

Chapter 10

Agriculture and Important Farmland

10.1 Affected Environment

This section describes the affected environment related to existing agricultural land uses, Important Farmland, Williamson Act contract lands, and forest resources in the primary and extended study areas. See Chapter 12, “Botanical Resources and Wetlands,” for detailed definitions of forest land habitats and Chapter 13, “Wildlife Resources,” for a discussion of the relationship between agricultural land uses and wildlife uses. See Chapter 17, “Land Use and Planning,” for a discussion of existing land uses within the primary and extended study areas and the project’s consistency with existing land uses.

10.1.1 Agriculture

Shasta Lake and Vicinity

The setting for agricultural resources in the Shasta Lake and vicinity portion of the primary study area consists of areas in Shasta County north of Shasta Dam, including lands surrounding the lake, that would be subject to inundation and areas where infrastructure would be removed, modified, or relocated under the five action alternatives.

Shasta Lake is surrounded by mountainous and rugged terrain. There are no known agricultural uses adjacent to the lake or in its immediate vicinity above Shasta Dam.

Upper Sacramento River (Shasta Dam to Red Bluff)

The upper Sacramento River portion of the primary study area consists of the portion of Shasta County south of Shasta Dam and downstream to Red Bluff in Tehama County. The valleys of the Sacramento River and its tributaries (Churn, Cottonwood, Anderson, Stillwater, Cow, Bear, Battle, and Clover creeks) contain some of the most productive agricultural land in Shasta and Tehama counties. In addition to the high quality of their soils, agricultural lands in this area enjoy a long growing season of 172 to 205 days. Water from the Anderson-Cottonwood Irrigation District (ACID), surface diversions of streams, or groundwater is available and good transportation access exists (Shasta County 2004). As of 2007, Shasta County’s 1,473 farms encompassed a total of almost 390,812 acres and Tehama County’s 1,752 farms were located on 532,206 acres (USDA 2007a, 2007b). About 253,000 acres of Important Farmland are located in the Sacramento River corridor between Shasta Dam and the Red Bluff

1 Pumping Plant. Please see Section 10.1.2, “Important Farmland,” below for
2 further discussion.

3 The majority of agricultural activity is located on the Sacramento Valley floor
4 in the south-central portion of Shasta County and across central Tehama
5 County. Small pockets of pastureland exist throughout Shasta County, including
6 mountainous regions. Based on production value, the largest use of agricultural
7 land in Shasta County is field crops, followed by livestock (Shasta County
8 2011). Nursery stock is the third largest use. Approximately 13 percent of
9 Shasta County land is devoted to some type of agricultural use.

10 Agricultural uses in the Tehama County portion of the Sacramento Valley
11 consist mostly of orchard and nursery plant operations. The primary crops of
12 Tehama County orchards are walnuts, prunes, almonds, and olives. These crops
13 are largely concentrated in the floodplain alongside the Sacramento River
14 (within and below the upper Sacramento River portion of the primary study
15 area) and are irrigated with groundwater, as well as surface water from local
16 creek diversions and the Sacramento River.

17 A drastic increase in orchard acreage has occurred since orchard production was
18 initially reported by the National Agricultural Statistics Service in 1930. A
19 combination of factors is responsible for this increase: the availability of
20 irrigation water, advances in irrigation technologies, relatively good commodity
21 prices for orchard crops, and the availability of processing facilities.

22 The upper Sacramento River portion of the primary study area (areas below
23 Shasta Dam) is largely serviced by ACID. ACID’s service area of
24 approximately 32,000 acres extends south from the city of Redding in Shasta
25 County into northern Tehama County. ACID does not provide water for
26 municipal and industrial uses in these areas. Approximately 90 percent of
27 ACID’s customers irrigate pasture for haying or livestock; however, in most of
28 the river corridor the water is used to irrigate orchard and other food crops. In
29 total, ACID’s service area accounts for about two-thirds of all irrigated pasture
30 in the Redding basin.

