraging and nesting habitat for special-status birds. Potential impacts on special-status birds within these habitats would be avoided or reduced through the implementation of Environmental Commitments for giant garter snake that include: restricting water transfers within and adjacent to established wildlife refuges and conservation areas and maintaining water in drains and canals in priority habitat areas. Decisions about the location and amount of cropland idling/shifting that would occur in any year would be made early in the year, before those birds that nest in affected habitats would have established their nests. In the process of selecting their nest territory, the adult birds would select areas that support their needs for cover and forage and thus there would be minimal impact of idling shifting on nesting habitat.

Groundwater Substitution

Purple martin, tricolored blackbird, and yellow-headed blackbird may inhabit riparian areas and associated wetland habitats that could be impacted by the groundwater substitution. 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. This potential impact would be reduced through Mitigation Measure GW-1 (see Section 3.3, Groundwater

Resources), which would be implemented if groundwater monitoring would indicate adverse environmental effects.

Releases from Reservoir Storage

Some of the species above occur in wetlands associated with reservoirs that may be affected by long-term water transfer. 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 fluctuate by scores of feet each year, and the additional increment of fluctuation caused by water transfers would be small.

The potential impacts of water transfers on each of the seven special-status bird species are discussed in the following sections.

Greater Sandhill Crane

Reducing seasonally flooded acreage in the Seller Service Area could reduce winter foraging habitat for this special-status bird species. 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.

This species would be affected by water transfer activities through its cropland idling/shifting. As small streams, rivers and reservoirs are not primary habitats for this species, the effects of groundwater substitution and releases from reservoir storage would not affect this species.

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). Environmental Commitments includes avoiding crop idling near ~~Butte Sink~~wildlife refuges and established wildlife areas that provide ~~, a~~ core wintering areas for greater sandhill crane, to reduce impacts to the crane population. This species would also benefit from Environmental Commitments to protect giant garter snake and

Pacific pond turtle. With these actions, this alternative would have a less than significant impact on greater sandhill crane.

<u>*Long-Billed Curlew*</u>

Reducing seasonally flooded acreage in the Seller Service Area would reduce winter forage for this special-status bird species. 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. The winter migrants can arrive as early as June (Zeiner et al. 1990) to feed on small vertebrates and invertebrates. 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. Birds would generally disperse to other fields; however, idling of habitat known to support colonies of long-billed curlew would be avoided. Environmental Commitments aimed at the protection of giant garter snake would also reduce impacts on long-billed curlew. Impacts to long-billed curlew would be less than significant.

<u>*Tricolored Blackbird*</u>

Reducing seasonally flooded acreage in the Sacramento Valley would reduce summer forage and potential breeding habitat for this species. Groundwater substitution may reduce flows in small streams or reduce the availability of surface waters in wetland habitats which would affect forage and potential breeding habitat for this species. In the winter, tricolored blackbirds inhabit the Sacramento-San Joaquin Delta and central California coast. In the spring, they migrate to breeding locations in Sacramento County and throughout the San Joaquin Valley (Zeiner et al. 1990). Tricolored blackbirds 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. They 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 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 populations foraging distribution behavior and patterns and would reduce foraging and breeding habitat. Implementing the environmental commitments would help avoid or minimize these potential impacts. The Proposed Action, with the environmental commitments, would have a less than significant impact on tricolored blackbird.

White-Faced Ibis

Reducing seasonally flooded agriculture in the Sacramento Valley could reduce winter forage for this special-status species. The species 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 Area. White-faced ibis inhabit wetland habitat and seasonally flood 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 specie, however, the species does not rely solely on flooded fields for foraging. This species would also benefit from Environmental Commitments aimed at protecting giant garter snake and Pacific pond turtle. The Proposed Action, with the environmental commitments, would have a less than significant impact on white-faced ibis.

Black Tern

Reducing seasonally flooded acreage in the Seller Service Area would reduce breeding habitat and summer habitat for this special-status bird species. 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 crop shifting/idling 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. Reclamation would review maps of areas proposed for crop idling/ crop shifting to ensure avoidance of core areas for black tern. This species would also benefit from environmental commitments aimed at the protection of giant garter snake and other special-status birds. Based on the forgoing, the Proposed Action, with the environmental commitments, would have a less than significant impact on black tern.

Purple Martin

Reducing seasonally flooded agriculture in the Sacramento Valley could reduce summer forage for this special-status species. Groundwater substitution transfers could reduce the quality or extent of habitat for purple martin in the Seller Service Area. 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 10.5 percent under the Proposed Action. Groundwater substitution 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. Implementation of the environmental commitments limit effects on irrigation system waterways, and small streams. With implementation of these environmental commitments, the impacts to purple martin would be less than significant.

Yellow-Headed Blackbird

Reducing seasonally flooded agriculture in the Sacramento Valley would reduce summer forage for this special-status species. Groundwater substitution in the Seller Service Area would reduce summer foraging and breeding habitat for this bird species. The species is associated with fresh emergent wetlands, along lakes and ponds. The yellow-headed blackbird uses these habitats for breeding, nesting, and roosting. These species has 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, crop idling/shifting would reduce the amount of rice habitat by approximately seven percent under the Proposed Action. Groundwater substitution 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 suitability for the species and reduce the amount of available habitat for the species. ~~Purple martin~~The yellow-headed blackbird would benefit from the environmental commitments limiting effects on irrigation system waterways and in small streams. With implementation of these environmental commitments, the impacts to ~~purple martin~~the yellow-headed blackbird would be less than significant.

Other Migratory Birds

Reducing seasonally flooded acreage in the Seller Service Area could reduce foraging and roosting habitat for resident and migratory waterfowl and shorebirds. Millions of waterfowl and hundreds of thousands of shorebirds, wading birds, and passerines use seasonal flooded agriculture 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.

Idling fields or crop shifting may affect the wintering distribution patterns of migratory birds in agricultural areas depending on which fields are idled; however, cropland idling is not expected the affect the amount of winter forage that is available through post-harvest flooding since water transfers will not be made using rice decomposition water. As discussed above in Section 3.8.2.4.1, only a portion of fields planted are flooded post-harvest and decisions on whether to flood are made based on the availability of fall and winter water and not on the amount of acres planted.

Because cropland idling/shifting as a result of water transfers would remain within historical variation of rice production and would not affect the amount of post-harvest flooding, –and because Environmental Commitments include minimizing crop idling near wildlife refuges and established wildlife areas that provide core wintering areas for these species, this alternative would have a less than significant impact on migratory birds.

Impacts on Special-Status Bird Species: Long-term water transfer actions, including implementation of the environmental commitments, under the Proposed Action would have a less than significant impact on greater sandhill crane, black tern, purple martin, long-billed curlew, tricolored blackbird, white-faced ibis, and yellow-headed blackbird, because there would be a less than significant impact on the habitats that support these species. These species are highly mobile and could easily relocate to other suitable habitats that would continue to exist in the surrounding areas.

Buyer Service Area

Under the Proposed Action, buyers would receive water made available through long-term water transfer actions. The effects of using the purchased water on natural resources would be within the range of existing activities in each CVP contract and existing BOs. Based on this, there would be no new effects on natural habitats or wildlife species in the Buyer Service Area.

Impacts on Special-Status Bird Species: Actions under the Proposed Action would have no impact on special-status bird species, as the impacts associated with transferred water would be within the range of existing activities under the buyers' CVP contracts and their associated BOs.

3.8.2.5 Alternative 3: No Cropland Modifications

3.8.2.5.1 Seller Service Area

Under this alternative, water would not be made available through cropland idling or crop shifting. Water would be made available for transfer through groundwater substitution, stored reservoir releases, and conservation. 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 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 as the Proposed Action. Effects on natural communities and special-status plant and wildlife species are described in Section 3.8.2.4.1.

Reservoirs

The No Cropland Modifications Alternative could impact reservoir storage and reservoir surface area. Under the No Cropland Modifications Alternative, model output 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. Water elevations and storage levels during transfers 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: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on natural communities associated with reservoirs, because the changes caused by the project would occur within the normal range of operations for the reservoirs.

Impacts on Special-Status Wildlife: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on special-status wildlife species associated with reservoirs, because the changes caused by the project would be 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: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on natural communities associated with Delta Outflow. No impacts would be expected to occur to tidal perennial aquatic habitat, saline emergent wetland, and tidal fresh emergent wetland, because the project would have very small effects on Delta hydrology.

Impacts on Special-Status Plants and Wildlife: Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on special-status plant and wildlife species associated with Delta outflow, because the project 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 through groundwater substitution. Water would be made available for transfer through cropland idling or crop shifting, stored reservoir releases, and conservation. 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 Transfers

Groundwater substitution 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 associated wildlife 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: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on natural communities associated with reservoirs, because the changes caused by the project would occur within the normal range of operations for the reservoirs.

Impacts on Special-Status Wildlife: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on special-status wildlife species associated with reservoirs as the changes caused by the project would be 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 3.8-3 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: Long-term water transfer actions under the No Groundwater Substitution Alternative would have no impact on surrounding natural communities in the Sacramento, Feather, Yuba, and American rivers and in smaller streams within the Sacramento River watershed, as no changes in streamflow would occur.

Impacts on Special-Status Wildlife: Long-term water transfer actions under the No Groundwater Substitution Alternative would have no impact on special-status wildlife species 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 natural communities.

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 long-term 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 Wildlife: Long-term water transfer actions under the No Groundwater Substitution Alternative would be beneficial to terrestrial special-status wildlife species, because during summer flows would be higher than under the No Action/No Project condition, while 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.

Impacts on Natural Communities: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on natural communities along the San Joaquin River, because changes in flow would be small.

Impacts on Special-Status Wildlife: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on special-status wildlife species along the San Joaquin River, because flow reductions would be small and thus would have little effect on natural communities or associated special-status species.

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: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on natural communities along the Merced River, as flows would not be substantially decreased and would remain within the range of variability projected for the No Action/No Project alternative.

Impacts on Special-Status Wildlife: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on special-status wildlife species along the Merced River because flow changes would be small and thus would have little effect on natural communities or associated special-status species.

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: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on natural communities associated within the Delta, because changes in Delta hydrology would be small. No impacts are expected to occur to tidal perennial aquatic habitat, saline emergent wetland, and tidal fresh emergent wetland, because the project would have very small effects on Delta hydrology.

Impacts on Special-Status Plants and Wildlife: Long-term water transfer actions under the No Groundwater Substitution Alternative would have a less than significant impact on special-status plant and wildlife species within the Delta, because changes in Delta hydrology would be small and thus would not affect natural communities or associated special-status species.

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 3.8-10 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~~ relative to the No Action/No Project Alternative.

Table 3.8-10. Comparative Analysis of Alternatives

Potential Impact	Alternative	Significance[1]			Significance after Mitigation	
		Natural Commu-nities	Special-Status Species	Proposed Mitigation	Natural Communities	Special-Status Species
Groundwater substitution could reduce groundwater levels and available groundwater for ~~supporting~~ 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
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
Groundwater substitution could reduce stream flows supporting natural communities in some small streams.	2, 3	S	S	GW-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
Cropland Idling/Shifting could alter habitat availability and suitability for upland species.	2, 4	LTS	LTS	None	LTS	LTS

Potential Impact	Alternative	Significance[1]		Proposed Mitigation	Significance after Mitigation	
		Natural Commu-nities	Special-Status Species		Natural Communities	Special-Status Species
Cropland idling/shifting under could alter the amount of suitable habitat for natural communities ~~and~~ , special-status wildlife species, and migratory birds associated with seasonally flooded agriculture and associated irrigation waterways.	2, 4	LTS	LTS	None	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	--	LTS	None	LTS	LTS
Transfers could affect giant garter snake and Pacific pond turtle by reducing aquatic habitat.	2, 3, 4	--	LTS	None	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	--	LTS	None	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 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)

Cropland idling, groundwater substitution, and reservoir storage transfers 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 the Environmental Commitments would be less than significant to both natural communities and special-status species. The

Proposed Action would increase water supplies to agricultural users 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 transferring water. Effects would continue to occur from groundwater substitution and reservoir storage transfers at the same levels described for the Proposed Action. The effects of this alternative with the implementation of the Environmental Commitments would be less than significant to both natural communities and special-status species. The Proposed Action would increase water supplies to agricultural users 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 transferring water. Effects would continue to occur from cropland idling/shifting and reservoir storage transfers. The amount of cropland idled/shifted would be greatest under this alternative, while reservoir storage transfers would be similar to the Proposed Action. The effects of this alternative with the implementation of the Environmental Commitments would be less than significant to both natural communities and special-status species. The Proposed Action would increase water supplies to agricultural users 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 Environmental Commitments/Mitigation Measures

Environmental Commitments described in Section 2.3.2.4 and Mitigation Measure GW-1 described in Section 3.3 would eliminate or reduce the potentially substantial effects of water transfer actions.

3.8.5 Potentially Significant Unavoidable Impacts

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

3.8.6 Cumulative Impacts

The timeframe for the cumulative effects analysis extends from 2015 through 2024, a ten-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 project method, which is further described in Chapter 4.

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 Section 4.3 in Chapter 4. SWP transfers could involve groundwater substitution transfers 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 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

Groundwater substitution and cropland idling/shifting 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 for transfer and up to 89,930 acre feet through cropland idling. 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 long-term water transfers.

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 shortages. 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 would not substantially change relative to existing conditions.

The effects of the long term water transfers on groundwater dependent natural communities would be small and local and the cumulative effect in combination with SWP water transfers and 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 long-term water transfers, and therefore there 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 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.

Long-term water transfers would not be cumulatively considerable with the other projects because each of the projects would have little or no impact 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, ~~this~~ these actions would not be cumulatively adverse in combination with long-term water transfers 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 long term transfers would be in compliance with applicable BOs for CVP and SWP operations. Generally, the SWP transfers, Yuba Accord, refuge transfers, and Long-Term Water Transfers 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 TAF to willing buyers under the Exchange Contractors 25- Year Water Transfers, including many of the buyers for the long-term water transfers. The Exchange Contractors service area does not overlap geographically with Long-Term Water Transfers 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 are 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

Cropland idling/shifting 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 described for the Proposed Action.

3.8.7 References

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Section 3.9
Agricultural Land Use

This section presents existing conditions for agricultural land use and resources within the area of analysis and discusses potential effects from the proposed alternatives.

Cropland idling would be the only water transfer method that would directly affect land use in the area of analysis. Implementation of crop shifting, groundwater substitution, conservation, or stored reservoir purchase transfers would not affect agricultural land uses and are not further discussed in this section. None of the alternatives or transfer types would affect other types of land uses (such as municipal or industrial); therefore, only agricultural land use is analyzed.

3.9.1 Affected Environment/Environmental Setting

3.9.1.1 Area of Analysis

The area of analysis for agricultural land use includes counties where cropland idling transfers could occur in the Seller Service Area and counties where transferred water would be used for agricultural purposes in the Buyer Service Area. Counties in the Seller Service Area include Glenn, Colusa, Butte, Sutter, Yolo, and Solano and counties in the Buyer Service Area include San Joaquin, Stanislaus, Merced, San Benito, Fresno, and Kings. Figure 3.9-1 shows the area of analysis for agricultural land use.

3.9.1.2 Regulatory Setting

3.9.1.2.1 Federal

Conservation Reserve Program (CRP)

The CRP is a Federal program administered by the U.S. Department of Agriculture (USDA) Farm Service Agency. The CRP is a voluntary program that offers annual rental payments, incentive payments, and annual maintenance payments for certain activities, and cost-share assistance to establish approved cover on eligible cropland. To be eligible for placement in the CRP, land must be (1) cropland that is planted or considered planted to an agricultural commodity two of the five most recent crop years (including field margins) and that is physically and legally capable of being planted in a normal manner to an agricultural commodity or (2) marginal pastureland that is either enrolled in the Water Bank Program or suitable for use as a riparian buffer to be planted to trees. As of April 1, 2012, there was a total of 103,471 acres of CRP cropland in California (USDA, Farm Service Agency 2012). Counties in the area of analysis with cropland acres in the CRP include: Glenn, Colusa, Sutter, Yolo, Solano, and Merced (USDA, Farm Service Agency 2012).

Figure 3.9-1. Agricultural Land Use Area of Analysis

3.9.1.2.2 State

Williamson Act

The California Land Conservation Act, also known as the Williamson Act, preserves agricultural and open space lands by discouraging premature and unnecessary conversion to urban uses. The Act creates an arrangement whereby private landowners contract with counties and cities to voluntarily restrict their land to agricultural and compatible open space uses. The vehicle for these agreements is a rolling term, 10-year contract (unless either party files a “notice of nonrenewal,” the contract is automatically renewed for an additional year). In return, restricted parcels are assessed for property tax purposes at a rate consistent with their actual use, rather than potential market value.

The Williamson Act established a definition of Prime agricultural lands based on the actual or potential agricultural productivity of the land being restricted (California Department of Conservation [DOC] 2010a; California DOC 2007a). Contracted land that meets the Williamson Act definition of prime agricultural land is designated as "Prime." Under the law, Prime Agricultural Land is defined as (California DOC 2007b):

- Land which qualifies for rating as class I or class II in the Natural Resources Conservation Service (NRCS) land use capability classifications;
- Land which qualifies for rating 80 to 100 in the Storie Index Rating;
- Land which supports livestock used for the production of food and fiber and which has an annual carrying capacity equivalent to at least one animal unit per acre as defined by the USDA;
- Land planted with fruit or nut-bearing trees, vines, bushes or crops which have a nonbearing period of less than five years and which will normally return during the commercial bearing period on an annual basis from the production of unprocessed agricultural plant production not less than two hundred dollars per acre;
- Land which has returned from the production of unprocessed agricultural plant production and has an annual gross value of not less than two hundred dollars per acre for three of the previous five years.

Non-Prime agricultural land is defined as land that does not meet any of the criteria for classification as Prime Agricultural Land. Most Non-Prime Land is in agricultural uses such as grazing or non-irrigated crops. However, Non-Prime Land may also include other open space uses that are compatible with agriculture and consistent with local general plans.

The Williamson Act also establishes a Farmland Security Zone (FSZ), which introduces a 20-year contract between a private landowner and a county that restricts land to agricultural or open space uses.[1] FSZ lands are designated as Urban and Non-Urban for subvention payment purposes. FSZ contracted land within a city's sphere of influence (SOI), or within three miles or the exterior boundaries of a city's SOI, is "Urban", while all other FSZ contracted land is "Non-Urban." Table 3.9-1 summarizes farm acreage by county enrolled in the Williamson Act and FSZ program in 2010 and 2011, which is data compiled by the California DOC, Division of Land Resource Protection [DLRP].

[1] An FSZ is essentially an area created within an AP by a board of supervisors upon request by a landowner or group of landowners. An AP defines the boundary of an area within which a city or county will enter into Williamson Act contracts with landowners. The boundary is designated by resolution of the board of supervisors or city council having jurisdiction. APs must generally be at least 100 acres in size.

California Farmland Conservancy Program (CFCP)

The CFCP is a voluntary program that seeks to encourage the long-term, private stewardship of agricultural lands through the use of agricultural conservation easements. The CFCP provides grant funding for projects that use and support agricultural conservation easements for protection of agricultural lands. An agricultural conservation easement is a voluntary, legally recorded deed restriction that is placed on a specific property used for agricultural production. The goal of an agricultural conservation easement is to maintain agricultural land in active production by removing the development pressures from the land. Such an easement prohibits practices that would damage or interfere with the agricultural use of the land. Because the easement is a restriction on the deed of the property, the easement remains in effect even when the land changes ownership. Table 3.9-1 summarizes the agricultural conservation easements in the area of analysis.

Farmland Mapping and Monitoring Program (FMMP)

The FMMP was established in 1982 and produces maps and statistical data used for analyzing effects on California's agricultural resources. The maps are updated every two years with the use of aerial photographs, a computer mapping system, public review, and field reconnaissance. The FMMP rates agricultural land according to soil quality and irrigation status and denotes the best quality land Prime Farmland. FMMP characterizes land use into the following categories:

- **Prime Farmland[2] –** Land with the best combination of physical and chemical features able to sustain long-term production of agricultural crops. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for production of irrigated crops at some time during the two update cycles prior to the mapping date.

[2] The term "Prime" as used here refers to the FMMPs designation of the location and extent of "Prime Farmland" as described above. The state's Williamson Act designates prime farmland based on different economic or production criteria, as described under the Williamson Act section above.

Table 3.9-1. Williamson Act and Agricultural Conservation Easement Acreage in Area of Analysis (2010-2011)

County	2010 Williamson Act Prime (acres)	2010 Williamson Act Non-Prime (acres)	2010 Total (Williamson Act lands; acres)	2011 Williamson Act Prime (acres)	2011 Williamson Act Non-Prime (acres)	2011 Total (Williamson Act lands; acres)	Percent Change (Total Williamson Act lands; 2010-2011)	FSZ (2011 acres) Urban Prime	FSZ (2011 acres) Urban Non-Prime	FSZ (2011 acres) Non-Urban Prime	FSZ (2011 acres) Non-Urban Non-Prime	Agricultural Conservation Easement (through the CFCP[1]; 2011 acres) Prime	Agricultural Conservation Easement (through the CFCP[1]; 2011 acres) Non-Prime	2011 Total Conservation lands (acres)[2]
Seller Service Area														
Glenn	63,618	267,432	**331,050**	63,781	270,024	**333,805**	**+0.83**	14,112	500	73,600	2,226	--	--	**424,243**
Colusa	66,952	193,720	**260,672**	66,952	193,720	**260,672**	**0**	15,989	737	40,628	2,035	--	--	**320,060**
Butte	113,686	106,293	**219,979**	113,808	103,367	**217,175**	**-1.3**	--	--	--	--	--	--	**220,175**
Sutter	51,408	13,165	**64,573**	51,408	13,165	**64,573**	**0**	--	--	--	--	--	--	**64,573**
Yolo	240,988	176,114	**417,102**	198,642	156,651	**355,593**	**-14.7**	158	1	--	--	200	7	**355,658**
Solano	120,053	145,582	**265,635**	119,936	145,371	**265,307**	**-0.12**	--	--	--	--	1,456	2,882	**269,916**
Buyer Service Area														
Stanislaus	293,495	396,459	**689,954**	--	--	**--**	**-100**	--	--	--	--	--	--	**--**
San Joaquin	323,478	149,489	**472,967**	322,528	148,460	**470,988**	**-0.42**	15,213	79	34,608	10,098	--	--	**530,986**
Merced	258,883	209,080	**467,963**	259,199	208,768	**467,967**	**+2.64**	--	--			--	--	**467,967**
San Benito	51,759	530,783	**582,542**	52,721	528,411	**580,132**	**-0.05**	--	--	--	--	--	--	**580,132**
Fresno	982,032	483,245	**1,465,277**	982,032	483,245	**1,465,277**	**-0.06**	--	--	25,799	3,482	--	--	**1,494,558**
Kings	279,062	110,671	**389,733**	278,839	110,671	**389,510**	**-0.07**	28,851	227	248,090	10,642	--	--	**677,320**

Source: California DOC 2013

[1] CFCP = California Farmland Conservation Program

[2] 2010 total conservation lands includes all Williamson Act lands, FSZ lands, and Agricultural Conservation Easements in 2010.

- **Farmland of Statewide Importance –** Land similar to Prime Farmland that has a good combination of physical and chemical characteristics for the production of crops. This land has minor shortcomings, such as greater slopes or less ability to store soil moisture than Prime Farmland. Land must have been used for production of irrigated crops at some time during the two update cycles prior to the mapping date.

- **Unique Farmland –** Lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include non-irrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the two update cycles prior to the mapping date.

- **Farmland of Local Importance –** Land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee. Often includes lands used for dryland farming and formerly irrigated land that has been left idle for three or more update cycles.

- **Grazing Land –** Land on which the existing vegetation is suited to the grazing of livestock.

- **Urban and Built-Up Land –** Land occupied by structures with a building density of at least one unit to 1.5 acres, or approximately six structures to one 10-acre parcel.

- **Other Land –** Land that does not meet the criteria of any other category.

- **Water –** Water areas with an extent of at least 40 acres.

3.9.1.2.3 Regional/Local

Cropland idling in the Seller Service Area could affect Important Farmland as well as lands enrolled in the Williamson Act and other land conservation programs by resulting in land conversion and/or incompatible land uses. The following local policies apply to agricultural lands in the Seller Service Area.

