Chapter 15
Agricultural Resources

This chapter describes the environmental setting and study area for agricultural resources; analyzes impacts that could result from construction, operation, and maintenance of the Delta Conveyance Project (project); and provides mitigation measures to reduce the effects of potentially significant impacts. This chapter also analyzes the impacts that could result from implementation of compensatory mitigation required for the project and describes any additional mitigation necessary to reduce those impacts, and analyzes the impacts that could result from other mitigation measures associated with other resource chapters in this Draft EIR.

Under CEQA Guidelines Appendix G, forestry resources are considered alongside agricultural resources. Resources within the study area that could be considered forest land are limited to riparian forest and woodland corridors along riverine channels. The study area contains no forests used for timber production or areas designated as a Timberland Production Zone. Any potential impacts that could arise from construction, operation, and maintenance of the project on riparian forest and oak woodland stands are covered in Chapter 13, *Terrestrial Biological Resources*. Forestry resources are thus not analyzed in this chapter.

15.0 Summary Comparison of Alternatives

Table 15-0 provides a summary comparison of important impacts on agricultural resources by alternative. The table presents the CEQA findings after all mitigation is applied. If applicable, the table also presents quantitative results after all mitigation is applied. Important impacts to consider include the conversion of Important Farmland and the conversion of farmland under Williamson Act contracts or in Farmland Security Zones on a temporary, short-term, or permanent basis.

Implementation of any alternative would result in the permanent and temporary conversion of Important Farmland. Alternative 2a would result in the greatest amount of farmland conversion (5,735.7 acres). Among all alternatives, Alternative 5 would result in the least amount of converted farmland (3,787.9 acres). Acres reported in Table 15-0 include impacts on farmland resulting from construction buildout and anticipated impacts associated with implementation of the Compensatory Mitigation Plan (CMP) on Bouldin Island and Interstate (I-)5 Ponds 6, 7, and 8. The total acres reported in Table 15-0 also include “remnant farmland areas,” which are generated when the margin of the construction footprint bisects an existing agricultural parcel, leaving a portion of the agricultural parcel that would not be directly permanently or temporarily converted due to construction. They nonetheless could be indirectly affected by the construction footprint. These “remnant farmland areas” could be too small in size to effectively support ongoing agricultural operations and are, therefore, conservatively considered to be permanently converted. Therefore, total acres noted for each alternative in Table 15-0 are the sum of impacts on farmland by acreage due to the project alternative, implementation of the CMP, and remnant farmland areas under each alternative.

Each alternative would result in the permanent or temporary conversion of Williamson Act farmland or farmland in a Farmland Security Zone. If the underlying Williamson Act contract or Farmland Security Zone remains in effect, the conversion to incompatible uses may result in potentially significant land use conflicts, whether from permanent or temporary conversion. Alternative 4a would cause the greatest amount of conversion of contracted land (1,355.2 acres). Alternative 2b would result in the least amount of conversion of contracted land (881.3 acres). Conversion of farmland under Williamson Act contract or under contract within a Farmland Security Zone largely represents a subset of those impacts for conversion of Important Farmland because much of the agricultural land within the study area is Important Farmland, but only a fraction of that land is under Williamson Act contract and an even smaller proportion is under contract in a Farmland Security Zone.

As noted above, the conversion of Williamson Act contracted farmland or land in a Farmland Security Zone involves not only the direct effect on the land resources, but also may create conflicts with the use restrictions that the contracts or Farmland Security Zones impose. Project activities in Farmland Security Zones are more likely to create compatible use conflicts.

Construction and operation of the project's water conveyance facilities could indirectly affect agriculture within the study area. The California Department of Water Resources (DWR) considered how construction activities for the project could affect local infrastructure supporting agricultural properties. Though agricultural properties were avoided to the greatest extent possible, additional infrastructure may be present and could permanently disrupt agricultural infrastructure. This impact would be potentially significant. Mitigation Measure AG-3: *Replacement or Relocation of Affected Infrastructure Supporting Agricultural Properties* would require disrupted agricultural infrastructure to be relocated or replaced; otherwise, the affected landowner would be fully compensated for any financial losses. After mitigation, this impact would be less than significant.

Table ES-2 in the Executive Summary provides a summary of all impacts disclosed in this chapter.

1 **Table 15-0. Comparison of Impacts on Agricultural Resources by Alternative**

	Alternative								
Chapter 15 – Agricultural Resources	1	2a	2b	2c	3	4a	4b	4c	5
Impact AG-1: Convert a Substantial Amount of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance as a Result of Construction of Water Conveyance Facilities (total acres)	5,355.1/ SU	5,735.7/ SU	4,838.1/ SU	5,211.8/ SU	4,931.7/ SU	5,380.0/ SU	4,404.1/ SU	4,812.9/ SU	3,787.9/ SU
Impact AG-2: Convert a Substantial Amount of Land Subject to Williamson Act Contract or under Contract in Farmland Security Zones to a Nonagricultural Use as a Result of Construction of Water Conveyance Facilities (total acres)	1,042.3/ SU	1,253.6/ SU	881.3/ SU	950.6/ SU	1,142.5/ SU	1,355.2/ SU	982.0/ SU	1,051.2/ SU	1,217.8/ SU
Impact AG-3: Other Impacts on Agriculture as a Result of Constructing and Operating the Water Conveyance Facilities Prompting Conversion of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS

2 LTS = less than significant; SU = significant and unavoidable.

15.1 Environmental Setting

This section describes the environmental setting and affected environment for agricultural resources in the study area (i.e., the area in which impacts may occur). The study area consists of the statutory Delta and certain areas immediately adjacent to the Delta.

The agriculture industry is an economically important industry in California and one of the state's largest employers. California has fewer than 4% of the nation's total number of farms and ranches yet produces 13% of the total United States agricultural production value (California Department of Food and Agriculture 2021). According to the California Department of Food and Agriculture, the state exports agricultural products to more than 190 countries and the value of its export commodities reached $20.56 billion in 2017 (California Department of Food and Agriculture 2018a:105). In 2017, California farmers produced 46% of the nation's fruits and nuts, which generated $20.8 billion in gross receipts, employed 1.1 million people, and created $60 billion in personal income each year (when considering direct, indirect, and induced contributions). The Central Valley Project (CVP) has the potential to deliver up to 9.5 million acre-feet (MAF) of water per year, but on average has delivered around 7 MAF annually since the early 1980s (Congressional Research Service 2021:6-7). The CVP annually provides about 5 MAF of water for farms, enough water to irrigate about 3 million acres or approximately one-third of the state's farmlands (Bureau of Reclamation 2019:3). Central Valley farms produced 8% of the nation's agricultural output on 1% of the total farmland in the United States (U.S. Geological Survey n.d.). During the drought years of 2012 through 2015, the entire CVP annual deliveries averaged approximately 3.45 MAF (Congressional Research Service 2021:7). The State Water Project (SWP) can deliver more than 4 MAF in a wet year, delivering supplemental water to approximately 750,000 acres of irrigated farmland (California Department of Water Resources 2020:24). As drier years are becoming more frequent throughout the state, it is projected that annual water delivery under the SWP will average around 2.4 MAF (California Department of Water Resources 2020:24).

Although the Delta represents less than 1% of California's land area, the land devoted to agriculture in the Delta represents approximately 2% of California's agricultural land and approximately 2% of agricultural production in the state. The total gross revenue of farms within the Delta was $965 million in 2016 (Delta Protection Commission 2020:38). Corn and alfalfa are the most common crops grown in the Delta by acreage; however, these same crop types also underwent the largest decreases in acreage between 2009 and 2016 (Delta Protection Commission 2020:1). In 2016, wine grapes represented the leading revenue crop in the Delta at $212 million followed by processing tomatoes at $116 million and corn at $86 million (Delta Protection Commission 2020:8). It is estimated that Delta farms directly support about 12,400 jobs, contributing to about $1.7 billion in annual economic output (Delta Protection Commission 2020:1). Other crop types which have experienced major decreasing acreage between 2009 and 2016 include oats (57% decline in acreage extent), tomatoes (23% relative decrease), wheat (16% relative decrease), and asparagus (73% relative decrease) (Delta Protection Commission 2020:9). The five crop types with the greatest increase in planted acreage from 2009 to 2016 include almonds (401% relative increase); wine grapes (38% relative increase); safflower (45% relative increase), rice (53% relative increase), and walnuts (82% relative increase) (Delta Protection Commission 2020:9).

The Delta's farmland has been and is expected to continue to be subject to conversion pressure, particularly along its periphery. Ecosystem restoration projects, including efforts to expand seasonal floodplains, tidal and seasonal wetlands, and riparian forests, can result in thousands of acres of active farmland being converted to nonagricultural uses—principally for the benefit of native plant and wildlife species. Often these restoration projects are targeted in areas of the Delta where elevations are higher, which typically is the outer periphery of the Delta, but may also occur in the interior Delta. Building of ranchettes can also contribute to a loss of acreage used for farming or result in farmland being transferred to less intensive and productive agricultural uses.[1] The farmland along the edges of the Delta is also vulnerable to ongoing urban growth, particularly in the southern portion of the Delta in the vicinity of Stockton and Lathrop, as these urban areas continue to experience population growth. Based on published programs and plans, it is projected that more than 20,000 acres of existing farmland within the study area would be converted, for either habitat areas or for new urban growth, over the course of the next couple decades. The effects of climate change associated with sea level rise and more intense storm events will place more strain on the Delta's levees, which protect much of the Delta's farmland from flooding.

15.1.1 Study Area

The study area for this chapter encompasses roughly 744,000 acres within Alameda (6,471 acres), Contra Costa (112,562 acres), Sacramento (121,857 acres), San Joaquin (318,882 acres), and Yolo (92,011 acres) Counties and matches the project area identified in Chapter 1, *Introduction*, since the operational effects on agricultural resources from implementing the project would not extend beyond the physical project boundaries. Lands used for agricultural purposes according to Farmland Mapping and Monitoring Program (FMMP) classifications comprise more than 585,000 acres of the study area and are a substantial economic factor within the region (California Department of Conservation 2016–2018). The study area is described in the following sections to support later discussions of environmental consequences associated with potential agricultural land use changes resulting from the temporary and permanent footprints of disturbance associated with construction of project water conveyance and related facilities and buildout of compensatory mitigation habitat sites, as well as other potential indirect impacts on agricultural resources stemming from the long-term operations and existence of these facilities and compensatory mitigation restoration sites.

15.1.1.1 Statutory Delta

The Delta stretches generally from Sacramento in the north to Lathrop in the south, with its rivers and sloughs eventually emptying into Suisun Bay near Pittsburg. The Delta's specific boundaries are legally defined by Section 12220 of the California Water Code. Historically, the Delta has been characterized by the presence of rich sedimentary and organic soils that are highly productive and a unique climate influenced by the Central Valley and ocean and coastal conditions. This combination of highly productive soils, a climate conducive to agricultural production, and readily available good quality irrigation water supply results in a region that supports a broad range of high-value crops. Figure 15-1 shows the distribution of agricultural resources within the Delta, by agricultural crop classification. Six counties lie partially within the statutory Delta: Alameda, Contra Costa,

[1] It is difficult to accurately link the building of ranchettes and other low-density rural residences specifically to loss of farmland because this type of development is not often dense enough to be classified as urban or built-up land by the FMMP.

Sacramento, San Joaquin, Solano, and Yolo Counties. Each of these counties supports agricultural production in the Delta.

15.1.1.2 Study Area Crop Types and Distribution

Lands within and surrounding the Delta contain soil types that, along with the regional climate, allow a wide variety of crops to be grown in the region. Historical flooding of the Sacramento and San Joaquin Rivers and their tributaries resulted in high concentrations of peat soils and the deposition of large quantities of minerals. Both of these elements contribute to the nutrient-rich soils that make the region highly productive for agriculture. Over 30 types of crops are grown in the study area's agricultural land. The top five Delta crops in terms of acreage are corn, alfalfa, miscellaneous grain/hay, wine grapes, and wheat (Land IQ 2018). Mixed pasture is the single largest agricultural land use in the Delta (Land IQ 2018). While corn and alfalfa cover the widest acreage in the Delta, the Delta Protection Commission's (2020:1) *The State of Delta Agriculture: Economic Impact, Conservation and Trends* has identified tomatoes and wine grapes as those crops that create the most economic value through their sales and in their linkages to manufacturing in the area.

Each crop is also grouped by similar growing needs as annual, perennial, or pasture. Annual crops are replanted each season, perennial crops provide produce for multiple seasons after planting, and pasture is made up of grasses for either harvest or cattle grazing.

Table 15-1 provides the acreages of crops grown in the study area by county in 2018. The acreages presented in Table 15-1 are used as estimates because annual and semiannual crop rotation and long-term crop change are based on a variety of outside influences including economic and climatic conditions.

Figure 15-1 represents a snapshot of crop distributions in the study area principally based on analysis of satellite imagery that was subsequently calibrated using field verification. Although Figure 15-1 illustrates a diverse array of crops in the study area, agricultural operators may shift cropping patterns between growing seasons (e.g., planting new crops or fallowing land); however, the dataset used to prepare Figure 15-1 represents the most recent comprehensive mapping of crop distribution for the entire study area currently available and is based on LandIQ data (LandIQ 2018). In the area where the Southern Forebay would be constructed, the agricultural land is predominantly planted in alfalfa, with mixed pasture and corn being the next most common. The area around the planned intake sites along the Sacramento River feature a diverse array of crops—including cherries, grapes, pears, tomatoes, wheat, and miscellaneous grain and truck crops—with no specific crop type particularly dominant. The reusable tunnel material (RTM) stockpile areas occur mainly in areas either managed as pasture or planted in corn or alfalfa crops. The shaft sites overlap with farmland that is not particularly dominated by a single crop type, with pasture and corn being the most common, followed by alfalfa and some limited amount of vineyard. Approximately a fifth of the farmland within the planned shaft sites was fallow during the time the land use mapping was conducted. The footprint of the pumping plant and surge basin considered under Alternative 5 would overlap with farmland planted in almonds, with wheat and alfalfa being the next common crops currently in production in that area.

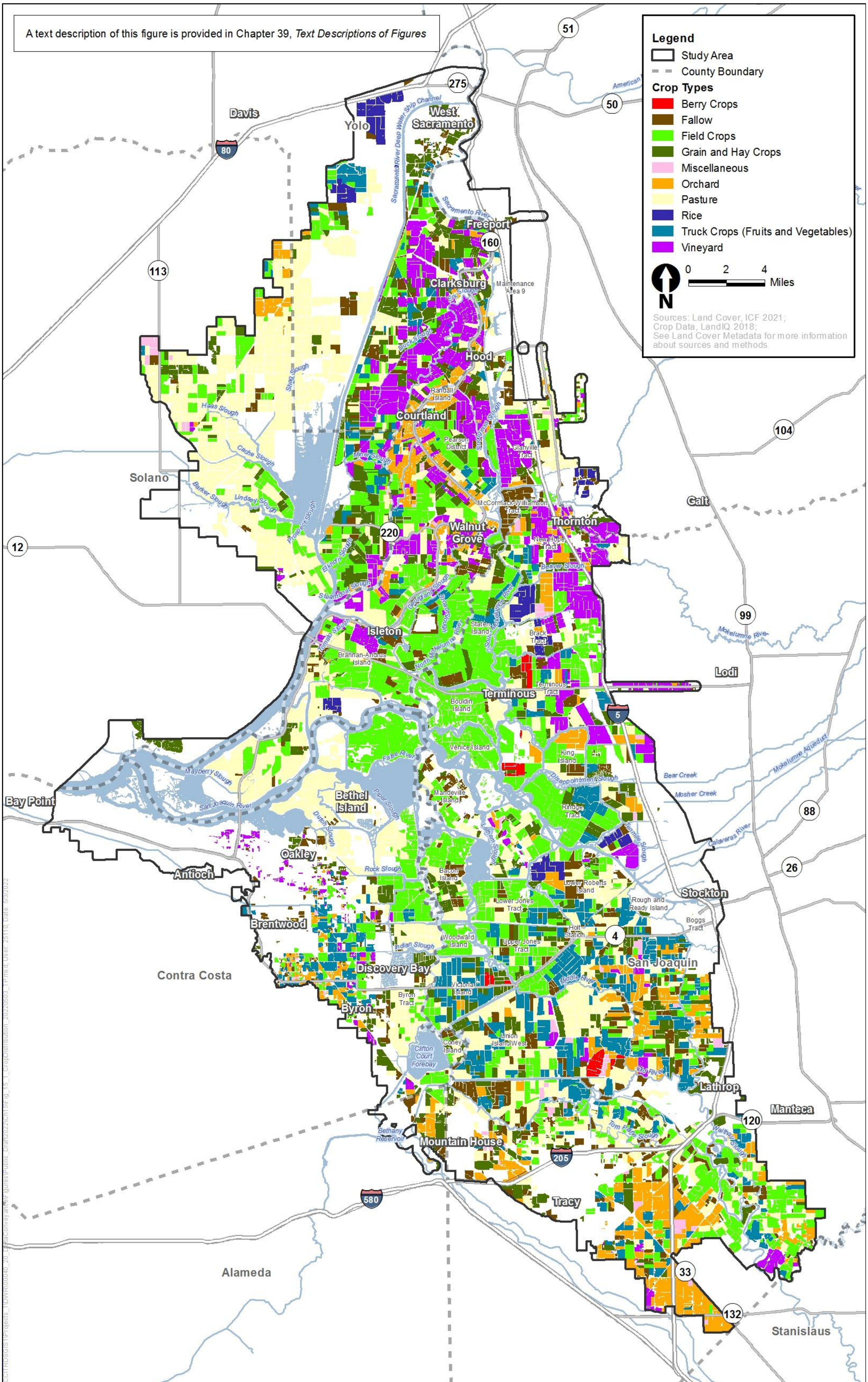

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Figure 15-1. Crop Distribution in the Study Area

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Table 15-1. 2018 Crop Acreages in the Study Area by County

	County						
Type/Crops	Alameda	Contra Costa	Sacramento	San Joaquin	Solano	Yolo	Total
Truck Crops							
Bush berries	–	–	–	1,699.2	–	–	1,699.2
Carrots	–	–	445.3	795.3	–	–	1,240.6
Cole crops	–	26.4	–	72.1	–	–	98.5
Melons, squash, and cucumbers	–	147.4	215.5	4,426.4	379.1	1,197.5	6,366.0
Miscellaneous truck crops	–	106.9	76.2	1,482.8	29.4	216.0	1,911.3
Onions and garlic	–	540.0	–	851.1	–	65.5	1,456.5
Peppers	–	76.5	–	389.4	–	–	465.9
Potatoes and sweet potatoes	–	–	60.7	3,362.4	–	–	3,423.1
Strawberries	–	8.4	–	–	–	–	8.4
Tomatoes	–	3,435.0	1,065.0	16,940.1	1,033.8	2,008.2	24,482.1
Field Crops							
Alfalfa and alfalfa mixtures	203.4	2,768.9	5,849.9	27,144.0	7,928.5	2,434.2	46,328.9
Beans (dry)	–	441.6	769.7	2,934.5	38.7	322.4	4,506.9
Corn, sorghum, and sudan	251.8	10,185.2	16,959.6	50,129.1	5,874.0	1,157.7	84,557.4
Miscellaneous field crops	–	28.7	5.7	541.2	–	61.3	636.9
Miscellaneous grain and hay	503.5	1,179.8	3,224.9	6,388.6	3,985.5	4,293.9	19,576.2
Safflower	–	810.7	2,687.6	2,058.1	3,432.0	2,773.8	11,762.2
Sunflowers	–	–	–	456.3	957.2	716.9	2,130.5
Wheat	447.4	2,240.9	3,158.6	15,152.9	3,171.7	4,306.7	28,478.2
Orchards							
Almonds	689.8	260.8	195.9	17,287.0	1,513.6	188.5	20,135.5
Apples	–	11.4	145.9	27.9	1.3	198.5	385.0
Cherries	–	958.0	1,169.3	532.5	26.4	19.5	2,705.7
Citrus	–	–	1.6	–	–	0.5	2.1
Kiwis	–	–	18.7	–	–	20.4	39.1
Olives	–	12.4	–	1,415.4	45.2	62.5	1,535.5
Peaches/nectarines	–	230.1	–	194.9	–	3.4	428.3
Pears	–	–	4,707.8	71.8	361.5	355.4	5,496.5
Pistachios	–	35.5	–	31.1	5.5	1.1	73.3
Plums, prunes, and apricots	–	33.9	–	122.2	–	–	156.1
Pomegranates	–	8.0	–	–	–	–	8.0
Walnuts	–	420.7	65.1	4,555.7	–	83.1	5,124.6
Grapes	2.4	1,805.7	12,083.1	13,437.9	1,704.6	11,947.3	40,981.0
Uncommon Crops							
Rice	–	–	908.6	2,967.1	–	1,816.6	5,692.3
Wild rice	–	–	–	–	–	886.9	886.9
Young perennial	–	151.5	286.8	2,562.4	724.6		3,725.3
Flowers, nursery and Christmas tree farms	–	15.9	–	39.4	–	3.2	58.6

Source: LandIQ 2018.
– = the crop type is not known to grow in the portion of the county within the study area.