31 ACID uses a rotation schedule to deliver irrigation water to its customers. Very
32 little groundwater is used within the district for agricultural purposes, except
33 occasionally during drought years. Water requirements are typically highest
34 during summer (June, July, and August) because of the area’s hot, dry climate.
35 A groundwater management program is being developed; by 2005, 12 dual-
36 completion groundwater monitoring wells had been installed within ACID
37 boundaries. The small portion of groundwater used is limited primarily to
38 deciduous crops and is pumped by privately owned wells. ACID’s facilities and
39 irrigation are important contributors to groundwater recharge in the Redding
40 basin. Annual seepage associated with the ACID Main Canal is estimated to be
41 approximately 44 thousand acre-feet (TAF).

1 Agricultural use within ACID’s service area is primarily pasture, in addition to
2 alfalfa and some deciduous orchard crops. Pasture use is typically in the range
3 of 75 percent of the total crop mix served by ACID. Annual cropping patterns
4 have not varied substantially since the mid-1970s. Therefore, associated on-
5 field water requirements and diversions for crops have been more a function of
6 water-year type and climate than changes in cropping.

7 Agriculture thus accounts for an important segment of the economic base of
8 Shasta and Tehama counties. In 2011, for example, the total market value of
9 farm products in Shasta County was \$76,328,000, a slight increase from the
10 \$70,760,000 produced in 2010. Minor increases in the annual production value
11 of orchard crops and apiary products accounted for this increase. Field crops
12 accounted for nearly 46 percent of this total, with livestock sales providing
13 nearly one-third (32.2 percent) of the county’s total agricultural production
14 value. In 2010 Shasta County ranked only 37th among the 58 California
15 counties in the value of total agricultural production – \$110,283,000, as reported
16 by the California Department of Food and Agriculture (Shasta County 2011).

17 In addition to its economic contribution, the agriculture industry is in large part
18 responsible for the rural character of Shasta and Tehama counties. Farmland can
19 also play an important role in the support of wildlife values through the effects
20 it has on conservation of wildlife habitats. As more farmland is developed for
21 urban and suburban uses, the available habitat for most field and woodland edge
22 species decreases, resulting in a subsequent decline in or potential elimination
23 of their populations. Agricultural lands also provide productive, privately
24 maintained open space that contributes to the open, natural landscape of much
25 of Shasta and Tehama counties.

26 ***Lower Sacramento River and Delta***

27 The Sacramento River below the Red Bluff Pumping Plant and the river’s
28 tributaries continue to provide water to crops grown in the river’s floodplain and
29 the valley floor, which broadens as it expands into the Central Valley. The
30 Sacramento River crosses Tehama, Butte, Glenn, Colusa, Sutter, Yolo, and
31 Sacramento counties and is an important source of water for the irrigation and
32 agricultural districts in those counties.

33 California’s Central Valley is home to more than 4 million people; agriculture is
34 the most important segment of the region’s robust economy. The Sacramento
35 and San Joaquin river basins provide drinking water for more than two-thirds of
36 Californians and irrigation water for California’s crops. The availability of
37 irrigation water makes the Central Valley a major source of reliable, high-
38 quality crops, such as almonds, walnuts, grapes, tomatoes, rice, and other
39 orchard, vineyard, and field crops, marketed to the nation and the world
40 (Reclamation and DWR 2005; DWR and Reclamation 2006).

1 As of 2007, California’s 81,033 farms included a total of 25.4 million acres
2 (USDA 2007c). Of that acreage, the Sacramento Valley had more than 11,000
3 farms with about 4.3 million acres. Sacramento Valley portions of the Central
4 Valley’s watersheds support a wide variety of agricultural uses, including
5 livestock grazing, irrigated grain and vegetable crops, and orchards (DWR and
6 Reclamation 2006).

7 Most agricultural water demands in the Sacramento Valley are met in average
8 water years. Farmers have been growing more crops per acre-foot of applied
9 water by improving productivity and efficiency. However, in some areas, water
10 sources once used for agriculture are now used for urban needs, environmental
11 restoration, and groundwater replenishment. During droughts, water supplies
12 are less reliable, heightening competition and at times leading to conflicts
13 among water users. Water quality is degraded, making it difficult and costly to
14 make the water drinkable. Irrigated agriculture and related businesses are
15 adversely affected, in turn affecting California’s economy. During droughts,
16 groundwater levels decline, pumping costs increase, and many rural residents
17 who depend on small water systems or wells run short of water (DWR and
18 Reclamation 2006).