Glenn County

The Glenn County General Plan, Volume I – Policies, includes the following policies in relation to the preservation of agricultural lands (Glenn County 1993a):

- Natural Resources Policy (NRP)-1: Maintain agriculture as a primary, extensive land use, not only in recognition of the economic importance of agriculture, but also in terms of agriculture's contribution to the preservation of open space and wildlife habitat.

- NRP-2: Support the concept that agriculture is a total, functioning system which will suffer when any part of it is subjected to regulation resulting in the decline of agriculture: economics productivity, unmitigated land use conflicts and/or excessive land fragmentation.

- NRP-5: Continue participation in the Williamson Act policy, and allow new lands devoted to commercial agriculture and located outside urban limit lines to enter the program, subject to the specific standards for inclusion in this General Plan.

- NRP-8: Assure future land use decisions protect and enhance the agricultural economics industry while also protecting existing uses from potential incompatibilities.

Glenn County Code Title 15 establishes the Unified Development Code. Section 15.460 describes the Agricultural Preserve (AP) Zone. The AP Zone applies to lands covered by the Williamson Act within the county and has the purpose of:

- Preserving the maximum amount of the limited supply of agricultural land which is necessary in the conservation of the county's economic resources and vital for a healthy agricultural economy; and,

- Protecting the general welfare of the agricultural community for encroachments of unrelated agricultural uses which, by their nature, would be injurious to the physical and economic well-being of the agricultural community.

The county code defines permitted uses in AP zones. Similarly, Section 15.470 defines FSZs within the county and permitted uses on these lands (Ordinance Number 1183 § 2) (Glenn County 2006).

Colusa County
The Conservation Element of Colusa County's 1989 General Plan includes Conservation (CO) Policy CO-2, which states that agricultural land should be preserved and protected (Colusa County 1989).

Colusa County's Code, Chapter 34, Farming Practices, is intended to, in part, "preserve and protect for agricultural use those lands zoned for agricultural use" (Ordinance Number 510) (Colusa County 2012).

Appendix 1.4, Article 4 of the county's code establishes zoning district regulations for the AP Zone and the exclusive agriculture zone.

Butte County

Chapter 7 of the Butte County General Plan (Butte County 2012a) is the agricultural element of the plan and addresses agricultural resource goals and policies. Relevant goals include:

- Goal (Agriculture) AG-2: Protect Butte County's agricultural lands from conversion to non-agricultural uses.

This goal is supported by multiple policies regarding protection of agricultural lands and requirements before redesignation or rezoning of agricultural land.

Sutter County

Chapter 4 of the Sutter County General Plan (Sutter County 2010a) addresses agricultural resources and agricultural resource policies within the county. Relevant policies include the following:

- AG 1.1 – Preserve and maintain agriculturally designated lands for agricultural use and direct urban/suburban and other nonagricultural related development to the cities, unincorporated rural communities, and other clearly defined and comprehensively planned development areas.

- AG 1.5 – Discourage the conversion of agricultural land to other uses unless all of the following findings can be made:

  - The net community benefit derived from conversion of the land outweighs the need to protect the land for long-term agricultural use;

  - There are no feasible alternative locations for the proposed use that would appreciably reduce impacts upon agricultural lands; and,

  - The use will not have significant adverse effects, or can mitigate such effects, upon existing and future adjacent agricultural lands and operations.

Chapter 1500, Division 13 of Sutter County's Code establishes the zoning code for unincorporated areas in the county (Sutter County 2011). As with other counties in the area of analysis, the Sutter County zoning code establishes permitted uses for agricultural lands within the unincorporated county.

Yolo County

The Yolo County 2030 Countywide General Plan, Agriculture and Economic Development Element (Yolo County 2009) addresses the preservation of agricultural resources through the following policies:

- Policy AG-1.2: Maintain parcel sizes outside of the community growth boundaries large enough to sustain viable agriculture and discourage conversion to non-agricultural home sites.

- Policy AG-1.3: Prohibit the division of agricultural land for non-agricultural uses.

- Policy AG-1.4: Prohibit land use activities that are not compatible within agriculturally designated areas.

- Policy AG-1.5: Strongly discourage the conversion of agricultural land for other uses. No lands shall be considered for redesignation from Agricultural or Open Space to another land use designation unless all of the following findings can be made:

  - There is a public need or net community benefit derived from the conversion of land that outweighs the need to protect the land for long-term agricultural use;

  - There are no feasible alternative locations for the proposed project that are either designated for non-agricultural land uses or are less productive agricultural lands; and,

  - The use would not have a significant adverse effect on existing or potential agricultural activities on surrounding lands designated Agriculture.

- Policy AG-1.6: Continue to mitigate at a ratio of no less than 1:1 the conversion of farmland and/or the conversion of land designated or zoned for agriculture, to other uses.

- Policy AG-1.8: Regulate and encourage removal of incompatible land uses and facilities from agriculturally designated lands.

- Policy AG-1.21: Within conservation easements, preclude the practice of fallowing fields for the purpose of water export. Fallowing as a part of normal crop rotation is not subject to this policy.

Yolo County’s Code, Title 8, Chapter 2, addresses zoning in the unincorporated county including AP zones, Agricultural Exclusive zones, and Agricultural General zones (Articles 4, 5, and 6) (Yolo County 2000). The zoning codes establish the principle uses for each agricultural zone.

Solano County
Chapter 3, Agriculture, of the Solano County General Plan (2008a) includes the following policies related to agricultural lands in the county:

- Agriculture Policy (Policy AG.P)-1: Ensure that agricultural parcels are maintained at a sufficient minimum parcel size so as to remain a farmable unit. Farmable units are defined as the size of parcels a farmer would consider viable for leasing or purchasing for different agricultural purposes. A farmable unit is not considered the sole economic function that will internally support a farm household.

- Policy AG.P-18: Support long-term viability of commercial agriculture and discourage inappropriate development of agricultural lands within the Delta.

- Policy AG.P-19: Require agricultural practices to be conducted in a manner that minimizes harmful effects on soils, air and water quality, and marsh and wildlife habitat.

Chapter 2.2 of Solano County's Code describes requirements for agricultural lands and operations within the unincorporated county (Solano County no date). Section 2.2-20 describes that it is the county's policy to conserve and protect both intensive and extensive agricultural land, and to protect those lands for exclusive agricultural uses that do not interfere with agricultural operations (Solano County no date). Chapter 28 of the county's code establishes zoning regulations within the unincorporated county including for agricultural districts.

3.9.1.3 Existing Conditions

The California DOC maps farmland throughout California every two years. The most recent data on farmland acreages and farmland conversions throughout the state is reported in the DOC's *Farmland Conversion Report 2006-2008* (California DOC 2011a). Additionally, the DOC has analyzed data on agricultural land conversions for the 2008 to 2010 period for some counties in the area of analysis.

The following sections describe agricultural and other land use within the counties in the area of analysis as well as recent land use conversions in each county.

3.9.1.3.1 Seller Service Area

Glenn County
In 2010, of the 849,129 acres mapped in Glenn County, 574,894 were in agricultural use, 6,420 acres were urbanized, 5,950 acres were water, and 261,775 acres were "other" (California DOC, DLRP 2012a). Table 3.9-2 summarizes further land use classifications and net changes from 2008 to 2010.

Table 3.9-2. Glenn County Summary and Change by Land Use Category

Land Use Category	Total Acreage Inventoried 2008	Total Acreage Inventoried 2010	2008-10 Acreage Changes: Acres Lost (-)	Acres Gained (+)	Total Acreage Changed	Net Acreage Changed
Prime Farmland	159,811	157,940	3,576	1,705	5,281	-1,871
Farmland of Statewide Importance	87,497	87,071	1,244	818	2,062	-426
Unique Farmland	17,306	17,300	1,007	1,001	2,008	-6
Important Farmland Subtotal	264,614	262,311	5,827	3,524	9,351	-2,303
Farmland of Local Importance	83,544	85,836	3,446	5,738	9,184	2,292
Grazing Land	227,391	226,837	1,587	1,033	2,620	-554
Agricultural Land Subtotal	575,549	574,984	10,860	10,295	21,155	-565
Urban and Built-up Land	6,372	6,420	123	171	294	48
Other Land	261,258	261,775	1,087	1,604	2,691	517
Water Area	5,950	5,950	0	0	0	0
Total Area Inventoried	**849,129**	**849,129**	**12,070**	**12,070**	**24,140**	**0**

Source: California DOC, DLRP 2012a.

In Glenn County, Farmland of Local Importance includes all lands not qualifying for Prime, Statewide, or Unique farmland that are cropped on a continuing or cyclic basis (irrigation is not a consideration). The classification also includes all farmable land within the Glenn County water district boundaries not qualifying for the Prime, Statewide, or Unique designations (California DOC 2011a).

Colusa County

In 2010, of the 740,393 acres mapped in Colusa County, 554,695 were in agricultural use, 5,142 acres were urbanized, 1,911 acres were water and 169,484 acres were “other” (California DOC, DLRP 2012b). Table 3.9-3 summarizes further land use classifications and net changes in land use categories.

Table 3.9-3. Colusa County Summary and Change by Land Use Category

Land Use Category	Total Acreage Inventoried 2008	Total Acreage Inventoried 2010	2008-10 Acreage Changes: Acres Lost (-)	Acres Gained (+)	Total Acreage Changed	Net Acreage Changed
Prime Farmland	197,497	196,320	1,537	360	1,897	-1,177
Farmland of Statewide Importance	2,012	2,046	14	48	62	34
Unique Farmland	121,186	120,316	1,435	565	2,000	-870
Important Farmland Subtotal	320,695	318,682	2,986	973	3,959	-2,013
Farmland of Local Importance	235,023	236,013	729	1,719	2,448	990
Grazing Land	9,111	9,161	49	99	148	50
Agricultural Land Subtotal	564,829	563,856	3,764	2,791	6,555	-973
Urban and Built-up Land	5,111	5,142	26	57	83	31
Other Land	168,542	169,484	406	1,348	1,754	942
Water Area	1,911	1,911	0	0	0	0
Total Area Inventoried	740,393	740,393	4,196	4,196	8,392	0

Source: California DOC, DLRP 2012b.

In Colusa County, Farmland of Local Importance includes all farmable lands within the county that do not meet the definitions of Prime, Statewide, or Unique, but are currently irrigated pasture or non-irrigated crops. The classification also includes non-irrigated land with soils qualifying for Prime Farmland or Farmland of Statewide Importance and lands that would have Prime or Statewide designation and have been improved for irrigation but are now idle. Additionally, lands in this category include lands with a General Plan Land Use designation for agricultural purposes, and lands that are legislated to be used only for agricultural (farmland) purposes (California DOC 2011a).

Butte County

In 2010, of the 1,073,252 acres mapped in Butte County, 640,350 were in agricultural use, 45,924 acres were urbanized, 22,858 acres were water and 364,130 acres were “other” (California DOC, DLRP 2012c). Table 3.9-4 summarizes further land use classifications and net changes in land use categories. In Butte County, the Board of Supervisors determined there would be no Farmland of Local Importance designation (California DOC 2011a).

Table 3.9-4. Butte County Summary and Change by Land Use Category

Land Use Category	Total Acreage Inventoried		2008-10 Acreage Changes			
	2008	2010	Acres Lost (-)	Acres Gained (+)	Total Acreage Changed	Net Acreage Changed
Prime Farmland	194,689	193,290	1,926	527	2,453	-1,399
Farmland of Statewide Importance	22,794	21,792	1,215	213	1,428	-1,002
Unique Farmland	23,078	22,190	1,143	255	1,398	-888
Important Farmland Subtotal	240,561	237,272	4,284	995	5,279	-3,289
Farmland of Local Importance	0	0	0	0	0	0
Grazing Land	401,859	403,078	873	2,092	2,965	1,219
Agricultural Land Subtotal	642,420	640,350	5,157	3,087	8,244	-2,070
Urban and Built-up Land	45,350	45,914	204	768	972	564
Other Land	362,624	364,130	977	2,483	3,460	1,506
Water Area	22,858	22,858	0	0	0	0
Total Area Inventoried	1,073,252	1,073,252	6,338	6,338	12,676	0

Source: California DOC, DLRP 2012c.

Sutter County

In 2010, of the 389,314 acres mapped in Sutter County, 339,358 were in agricultural use, 13,560 acres were urbanized, 1,883 acres were water, and 34,513 acres were "other." (California DOC, DLRP 2012d) Table 3.9-5 summarizes further land use classifications and net changes from 2008 to 2010. In Sutter County, the Board of Supervisors determined there would be no Farmland of Local Importance designation (California DOC 2011a).

Table 3.9-5. Sutter County Summary and Change by Land Use Category

Land Use Category	Total Acreage Inventoried		2008-10 Acreage Changes			
	2008	2010	Acres Lost (-)	Acres Gained (+)	Total Acreage Changed	Net Acreage Changed
Prime Farmland	165,315	162,673	3,266	624	3,890	-2,642
Farmland of Statewide Importance	106,597	105,395	1,709	507	2,216	-1,202
Unique Farmland	19,156	17,752	1,720	316	2,036	-1,404
Important Farmland Subtotal	291,068	285,820	6,695	1,447	8,142	-5,248
Farmland of Local Importance	0	0	0	0	0	0
Grazing Land	52,571	53,538	1,426	2,393	3,819	967
Agricultural Land Subtotal	343,639	339,358	8,121	3,840	11,961	-4,281
Urban and Built-up Land	13,230	13,560	25	355	380	330
Other Land	30,562	34,513	670	4,621	5,291	3,951
Water Area	1,883	1,883	0	0	0	0
Total Area Inventoried	389,314	389,314	8,816	8,816	17,632	0

Source: California DOC, DLRP 2012d.

Yolo County

In 2010, of the 653,453 acres mapped in Yolo County, 534,984 were in agricultural use, 30,537 acres were urbanized, 7,804 acres were water, and 80,128 acres were "other" (California DOC, DLRP 2012e).

Table 3.9-6 summarizes further land use classifications and net increases and reductions in categories from 2008 to 2010. In Yolo County, Farmland of Local Importance includes cultivated farmland having soils which meet the criteria for Prime or Statewide, except that the land is not presently irrigated, and other nonirrigated land (California DOC 2011a).

Table 3.9-6. Yolo County Summary and Change by Land Use Category

	Total Acreage Inventoried		2008-10 Acreage Changes			
Land Use Category	**2008**	**2010**	**Acres Lost (-)**	**Acres Gained (+)**	**Total Acreage Changed**	**Net Acreage Changed**
Prime Farmland	255,193	252,083	3,661	551	4,212	-3,110
Farmland of Statewide Importance	16,793	16,412	568	187	755	-381
Unique Farmland	45,750	43,629	3,071	950	4,021	-2,121
Important Farmland Subtotal	317,736	312,124	7,300	1,688	8,988	-5,612
Farmland of Local Importance	60,345	62,410	3,096	5,161	8,257	2,065
Grazing Land	157,963	160,450	2,337	4,824	7,161	2,487
Agricultural Land Subtotal	536,044	534,984	12,733	11,673	24,406	-1,060
Urban and Built-up Land	30,225	30,537	20	332	352	312
Other Land	79,370	80,128	693	1,451	2,144	758
Water Area	7,814	7,804	10	0	10	-10
Total Area Inventoried	653,453	653,453	13,456	13,456	26,912	0

Source: California DOC, DLRP 2012e.

Solano County

In 2010, of the 582,373 acres mapped in Solano County, 356,659 were in agricultural use, 59,591 acres were urbanized, 53,462 acres were water and 112,661 acres were "other" (California DOC, DLRP 2012f). Table 3.9-7 summarizes further land use classifications and net changes in land use categories from 2008 to 2010.

Table 3.9-7. Solano County Summary and Change by Land Use Category

Land Use Category	Total Acreage Inventoried		2008-10 Acreage Changes			
	2008	2010	Acres Lost (-)	Acres Gained (+)	Total Acreage Changed	Net Acreage Changed
Prime Farmland	135,735	131,820	4,498	583	5,081	-3,915
Farmland of Statewide Importance	7,038	6,369	873	204	1,077	-669
Unique Farmland	10,526	9,275	1,540	289	1,829	-1,51
Important Farmland Subtotal	153,299	147,464	6,911	1,076	7,987	-5,835
Farmland of Local Importance	0	0	0	0	0	0
Grazing Land	204,519	209,195	1,511	6,187	7,698	4,676
Agricultural Land Subtotal	357,818	356,659	8,422	7,263	15,685	-1,159
Urban and Built-up Land	59,157	59,591	194	628	822	434
Other Land	112,087	112,661	420	994	1,414	574
Water Area	53,311	53,462	0	151	151	151
Total Area Inventoried	582,373	582,373	9,036	9,036	18,072	0

Source: California DOC, DLRP 2012f.

In Solano County, the Board of Supervisors determined that there will be no Farmland of Local Importance (California DOC 2011a).

3.9.1.3.2 Buyer Service Area

The following sections summarize land use in the counties in the Buyer Service Area that could be affected by the proposed alternatives. Land use numbers were derived from the most recent FMMP mapping.

Stanislaus

In 2012, of the 970,168 acres mapped in Stanislaus County, 832,453 acres were in agricultural use, 64,822 acres were urbanized, 7,465 acres were water and 65,428 acres were “other” (California DOC, DLRP 2012k). Table 3.9-8 summarizes further land use classifications and net changes in land use categories from 2010 to 2012.

Table 3.9-8. Stanislaus County Summary and Change by Land Use Category

Land Use Category	Total Acreage Inventoried		2010-12 Acreage Changes			
	2010	2012	Acres Lost (-)	Acres Gained (+)	Total Acreage Changed	Net Acreage Changed
Prime Farmland	253,434	251,723	3,037	1,326	4,363	-1,711
Farmland of Statewide Importance	31,475	31,765	297	587	884	290
Unique Farmland	87,524	95,187	715	8,378	9,093	7,663
Important Farmland Subtotal	**31,366**	**31,331**	**2,312**	**2,277**	**4,589**	**-35**
Farmland of Local Importance	403,799	410,006	6,361	12,568	18,929	6,207
Grazing Land	429,545	422,447	8,968	1,870	10,838	-7,098
Agricultural Land Subtotal	**833,344**	**832,453**	**15,329**	**14,438**	**29,767**	**-891**
Urban and Built-up Land	64,529	64,822	76	369	445	293
Other Land	64,830	65,428	521	1,119	1,640	598
Water Area	7,465	7,465	0	0	0	0
Total Area Inventoried	**970,168**	**970,168**	**15,926**	**15,926**	**31,852**	**0**

Source: California DOC, DLRP 2012k.

Stanislaus County defines Farmland of Local Importance as farmlands growing dryland pasture, dryland small grains, and irrigated pasture (California DOC 2011a).

San Joaquin

In 2008, of the 912,593 acres mapped in San Joaquin County, 754,229 acres were in agricultural use, 91,929 acres were urbanized, 54,662 acres were water and 11,773 acres were "other" (California DOC, DLRP 2012l). Table 3.9-9 summarizes further land use classifications and net changes in land use categories from 2008 to 2010.

Table 3.9-9. San Joaquin County Summary and Change by Land Use Category

Land Use Category	Total Acreage Inventoried		2008-10 Acreage Changes			
	2008	2010	Acres Lost (-)	Acres Gained (+)	Total Acreage Changed	Net Acreage Changed
Prime Farmland	396,984	385,337	12,570	923	13,493	-11,647
Farmland of Statewide Importance	86,297	83,307	3,202	212	3,414	-2,990
Unique Farmland	66,621	69,481	1,590	4,450	6,040	2,860
Important Farmland Subtotal	**65,788**	**76,869**	**3,644**	**14,725**	**18,369**	**11,081**
Farmland of Local Importance	615,690	614,994	21,006	20,310	41,316	-696
Grazing Land	142,460	139,235	3,341	116	3,457	-3,225
Agricultural Land Subtotal	**758,150**	**754,229**	**24,347**	**20,426**	**44,773**	**-3,921**

Land Use Category	Total Acreage Inventoried		2008-10 Acreage Changes			
	2008	2010	Acres Lost (-)	Acres Gained (+)	Total Acreage Changed	Net Acreage Changed
Urban and Built-up Land	90,529	91,929	127	1,527	1,654	1,400
Other Land	52,141	54,662	838	3,359	4,197	2,521
Water Area	11,773	11,773	0	0	0	0
Total Area Inventoried	**912,593**	**912,593**	**25,312**	**25,312**	**50,624**	**0**

Source: California DOC, DLRP 2012l.

San Joaquin County defines Farmland of Local Importance as lands that are farmable and do not meet the definition of Prime Farmland, Farmland of Statewide Importance, or Unique Farmland. This also includes idle lands previously designated as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland (California DOC 2011a).

Merced

In 2010, of the 1,265,619 acres mapped in Merced County, 1,160,885 acres were in agricultural use, 37,417 acres were urbanized, 16,859 acres were water and 50,458 acres were “other” (California DOC, DLRP 2012f). Table 3.9-10 summarizes further land use classifications and net changes in land use categories from 2006 to 2008.

Table 3.9-10. Merced County Summary and Change by Land Use Category

Land Use Category	Total Acreage Inventoried		2006-10 Acreage Changes			
	2006	2010	Acres Lost (-)	Acres Gained (+)	Total Acreage Changed	Net Acreage Changed
Prime Farmland	272,095	270,644	5,739	722	6,461	-5,017
Farmland of Statewide Importance	153,249	150,874	3,207	485	3,692	-2,722
Unique Farmland	104,418	103,992	2,141	1,715	3,856	-426
Important Farmland Subtotal	529,762	525,510	11,087	2,922	14,009	-8,165
Farmland of Local Importance	59,851	67,984	1,188	9,321	10,509	8,133
Grazing Land	569,829	567,391	2,593	155	2,748	-2,438
Agricultural Land Subtotal	1,159,442	1,160,885	14,868	12,398	27,266	-2,470
Urban and Built-up Land	36,769	37,417	116	668	784	552
Other Land	48,351	50,458	340	2,258	2,598	1,918
Water Area	16,859	16,859	0	0	0	0
Total Area Inventoried	1,261,421	1,265,619	15,324	15,324	30,648	0

Source: California DOC, DLRP 2012f.

Merced County defines Farmland of Local Importance as farmlands that have physical characteristics that would qualify for Prime or Statewide except for the lack of irrigation water. Merced County also includes farmlands that produce crops not listed under Unique but are important to the economy of the county or city (California DOC 2011a).

San Benito

In 2010, of the 899,386 acres mapped in San Benito County, 672,281 were in agricultural use, 8,023 acres were urbanized, 1,145 acres were water, and 207,937 acres were "other" (California DOC, DLRP 2012g). Table 3.9-11 summarizes further land use classifications and net changes from 2008 to 2010.

Table 3.9-11. San Benito County Summary and Change by Land Use Category

	Total Acreage Inventoried		2008-10 Acreage Changes			
Land Use Category	**2008**	**2010**	**Acres Lost (-)**	**Acres Gained (+)**	**Total Acreage Changed**	**Net Acreage Changed**
Prime Farmland	28,701	27,425	2,106	830	2,936	-1,276
Farmland of Statewide Importance	6,587	6,475	700	588	1,288	-112
Unique Farmland	2,399	2,250	355	206	561	-149
Important Farmland Subtotal	37,687	36,150	3,161	1,624	4,785	-1,537
Farmland of Local Importance	23,234	21,310	5,056	3,132	8,188	-1,924
Grazing Land	612,455	614,821	3,116	5,482	8,598	2,366
Agricultural Land Subtotal	**673,376**	**672,281**	11,333	10,238	21,571	-1,095
Urban and Built-up Land	7,902	8,023	55	176	231	121
Other Land	206,968	207,937	326	1,295	1,621	969
Water Area	1,140	1,145	10	15	25	5
Total Area Inventoried	**889,386**	**889,386**	**11,724**	**11,724**	**23,448**	**0**

Source: California DOC, DLRP 2012g.

San Benito County defines Farmland of Local Importance as land cultivated as dry cropland. The usual crops grown on Farmland of Local Importance include wheat, barley, safflower, and grain hay. Orchards affected by boron in the area specified by County Resolution Number 84-3 are also included (California DOC 2011a).

Fresno

The most recent land use mapping for Fresno County was completed by the California DOC in 2008. Out of the 2,437,418 acres mapped in Fresno County, 2,203,231 were in agricultural use, 177,568 acres were urbanized, 4,915 acres were water, and 111,704 acres were "other" (California DOC, DLRP 2012h). Table 3.9-12 summarizes further land use classifications and net changes from 2006-2008.