Permanent Crops

Permanent crops account for a major proportion of the revenue generated by agriculture in the Delta. They include almonds, apples, apricots, cherries, grapes, olives, peaches, nectarines, pears, and walnuts, which account for approximately 17.9% of the agricultural land in the Delta (LandIQ 2018). There has been a more than doubling of the proportion of Delta agricultural land planted with permanent crops compared to the period of 1994–2007, when such crops represented an estimated 7.3% of the agricultural land in the Delta (LandIQ 2018; California Department of Water Resources 2016a:14-9). Northern California, including the Delta, is well known for its vineyards and wine production. In 2017, wine had the fourth highest export value of all commodities grown in California—just behind dairy products and pistachios, which had year-over-year increases in export value of 12.9% and 32.7%, respectively, from 2016 to 2017 (California Department of Food and Agriculture 2018b:107). Almonds have been gaining more prominence in the Delta, with the acreage in almond orchard increasing 401% from 2009 to 2016; however, almonds are less prevalent in the Delta than in the Central Valley (Delta Protection Commission 2020:9). Figure 15-1 depicts the distribution of crop classes throughout the study area. Wine appellations are located in Clarksburg and Lodi, which are in the north and east Delta, respectively. Revenue generated by agricultural production in the Delta is described in Chapter 17*, Socioeconomics,* Section 17.1.1.7, *Economics of Agriculture in the Study Area*.

Annual Crops

Annual crops in the Delta include corn, dry beans, and grains such as safflower, rice, hay, and tomatoes. In addition to their economic value, agricultural lands provide resources for a variety of wildlife species. For example, alfalfa fields provide high-quality foraging habitat conditions for Swainson's hawks (*Buteo swainsoni*) because the fields attract their prey species (e.g., small mammals). For more details on the connection between agricultural lands and special-status terrestrial wildlife, please refer to Chapter 13, *Terrestrial Biological Resources*, Section 13.1.2.2, *Natural Community Descriptions*.

Pasture

Agricultural lands are typically selected to produce pasture (as opposed to other crop choices) because of lower productivity soils, such as hard pan, high water tables, poor drainage, or a combination of these characteristics that limit the use of such lands for higher value agricultural crops. Dairy cow pastures are often irrigated pasture, and the proximity to dairy facilities is another factor that could determine the selection of pasture production. Cattle operations use Delta pastures as seasonal range, which complements high Sierra Nevada grazing ranges. Figure 15-1 shows pasture locations within the Delta.

Aquaculture

Aquaculture, the cultivation of aquatic organisms for commercial gain, ranges from the production of aquatic plants and invertebrates to fish production, which has become a profitable and popular practice in many regions. Although aquaculture is practiced in California, no registered aquaculturists are identified within the Delta (California Department of Fish and Wildlife 2020:1–8). Therefore, no further discussion of potential impacts on aquaculture is provided.

Typical Crop Yields, Destinations, and Tonnages

Crops grown in the study area, and agricultural products made from those crops, are shipped statewide, nationally, and internationally. Crop destinations and tonnages vary depending on crop yield, quality, and market during the specific harvest season. Specific crop destinations likely would not be affected by the project alternatives; therefore, crop destinations are not discussed in detail. Potential impacts on crop production, however, could alter the economics of crop production in the Delta and the subsequent crop selection by Delta growers. Table 15-2 shows the average crop yield by type for crops grown in the counties of the Delta.

Table 15-2. Average County Crop Yield by Type in Crop Year 2017–2018 (tons per acre per year)

Crop	Alameda	Contra Costa	Sacramento	San Joaquin	Solano	Yolo	Statewide
Alfalfa	1.88	4.41	6.30	6.31	5.81	5.72	7.14
Almonds	n.d.	n.d.	0.60	1.26	0.47	0.80	1.03
Apples	–	n.d.	n.d.	16.60	n.d.	n.d.	14.52
Apricots	–	2.57	–	6.04	–	–	5.03
Asparagus	–	–	–	3.00	–	–	3.26
Cherries	–	0.94	1.70	1.10	n.d.	n.d.	1.38
Corn (grain)	n.d.	n.d.	4.60	4.64	4.44	5.84	5.05
Dry beans	–	n.d.	n.d.	1.45	1.22	n.d.	1.35
Grain and hay	n.d.	3.49	2.70	n.d.	3.90	3.46	3.46
Grapes (wine)	5.34	5.29	8.79	7.73	6.45	6.53	7.26
Peaches and nectarines	–	4.28–4.70	–	14.80–22.04	–	n.d.	9.11–15.45
Pears (Bartlett)	–	–	16.39	n.d.	n.d.	n.d.	17.00
Rice	–	–	4.40	4.81	–	3.90	4.46
Safflower	–	n.d.	1.00	1.55	1.36	1.24	1.24
Sorghum (grain)	–	–	–	3.67	–	–	9.06
Sunflowers	–	–	–	n.d.	0.83	n.d.	0.81
Tomatoes	–	n.d.	43.98	50.05	42.14	48.68	53.89
Walnuts (English)	–	1.95	1.39	2.11	1.67	1.24	1.93

Source: California Department of Food and Agriculture 2020.

n.d. = no data: although a limited amount of the crop type is grown in the study area, no county-level data are available regarding crop yields; – = the crop type is not grown in the portion of the county within the study area.

15.1.1.3 Important Farmland and Land Subject to Williamson Act Contract or Under Contract in Farmland Security Zones

The Delta includes a large area of land uses designated for agricultural or specified compatible open-space uses under the provisions of the California Land Conservation Act of 1965, more commonly known as the Williamson Act. The purpose of the Williamsons Act is to help maintain the agricultural economy of the state by preserving its agricultural uses and to discourage premature and unnecessary conversion of such lands to urban development by reducing property taxes if landowners enter long-term contracts, minimum 10 years, with cities or counties to keep agricultural land in production.

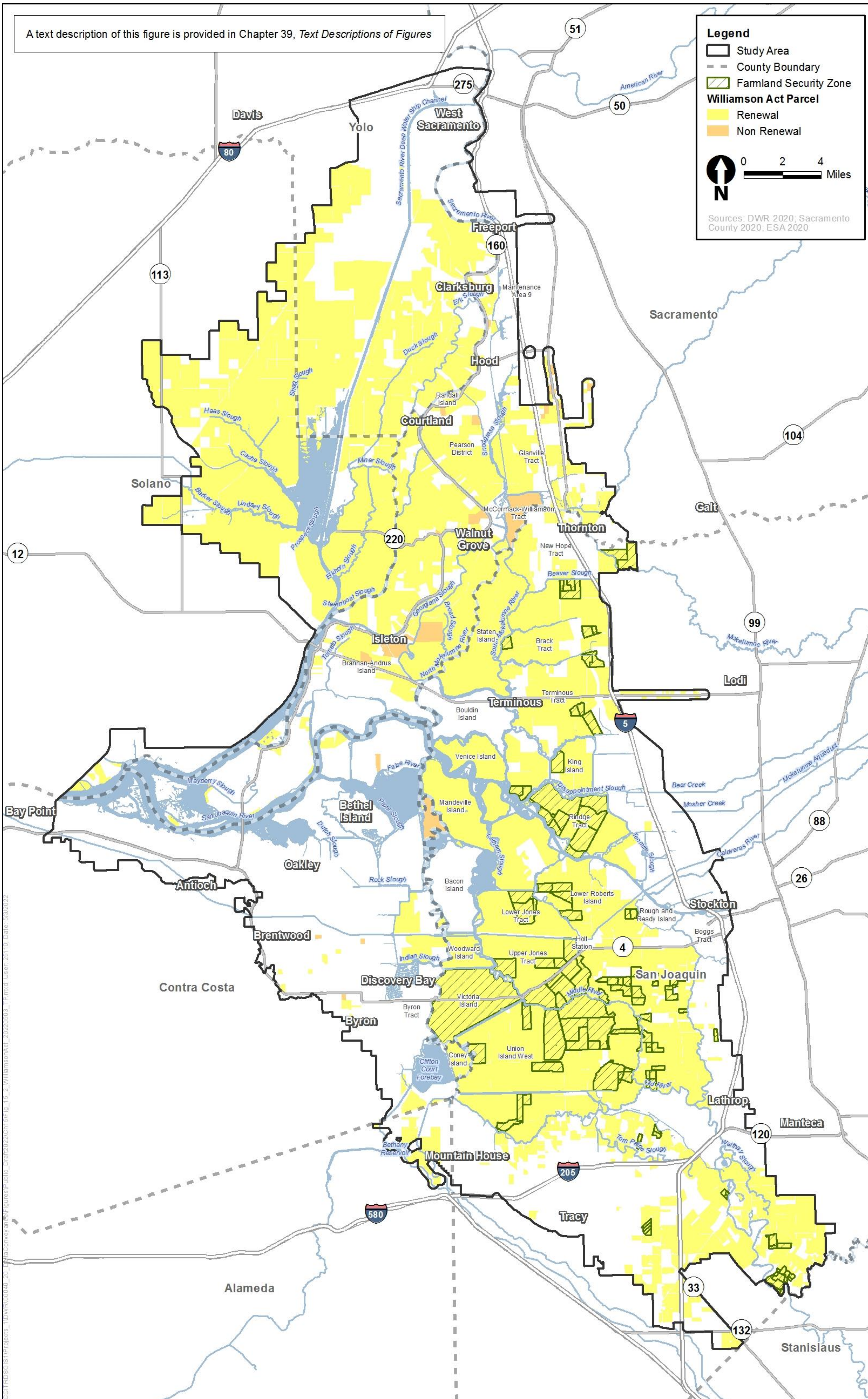
The Delta contains about 391,000 acres of agricultural land subject to active Williamson Act contract, with an additional 10,000 acres of land under Williamson Act contract but currently in a nonrenewal process (California Department of Conservation 2016–2018). Nonrenewal of a Williamson Act contract occurs when a landowner seeks to end the contract and files a notice of nonrenewal with the respective county or municipality. The landowner provides written notice of the request for nonrenewal before the contract renewal date; the contract would then terminate 9 years after the renewal date following the notice of nonrenewal. Figure 15-2 shows the areas of nonrenewal.

Another option under the Williamson Act program is the establishment of a Farmland Security Zone. The minimum initial term for a Farmland Security Zone contract is 20 years. As with standard Williamson Act contracts, contracts for Farmland Security Zones renew annually unless an active request for nonrenewal is filed. Since the initial contract duration is longer, landowners are offered greater property tax reductions than under a standard Williamson Act contract.

Under CEQA, the designations for Prime Farmland, Farmland of Statewide Importance, and Unique Farmland are defined as “agricultural land” or “farmland” (California Public Resources Code §§ 21060.1 and 21095, and CEQA Guidelines Appendix G). Important Farmland is classified by the California Department of Conservation to include those same three categories of farmland as well as Farmland of Local Importance. In this chapter, these four categories of farmland are considered Important Farmland and represent land that may be actively farmed economically absent conversion to a nonagricultural use. The FMMP currently conducts Important Farmland mapping efforts within the State of California (California Department of Conservation 2020). The California Department of Conservation FMMP maps are updated every 2 years using aerial photographs, public review, and field reconnaissance. The following list provides a description of the Important Farmland types.

- **Prime Farmland**—Land that has the best combination of physical and chemical features able to sustain long-term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields.
- **Farmland of Statewide Importance—**Land similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture.
- **Unique Farmland—**Land of lesser quality soils used for the production of the state’s leading agricultural cash crops. This land is usually irrigated but may include non-irrigated orchards or vineyards as found in some climatic zones in California.
- **Farmland of Local Importance—**Land that is of importance to the local agricultural economy, as defined by each county’s local advisory committee and adopted by its board of supervisors.

A substantial portion of agricultural land in the study area is designated Important Farmland in the FMMP. Under this program, lands are categorized into one of eight categories. In the Delta, there are approximately 432,000 acres of Important Farmland, including approximately 375,000 acres of Prime Farmland, 32,000 acres of Farmland of Statewide Importance, 25,000 acres of Unique Farmland, and 52,000 acres of Farmland of Local Importance. Additionally, there are about 65,000 acres of Grazing Land, Semi-Agricultural and Rural Commercial Land, and Farmland of Local Potential—categories that are not included in estimates of Important Farmland. Figure 15-3 shows these areas.



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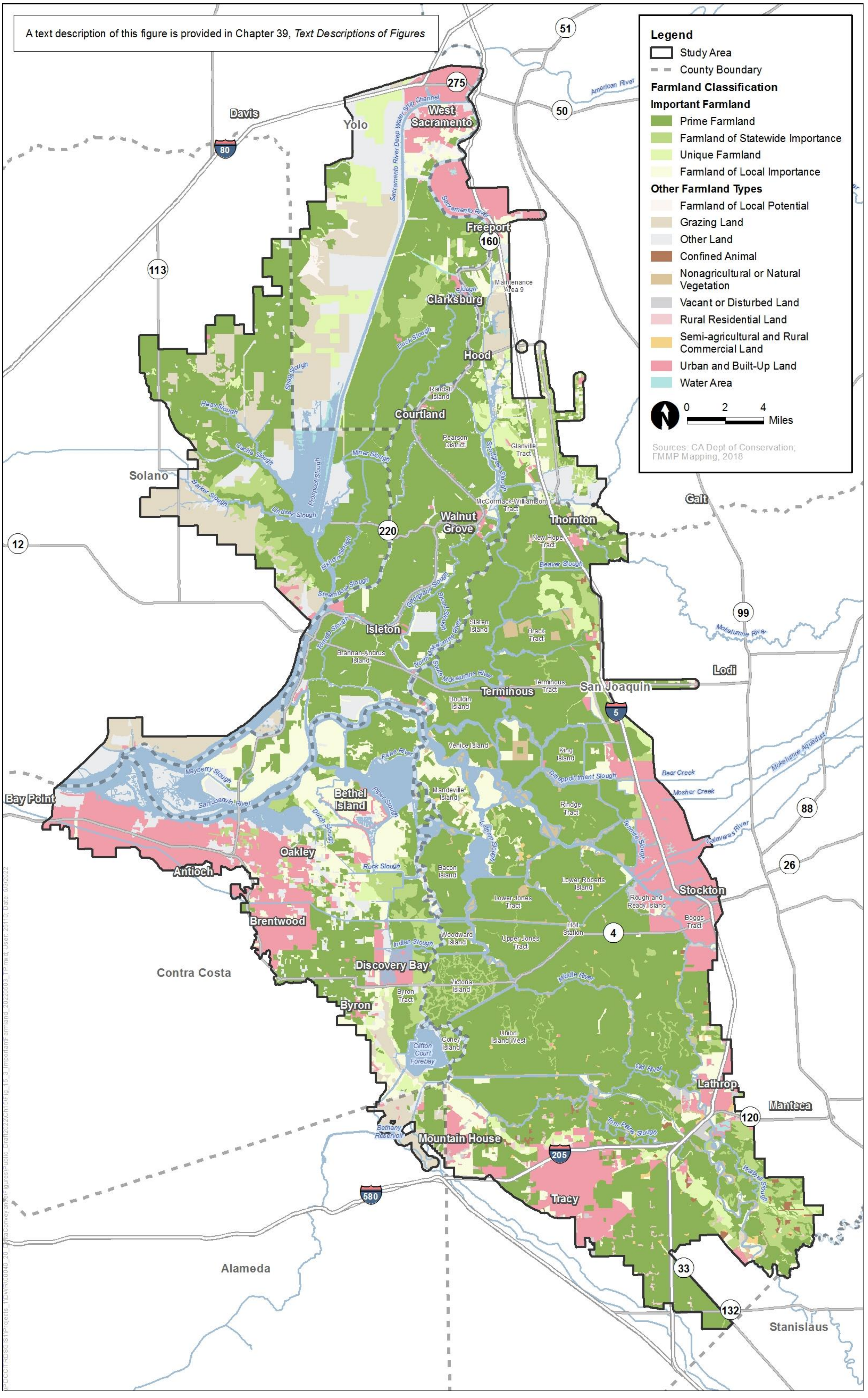
2 **Figure 15-2. Williamson Act Parcels in the Study Area**



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2 **Figure 15-3. Farmland Classification in the Study Area**

15.1.1.4 General Crop Production Practices and Characteristics

The Delta's Mediterranean climate makes crop production possible year-round. In general, farmers cultivate and till during the winter and early spring, and harvest through the summer and early fall. However, crop production practices and timelines vary with each crop type, depending on soil, microclimate, irrigation practices, and other factors. Therefore, although many farms across the Delta may grow the same crops, each farm may have unique cultural practices and harvest timing that best suit the local conditions and the farmer's target market (e.g., fresh market tomatoes versus processing tomatoes, or apples for juice versus fresh market).