19 Table 10-1 provides examples of water supply distribution among uses in recent
20 wet, above-normal, and dry years.¹ Delta agricultural lands were “reclaimed”
21 when levees were constructed and marshy areas were drained. In less than 100
22 years, from 1850 to 1930, hundreds of thousands of acres of land went into
23 agricultural production. Historically, asparagus, corn, alfalfa, and sugar beets
24 were the Delta’s dominant crops. However, a wide variety of crops have been
25 grown in the Delta. In 2008, the Delta’s main crops were corn, alfalfa, tomatoes,
26 and wine grapes (DWR 2009).

27

¹ Throughout this document, water year types are defined according to the Sacramento Valley Index Water Year Hydrologic Classification unless specified otherwise.

Table 10-1. California Water Balance Summary for Wet, Above-Normal, and Dry Years

Category	State Summary (MAF)			Sacramento River (TAF)			San Joaquin River (TAF)		
	1998 (171%) ^a	2000 (97%) ^a	2001 (72%) ^a	1998 (168%) ^a	2000 (105%) ^a	2001 (67%) ^a	1998 (171%) ^a	2000 (97%) ^a	2001 (72%) ^a
Total Supply (Precipitation and Imports)	336.9	194.7	145.5	90,351	58,217	36,564	40,727	28,497	20,010
Total Uses, Outflows, and Evaporation	331.1	200.5	159.8	86,859	59,469	40,124	38,922	28,527	22,707
Net Storage Changes in State	5.8	-5.8	-14.3	3,492	-1,252	-3,560	1,805	-30	-2,697
Distribution of Dedicated Supply (Includes Reuse) to Various Applied Water Uses									
Urban Uses	7.8	8.9	8.6	727.3	859.6	877.2	562.5	594.0	622.8
	(8%)	(11%)	(13%)	(3%)	(4%)	(5%)	(5%)	(5%)	(6%)
Agricultural Uses	27.3	34.2	33.7	6,458.2	8,713.9	8,567.1	5,458.1	7,034.1	7,154.2
	(29%)	(41%)	(52%)	(27%)	(38%)	(45%)	(47%)	(57%)	(67%)
Environmental Water ^b	59.4	39.4	22.5	16,397.8	13,487.6	9,587.7	5,604.5	4,637.1	2,930.1
	(63%)	(48%)	(35%)	(70%)	(58%)	(50%)	(48%)	(38%)	(27%)
Total Dedicated Supply	94.5	82.5	64.8	23,583.3	23,061.1	19,032.0	11,625.1	12,265.2	10,707.1

Source: DWR and Reclamation 2006

Notes:

^a Percentage of normal precipitation. Water year 1998 was classified as a wet water year; 2000 was an above-normal water year; 2001 was a dry water year.

^b Environmental water includes instream flows, wild and scenic river flows, required Delta outflow, and managed wetlands water use. Some environmental water is reused by agricultural and urban water users.

Key:

DWR = California Department of Water Resources

MAF = million acre-feet

Reclamation = U.S. Department of Interior, Bureau of Reclamation

TAF = thousand acre-feet

1 **CVP/SWP Service Areas**

2 The CVP is the largest water storage and delivery system in California,
3 covering 29 of the state’s 58 counties. Operated by Reclamation, the CVP
4 consists of 21 reservoirs capable of storing 12 million acre-feet of water, 11
5 powerplants, 500 miles of major canals and aqueducts, and many tunnels,
6 conduits, and power transmission lines. The CVP irrigates about 3.25 million
7 acres of farmland and supplies water to more than 2 million people through
8 more than 250 water districts, individuals, and companies through water service
9 contracts, Sacramento River water rights, and San Joaquin River exchange
10 contracts. Most of the CVP service area is inside the Central Valley. About 90
11 percent of the south-of-Delta contractual delivery is for agricultural uses
12 (Reclamation 2007).

13 The CVP plays a key role in California’s economy, providing water for 6 of the
14 top 10 agricultural counties in the nation’s top farming state. The CVP provides
15 about 5 million acre-feet of water for farms, which is enough to irrigate about 3
16 million acres, or approximately one-third of the agricultural land in California
17 (Reclamation 2009).

18 Most of the population of the CVP service area is concentrated in urban areas.
19 The CVP service area includes various municipal and industrial water
20 contractors and water districts that serve portions of the Sacramento and
21 Stockton metropolitan areas and the San Francisco Bay Area (Reclamation
22 2007).