Table 3.9-12. Fresno County Summary and Change by Land Use Category

Land Use Category	Total Acreage Inventoried		2006-08 Acreage Changes			
	2006	2008	Acres Lost (-)	Acres Gained (+)	Total Acreage Changed	Net Acreage Changed
Prime Farmland	713,084	693,173	17,455	1,112	18,567	-16,343
Farmland of Statewide Importance	478,730	439,020	39,939	576	40,515	-39,363
Unique Farmland	98,091	94,177	4,315	401	4,716	-3,914
Important Farmland Subtotal	1,289,905	1,226,370	61,709	2,089	63,798	-59,620
Farmland of Local Importance	95,534	149,906	2,344	56,716	59,060	54,372
Grazing Land	827,116	826,955	365	204	569	-161
Agricultural Land Subtotal	**2,212,555**	**2,203,231**	64,418	59,009	123,427	-5,409
Urban and Built-up Land	115,366	117,568	601	2,897	3,498	2,296
Other Land	108,783	111,704	1,680	4,790	6,470	3,110
Water Area	4,912	4,915	1	4	5	3
Total Area Inventoried	**2,441,616**	**2,437,418**	**66,700**	**66,700**	**133,400**	**0**

Source: California DOC, DLRP 2012h

In Fresno County, all farmable lands within the county that do not meet the definitions of Prime, Statewide, or Unique are defined as Farmland of Local Importance. This definition includes land that is or has been used for irrigated pasture, dryland farming, confined livestock and dairy, poultry facilities, aquaculture and grazing land (California DOC 2011a).

Kings

In 2010, of the 890,786 acres mapped in Kings County, 823,918 were in agricultural use, 35,847 acres were urbanized, 62 acres were water, and 30,959 acres were “other” (California DOC, DLRP 2012i). Table 3.9-13 summarizes further land use classifications and net changes from 2008 to 2010.

Lands that support dairies, confined livestock, and poultry operations are defined as Farmland of Local Importance in Kings County (California DOC 2011a).

Table 3.9-13. Kings County Summary and Change by Land Use Category

Land Use Category	Total Acreage Inventoried 2008	Total Acreage Inventoried 2010	2008-10 Acreage Changes Acres Lost (-)	Acres Gained (+)	Total Acreage Changed	Net Acreage Changed
Prime Farmland	138,089	130,257	8,327	495	8,822	-7,832
Farmland of Statewide Importance	397,065	388,891	11,183	3,009	14,192	-8,174
Unique Farmland	22,928	21,801	1,792	665	2,457	-1,127
Important Farmland Subtotal	558,082	540,949	21,302	4,169	25,471	-17,133
Farmland of Local Importance	10,022	11,138	156	1,272	1,428	1,116
Grazing Land	257,746	271,831	4,610	18,695	23,305	14,085
Agricultural Land Subtotal	**825,850**	**823,918**	26,068	24,136	50,204	-1,932
Urban and Built-up Land	32,220	35,847	56	3,683	3,739	3,627
Other Land	32,654	30,959	2,445	750	3,195	-1,695
Water Area	62	62	0	0	0	0
Total Area Inventoried	**890,786**	**890,786**	28,569	28,569	57,138	0

Source: California DOC, DLRP 2012i.

3.9.2 Environmental Consequences/Environmental Impacts

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

3.9.2.1 Assessment Methods

Cropland idling transfers would take agricultural land out of production during the transfer year. If consecutive idling actions occur for the same fields over the ten year period, there could be a change in land use classifications.

To analyze these impacts, potential changes in land use are evaluated qualitatively within the counties that could participate in cropland idling water transfers. This analysis assesses any permanent conversions of agricultural land to other uses under transfer conditions relative to the baseline condition. Such conversions could result in a change in land classification or an incompatible use.

3.9.2.2 Significance Criteria

Impacts on agricultural land use would be considered potentially significant if transfers result in:

- Substantial conversion of any lands categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland (referred together as Important Farmland) under the FMMP.

- Substantial permanent conversion of agricultural lands, including lands enrolled in the Williamson Act and other land conservation programs, to an incompatible use.

- Conflict with local land use policies.

3.9.2.3 Alternative 1: No Action/No Project

There would be no impacts to Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the No Action/No Project Alternative. Under the No Action/No Project Alternative, Central Valley Project (CVP) water supply shortages to agricultural users could result in increased land idling in the Buyer Service Area in Merced, Fresno, Kings, and San Benito counties. As shown in Tables 3.9-8 through 3.9-11, these counties have lost acres of prime farmland, farmland of statewide importance, and unique farmland in recent years. Much of this acreage was converted to non-irrigated land uses because it was fallow for three or more update cycles. This trend would likely continue under the No Action/No Project Alternative with continued CVP water shortages. Land reclassified to a non-irrigated uses would not be a permanent change in land use; farmers can place previously idled lands back into production and land could be reclassified to its previous status.

Conversions of irrigated agricultural lands under existing conditions also occur in response to urban development pressures. Important Farmland is converted to houses, commercial businesses, industrial buildings, schools, and other urban infrastructure. Continued CVP water shortages under the No Action/No Project Alternative may make more farmers willing to sell lands for urban development, which would result in permanent conversions of agricultural lands. Conversions to urban lands would likely continue as in previous years. This would further reduce agricultural lands in the future.

There would be no change in cropland conversion compared to existing conditions under the No Action/No Project Alternative.

There would be no impacts to agricultural lands under the Williamson Act and other land resource programs under the No Action/No Project Alternative. Water shortages under the No Action/No Project Alternative could increase land idling in the Buyer Service Area, similar to existing conditions. Some farmers may choose to take land out of production for one or two years and others may remove land from agricultural production for the long-term if shortages are expected to prolong and increase. Under the No Action/No Project Alternative, lands taken out of agricultural production temporarily would not affect Williamson Act or FSZ contracts. Some land may be reclassified as Non-Prime, but the land would still be in the program and be compatible with agricultural uses. From 2009 to 2010, there was very little change (0.05 – 0.07 percent decreases) in acreage of Williamson Act lands in the Buyer Service Area (Table 3.9-1). This trend is expected to continue under the No Action/No Project Alternative.

Agricultural lands enrolled in the Williamson Act and other land resources programs under the No Action/No Project Alternative would not likely change relative to existing conditions.

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

Cropland idling transfers could decrease the amount of lands categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP. Under the Proposed Action, cropland idling transfers could occur in Glenn, Colusa, Butte, Yolo, Solano, and Sutter Counties in the Seller Service Area. Table 3.9-12 shows the maximum acreages that could be idled in a year. Cropland idling transfers during a single year would likely affect less than the maximum acreages listed in Table 3.9-14.

Table 3.9-14. Maximum Annual Cropland Idling Acreages under the Proposed Action

Region	Rice	Alfalfa/ Sudan Grass	Corn	Tomatoes	Total
Sacramento Region	40,704	1,400	400	400	42,904
Feather Region	10,769	600	800	400	12,569
Delta Region	-	3,000	1,500	-	4,500
Total	**51,473**	**5,000**	**2,700**	**800**	**59,973**

Cropland idling would be temporary in nature and would not result in a permanent conversion of agricultural lands. Landowners would annually choose whether to idle their fields to transfer water and could place fields back into production the following season. Therefore, there would be no permanent effects to land categorized as Important Farmland as a result of transfers.

In order for agricultural lands to be categorized as Important Farmland on the FMMP maps, they must have been used for irrigated agricultural production at some point during the four years prior to the Important Farmland Map date (mapping is completed every two years) and the soils must meet the physical and chemical criteria as determined by the USDA NRCS (California DOC 2011a and California DOC, DLRP 2012j). Therefore, for lands to be reclassified out of Important Farmland categories, the same parcel would need to be idled for four consecutive years. Transfers would not change the soil characteristics of land.

As shown in Tables 3.9-2, 3.9-3, and 3.9-6, there was a total of 893,117 acres of Important Farmland in Colusa, Glenn, and Yolo counties (the Sacramento Region) in 2010. Of this, the maximum proposed for idling in any one year is 42,904 acres. This is about 4.8 percent of the Important Farmland in these counties. In Sutter and Butte counties (the Feather Region), there was a total of 523,092 acres of Important Farmland (Tables 3.9-4 and 3.9-5) as of the most recent FMMP mapping. Maximum idling would affect approximately 12,569 acres, or 2.4 percent of the total Important Farmland in these counties. As shown in Table 3.9-7, Solano County has 147,464 acres of Important Farmland. Cropland idling in Solano County under the Proposed Action would idle a maximum of 4,500 acres, or 3.1 percent, of Important Farmland in the county. As mentioned, these are maximum idling acreages and would not likely occur each year over the 10-year transfer period.

The proposed maximum acreages for idling do not represent a substantial amount of total Important Farmland in the counties. Further, buyers have indicated cropland idling transfers are the lowest priority transfer method under the Proposed Action (see Chapter 2); therefore, it is unlikely that the maximum cropland idling transfer would occur consecutively over four years and the same parcels would be included in the transfers for substantial amounts of land to be reclassified out of Important Farmland.

Because cropland idling would be temporary in nature and transfers would affect a small percentage of the overall Important Farmland acres within counties in the Seller Service Area, the Proposed Action's impacts on agricultural land use would be less than significant.

Cropland idling water transfers could convert lands under the Williamson Act and other land resource programs in the Seller Service Area to an incompatible use. As discussed above, cropland idling would be temporary and would not result in permanent changes to the land and land would not be converted to an incompatible use. Idling actions would not interfere with objectives of the Williamson Act, FSZ lands, or other agricultural easements to preserve open space land. Yolo and Solano counties have lands under CFCP conservation easements (Table 3.9-1) that could be idled under the Proposed Action. However, agricultural lands temporarily taken out of production as a result of cropland idling water transfers would not be converted to an incompatible use. The Proposed Action's potential effects to agricultural land use would be less than significant.

Cropland idling transfers could conflict with local land use policies. Section 3.9.1.2.3 summarizes agricultural land-related policies in local planning documents of counties in the Seller Service Area. All counties have policies to protect and maintain agricultural land uses for the long-term. Cropland idling would be temporary and not permanently change land uses or conflict with land use policies in Glenn, Colusa, Butte, Sutter, and Solano counties. Yolo County has a policy that precludes the practice of fallowing fields within conservation easements for the purpose of water export. Lands under farmland conservation easements are restricted to agricultural activities. The easement would preclude landowners from participating in cropland idling water transfers. Therefore, land would continue to be farmed and there would be no change relative to the No Action/No Project Alternative.

Water transfers could provide water to irrigators in the Buyer Service Area to irrigate existing crop fields. Water deliveries could bring lands back into agricultural production that were previously idle because of reductions in available water supply. Based on the amount of water available relative to the agricultural water needs in the San Joaquin Valley, lands returned to production would not be substantial as a result of the Proposed Action. Therefore, the Proposed Action's impacts on agricultural land use would be beneficial, but minor.

3.9.2.5 Alternative 3: No Cropland Modifications

There would be no cropland idling under Alternative 3. There would be no impacts to agricultural land use in the Seller Service Area as a result of the No Cropland Modification Alternative.

Water transfers could provide water to irrigators in the Buyer Service Area to irrigate existing crop fields. Similar to the Proposed Action, the No Cropland Modification Alternative could convert land back to agricultural use that was idled because of limited water supplies. The land conversion would not be extensive because of the amount of water available relative to the agricultural water needs in the San Joaquin Valley. Therefore, the No Cropland Modification Alternative's impacts on agricultural land use would be beneficial, but minor.

3.9.2.6 Alternative 4: No Groundwater Substitution

Cropland idling transfers could permanently or substantially decrease the amount of lands categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP. Table 3.9-15 shows the maximum acreage that could be idled in the Seller Service Area under the No Groundwater Substitution Alternative. Cropland idling transfers could idle a maximum of 59,973 acres of farmland in counties in the Seller Service Area. These upper limits for cropland idling transfers are the same as in the Proposed Action. The maximum acreage would not likely be idled each year of the 10-year period.

Table 3.9-15. Maximum Annual Cropland Idling Acreages under Alternative 4

Region	Rice	Alfalfa/ Sudan Grass	Corn	Tomatoes	Total
Sacramento Region	40,704	1,400	400	400	42,904
Feather Region	10,769	600	800	400	12,569
Delta Region	-	3,000	1,500	-	4,500
Total	**51,473**	**5,000**	**2,700**	**800**	**59,973**

As discussed in the analysis of the Proposed Action, cropland idling would be temporary in nature and would not result in a permanent conversion of agricultural lands. The maximum number of acres idled would be small relative to the overall acreage of Important Farmland within the counties.

While the upper limit for cropland idling transfers would be the same as in the Proposed Action, cropland idling transfers could occur more often under the No Groundwater Substitution Alternative because groundwater substitution transfers would not be available.

There is a potential for cropland idling water transfers to change the classification of Important Farmland. Changes to the classification of farmland could result in a significant impact. In order to avoid a significant impact if cropland would change the classification to levels less than Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP, agencies participating in water transfers would implement Mitigation Measure Land Use (LU)-1, described in Section 3.9.4 to avoid changing land classifications. Consequently, land use effects would be less than significant with mitigation.

Cropland idling water transfers could convert lands under the Williamson Act and other land resource programs in the Seller Service Area to an incompatible use. As discussed above, crop idling would be temporary and would not result in permanent changes to the land and land would not be converted to an incompatible use under the Williamson Act, CFCP, or FSZ. Idling actions would not interfere with objectives of the Williamson Act and other agricultural easements to preserve open space land. In addition, increased net returns allowed by water transfers could help landowners avoid selling land for development and preserve farmland. Potential effects to agricultural land use would be less than significant.

Cropland idling transfers could conflict with local land use policies. Yolo County has a policy that precludes the practice of fallowing fields within conservation easements for the purpose of water export. The easement would preclude landowners from participating in cropland idling water transfers. Therefore, land would continue to be farmed and there would be no change relative to the No Action/No Project Alternative.

Water transfers could provide water to irrigators in the Buyer Service Area to irrigate existing crop fields. Water deliveries could bring lands back into agricultural production that were previously fallow due to reductions in available water supply. Potential effects would be the same as those described for the Proposed Action. Impacts would be beneficial, but minor.

3.9.3 Comparative Analysis of Alternatives

Table 3.9-16 lists 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.

3.9.3.1 No Action/No Project Alternative

Under the No Action/No Project Alternative, farmers in the Buyer Service Area would idle fields as a result of CVP water shortages. Depending on the extent of shortages and the number of years a particular field is idled consecutively, there could be reductions in the amount of land classified as Important Farmland. Prolonged water shortages could also result in permanent conversions of agricultural land if farmers choose to sell land to developers because of lack of irrigation water.

Table 3.9-16. Comparative Analysis of Alternatives

Potential Impact	Alternatives	Significance	Proposed Mitigation	Significance after Mitigation
Reductions in CVP water supplies for agricultural users could permanently or substantially decrease lands categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP.	1	NCFEC	None	NCFEC
Reductions in CVP water supplies for agricultural users could convert agricultural lands under the Williamson Act and other land resource programs to an incompatible use.	1	NCFEC	None	NCFEC
Cropland idling water transfers could ~~permanently or substantially~~ decrease the amount of lands categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP.	2	LTS	None	LTS
	4	S	Mitigation Measure LU-1: Avoiding changes in FMMP land use classifications	LTS
Cropland idling water transfers could convert agricultural lands under the Williamson Act and other land resource programs to an incompatible use.	2, 4	LTS	None	LTS
Cropland idling water transfers could conflict with local land use policies.	2, 4	NI	None	NI
Water transfers could provide water to irrigators in the Buyer Service Area to irrigate existing crop fields and maintain agricultural land uses.	2, 3, 4	B	None	B

Note:
B = beneficial;
LTS = less than significant
NCFEC = no change from existing conditions
NI = no impact
S = significant

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

The Proposed Action includes idling of up to 59,973 acres. This maximum acreage would not be idled each year over the 10-year transfer period or each year that transfers occur. The maximum acreage is also a small percentage of the total amount of Important Farmland in the Seller Service Area. Therefore, cropland idling transfers would not substantially decrease the amount of land classified as Important Farmland. Cropland idling transfers would also not result in permanent land reclassifications or conversions to incompatible uses. In the Buyer Service Area, increased water deliveries from transfers could result in beneficial impacts to agricultural land use because owners may start farming land again that had been idled because of limited water supplies.

3.9.3.3 Alternative 3: No Cropland Modifications

The No Cropland Modification Alternative does not include cropland idling. There would be no impacts in the Seller Service Area as a result of idling. Effects in the Buyer Service Area would be the same as the Proposed Action.

3.9.3.4 Alternative 4: No Groundwater Substitution

The No Groundwater Substitution Alternative includes the same upper limit for cropland idling as the Proposed Action. This maximum acreage would not likely be idled each year over the 10-year transfer period; however, it would occur more frequently during years that transfers occur relative to the Proposed Action because there are fewer other types of transfers. The frequency of idling in the No Groundwater Substitution Alternative could result in substantial decreases in the amount of Important Farmland. Implementation of Mitigation Measure LU-1 would make impacts to agricultural land use designations less than significant. Similar to the Proposed Action, cropland idling transfers would not result in permanent land reclassifications or conversions to incompatible uses. Effects in the Buyer Service Area would be the same as the Proposed Action.

3.9.4 Environmental Commitments/Mitigation Measures

The following mitigation measures would reduce adverse land use effects of the No Groundwater Substitution Alternative.

3.9.4.1 Mitigation Measure LU-1: Avoiding Changes in FMMP Land Classifications

Water would not be acquired from a particular parcel of land if idling the land would result in a lower classification of Important Farmland as defined under the FMMP. The selling agency will provide cropping history of specific parcels to be idled for the transfer to Reclamation to determine if idling will result in a change in classification from Important Farmland.

3.9.5 Potentially Significant Unavoidable Impacts

None of the action alternatives would result in potentially significant unavoidable impacts to agricultural land use.

3.9.6 Cumulative Effects

The timeframe for the Long-Term Water Transfers cumulative analysis extends from 2015 through 2024, a ten-year period. The cumulative effects analysis for agricultural land use considers State Water Project (SWP) water transfers and the CVP Municipal and Industrial (M&I) Water Shortage Policy (WSP). Chapter 4 further describes these projects and policies. Land protections and environmental restoration programs are also considered since these programs take actions to maintain agricultural and open space land uses.

The cumulative analysis also considers general population growth and associated urban development planned in the future in counties where cropland idling could occur. The following paragraphs describe planned land use changes in the area of analysis.

3.9.6.1 Seller Service Area

3.9.6.1.1 Glenn County

The most recent county general plan documents (1993b) describe the prominent land use in the county as agriculture, forests, and open space/grazing lands. While the general plan is from almost a decade ago, existing land uses in the county have not changed substantially during that period (Popper 2012). Approximately 500,000 acres of land in the unincorporated county is used for agricultural purposes with half in grazing land and half in farming (Glenn County 1993b). Urban and residential development is clustered around the unincorporated communities in the county including Bayliss, Glenn, Ord Bend, Capay, Codora Four Corners, Artois, Hamilton City, Butte City, North Willows, Northeast Willows, and West Orland (Glenn County 1993b).

There are currently no development applications in the unincorporated area of Glenn County which would potentially displace large acreages of irrigable ground (Popper 2012). Approximately seven miles northwest of the City of Willows, there is a pending solar power development. The proposed project is currently undergoing environmental review. It proposes to change the zoning of an approximately 170 acre parcel from AP to Recreation and Planned Motor Sports. This rezoning would also cancel a land conservation contract (Popper 2012). There is no current timeline for construction of this proposed project.

As shown in Table 3.9-1, from 2010 to 2012, there was a slight increase in Williamson Act lands in the county. However, the California DOC notes that from 2008 to 2010 there were land use changes in the county from irrigated farmland to urban land (California DOC 2011b). These changes were primarily due to the construction of new homes, buildings and parking lots.

City of Orland

Land use in the City of Orland is primarily low density residential and residential estate (City of Orland no date). Other uses that make up a smaller portion of land area within the city and the SOI include commercial, heavy and light industrial, medium and high density residential, public facility, mixed-used, and open space/resource conservation. The Land Use Element of the 2008 Draft General Plan guides the city's growth over 15-20 years (City of Orland 2010). One of the basic principles in the General Plan, Land Use Element is to preserve open space and farmland from intensive development. The land use SOI is defined as lands surrounding the city where expansion is likely to occur in the near future. While the city can work with Glenn County to affect changes to land use and proposed development within the SOI, it has no direct land use authority outside of the city limits.

From 1990 to 2000, the population of the city increased by 24.3 percent with an average annual increase of 2.2 percent. By comparison, the population of Glenn County increased by 6.7 percent over that same time period (City of Orland 2010). The General Plan also presents projected population growth from 2008-2028 using three growth rate scenarios. Table 3.9-17 summarizes these projections.

Table 3.9-17. Population Projections, City of Orland (2008-2028)

Growth Rate	Orland Population				
(%)	**2008**	**2013**	**2018**	**2023**	**2028**
High (2.6)	7,376	8,386	9,534	10,840	12,324
Medium (2.2)	7,347	8,192	9,133	10,183	11,354
Low (1.8)	7,318	8,001	8,748	9,564	10,456

Source: City of Orland 2010

The city also projects future land use demands based on projected population growth. Table 3.9-18 summarizes the land use development forecast for all residential, commercial, and industrial land use needs from 2007 through 2027 at each potential growth rate.

Table 3.9-18. Total Land Use Development Forecast

Growth Rate (%)	Land Required (acres)				
	2007-2011	2012-2016	2017-2021	2022-2027	Total
High (2.6)	165	189	214	244	812
Medium (2.2)	139	157	171	193	606
Low (1.8)	113	121	133	143	510

Source: City of Orland 2010

The city used the established General Plan land uses and densities of land within the city as well as the undeveloped land acreages to estimate the number of new homes and population that could result from current policies. Table 3.9-19 summarizes the maximum residential growth (on land designated for residential land use in the General Plan) and population at buildout of the General Plan. If the city's residential land were built out to its potential (assuming a density of three persons per single-family unit, 2.5 persons per medium-density multi-family unit, and two persons per high density multi-family unit) the total population could reach over 25,000 (City of Orland 2010).

Table 3.9-19. Maximum Residential Growth at Buildout

General Plan Designation	Additional Developable Acres	Additional Population	Total Possible Population[1]
Residential, low density	149	2,682	29,705
Residential, medium density	-5	-120	1,284
Residential, high density	41	2,050	4,027
Residential, estate	896	5,376	10,090
Mixed Use	29	870	870
TOTAL	**1,110**	**10,858**	**45,940**

Source: City of Orland 2010
Note:
[1] Number is based on addition to Possible Population under 2003 General Plan

Table 3.9-17 illustrates that total possible population at maximum buildout of residential lands in the city would accommodate the population projections shown in Table 3.9-15, above. Further, Policy 2.2.A in the General Plan states that the city will "maintain defined boundaries and adequate buffers between agricultural land and urbanized areas" (City of Orland 2010). Policy 2.2B states that the "City shall direct development towards existing neighborhoods by encouraging infill and redevelopment activity" (City of Orland 2010).

City of Williams

Main land uses in the city consist of business park, agriculture, and suburban residential on the edges of the city with urban residential, commercial, downtown, industrial, institutional, neighborhood conservation, and parks and recreation in the central part of the city (City of Williams 2010a).

The City of Williams' General Plan describes that the city population is expected to grow to around 9,822 persons by the year 2030 (City of Williams 2010b). This represents an increase of approximately 4,535 persons. Similar to the City of Orland, Williams developed three future growth scenarios to plan for future land use and population growth, a low growth, moderate growth, and high growth scenario (City of Williams 2010b). Table 3.9-20 summarizes the population estimates and projections from 2009 to 2030.

Table 3.9-20. Population Projections, City of Williams (2009-2030)

	Population	Actual Change
2009 Estimate	5,287	--
Year 2030 Low	7,667	2,380
Year 2030 Mid	9,822	4,535
Year 2030 High	12,048	6,761

Source: City of Williams 2010b

The city identified the mid-range growth scenario as their preferred future growth rate and the future land use plan establishes residential land acreages that will accommodate this level of growth; these are summarized in Table 3.9-21.

Table 3.9-21. District Acreages and Corresponding Populations

	Residential District			
	Estate	Suburban	Urban	Total
Acres	204	101	260	565
Density (units/acre)	0.43	2.13	3.48	
Persons per Household	3.7	3.7	3.7	
Total Persons	325	796	3,348	9,755[1]

Source: City of Williams 2010b

Note:

[1] Total includes total persons projected in each residential district (4,468) added to the 2009 population estimate of 5,287.