Irrigation and Drainage

Delta agricultural production relies heavily on irrigation because there is high rainfall during the winter and low rainfall during the majority of the growing season. Irrigation and drainage practices vary with each crop; methods include drip, sprinkler, furrow, flood, border strip, basin, subirrigation, or a combination of these. Subsurface irrigation, or subirrigation, is a common irrigation method for peat soils. Peat soil subirrigation is conducted by applying water into a system of narrow and deep unlined ditches, which raises the water table in the porous peat soils to be within several inches of the surface. After the water table drops again from crops drawing water, the ditches can be refilled to once again raise the water table and fill the root zone with water. Subirrigation is particularly dependent upon good water quality, as this method does not push salts down below the root zone. Higher salinity irrigation water tends to concentrate salts at the surface and in the root zone. This is particularly problematic for salt-sensitive crop growth stages such as germination and seedling. Many crops are irrigated through subirrigation. Annual row crops are often sprinkler-irrigated for crop germination and furrow-irrigated for the rest of the season. Permanent crops are drip-, sprinkler-, furrow-, or flood-irrigated. Irrigated pasture and alfalfa are typically sprinkler- or flood-irrigated.

All applied irrigation water is subject to being leached below the root zone, transpired by plant tissue, or to evaporation or runoff from the soil surface (Edinger-Marshall and Letey 1997:38). Sprinkler and drip systems decrease leaching and runoff and offer greater control over the amount and distribution of water to the root zone in comparison to flood or furrow irrigation. This control translates to maximized yields and protection of groundwater. However, capital costs are higher for drip irrigation systems. Flood and furrow irrigation have a higher incidence of water evaporation or runoff from the soil surface. These methods increase the initial amount of water needed for irrigation and can increase irrigation runoff. Since the advent of drip irrigation between 1969 and 1970 (Marsh 1977:19), drip and sprinkler irrigation use have increased as the use of furrow or flood irrigation has decreased across the state (Edinger-Marshall and Letey 1997:39).

Pre-irrigation (irrigation prior to crop planting) is not widely practiced in the Delta because winter rains provide for full soil moisture profiles, and pre-irrigation leaching, which is typically used to mobilize salts out of the crop root zone, is not needed because relatively high-quality irrigation water in the Delta results in low soil salt concentrations. Most crops produced in the Delta require weekly or biweekly irrigation throughout the crop-growing season until a few weeks before harvesting. In-season irrigation quantities depend on crop type, stage of crop growth, soil moisture profile, management of plant pests and diseases, and weather conditions. Areas in the south Delta may be the exception because, during some water year types and oftentimes late in the growing season, irrigation water can become more saline, which may require modification to irrigation practices to avoid crop salt burning (University of California Cooperative Extension 1986:2).

Table 15-3 identifies water requirements for each crop. This data represents the combined practices of San Joaquin and Sacramento Valleys and is representative of general requirements for the study area.

In general, irrigation water is diverted directly from Delta waterways and transported to agricultural lands via irrigation and drainage canals. In some cases, however, water is pumped directly into field furrows. Irrigation and drainage canals are typically operated and maintained in the Delta by reclamation districts, irrigation districts, and water agencies. Because irrigation water is diverted directly from surface water resources, little groundwater is pumped for surface irrigation purposes. See Chapter 6, *Water Supply*, Section 6.2.1, *SWP and CVP Facilities and Operations*, for more information regarding SWP/CVP water diversion operations and Chapter 8, *Groundwater*, Section 8.1.3, *Delta Region Groundwater*, for discussion of groundwater levels in the Delta. Some of the agricultural surface water diversions are screened to protect fish, but many are not (Chapter 12, *Fish and Aquatic Resources*, Section 12.1.4, *Delta and Suisun Bay/Marsh*). Agricultural surface water diversion operations depend on sufficient water surface levels to keep the intakes submerged. Energy requirements for pumping, and therefore agricultural water costs in the Delta, are also affected by surface water levels.

Agricultural runoff percolates into the water table or is discharged into Delta waterways. Within the Delta, reclamation district canals and ditches function as both water supply and drainage conveyance facilities. Canals and ditches are typically kept at low water levels during the drainage season and are pumped out by the reclamation districts to remove drainage and stormwater. During the crop irrigation season, water is diverted from tributaries into water supply ditches and irrigation drainage water is captured in the canals and ditches and reused in subsequent irrigation. The practice of reusing irrigation drainage water for subsequent irrigation is not currently constrained because the quality of agricultural drainage and supply water is relatively good. Discharge of agricultural runoff and drainage water is regulated and monitored (Chapter 9, *Water Quality*, Section 9.1.5, *Existing Surface Water Quality*).

Table 15-3. Applied Irrigation Requirements of Crops Grown in the Study Area by Acre

Crop	Water Requirements (acre-inches) [a, b]	Typical Irrigation Methods
Alfalfa	42–54	Flood, Drip
Almonds	38–52	Micro-sprinkler
Common dry beans, double cropped	28	Furrow
Cherries	30	Micro-sprinkler
Field corn	31	Flood
Wine grapes	18	Drip
Cling peaches	42	Furrow
Rice	48–72	Flood
Sorghum	24.5	Flood
Sunflowers	24	Drip
Tomatoes—processing	27.5	Drip
Walnuts	36–42	Micro-sprinkler
Wheat	6	Furrow

Source: University of California, Davis 2014a:5, 2014b:4, 2015a:11, 2015b:4, 2016a:18, 2016b:4, 2016c:3, 2016d:13, 2017a:6, 2017b:3, 2017c:6, 2017d:4, 2017e:4, 2018a:4, 2018b:4, 2019:7, 2020:5.

[a] Values are for established crops on a per-acre basis.
[b] No assumption is made for rainfall.

General Fertilizer, Pesticide, and Herbicide Use

Fertilizers, pesticides, and herbicides are commonly used for crop yield optimization and crop quality protection. The term *pesticides* encompasses natural and chemically synthesized insecticides, fungicides, herbicides, and fumigants used to stabilize the crop cultivation environment against floral and faunal pests (U.S. Environmental Protection Agency n.d.). Fertilizers are used in agricultural production to replenish soil nutrients lost during the growing season and to replace nutrients removed from the field by crop harvest. The application of fertilizers to irrigation water can lead to fertilizers leaching to the groundwater or being discharged into agricultural drainage water. Although pesticides and herbicides are designed to naturally break down to innocuous compounds, leaching of these chemical compounds into groundwater or surface water can be problematic for wildlife and water quality.

The application of fertilizers varies by several different methods including the irrigation system, best management practices, weather conditions, timing, and crop type. Because of these variabilities, there is potential contamination from fertilizers, pesticides, and herbicides. Chapter 25, *Hazards, Hazardous Materials, and Wildfire*, Section 25.1.2.2, *Hazards from Agricultural Practices*, discusses that pesticides may persist in sediment and soil and be present in and near agricultural lands, including pesticides that are no longer in use but were historically applied. Chapter 9, Section 9.1.5 describes the impacts of excess nutrients and pesticides on aquatic organisms and fish. Chapter 26, *Public Health*, Section 26.1.1.1, *Drinking Water*, describes the impacts of pesticides on human health.

Crop Water Table Tolerances

Delta groundwater levels vary seasonally and are highly influenced by seasonal precipitation, drainage, soil texture and profile, proximity to tributaries and open water, and surface water levels. Surface water levels in the Delta are determined by Delta inflows, tides, diversions, and water exports. High water tables and poor drainage can limit crop selection options, lead to crop loss or damage, contribute to pest infestations (e.g., fungus, mildew), and changes in soil conditions (e.g., from aerobic to anaerobic). Drain tiles to control groundwater depth and to move drain water are installed for most permanent crops and some open ground throughout the Delta so soils are not oversaturated. The interaction between crops and the water table depends on the type of crop and the water-holding capabilities of the soil. The water table elevation must be below the crop root zone to maximize growth and yield and minimize root rotting from oversaturation (University of California Cooperative Extension 1986). Table 15-4 provides root depth of crops grown in the Delta.

Table 15-4. Crop Type Root Depths (in feet) [a]

Crop Type	Depth in Feet
Pasture (annual)	2
Alfalfa	4–6
Grain	2–3
Almonds	2–4
Beans (dry)	2

Crop Type	Depth in Feet
Bush berries	3–5
Cherries	2.5–4
Citrus	2–4
Olives	3–4
Onions	1–2
Peaches	2–4
Pears	3–4
Strawberries	1–2
Sudan grass	3–4
Walnuts	5–7
Tomatoes	2–4
Vineyards	3–5
Corn	2–4

Source: University of California, Division of Agricultural and Natural Resources 2020.
[a] Presents the depths to which the roots of mature crops will deplete available water supply when grown in deep permeable, well-drained soils under average conditions.

Crop Salinity Tolerances

Crops have varying degrees of tolerance to changes in irrigation water salinity (Medellín-Azuara et al. 2014:2). Surface water and groundwater quality is determined by the natural, physical, and chemical properties of the land above or surrounding a waterbody (Chapter 8, Section 8.1.3, and Chapter 9, Section 9.1.1, *Study Area*). Agricultural practices affect water quality as a result of the physical alterations to the land, as well as the chemical influences of agricultural production (e.g., pesticides, fertilizers, herbicides, animal manure). In general, crops have varying degrees of tolerance to water salinity, which can vary by growth stage.

In addition to influencing surface and groundwater quality, the application of irrigation water adds soluble salts such as sodium, calcium, magnesium, potassium, sulfate, and chloride that have dissolved from geologic materials. Evaporation and transpiration of irrigation water allow salts to concentrate in irrigation water and accumulate in soils unless adequate leaching and drainage are provided. Excessive soil salinity can affect soil structure, impede water and root penetrations, and result in seedling mortality, reduced plant growth rates, and reduced yields (Grattan 2002:2–5).

The concentration and composition of dissolved constituents in water determines whether the water quality is suitable for irrigation. Electrical conductivity (EC) is measured in deciSiemens (dS) and is used to indicate the total salt content or total dissolved salt content. The strength of the electrical current depends on the water temperature, types of ions, and salt concentrations. Water with a higher salt content is more conductive than water with lower salt content. For more information on agricultural irrigation water quality suitability, see Chapter 9, Section 9.1.5.

Irrigation can be used to control salt levels in the soil by over-irrigating, careful drainage, or maintaining high moisture levels to dilute salt (California Department of Water Resources 2016b:8). Soil salinity is measured in terms of EC. EC_e is the electrical conductivity of the soil in deciSiemens per meter (dS/m) at 25 degrees Celsius (°C) and EC_w is the electrical conductivity of water in dS/m. Crop tolerances for soil and water salinities vary. Some crop varieties have the ability to withstand higher salt concentrations, such as Sudan grass, which can tolerate 24 dS/m before crop yield loss occurs.

The impacts of salts or salinity on agricultural production depend upon the texture of the soil, the distribution of salt in the soil profile, the composition of the salt, irrigation practices, cultural practices, soil moisture content management, the plant species, transpirational load, and the growth stage of the plant (Ayers and Westcot 1985:13–21). Salinity problems in irrigation water supply in the Delta are uncommon, but areas of the south Delta (e.g., Old River) and west Delta can be affected depending on water year type, time of year, and flow conditions. In the west Delta, the primary driver of seasonal and annual salinity variability is the amount of precipitation in the watershed, while tides affect the location of the freshwater-seawater interface in the Delta on a daily timestep. In the west Delta the primary source of salinity is seawater. Agricultural drainage is another major source of salinity in the Delta, particularly from the San Joaquin Valley. Because the San Joaquin River carries a higher concentration of salt load than the Sacramento River (the Sacramento River basin ultimately contributes more salt load to the Delta than the San Joaquin River basin because the total magnitude of its flows is much higher), the south Delta salinity levels are typically much higher than those found in the north Delta (California Department of Water Resources 2016b:3–4). Areas of the south Delta that grow processing tomatoes, which are particularly salt-sensitive in seedling and blooming growth stages, have been documented to exhibit seedling mortality and bloom loss resulting from salt burning during irrigation that have resulted in reduced yields and crop quality during certain years. Most salinity problems in the Delta result from intrusion of saline drainage water from the San Joaquin Valley and from intrusion of saline water from the San Francisco Bay, a situation likely to worsen with any increases in sea level (Sumner and Rosen-Molina 2011:15; Public Policy Institute of California 2012:12).

Table 15-5 shows the crop tolerance and yield potential of certain crops grown in the Delta. The table shows the EC_e and EC_w salinity content at which crops would have a 100%, 75%, 50%, or 0% crop yield. Chapter 9, Section 9.1.5 provides additional discussion of water quality and, specifically, salinity.

Table 15-5. Crop Tolerance and Yield Potential of Selected Crops as Influenced by Irrigation Water Salinity (EC_w) or Soil Salinity (EC_e) in DeciSiemens per Meter (dS/m) [a, b]

Crop	100% EC_e	75% EC_e	50% EC_e	0% [c] EC_e	100% EC_w	75% EC_w	50% EC_w	0% [c] EC_w
Alfalfa	2.0	5.4	8.8	16.0	1.3	3.6	5.9	10.0
Almond [d]	1.5	2.8	4.1	6.8	1.0	1.9	2.8	4.5
Apricot [d]	1.6	2.6	3.7	5.8	1.1	1.8	2.5	3.8
Bean	1.0	2.3	3.6	6.3	0.7	1.5	2.4	4.2
Corn (maize)	1.7	3.8	5.9	10.0	1.1	2.5	3.9	6.7
Corn (forage) (maize)	1.8	5.2	8.6	15.0	1.2	3.5	5.7	10.0
Corn, sweet (maize)	1.7	3.8	5.9	10.0	1.1	2.5	3.9	6.7
Cucumber	2.5	4.4	6.3	10.0	1.7	2.9	4.2	6.8
Grape [e]	1.5	4.1	6.7	12.0	1.0	2.7	4.5	7.9
Peach	1.7	2.9	4.1	6.5	1.1	1.9	2.7	4.3
Rice (paddy)	3.0	5.1	7.2	11.0	2.0	3.4	4.8	7.6
Squash, zucchini (courgette)	4.7	7.4	10.0	15.0	3.1	4.9	6.7	10.0

Crop	100% EC_e	75% EC_e	50% EC_e	0% [c] EC_e	100% EC_w	75% EC_w	50% EC_w	0% [c] EC_w
Squash, scallop	3.2	4.8	6.3	9.4	2.1	3.2	4.2	6.3
Sudan grass	2.8	8.6	14.0	26.0	1.9	5.7	9.6	17.0
Sugar beet [e]	7.0	11.0	15.0	24.0	4.7	7.5	10.0	16.0
Tomato	2.5	5.0	7.6	13.0	1.7	3.4	5.0	8.4

Source: Ayers and Westcot 1985.

EC_e = electrical conductivity of soil; EC_w = electrical conductivity of water; dS/m = deciSiemens per meter.

[a] Adapted from Maas and Hoffman (1977) and Maas (1984). These data should only serve as a guide to relative tolerances among crops. Absolute tolerances vary depending upon climate, soil conditions, and cultural practices. The table also does not reflect newer crop varieties developed over the past couple of decades for commercial use by agricultural operators that have more saline tolerance than older varieties. In soils with high concentrations of gypsum, plants will tolerate about 2 dS/m higher EC_e than indicated; however, the EC_w will remain the same as shown in the table.

[b] EC_e means average root zone salinity as measured by EC of the saturation extract of the soil, reported in dS/m at 25°C. EC_w means EC of the irrigation water in dS/m. The relationship between soil salinity and water salinity (EC_e = 1.5 EC_w) assumes a 15%–20% leaching fraction and a 40%-30%-20%-10% water use pattern for the upper to lower quarters of the root zone. These assumptions were used in developing this table.

[c] The zero yield potential or maximum EC_e indicates the theoretical EC_e at which crop growth ceases.

[d] Tolerance evaluations are based on tree growth and not on yield.

[e] Beets are more sensitive during germination; EC_e should not exceed 3 dS/m in the seeding area for garden beets and sugar beets.

Agriculture-Related Infrastructure

Agricultural production always requires supporting industry, related industry, and infrastructure. Supporting industry, related industry, and infrastructure include road access, irrigation and drainage facilities, electrical power, fuel suppliers, agrochemical and seed suppliers, equipment supply and repair operations, and post-harvest facilities. Levees, irrigation facilities, and drainage infrastructure are particularly important in supporting agriculture within the study area. After crops are harvested, they may be stored, processed, and shipped to other parts of the state, country, or world, depending on the crop and market. Shipping out harvested crops may require extensive traveling and transportation to appropriate vendors. A description of the transportation network in the Delta and its importance to movement of agricultural commodities to market is discussed in Chapter 20, *Transportation*. Post-harvest infrastructure examples in the study area include packing houses and cold storage plants for apples and pears, wineries for wine grapes, packing sheds for vegetables and melons, and hay barns for alfalfa. The prevalence and distribution of agricultural infrastructure directly and indirectly affects labor requirements, economics, and environmental justice. These issues are discussed in Chapter 17, *Socioeconomics*, and Chapter 29, *Environmental Justice*.

15.1.1.5 Delta Climate

Delta temperatures tend to be lower than the surrounding areas during the summer because of periodic and diurnal cooling that is a result of its proximity to the Pacific Ocean and the San Francisco Bay. Locally, the marine cooling influence is referred to as the “Delta breeze,” which creates unique growing conditions (Drexler et al. 2008:726). These conditions are reflected in the character of the wine grapes grown in the region and its suitability for certain crops (e.g., pears). The Delta breeze also influences the timing of harvest to increase the value and marketability of crops by allowing growers to harvest their crops during market windows of relatively low product availability elsewhere in the state and nation. This specialized harvest timing is practiced for pears, cherries, apricots, peaches, and nectarines. Further, the Delta breeze influences the timing of harvest to optimize the temporal distribution of food processing harvest volumes (e.g., processing tomatoes).

15.1.1.6 General Crop Production Interactions with Soil Subsidence

Prior to agricultural development, much of the soil in the Delta was waterlogged as a result of frequent flooding, which caused anaerobic (oxygen-poor) soil conditions that led to the formation of peat soils (Whipple et al. 2012:8) (Chapter 11, *Soils,* Section 11.1.2.2, *Historical Causes of Subsidence in the Delta*). As the region developed its agricultural industry, local growers and reclamation districts constructed levees to allow soils to drain and become aerobic (oxygen-rich) and available for agricultural production. As the peat soils became more aerobic, the rate of peat soil oxidation and volatilization increased. Continuous organic decomposition has kept soils in the Delta nutrient-rich. However, this has also resulted in land subsidence throughout the Delta (Whipple et al. 2012:169). The impacts of subsidence—the lowering of land-surface elevation due to decomposition of organic carbon in peat soil—on crops and crop production are discussed below. In addition, the fine particles of peat soil can often be a source of poor air quality as tillage operations for agricultural production cause these particles to be disturbed and become airborne (for further discussion of particulate matter and its sources, see Chapter 23, *Air Quality and Greenhouse Gases*, Section 23.1.2.1, *Criteria Pollutants*, under *Particulate Matter*).