23 Outside of the fast-growing population centers, most of the CVP service area is
24 rural, with irrigated agriculture being the predominant land use and driver of the
25 local and regional economies (Reclamation 2007). As California’s population
26 continues to grow at a notable pace, water and power supplies have become
27 more scarce and expensive; as a result, existing supplies have become more
28 valuable.

29 Through contracts with 29 water agencies, the SWP provides water to Butte,
30 Solano, Kings, and Kern counties in the Central Valley; to several Southern
31 California counties; to Alameda and Santa Clara counties in the south San
32 Francisco Bay Area; and to Napa and Solano counties in the north San
33 Francisco Bay Area. In addition, the SWP provides water rights deliveries to
34 water rights holders along the Feather River (Butte and Plumas counties). Of the
35 total water delivered throughout California, the SWP provides water to about
36 600,000 acres of farmland. The SWP supplies about 10 percent of the total
37 agricultural water used in the extended study area (DWR 2011).

38 Local surface water supplies (those not delivered by either the CVP or SWP)
39 provide about 40 percent of all agricultural water used in the extended study
40 area. More local surface water supplies are available on the east side of the
41 valley because of the larger amount of precipitation in the Sierra Nevada.
42 Locally owned water projects are especially important on the Yuba, Stanislaus,

1 Tuolumne, Kings, and Merced rivers; but local sources on the west side, such as
2 the Federal Solano Project, also are important.

3 As surface water flows through the San Joaquin Valley, numerous turnouts
4 convey the water to farmland within the service areas of the SWP and CVP. The
5 remaining water conveyed by the California Aqueduct is delivered to Southern
6 California, home to about two-thirds of California's population (DWR 2011).

7 Groundwater provides an important supply of water for agriculture in normal
8 years and often is used to reduce or eliminate shortages of surface water
9 supplies during drought years. On average, groundwater provides about 20
10 percent of the total agricultural water used in the extended study area. Declining
11 groundwater tables, subsidence, and loss of aquifer storage continue to be costly
12 problems, particularly in the western and southern parts of the San Joaquin
13 River region and the San Francisco Bay region, where less surface water is
14 available.

15 **10.1.2 Important Farmland**

16 Important Farmland is classified by the California Department of Conservation
17 (DOC) as Prime Farmland, Farmland of Statewide Importance, Unique
18 Farmland, and Farmland of Local Importance (see Section 10.2, "Regulatory
19 Framework," for further discussion). The following discussion of Important
20 Farmland is derived from DOC's *California Farmland Conversion Report*
21 *2006–2008*, published in January 2011 (DOC 2011).

22 In 2008, DOC estimated that California had approximately 31.6 million acres of
23 agricultural land, of which approximately 12.4 million acres were identified as
24 Important Farmland and 19.2 million acres were identified as Grazing Land.
25 During the 12 biennial reporting cycles since DOC's Farmland Mapping and
26 Monitoring Program (FMMP) was established, more than 1.3 million acres of
27 agricultural land in California have been converted to nonagricultural purposes.

28 Losses of irrigated farmland (Prime Farmland, Farmland of Statewide
29 Importance, and Unique Farmland) have accelerated, as shown in recent updates
30 to Important Farmland maps. Irrigated farmland decreased by 203,000 acres in
31 2008, a 30 percent greater decrease than in 2006. Idling of irrigated farmland
32 became a major factor in 2008, exceeding the effect of urbanization for the first
33 time in FMMP history. Losses of irrigated farmland have resulted in part from
34 two factors: (1) drought-related reductions in water supply and
35 (2) reclassification to Grazing Land or Farmland of Local Importance of those
36 lands left idle for three or more update cycles, some of which may have been
37 idled in anticipation of development.

38 Urban development decreased by 29 percent relative to the 2004–2006 period
39 and the 2008 urbanization rate was the lowest rate recorded since the late 1990s.
40 Nonetheless, between 2006 and 2008, 72,300 acres of agricultural land in the
41 state were lost to urbanization, with irrigated farmland making up 20,400 acres,

1 or 28 percent of all new urban land. Housing developments were the most
2 frequent and largest category of newly urbanized land. The increase was
3 associated mostly with construction of single-family homes at the periphery of
4 existing cities, and to a lesser degree, with construction of apartment complexes.
5 Retail and commercial developments and community infrastructure supporting
6 new residential development also contributed substantially to urbanization.