The city's General Plan and Future Land Use Plan illustrate that housing for projected population increases is anticipated to be accommodated for within the existing SOI. Land use policies related to future growth patterns including growing contiguously to maintain the efficiency of public services and a compact community form (Policy 3.30 of the City of Williams 2010b).

3.9.6.1.2 Colusa County

Existing land uses in Colusa County are primarily agricultural (Colusa County 2010). Steady population growth over the last several decades has led to corresponding increases in housing development throughout the unincorporated county and incorporated cities over the past 20 years. Table 3.9-22 summarizes the percentage of existing land uses in Colusa County.

Table 3.9-22. Existing Land Uses (2008)

Land Use Category	Percent
Cropland	75
Grazing Lands	1
National Forest	10
National Wildlife Refuge	2
Incorporated Cities	0.3
Communities	0.4
Rural Subdivisions and Settlements	0.2
Other Lands	11
Water Areas	0.3

Source: Colusa County 2010.

The county's General Plan Background Report (Colusa County 2010) lists several approved and pending development projects in the unincorporated county as well as in the Cities of Colusa and Williams. Some of the planned development within the county, both incorporated and unincorporated areas, has slowed as a result of the economic downturn in recent years; however, residential development is still occurring and more is planned for the future. The background report notes that while growth in the unincorporated county is directed primarily to Special Growth Areas designated by the county's general plan, areas in the county are slowly transitioning from orchard and field crop land uses to residential land uses.

As shown in Table 3.9-1, the county lost 0.19 percent of its Williamson Act lands from 2009 to 2010; although, this is not directly tied to increases in residential development. In light of this decrease, the California DOC notes that from 2008 to 2010, there were no conversions from irrigated farmland to urban land within the county (California DOC 2011c). While there were no direct conversions from irrigated farmland to urban land, there were land use conversions from irrigated farmland to nonirrigated uses. The majority of these changes occurred because plots of irrigated farmland had been fallow for three or more FMMP update cycles (California DOC 2011c).

City of Colusa

The City of Colusa's SOI is approximately 2,842 acres including all land within the city limits and an additional 1,668 acres outside of the city limits. Unincorporated land represents approximately 59 percent of the city's total SOI area (City of Colusa 2007). The population growth rate since 1990 has averaged 0.95 percent per year with a high of 2.56 percent between 1996 and 1997 (City of Colusa 2007). Existing land uses in the city consist of residential, commercial (along the State Route (SR) 20/45 corridor and in the core downtown area), industrial, airport, recreation, open space, and public facilities. The city's General Plan Land Use Map identifies lands adjacent to and outside of the SOI as agricultural lands.

The city anticipates a growth rate of three to four percent over the next 20 years. The General Plan Land Use Element describes that various areas proposed for future annexation and/or development are designated as agricultural land. While this fact may lead to some continuing conversion of agricultural lands to residential or other uses, the city acknowledges the need for agricultural buffers to mitigate impacts from the agriculture-urban interface. General Plan policies support the use of various techniques such as the use of Urban Reserve land use designations, density transfers, agricultural easements, land transfers to non-profit farmland trusts, and private agreements between developers and agricultural land owners to allow necessary residential development while preserving important agricultural resources.

3.9.6.1.3 Butte County

The majority of existing land use in unincorporated Butte County is agricultural, with small areas of residential, commercial, and industrial land use types (Butte County 2012b). Table 3.9-23 summarizes existing land uses within the unincorporated county.

Table 3.9-23. Existing Land Uses (2008)

Land Use Category	Percent
Agriculture	58
Public/Quasi-Public	17
Residential – Single-Family	11
Vacant	9
Undefined	2.6
Residential – Multi-Family	0.9
Commercial and Office	0.4
Industrial	0.1
Tribal Lands	0.04

Source: Butte County 2012b.

While most residential units are located within the five incorporated municipalities, which are Cities of Chico, Oroville, Gridley, and Biggs, and the Town of Paradise, some residential units are dispersed throughout the unincorporated county. Commercial and industrial uses are primarily located near the municipalities (Butte County 2012b).

The county directs growth to existing urbanized areas and near existing infrastructure to prevent scattered development (Butte County 2012b). Existing and future planned unit developments and area, neighborhood, or specific plans have been or are being developed for areas surrounding Chico, Oroville, and Paradise. Transfers in Butte County occur in the southwestern portion of the county, near the Cities of Gridley and Biggs, and therefore these development plans do not affect agricultural resources in the transfers area.

The California DOC reports that from 2008 to 2010 there were small changes from irrigated farmland or non-irrigated land uses to urban land within the county. These changes are due to construction of homes and commercial buildings on parcels less than 15 acres adjacent to municipalities, including Gridley and Biggs. Conversions of irrigated farmland to non-irrigated uses were primarily a result of farmland going fallow for three or more FMMP update cycles. There were a large number of changes from irrigated farmland to other land, with large areas near the Gray Lodge Wildlife Area and south of Chico being tracked for seasonal flooding and return to wetlands. In Gridley, almost 20 acres planned for an industrial park was changed from urban land due to inactivity on the project. The California DOC reports that Gridley and Biggs area appear to have more land use changes on a smaller scale (California DOC 2011d).

City of Biggs

The Biggs SOI encompasses 540.6 acres and the Planning Area is 4,627 acres. The City of Biggs, which is approximately 414 acres, is predominantly single-family residential. Less than 16 percent of the total area of the city is employment-generating, commercial, or vacant and available for development. Commercial and industrial land use have been declining due to development of large retail stores in the surrounding larger cities and limited employment options. Biggs has limited infill and redevelopment opportunities and has expressed interest in extending the SOI to expand growth opportunities (City of Biggs 2014).

The Butte County Association of Governments has projected that the city could potentially double its population by the year 2035. Up to 1,090 new housing demand is projected for a high growth scenario. Development areas surrounding the city, within the current Planning Area, have been identified to accommodate new residences, schools, parks, wastewater treatment plant, and commercial and industrial uses (City of Biggs 2014).

City of Gridley

Similar to Biggs, growth within the current City of Gridley is limited. To accommodate for future growth of Gridley and Biggs, a 2,846-acre area of concern was established by the Butte Local Agency Formation Commission. Approximately 1,200 acres of this area is designated as the planned growth area for Gridley. The buildout of the General Plan could result in up to 4,700 residential units, 1.3 million square feet of commercial building space, four million square feet of industrial building space, and additional schools, parks, and infrastructure for the growth within the existing city, the SOI, and planned growth area. (City of Gridley 2010)

3.9.6.1.4 Sutter County

Unincorporated Sutter County land use is dominated by agriculture. Other uses including residential and commercial are located in unincorporated rural communities in the county as well as the cities of Yuba and Live Oak (Sutter County 2010b). Table 3.9-24 summarizes existing land uses within the county.

Table 3.9-24. Existing Land Uses (2010)

Land Use Category	Percent
Agricultural	86.6
Residential	1
Public and Airport	0.1
Commercial	0.1
Industrial	0.2
Open Space, Parks and Golf Course	11.9
Transportation and Utilities	0.5
Vacant	0.1

Source: Sutter County 2010b.

The majority of agricultural land is located in the unincorporated areas of the county outside of the boundaries of the unincorporated communities (Meridian, Sutter, Robbins, Nicolaus, East Nicolaus, Trowbridge, and Rio Oso). While most residential uses are located in these communities and Yuba City and Live Oak, there are also residential uses in the unincorporated county. Most of these residential uses are located near the cities and communities or along major transportation corridors (Sutter County 2010b).

In order to accommodate future growth, the county directs growth to five identified Growth Areas that are in close proximity to existing public infrastructure and services. In addition to these growth areas, future growth in the county is planned to be directed towards the Yuba City and Live Oak spheres of influence. In total, new growth is expected to change the land use of approximately eight percent of unincorporated county lands (Sutter County 2010b). Some of these growth areas overlap lands currently used for agriculture (Sutter County 2010b).

The California DOC reports that from 2008 to 2010 there were small additions to existing urban land within the county. These changes are noted as primarily small changes from irrigated farmland to urban land. The largest land use conversion was a residential development located near orchards south of Yuba City (California DOC 2011e). Other conversions of irrigated farmland to non-irrigated uses were primarily a result of farmland going fallow for three or more FMMP update cycles (California DOC 2011e).

City of Live Oak

The majority of land in the City of Live Oak is in residential use (City of Live Oak Nd.). Commercial uses occur along the SR-99 corridor, with both a historic commercial and new commercial district. There are also parks and civic land uses throughout the city. Through their General Plan, the city describes that they have provided sufficient land to accommodate housing and job growth through the year 2030. Table 3.9-25 summarizes the acreage and housing units of land uses in the county under full buildout.

Table 3.9-25. General Plan Land Use Designations and Housing Units, City of Live Oak (1999-2030)

Designation	Acres	Housing Units
Low-Density Residential	1,610-1,970	5,290-6,460
Smaller-Lot Residential	1,310-1,610	6,190-7,570
Medium-Density Residential	160-200	1,200-1,460
Higher Density Residential	100-130	1,410-1,720
Commercial Mixed Use	190-230	--
Downtown Mixed Use	70-90	--
Community Commercial	60-70	--
Employment	190-230	--
Civic	140-180	--
Park	160-200	--
Open Space Buffer	60-70	--

Source: City of Live Oak Nd.

As with other cities, Live Oak recognizes development pressures in the urban reserve area outside of the city boundaries. Land use policies, such as policy LU-1.5, provide for development within this urban reserve area only after a comprehensive planning and environmental review (City of Live Oak Nd.).

City of Yuba City

Lands within the urban growth boundary (UGB) for Yuba City include 12,954 acres (City of Yuba City 2004). Most of the developed land is within the existing city limits and approximately 7,079 acres are located in unincorporated Sutter County. Table 3.9-26 summarizes existing land uses with the UGB.

Table 3.9-26. Land Use in the Yuba City UGB, 2002

Designation	Incorporated (acres)	Unincorporated (acres)	Total (acres)
Single-Family Residential	2,266	1,271	3,538
Multi-Family Residential	371	51	421
Mobile Home Park	66	72	138
Commercial Retail	311	34	345
Shopping Center	95	--	95
Office	104	8	111

Designation	Incorporated (acres)	Unincorporated (acres)	Total (acres)
Other Commercial	18	2	20
Auto Services	5	1	6
Visitor Services – Hotel/Motel	11	--	11
General Industrial	380	159	539
Public and Semi-Public	601	499	1,100
School	122	17	140
Park and Recreation	84	1	85
Agricultural Land	630	4,821	5,451
Transportation, Communications, and Utilities	25	12	38
Vacant	787	130	918
Total	**5,875**	**7,079**	**12,954**

Source: City of Yuba City 2004

The General Plan describes that adequate land was provided in the planning process to accommodate anticipated housing and job development through 2025 (City of Yuba City 2004). Full buildout includes a total of 7,200 gross acres that would be developed within the UGB, including infill sites. Most areas planned for new development are residential in use and total an area of approximately 4,655 acres.

The city estimates a 2.5 percent annual growth rate and a total population within the SOI (including the City of Yuba City and surrounding unincorporated areas) in 2025 of 105,730. The Land Use Plan of the General Plan accommodates a higher population than the projection. The Plan accommodates for 19,220 new housing units and 51,310 new residents, for a projected possible population of 108,340.

While realizing the need to accommodate this growth, the Land Use Plan policies encourage maintaining the compact form of the city and continuing to protect rural areas by the establishment of the UGB. The Land Use Plan policies, such as policy 3.4-G-1, which states “maintain a well-defined compact urban form, with a defined growth boundary and urban development intensities on land designated for urban uses,” are focused on maintaining the city’s small town feel and preserving the surrounding agricultural land (City of Yuba City 2004).

3.9.6.1.5 Yolo County

The majority of land use in Yolo County is cultivated agriculture with livestock grazing and public open space as the next largest uses (Yolo County 2005). Approximately four percent of total county lands are within the jurisdictional boundaries of a city (Yolo County 2005). Existing land uses in Yolo County (both incorporated and unincorporated areas) are summarized in Table 3.9-27.

Table 3.9-27. Existing Land Uses – Yolo County Incorporated and Unincorporated Areas[1]

Land Use Category	Percent
Agricultural commodities	0
Commercial	0
Cultivated Agricultural Lands	54
Industrial	1
Livestock	22
Office	0
Orchards/Vineyards	7
Private Recreational (developed and open space)	0
Public Open Space	8
Public/Quasi-Public	2
Residential (mobile home, multi-family, single-family)	1
Roads	0
Rural Residential	2
Unknown	0
Vacant	1
Water	1

Source: Yolo County 2005
[1] Does not account for most lands in railroad and public rights of way.

The county's *Agricultural Preservation Techniques Report* (Yolo County 2006) describes the urban development pressures Yolo County faces due to statewide population growth as well as the county's proximity to Sacramento and the San Francisco Bay Area.

The county actively protects its farmlands through Williamson Act contracts, agreements with cities to limit new development within the cities' spheres of influence, and requirements for mitigation of farmland conversion (Yolo County 2006). There are several approved and pending development projects in the county that would alter agricultural land use. One such project is the Clark Pacific Expansion Project. The Clark Pacific Company manufactures concrete products and is requesting rezoning on approximately 140 acres of their property to change the use from agriculture to industrial (Yolo County Planning and Public Works Department 2012). In addition to this development in the unincorporated county, there are several approved and completed residential and commercial developments in the community areas of Clarksburg, Dunnigan, Esparto, and Knights Landing (Yolo County 2012). These developments range from a 180-unit subdivision and proposed town center area in Esparto to a truck and travel center in Dunnigan (Yolo County 2012). Many of these would take place on existing open space and agriculturally zoned land.

City of Woodland

The Planning Area for the Woodland General Plan Land Use and Community Design Chapter includes all land designated for or to be considered for future development as part of the city (City of Woodland 2002). The area outside of the Planning Area is designated as agriculture. The General Plan describes that “many forces are encouraging new residential and employment development in Woodland” (City of Woodland 2002). The city projects population growth to increase from approximately 42,500 in 1995 to approximately 66,000 by 2020. The urban limit line, which is within the Planning Area and is defined as a line encompassing all land to be considered for urban development within the timeframe of the General Plan, is established to accommodate projected growth through 2020.

The city recognizes that continued development and growth would convert some agricultural land to urban development. However, policies in the General Plan are aimed at maintaining agricultural uses and protecting adjacent agricultural lands from the negative effects to urban development (City of Woodland 2002). For example, Policy 1.I.1 states that “the city shall discourage leapfrog development and development in peninsulas extending into agricultural lands to avoid adverse effects on agricultural operations” (City of Woodland 2002).

3.9.6.1.6 Solano County

Approximately 85 percent of the land in Solano County is unincorporated. Of this, approximately 70 percent is currently used for agriculture (Solano County 2008b). Agricultural land is concentrated in the eastern part of the county, where cropland idling transfers would occur. Solano County’s cities include Benicia, Dixon, Fairfield, Rio Vista, Suisun City, Vacaville, and Vallejo. Given the majority of residential development occurs within the incorporated areas of the county, the county’s cities account for approximately 95 percent of the population (Solano County 2008b). While residential development does exist in the unincorporated county, it is at rural residential densities of one unit per 2.5 or more acres. Denser residential development is located in the cities and a small amount in the unincorporated areas in Vallejo.

The county’s 2030 general plan defines future land use designations and land uses within the unincorporated county. The majority of open space and agricultural designations within the county are not proposed to change (Solano County 2008b). Table 3.9-28 summarizes existing land uses within the county as of 2006.

There are a couple of current planning projects in the unincorporated county that propose major subdivisions (Solano County 2012). One is an eight lot subdivision of an Exclusive Agriculture District, which is a zoning designation where regulations and special permitting apply, and the other is a seven lot subdivision of an Exclusive Agriculture District (Solano County 2012). The county continues to guide most residential and commercial development toward the incorporated cities using municipal service areas (generally defined as the city boundaries) (Solano County 2008b).

Table 3.9-28. Existing Land Uses – Solano County (2006)

Land Use Category	Percent
Water	8.8
Park and Recreation	0.1
Marsh	11.1
Watershed	6.3
Agriculture	56.5
Public/Quasi-Public	0.3
Residential	1.2
Commercial	0.1
Industrial	0.4
Vacant Land	0.2
Roadways/Railroad Right of Ways	1.1
Incorporated Areas	14

Source: Solano County 2008b.

3.9.6.2 Buyer Service Area

3.9.6.2.1 Stanislaus County

The vast majority of land within Stanislaus County is designated as agricultural land and lies outside of designated growth areas. The county actively directs additional growth and urban development to underused land within the incorporated cities and unincorporated communities in the county. There are nine incorporated cities in the county: Ceres, Hughson, Modesto, Newman, Oakdale, Patterson, Riverbank, Turlock, and Waterford (Stanislaus County 20123).

The most recent land use change report, published by the California DOC, for Stanislaus County is from 2012. The report notes that there was a slight land use change from irrigated farmland to urban land. The majority of these changes occurred in or adjacent to the City of Riverbank. Additional urban development took place on non-irrigated land uses (defined as grazing areas, dryland crop farming, and formerly irrigated land that has been left idle for three or more FMMP update cycles) (California DOC 201211k).

3.9.6.2.2 San Joaquin County

Like most of the counties in the area of analysis, agriculture (including grazing) accounts for the majority of existing land use in the unincorporated county, approximately 89.1 percent of the total land in the county. Residential uses make up approximately 4.83 percent of the existing land use in the county (San Joaquin County 20052014a). There are eleven seven incorporated cities in the county: Delta, Escalon, Lathrop, Linden, Lockeford, Lodi, Manteca, Ripon, Stockton, Thornton, and Tracy (San Joaquin County 2014b1). Table 3.9-29 summarizes the acreage and percent of lands in major land use categories in the unincorporated county.

Table 3.9-29. Existing Land Uses – San Joaquin County (2009)

Land Use Category	Percent
Agriculture	89.1
Commercial	1.2
Industrial	0.6
Residential[1]	4.8
Vacant	1.21
Miscellaneous	3.0

Source: San Joaquin County 2005.

[1] Rural parcels which are five acres are les and which contain a house are considered residential.

The most recent land use change report, published by the California DOC, for San Joaquin County is from 2010. The report notes land use changes from irrigated farmland to urban land. The majority of these changes occurred in or adjacent to the cities of Manteca, Stockton, and Tracy. Additional urban development took place on non-irrigated land uses (defined as grazing areas, dryland crop farming, and formerly irrigated land that has been left idle for three or more FMMP update cycles). While urban development is responsible for some of the conversions of irrigated farmland, land fallowing (for three or more update cycles), contributed to a large portion of land conversions from irrigated agricultural uses (California DOC 201~~1~~j0b).

3.9.6.2.3 Merced County

Land in Merced County is separated into specific land use designations which aid in guiding the type of development that takes place within the county. The vast majority of land within the county is designated as Agriculture and Foothill Pasture and lies outside of designated growth areas. Growth is directed towards the county's urban land use area, which include city planning areas, urban communities, rural centers, rural residential centers, highway interchange centers, and isolated urban designations (Merced County 2011). These urban area boundaries are defined either by the city jurisdictional boundaries in the county or by areas of existing concentrations of residential and commercial uses supported by existing infrastructure. The county actively directs additional growth and urban development to vacant and underused land within the incorporated cities and unincorporated communities in the county. There are six incorporated cities in the county: Atwater, Dos Palos, Gustine, Livingston, Los Banos, and Merced (Merced County 2011).

The most recent land use change report, published by the California DOC, for Merced County is from 2008. The report notes land use changes from irrigated farmland to urban land. The majority of these changes occurred in or adjacent to the cities of Atwater, Merced, and Los Banos. Additional urban development took place on non-irrigated land uses (defined as grazing areas, dryland crop farming, and formerly irrigated land that has been left idle for three or more FMMP update cycles). While urban development is responsible for some of the conversions of irrigated farmland, land fallowing (for three or more update cycles), contributed to a larger portion of land conversions from irrigated agricultural uses (California DOC 2009a).

3.9.6.2.4 San Benito County

Approximately 99.5 percent of land within the county is unincorporated, while the remaining 0.5 percent is incorporated (San Benito County 2010). Like most of the counties in the area of analysis, agriculture (including grazing) accounts for the majority of existing land use in the unincorporated county. The county also contains a significant amount of land (8.9 percent of the unincorporated county) owned by city, state, and federal governments. Residential uses make up approximately 1.1 percent of the existing land use in the county (San Benito County 2010). Table 3.9-30 summarizes the acreage and percent of lands in major land use categories in the unincorporated county.

Table 3.9-30. Existing Land Uses – San Benito County (2009)

Land Use Category	Percent
Agriculture[1]	83.2
Commercial[2]	0.1
Industrial[3]	0.3
Residential[4]	1.1
Vacant[5]	0.6
Other[6]	14.5

Source: San Benito County 2010.

[1] Agriculture includes crops, dry farming, facility, general, grazing, nursery, recreation, resource, livestock, orchard, and vineyard.

[2] Commercial includes commercial, medical, motel, and recreation.

[3] Industrial includes heavy industrial, industrial, industrial farming, industrial food, and mines or quarries.

[4] Residential includes residential, rural, single-family, multi-family, mobile homes, and mobile home park.

[5] Vacant includes vacant agriculture, vacant commercial, vacant industrial, and vacant residential.

[6] Other includes infrastructure, miscellaneous, public/quasi-public, parks/resource management land, and unknown.

The two cities within San Benito County are Hollister and San Juan Batista. The county operates with a Local Agency Formation Commission, which acts to, among other things, preserve agricultural land resources and discourage urban sprawl (San Benito County 2010).

Based on the existing general plan land use designations and zoning, there is future residential buildout potential in the county of approximately 32,300 units to 34,300 units (San Benito County 2010). Information on previous developments from the county illustrates that both residential and industrial developments resulted in some conversions of agricultural land over the past year (San Benito County 2012).

The California DOC reports changes from irrigated farmland to both residential and non-irrigated land uses as well. Between 2008 and 2010, there were only a couple conversions from irrigated farmland to urban land. These occurred in the Cities of Hollister and San Juan Bautista (California DOC 2011hf). The majority of conversions from irrigated farmland to non-irrigated uses were related to land fallowing for three or more FMMP update cycles (California DOC 2011hf).

3.9.6.2.5 Fresno County

As shown in Table 3.9-31, the largest land use in Fresno County is agriculture.

Table 3.9-31. Existing Land Uses – Fresno County (1997)

Land Use Category	Percent
Residential	2.5
Commercial	0.12
Industrial	0.18
Agriculture	48.0
Resource Conservation	44.8
Unclassified (includes streets, highways, and rivers)	0.18
Incorporated Cities	2.6

Source: Fresno County 2000.

The most recent land use change report, published by the California DOC, for Fresno County is from 2008. The report notes land use changes from irrigated farmland to urban land. The majority of these changes was less than 20 acres and was attributable to residential and educational facility development. Two of these changes were developments over 100 acres in size (California DOC 2009b). While urban development is responsible for some of the conversions of irrigated farmland, land fallowing (for three or more FMMP update cycles), contributed to a larger portion of land conversions from irrigated agricultural uses (California DOC 2009b).

Other recent pending and approved developments that propose rezoning agricultural land to residential and other uses in the county include a couple proposals for natural gas drilling, a solar power generation facility, and residential development (Fresno County 2012). While Fresno County faces development pressures and conversions of agricultural land uses, the county's policies of directing urban growth away from agricultural lands and to cities, unincorporated communities, and other areas planned for such development, helps maintain agriculturally designated areas for agricultural use (Fresno County 2010).

3.9.6.2.6 Kings County

Kings County has four incorporated cities, Avenal, Corcoran, Hanford, and Lemoore (Kings County 2010). Table 3.9-32 summarizes land uses in the county and illustrates the fact that agriculture is by far the dominant land use in the county (Kings County 2010).

Table 3.9-32. Existing Land Uses – Kings County

Land Use Category	Percent
Agriculture	90.17
Residential	0.38
Mixed Use	0.02
Commercial	0.10
Industrial	0.31
Other Uses (Natural Resource Conservation, Open Space, and Public)	9.03

Source: Kings County 2010.

Between 1993 and the county's most recent General Plan update, agriculture accounted for the greatest amount of land use conversions (Kings County 2010). Of the over 97,000 acres of agricultural land converted to another use, approximately 73 percent was converted to Natural Resource Conservation and Open Space (Kings County 2010).