Peat soils make up a substantial portion of soils in the study area. The high nutrient and organic content of peat soils is beneficial for crops, and peat soils warm quickly because of its heat-absorbing dark color. This characteristic is beneficial for crop management because planting can begin earlier if soils warm earlier in the season. The water retention capability of peat soils is high. Subsurface irrigation is a common means to irrigate crops in peat soils (Section 15.1.1.4, *General Crop Production Practices and Characteristics*, under *Irrigation and Drainage*). The Storie Index Rating System uses soil characteristics to determine the relative ranking and crop suitability of potential agricultural land. Peat soils receive a high ranking in the Natural Resources Conservation Service Soil Capability Classification System and the Storie Index Rating System. Further discussion of the Storie Index Rating System, along with ratings for the soil types found in the study area, is provided in Appendix 11C, *Soil Chemical and Physical Properties, Soil Interpretations, and Land Classifications*.

Land in the Delta is subject to subsidence because organic carbon in peat soils is continually decomposing (Deverel et al. 2016:569). While this is the principal cause of subsidence, processes such as mechanical compaction, wind erosion, and groundwater overdraft have also been cited as significant factors in subsidence (Deverel and Leighton 2010:4). Within the Delta, the primary influences of subsidence associated with crop production are organic carbon decomposition and mechanical compaction and disturbance-related wind erosion caused in part by crop tillage.

Organic carbon decomposition in peat soils began when the peat soils in the Delta were drained to create agricultural land. During decomposition, most of the carbon lost is emitted as carbon dioxide (CO_2) to the atmosphere (Deverel and Rojstaczer 1996:2359; Ingebritsen et al. 2000; Drexler et al. 2007:1). Carbon loss can also occur through mineralization process promoted by crop root interactions with microorganisms in the soils. Agricultural production accelerates oxidation of peat soils when plants remove CO_2, water, and nutrients. This, in conjunction with mechanical compaction and wind erosion from agricultural machinery, accelerates subsidence of soils in the

Delta. Land subsidence poses risks to the long-term sustainability of agriculture in the study area because it affects the levee system that protects the Delta from flooding. Subsidence increases the hydraulic gradient between agricultural land and channels, leading to more seepage through levees and the resultant need to continually deepen drainage ditches. Additionally, where adjacent lands lie below sea level, levees must be strengthened and maintained to successfully hold back water year-round. Potential sea level rise and seismic activity compound issues of subsidence. Some estimates predict that additional subsidence—ranging from 1 inch to 4.5 feet—will occur throughout the Delta by 2050; the effects will be most prominent in the central Delta (e.g., Webb Tract, Venice Island, Bouldin Island, Bacon Island, Woodward Island, Medford Island, Staten Island, Tyler Island) and lesser impacts around the periphery in the western, northern, and southern Delta (Deverel and Leighton 2010:16). The large variation in projected level of subsidence depends on the proportion of soil organic matter content present locally; areas with high levels of peat soil remaining have a higher risk for continuing to subside, while the projected rate of subsidence in areas of the Delta that are dominated by mineral deposits (or where most of the peat soil has already been lost) would be minimal.

15.1.1.7 Crop Planting and Harvesting Times

Table 15-6 provides the usual planting and harvest dates for major crop types grown in the Delta. The dates shown indicate the periods in which the crops are planted and harvested in most years and do not account for exceptionally early or late dates of scattered planting and harvesting, nor abnormal seasonal conditions caused by climatic or economic conditions. Timing may vary based on soil type (peat versus mineral soils), weather conditions, and other practical aspects as determined by the grower.

Table 15-6. Crop Planting, Harvest, and Irrigation Calendar

Delta Crop	Period
Alfalfa	
Planting	February–March; September–November
Harvest	April–October
Irrigation	April–September
Corn (grain)	
Planting	March–May
Harvest	September–November
Irrigation	May–August
Corn (silage)	
Planting	March–June
Harvest	September–November
Irrigation	May–August
Tomatoes (processing)	
Planting (direct seeding)	January–March
Planting (transplanting)	March–June
Harvest	July–October
Irrigation	March–September

Delta Crop	Period
Safflower	
Planting	February–May
Harvest	August–September
Irrigation (pre-plant)	January–March
Irrigation (in-season)	May–June
Grain	
Planting	November–January
Harvest	June–July
Irrigation	March–May

Source: University of California, Division of Agriculture and Natural Resources 2015, 2020.

15.2 Applicable Laws, Regulations, and Programs

The applicable laws, regulations, and programs considered in the assessment of project impacts on agricultural resources are indicated in this section, in Section 15.3.1, *Methods for Analysis*, or the impact analysis, as appropriate. Applicable laws, regulations and programs associated with state and federal agencies that have a review or potential approval responsibility have also been considered in the development CEQA impact thresholds or are otherwise considered in the assessment of environmental impacts. A listing of some of the agencies and their respective potential review and approval responsibilities, in addition to those under CEQA, is provided in Chapter 1, *Introduction*, Table 1-1. A listing of some of the federal agencies and their respective potential review, approval, and other responsibilities, in addition to those under NEPA, is provided in Chapter 1, Table 1-2.

15.3 Environmental Impacts

This section describes the direct and cumulative environmental impacts associated with agriculture that would result from project construction, operation, and maintenance. It describes the methods used to determine the impacts of the project and lists the thresholds used to conclude whether an impact would be significant. Appendix 15B, *Agricultural and Land Stewardship Considerations*, summarizes the design considerations and modifications that have been made during project planning to reduce conversion of farmland. To address effects on agricultural resources that could not be avoided during development of the project description, mitigation measures that avoid, minimize, rectify, reduce, eliminate, or compensate for significant impacts are provided under the respective impact analyses. Potential economic disruption to agricultural communities in the Delta from construction buildout is discussed in Chapter 17, *Socioeconomics*. Chapter 31, *Growth Inducement,* includes analysis of the direct growth inducement on employment, the extent of indirect growth inducement associated with construction of access roads which may remove the obstacle to growth presented by lack of roadway infrastructure, and indirect growth inducement associated with increased water supply reliability.

15.3.1 Methods for Analysis

The underlying information for the analysis incorporated the project-specific geospatial data describing the location of project facilities for each tunnel alignment and corresponding scenarios. This chapter specifically identifies conversion of agricultural land designated as Important Farmland (Prime, Unique, Statewide Importance, and Local Importance as established by the California Department of Conservation based on land's suitability for agricultural production rather than solely reflecting the physical and chemical characteristics of the soil) and subject to Williamson Act contract or under contract in Farmland Security Zones. Project-specific data also determined whether features would create footprint impacts that would be temporary or permanent in nature. The chapter describes potential changes to agricultural viability from the project as it relates to operational impacts on irrigation water quality, groundwater elevation, and loss of agricultural infrastructure (e.g., drainage features). Finally, Impact AG-3: *Other Impacts on Agriculture as a Result of Constructing and Operating the Water Conveyance Facilities* considers several indirect consequences on agricultural resources that may result from the project alternatives, including how changes in Delta flow conditions from future operations of the project facilities may affect the salinity of water used to irrigate farmland.

This chapter also considers how compensatory mitigation for the project for other nonagricultural resources, such as restoration of habitat for terrestrial species (e.g., giant garter snakes) would require conversion of land designated as Important Farmland within the study area. Project-level details for creation and enhancement of habitat for special-status species and wetland habitat have been developed for sites on Bouldin Island and within I-5 Ponds 6, 7, and 8. The CMP details are discussed in Appendix 3F, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*.

The Land Evaluation and Site Assessment (LESA) model is a point-based approach for rating the relevant importance of agricultural land resources based upon specific measurable features. It was developed to provide CEQA lead agencies with an optional methodology to quantitively assess whether the agricultural land conversion being considered in the environmental review analysis resulted in potentially significant effects on the environment. It was determined by DWR that the optional LESA model was impracticable because this approach was more suited for smaller, more confined project footprints, whereas the project is expected to result in a considerable magnitude of farmland conversion spanning multiple Delta counties. Nevertheless, DWR did incorporate many of the key facets of the LESA model when developing mitigation measures for this project to address impacts associated with farmland conversion.

A remnant farmland area analysis was developed to identify portions of Important Farmland parcels that are bisected by the construction footprint; while this remaining portion of the Important Farmland parcel outside the construction footprint area would not be directly converted due to construction, these remnant areas could nonetheless be indirectly converted if they are too small in size to effectively support ongoing agricultural operations. Information presented in the Sacramento County (County of Sacramento 2019:13), San Joaquin County (County of San Joaquin 2017:57), and Contra Costa County (County of Contra Costa 2005:3-37) general plans was used as the basis for determining that 20 contiguous acres under the same property ownership was the minimum agricultural property size adequate to support general commercial agriculture. A geographic information system (GIS) analysis identified all areas where the construction footprint for the project would fragment or sever larger farmland areas (i.e., more than 20 contiguous acres of

Important Farmland) into smaller remnant farmland areas of Important Farmland that were less than 20 contiguous acres.

15.3.1.1 Process and Methods of Review for Agricultural Resources

To evaluate impacts stemming from the project alternatives, this analysis uses a range of methodological approaches. First, geospatial data was used in a similar manner described above to quantify the number of acres that would be affected by the physical footprint of all associated project facilities. Additionally, the extent of Important Farmland, land contracted under Williamson Act, and land under contract within a Farmland Security Zone that would be affected by the footprint was determined using data from the FMMP and from County assessors' offices.

- **Permanent impacts** include those resulting from the physical footprint of project facilities—land that cannot be returned to farmland because it now contains, for example, a pump station, intake, forebay, sedimentation basin, or farmland has been permanently modified in a manner that makes it unsuitable for growing crops (e.g., topsoil was entirely removed). In addition, some traditionally "temporary" impacts are designated as permanent agricultural impacts where there is uncertainty whether the farmland would be returned to productive farmland following completion of construction activities (e.g., due to it being subject to an amount of soil compaction that may hinder its crop productivity or the area is potentially too small to be farmed economically). These include areas that are in the construction footprint where no permanent physical structures are planned (e.g., areas with temporary structures, staging areas, and access roads).
- **Temporary impacts** are those that would be largely limited to the duration of construction activities at a given site but could be returned to active farmland after cessation of construction activities. Those areas that are considered temporarily affected would be returned to a condition suitable for farming immediately after work activities are finished, and are associated with areas temporarily trenched for utility line connections or geotechnical sampling. The extent of agricultural land that would be disturbed by construction activities determines the severity of each effect.

Compensatory mitigation for the Delta Conveyance Project would involve actions such as habitat restoration activities within the Delta to mitigate impacts on habitat for special-status plant and wildlife species (including fish), as well as natural communities (including wetlands and other aquatic resources) resulting from the project. These activities include restoration of seasonal wetlands, riparian forest, and annual grasslands. Initial mitigation sites have been identified, which are located on lands owned by DWR or another public agency; these sites include I-5 Ponds 6, 7, and 8 and Bouldin Island. The planned mitigation concepts at these sites allow for the establishment of created and enhanced habitats ahead of impacts associated with construction buildout and project operation. For any compensatory habitat needs not met at these aforementioned sites, there is a framework for developing additional mitigation sites. The CMP details are discussed in Appendix 3F.

15.3.1.2 Evaluation of Construction Activities

Permanent impacts on agricultural resources include farmland areas designated for physical footprints of permanent project facilities (e.g., intakes), areas where temporary structures or concrete slabs would be placed, areas used for stockpiling of RTM, staging and access areas that may undergo soil compaction, and areas potentially too small to be farmed economically.

Areas affected by the construction footprint that are not designated to be returned to farming following cessation of construction activities include the footprints where permanent physical infrastructure for the water conveyance facilities and associated appurtenant structures would be constructed. Project facilities that would remain following the completion of construction activities, such as the intake sites, shaft pad sites, transportation infrastructure improvements (e.g., roadway widenings, new/expanded roadway interchanges), and the Southern Forebay (e.g., pumping plant, reservoir embankments, the forebay proper) or the Bethany Complex are considered permanent direct impacts on agricultural land because the land cannot be returned to agricultural production during operation of the project.

Some of the areas designated in this chapter as permanently affected may also include sections of the construction footprint where, although no permanent constructed features (e.g., forebay, intake) or appurtenant infrastructure (e.g., electrical substations) are planned, the areas may experience conditions that may prevent the ability to return the land to productive farmland postconstruction. For example, the placement of RTM in stockpiles, or placement of temporary structures or concrete slabs, on agricultural land would be considered a permanent impact on the underlying farmland due to their potential for compression of underlying peat soils, which could degrade their agricultural production value even with remediation efforts.

For areas of the construction footprint that would undergo soil compaction, agronomic testing would be employed to identify methods to minimize the effects of soil compaction and return the agricultural potential for disturbed farmland. These investigations would first employ greenhouse-based treatments of material sourced from the Twin Cities Complex followed by field-scale testing of the most promising approaches from the greenhouse-testing phase to identify the most appropriate treatment options to return lands affected by construction activities back to productive farmland. Informed by the results of the agronomic testing, certain areas of the construction footprint subject to soil compaction would undergo appropriate land reclamation techniques, including but not limited to ripping the soil and incorporating soil amendments to reduce compaction. Since the effectiveness of the reclamation techniques is uncertain at this point, any farmland areas targeted for such techniques are still considered to be permanently affected.

Temporary impacts on agricultural resources include areas of the construction footprint where farmland conversion would only last through the period of active construction at a given site and is expected to be a short-term effect (i.e., generally the conversion not extending beyond 2 years at a given location). These temporary impacts may include portions of agricultural fields that are excavated for the installation of power transmission or supervisory control and data acquisition (SCADA) lines (or those areas targeted for the various field investigation, including geotechnical sampling) and subsequently backfilled.

15.3.1.3 Evaluation of Operations

Operational impacts of the project, including changes in salinity that affect agricultural irrigation water quality, would be considered a permanent direct impact if such degradations occur and are persistent during periods when agricultural operators are normally applying irrigation water to their fields and would directly contribute to the conversion of those lands to nonagricultural use (e.g., fallowed). Potential changes in water quality, which could alter irrigation practices or economically viable crop choices (i.e., crop types or acreages), have been identified based on information from Chapter 9, *Water Quality*, and proposed operational guidelines with respect to existing D-1641 salinity standards protecting agricultural beneficial uses in the Delta. Modeling results were analyzed to identify and quantify, to the extent feasible, specific areas that could be affected by these changes. Salinity, as measured by EC, is a primary indicator of water quality that could affect agricultural production in the study area. The magnitude, duration, and frequency of a salinity change in irrigation water were evaluated by analyzing the change in the number of days when EC objectives for agricultural beneficial uses would be exceeded or out of compliance. Specifically, exceedance of crop salinity objectives was evaluated using Delta Simulation Model II (DSM2) output for eight representative nodes for agricultural beneficial use in the study area: (1) Sacramento River at Emmaton/Three Mile Slough near Sacramento River (Emmaton for Existing Conditions and No Project Alternative and Three Mile Slough following the change in compliance point under each project alternative) and (2) San Joaquin River at Jersey Point in the western Delta; (3) South Fork Mokelumne River at Terminous and (4) San Joaquin River at San Andreas Landing in the interior Delta; and (5) San Joaquin River at Vernalis, (6) San Joaquin River at Brandt Bridge, (7) Old River near Middle River, and (8) Old River at Tracy Bridge in the southern Delta.

15.3.2 Thresholds of Significance

This impacts analysis assumes that a project alternative would have a significant impact under CEQA if implementation would result in one of the following conditions, which closely models the CEQA Appendix G Guidelines for agricultural and forestry resources.

- Convert a substantial amount of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance to nonagricultural use.
- Convert a substantial amount of land subject to Williamson Act contract or in Farmland Security Zones to a nonagricultural use incompatible with contract restrictions or local preserve rules or ordinances, or substantially conflict with surrounding land uses or the terms of the applicable Farmland Security Zone.
- Involve other changes in the existing environment that, due to their location or nature, could result in conversion of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance to nonagricultural use.
- Conflict with existing zoning for, or cause rezoning of forest land or timberland zoned for timberland production.
- Result in the loss of forest land or conversion of forest land to non-forest use.
- Involve other changes in the existing environment that, due to their location or nature, could result in conversion of forest land to non-forest use.

The study area contains no forests used for timber production. Any potential impacts that could arise from construction, operation, and maintenance of the project on riparian forest and oak woodland stands are adequately covered in Chapter 13, *Terrestrial Biological Resources*, because the value in these existing forest patches is in providing habitat for plants and wildlife and not forestry products (e.g., timber). Forestry resources are thus not analyzed further in this chapter.

15.3.2.1 Evaluation of Mitigation Impacts

CEQA also requires an evaluation of potential impacts caused by mitigation measures. Following the CEQA conclusion for each impact, the chapter analyzes potential impacts associated with implementing both the CMP and the other mitigation measures required to address with potential impacts caused by the project. Mitigation impacts are considered in combination with project impacts in determining the overall significance of the project. Additional information regarding the analysis of mitigation measure impacts is provided in Chapter 4, *Framework for the Environmental Analysis*.

15.3.3 Impacts and Mitigation Approaches

15.3.3.1 No Project Alternative

As described in Chapter 3, *Description of the Proposed Project and Alternatives,* CEQA Guidelines Section 15126.6 directs that an EIR evaluate a specific alternative of "no project" along with its impact. The No Project Alternative in this Draft EIR represents the circumstances under which the project (or project alternative) does not proceed and considers predictable actions, such as projects, plans, and programs, that would be predicted to occur in the foreseeable future if the Delta Conveyance Project is not constructed and operated. This description of the environmental conditions under the No Project Alternative first considers how agricultural resources could change over time and then discusses how other predictable actions could affect agricultural resources.

Future Agricultural Resources Conditions

Overall, the effect of the No Project Alternative on agricultural resources under 2040 conditions is expected to be similar to the 2020 baseline. The potential magnitude of farmland conversion is anticipated to be the same or smaller due to the ongoing trend of loss of farmland from conversion to urban development or permanent fallowing in response to inadequate fresh water supplies. Pressures on farmland would increase throughout the state as a result of increasing droughts, urban growth, and sea level rise (contributing increased flooding of farmland and salinization of coastal aquifers), and likely future restrictions on groundwater use as the state moves toward more sustainable management of groundwater supplies. Because of these increased pressures, the extent of land mapped as Important Farmland or farmland under a Williamson Act contract or within a Farmland Security Zone would be reduced by 2040. Changes in water quality may affect crop production on agricultural lands by reducing the quantity and quality of water suitable for irrigation. In addition, water supply projects and facilities, including desalination projects and water recycling projects, would result in conversion of Important Farmland or land under Williamson Act contract or within a Farmland Security Zone in areas where such farmland is present.

Predictable Actions by Others

A list and description of actions included as part of the No Project Alternative are provided in Appendix 3C, *Defining Existing Conditions, No Project Alternative, and Cumulative Impact Conditions*. As described in Chapter 4 the No Project Alternative analyses focus on identifying the additional water supply–related actions public water agencies may opt to follow if the Delta Conveyance Project does not occur.