7 The vast majority of the Important Farmland in California is located in the
8 Central Valley, fed by the Sacramento and San Joaquin rivers and their
9 tributaries.

10 ***Shasta Lake and Vicinity***

11 According to the Shasta County Important Farmland map, published by DOC's
12 Division of Land Resource Protection, no lands adjacent to Shasta Lake or in
13 the immediate vicinity above Shasta Dam are designated as Important Farmland
14 (Figure 10-1).

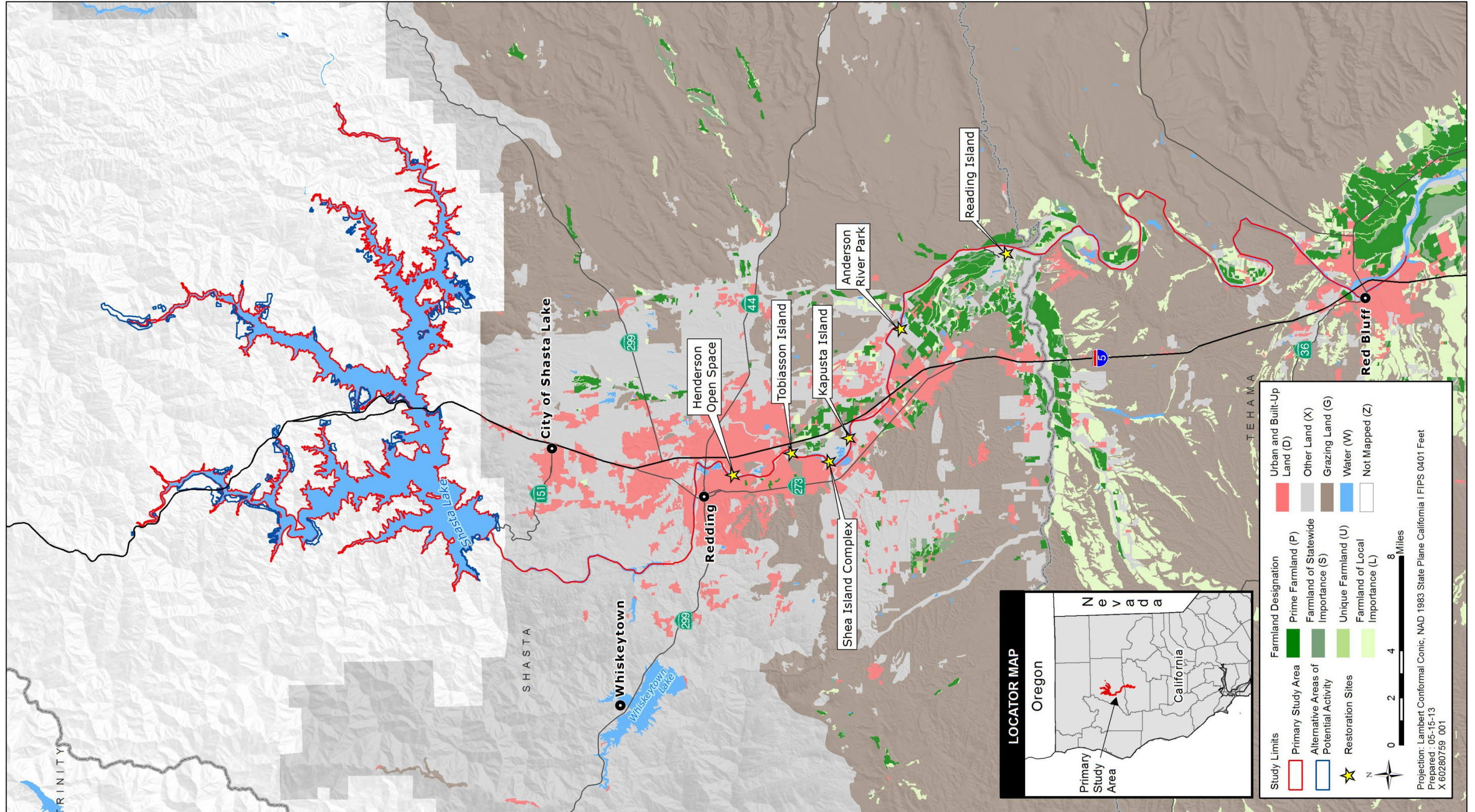


Figure 10-1. Important Farmland in the Primary Study Area

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Upper Sacramento River (Shasta Dam to Red Bluff)

The majority of Important Farmland in the primary study area is clustered in the former floodplain of the Sacramento River. As of 2008, Shasta County had 22,191 acres and Tehama County had 230,932 acres of Important Farmland (Table 10-2). The sites designated by two SLWRI alternatives, CP4 and CP5, as potential restoration sites and potential gravel augmentation sites are not located on Important Farmland.