Kings County's land use policies identify priority agricultural areas for conservation and guide development away from these areas; however, the California DOC reports land use changes from irrigated farmland to urban land in the county between 2008 and 2010 (California DOC 2011ig). The majority of these changes took place within the incorporated cities in the county. Additionally, as with other counties in the area of analysis, changes from irrigated farmland to non-irrigated land uses were largely the result of land being fallow for three or more FMMP update cycles (California DOC 2011ig).

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

3.9.6.3.1 Seller Service Area

Water acquisition via cropland idling under the Proposed Action in combination with other water management activities, population growth, and development projects converting agricultural land to different uses could decrease the amount of land in the Seller Service Area categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP and convert Williamson Act or other land conservation program lands to an incompatible use. Water management activities that could result in cumulative effects with long-term water transfers include the CVP M&I WSP and SWP water transfers. The CVP M&I WSP could limit water supplies to agricultural users and result in increased agricultural land idling in the Seller Service Area. These changes, however, would likely be minor because the changes in water deliveries would likely represent a small amount of the overall water supply within the area of analysis.

Cropland idling implemented under the SWP transfers could result in a maximum of 26,342 acres of idled rice land. Similar to cropland idling for CVP transfers, SWP cropland idling transfers would be a temporary effect and would not result in land being converted to incompatible uses. Under the cumulative condition, land classifications could change if parcels are repeatedly idled under other water transfer programs. The majority of SWP cropland idling transfers would occur in Butte County, where only small amounts of idling could occur under the Proposed Action. Both CVP and SWP transfers could occur in Sutter County, although SWP transfers projected from Sutter County are relatively small. The Proposed Action includes a maximum of up to 12,569 acres that could be idled in Butte and Sutter counties, which is not a substantial amount of Important Farmland acreage in the counties.

As described in Section 3.9.2.4, cropland idling under the Proposed Action would be temporary in nature and transfers would affect a small percentage of the overall Important Farmland acres within counties in the Seller Service Area. The cumulative water management activities similarly have temporary and small impacts to agricultural land classification.

Counties and cities in the Seller Service Areas continue to undergo development pressures that result in the conversion of agricultural lands to urban uses. Additionally, throughout the area of analysis, cropland idling is a large driver in the conversion of agricultural lands and the reclassification of FMMP designations. Conversions of agricultural lands to urban uses and land fallowing would likely continue into the future. While counties in the area of analysis set policies to guide development in ways that conserve agricultural lands, permanent conversions of agricultural lands would continue in the future.

As described in Section 3.9.6.1, cities in the Seller Service Area would continue to undergo population and employment growth into the future and throughout the city general plan planning horizons. In the current general plans for cities in the Seller Service Area, many cities anticipate higher annual growth rates than have been experienced over previous planning horizons. All of the cities have accounted for this future growth in their general plans, and many attempt to guide growth through the establishment of UGBs or urban limit lines. All city general plans acknowledge the possibility of future pressures for annexation of lands designated as agriculture. While cities in the Seller Service Area acknowledge the importance of preserving agricultural resources as well as the agricultural industry, future development could continue to convert agricultural land to non-agricultural uses. These cumulative land use changes as well as other agricultural land conversions in the county would be potentially significant.

Cropland idling under the Proposed Action would not result in permanent conversions of Important Farmland under the FMMP or Williamson Act and other land conservation program lands to an incompatible use. When considered in combination with other past, current, and future changes to agricultural land use in the area of analysis, agricultural land use impacts associated with acquisition of water via cropland idling in the Proposed Action would not be cumulatively considerable.

3.9.6.3.2 Buyer Service Area

Water transfers in combination with other water management activities, population growth, and development projects in the Buyer Service Area could change the amount of land in the area of analysis categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP. Water management activities that could result in cumulative effects with long-term water transfers include the CVP M&I WSP, refuge transfers, and SWP water transfers. The CVP M&I WSP could limit water supplies to agricultural users and result in increased agricultural land idling in the Buyer Service Area. These changes, however, would likely be minor because the changes in water deliveries would likely represent a small amount of the overall water supply within the Buyer Service Area. Refuge transfers could purchase water from sellers in the San Joaquin Valley that make water available through cropland idling, but this would also represent a very small change in land use within the area. The Proposed Action and SWP transfers would offset this minor, adverse impact by increasing the water supplies within the Buyer Service Area.

Similar to the Seller Service Area, the counties in the Buyer Service Area project agricultural conversion to urban or environmental uses in the future. The cumulative agricultural land conversions would be potentially significant. The Proposed Action's incremental contribution to this significant cumulative effect would be beneficial because it would increase water supplies and potentially allow growers to place previously idled land into production.

3.9.6.4 Alternative 3: No Cropland Modifications

Because Alternative 3 would not include cropland idling, it would not contribute to cumulative impacts as a result of conversion of Important Farmland under the FMMP in the Seller Service Area. Additionally, there would be no cumulative impacts related to conversion of Williamson Act or other land conservation program lands to an incompatible use in the Seller Service Area.

Water transfers in combination with other water management activities, population growth, and development projects in the Buyer Service Area could change the amount of land in the area of analysis categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP. Water management activities that could result in cumulative effects with Alternative 3 include the CVP M&I WSP, refuge transfers, and SWP water transfers. The CVP M&I WSP could limit water supplies to agricultural users and result in increased agricultural land idling in the Buyer Service Area. These changes, however, would likely be minor because the changes in water deliveries would likely represent a small amount of the overall water supply within the Buyer Service Area. Refuge transfers could purchase water from sellers in the San Joaquin Valley that make water available through cropland idling, but this would also represent a very small amount of the water supply within the area. Alternative 3 and SWP transfers would offset this minor, adverse impact by increasing the water supplies within the Buyer Service Area.

The counties in the Buyer Service Area project agricultural conversion to urban or environmental uses in the future. The cumulative agricultural land conversions would be potentially significant. The incremental contribution from Alternative 3 to this significant cumulative effect would be beneficial because it would increase water supplies and potentially allow growers to place previously idled land into production.

3.9.6.5 Alternative 4: No Groundwater Substitution

Cumulative impacts under Alternative 4 would be similar to those described under the Proposed Action.

3.9.6.5.1 Seller Service Area

Cropland idling under Alternative 4 in combination with other water management activities could decrease the amount of land in the Seller Service Area categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP and convert Williamson Act or other land conservation program lands to an incompatible use.

Water acquisition via cropland idling under Alternative 4 in combination with other water management activities, population growth, and other development projects converting agricultural land to different uses could decrease the amount of lands in the Seller Service Area categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP and convert Williamson Act or other land conservation program lands to an incompatible use. As described under Section 3.9.2.6, Cropland idling transfers would occur more often under the No Groundwater Substitution Alternative relative to the Proposed Action. Thus, there is a potential for cropland idling water transfers to change the classification of Important Farmland. However, Mitigation Measure LU-1 (Section 3.9.4), would reduce this potential impact to less than significant.

Cumulatively, the M&I WSP would continue to have very small effects relative to agricultural land use (see Section 3.9.6.1). However, both Alternative 4 and the SWP transfers could idle cropland in Butte and Sutter counties.

As described for the Proposed Action (Section 3.9.6.1), permanent conversion of agricultural land would likely continue into the future despite counties' policies to guide development in ways that conserve agricultural lands. In the Seller Service Area, cumulative agricultural land conversions would be potentially significant. Cropland idling under Alternative 4, after incorporating Mitigation Measure LU-1, would not result in permanent conversions of Important Farmland under the FMMP or Williamson Act and other land conservation program lands to an incompatible use. When considered in combination with other past, current, and future changes to agricultural land use in the area of analysis, agricultural land use impacts associated with acquisition of water via cropland idling in Alternative 4 would not be cumulatively considerable.

3.9.6.5.2 Buyer Service Area

Water transfers in combination with other water management activities, population growth, and development projects in the Buyer Service Area could change the amount of land in the area of analysis categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP. Water management activities that could result in cumulative effects with Alternative 4 include the CVP M&I WSP, refuge transfers, and SWP water transfers. The CVP M&I WSP could limit water supplies to agricultural users and result in increased agricultural land idling in the Buyer Service Area. These changes, however, would likely be minor because the changes in water deliveries would likely represent a small amount of the overall water supply within the Buyer Service Area. Refuge transfers could purchase water from sellers in the San Joaquin Valley that make water available through cropland idling, but this would also represent a very small amount of the water supply within the area. Alternative 4 and SWP transfers would offset this minor, adverse impact by increasing the water supplies within the Buyer Service Area.

The counties in the Buyer Service Area project agricultural conversion to urban or environmental uses in the future. The cumulative agricultural land conversions could be potentially significant. The incremental contribution from Alternative 4 to this significant cumulative effect would be beneficial because it would increase water supplies and potentially allow growers to place previously idled land into production.

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Section 3.10
Regional Economics

This section describes the regional economies within the area of analysis and discusses potential economic effects from the proposed alternatives.

Economic effects could occur from all types of transfer methods: cropland idling, crop shifting, groundwater substitution, stored reservoir water, and conservation.

3.10.1 Affected Environment/Environmental Setting

This section identifies the area of analysis, describes applicable laws and policies relevant to water transfers and potential economic effects, and describes the regional economies that could be affected by water transfers.

3.10.1.1 Area of Analysis

The area of analysis for regional economics includes counties where cropland idling transfer water would originate, areas overlying groundwater basins where groundwater substitution for water transfers could occur, counties where stored and conserved water would originate, and counties where transfer water would be used. Counties of origin are also affected because sellers within these counties receive payment for water, and sellers within the destination counties provide payment. Figure 3.10-1 shows the regional economics area of analysis.

3.10.1.2 Regulatory Setting

Federal and state laws provide some protection for local economies from potential adverse effects of water transfers. These laws and applicable sections that are further described in Chapter 1 are:

- Central Valley Project (CVP) Improvement Act Section 3405(a)
- California Water Code Sections 1745 and 1810

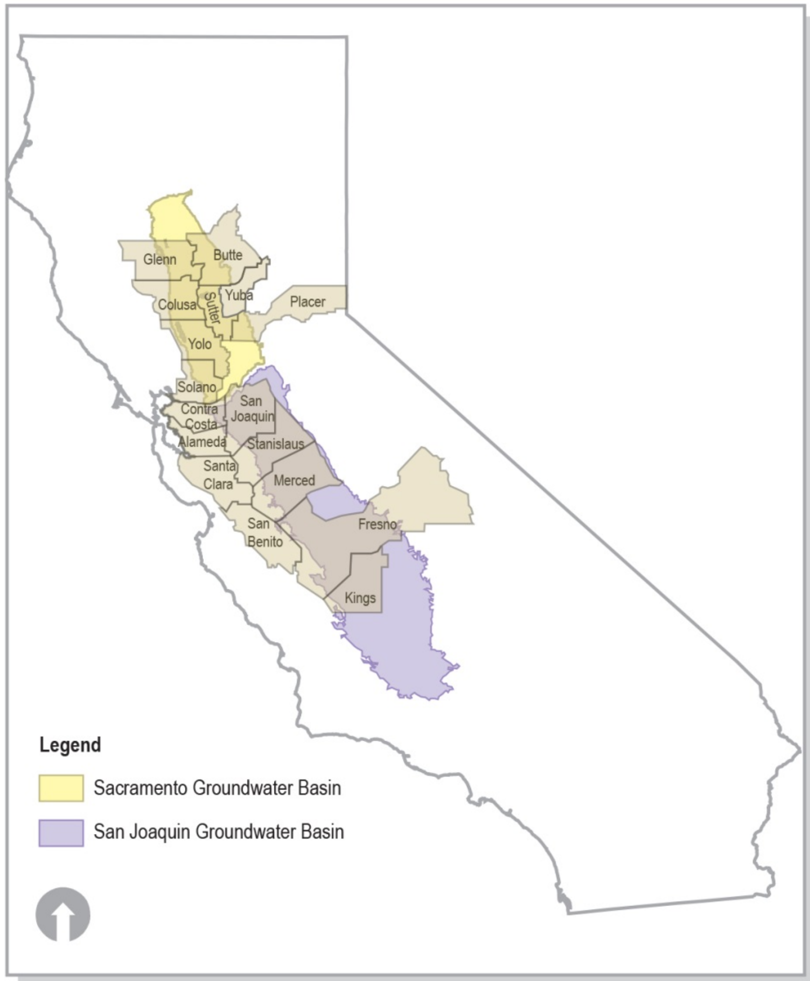

Figure 3.10-1. Regional Economics Area of Analysis

Local governments have also adopted policies and ordinances to protect their respective economies. County and city general plans in the area of analysis have policies for economic development and maintaining agricultural activities. For example, one of Colusa County's General Plan objectives in the Economic Development Element is to Promote and Expand the County's Agricultural Sector, which includes policies to encourage development of agricultural businesses and increase processing and manufacturing of agricultural commodities. Yolo County's Agriculture and Economic Development Element of the General Plan has goals for the Preservation of Agriculture and a Healthy Farm Economy.

Section 3.9, Agricultural Land Use, provides additional detail on county General Plans, codes, and other planning documents.

Section 3.3, Groundwater Resources, also discusses local ordinances that protect non-transferring parties from the effects of water transfers.

3.10.1.3 Existing Conditions

The following section describes relevant portions of regional economies within the area of analysis.

3.10.1.3.1 Seller Service Area

Glenn County

In 2011, the top two industries in Glenn County in terms of employment and value of output were agriculture and services. Table 3.10-1 presents employment, labor income, and output by industry for Glenn County in 2011. The county had over $560 million of agricultural production in 2010 (California Department of Food and Agriculture [CDFA] 2011). Important economic centers include Willows, Orland, and Artois, all on the I-5 corridor.

Table 3.10-1. Summary of 2011 Regional Economy in Glenn County

	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	3,924	$148.0	$703.7
Mining	43	$3.8	$13.2
Construction	695	$27.8	$70.3
Manufacturing	616	$34.7	$278.1
Transportation, Information, Public Utilities	837	$38.4	$170.6
Trade	1,054	$45.3	$109.3
Service	3,730	$93.2	$445.2
Government	2,015	$146.2	$185.1
Total	12,912	$537.3	$1,975.5

Source: Minnesota Implan Group (MIG) Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

In 2007, Glenn County had 1,242 farms encompassing a total of 489,186 acres with a median farm size of 50 acres (U.S. Department of Agriculture [USDA] 2009). These farms had production expenses of about $300 million. Total cropland[1] acreage was 250,279 acres. Harvested cropland[2] was 228,533 acres on 924 farms. Irrigated land[3] acreage was 236,134 acres on 1,020 farms.

[1] Total cropland includes cropland harvested, cropland used only for pasture or grazing, cropland on which all crops failed or were abandoned, cropland in cultivated summer fallow, and cropland idle or used for cover crops or soil improvement but not harvested and not pastured or grazed.

[2] Harvested cropland includes land from which crops were harvested and hay was cut, land used to grow short-rotation woody crops and land in orchards, citrus groves, Christmas trees, vineyards, nurseries, and greenhouses. Land from which two or more crops were harvested was counted only once.

[3] Irrigated land includes all land watered by any artificial or controlled method and includes supplemental, partial, and preplant irrigation. Each acre was counted only once regardless of the number of times it was irrigated or harvested.

Of the total farms, full owners operated 810 farms, part owners operated 271 farms, and tenant farmers operated 161 farms in 2007 (USDA 2009).

In 2010, the top five commodities in terms of production value in Glenn County were rice ($165.8 million), almonds ($104.4 million), walnuts ($0.70 million), milk ($0.55 million), and olives ($0.25 million) (CDFA 2011). Table 3.10-2 shows crop acreages for the types of crops that may be included in cropland idling transfer in Glenn County.

Table 3.10-2. 2001-2012 Crop Acreage Summary for Potential Cropland Idling Transfers in Glenn County

Year	Alfalfa	Beans, Dry	Corn, Grain	Rice	Safflower	Sunflowers	Vine Seed	Wheat
2001	15,964	864	22,992	87,239	930	3,612	1,033	15,726
2002	19,184	2,618	21,813	92,382	2,839	4,772	1,058	14,006
2003	19,280	608	15,653	87,793	287	4,427	1,948	16,000
2004	15,247	374	12,529	86,017	146	4,555	2,916	8,184
2005	10,506	2,267	12,620	88,876	205	6,915	n/a[1]	5,019
2006	16,345	2,153	8,413	82,436	306	4,120	1,448	6,389
2007	16,008	3,033	15,101	82,668	221	3,456	1,251	10,019
2008	16,068	1,713	10,807	77,770	1,030	2,790	641	14,902
2009	17,736	2,394	13,617	89,483	n/a	4,275	3,742	13,125
2010	15,100	1,550	15,750	88,209	n/a	4,380	3,610	10,500
2011	11,000	1,104	16,200	84,900	n/a	6,240	2,580	13,500
2012	12,800	1,790	n/a	84,800	n/a	5,320	4,510	10,800
Average (2001-12)	15,437	1,706	15,045	86,048	746	4,572	2,249	11,514
Average (2008-12)	14,541	1,710	14,094	85,032	1,030	4,601	3,017	12,565

Source: National Agricultural Statistics Service (NASS) 2001-2013
n/a – no acreage present or data is not reported individually for Glenn County. Averages do not include these years

Colusa County

In 2011, the top two industries in Colusa County in terms of employment were agriculture and services. The top two industries in value of output were agriculture and manufacturing. Table 3.10-3 presents employment, labor income, and output by industry for Colusa County in 2011. The county had over $640 million of agricultural production in 2010 (CDFA 2011). Important economic centers include Colusa, Williams, Maxwell, and Arbuckle, all on or near the I-5 corridor.

Table 3.10-3. Summary of 2011 Regional Economy in Colusa County

	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	3,810	$179.1	$642.3
Mining	5	$0.2	$1.4
Construction	251	$16.6	$31.9
Manufacturing	1,485	$90.0	$854.9
Transportation, Information, Public Utilities	273	$17.5	$76.5
Trade	1,495	$73.4	$186.3
Service	2,722	$86.5	$321.6
Government	2,083	$120.4	$160.3
Total	12,124	$583.7	$2,275.2

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

In 2007, Colusa County had 814 farms encompassing a total of 474,092 acres with a median farm size of 190 acres (USDA 2009). These farms had production expenses of about $310 million. Total cropland acreage was 298,996 acres. Harvested cropland was 276,588 acres on 661 farms. Irrigated land acreage was 277,332 acres on 682 farms.

Of the total farms, full owners operated 429 farms, part owners operated 175 farms, and tenant farmers operated 210 farms in 2007 (USDA 2009).

In 2010, the top five commodities in terms of production value in Colusa County were rice ($270.3 million), almonds ($144.2 million), vegetable and vine seed ($0.44 million), processing tomatoes ($0.35 million), and rice seed ($0.25 million) (CDFA 2011). Table 3.10-4 shows crop acreages for the types of crops that may be included in cropland idling transfer in Colusa County.

Table 3.10-4. 2001-2012 Crop Acreage Summary for Potential Cropland Idling Transfers in Colusa County

Year	Alfalfa	Beans, Dry	Corn, Grain	Rice	Safflower	Sunflowers	Tomatoes, Processing	Vine Seed	Wheat
2001	6,650	8,250	1,690	111,250	10,750	475	20,250	8,010	22,600
2002	6,700	7,520	1,700	134,300	12,400	390	18,900	6,977	21,400
2003	6,750	7,050	1,240	127,350	9,350	790	16,900	10,525	21,500
2004	6,550	4,370	1,410	150,130	4,950	810	20,500	14,255	24,200
2005	7,150	6,050	720	136,400	4,200	1,760	23,650	11,715	13,500
2006	8,000	6,400	410	142,600	3,840	2,180	18,400	9,837	14,700
2007	10,050	6,100	6,420	148,550	7,650	1,790	16,500	7,570	22,900
2008	11,800	4,390	2,750	150,200	7,750	1,780	13,940	9,090	27,400
2009	12,300	4,620	650	152,400	3,630	3,850	18,440	8,000	20,450
2010	12,700	4,040	4,310	154,000	2,050	2,220	11,800	14,200	18,600
2011	10,900	4,260	4,560	149,000	1,060	5,570	12,700	16,600	16,600
2012	11,800	5,290	5,660	150,000	1,610	6,560	13,500	11,700	16,100
Average (2001-12)	9,279	5,695	2,627	142,182	5,770	2,348	17,123	10,707	19,996
Average (2008-12)	11,900	4,520	3,586	151,120	3,220	3,996	14,076	11,918	19,830

Source: NASS 2001-2013

Butte County

In 2011, the top industry in terms of employment and output was services. Table 3.10.5 presents employment, labor income, and output by industry for Butte County for 2011.

Table 3.10-5. Summary of 2011 Regional Economy in Butte County

	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	5,760	$199.6	$655.5
Mining	131	$1.5	$24.6
Construction	6,078	$271.6	$643.7
Manufacturing	4,012	$205.1	$1,903.6
Transportation, Information, Public Utilities	3,354	$146.4	$700.4
Trade	14,087	$495.6	$1,232.6
Service	55,459	$1,866.7	$6,185.2
Government	13,693	$813.7	$1,010.0
Total	102,574	$4,000.2	$12,355.6

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

In 2007, Butte County had 2,048 farms encompassing a total of 373,786 acres with a median farm size of 21 acres (USDA 2009). These farms had production expenses of about $276 million. Total cropland acreage was 222,713 acres.

Harvested cropland was 200,943 acres on 1,460 farms. Irrigated land acreage was 202,234 acres on 1,429 farms.

Of the total farms, full owners operated 1,582 farms, part owners operated 275 farms, and tenant farmers operated 191 farms in 2007 (USDA 2009).

In 2010, the top five commodities in terms of production value in Butte County were rice ($182.2 million), walnuts ($173.4 million), almonds ($113.8 million), dried plums ($0.42 million), and nursery products ($0.24 million) (CDFA 2011). Table 3.10-6 shows crop acreages for the types of crops that may be included in cropland idling transfer in Butte County. Crops eligible for idling that are not listed in the table are not grown in notable acreages in Butte County (corn, sunflowers, tomatoes for processing, and vine seed).

Table 3.10-6. 2001-2012 Crop Acreage Summary for Potential Cropland Idling Transfers in Butte County

Year	Alfalfa	Beans, Dry	Rice	Safflower	Wheat
2001	3,000	500	86,000	900	3,500
2002	3,171	500	94,700	891	4,000
2003	2,900	500	92,500	700	4,440
2004	2,400	600	105,000	267	2,147
2005	1,885	756	96,400	210	1,600
2006	1,944	600	105,673	150	2,700
2007	1,602	610	101,634	380	3,200
2008	1,716	930	105,301	222	4,271
2009	1,508	1,672	103,416	120	3,704
2010	1,080	950	93,800	375	3,960
2011	987	619	95,000	348	5,750
2012	1,080	794	94,500	288	8,970
Average (2001-12)	1,939	753	97,827	404	4,020
Average (2008-12)	1,274	993	98,403	271	5,331

Source: NASS 2001-2013

Sutter County

In 2011, the top two industries in Sutter County in terms of employment were services and trade. The top two industries in value of output were services and manufacturing. Table 3.10-7 presents employment, labor income, and output by industry for Sutter County in 2011. The county had over $520 million of agricultural production in 2010 (CDFA 2011). Yuba City is the main economic center.

Table 3.10-7. Summary of 2011 Regional Economy in Sutter County

	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	5,688	$189.4	$523.4
Mining	228	$17.3	$85.2
Construction	2,563	$101.4	$258.4
Manufacturing	1,627	$94.2	$727.2
Transportation, Information, Public Utilities	2,543	$91.8	$352.6
Trade	6,599	$276.1	$626.9
Service	20,351	$623.6	$2,218.4
Government	4,524	$287.1	$375.0
Total	44,124	$1,680.9	$5,167.2

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

In 2007, Sutter County had 1,263 farms encompassing a total of 359,802 acres with a median farm size of 45 acres (USDA 2009). These farms had production expenses of about $268 million. Total cropland acreage was 274,439 acres. Harvested cropland was 241,597 acres on 1,055 farms. Irrigated land acreage was 231,713 acres on 1,039 farms.

Of the total farms, full owners operated 856 farms, part owners operated 237 farms, and tenant farmers operated 170 farms in 2007 (USDA 2009).