Public water agencies participating in the Delta Conveyance Project have been grouped into four geographic regions. The water agencies within each geographic region would likely pursue a similar suite of water supply projects under the No Project Alternative (see Appendix 3C). Construction of water supply projects under the No Project Alternative would consist of new or expanded facilities (e.g., desalination plants, water recycling facilities, groundwater recharge and recovery systems) that could result in conversion of Important Farmland or land subject to Williamson Act contract. The extent of the potential Important Farmland conversion or loss of lands under Williamson Act contract would vary widely depending on the footprint and geographic location of these new or expanded water supply facilities, and the distribution of agricultural land.

Desalination projects would most likely be pursued in the northern and southern coastal regions. The southern coastal regions would likely require larger and more desalination projects than the northern coastal region in order to replace the water yield that otherwise would have been received through the Delta Conveyance Project. These projects would be sited near the coast, where the highest quality farmland is less likely to be present. Groundwater recovery (treatment of high salinity or contaminated groundwater) would involve similar types of land conversion but could occur across the northern inland, southern coastal, southern inland regions and in both coastal and inland areas, such as the San Joaquin Valley. In situations where such facilities are sited on agricultural properties, there is a potential that such work would result in conversion of Important Farmland or land under Williamson Act contract. Surface water intakes and diversion intake facilities would generally be expected to have minimal construction-related permanent conversion of agricultural land, since they would generally be located along large riverine channels and not within actively farmed areas.

The northern and southern coastal regions and the southern inland region are also most likely to explore constructing groundwater management projects. The southern coastal region and southern inland region would require more projects than the northern coastal region under the No Project Alternative. Groundwater management projects would occur in association with an underlying aquifer. Construction activities for each project could require excavation for the construction of the recharge basins, pumping, and conveyance facilities. Water conveyance infrastructure required to connect these facilities to existing distribution and conveyance systems would likely be constructed using typical open trench construction methods, which would result in conversion of agricultural lands for the segments of the canal or pipeline alignment which intersect with farmlands.

Water recycling projects could be pursued in all four regions. The northern inland region would require the fewest number of wastewater treatment/water reclamation plants, followed by the northern coastal region, followed by the southern coastal region. The southern inland region would require the greatest number of water recycling projects to replace the anticipated water yield that it would have received through the Delta Conveyance Project. These water recycling projects would be located near water treatment facilities. Construction of such facilities would result in conversion of Important Farmland or land under Williamson Act contract in areas where such farmland is present. In the southern inland region where a greater number of projects would be needed as a substitute for the Delta Conveyance Project, the potential for impact would be greatly increased.

Water efficiency projects could be pursued in all four regions and involve a wide variety of project types, such as flow measurement or automation in a local water delivery system, lining of canals, use of buried perforated pipes to water fields, and additional detection and repair of commercial and residential leaking pipes. Since these activities would occur within already developed areas, they would be expected to result in minimal to no permanent conversion of farmland.

15.3.3.2 Impacts of the Project Alternatives on Agricultural Resources

Impact AG-1: Convert a Substantial Amount of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance as a Result of Construction of Water Conveyance Facilities

All Project Alternatives

Project Construction—Temporary Impacts

Temporary impacts on existing agricultural lands would occur because of various field investigations conducted during the preconstruction and construction phases. These field investigations include geotechnical and hydrogeologic sampling and other construction test projects supporting geotechnical analysis. These investigations would be used to more specifically identify appropriate construction methodologies given existing site conditions. Although these field investigations may temporarily interfere with agricultural operations in the vicinity where sampling is taking place, field investigation work is not expected to result in conversion of agricultural properties to nonagricultural use. Any proposed soil investigation activities that occur on agricultural lands would be grouted with materials from the full depth to 5 feet (1.5 meters) below the surface, with the final 5 feet of topsoil replaced to return the affected area to as close to pre-activity conditions as possible.

Excavation and installation of some of the utility infrastructure, specifically power transmission and SCADA lines, for water conveyance facilities under all of the project alternatives would result in limited temporary conversion of existing agricultural land. During the period of construction, these areas would be unavailable for agricultural production. Once the installation process for these buried utilities lines is complete, the excavations would be subsequently backfilled to pre-project contours to allow potential agricultural use to resume (refer to Appendix 15A, *Supplemental Tables for Agricultural Resources Chapter*). The acreage of farmland considered to be temporarily affected is approximately 200 acres or fewer across all alternatives, with minimal variation between alternatives (Table 15-7).

Project Construction—Permanent Impacts

Appendix 15B, *Agricultural and Land Stewardship Considerations*, describes the detailed siting criteria and design process to minimize the extent of farmland that would be permanently converted as a result of project buildout. Although the extent of permanent conversion of Important Farmland was reduced through the early planning processes, the project design would still result in conversion of Important Farmland. Physical structures (e.g., intake structures, pumping plants, and shaft pads) associated with construction of the project would preclude Important Farmland from future agricultural use and thereby are categorized as permanent impacts on farmland. Additionally, some of the areas within the footprint construction where no permanent physical structures are planned as part of construction buildout (e.g., staging areas), and areas where any built features are by design “temporary” and thereby removed (e.g., removal of the temporary ring levee at the Twin Cities Complex or temporary on-site access roads or concrete slabs from temporary material storage areas) following completion of construction work in the area are also considered to be permanent impacts on farmland. These areas are cataloged as permanent impacts because the potential peat soil compaction may hinder its ability to be returned to productive farmland, or the areas are too small and isolated from other active farmland under the same ownership to be farmed economically.

Although many of the areas where soil compaction may occur due to construction activities are targeted with land reclamation or remediation techniques, with the expectation that such treatments would return the affected lands to conditions where they can support productive farming operations, since there is no guarantee that any potential damage to those previous farmland areas could be ameliorated to a minimal level, for the purpose of this analysis they are considered to be permanently converted farmland. Table 15-7 presents a summary of the permanent impacts on Important Farmland, broken down by individual Delta county and by alternative. Construction of the physical structures for project water conveyance and related facilities under any of the alternatives would not convert more than 1% of Important Farmland within the Delta. Mapbooks 15-1 through 15-3 show the footprint of all the construction features along with the distribution of Important Farmland.

Table 15-7. Estimated Conversion of Important Farmland as a Result of Construction of Water Conveyance Facilities by Alternative (acres)

	Permanent Impacts					Temporary Impacts						
County	Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal of Important Farmland	Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal of Important Farmland	Grand Total	Percent of Study Area [a]
Alternative 1. Central Alignment, 6,000 cfs, Intakes B and C												
Alameda	33.7	–	0.4	–	34.1	–	–	–	–	–	34.1	0.01%
Contra Costa	1,183.9	230.5	115.1	137.4	1,666.9	1.6	1.3	0.1	3.7	6.7	1,673.6	0.35%
Sacramento	456.5	473.7	20.8	54.3	1,005.2	34.4	24.0	14.1	12.8	85.3	1,090.6	0.23%
San Joaquin	812.7	24.1	1.3	57.7	895.8	88.2	2.8	0.1	8.3	99.4	995.2	0.21%
Subtotal	2,486.7	728.3	137.7	249.4	3,602.0	124.2	28.1	14.3	24.8	191.4	3,793.5	0.79%
Alternative 2a. Central Alignment, 7,500 cfs, Intakes A, B, C												
Alameda	56.9	–	0.4	–	57.3	0.3	–	0.3	–	0.5	57.8	0.01%
Contra Costa	1,183.9	230.5	115.1	163.8	1,693.3	1.6	1.3	2.4	3.9	9.2	1,702.5	0.35%
Sacramento	586.1	521.7	22.7	105.9	1,236.4	40.3	23.3	13.6	13.8	90.9	1,327.4	0.28%
San Joaquin	854.2	24.1	1.3	57.7	937.4	88.1	2.8	0.1	8.3	99.3	1,036.7	0.21%
Subtotal	2,681.1	776.3	139.6	327.4	3,924.5	130.3	27.4	16.4	26.0	200.0	4,124.4	0.85%
Alternative 2b. Central Alignment, 3,000 cfs, Intake C												
Alameda	33.7	–	0.4	–	34.1	–	–	–	–	–	34.1	0.01%
Contra Costa	1,183.9	230.5	115.1	137.4	1,666.9	1.6	1.3	0.1	3.7	6.7	1,673.6	0.35%
Sacramento	229.8	339.0	17.2	22.4	608.4	24.9	24.1	10.6	12.3	71.9	680.3	0.14%
San Joaquin	737.9	24.1	1.3	57.7	821.1	88.3	2.8	0.1	8.3	99.5	920.6	0.19%
Subtotal	2,185.3	593.6	134.0	217.5	3,130.4	114.8	28.2	10.8	24.3	178.1	3,308.5	0.69%
Alternative 2c. Central Alignment, 4,500 cfs, Intakes B and C												
Alameda	33.7	–	0.4	–	34.1	–	–	–	–	–	34.1	0.01%
Contra Costa	1,183.9	230.5	115.1	137.4	1,666.9	1.6	1.3	0.1	3.7	6.7	1,673.6	0.35%
Sacramento	438.3	405.5	18.9	38.5	901.3	35.6	24.5	14.1	13.1	87.3	988.6	0.20%
San Joaquin	782.9	24.1	1.3	57.7	866.1	88.3	2.8	0.1	8.3	99.5	965.5	0.20%
Subtotal	2,438.8	660.1	135.8	233.6	3,468.3	125.4	28.6	14.3	25.1	193.5	3,661.8	0.76%

County	Permanent Impacts: Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal of Important Farmland	Temporary Impacts: Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal of Important Farmland	Grand Total	Percent of Study Area [a]
Alternative 3. Eastern Alignment, 6,000 cfs, Intakes B and C												
Alameda	33.7	–	0.4	–	34.1	–	–	–	–	–	34.1	0.01%
Contra Costa	1,213.3	230.9	116.4	137.4	1,698.0	1.5	1.3	0.1	3.7	6.5	1,704.5	0.35%
Sacramento	455.4	474.0	20.8	54.3	1,004.5	32.2	23.7	14.1	13.8	83.7	1,088.2	0.23%
San Joaquin	510.0	6.0	11.3	16.1	543.4	81.7	4.2	5.3	3.2	94.5	637.9	0.13%
Subtotal	2,212.3	710.9	148.9	207.8	3,279.9	115.3	29.2	19.5	20.8	184.7	3,464.7	0.72%
Alternative 4a. Eastern Alignment, 7,500 cfs, Intakes A, B, C												
Alameda	56.9	–	0.4	–	57.3	0.3	–	0.3	–	0.5	57.8	0.01%
Contra Costa	1,236.1	230.9	117.4	163.8	1,748.3	2.2	1.3	2.4	6.6	12.4	1,760.7	0.36%
Sacramento	584.9	521.7	22.7	105.9	1,235.3	38.0	23.3	13.6	15.1	90.0	1,325.3	0.27%
San Joaquin	547.8	6.0	11.3	16.1	581.2	81.7	4.2	5.3	3.2	94.5	675.7	0.14%
Subtotal	2,425.8	758.6	151.9	285.8	3,622.1	122.1	28.8	21.6	24.9	197.4	3,819.5	0.79%
Alternative 4b. Eastern Alignment, 3,000 cfs, Intake C												
Alameda	33.7	–	0.4	–	34.1	–	–	–	–	–	34.1	0.01%
Contra Costa	1,183.9	230.5	115.1	137.4	1,666.9	1.6	1.3	0.1	3.7	6.7	1,673.6	0.35%
Sacramento	228.6	339.0	17.2	22.4	607.2	22.6	24.3	10.6	13.3	70.9	678.1	0.14%
San Joaquin	430.1	6.0	11.3	16.1	463.5	81.7	4.2	5.3	3.2	94.5	558.0	0.12%
Subtotal	1,876.3	575.5	144.0	175.9	2,771.7	105.9	29.8	16.1	20.3	172.0	2,943.7	0.61%
Alternative 4c. Eastern Alignment, 4,500 cfs, Intakes B and C												
Alameda	33.7	–	0.4	–	34.1	–	–	–	–	–	34.1	0.01%
Contra Costa	1,200.8	230.8	115.8	137.4	1,684.9	1.5	1.3	0.1	3.7	6.6	1,691.5	0.35%
Sacramento	437.2	405.5	18.9	38.5	900.1	33.4	24.7	14.1	14.2	86.3	986.4	0.20%
San Joaquin	478.5	6.0	11.3	16.1	511.9	81.7	4.2	5.3	3.2	94.5	606.3	0.13%
Subtotal	2,150.1	642.3	146.5	192.0	3,130.9	116.5	30.2	19.5	21.1	187.4	3,318.3	0.69%

County	Permanent Impacts: Prime Farmland	Permanent Impacts: Farmland of Statewide Importance	Permanent Impacts: Unique Farmland	Permanent Impacts: Farmland of Local Importance	Permanent Impacts: Subtotal of Important Farmland	Temporary Impacts: Prime Farmland	Temporary Impacts: Farmland of Statewide Importance	Temporary Impacts: Unique Farmland	Temporary Impacts: Farmland of Local Importance	Temporary Impacts: Subtotal of Important Farmland	Grand Total	Percent of Study Area [a]
Alternative 5. Bethany Reservoir Alignment, 6,000 cfs, Intakes B and C												
Alameda	336.9	–	1.4	0.0	338.3	3.0	–	0.1	0.0	3.2	341.5	0.07%
Contra Costa	8.3	–	4.7	9.3	22.3	7.0	0.3	0.2	0.8	8.3	30.7	0.01%
Sacramento	453.8	528.0	23.7	86.7	1,092.2	32.2	23.2	14.1	13.3	82.8	1,174.9	0.24%
San Joaquin	677.0	–	11.0	13.3	701.3	78.6	2.8	5.4	4.8	91.6	792.8	0.16%
Subtotal	1,476.0	528.0	40.8	109.3	2,154.2	120.8	26.2	19.8	18.9	185.8	2,340.0	0.48%

cfs = cubic feet per second.

[a] Reflects the percentage of Important Farmland in the study area that would be affected by construction.

A majority of the permanent impacts on Important Farmland under Alternatives 1, 2a, 2b, 2c, 3, 4a, 4b, and 4c would result from construction of the new Southern Forebay. This new forebay construction would convert approximately 1,300 acres of Important Farmland. Permanent features associated with the Southern Complex that would result in permanent conversion of Important Farmland predominately consist of the forebay itself, which would have an operational storage capacity of 9,000 acre-feet with a maximum surface area of approximately 750 acres and have surrounding embankments and seepage cutoffs along its perimeter. Another Southern Forebay feature that would result in permanent conversion of Important Farmland is the concrete-lined emergency spillway to direct flows to Italian Slough when the water level in the forebay needs to be lowered in case of an emergency. Additionally, there would be RTM stockpiles near the forebay to accommodate the RTM generated by the Byron Tract tunnel working shaft, Southern Forebay Inlet Structure tunnel launch shaft, and Southern Forebay Outlet and Control Structure tunnel launch shaft. Because Alternative 5 does not involve construction of the Southern Forebay, it would result in substantially less permanent conversion of Important Farmland within Contra Costa County compared to Alternatives 1, 2a, 2b, 2c, 3, 4a, 4b, and 4c (Table 15-7). However, the Bethany Reservoir alignment (Alternative 5) would result in additional permanent impacts on Important Farmland within Alameda County associated with the tie-in of south Delta facilities to Bethany Reservoir (i.e., approximately 60 acres of permanent impacts on Prime Farmland associated with the aqueduct from the Bethany Reservoir Pumping Plant to Bethany Reservoir and approximately 223 acres of permanent impacts on Prime Farmland in Alameda County for the surge basin; see Appendix 15A, Tables 15A-12A and 15A-13A) (Delta Conveyance Design and Construction Authority 2022a:9). Overall, the Bethany Reservoir alignment is expected to result in much fewer total permanent impacts on Important Farmland throughout the study area: more than a third fewer projected impacts under similar 6,000 cubic feet per second (cfs) options for central alignment (Alternative 1) and eastern alignment (Alternative 3).

Another contributor to the projected permanent conversion of Important Farmland under all alternatives involves the RTM stockpiles. RTM would be processed and stored at three launch shaft sites during construction: Twin Cities Complex, Bouldin Island (for the central alignment [Alternatives 1, 2a, 2b, 2c]) or Lower Roberts Island (for the eastern and Bethany Reservoir alignments [Alternatives 3, 4a, 4b, 4c, and 5]), and Southern Forebay (for central and eastern alignments). Portions of the Southern Forebay area (under Alternatives 3, 4a, and 4c), Twin Cities Complex and the Bouldin Island (for central alignment) or Lower Roberts Island (for eastern alignment and Bethany Reservoir alignment) sites would be used for long-term RTM storage. These RTM storage areas are expected to result in conversion of approximately 50 to 450 acres throughout the study area (refer to Appendix 15A). Alternative 5 is expected to utilize approximately 430 acres of Important Farmland for RTM drying and stockpiling (Delta Conveyance Design and Construction Authority 2022b:26). Given the quantity of RTM that would be generated at the shaft sites and extent of Important Farmland within the study area, it was not practicable to site RTM stockpiles to avoid Important Farmland.

The storage of excess stockpiles of RTM under all alternatives is expected to result in compression of the underlying soils, including peat soils if present, degrading the value of the RTM stockpile areas as productive agricultural land. The Twin Cities Complex is located outside the area where peat soils are mapped within the study area; for more details, please refer to Chapter 11, *Soils*, Section 11.1.1.1, *NRCS Soil Associations*.

Agronomic testing would be conducted related to agricultural lands utilized for RTM drying and stockpiling and other portions of the construction site where no permanent facilities would be constructed (e.g., locations for construction trailers, temporary topsoil stockpiles, equipment storage, truck movement areas). One of the objectives of the agronomic testing is to determine whether it is possible to remediate the underlying soils using restoration techniques to mitigate the expected compression of the soils. Given the uncertainty of whether land reclamation efforts can fully restore these areas to pre-project conditions, areas that undergo land reclamation treatments are still considered permanently affected.

The construction of new water conveyance facilities, such as intakes and shafts, would result in permanent conversion of Important Farmland because they involve physical features or structures that would remain in place postconstruction and would permanently preclude agricultural uses within their footprints. Appendix 15A provides tables that show the differences in permanent impacts on Important Farmland by alternative for the intake sites and for the shaft locations. For the intake locations, these permanent features include the modified Sacramento River levee and State Route 160 alignment, including associated ground improvement to the embankments, sedimentation basins, basin outlet structure and outlet channel connection to tunnel inlet, sediment drying lagoons, and an electrical substation. The alternatives vary in terms of permanent impacts on Important Farmland associated with the intake footprints; those alternatives having a higher number of intakes (e.g., three intakes for Alternatives 2a and 4a) would have a larger commensurate effect than alternatives with fewer intakes (e.g., one intake for Alternatives 2b and 4b or two intakes for Alternatives 1, 2c, 3, 4c, and 5). For the shaft locations, these permanent features include the shaft pad footprint, ancillary support buildings, paved access roads, and paved helipads for use during emergency evacuation response efforts (at intakes, tunnel launch shafts, Southern Complex, and Bethany Complex only). The scale of impacts on Important Farmland associated with the shaft locations is similar across all alternatives, but Alternatives 2a and 4a would have slightly larger impacts on Important Farmland because they have additional facilities within the Southern Complex west of Byron Highway to connect to the Jones approach channel (also known as *Delta-Mendota Canal*) (see Appendix 15A, Table 15A-5A).