Table 10-2. Acreage of Important Farmland in Shasta and Tehama Counties

Important Farmland Category	Shasta County	Tehama County	Total
Prime Farmland	12,290	63,037	75,327
Farmland of Statewide Importance	3,288	17,232	20,520
Unique Farmland	510	18,055	18,565
Farmland of Local Importance	6,103	132,608	138,711
Total	22,191	230,932	253,123

Source: DOC 2011

Key:

DOC = California Department of Conservation

According to the Important Farmland maps for Shasta and Tehama counties, the primary study area includes 432 acres of Important Farmland. Of this total, 90 acres are located in Shasta County and 342 acres are located in Tehama County (Table 10-3).

Table 10-3. Acreage of Important Farmland in Portions of Shasta and Tehama Counties Within the Primary Study Area

Important Farmland Category	Shasta County	Tehama County	Total
Prime Farmland	69	30	99
Farmland of Statewide Importance	8	–	8
Unique Farmland	8	38	46
Farmland of Local Importance	5	274	279
Total	90	342	432

Source: DOC 2010a

Key:

DOC = California Department of Conservation

Lower Sacramento River and Delta

Urbanization in the Sacramento Valley between 2006 and 2008 resulted in a decrease of 5,300 acres of irrigated farmland, which accounted for 33 percent of the statewide net decrease. Housing was the largest component of new urban acreage in the lower Sacramento River portion of the extended study area. Most

1 of the increase was associated with single-family homes located at the periphery
2 of existing cities, retail and commercial developments, and community
3 infrastructure supporting new residential development. It is anticipated that
4 current and future population growth will increase the demand for developable
5 land, particularly near the Bay Area, Stockton, and Sacramento. This demand
6 results in the conversion of open space, primarily agricultural land, to
7 residential and commercial uses.

8 Overall, the Sacramento Valley saw the largest drop in urbanization between
9 2006 and 2008—63 percent—with a rate that fell below that of the San
10 Francisco Bay Area for the first time since 2002. Much of this decrease was
11 caused by the slowdown in Sacramento County’s growth between the two
12 updates. While urbanization in the Sacramento Valley dropped substantially,
13 ecological restoration remained a factor. Most wetland restoration projects in
14 the region were adjacent to existing wildlife refuges and river channels.

15 Other factors besides conversion to urban or other land uses (e.g., habitat
16 restoration) also affect the acreage of irrigated farmland. Regionally, complex
17 factors related to availability of surface and groundwater supplies, crop markets,
18 and anticipation of urban development affect the acreage of irrigated farmland.
19 More locally, changes in annual water supplies, drainage, access, and
20 compatibility with adjacent land uses also affect the productivity and value, and
21 thus use, of agricultural land. Potential conflicts of adjacent land uses with
22 agricultural production include traffic, vandalism, dumping, and provision of
23 habitat for pest organisms (EDAW 2006; Sokolow et al. 2010).

24 The periphery of the Delta is undergoing rapid urbanization associated with
25 substantial population growth. In 2008, declines of irrigated farmland in the
26 Delta occurred primarily in Contra Costa and Solano counties, as each lost more
27 than 4,100 acres of irrigated land during the update. Urbanization accounted for
28 more than half the decrease in Contra Costa County, while Solano County was
29 affected by restoration projects in the south county (Liberty Island area) and
30 land idling near Vacaville. Between 2000 and 2008, about 75,000 acres of
31 agricultural land in the Delta were converted to urban and conservation uses. As
32 of 2008, approximately 550,100 acres of Important Farmland were located in
33 the Delta.