In 2010, the top five commodities in terms of production value in Sutter County were rice ($203.0 million), walnuts ($0.72 million), dried plums ($0.49 million), peaches ($0.32 million), and processing tomatoes ($0.22 million) (CDFA 2011). Table 3.10-8 shows crop acreages for the types of crops that may be included in cropland idling transfer in Sutter County.

Table 3.10-8. 2001-2012 Crop Acreage Summary for Potential Cropland Idling Transfers in Sutter County

Year	Alfalfa	Beans, Dry	Corn, Grain	Rice	Safflower	Sunflowers	Tomatoes, Processing	Vine Seed	Wheat	Wild Rice
2001	6,740	4,482	5,931	81,857	15,596	2,008	9,500	1,684	11,594	4,185
2002	7,054	6,605	4,780	96,224	13,556	2,103	9,100	1,725	10,331	3,245
2003	7,247	5,429	2,928	93,654	14,991	3,685	8,000	2,910	14,246	2,261
2004	6,935	4,268	6,491	121,131	4,960	3,310	6,300	2,905	12,950	1,720
2005	7,004	4,084	3,210	97,801	10,641	4,069	5,200	1,704	11,580	1,707
2006	8,960	4,869	1,644	92,984	6,984	4,383	6,900	2,000	2,415	2,670
2007	7,772	2,320	7,800	108,241	5,213	4,435	7,900	745	20,721	2,871
2008	8,444	3,067	7,720	92,344	6,517	7,103	8,000	2,124	15,669	4,455
2009	7,250	2,183	3,477	109,766	1,965	9,041	9,000	2,266	14,045	1,371
2010	5,760	1,960	4,320	115,000	1,940	7,740	7,330	3,630	12,500	550
2011	5,960	4,770	7,700	112,000	1,940	6,520	7,740	3,760	12,900	871
2012	6,570	_	9,810	116,000	1,940	9,680	7,830	2,580	11,500	1,100
Average (2001-12)	7,141	4,003	5,484	103,084	7,187	5,340	7,733	2,336	12,538	2,251
Average (2008-12)	6,797	2,995	6,605	109,022	2,860	8,017	7,980	2,872	13,323	2,383

Source: NASS 2001-2013

Yolo County

In 2011, the top two industries in Yolo County in terms of employment and output were services and government. Table 3.10-9 presents employment, labor income, and output by industry for Yolo County in 2011. The county had over $440 million of agricultural production in 2010 (CDFA 2011). Yolo County is an important suburb of the Sacramento metropolitan area and important economic centers in the county include West Sacramento, Davis, and Woodland.

Table 3.10-9. Summary of 2011 Regional Economy in Yolo County

	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	6,385	$312.6	$818.2
Mining	340	$14.0	$100.2
Construction	4,952	$307.0	$610.1
Manufacturing	5,865	$353.5	$2,728.3
Transportation, Information, Public Utilities	8,138	$384.9	$1,061.4
Trade	14,613	$680.8	$1,620.9
Service	43,135	$1,693.9	$5,475.0
Government	34,297	$2,648.5	$3,087.0
Total	117,725	$6,395.3	$15,501.1

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

In 2007, Yolo County had 983 farms encompassing a total of 479,858 acres with a median farm size of 60 acres (USDA 2009). These farms had production expenses of about $313 million. Total cropland acreage was 311,307 acres. Harvested cropland was 258,261 acres on 682 farms. Irrigated land acreage was 246,341 acres on 694 farms.

Of the total farms, full owners operated 692 farms, part owners operated 142 farms, and tenant farmers operated 149 farms in 2007 (USDA 2009).

In 2010, the top five commodities in terms of production value in Yolo County were processing tomatoes ($0.88 million), rice ($0.56 million), wine grapes ($0.46 million), vegetable ($0.45 million), and alfalfa ($0.28 million) (CDFA 2011). Table 3.10-10 shows crop acreages for types of crops that may be included in cropland idling transfer in Yolo County.

Table 3.10-10. 2001-2012 Crop Acreage Summary for Potential Cropland Idling Transfers in Yolo County

Year	Alfalfa[1]	Corn, Grain	Rice	Safflower	Sunflowers	Tomatoes, Processing	Vine Seed	Wheat
2001	45,885	18,308	28,717	27,650	4,540	40,374	1,100	43,774
2002	53,231	9,195	32,446	20,765	3,372	42,812	1,179	33,076
2003	55,914	6,495	37,303	20,674	9,294	38,274	1,703	56,227
2004	52,904	9,523	45,655	9,991	13,403	45,129	3,591	44,098
2005	45,776	4,238	34,670	12,955	13,615	42,232	2,942	34,647
2006	59,269	2,452	29,997	10,176	35,500	37,026	2,756	20,976
2007	53,959	11,596	32,660	9,030	28,136	42,149	684	35,613
2008	56,710	8,118	30,057	13,514	13,808	37,571	1,663	42,398
2009	49,450	6,502	36,593	8,563	15,574	37,881	2,698	28,062
2010	42,900	16,300	41,400	9,530	12,700	33,000	1,030	33,900
2011	41,000	20,200	42,500	8,780	19,000	40,100	2,630	42,900
2012	42,600	23,500	40,500	9,790	21,900	36,800	3,170	35,800
Average (2001-12)	49,967	11,369	36,042	13,452	15,904	39,446	2,096	37,623
Average (2008-12)	46,532	14,924	38,210	10,035	16,596	37,070	2,238	36,612

Source: NASS 2001-2013

[1] Alfalfa cannot be idled within the legal boundaries of the Delta

Solano County

In 2011, the top two industries in Solano County in terms of employment were services and government. The top two industries in value of output were services and manufacturing. Table 3.10-11 presents employment, labor income, and output by industry for Solano County in 2011. The county had over $259 million of agricultural production in 2010 (CDFA 2011). Important economic centers include Dixon, Vacaville and Fairfield, all on the I-80 corridor.

Table 3.10-11. Summary of 2011 Regional Economy in Solano County

	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	2,126	$118.9	$454.3
Mining	302	$21.5	$155.8
Construction	11,052	$801.0	$1,477.8
Manufacturing	8,937	$982.8	$11,397.7
Transportation, Information, Public Utilities	10,176	$259.6	$990.8
Trade	25,026	$986.4	$2,355.9
Service	73,403	$3,314.2	$9,922.1
Government	30,325	$3,094.8	$3,834.4
Total	161,347	$9,579.2	$30,588.9

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

In 2007, Solano County had 890 farms encompassing a total of 358,225 acres with a median farm size of 30 acres (USDA 2009). These farms had production expenses of about $195 million. Total cropland acreage was 154,937 acres. Harvested cropland was 120,410 acres on 506 farms. Irrigated land acreage was 145,988 acres on 517 farms.

Of the total farms, full owners operated 646 farms, part owners operated 137 farms, and tenant farmers operated 107 farms in 2007 (USDA 2009).

In 2010, the top five commodities in terms of production value in Solano County were processing tomatoes ($0.37 million), walnuts ($0.31 million), vegetables ($0.27 million), nursery products ($0.23 million), and cattle and calves ($0.23 million) (CDFA 2011). Table 3.10-12 shows crop acreages for types of crops that may be included in cropland idling transfer in Solano County.

Table 3.10-12. 2001-2012 Crop Acreage Summary for Potential Cropland Idling Transfers in Solano County

Year	Alfalfa[1]	Beans, Dry	Corn, Grain	Safflower	Sudan Grass	Sunflowers	Tomatoes, Processing	Vine Seed	Wheat
2001	31,969	2,911	13,677	6,018	3,233	1,191	13,801	519	39,350
2002	36,492	3,927	10,900	6,017	3,853	1,246	14,626	634	34,516
2003	34,602	1,859	7,406	8,246	6,242	2,474	11,952	1,221	32,956
2004	33,782	1,713	10,457	5,771	6,504	4,263	10,344	1,476	27,997
2005	34,605	2,789	6,445	6,276	7,938	6,526	10,300	1,307	25,227
2006	36,304	2,894	2,836	5,764	8,360	6,615	10,000	887	21,494
2007	29,483	n/a	8,282	4,200	6,863	6,070	9,700	832	26,575
2008	30,599	2,968	7,504	3,235	8,370	7,535	10,000	222	25,669
2009	31,438	1,642	7,104	1,680	5,024	9,439	12,000	221	25,141
2010	27,100	1,060	11,200	3,220	10,100	6,010	11,000	496	25,700
2011	26,100	545	11,200	3,710	8,820	7,670	9,000	1,250	30,400
2012	28,200	1,590	10,700	2,920	9,020	8,640	10,000	1,020	20,000
Average (2001-12)	31,723	2,173	8,976	4,755	7,027	5,640	11,060	840	27,919
Average (2008-12)	28,687	1,561	9,542	2,953	8,267	7,859	10,400	642	25,382

Source: NASS 2001-2013

n/a – no acreage present or data is not reported individually for Solano County

[1] Alfalfa cannot be idled within the legal boundaries of the Delta

Yuba County

In 2011, the top two industries in Yuba County in terms of employment and output were government and services. Table 3.10-13 presents employment, labor income, and output by industry for Yuba County in 2011. Important economic centers include Marysville and Olivehurst. No cropland idling transfers are proposed in Yuba County; therefore, data on agricultural economies are not presented.

Table 3.10-13. Summary of 2011 Regional Economy in Yuba County

	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	1,858	$91.5	$279.3
Mining	102	$6.3	$29.9
Construction	1,631	$60.1	$160.0
Manufacturing	511	$36.1	$195.4
Transportation, Information, Public Utilities	1,216	$211.0	$308.3
Trade	1,927	$87.4	$195.2
Service	8,335	$309.6	$1,064.7
Government	9,833	$986.5	$1,249.4
Total	25,412	$1,788.5	$3,482.1

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

Shasta County

In 2011, services provided the most jobs in Shasta County, followed by trade, and government. Services had the highest output in the county, followed by trade, and government. Incorporated cities are Anderson, Redding, and Shasta Lake. Table 3.10-14 summarizes the regional economy in Shasta County, in terms of employment, output, labor income, and total value added. No cropland idling transfers are proposed in Shasta County; therefore, data on agricultural economies are not presented. Shasta County is include because it overlies the Redding Groundwater Basin where economic effects from groundwater substation could occur.

Table 3.10-14. Summary of 2011 Regional Economy in Shasta County

Industry	Employment (Jobs)	Output (Million $)	Labor Income (Million $)	Total Value Added (Million $)
Agriculture	2,465	$218.3	$76.1	$86.1
Mining	753	$133.9	$16.0	$58.0
Construction	5,306	$597.2	$272.3	$321.4
Manufacturing	2,524	$733.0	$143.8	$202.8
TIPU	3,786	$925.0	$236.4	$405.7
Trade	12,810	$1,129.9	$458.9	$824.8
Service	44,448	$5,074.1	$1,598.3	$3,170.5
Government	12,225	$1,033.3	$827.4	$966.4
Total	84,317	$9,844.7	$3,629.2	$6,035.7

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

Tehama County

In 2011, services provided the most jobs in Tehama County, followed by government, and agriculture. Services had the highest output in the county, followed by manufacturing, and agriculture. Corning, Red Bluff, and Tehama are the only incorporated cities in the county Table 3.10-15 summarizes the regional economy in Tehama County, in terms of employment, output, labor income, and total value added. No cropland idling transfers are proposed in Tehama County; therefore, data on agricultural economies are not presented. Tehama County is include because it overlies the Redding Groundwater Basin where economic effects from groundwater substation could occur.

Table 3.10-15. Summary of 2011 Regional Economy in Tehama County

Industry	Employment (Jobs)	Output (Million $)	Labor Income (Million $)	Total Value Added (Million $)
Agriculture	3,290	$367.1	$106.0	$164.7
Mining	169	$55.3	$3.2	$14.5
Construction	1,284	$128.2	$49.6	$61.5
Manufacturing	1,430	$495.0	$86.7	$117.7
TIPU	1,569	$280.3	$80.1	$126.0
Trade	2,573	$239.7	$92.0	$173.4
Service	8,946	$1,056.5	$272.6	$637.0
Government	3,853	$303.2	$228.1	$273.2
Total	23,114	$2,925.3	$918.3	$1,568.0

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

Sacramento County

In 2011, services provided the most jobs in Sacramento County, followed by government, and trade. Services had the highest output in the county, followed by government, and manufacturing. Table 3.10-16 summarizes the regional economy in Sacramento County in 2011, in terms of employment, output, and labor income. No cropland idling transfers are proposed in Sacramento County; therefore, data on agricultural economies are not presented. Sacramento County is include because it overlies the Sacramento Valley Groundwater Basin where economic effects from groundwater substation could occur.

Table 3.10-16. Summary of 2011 Regional Economy in Sacramento County

Industry	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	3,468	$831.7	$248.3
Mining	325	$138.7	$12.9
Construction	35,107	$4,410.2	$2,260.8
Manufacturing	20,291	$11,641.3	$1,768.8
TIPU	14,149	$3,164.5	$1,077.0
Trade	86,564	$8,204.4	$3,615.0
Service	391,826	$55,621.6	$19,928.2
Government	188,723	$18,740.2	$15,949.1
Total	740,453	$102,752.6	$44,860.1

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

Placer County

In 2011, the top two industries in Placer County in terms of employment were services and trade. The top two industries in output were services and manufacturing. Table 3.10-~~14~~ 17 presents employment, labor income, and output by industry for Placer County in 2011. Placer County is closely linked to the Sacramento metropolitan area and also includes communities in the Sierra Nevada foothills and near Lake Tahoe. No cropland idling transfers are proposed in Placer County; therefore, data on agricultural economies are not presented.

Table 3.10-~~14~~17. Summary of 2011 Regional Economy in Placer County

	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	1,661	$30.7	$166.8
Mining	297	$2.1	$62.7
Construction	12,972	$1,063.3	$1,856.4
Manufacturing	7,533	$683.7	$3,741.1
Transportation, Information, Public Utilities	3,117	$343.9	$1,287.9
Trade	32,379	$1,342.5	$3,047.9
Service	104,943	$4,740.8	$14,303.9
Government	17,230	$1,207.4	$1,496.6
Total	180,131	$9,414.4	$25,963.3

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

Merced County

In 2011, the top two industries in Merced County in terms of employment were agriculture and services. The top two industries in value of output were services and manufacturing. Table 3.10-~~15~~ 18 presents employment, labor income, and output by industry for Merced County in 2010. No cropland idling transfers are proposed in Merced County; therefore, data on agricultural economies are not presented.

Table 3.10-~~15~~18. Summary of 2010 Regional Economy in Merced County

	Employment	Labor Income (million $)	Output (million $)
Agriculture	16,175	$680.3	$3,121.9
Mining	119	$7.4	$27.5
Construction	3,469	$194.7	$407.1
Manufacturing	7,764	$383.7	$3,348.4
Transportation, Information, Public Utilities	4,254	$220.1	$731.0
Trade	12,206	$425.7	$1,107.5
Service	34,518	$1,101.8	$4,320.3
Government	15,817	$1,050.8	$1,306.5
Total	94,323	$4,064.4	$14,370.2

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

3.10.1.3.2 Buyers Service Area

The buyer service area includes CVP municipal and industrial (M&I) and agricultural contractors. Transfers would be used to serve existing demands in the contractors' service areas.

M&I Contractors

M&I contractors include East Bay Municipal Utility District (MUD), Contra Costa Water District (WD), and Santa Clara Valley WD. The M&I contractors serve mostly urban water customers in Contra Costa, Alameda, and Santa Clara counties. This section presents both regional economic data on the counties served by the M&I contractors and information about water use by sector within their service areas.

Table 3.10-~~16~~ 19 presents employment, labor income, and output in these three counties in 2011. In 2011, the top two industries in the three-county region in terms of employment were services and trade. The top two industries in terms of output were manufacturing and services.

Table 3.10-~~16~~19. Summary of 2011 Regional Economy in Alameda, Contra Costa and Santa Clara Counties

	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	6,078	$329.0	$690.6
Mining	3,071	$337.8	$1,542.6
Construction	114,261	$8,959.4	$15,952.7
Manufacturing	244,305	$37,615.4	$314,807.7
Transportation, Information, Public Utilities	56,873	$4,125.7	$13,539.1
Trade	325,985	$19,139.1	$38,641.8
Service	1,459,455	$103,203.8	$234,574.7
Government	227,128	$20,929.8	$24,705.4
Total	2,437,156	$194,640.0	$644,454.6

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

Contra Costa WD is a wholesale and retail water provider in Contra Costa County. Figure 3.10-2 shows actual 2010 retail water use within the service area. In 2010, total service area demands were 114,679 acre-feet (AF), including 39,570 AF of wholesale demands and 66,460 AF of retail demands. The remainder of total demands account for system losses (Contra Costa WD 2011). Contra Costa WD projects service area demands to increase to 203,400 AF in 2025 (74,770 for wholesale demands and 116,420 for retail demands), which does not include planned conservation and water recycling. This is a 77 percent increase over actual 2010 water use. The largest projected increase in water use is for untreated industrial water, an increase of 28,441 over 2010 use (Contra Costa WD 2011).

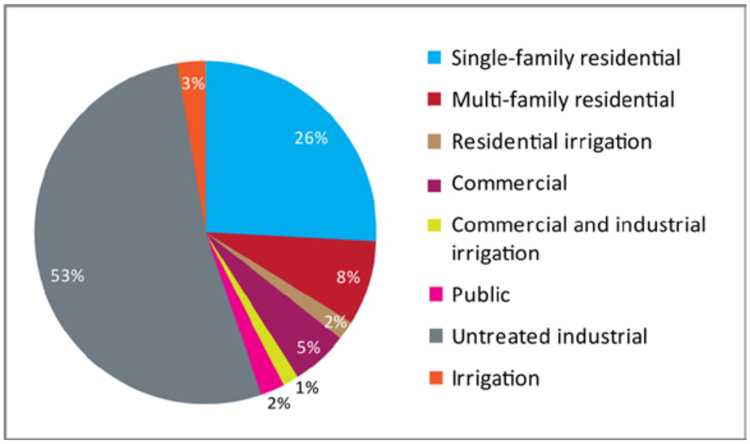

Figure 3.10-2. Sector Water Use in Contra Costa WD Service Area

East Bay MUD provides water to customers in Alameda and Contra Costa counties. Figure 3.10-3 summarizes historic water consumption by customer category in East Bay MUD. Residential water use accounted for about 63 percent of total water use (East Bay MUD 2011a). East Bay MUD projects demands to remain relatively stable from 2010 through 2025, except for an increase in multi-family residential demands of about 17,930 AF (East Bay MUD 2011a). Single-family, industrial, institutional and irrigation uses are projected to slightly decrease during the same period (East Bay MUD 2011a).

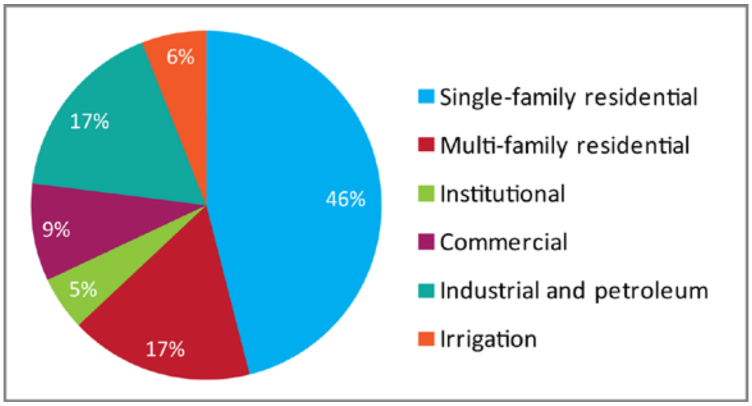

Figure 3.10-3. Sector Water Use in East Bay MUD Service Area

Santa Clara Valley WD is a wholesale district that provides water to 13 local retail agencies throughout Santa Clara County. About 90 percent of the water use in the county is for M&I uses and the remaining ten percent is for agricultural uses. As a wholesaler, Santa Clara Valley WD does not collect water use data by classification, but has estimated sector use based on available data provided by retailers. Figure 3.10-4 shows county water use by sector. Total demands in the Santa Clara Valley WD service area are projected to increase from 375,720 AF in 2015 to 396,420 AF in 2025, a six percent increase. San Jose Water Company estimated the largest increase, in terms of AF, of 7,140 AF. Agricultural demands were projected to decrease about 1,950 AF from 2015 to 2025 (Santa Clara Valley WD 2011).

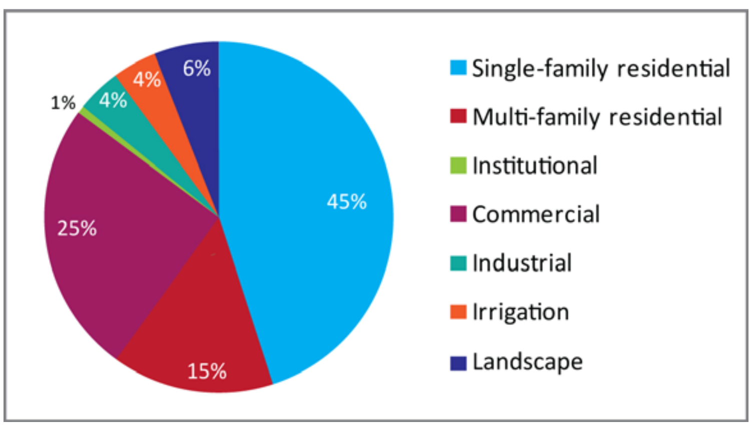

Figure 3.10-4. Sector Water Use in Santa Clara Valley WD Service Area

As part of the Urban Water Management Plans, M&I contractors are required to develop a Water Shortage Contingency Plan that defines actions during various stages of supply shortages. Each stage involves district actions in response to shortage (such as outreach, adopting ordinances, enforcing regulations, offering financial incentives, and monitoring), water use reductions, and penalties. As the shortage increases, customer water use reductions typically increase and become mandatory and penalties for disallowed uses become more severe.

Contra Costa WD and East Bay MUD set customer water rates and charges sufficient to cover operating expenses, including interest on debts, and to provide funds for replacement or construction of facilities. Contra Costa WD's residential water rates are made up of a service and demand charge, a quantity charge based on the volume of water used, an energy surcharge and a fire protection surcharge (Contra Costa WD ~~2012~~2015). East Bay MUD's water rates to residential customers are made up of a service charge; a Seismic Improvement Program surcharge for each residential account; a charge for water delivered; and an elevation surcharge (East Bay MUD 2014). Santa Clara Valley WD charges water retailers for water supplies, which affect retail agencies customer water rates. Santa Clara Valley WD major costs include operations, debt service, capital improvements to the treatment and delivery system, and water purchases from outside the county (Santa Clara Valley WD 2014).

Agricultural Contractors

Potential buyers also include CVP contractors that serve water primarily for agricultural uses in San Benito County and western areas of San Joaquin, Stanislaus, Merced, Fresno, and Kings counties. Transfers to these counties would also serve some M&I uses, but for purposes of the analysis, it is assumed agriculture would be the primary use of transfer water.

Table 3.10-~~17~~ 20 presents employment, labor income, and output in the six counties combined in 2011. In 2011, the top two industries in the six-county region in terms of employment were services and government. In 2011, the top two industries in the six-county region in output were services and manufacturing. The region had over $10.6 billion of agricultural production in 2010 (CDFA 2011). Important economic centers include Fresno, Merced, Hanford and Hollister.

Table 3.10-~~18~~ 21 summarizes some farm, owner, and operator characteristics in the six counties in 2007.