Permanent impacts on Important Farmland would also arise from necessary improvements to transportation corridors. The transportation improvements would include widened and improved roads, new roads, and new and widened bridges. Roads used for material hauling, construction equipment access, and employee access would consist of existing Delta state highways and two-lane roadways, new gravel or paved roadways constructed from existing roads to construction sites, and new roads located within facility construction sites. Byron Highway near the Southern Forebay would be realigned west of the current alignment to accommodate regional transportation plans and forebay construction. Because of the location of the central alignment, Alternatives 1, 2a, 2b, and 2c would require more improvements to transportation infrastructure and thereby result in a higher permanent conversion of Important Farmland compared to the eastern and Bethany Reservoir alignment alternatives (Alternatives 3, 4a, 4b, 4c, and 5), which benefit from the tunnel's closer proximity to I-5 and other various improved transportation networks around the study area's eastern margin (see Appendix 15A). All central and eastern alignment alternatives would entail approximately 110 to 170 acres of permanent conversion of Important Farmland for construction of various access roads to connect existing roadways to project features such as the intakes, tunnel shafts, and the Southern Complex at Byron Tract. The Bethany Reservoir alignment alternative would result in approximately 51 acres of permanent conversion of Important Farmland to facilitate access to the Bethany Reservoir aqueduct, discharge structure, surge basin, and pumping plant.

Park-and-ride lots would be established near major commute routes, where workers could park their vehicles and ride shuttle buses or vans to construction sites. Trucks arriving late at night could also use these lots to park overnight to avoid making nighttime deliveries to construction sites. The central alignment alternatives would entail about 6 acres of Important Farmland conversion, the eastern alignment alternatives about 5 acres, and the Bethany Reservoir alignment about 3 acres, associated with construction of new park-and-ride lots.

In total, the Delta Conveyance Project is expected to result in permanent conversion of Important Farmland of over 3,000 acres for all the central and eastern alignment alternatives, except Alternative 4b, which would convert nearly 2,800 acres. The eastern alignment alternatives (Alternatives 3, 4a, 4b, and 4c) would result in fewer acres of Important Farmland conversion compared to the central alignment alternatives (Alternatives 1, 2a, 2b, and 2c). Under the eastern alignment alternatives, the loss of Important Farmland would range from just under 2,800 acres (Alternative 4b), to just over 3,600 acres (Alternative 4a). Under the central alignment alternatives, the permanent loss of Important Farmland would range from approximately 3,100 acres (Alternative 2b) to just over 3,900 acres (Alternative 2a). The Bethany Reservoir alignment (Alternative 5) would result in approximately 2,150 acres of impacts on Important Farmland.

Project Construction—Indirect Impacts

As described in Appendix 15B, *Agricultural and Land Stewardship Considerations*, the project's extensive initial siting and design process sought to minimize the extent of farmland that would be permanently converted as a result of project construction. One approach to minimize affected farmland involved was to acquire only the portion of an existing Important Farmland parcel that would be utilized to support construction activities and subsequent operation and maintenance of project facilities. The remaining areas of Important Farmland within the parcel not utilized by the project, hereafter referred to as remnant farmland areas, would be left intact. Some subset of these remnant farmland areas avoided by the construction footprint could nevertheless be too small to support ongoing agricultural operations, and thereby are considered indirectly converted as a result of project construction activities.

The totals of remnant farmland areas that were individually less than 20 contiguous acres were compiled for each alternative and are presented in Table 15-8. The remnant farmland area analysis conservatively assumed that the remnant areas identified in Table 15-8 would eventually be converted from agricultural to nonagricultural use following commencement of adjacent project-related construction activities. However, much of the remnant farmland acreage identified in Table 15-8 could ultimately remain in agricultural use. During the project's land acquisition phase, DWR would coordinate with remnant farmland area landowners to determine the best use of the remnant farmland areas. If the landowner decides to continue farming operations or would like to utilize the property for another use, the remnant farmland area would not be acquired for the project. For example, high-value specialty crops (e.g., orchards, vineyards) commonly grown in the Delta are often grown on fewer than 20 contiguous acres. In addition, remnant farmland areas could be leased out to hobby farmers interested in managing small acreages of land at a time, or to agricultural operators who are interested in farming a remnant farmland area. Since there is reasonable uncertainty on whether there would be adequate interest by agricultural operators to ensure remnant farmland areas are productive for continued agricultural use, the project would indirectly result in their conversion to nonagricultural use. The remnant farmland area acreage is thereby conservatively considered to be a permanent impact. Mitigation Measure AG-1: *Preserve Agricultural Land* would mitigate this potential indirect conversion of remnant areas of Important Farmland.

Table 15-8. Estimated Conversion of Land (acre) Based on Remnant Important Farmland Area Analysis

Alternative	Remnant Farmland Area
Alternative 1. Central Alignment, 6,000 cfs, Intakes B and C	363.3
Alternative 2a. Central Alignment, 7,500 cfs, Intakes A, B, C	413.0
Alternative 2b. Central Alignment, 3,000 cfs, Intake C	331.3
Alternative 2c. Central Alignment, 4,500 cfs, Intakes B and C	351.7
Alternative 3. Eastern Alignment, 6,000 cfs, Intakes B and C	268.7
Alternative 4a. Eastern Alignment, 7,500 cfs, Intakes A, B, C	362.2
Alternative 4b. Eastern Alignment, 3,000 cfs, Intake C	262.1
Alternative 4c. Eastern Alignment, 4,500 cfs, Intakes B and C	296.3
Alternative 5. Bethany Reservoir Alignment, 6,000 cfs, Intakes B and C	249.6

cfs = cubic feet per second.

Operations and Maintenance

Operation and maintenance of facilities established by the project would entail repair, cleaning, and inspection of new surface water diversions, fish screens, and water conveyance facilities. Operation and maintenance of these structures and facilities would not convert additional farmland to nonagricultural use beyond what would be converted during construction.

CEQA Conclusion—All Project Alternatives

The construction of the project's water conveyance facilities would result in temporary and permanent conversion of Important Farmland. The total extent of Important Farmland that would be temporarily or permanently affected ranges from approximately 2,150 acres under Alternative 5 to approximately 3,900 acres under Alternative 2a. Given the thousands of acres of anticipated conversion of Important Farmland from project buildout, the impact is potentially significant. These totals represent approximately 1% or less of all the Important Farmland available within the Delta (Table 15-7). A major factor influencing the differences in the extent of affected Important Farmland between the central and eastern alignment alternatives is the number of intake sites. Alternatives with just one intake (i.e., Alternatives 2b, 4b) would have a reduced permanent footprint, along with fewer temporary construction work areas necessary to support construction of the intake, compared to alternatives with three intakes (i.e., Alternatives 2a, 4a) along the Sacramento River. The difference in the range of anticipated impacts between the central and eastern alignment alternatives may vary by a few hundred acres, which is a substantial difference, but represents a relatively small percentage difference given the extent of total Important Farmland conversion that is projected under these two alignments. The Bethany Reservoir alignment (Alternative 5) would have substantially fewer impacts when considering either total combined permanent and temporary impacts or permanent impacts alone compared to any alternatives under the central or eastern alignments.

Appendix 15B describes the methodology employed during the initial siting and design process to greatly minimize the extent of farmland that would be permanently converted as a result of project buildout. Mitigation Measure AG-1: *Preserve Agricultural Land* would reduce the extent of the remaining impacts that could not be avoided through careful project planning. However, these impacts would remain significant and unavoidable for all alternatives after implementation of the mitigation measures because conservation of agricultural farmland through acquisition of agricultural conservation easements, even at a ratio of 1:1 or greater, would not avoid a net loss of Important Farmland in the study area.

Mitigation Measure AG-1: Preserve Agricultural Land

1. Permanently converted Important Farmland will be mitigated at an acreage ratio of at least 1:1. This mitigation ratio will be achieved through a combination of acquisition and dedication of agricultural land, acquisition of development rights or conservation easements to permanently protect agricultural land, or payment of in-lieu fees to fully fund the acquisition and maintenance of such real property interests by a third party. To the extent feasible, any rights to land acquired for the purpose of mitigation of agricultural land conversion will be of equal or better farmland quality than the land that was permanently converted. Therefore, impacts on Prime Farmland will be mitigated through protection of Prime Farmland; impacts on Farmland of Statewide Importance will be mitigated through protection of Prime Farmland or Farmland of Statewide Importance; impacts on Farmland of Local Importance will be mitigated through protection of Prime Farmland, Farmland of Statewide Importance, or Farmland of Local Importance. Because Unique Farmland is land used to grow a crop considered by the State of California to be an agricultural product of economic importance, mitigation for impacts on Unique Farmland will be targeted at lands that are also mapped as Unique Farmland.

   a. Preservation of agricultural lands will be within the Delta counties (i.e., Sacramento, San Joaquin, Contra Costa, Alameda, Solano, and Yolo).

   b. Any agricultural conservation easements acquired pursuant to this mitigation strategy will be held by a qualified organization that has the legal and technical ability to hold and administer agricultural conservation easements for the purpose of conserving and maintaining lands in agricultural production.

   c. DWR will also consider an optional approach of funding farm improvements to enhance the productivity of the lower-quality farmland, consistent with Agricultural Land Stewardship Consideration A2.

Mitigation Impacts

<u>*Compensatory Mitigation*</u>

Although the CMP described in Appendix 3F, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources,* does not act as mitigation for impacts on this resource from project construction or operations, implementation of the CMP could result in impacts on this resource as analyzed in this chapter. CEQA requires analysis of the impacts of mitigation and, therefore, this discussion is included here within the chapter.

The compensatory mitigation planned at the I-5 ponds (Ponds 6, 7, and 8), on Bouldin Island, and the North Delta Arc is expected to be built to offset, in part or in whole, the potential impacts resulting from construction and operation of the project on terrestrial and aquatic biological resources. The CMP is described in detail in Appendix 3F. Several major habitat types are targeted under the CMP for restoration, including freshwater marsh, riparian, seasonal wetland, tidal marsh, channel margin, lacustrine (lake/pond), and grasslands. These habitat restoration efforts would largely be sited in existing agricultural areas, resulting in potential permanent conversion of Important Farmlands. The planned habitat restoration projects for Bouldin Island, the I-5 ponds, and the North Delta Arc are projected to result in additional permanent conversion of approximately 1,200 acres of Important Farmland, most of which would occur on Bouldin Island.

Not all land management actions to be undertaken under the CMP would result in loss of existing agricultural land. The existing land cover within the I-5 ponds 8 are predominantly either grassland, riparian, or wetland, as stated in Appendix 3F. On Bouldin Island, the overwhelming majority of the existing cropland on the site would be retained. The retention of the agricultural lands on Boudin Island is intended to promote the agricultural heritage of the island. Some of the proposed mitigation efforts to protect terrestrial biological resources would specifically preserve existing agricultural lands, ensuring that they are actively managed in certain crop types (e.g., alfalfa, winter wheat) known to support foraging by certain agriculture-dependent special-status wildlife (e.g., Swainson's hawk, sandhill crane). The project plans for Bouldin Island do not involve any permanent disruptions in the functionality of the existing conveyance system of ditches throughout the island used for irrigation of croplands. Overall, the CMP would result in approximately 1,175 acres of Important Farmland permanently converted on Bouldin Island to habitat uses, including approximately 927 acres of Prime Farmland and 233 acres of Farmland of Local Importance. The farmland would be converted to establish a suite of different land cover types, including freshwater marsh, grassland, lake/pond, riparian, and seasonal wetland.

Implementation of the CMP would require developing temporary facilities, such as staging areas, access haul roads, work areas, and borrow sites. These facilities would be located on Important Farmland. Construction activities pursuant to the CMP could also involve installation of temporary site fencing and signage, soil and vegetation removal, excavation and grading activities, and dust abatement in staging areas, along access haul roads, and on construction areas for the habitat restoration sites. Areas of existing farmland where there would be staging areas and access roads would be considered permanent impacts on farmland. It is generally estimated that site preparation work (e.g., excavation, grading, levee reinforcement) to construct the marsh and seasonal wetland habitats would take 2 years, although it may take several years more for the newly constructed wetland habitats to fully establish. For channel margin habitat, which would be created within the North Delta Arc, it is projected that roughly 4,500 linear feet of improvements could be constructed annually (i.e., it would take over 6 years to improve approximately 5 miles of channel margin habitats). The potential for channel margin habitat mitigation to result in conversion of Important Farmland is minimized since the work will be focused on improving fish and wildlife habitat conditions specifically along riverine corridors. It is anticipated that approximately 18 to 76 acres of tidal perennial habitat would be required as compensatory mitigation for construction impacts, while approximately 1,100 to 1,400 acres of tidal habitat for delta smelt and approximately 110 to 140 acres of tidal habitat for longfin smelt would be required as compensatory mitigation for operations impacts (these estimates regarding tidal habitat mitigation are preliminary and subject to refinement pending ongoing coordination with the regulatory agencies). Appendix 3F provides a framework for the site selection criteria for placement of tidal wetland habitat mitigation sites.

Operation and maintenance activities of habitat restoration areas undertaken as part of the CMP could include monitoring of vegetation and natural structures and various land management activities (e.g., operation of tide gates, flow control structures, and pumps; installation or removal of irrigation infrastructure; weed abatement of invasive terrestrial or aquatic vegetation; trash removal; anti-poaching efforts). These maintenance activities would likely occur within the restored habitat footprint or in the immediate vicinity within riverine channels. The maintenance activities would not result in the permanent conversion of additional Important Farmland because access roads to locations requiring maintenance activities would already be established during construction activities.

Implementation of the CMP would include permanent conversion of approximately 1,200 acres of Important Farmland, based on the specific planned habitat restoration activities on Bouldin Island, at the I-5 ponds, and the North Delta Arc which would be a potentially significant impact (Table 15-9). There is expected to be additional conversion of Important Farmland associated with tidal wetland restoration tied to mitigation of construction and operations impacts on migrating juvenile salmonid and delta smelt spawning habitat; however, these effects on Important Farmland can only be analyzed at a programmatic level because the amount of tidal habitat mitigation and the location of future tidal habitat mitigation sites have yet to be determined. DWR would minimize the impacts on loss of Important Farmlands from implementation of the CMP through Mitigation Measure AG-1: *Preserve Agricultural Land*. Even with this mitigation measure, the impact would remain significant and unavoidable.

Table 15-9. Estimated Conversion of Important Farmland as a Result of the Compensatory Mitigation Plan on DWR I-5 Ponds 6, 7, and 8 and on Bouldin Island (acres)

Important Farmland Type	Permanent Impacts
Prime Farmland	934.9
Farmland of Statewide Importance	22.8
Unique Farmland	5.1
Farmland of Local Importance	235.5
Total	1,198.3

Other Mitigation Measures

Expansion of subsidence reversal and/or carbon sequestration projects on Sherman and Twitchell Islands, required under Mitigation Measure AQ-9: *Develop and Implement a GHG Reduction Plan to Reduce Construction and Net CVP Operational Pumping Emissions to Net Zero* may require conversion of agricultural land to other land uses, such as marshland. Mitigation Measure AG-1: *Preserve Agricultural Land* would reduce the severity of this effect. Further, DWR would, where available and feasible, choose to convert lower-quality farmland or farmland with lower habitat values, rather than Important Farmland or farmland of higher habitat value for subsidence reversal and/or carbon sequestration.

Overall, depending on the feasibility of applying Mitigation Measure AG-1: *Preserve Agricultural Land*, the availability of lower-quality farmland for conversion, and the areal extent of land required, it is possible that impacts relating to agricultural land conversion from the construction of compensatory mitigation and implementation of other mitigation measures, combined with project alternatives, would remain significant and unavoidable.

Impact AG-2: Convert a Substantial Amount of Land Subject to Williamson Act Contract or under Contract in Farmland Security Zones to a Nonagricultural Use as a Result of Construction of Water Conveyance Facilities

Conversion of farmland under Williamson Act contract or under contract within a Farmland Security Zone largely represents a subset of those impacts previously described under Impact AG-1 regarding conversion of Important Farmland. Most of the agricultural land within the study area is Important Farmland, but only a fraction of that land is under Williamson Act contract and an even smaller proportion is under contract in a Farmland Security Zone. Therefore, the effects on farmland analyzed under Impact AG-2 are not additive to those effects on farmland disclosed under Impact AG-1.

All Project Alternatives

Project Construction—Temporary Impacts

Temporary construction activities associated with building the Delta Conveyance Project facilities would result in conversion of land subject to Williamson Act contract (Table 15-10) or under contract within Farmland Security Zones (Table 15-11). The only county with lands enrolled in Farmland Security Zones within the study area is San Joaquin County. Generally, land subject to Williamson Act contract or under contract within a designated Farmland Security Zone is also considered Important Farmland.[2]

Appendix 15A provides tables that show the differences in temporary impacts on land under Williamson Act contract by alternative for individual project features such as intake sites, the shaft locations, the Southern Forebay (for Alternatives 1, 2a, 2b, 2c, 3, 4a, 4b, and 4c) and the Bethany Reservoir aqueduct and surge basin (for Alternative 5). Work areas adjacent to the intakes would require the temporary conversion of approximately 1 to 6 acres of land under Williamson Act contract near the east bank of the Sacramento River between Clarksburg and Courtland. The lower range of these temporary impacts are associated with those alternatives with only one or two intakes along the Sacramento River (i.e., Alternatives 1, 2b, 2c, 3, 4b, 4c, and 5). Approximately 6 acres of land within a Williamson Act contract would be temporarily affected under Alternatives 2a and 4a, which would involve installation of three intakes.

Approximately 5 to 9 acres of land subject to Williamson Act contract would be temporarily affected by construction work areas associated with the shaft areas, depending on alternative. There are also minor amounts of temporary impacts on Williamson Act contact lands associated with various other project features including installation of SCADA to various areas of the footprint (6–14 acres) and road work (15–30 acres).

The project would also temporarily affect agricultural land under contract within a Farmland Security Zone (Table 15-11). The central alignment alternatives (Alternatives 1, 2a, 2b, and 2c) would result in temporary conversion of land under contract within a Farmland Security Zone of approximately 7 acres while the eastern alignment (Alternatives 3, 4a, 4b, and 4c) and Bethany

[2] At least 95% of land under Williamson Act contract to be permanently or temporarily converted under Alternatives 1, 2a, 2b, 2c, 3, 4a, 4b, or 4c is mapped by the FMMP as one of the Important Farmland categories. More than 90% of land under Williamson Act contract to be permanently or temporarily converted under Alternative 5 is also mapped as Important Farmland. Generally, the land under Williamson Act contract that is not also considered Important Farmland is grazing land.