34 ***CVP/SWP Service Areas***

35 Declines in Important Farmland in the CVP/SWP service areas have been
36 similar to those discussed above for the lower Sacramento River and Delta.
37 Urbanization was responsible for 77 percent (55,670 acres) of the total losses of
38 Important Farmland in the CVP/SWP service areas between 2006 and 2008.
39 Twenty-one percent of the newly developed land in the CVP/SWP service areas
40 was located in Riverside County alone. Southern California led all regions with
41 50 percent of the developed acres, while the San Joaquin Valley ranked second
42 at 27 percent of the total. Overall, both regions showed a decline in urbanization
43 relative to the 2004–2006 period. Southern California’s decrease was larger—

1 24 percent compared to the 17-percent drop in urbanization in the San Joaquin
2 Valley.

3 In addition, the San Joaquin Valley lost 66 percent of its irrigated farmland to
4 long-term land idling in Fresno, Kings, and Kern counties. The Fresno County
5 decrease—more than 56,000 acres—was particularly notable and is associated
6 with salinity and drought-related land retirement on the west side of the valley.

7 **10.1.3 Williamson Act**

8 As of January 1, 2008, 16.6 million acres were enrolled under the Williamson
9 Act statewide. (Figure 10-2 shows Williamson Act lands in the primary study
10 area.) This represents approximately half of California’s farmland and nearly
11 one-third of its privately owned land. The nonrenewal process is the most
12 common mechanism for terminating Williamson Act contracts. Nonrenewal
13 trends may be seen as an indicator of likely farmland conversion in particular
14 locations. Statewide, nonrenewal initiations have increased each year since
15 2001 and reached a new high in 2007, with the San Joaquin Valley accounting
16 for the largest increase in nonrenewal initiations. Overall, a total of 520,550
17 acres of contracted land was at some stage of the nonrenewal process in 2008
18 (DOC 2009, 2010b).

19 **10.1.4 Forest Land**

20 Forest land is defined as native tree cover greater than 10 percent that allows for
21 management of timber, aesthetics, fish and wildlife, recreation, and other public
22 benefits (California Public Resources Code (PRC) Section 12220(g)). Natural
23 forest and woodland vegetation types in the study area typically have greater
24 than 10 percent cover by native trees. (Figures 12-2a through 12-2f in Chapter
25 12, “Botanical Resources and Wetlands,” display the distribution of natural
26 forest and woodland vegetation.)

27 Forests serve as high-quality habitat for fish and wildlife species, sequester
28 carbon to mitigate effects of climate change, capture vital runoff for agricultural
29 and domestic water supply, and provide a variety of outdoor recreation and
30 education opportunities. Many rural communities depend on income and
31 employment opportunities that result from working timber industries or on
32 amenity values to attract new residents seeking a better lifestyle. In metropolitan
33 areas, urban forests contribute to improved air quality, cooling of heat islands
34 for energy conservation, and local employment (Cal Fire 2010).