Table 3.10-~~17~~20. Summary of 2011 Regional Economy in Merced, Fresno, Kings, San Joaquin, Stanislaus and San Benito Counties

	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	111,743	$5,677	$18,073
Mining	678	$42	$231
Construction	47,387	$2,702	$5,602
Manufacturing	83,427	$4,769	$37,457
Transportation, Information, Public Utilities	51,266	$2,732	$9,076
Trade	155,649	$6,000	$14,906
Service	479,179	$17,510	$58,525
Government	158,653	$12,339	$15,215
Total	1,087,982	$51,771	$159,085

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

Table 3.10-~~18~~21. 2007 Farm and Farm Tenure Characteristics in Merced, San Benito, San Joaquin, Stanislaus, Fresno, and Kings Counties

	Merced	San Benito	San Joaquin	Stanislaus	Fresno	Kings
Number of farms	2,607	625	3,624	4,114	6,081	1,129
Median farm size (acres)	40	25	25	20	36	40
Land in farms (acres)	1,041,115	579,851	737,503	788,954	1,636,224	680,662
Total cropland (acres)	537,716	55,213	492,032	351,195	1,102,163	512,870
Irrigated land (acres)	514,162	30,372	453,980	374,997	984,445	421,571
Full owners	1,826	435	2,746	3,110	4,643	798
Part owners	492	116	584	631	907	212
Tenants	289	74	294	373	531	119

Source: USDA 2009

In 2010, Fresno, Stanislaus, San Joaquin, Kings, and Merced counties all were in the top ten counties in California in agricultural production value. Fresno County led the state in 2010 with an agricultural production value of $5.94 billion, an increase of 11.2 percent from the 2009 production value. In 2010, Stanislaus County had a production value of $2.31 billion, an 11.2 percent increase over 2009; San Joaquin County had a production value of $2 billion, a 2 percent decrease since 2009; Merced County had a production value of $2.73 billion, an 11.2 percent increase over 2009; Kings County had a production value of $1.72 billion, a 30.1 percent increase over 2009; and San Benito County had a production value of $255.45 million, a 5.2 percent increase over 2009. Table 3.10-~~19~~ 22 shows the top five commodities in terms of value of production in the six counties.

Table 3.10-~~19~~22. 2010 Top Five Commodities in Gross Value of Agricultural Production in Merced, San Benito, Fresno , Kings, Stanislaus and San Joaquin Counties

Rank	Merced Commodity	Merced Value ($1,000)	San Benito Commodity	San Benito Value ($1,000)	Fresno Commodity	Fresno Value ($1,000)
1.	Milk	$736,192	Vegetables	$40,989	Almonds	$581,230
2.	Almonds	$286,600	Lettuce	$23,594	Poultry	$423,768
3.	Chickens	$275,536	Bell Peppers	$21,563	Grapes	$399,734
4.	Cattle and Calves	$225,408	Fruits and Nuts	$19,916	Milk	$391,453
5.	Sweet Potatoes	$152,863	Nursery Products	$18,392	Tomatoes, Processing	$347,208
Rank	**Kings Commodity**	**Kings Value ($1,000)**	**Stanislaus Commodity**	**Stanislaus Value ($1,000)**	**San Joaquin Commodity**	**San Joaquin Value ($1,000)**
1.	Milk	$584,956	Milk	$506,056	Milk	$308,389
2.	Cotton, Pima	$185,566	Almonds	$390,498	Grapes	$247,641
3.	Tomatoes, Processing	$134,872	Chickens	180,852	Walnuts	$207,230
4.	Cattle and Calves	$129,451	Chickens (Chicks)	$127,189	Cherries	$184,544
5.	Pistachios	$73,766	Walnuts	$116,246	Almonds	$156,822

Source: NASS 2011

3.10.1.3.3 Crop Prices

Growers voluntarily participate in water transfers. There are likely many factors that affect a grower’s decision to idle fields and sell water via cropland idling transfers, including crop prices. Table 3.10-23 presents past crop prices for most crops eligible for idling. Growers would presumably participate in idling transfers if water transfer revenues are greater than the net revenues received from growing the crop. Rice prices peaked in 2008 and have been steadily decreasing, but are still higher than prices from 2003 through 2007. Reclamation has set maximum annual acreages for cropland idling transfers; therefore, even if crop prices are beneficial for a grower to participate, the level of idling would be limited by the maximum acreages.

Table 3.10-23 Past Crop Prices for Crops Eligible for Idling

	Alfalfa	Beans, Dry	Corn, Grain	Rice	Safflower	Sunflower	Tomatoes, Processing	Wheat
	$/Ton	$/Cwt.	$/Ton	$/Cwt.	$/Cwt.	$/Cwt.	$/Ton	$/Ton
2003	$93.00	$35.30	$103.57	$10.40	---	---	$57.20	$118.00
2004	$118.00	$36.90	$94.64	$7.34	---	---	$57.40	$126.67
2005	$136.00	$41.00	$96.43	$10.10	$11.30	---	$59.60	$124.67
2006	$116.00	$46.60	$119.64	$13.00	$13.70	---	$65.40	$138.00
2007	$165.00	$48.90	$152.86	$16.20	$19.10	---	$70.30	$180.33
2008	$204.00	$61.40	$170.36	$27.50	$23.90	---	$78.60	$236.00
2009	$107.00	$50.80	$152.86	$19.60	$16.40	$18.60	$86.10	$187.67

	Alfalfa	Beans, Dry	Corn, Grain	Rice	Safflower	Sunflower	Tomatoes, Processing	Wheat
	$/Ton	$/Cwt.	$/Ton	$/Cwt.	$/Cwt.	$/Cwt.	$/Ton	$/Ton
2010	$133.00	$47.00	$181.43	$21.00	$17.00	$20.90	$71.40	$173.65
2011	$239.00	$55.10	$228.93	$18.60	$23.50	$26.40	$74.30	$225.98
2012	$211.00	$54.60	$251.79	$17.10	$25.30	$26.30	$75.00	$271.64

Source: CDFA 2013

3.10.1.3.4 Groundwater ~~Pumping~~ Costs

Section 3.3, Groundwater Resources, describes existing groundwater conditions in the area of analysis. The area of analysis for the groundwater costs analysis includes the counties overlying the Sacramento Valley Groundwater Basin and the Redding Groundwater Basin. Groundwater pumping costs are related to depth to groundwater, pump efficiencies, and power costs. Pumping costs tend to increase during drought as more water is pumped and average depth to water increases. Groundwater costs also include costs to deepen wells or drill new wells. The costs for deepening or drilling a well can vary widely depending on many factors, such as depth, diameter, well use (potable vs. irrigation), and construction materials. There are also permitting costs.

3.10.1.3.~~4~~5 Local Government Revenues

County services typically include public safety (police, fire and emergency services), land use planning, parks and recreation, social services, and the justice system. Local governments also provide facilities including roads, flood protection, sewers, water, solid waste disposal and other utilities. Counties also deliver many state services, such as foster care, public health care, jails and elections.

Revenues to pay for these services come from many sources. Statewide, most county revenues are transfers from other governments. Service charges, property income, fines and forfeitures, and a variety of other sources are typically about a quarter of revenues.

Tax revenues average less than a quarter of all county revenues. General taxes can be used for any legitimate purpose, but special tax revenues are dedicated to specified purposes. Most local tax revenue is from the sales and use tax. Most sales tax revenue goes directly to State government, but about 20 percent of that is returned to cities and counties. Sales tax revenues fund county and city operations, social services, mental health, transportation, and public safety, and additional special taxes fund a variety of voter-approved programs. Other local taxes include business license, hotel, utility and parcel taxes.

Local governments in rural counties are facing financial stress stemming from the ongoing economic recession. Statewide, county revenues decreased from $56.4 billion in 2007-2008 to $55.8 billion in 2009-2010 (California State Controller 2009 and 2011). In 2009-2010, tax revenues had fallen 4.21 percent from the previous year. Most of the loss was made up by federal funds. The

State has proposed to reduce some revenue transfers from the State, and some program responsibilities may be shifted to the counties.

3.10.2 Environmental Consequences/Environmental Impacts

These sections describe economic assessment methods and the environmental consequences associated with each alternative.

3.10.2.1 Assessment Methods

This section describes the assessment methods used to analyze potential economic effects of implementing water transfers to CVP contractors.

3.10.2.1.1 Cropland Idling

In cropland idling transfers, participating growers would voluntarily cease irrigation for a crop season and transfer the unused irrigation water to the buyer. The potential economic effects of cropland idling could occur because of trade linkages between irrigated production and regional economies. Many businesses trade with growers. Growers buy inputs from workers, farm stores, equipment supply stores, custom operators, and other growers. Other regional businesses earn their income by transporting, storing, marketing, and processing agricultural products. Idling of cropland reduces the volume of sales for these businesses in the counties where cropland idling occurs. These types of effects are often referred to as third-party economic effects.

For purposes of the economic analysis of cropland idling transfers, the Seller Service Area is separated into three regions:

- Colusa, Glenn, and Yolo counties
- Sutter and Butte counties
- Solano County

Glenn, Colusa and Yolo counties and Sutter and Butte counties were combined because some participating sellers span the county boundaries. For Solano County, Reclamation District (RD) 2068 is primarily in Solano County with a small portion of the service area in Yolo County. A single region for Solano County was used for this district because it is in the Delta region and cropland idling requirements are unique for the Delta region, as described in Chapter 2. Table 3.10-~~20~~ 24 shows the potential sellers and the counties they are in.

Table 3.10-~~20~~24. Sellers Potentially Participating in Cropland Idling Transfers and County Locations

Sellers	County
Conaway Preservation Group	Yolo
Cranmore Farms	Sutter
Glenn-Colusa Irrigation District	Glenn and Colusa
Pelger Mutual Water Company	Sutter
Pleasant Grove-Verona MWC	Sutter
RD 108	Colusa and Yolo
RD 1004	Colusa
Sycamore MWC	Colusa
Te Velde Revocable Family Trust	Yolo
Butte Water District	Butte and Sutter
Goose Club Farms and Teichert Aggregates	Sutter
RD 2068	Solano and Yolo

The economic analysis of cropland idling transfers uses a model based on IMPLAN, an input-output (IO) database and modeling software, with information from recent University of California Cooperative Extension (UCCE) crop budgets (UCCE 2008a, 2008b, 2008c and 2012). IMPLAN is a county-level database and modeling package that calculates the economic impacts of a change in value of production.

The analysis estimates the direct agricultural effects of cropland idling using the crop budget information and potential amount of idled acreage, and estimates indirect and induced effects in individual counties or aggregations of counties with IMPLAN. Indirect effects are caused by expenditures in the region by affected regional industries, and include purchases of inputs to grow crops and make products. Induced effects are caused by expenditure of household income.

IMPLAN is designed to look at backward linkages of the supply chain in the economy. Forward linkages are typically examined outside the model. Forward linkages describe the process of how a company in a given sector sells its goods, products, or supplies to a company in a different sector. For example, after rice is harvested, it must be transported and milled. IMPLAN does not account for these changes, depending on the sector where the change in final demand was measured. For this analysis, forward linkages for transportation, rice milling, and tomato processing were added to the direct effect, which was then run through IMPLAN to calculate indirect and induced effects.

IMPLAN estimates effects on various economic measures, including employment, labor income, and total value of output. Employment is the number of jobs, including full-time, part-time and seasonal. Labor income consists of employee compensation and proprietor’s income. Value of output is the dollar value of production.

IMPLAN calculates annual effects based on the long-run average cost structure of each industry. In the case of single year transfers, land idling may not reduce all long run costs. For example, the grower might retain most of their equipment and other fixed assets, and this would reduce the direct effect of the transfer relative to that estimated by IMPLAN. For this reason, IMPLAN tends to provide a larger direct impact per acre for temporary transfers than might be warranted. If the grower expected to transfer water every year, then the economic impacts provided by IMPLAN are more representative. However, as discussed previously and in Chapter 2, cropland idling would not likely be implemented each year and the grower would not have the option to idle fields. If the grower has the option to transfer in consecutive years, the economic effects presented in this analysis could occur each year.

IMPLAN calculates annual effects based on a single year economy. The 2011 county data packages were used for this analysis, which were the most recent available data packages at the time the analysis was completed.

IMPLAN can apply IO models for any county or group of counties. There is no readily available method for developing IO information for local economies within counties, so this analysis includes a qualitative discussion of economic effects on local economies.

Use of Representative Crops

Table 2-3 in Chapter 2, Proposed Action and Alternatives, shows the crops eligible for cropland idling transfers, as defined by Reclamation and California Department of Water Resources (DWR). Section 2.3.2.1.3 explains why the crops are eligible for idling transfers. Because of the complexity of analyzing all eligible crops, this analysis uses a representative crop approach to assess potential economic effects. The analysis combines crops based on similar water use, agricultural production practices, gross returns, and farm labor requirements. Each group is represented by one crop that is predominant in the region. Table 3.10-~~21~~ 25 identifies the representative crops and crop groups and provides the technical basis for developing crop groups and assigning representative crops. Crops with little or no acreage in the Seller Service Area are listed as part of a crop group, but economic information is not provided.

Table 3.10-~~21~~25. Representative Crops, Eligible Crops, and Crop Characteristics

Representative Crop	Eligible Crops	Regional Acreage[1]	ETAW (AF/ Acre)	Direct Labor Hours/Acre [2]	Gross Revenue per acre[2]	Operating Costs per acre[2]	Production Practices[2]
	Rice	383,384	3.3	4.99	$1,547	$1,111	May be rotated depending on soils
Rice	Wild Rice	1,669	2	Data not available in recent cost and return studies	Data not available in recent cost and return studies	Data not available in recent cost and return studies	May be rotated depending on soils
	Tomatoes, Processing	69,526	1.9	27.42	$2,450	$2,017	Rotation crop, contracts with processors
Tomatoes, Processing[3]	Vine Crops	20,687	1.1	Data not available in recent cost and return studies	Data not available in recent cost and return studies	Data not available in recent cost and return studies	Rotation crop
	Corn Grain	48,751	1.9	11.03	$1,020	$673	Rotation crop
	Beans	10,786	1.5	11.88	$975	$731	Rotation crop
	Sunflower	41,069	1.4	4.86	$1,360	$447	Rotation crop
	Safflower	20,099	1	4.99	$363	$261	Rotation crop, some acreage is not irrigated
Corn[4]	Wheat	107,712	1	3.17	$450	$351	Rotation crop, some acreage is not irrigated
	Alfalfa	108,457	1.7	1.91	$1,450	$582	Rotation crop, contracts with dairies
Alfalfa[5]	Sudan Grass	8,267	3	1.52	$550	$756	Rotation crop

Source:
[1] NASS 2009-2013, Region includes Glenn, Colusa, Butte, Sutter, Yolo, and Solano counties. 2008-2012 averages
[2] UCCE Crop Budgets. Does not include labor provided by custom operators
[3] Other crops included in this group that could be idled: Sugar Beets, Melons, Onions
[4] Other crops included in this group that could be idled: Sorghum Grain, Cotton
[5] In Sacramento Valley north of the American River. Alfalfa cannot be idled in the Delta Region.
Key:
ETAW = evapotranspiration of applied water

Cropland Idling Acreages

The extent of economic effects depends on the crop type, amount of acreage, and frequency that crops are idled. This analysis estimates economic effects based on maximum idling acreages for each alternative that includes cropland idling transfers. Sellers provided crop types and quantities of water that could be made available through cropland idling.

Rice provides the largest amount of water per acre idled, currently 3.3 AF of evapotranspiration of applied water (ETAW) per acre. Rice is the most likely crop to be idled because it has historically been the largest source of water for crop idling transfers and it has the highest ETAW per acre of all the crops eligible for idling. Therefore, to estimate rice acreage idled, this analysis assumes that all water available for cropland idling transfers under each alternative could be made up completely by idling rice fields only.

Because other non-rice crops can also be idled, this analysis also estimates economic effects of idling other crops. The assumed acreages of these crops are much lower than rice acreage because, as previously stated, rice would be the main crop idled. The acreages idled for other crops were based on information provided by sellers.

Table 3.10-26 shows the maximum acreages for idling annually for each of the crop groups by economic region. Table 3.10-25 lists the crops within each representative crop category.

Table 3.10-26. Maximum Acreages for Cropland Idling

Region	Rice	Tomatoes, Processing	Corn	Alfalfa	Total
Colusa, Glenn, Yolo	40,704	400	400	1,400	42,904
Sutter, Butte	10,769	400	800	600	12,569
Solano	-	-	1,500	3,000[1]	4,500
Total	51,473	800	2,700	5,000	59,973

[1] Alfalfa cannot be idled within the legal boundaries of the Delta

Cropland idling transfers are the lowest priority for buyers because buyers would need to pay for the ETAW for an entire irrigation season, but they may only receive the ETAW amount from July through September if the water could not be stored April through June. Therefore, in the Proposed Action, idling transfers would be limited in quantity and do not occur every year that transfers are implemented. For the No Groundwater Substitution Alternative, cropland idling transfers continue to be the lowest priority for buyers; however, because less water is available from other transfer methods, crops may be idled more frequently to meet transfer needs. Though, the acreages shown in Table 3.10-26 are the maximum acreages for all alternatives that include cropland idling transfers.

Water Code Section 1745.05 (b) provides that, if the amount of water made available by land fallowing (idling) exceeds 20 percent of the water that would have been applied absent the proposed water transfer, a public hearing by the water supply agency is required. In the past, cropland idling programs have stayed well below the 20 percent water delivery threshold for a hearing.

Crop Shifting

In crop shifting, participating growers would shift from a higher water use crop mix to a lower water use crop mix and sell the remaining unused water to the buyer. The crop shifting analysis is conducted qualitatively using relevant information from the cropland idling analysis described.

Local Government Finances and Economic Policies
Regional economic effects of cropland idling transfers could affect sales tax and other revenues to local governments or increase costs of providing social programs. Effects to local government finances, including tax revenues and costs, are described qualitatively. Water transfers could conflict with some economic policies that local governments have identified in planning and policy documents, such as General Plans. These effects are described qualitatively.

Groundwater Substitution Transfers
Groundwater substitution transfers could reduce groundwater levels, which would result in increased pumping costs for growers selling water and growers using nearby wells. This analysis uses results of changes in groundwater levels from the groundwater simulation described in Section 3.3, Groundwater Resources, to evaluate potential changes in pumping costs. Section 3.3 also describes the existing groundwater levels in the Sacramento Valley Basin. In the Sacramento Valley Groundwater Basin, production wells are typically located no closer than 0.25 mile from each other (Niblack 2012). For nearby wells, this analysis estimates changes in groundwater pumping costs in areas 0.25 miles away from regions of maximum drawdown as a result of transfers.

The energy costs required to pump one acre-foot of groundwater per one foot of lift can be estimated using the following formula[4]:

Energy Cost ($) = (1.02 x Electricity Rate)/Pump Efficiency

The Pacific Gas and Electric Company (PG&E) rate schedules for large agricultural users shows an average power rate of approximately $0.22/kilowatt-hour (PG&E 2012). Pump efficiencies average about 56 percent in the Sacramento and San Joaquin Valleys (Irrigation Training and Research Center 2011). Based on the above equation, a farmer pays approximately $0.32 for electricity to pump one acre-foot of water one foot.

Stored Reservoir Purchase and Conservation Transfers
Revenues received from stored reservoir and conservation transfers could increase operating incomes for sellers. These effects are described qualitatively.

Use of Transfer Water in Buyer Service Area
Use of transfer water in the Buyer Service Area would reduce potential effects of CVP shortages for agricultural and M&I uses. In agricultural areas of the Buyer Service Area, districts would be able to use water to support the farming industries, including related businesses. This analysis describes economic effects in the Buyer Service Area qualitatively.

[4] UCCE 1996, Reclamation 2012

3.10.2.2 Alternative 1: No Action/No Project

3.10.2.2.1 Seller Service Area

Under the No Action/No Project Alternative, there would be no cropland idling or crop shifting transfers to CVP contractors that would affect the regional economies in the Seller Service Area. Under the No Action/No Project Alternative, sellers would not sell water to CVP contractors in the Buyer Service Area through cropland idling or crop shifting. Therefore, crop production would not decrease in the Seller Service Area and the volume of business for agricultural support businesses would not change as a result of water transfers. In general, irrigated acreages and agricultural economies in the Seller Service Area would not change substantially under the No Action/No Project Alternative relative to existing conditions. Growers would continue to idle some land temporarily and would continue to rotate other previously-idled land back into production as common land management practices. These farming practices cause normal variations in employment, labor income, and output.

Under the No Action/No Project Alternative, water transfers to CVP contractors would not affect local government finances. Under the No Action/No Project Alternative, water transfers to CVP contractors would not occur and would not affect tax receipts or operating costs of local governments. There would be no effects related to CVP transfers to local government finances.

Under the No Action/No Project Alternative, groundwater pumping costs would not be affected by water transfers to CVP contractors in the Seller Service Area. Under the No Action/No Project Alternative, water users in the Seller Service Area would continue to use surface water supplies, rather than pump groundwater. Groundwater levels would not be affected by water transfers to CVP contractors; therefore, groundwater pumping costs for sellers and nearby well owners would not change relative to existing conditions.

3.10.2.2.2 Buyer Service Area

Under the No Action/No Project Alternative, growers in the Buyer Service Area would idle crops in responses to CVP water shortages. In the Buyer Service Area, growers would need to idle crops in response to CVP water shortages. Idling could last for one year or multiple years depending on the length of the shortage. Under existing conditions, growers are idling crops because of reduced water supplies. Cropland idling reduces farm incomes, purchases of agricultural inputs, and farm labor. Under the No Action/No Project Alternative, there could be adverse effects to regional economics because cropland idling would continue similar to existing conditions.

Under the No Action/No Project Alternative, growers would pump groundwater for irrigation in the Buyer Service Area, which could increase pumping costs if groundwater levels decline. Under existing conditions, growers are pumping groundwater for irrigation because of reduced surface water supplies. Under the No Action/No Project Alternative, growers in the Buyer Service Area would continue to pump groundwater for irrigation when CVP water deliveries are reduced, which would reduce groundwater levels. As a result, groundwater pumping and management costs would be similar to or more than that which would occur under existing conditions. Increased groundwater costs would reduce farmer net revenues and spending in the regional economy.

3.10.2.3 Alternative 2: Full Range of Transfers

3.10.2.3.1 Seller Service Area

Cropland Idling and Crop Shifting Transfers

Cropland idling transfers would occur from sellers in Glenn, Colusa, Yolo, Sutter, Butte, and Solano counties. Table 3.10-~~22~~ 27 summarizes the maximum acreages of each crop that would be idled under the Proposed Action. Idling rice fields would likely provide most, if not all, of the transfer water in Glenn, Colusa, Yolo, Sutter, and Butte counties.

Table 3.10-~~22~~27. Maximum Acreages for Cropland Idling under the Proposed Action

	Rice	Tomatoes, Processing	Corn	Alfalfa	Total
Colusa, Glenn, Yolo	40,704	400	400	1,400	42,904
Sutter, Butte	10,769	400	800	600	12,569
Solano	-	-	1,500	3,000[1]	4,500
Total	51,473	800	2,700	5,000	59,973

[1] Alfalfa cannot be idled within the legal boundaries of the Delta

Revenues from cropland idling water transfers could increase incomes for growers or landowners selling water. Selling water for transfers is voluntary for growers and landowners. For cropland idling transfers, growers would be willing to participate if the expected net return from the water transfer exceeds their expected net return from growing the crop. This would increase returns to farmers and be an economic benefit.

The economics of participation for a typical farmer can be shown using ~~2006~~2008-~~2010~~ 2012 agricultural prices and crop yields and farm production costs from UCCE crop budgets. Table 3.10-23 compares the net revenues gained by the water transfer to the net revenue lost from discontinued crop production based on ~~2006~~2008-~~2010~~ 2012 conditions. The analysis assumes a transfer price of $~~225~~ 350 for each acre-foot for water made available by idling crop land. This water transfer price is a representative price. It was calculated based on the weighted average of SLDMWA transfers in 2013 and 2014. Prices were $190 per acre-foot in 2013 and $500 per acre-foot in 2014. The actual price would be negotiated among buyers and sellers and would likely vary according to hydrologic conditions, prices in agricultural markets, and other factors.

Table 3.10-~~24~~ 28 suggests whether or not it would be economical for a typical farmer to participate in a crop idling transfer based on the assumed water transfer prices and representative crop production costs and returns. The table compares net revenues from farming and water transfers for rice, corn, tomatoes, and alfalfa. In general, if the net revenue received per acre from a water transfer (column 1) would be larger than the net revenue over variable costs received from crop production (column 4), a farmer would choose to participate.