Reservoir alignment (Alternative 5) are projected to result in around 22 acres of temporary surface impacts on land under contract within a Farmland Security Zone.

Project Construction—Permanent Impacts

Physical components of the alternatives would directly and permanently convert land subject to Williamson Act contract to nonagricultural uses (Table 15-10). Appendix 15B describes the planning process to avoid and minimize impacts on agricultural resources, including lands subject to Williamson Act contract, when feasible. While there were constraints on how flexible the siting of construction elements could be, due to engineering constraints or conflicts with other environmental resources (e.g., special-status species habitat or areas of known cultural resources), the impacts on Important Farmland were minimized, where possible. Mapbooks 15-4 through 15-6 show the footprint of all construction features along with the land under Williamson Act contract.

Appendix 15A provides tables that show the differences in permanent impacts on land under Williamson Act contract by alternative for individual project features. Of the land subject to Williamson Act contract, RTM stockpile areas would directly affect anywhere from approximately 15 acres to approximately 285 acres. Alternatives with more intakes and a larger-diameter tunnel (e.g., Alternatives 2a and 4a) are associated with a greater extent of RTM stored on lands at the tunnel launch shaft sites under Williamson Act contract. Agronomic testing would be conducted to determine if it is possible to remediate soils compacted under the RTM to productive agricultural use. For the purposes of this analysis, however, the RTM stockpiles are considered a permanent conversion of agricultural land given the uncertainty of whether the land can be effectively returned to agricultural uses following potentially substantial soil compaction under the weight of the stockpiles.

Additionally, a concrete batch complex to be located near the intersection of Lambert Road and Franklin Road is projected to result in permanent, long-term conversion of approximately 7 to 15 acres of land subject to Williamson Act contract. The upper range of this impact is associated with alternatives involving two or three intakes (Alternatives 1, 2a, 2c, 3, 4a, 4c, and 5) because the complex would include two concrete batch plants near Lambert Road. The low end of this range is associated with alternatives involving a single intake (Alternatives 2b and 4b) because they would only involve a single concrete batch plant near Lambert Road.

Of land subject to Williamson Act contract, the intakes would require the permanent, long-term conversion of approximately 180 to 330 acres near the east bank of the Sacramento River between Clarksburg and Courtland. The lower range of impacts are associated with alternatives having only one or two intakes along the Sacramento (i.e., Alternatives 1, 2b, 2c, 3, 4b, 4c, and 5). Approximately 330 acres of land within a Williamson Act contract would be permanently converted under Alternatives 2a and 4a, which would involve installation of three Sacramento River intakes.

Other components that would contribute to permanent conversion of land subject to Williamson Act contract include shaft pad area (approximately 300 to 390 acres for central alignment alternatives [1, 2a, 2b, and 2c]; 270 to 340 acres for eastern alignment alternatives [3, 4a, 4b, and 4c]; approximately 420 acres for the Bethany Reservoir alignment [Alternative 5]), and road improvements including rights-of-way (approximately 30 acres for the central alignment alternatives; 47 acres for the Bethany Reservoir alignment; 19 acres for the eastern alignment alternatives). Alternative 5 would involve approximately 72 acres of permanent impacts on land under Williamson Act contract associated with the aqueduct from the Bethany Reservoir Pumping Plant to Bethany Reservoir.

1 **Table 15-10. Estimated Conversion of Land under Williamson Act Contract as a Result of Construction**
2 **of Water Conveyance Facilities by Alternative (acres)**

County	Permanent Impacts Non-Renewal	Permanent Impacts Active	Permanent Impacts Subtotal	Temporary Impacts Non-Renewal	Temporary Impacts Active	Temporary Impacts Subtotal	Grand Total	Percent of Study Area [a]
Alternative 1. Central Alignment, 6,000 cfs, Intakes B and C								
Alameda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
Contra Costa	0.0	88.9	88.9	0.0	0.0	0.0	88.9	0.02%
Sacramento	0.0	690.6	690.6	3.0	24.8	27.9	718.5	0.18%
San Joaquin	0.0	130.1	130.1	0.0	63.2	63.2	193.3	0.05%
Subtotal	0.0	909.6	909.7	3.0	88.1	91.1	1,000.8	0.26%
Alternative 2a. Central Alignment, 7,500 cfs, Intakes A, B, C								
Alameda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
Contra Costa	0.0	88.9	88.9	0.0	2.3	2.3	91.3	0.02%
Sacramento	3.3	892.6	895.9	4.4	27.2	31.6	927.5	0.24%
San Joaquin	0.0	130.1	130.1	0.0	63.2	63.2	193.3	0.05%
Subtotal	3.3	1,111.7	1,115.0	4.4	92.8	97.2	1,212.1	0.31%
Alternative 2b. Central Alignment, 3,000 cfs, Intake C								
Alameda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
Contra Costa	0.0	88.9	88.9	0.0	0.0	0.0	88.9	0.02%
Sacramento	0.0	529.2	529.3	3.0	25.3	28.3	557.5	0.14%
San Joaquin	0.0	130.1	130.1	0.0	63.2	63.2	193.3	0.05%
Subtotal	0.0	748.3	748.3	3.0	88.5	91.5	839.8	0.21%
Alternative 2c. Central Alignment, 4,500 cfs, Intakes B and C								
Alameda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
Contra Costa	0.0	88.9	88.9	0.0	0.0	0.0	88.9	0.02%
Sacramento	0.0	597.5	597.5	3.0	26.3	29.3	626.8	0.16%
San Joaquin	0.0	130.1	130.1	0.0	63.2	63.2	193.3	0.05%
Subtotal	0.0	816.5	816.5	3.0	89.5	92.5	909.1	0.23%
Alternative 3. Eastern Alignment, 6,000 cfs, Intakes B and C								
Alameda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
Contra Costa	0.0	88.9	88.9	0.0	0.0	0.0	88.9	0.02%
Sacramento	0.0	690.8	690.8	1.1	24.2	25.3	716.1	0.18%
San Joaquin	0.0	185.3	185.3	0.0	75.1	75.1	260.4	0.07%
Subtotal	0.0	965.0	965.1	1.1	99.3	100.4	1,065.5	0.27%
Alternative 4a. Eastern Alignment, 7,500 cfs, Intakes A, B, C								
Alameda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
Contra Costa	0.0	88.9	88.9	0.0	3.2	3.2	92.2	0.02%
Sacramento	3.3	892.6	895.9	2.5	27.2	29.7	925.6	0.24%
San Joaquin	0.0	185.3	185.3	0.0	75.1	75.1	260.4	0.07%
Subtotal	3.3	1,166.9	1,170.2	2.5	105.5	108.0	1,278.2	0.33%
Alternative 4b. Eastern Alignment, 3,000 cfs, Intake C								
Alameda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
Contra Costa	0.0	88.9	88.9	0.0	0.0	0.0	88.9	0.02%
Sacramento	0.0	529.2	529.3	1.1	25.2	26.3	555.6	0.14%
San Joaquin	0.0	185.3	185.3	0.0	75.1	75.1	260.4	0.07%
Subtotal	0.0	803.5	803.5	1.1	100.3	101.4	905.0	0.23%

	Permanent Impacts			Temporary Impacts				
County	Non-Renewal	Active	Subtotal	Non-Renewal	Active	Subtotal	Grand Total	Percent of Study Area [a]
Alternative 4c. Eastern Alignment, 4,500 cfs, Intakes B and C								
Alameda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
Contra Costa	0.0	88.9	88.9	0.0	0.0	0.0	88.9	0.02%
Sacramento	0.0	597.5	597.5	1.1	26.2	27.3	624.8	0.16%
San Joaquin	0.0	185.3	185.3	0.0	75.1	75.1	260.4	0.07%
Subtotal	0.0	871.8	871.8	1.1	101.3	102.4	974.2	0.25%
Alternative 5. Bethany Reservoir Alignment, 6,000 cfs, Intakes B and C								
Alameda	0.0	152.3	152.3	0.0	3.7	3.7	156.0	0.04%
Contra Costa	0.0	0.4	0.4	0.0	3.8	3.8	4.2	0.00%
Sacramento	0.0	765.7	765.8	1.1	23.6	24.7	790.5	0.20%
San Joaquin	0.0	153.7	153.7	0.0	73.9	73.9	227.6	0.06%
Subtotal	0.0	1,072.1	1,072.1	1.1	105.1	106.2	1,178.4	0.30%

cfs = cubic feet per second.
[a] Reflects the percentage of land under Williamson Act contract in the study area that would be affected by construction.

Table 15-11. Estimated Conversion of Land under Contract within a Farmland Security Zone as a Result of Construction of Water Conveyance Facilities by Alternative (acres)

Alternative	Permanent Impacts	Temporary Impacts	Grand Total	Percent of Study Area [a]
Alternative 1. Central Alignment, 6,000 cfs, Intakes B and C	34.9	6.6	41.5	0.11%
Alternative 2a. Central Alignment, 7,500 cfs, Intakes A, B, C	34.9	6.6	41.5	0.11%
Alternative 2b. Central Alignment, 3,000 cfs, Intake C	34.9	6.6	41.5	0.11%
Alternative 2c. Central Alignment, 4,500 cfs, Intakes B and C	34.9	6.6	41.5	0.11%
Alternative 3. Eastern Alignment, 6,000 cfs, Intakes B and C	53.1	23.9	77.0	0.21%
Alternative 4a. Eastern Alignment, 7,500 cfs, Intakes A, B, C	53.1	23.9	77.0	0.21%
Alternative 4b. Eastern Alignment, 3,000 cfs, Intake C	53.1	23.9	77.0	0.21%
Alternative 4c. Eastern Alignment, 4,500 cfs, Intakes B and C	53.1	23.9	77.0	0.21%
Alternative 5. Bethany Reservoir Alignment, 6,000 cfs, Intakes B and C	18.2	21.2	39.4	0.11%

cfs = cubic feet per second.
[a] Reflects the percentage of land under Williamson Act contract in the study area that would be affected by construction.

The project would also permanently affect agricultural land under contract within a Farmland Security Zone (Table 15-11). Appendix 15A provides tables that show the differences in permanent impacts on land under contract within a Farmland Security Zone by alternative for individual project features. The central alignment alternatives (Alternatives 1, 2a, 2b, and 2c) would result in permanent conversion of land under contract within a Farmland Security Zone of approximately 35 acres. Each of the alternatives following the eastern alignment (Alternatives 3, 4a, 4b, and 4c) would result in approximately 53 acres of permanent surface impacts on land under contract within a Farmland Security Zone. The Bethany Reservoir alignment (Alternative 5) would result in approximately 18 acres of permanent impacts on land under contract within a Farmland Security Zone. The permanent impacts on land under contract within Farmland Security Zones would be associated with the shaft sites and access roads.

Operations and Maintenance

There are no operations and maintenance impacts associated with any of the alternatives that would result in physical conversion of Important Farmland to nonagricultural uses (refer to Impact AG-3: *Other Impacts on Agriculture as a Result of Constructing and Operating the Water Conveyance Facilities* for analysis regarding impacts that changes in water quality of irrigation water resulting from operation of the proposed water conveyance facilities would have on agricultural resources).

CEQA Conclusion—All Project Alternatives

Construction of the water conveyance facilities would result in temporary and permanent conversion of farmland subject to Williamson Act contract or land under contract within a Farmland Security Zone, which would prevent agricultural operations within these areas.

This conversion of farmland under Williamson Act contract or under contract within a Farmland Security Zone identified in Tables 15-10 and 15-11 largely represents a subset of those impacts previously described under Impact AG-1 regarding conversion of Important Farmland, since most of the agricultural land within the study area is Important Farmland but only a fraction of that land is under Williamson Act contract and a much smaller proportion is under contract in a Farmland Security Zone. Depending on the specific alternative, the total extent of land under Williamson Act contract that would be temporarily or permanently affected ranges from just under 840 acres (Alternative 2b) to just under 1,300 acres (Alternative 4a). Lands under a Williamson Act contract that would be temporarily affected range from around 90 to 110 acres across all alternatives. Project facilities would result in permanent conversion of around 750 acres (Alternative 2b) to just under 1,200 acres (Alternative 4a) of land under Williamson Act contract, with Alternative 5 also around 1,100 acres. The major factor influencing the differences in the extent of affected farmland under Williamson Act contract is the number of intake sites. Alternatives with just one intake (Alternatives 2b, 4b) would have a reduced permanent footprint relative to alternatives with three intakes along the Sacramento River (Alternatives 2a, 4a). Of the land currently under Williamson Act contract, RTM stockpile areas would permanently affect from 15 acres to approximately 290 acres, depending on the alternative; those project alternatives with more intakes and a larger-diameter tunnel are associated with a greater extent of RTM stored on lands under Williamson Act contract.

There is projected to be temporary or permanent conversion of approximately 42 acres of agricultural land under contract within a Farmland Security Zone under the central alignment alternatives (Alternatives 1, 2a, 2b, and 2c); 77 acres of conversion under the eastern alignment alternatives (Alternatives 3, 4a, 4b, and 4c), and 39 acres under the Bethany Reservoir alignment (Alternative 5). The permanent impacts on land under contract with Farmland Security Zone would be associated with the shaft sites and new overhead power transmission lines, while the temporary impacts would result from work associated with geotechnical exploration sites and underground installation of utility lines.

DWR would comply with all applicable provisions of California Government Code Sections 51290–51295 as they pertain to acquiring lands subject to Williamson Act contract. California Government Code Section 51292 requires that public agencies find that the proposed public improvements will not be located within an agricultural preserve based primarily on consideration of the lower cost of acquiring land. However, California Government Code Section 51293 provides certain exemptions to the requirements of Section 51292, including all facilities considered part of the State Water Facilities, as defined in California Water Code Section 12934. As such, since the Delta Conveyance Project constitutes an infrastructure improvement to State Water Facilities, namely, the SWP, the acquisition of agricultural land within the agricultural preserve is exempt from the finding's requirement of Section 51292.

Among the provisions of California Government Code Section 51290 are the following:

> (a) It is the policy of the state to avoid, whenever practicable, the location of any federal, state, or local public improvements and any improvements of public utilities, and the acquisition of land therefor, in agricultural preserves.
>
> (b) It is further the policy of the state that whenever it is necessary to locate such an improvement within an agricultural preserve, the improvement shall, whenever practicable, be located upon land other than land under a contract pursuant to this chapter.

The routing of the tunnel and appurtenant water conveyance facilities has been determined through an exceptionally thorough siting process (Delta Conveyance Design and Construction Authority 2022c:68), and it would be impractical to find other land outside of an agricultural preserve that meets the engineering requirements for all elements of the project buildout, particularly given the significant extent of the agricultural preserves—and more specifically land under active Williamson Act contract—in the Delta (Figure 15-2).

As required by California Government Code Section 51293, DWR would notify the California Department of Conservation within 10 working days following transfer of any title for property necessary to complete the Delta Conveyance Project that is within an agricultural preserve. Furthermore, pursuant to the requirements specified within California Government Code Section 51295, if any land under Williamson Act contract is acquired for the purpose of the Delta Conveyance Project but for which the property is deemed to not be used for construction or operation of the project, those lands would be re-enrolled under a Williamson Act contract.

Although DWR would comply with all relevant and applicable requirements under California Government Code Sections 51290–51295, the project would still result in substantial conversion of lands that are subject to Williamson Act contract or under contract within a Farmland Security Zone. This impact would be considered significant. Mitigation Measure AG-1: *Preserve Agricultural Land* would be available to reduce the extent of the impact. However, the impact would remain significant and unavoidable.

Mitigation Measure AG-1: Preserve Agricultural Land

See description of Mitigation Measure AG-1 under Impact AG-1.

Mitigation Impacts

<u>*Compensatory Mitigation*</u>

Although the CMP described in Appendix 3F does not act as mitigation for impacts on this resource from project construction or operations, implementation of the CMP could result in impacts on this resource as analyzed in this chapter. CEQA requires analysis of the impacts of mitigation and, therefore, this discussion is included here within the chapter.

The compensatory mitigation is expected to offset, in part or in whole, the potential impacts on terrestrial and aquatic biological resources resulting from the construction and operation of the project. The potential implications of these various mitigation projects on agricultural resources are described in more detail under Impact AG-1. The specific habitat mitigation plans are focused on wetlands and other habitats on Bouldin Island, the I-5 ponds (Ponds 6, 7, and 8), and channel margin and tidal wetland habitat in the North Delta Arc, as described in Appendix 3F. None of these areas is subject to an existing Williamson Act contract or situated within a Farmland Security Zone. Farmland conversion associated with tidal wetland restoration is anticipated, some of which could be under an existing Williamson Act contract or situated within a Farmland Security Zone; these effects can only be analyzed at a programmatic level since the amount of tidal habitat mitigation and the location of future tidal habitat mitigation sites have yet to be determined. The criteria used to screen potential sites for tidal wetland mitigation include focusing on sites that are already DWR-owned or publicly owned lands first, reducing the likelihood that the tidal wetland mitigation will result in conversion of lands that are under Williamson Act contract or under contract within a Farmland Security Zone. The potential for channel margin habitat mitigation to result in conversion of lands that are under Williamson Act contract or under contract within a Farmland Security Zone is minimized since the work will be focused on improving fish and wildlife habitat conditions specifically along riverine corridors. Therefore, while the overall impact would remain significant and unavoidable, implementation of the CMP combined with the project alternatives on conversion of land subject to Williamson Act contract or under contract within a Farmland Security Zone would not change the overall impact conclusion.

<u>*Other Mitigation Measures*</u>

Expansion of subsidence reversal and/or carbon sequestration projects on Sherman and Twitchell Islands, required under Mitigation Measure AQ-9: *Develop and Implement a GHG Reduction Plan to Reduce Construction and Net CVP Operational Pumping Emissions to Net Zero* may require conversion of agricultural land to other land uses, such as marshland. Mitigation Measure AG-1: *Preserve Agricultural Land* would reduce the severity of this effect. Further, DWR would, where available and feasible, choose to convert lower-quality farmland or farmland with lower habitat values, rather than convert land subject to Williamson Act contract, land under contract in Farmland Security Zones, or farmland of higher habitat value for subsidence reversal and/or carbon sequestration.

Overall, depending on the feasibility of applying Mitigation Measure AG-1: *Preserve Agricultural Land*, the availability of lower-quality farmland for conversion, and the areal extent of land required, it is possible impacts relating to agricultural land conversion from the construction of compensatory mitigation and implementation of other mitigation measures, combined with project alternatives, would be significant and unavoidable.