Table 3.10-~~23~~28. Net Revenue From Water Transfer, Lost Revenue, Variable Costs Avoided and Lost Return Over Variable Costs ($ per Acre)

	(1)	(2)	(3)	(4)	(5)
Crop	Net Revenue from Water Transfer	Revenue from Crop Production (lost)	Variable Costs Avoided by the Transfer	Net Revenue from Crop Production (lost) (2) – (3)	Net Revenue Gained from Water Transfer (1) – (4)
Rice	1,155	1,719	1,111	608	547
Tomatoes, Processing	665	3,513	2,017	1,496	-831
Corn	665	1,041	673	368	297
Alfalfa	595	1,237	582	655	-60

Source: UCCE 2012, 2008a, 2008b, 2008c, CDFA 2013

Table 3.10-~~23~~ 28 shows that tomato and alfalfa crops may not be economical to idle based on the assumed water transfer price and net revenues. It is important to note that each farmer's situation is unique and growers might choose to participate for reasons other than net revenues. Also, some growers with less productive fields or higher costs would likely expect more net revenue improvement from participating in the water transfer than the representative farm. It is expected that growers would first idle marginal fields. For these fields, the economic benefits of water transfers would be better than average. If water transfer prices remain at 2014 levels, which was $500 per acre-foot, alfalfa would become economical to idle. The farmer would receive $850 per acre for the transfer water and the price differential between the water transfer revenue and the net revenue lost from crop production would be $195 per acre. At this water transfer price, tomato crops would still not be economical to transfer at the assumed price and yield. The farmer would receive $950 per acre for the transfer water and the price differential between the water transfer revenue and the net revenue lost from crop production would be -$545 per acre.

Growers would likely spend a portion of their income received from the transfer in the regional economy, which would result in positive induced effects in the regional economy. These effects would offset some of the adverse regional economic effects of cropland idling described below. In general, the higher the water transfer price, the more money would likely be spent in the regional economy and it would offset a larger portion of the adverse regional economic effects. It is difficult to quantify how much of the farmer income would result in induced effects because it is unknown how much of the water transfer revenue would go to debt retirement, savings, vacations, or outside investments, which would not have any regional economic effects. However, a higher transfer price would be a benefit to the Seller Service Area.

Cropland idling transfers in Glenn, Colusa, and Yolo counties could reduce employment, labor income, and economic output for businesses and households linked to agricultural activities. Growers or landowners selling water for transfers would be compensated for their expected losses in income; however, adverse regional economic effects would still occur to businesses and individuals who support farming activities, such as farm workers, fertilizer and chemical dealers, wholesale and agricultural service providers, truck transport, and others involved in crop production and processing. These businesses and individuals would not receive any compensation from the water transfer.

Table 3.10-~~24~~ 29 shows maximum annual cropland idling acreages, crop ETAW values, and water made available for transfer in Glenn, Colusa, and Yolo counties. It is not likely that all the acreage would be idled in a single year. Since the maximum crop acreage would not be idled in most years, the average annual effect would be even less. Cropland idling transfers would also not occur each year over the 10-year long-term water transfers period. As discussed in Chapter 2, cropland idling transfers are the lowest priority transfer for buyers.

Table 3.10-~~24~~29. Maximum Annual Cropland Idling Acreages in Glenn, Colusa, and Yolo Counties under the Proposed Action

	Rice	Tomatoes, Processing	Corn	Alfalfa	Total
Acres Idled	40,704	400	400	1,400	42,904
ETAW (AF per acre)	3.3	1.8	1.8	1.7	-
Total AF	134,323	720	720	2,380	138,143

As described in Section 3.10.2.1, Assessment Methods, Glenn, Colusa, and Yolo counties have been combined into one region for this economic analysis. Table 3.10-~~25~~ 30 shows economic data for the combined three-county region. Tables 3.10-1, 3.10-3 and 3.10-9 show the regional economies individually for each county. Regional economic effects are compared relative to the three-county region. It is important to note that Yolo County represents a significant portion of the employment, labor income, and output in this region because of its proximity to the urban Sacramento area and economic activities associated with the University of California at Davis. If acres idled are concentrated in Glenn or Colusa counties, local economic effects may be more severe. The discussion below on local economic effects discusses economic effects of idling in small rural areas.

Table 3.10-2530. Summary of 2011 Regional Economy in Glenn, Colusa, and Yolo Counties

	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	14,118	639.7	2,164.3
Mining	388	17.9	114.7
Construction	5,897	351.3	712.3
Manufacturing	7,965	478.3	3,861.2
Transportation, Information, Public Utilities	9,248	440.7	1,308.5
Trade	17,161	799.5	1,916.4
Service	49,587	1,873.6	6,241.8
Government	38,395	2,915.1	3,432.4
Total	142,761	7,516.2	19,751.7

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

Table 3.10-26 31 shows the potential annual economic effects of idling the proposed maximum acreages of rice in Glenn, Colusa, and Yolo counties in a single year. Effects to employment, labor income, and output would result in a reduction of less than one percent relative to 2011 baseline economy.

In some transfer years, growers may choose to idle crops other than rice, which would have varying economic effects. It is likely that limited acreages of these crops would be idled because of lower ETAWs, higher net returns to growers, existing contracts with processors, and other factors. Table 3.10-26 31 also shows annual economic effects of idling the maximum acreage of other crop types, which are represented by tomatoes, corn, and alfalfa in this analysis. Idling the proposed acreages of non-rice crops would result in minimal effects (0.0 to 0.01 percent of the baseline economy) to the employment, labor income and output in the three-county region.

Cropland idling transfers could occur in consecutive years, meaning that these effects would occur each year. If the maximum cropland idling transfers occurred in consecutive year, 495 jobs would be lost in the regional economy each year the transfer occurs. Output and labor income would also reduce each year the same amounts as shown in Table 3.10-31. During consecutive year cropland idling transfers, the economic effects would become less temporary and the adverse economic effects may be felt more in the local agricultural economy than a single year cropland idling transfer. Local economic effects are described below. On a regional level, the adverse economic effects are relatively small each year and would not substantially affect regional economic activities in the three county region. Cropland idling transfers are the lowest priority for buyers and would not likely occur each year during the 10-year period, or even in all years that transfers occur. Chapter 2 describes the frequency of transfers.

Table 3.10-~~26~~31. Regional Economic Effects in Glenn, Colusa, Yolo Counties from Maximum Cropland Idling Transfer under the Proposed Action (2012 dollars)

Crop	Maximum Acreage Idled	Employment (Jobs)	% change from Total Employment	Labor Income (Million $)	% change from Total Labor Income	Output (Million $)	% change from Total Output
Rice	40,704	-464	-0.33%	-$18.31	-0.24%	-$86.52	-0.44%
Tomatoes, Processing	400	-14	-0.01%	-$0.50	-0.01%	-$1.90	-0.01%
Corn	400	-3	-0.00%	-$0.11	-0.00%	-$0.37	-0.00%
Alfalfa	1,400	-13	-0.01%	-$0.47	-0.01%	-$1.64	-0.01%
Total	42,904	-495	-0.35%	-$19.38	-0.26%	-$90.43	-0.46%

Cropland idling transfers in Sutter and Butte counties could reduce economic output, value added, and employment for businesses and households linked to agricultural activities. Table 3.10-~~27~~ 32 shows maximum cropland idling acreages, ETAW values, and water made available for transfers in Sutter and Butte counties. It is not likely that all the acreage would be idled in a single year under the Proposed Action. Since the maximum would not be idled in most years, the average annual effect would be even less.

Table 3.10-~~27~~32. Maximum Cropland Idling Acreages in Sutter and Butte Counties under the Proposed Action

	Rice	Tomatoes, Processing	Corn	Alfalfa	Total
Acres Idled	10,769	400	800	600	12,569
ETAW (AF/acre)	3.3	1.8	1.8	1.7	-
Total AF	35,538	720	1,440	1,020	38,718

As described in Section 3.10.2.1, Assessment Methods, Sutter and Butte counties have been combined into one region for this economic analysis. Table 3.10-~~28~~ 33 shows economic data for the combined two-county region. It is important to note that Butte County represents a significant portion of the employment, labor income, and output in this region because it includes the larger economy of the City of Chico and economic activities associated with California State University at Chico. Tables 3.10-5 and 3.10-7 show the individual county economies.

Table 3.10-~~28~~33. Summary of 2011 Regional Economy in Sutter and Butte Counties

	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	11,448	$389.0	$1,178.8
Mining	359	$18.7	$109.7
Construction	8,642	$373.0	$902.1
Manufacturing	5,640	$299.3	$2,630.9
Transportation, Information, Public Utilities	5,897	$238.2	$1,053.0
Trade	20,686	$771.7	$1,859.5
Service	75,809	$2,490.3	$8,403.6
Government	18,217	$1,100.8	$1,385.0
Total	146,698	$5,681.1	$17,522.7

Source: MIG Inc. 2011

[1] Employment is measured in number of jobs.

[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.

[3] Output represents the dollar value of industry production.

Table 3.10-~~29~~ 34 shows the potential economic effects of idling the proposed maximum acreages of rice in a single year. Effects are compared to the regional economy of Sutter and Butte counties. Effects to employment, labor income, and output of idling the maximum rice acreages would result in a less than one percent change relative to the 2011 regional economy.

Table 3.10-~~29~~ 34 also shows economic effects of idling the maximum assumed acreage of other crop types in Sutter and Butte counties, which are represented by tomatoes, corn, and alfalfa in this analysis. Idling the proposed acreages of non-rice crops would result in minimal effects to the employment, labor income and output in the county.

Table 3.10-~~29~~34. Regional Economic Effects in Sutter and Butte Counties from Maximum Cropland Idling Transfer under the Proposed Action (2012 dollars)

Crop	Maximum Acreage Idled	Employment (Jobs)	% change from Total Employment	Labor Income (Million $)	% change from Total Labor Income	Output (Million $)	% change from Total Output
Rice	10,769	-132	-0.09%	-$4.56	-0.08%	-$23.21	-0.13%
Tomatoes, Processing	400	-16	-0.01%	-$0.50	-0.01%	-$2.00	-0.01%
Corn	800	-8	-0.01%	-$0.22	-0.00%	-$0.81	-0.00%
Alfalfa	600	-7	-0.00%	-$0.21	-0.00%	-$0.75	-0.00%
Total	12,569	-163	-0.11%	-$5.50	-0.10%	-$26.76	-0.15%

Cropland idling transfers could occur in consecutive years, meaning that these effects would occur each year. If the maximum cropland idling transfers occurred in consecutive year, 163 jobs would be lost in the regional economy each year the transfer occurs. Output and labor income would also reduce each year the same amounts as shown in Table 3.10-34. During consecutive year cropland idling transfers, the economic effects would become less temporary and the adverse economic effects may be felt more in the local agricultural economy than a single year cropland idling transfer. Local economic effects are described below. On a regional level, the adverse economic effects are relatively small each year and would not substantially affect regional economic activities in the region. Cropland idling transfers are the lowest priority for buyers and would not likely occur each year during the 10-year period, or even in all years that transfers occur. Chapter 2 describes the frequency of transfers.

Cropland idling transfers in Solano County could reduce economic output, labor income, and employment for businesses and households linked to agricultural activities. RD 2068 is the only potential seller in Solano County that could make water available through cropland idling. Table 3.10-~~30~~ 35 summarizes a potential maximum transfer in the county under the Proposed Action. RD 2068 would not idle rice or tomato crops; therefore, these crops are not included in the cropland idling analysis for Solano County.

Table 3.10-~~30~~35. Maximum Cropland Idling Acreages in Solano County under the Proposed Action

	Corn	Alfalfa	Total
Acres Idled	1,500	3,000	4,500
ETAW (AF/acre)	1.8	1.7	-
Total AF	2,700	5,100	7,800

Table 3.10-~~31~~ 36 shows economic effects of idling the maximum assumed acreage of other crop types in Solano County, which are represented by corn and alfalfa in this analysis. Idling effects are compared to the regional economy of Solano County, shown in Table 3.10-11. Idling the proposed acreages would result in minimal effects to the employment, labor income and output in the county. Since the maximum acreage would not be idled in most years, the average annual effect would be even less.

Table 3.10-~~31~~36. Regional Economic Effects in Solano County from Maximum Non-Rice Idling Transfer (2012 dollars)

Crop	Maximum Acreage Idled	Employment (Jobs)	% change from Total Employment	Labor Income (Million $)	% change from Total Labor Income	Output (Million $)	% change from Total Output
Corn	1,500	-14	-0.01%	-$0.43	-0.00%	-$1.45	-0.00%
Alfalfa	3,000	-18	-0.01%	-$0.70	-0.01%	-$3.12	-0.01%
Total	4,500	-32	-0.02%	-$1.13	-0.01%	-$4.58	-0.01%

Cropland idling transfers could occur in consecutive years, meaning that these effects would occur each year. If the maximum cropland idling transfers occurred in consecutive year, 32 jobs would be lost in the regional economy each year the transfer occurs. Output and labor income would also reduce each year the same amounts as shown in Table 3.10-36. During consecutive year cropland idling transfers, the economic effects would become less temporary and the adverse economic effects may be felt more in the local agricultural economy than a single year cropland idling transfer. Local economic effects are described below. On a regional level, the adverse economic effects are relatively small each year and would not substantially affect regional economic activities in the region. Cropland idling transfers are the lowest priority for buyers and would not likely occur each year during the 10-year period, or even in all years that transfers occur. Chapter 2 describes the frequency of transfers.

Cropland idling transfers could have adverse local economic effects. The following is a qualitative discussion of local economic effects that applies to local agricultural communities in the Seller Service Area. For this analysis, "local effects" means economic effects on towns, small cities, and local industries. Local economic data do not exist for all local communities, and the locations of cropland idling within counties cannot be predicted with certainty. Therefore, this analysis does not attempt to predict economic effects in specific communities, and the analysis of local effects is handled descriptively and qualitatively.

Most of the communities in areas where cropland idling could occur are small and are dependent on agriculture. The small towns often house companies associated with crop production, such as seed and fertilizer suppliers, aerial application services, rice mills and driers, tomato processing plants, and storage warehouses that rely on crop production for revenue. These companies also provide employment to many local residents.

The effects of the idling actions described in the above sections are changes in employment, labor income, and output at the regional or county levels. Large urban centers in some counties create large baseline economic measures. In the area of analysis, Solano, Butte, and Yolo counties have larger baseline economies than Glenn, Colusa and Sutter counties because of their economic base and proximity to the Sacramento area and the San Francisco Bay area. Rural communities that have much smaller economic bases are more dependent on local agriculture, so any change to economic measures would be relatively more adverse at the local level than for the larger regional and county economies. That is, the percent change in an economic measure based on local measures alone may be much larger than the "% change" estimates in the previous tables.

Local economic effects would be more adverse if cropland idling transfers occurred in consecutive years. Business owners would likely be able to recover from reduced sales in a single year, but it would be more difficult if sales remained low for multiple years. Workers may also have more trouble finding long-term jobs if cropland idling occurred in consecutive years.

The size of local effects depends on the location of the local community relative to an urban center, the buying patterns of the participating farmer, and the types of other services provided.

The magnitude of effects to local businesses could vary based on the proximity of a local community to a large urban center. The adverse effects would be larger if the idled land was near a local community that was far from any large urban center because growers would likely pay a larger share of expenses to local businesses. Residents of rural communities far from urban centers typically spend larger portions of their incomes within the community than residents of rural communities that are close to large urban centers. A reduction in local spending would be adverse to the regional economy.

Despite the location of the community, some growers have unique buying patterns that could influence the overall effect of a transfer on a regional economy. For example, some growers may buy inputs locally, as described above. Cropland idling would have a more adverse effect on the regional economy if that farmer participates in water transfers. Other growers may drive to a larger urban area outside the region or use the internet to purchase inputs. If those growers participated in water transfers, there would not be much effect to local businesses. Depending on the buying patterns of the participating growers, a water transfer may affect local businesses very much, or not at all.

Farmland owners would realize a net gain in net revenue by selling water. Presumably, growers or landowners would spend some of their increased net revenues in the local economy. This effect could offset some of the decrease in local spending by the third parties described above.

Agriculture is in the top two industries in employment, labor income, and output in Glenn and Colusa counties. The counties do not offer many other services, such as recreation tourism, that attracts outside spending to boost the regional economy. Some out-of-region visitors go to the wildlife refuges and spend money within the counties, but the county economy cannot depend on outside tourism. Therefore, changes in agricultural production would have more adverse effects on Glenn and Colusa counties relative to counties that can provide alternate services to support the regional economy.

Water transfers from idling alfalfa could increase costs for dairy and other livestock feed. Alfalfa is an important feed for California dairy and other livestock producers. California is the nation's largest dairy producer, providing about 20 percent of the nation's milk supply and $5 billion of dairy products annually. California is also the nation's largest producer of alfalfa (Putnam et al 2007). California recently grew alfalfa on about one million acres and produced about seven million tons per year.

On average, grazing is a small share of California dairy feed, and most feed is purchased. A loss of alfalfa production from land idling could increase the cost of purchased feed for California dairies and the cost of dairy products. However, the amount of acreage and production potentially affected is very small relative to California's market for alfalfa. Also, reductions in production of alfalfa in the Seller Service Area could be partly offset by increases of alfalfa plantings in the Buyer Service Area. Therefore, any effects of water transfers on alfalfa and dairy prices would be minimal.

Cropland idling transfers could decrease net revenues to tenant farmers whose landowners choose to participate in transfers. Tenant farmers, those who rent land from property owners, could be adversely affected by cropland idling. The landowner would receive revenues from the sale of the water instead of rent from the tenant, but the tenant farmer would not receive the net revenue from crop production. If there was no other land available for rent, or if land rents were increased, the tenant farmer would be worse off.

In 2007, full owners operated about 66 percent of harvested cropland in the Seller Service Area and part owners operated about 19 percent. Tenant farmers operated about 15 percent of harvested cropland in the region (USDA 2009). Tenant farmers might be able to rent other parcels of land or engage in alternative economic activity. Some tenant farmers could also own land. In other cases, tenants could have formal or informal agreements with landowners that would result in sharing of the water transfer revenue. Still, the temporary loss of farming opportunities would have an adverse effect on some tenant farmers in the region.

Crop shifting transfers could change economic output, value added, and employment for businesses and households linked to agricultural activities. For crop shifting transfers, growers would switch from a higher water use crop mix to a lower water use crop mix and sell the excess water for transfer. For a crop shifting transfer, growers would continue to spend money to grow a crop, employ farm labor, and generate revenue. Some crops such as wheat require less labor and inputs, which may have some adverse indirect and induced effects. Normal farming practices in the Seller Service Area include crop rotations; therefore, agricultural support businesses and farm workers are subject to these variations in sales and employment. Some crops may also be shifted to those that require more inputs and employment, which would have positive indirect and induced effect. Crop shifting to a lower water use crop would have minimal adverse effects on the regional economy.

Local Government Finances and Economic Policies

Reductions in local sales associated with cropland idling transfer effects could reduce tax revenues and increase costs to county governments. Idling of cropland could reduce revenues to county governments, primarily through the sales and use tax. Idling reduces the farmer's expenditures for production inputs, but much of this expenditure is not bought through retail channels that are subject to the tax. However, the reduced expenditure, especially reduced labor expenditure, reduces the incomes of many other persons who buy goods and services in the local economy. These people have less income to spend, and the share they spend on retail goods results in a loss of sales and use tax. On the other hand, the farmer who transfers water would presumably have a higher net income relative to revenues received from farming and could spend more in the regional economy.

Regional economic effects as a result of water transfers could increase costs for local governments in the form of unemployment costs and other social services. Given the size of economic effects relative to base economies, such effects would be minimal.

Table 3.10-37 shows tax impacts of cropland idling transfers, as estimated by IMPLAN. IMPLAN calculates tax impacts based on tax receipts, not actual tax rates. IMPLAN does not have the underlying data to separate state and local taxes; therefore, they are lumped together. It is not possible to identify the tax impact on local county and city jurisdictions. These impacts to tax revenues would be an adverse effect on the federal, state, and local economies.

Table 3.10-37. Federal, State, and Local Tax Impacts of Cropland Idling Transfers

-	Colusa, Glenn, Yolo	Sutter, Butte	Solano
State/Local	-$2,307,000	-$707,000	-$108,000
Federal	-$2,851,000	-$930,000	-$167,000

Source: MIG Inc. 2011

Economic effects associated with cropland idling could conflict with economic policies and objectives set forth in local plans. As identified in the Regulatory Setting, some counties in the Seller Service Area have established policies in documents such as General Plans to promote growth in the agricultural economy. As described above, cropland idling could affect sales for agricultural support businesses, which would conflict with economic policies or objectives. This would occur during the year of the transfer and effects would be an adverse effect. Cropland idling would benefit growers that sell water for transfer by increasing income. This increased income to growers could support growth in the agricultural economy.

Groundwater Substitution Transfers

Groundwater substitution transfers could increase costs to water users for groundwater pumping, ~~g costs~~ deepening existing wells, or drilling new wells ~~for water users~~ in areas where groundwater levels decline as a result of the transfer. Groundwater substitution transfers would cause groundwater levels to decline in local areas within the Sacramento and Redding Groundwater Basins.

Section 3.3, Groundwater Resources, discusses potential impacts to groundwater levels as a result of water transfers. Decreased groundwater levels would increase pumping costs for nearby well owners who are not participating in groundwater substitution transfers. Increased costs would reduce net farm revenues and, subsequently, household spending in the regional economy. In general, most agricultural wells in the Sacramento Valley Groundwater Basin are at least about 0.25 miles apart, so neighboring wells would not be pumping at the point of maximum drawdown in the basin. Figures 3.10-5 and 3.10.6 show potential changes in groundwater pumping costs after a one-year transfer and after multi-year transfers, respectively. As described in Section 3.3.2.4.2, the groundwater level figures show the simulated drawdown of groundwater elevations under September 1976 hydrologic conditions (WY 1976 was historically a critical dry year) and simulated drawdown of groundwater elevations under September 1990 hydrologic conditions, which shows the cumulative effects of multi-year transfers as groundwater substitution pumping was simulated in 1987, 1988, 1989, and 1990. Table 3.10-~~32~~ 38 shows potential changes in pumping costs corresponding to decline in groundwater levels. Figure 3.10-5 shows that after a single year transfer, pumping costs in most areas would increase about $0.64 to $1.60 per AF. In some areas in Sacramento, Glenn and Sutter counties, pumping costs could increase up to $3.20 to $4.80 per AF for nearby wells close to 0.25 miles from the transfer well. In some areas of Colusa and Yuba counties, groundwater levels could decline up to about 25 feet, which would be an increase in pumping costs between $6.40 and $8.00 per AF. After consecutive years of water transfers, changes in pumping costs would be similar (Figure 3.10-6); however, they would be more widespread across the basin. For many growers, pumping costs would increase in the range of $0.32 to $1.60 per AF. Increased pumping costs for nearby growers would be an adverse economic effect.

Table 3.10-~~32~~38. Potential Increases in Energy Costs Associated With Groundwater Level Declines

Groundwater Decline	Energy Costs ($/AF)
1-2 feet	$0.32-$0.64
2-5 feet	$0.64-$1.60
5-10 feet	$1.60-$3.20
10-15 feet	$3.20-$4.80
15-20 feet	$4.80-$6.40
20-25 feet	$6.40-$8.00
25-30 feet	$8.00-$9.60
30-50 feet	$9.60- $16.00
>50 feet	>$16.00

Reduction in groundwater levels could also result in existing wells that may not be participating in the water transfers to dry out. This would require either deepening existing wells or drilling new wells to continue to pump groundwater. Deepening or drilling new wells would result in excessive costs to third parties and would be a substantial adverse economic effect.

Mitigation measure GW-1 (see Section 3.3, Groundwater Resources) establishes monitoring programs for groundwater substitution transfers. The programs would monitor groundwater level fluctuations within the local pumping area and if effects were reported or occurred, the participating selling agencies would implement appropriate mitigation, also described in mitigation measure GW-1. Mitigation measure GW-1 would reduce the effects of increased groundwater pumping costs for well owners in areas where groundwater levels decline as a result of transfers. This would reduce adverse economic effects of increased pumping costs. Mitigation measure GW-1 also includes monitoring and mitigation actions to prevent wells from going dry or to mitigate the third party in the event that a well does go dry. Section 3.3.4.1.2 describes the monitoring plan that sellers must complete for groundwater substitution transfers and to address third party concerns. Section 3.3.4.1.3 details the mitigation plan for third party effects.

Revenues from groundwater substitution water transfers could increase incomes for growers or landowners selling water. Similar to cropland idling transfers, growers or landowners would likely participate in groundwater substitution water transfers if the income received from the water transfer is larger than the cost of pumping groundwater in lieu of surface water for irrigation. This would increase total net revenues for the farmer.

Stored Reservoir Release and Conservation Transfers

Revenues received from stored reservoir release and conservation transfers could increase operating incomes for sellers. Water transfer revenues from stored reservoir release and conservation transfers would go to the seller. The seller could use the revenues for operating expenses or to fund planned future projects, such as infrastructure replacement. Any of these effects could be beneficial, but would be minor as water transfer revenues would not be a large or consistent income source.