15.3.3.3 Impacts of the Project Alternatives on Farmland Productivity

Impact AG-3: Other Impacts on Agriculture as a Result of Constructing and Operating the Water Conveyance Facilities Prompting Conversion of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance

All Project Alternatives

Project Construction

Construction of the water conveyance facilities was analyzed to determine if it would indirectly affect agriculture by altering the elevation of the groundwater within portions of the study area. The nature of these effects is discussed in more detail in Chapter 8, *Groundwater*. Areas in which crop roots are exposed to a surplus of water could result in root rot, potentially compromising the viability of those crops. Localized effects related to dewatering activities would be minimized through the placement of seepage cutoff walls at the north Delta intake locations and the Southern Forebay. These design considerations would minimize the effect of changes in groundwater elevations on adjacent properties, including farmland. Modeling outputs from the DeltaGW reveal no groundwater elevation changes in excess of 5 feet occurred in more than 5% of simulated months for any of the assessed alternatives. The modeling also indicates that groundwater supply wells would be largely unaffected by changes in groundwater elevation, with approximately only 2% of identified wells in the study area experiencing more than 5 feet drops in elevation, and no wells expected to undergo a 10-foot drop in groundwater levels. Groundwater monitoring would occur during project construction to provide real-time feedback on groundwater conditions, allowing for modifications to groundwater extraction and recharge to minimize effects on nearby agricultural operators. The various field investigations conducted during the preconstruction and construction phases involving hydrogeologic sampling and other construction test projects would be used to more specifically identify the appropriate groundwater monitoring programs that could be extended in the construction phase. Given the minimal changes to groundwater elevations projected by the modeling, the net effect of project construction on groundwater levels would not prevent agricultural uses on neighboring properties mapped as Important Farmland.

Temporary construction activities and permanent effects of construction of water conveyance facilities can create conflicts with existing agricultural infrastructure, including irrigation and drainage features. Construction activities requiring excavation or use of land where irrigation canals are situated could temporarily disrupt the delivery of water to crops during the period of construction, which would negatively affect conditions for effective agricultural operations. Similarly, construction work that results in an existing agricultural drainage facility becoming disconnected could cause localized conditions of excessive soil saturation levels that can inhibit crop growth and yield. The project design was sited in such a way to avoid interference with any known local agricultural infrastructure, such as irrigation intakes or irrigation canals. Some irrigation and drainage systems that may serve parcels that would be acquired for the project could also service parcels adjacent to the construction footprint. During the design phase, when the project can acquire access to specific parcels, these facilities would be mapped for each site.

In order to provide adequate power for construction and future operation of the water conveyance facilities, some new aboveground power towers with high-voltage lines would be erected to extend service to specific areas within the construction footprint, in the southern portion of the alignment in the general vicinity of Clifton Court Forebay (see Chapter 3, *Description of the Proposed Project* *and Alternatives*, Figure 3-13). Depending on site-specific parameters, new power lines would be installed underground or colocated with existing power line alignments. Aboveground high voltage lines can affect crop-dusting operations, which typically involve flying aircraft relatively low to the ground. Since crop-dusting commonly occurs in close proximity to overhead transmission lines and aircraft pilots have learned to adjust, the presence of additional high-voltage power towers and lines within the study area adjacent to actively farmed land is not expected to trigger conversion of those areas to a nonagricultural use. Appendix 15B, *Agricultural and Land Stewardship Considerations*, describes the outreach made by the Delta Conveyance Design and Construction Authority through the Stakeholder Engagement Committee. The Stakeholder Engagement Committee provided a forum for interested parties in the Delta to provide feedback on conceptual project designs and ways to minimize the effects of the project buildout on a broad array of considerations, including minimizing disturbances to farmland and agricultural operations. Over the course of the conceptual project design development, major design considerations were implemented as an effort to minimize effects on the Delta communities during construction of the Delta Conveyance Project, as summarized in Appendix 15B.

Operations and Maintenance

Operation of the proposed new water conveyance facilities was analyzed to determine if it would indirectly affect agricultural production by altering the quality of irrigation water in portions of the study area. Crops generally have varying degrees of tolerance to water salinity, which can vary by growth stage. Excessive soil salinity can result in seedling mortality, reduced plant growth rates, and reduced yields. Applicable water quality objectives for EC in the Delta are included in the *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary* (Bay-Delta WQCP) (State Water Resources Control Board 2018:12–13). The Bay-Delta WQCP defines EC objectives for the protection of agricultural beneficial uses that vary by location, month, and water year type. For example, the State Water Resources Control Board based the southern Delta EC objectives for the protection of agricultural beneficial uses on the calculated maximum salinity of applied water that sustained 100% yields of two important crops grown in the southern Delta: beans and alfalfa (State Water Resources Control Board 2012:4–2). As shown previously in Table 15-5, beans are particularly sensitive to salinity, with declines in yield due to irrigation water salinity triggering at a lower threshold than other common Delta crops. Table 9G-3 in Appendix 9G, *Electrical Conductivity*, provides an overview of the EC objectives for protection of agriculture set in the Bay-Delta WQCP for various locations within the Delta including: Sacramento River at Emmaton, San Joaquin River at Jersey Point, South Fork Mokelumne River at Terminous, San Joaquin River at San Andreas Landing, San Joaquin River at Airport Way Bridge, Vernalis, San Joaquin River from Vernalis to Brandt Bridge, Middle River from Old River to Victoria Canal, Old River/Grant Line Canal from Head of Old River to West Canal, West Canal at mouth of Clifton Court Forebay, and Delta-Mendota Canal at Jones Pumping Plant.

Water quality modeling for the project indicates that the operation of the new water conveyance facilities would modestly increase salinity, as measured by EC, relative to existing conditions at various locations within the study area. Appendix 15C, *Agricultural Resources 2040 Analysis*, summarizes how operation of project facilities would affect EC when considering a future 2040 baseline scenario. The amount of change varies by location, along with other factors such as time of year and water year type. For example, at the San Joaquin River at Jersey Point, in March through September, monthly average EC levels is projected to increase by a small amount—9 micromhos per centimeter (μmhos/cm) or less under Alternatives 1 and 3. EC levels would increase slightly more during the other months of the year, compared to existing conditions; however, this period largely resides outside the normal irrigation period for most crops grown in the Delta. Under Alternatives 2a, 2b, 2c, 4a, 4b, 4c, and 5, the changes in EC levels, relative to existing conditions, would have a similar seasonal pattern and magnitude to those that would occur under Alternatives 1 and 3 for San Joaquin River at Jersey Point. In the San Joaquin River at Vernalis and Brandt Bridge, Old River at Middle River and Tracy Bridge, Steamboat Slough, and South Fork Mokelumne at Terminous, little change in monthly average EC levels would occur under any of the alternatives, relative to existing conditions, regardless of water year type. The increase in monthly average EC would generally be around 2 µmhos/cm or less. In the Sacramento River at Emmaton location, the modeling projects that on a long-term average basis, monthly average EC levels would increase by up to about 12%, relative to existing conditions. During the February–August period, the increase in monthly average EC would be 19 µmhos/cm or less at these locations for the simulated period under Alternatives 1 and 3. During certain months in the fall, median EC levels would increase substantially under these alternatives. For September specifically during below normal water year types, it is projected that median average monthly EC under Alternatives 1 and 3 would increase from 2,294 µmhos/cm to 2,796 µmhos/cm, an increase of 22%. September generally represents the tail end of the typical irrigation season in the Delta, although it is around this time of year new alfalfa fields are planted and irrigated to prompt germination and seedling growth. The anticipated increase in EC levels in late summer to early fall largely reflects the lapse in the Bay-Delta WQCP protective standards for agricultural beneficial uses, which end in mid-August. Under Alternatives 2a, 2b, 2c, 4a, 4b, 4c, and 5, the changes in EC levels, relative to existing conditions, would have a similar seasonal pattern and magnitude to those that would occur under Alternatives 1 and 3 for Sacramento River at Emmaton. As described in Chapter 9, *Water Quality*, the anticipated level of EC for irrigation water in the western Delta could exceed the tolerance level of some of the types of salt-sensitive crops grown in the Delta (e.g., fruits and vegetables) more frequently under below normal water year types, meaning that there is a potential that crop yields could decline. These changes though are not expected to result in conversion of agricultural land to nonagricultural use (e.g., long-term fallowing). Many of the crops grown in the Delta are harvested before the early fall, greatly minimizing the potential that irrigation water with increased levels of EC modeled to occur in the fall under certain conditions of project operations would be applied on cropland. Growers in the western Delta are accustomed to conditions where Delta waters are more prone to be saline, as evidenced by the fact that much of the western Delta is managed in pasture (see Figure 15-1), which are much more tolerant of salinity than the fruit and vegetable crops grown in the northern Delta. Also, the natural interannual variability in Delta outflows would remain a much larger driver of EC levels in the western Delta than the modeled changes resulting from project-related intake operations. Given these considerations, changes in the level of salinity in the western Delta under the project are not expected to result in exceedance of any significance thresholds for this chapter because it is not anticipated that these changes specifically would trigger a substantial conversion of Important Farmland to nonagricultural use.

CEQA Conclusion—All Project Alternatives

Construction and operation of the project's water conveyance facilities could indirectly affect agriculture within the study area through changes in groundwater elevation in localized areas affecting crop yields, disruption of agricultural infrastructure such as irrigation and drainage facilities, and operation-related changes in salinity affecting the water quality of irrigation water applied to crops. The potential for impacts resulting from changes in groundwater elevations during construction and operation would be minimized by design elements such placement of seepage cutoff wall placements around the north Delta intakes and the Southern Forebay, where such issues are most likely to arise. Implementation of these design elements to prevent changes in groundwater elevations that may affect neighboring properties, including farmland, would be tracked through groundwater monitoring programs. Furthermore, with Mitigation Measure GW-1: *Maintain Groundwater Supplies in Affected Areas*, identified in Chapter 8, the effects of temporary dewatering associated with the project are not anticipated to adversely disrupt agricultural operations in the vicinity of the intake sites or the Southern Forebay that would result in conversion of Important Farmland to nonagricultural use.

Operation of the project's water conveyance facilities would alter salinity regimes relative to existing conditions in the western Delta. Operation of the project would remain in compliance with all water quality standards set by the State Water Resources Control Board to be protective of Delta agricultural beneficial uses. None of the modeled changes to salinity during the times of year when the Bay-Delta WQCP does not identify EC targets for agricultural beneficial uses (i.e., post August 15) would be expected to trigger a substantial conversion of Important Farmland to nonagricultural use.

DWR considered how construction work for the project could affect local infrastructure supporting agricultural properties, including drainage and irrigation facilities. Such disruptions could result in the areas serviced by this infrastructure being fallowed. During project planning, known infrastructure used to serve agricultural properties were avoided to the greatest extent possible; however, the presence of additional infrastructure (e.g., buried pipelines that are not visible on aerial imagery and not identified in publicly available maps) may be revealed during future site level investigations. Although these disruptions may last only for the duration of project construction activity at a particular work area, such disruptions may persist for 7 to 15 years, depending on the facility being constructed. The effect would be permanent if the disruption to the infrastructure remains after construction is complete. This impact would be potentially significant. Mitigation Measure AG-3: *Replacement or Relocation of Affected Infrastructure Supporting Agricultural Properties* would require that any agricultural infrastructure that is disrupted by construction activities would be relocated or replaced to support continued agricultural activities; otherwise, the affected landowner would be fully compensated for any financial losses resulting from the disruption. The impact would be less than significant with mitigation.

Mitigation Measure AG-3: Replacement or Relocation of Affected Infrastructure Supporting Agricultural Properties

1. To the extent feasible, project designs will be modified to avoid any conflicts with irrigation or drainage infrastructure servicing farmland located outside the construction footprint for the project. DWR will consult with the neighboring landowners and agricultural operators to require that construction of the project facilities adequately avoids the impact on agricultural infrastructure servicing their properties, based on their understanding of local site conditions. If such impacts cannot be avoided through a redesign of local project design elements, DWR will implement at least one of the following options:

    - Provide new water wells until diversion connection is reestablished.
    - Relocate and/or replace wells, pipelines, power lines, drainage systems and other infrastructure that are needed to support ongoing agricultural uses.

    In the event that none of the above options is feasible, as part of a negotiated settlement process, DWR will compensate owners for production losses attributable to reductions in water supply from affected diversions, losses associated with disruption in drainage facilities, and losses associated with other infrastructure disruptions.

Mitigation Impacts

Compensatory Mitigation

Although the CMP described in Appendix 3F does not act as mitigation for impacts on this resource from project construction or operations, implementation of the CMP could result in impacts on this resource as analyzed in this chapter. CEQA requires analysis of the impacts of mitigation and, therefore, this discussion is included here within the chapter.

Compensatory mitigation would result in the creation of wetlands and other habitat at Boudin Island, the three I-5 ponds (Ponds 6, 7, and 8), and tidal wetland and channel margin habitat in the North Delta Arc and would not present substantial sources of EC to receiving waters relative to existing conditions and tidal influences. Therefore, these habitat areas would not be expected to have an effect on salinity levels of irrigation water used for croplands.

Tidal and seasonal wetland restoration may increase the potential for increased seepage onto neighboring agricultural properties as previously dry upland areas are converted or restored back to wetland conditions. DWR would implement the relevant mitigation measures identified in Chapter 8 to ameliorate any negative effects from seepage associated with compensatory mitigation.

Temporary increased construction traffic associated with the buildout of the habitat restoration sites at the I-5 ponds and Bouldin Island would be addressed by the mitigation measures presented in Chapter 20, *Transportation*. The level of traffic increases associated with implementation of the CMP is expected to be much smaller than the construction of the water conveyances facilities components of the project.

The habitat design plans for the I-5 ponds and Bouldin Island were developed to avoid impacts on drainage and irrigation infrastructure supporting neighboring farmland. In particular, the CMP for Bouldin Island was meant to preserve as much of the existing agricultural operations on the island as possible. The CMP is described in detail in Appendix 3F. Therefore, implementation of compensatory mitigation would not change the overall impact conclusion of less than significant with mitigation.

Other Mitigation Measures

Impacts from other mitigation measures proposed are accounted for and discussed in Impact AG-1 and Impact AG-2. No additional impacts on agricultural resources would result from other mitigation measures under Impact AG-3. Overall, construction of compensatory mitigation and implementation of other mitigation measures, combined with project alternatives, would be designed to avoid farmland as much as feasible and would not change the less-than-significant impact conclusion.

15.3.4 Cumulative Analysis

The cumulative impact analysis considers a representative list of those projects that could affect agricultural resources and, when appropriate, in the same timeframe as the alternatives of the Delta Conveyance Project, result in a cumulative impact (Table 15-12). The list of projects presented in

Table 15-12 is not meant to be exhaustive; however, it provides context for the general range and types of projects that would be implemented concurrently with the Delta Conveyance Project, which are anticipated to also directly affect agricultural resources within the study area. Agricultural resources are expected to change as a result of past, present, and reasonably foreseeable future projects related to population growth and changes in economic activity in the study area in combination with any one of the project alternatives or the No Project Alternative. It is anticipated that some changes related to agriculture, including conversion of Important Farmland and land subject to Williamson Act contract or under contract in Farmland Security Zones, would take place, even assuming that reasonably foreseeable future projects would be designed to avoid such impacts to the extent feasible.

Table 15-12. Cumulative Impacts on Agricultural Resources from Plans, Policies, and Programs

Program/Project	Agency	Status	Description of Program/Project	Impacts on Agriculture
Lookout Slough Tidal Habitat Restoration	DWR	Planning phase	Tidal marsh restoration	Results in permanent conversion of 1,460-acre of Prime Farmland. Mitigation associated with the project would result in enhancing farmland quality on a nearby property to Prime Farmland quality.
Dutch Slough Tidal Marsh Restoration Project	DWR	Ongoing	Tidal marsh restoration	The project would result in the loss of approximately 920 acres of farmland due to conversion to open water, marsh, and upland habitat types for wildlife species.
City of Antioch Brackish Water Desalination Project	City of Antioch	Planning phase	Water supply project for the City of Antioch	No significant direct impact on irrigation water quality for Delta agricultural water users.
Lower Yolo Ranch Restoration Project	Westlands Water District	Planning phase	Tidal marsh restoration	Results in permanent conversion of approximately 230 acres of Important Farmland.
Three Creeks Parkway Restoration Project	Contra Costa County Flood Control and Water Conservation District	Planning phase	Riparian restoration along an approximately 4,000-linear-foot section of Marsh Creek	There would be no impact on Important Farmland.
Winter Island Tidal Habitat Restoration Project	DWR	Planning phase	Tidal marsh restoration	There would be no impact on Important Farmland. The Farmland Mapping and Monitoring Program designated the project footprint as “other land.”
Grizzly Slough Floodplain Restoration Project at the Cosumnes River Preserve	DWR	Planning phase	Seasonal floodplain restoration	Less-than-significant impacts on agricultural land with mitigation incorporated. Mitigation would involve a conservation easement agreement on Staten Island to require protection of agricultural land.

Program/Project	Agency	Status	Description of Program/Project	Impacts on Agriculture
McCormack-Williamson Tract Flood Control and Ecosystem Restoration Project	DWR	Planning phase	Tidal marsh restoration	Less-than-significant impacts on agricultural land with mitigation incorporated. Mitigation would involve a conservation easement agreement on Staten Island to require protection of agricultural land.

DWR = California Department of Water Resources.

15.3.4.1 Cumulative Impacts of the No Project Alternative on Agricultural Resources

The projects and programs implemented in the Delta under the No Project Alternative in combination with the past, present, and probable future projects in the study area (Table 15-12) could result in conversion of agricultural land, including Important Farmland, farmland subject to Williamson Act contract or under contract in a Farmland Security Zone, to nonagricultural use. For example, construction on land that is currently designated as Important Farmland would result in a net loss of Important Farmland within the study area. Both types of projects assumed under the No Project Alternative (large water supply projects or habitat restoration projects) have the potential to convert existing farmland within the study area. The actual amount of agricultural land that may be converted by other projects is not known.

15.3.4.2 Cumulative Impacts of the Project Alternatives on Agricultural Resources

The foreseeable projects listed in Table 15-12 and evaluated for consideration of cumulative impacts include projects that would convert agricultural lands to nonagricultural uses or affect agricultural operations in some manner (e.g., affecting irrigation water quality). The Delta Conveyance Project, when considered in conjunction with these other projects that would affect agricultural resources within the study area, would result in a conversion of Important Farmland and land that is subject to Williamson Act contract or under contract in a Farmland Security Zone to nonagricultural use. Agricultural land conversion within the study area would largely result from urban expansion within the study area under City of Stockton's General Plan along with habitat restoration projects, water supply projects, and flood risk reduction projects. While the amounts of land that may be converted in the future under the foreseeable projects listed in Table 15-12 cannot be precisely determined at this time, in combination with any of the alternatives for the project, they are expected to result in a significant cumulative impact because the acreage of Important Farmland and land that is subject to Williamson Act contract or under contract in a Farmland Security Zone that would be lost throughout the Delta would be substantial. Furthermore, the contribution of any of the project's alternatives on the temporary or permanent conversion of Important Farmland and land that is subject to Williamson Act contract or under contract in a Farmland Security Zone—which at a minimum would be approximately 2,400 acres—is considered a cumulatively considerable impact.