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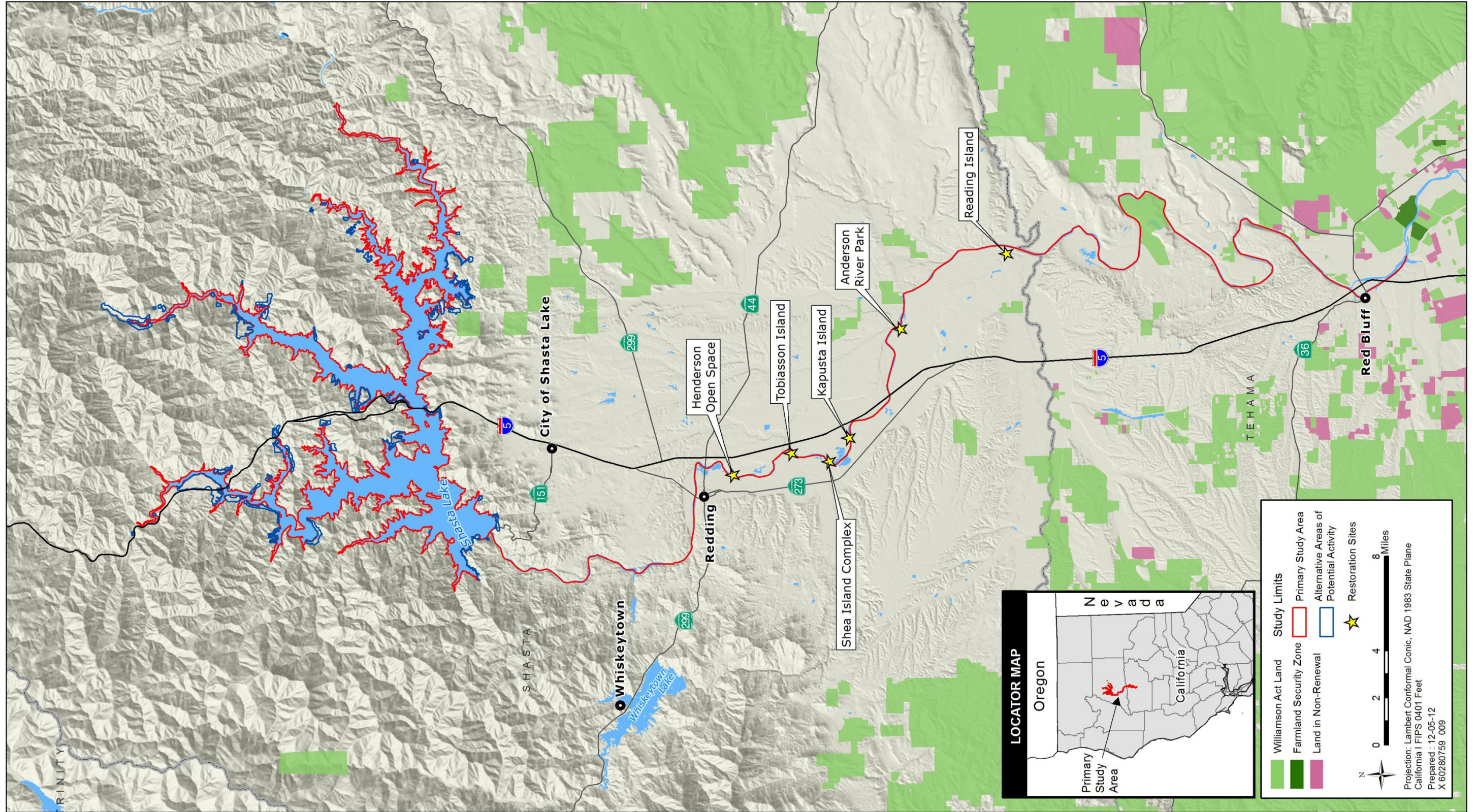


Figure 10-2. Williamson Act Lands in the Primary Study Area

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Shasta Lake and Vicinity

The study area for forest resources in the Shasta Lake and vicinity portion of the primary study area consists of the *impoundment areas* and the *relocation areas*. The impoundment areas are the areas that would be subject to inundation by the five arms and Main Body of Shasta Lake under the proposed dam enlargement scenarios. The relocation areas are those areas proposed as relocation sites for roadways, bridges, utilities, and campgrounds that could be inundated after the enlargement of Shasta Dam, as well as proposed dike locations.

The impoundment areas and relocation areas are characterized by a variety of forest lands typical of transitional mixed woodland and low-elevation forests: blue oak woodland, Brewer’s oak, California black oak forest, canyon live oak forest, Fremont cottonwood forest, ghost pine woodland, interior live oak woodland, knobcone pine forest, Oregon white oak woodland, ponderosa pine–Douglas fir forest, ponderosa pine forest, and valley oak woodland (see Figures 12-2a through 12-2f and Table 12-1 in Chapter 12, “Botanical Resources and Wetlands”). As discussed in Chapter 12, “Botanical Resources and Wetlands,” approximately 4,675 acres of forest land in the impoundment areas and relocation areas could potentially be affected by the alternatives (Table 10-4).

The exact combination of vegetation varies, with dramatic changes often occurring in relation to aspect, slope, geologic substrate, or juxtaposition with other habitats.

Table 10-4. Maximum Amount of Forest Land in the Impoundment and Relocation Areas

Forest Land	Area (Acres)
Blue oak woodland	11
Brewer oak scrub	151
California black oak forest	663
Canyon live oak forest	408
Fremont cottonwood forest	<1
Ghost pine woodland	456
Interior live oak woodland	6
Knobcone pine forest	293
Oregon white oak woodland	8
Ponderosa pine–Douglas fir forest	502
Ponderosa pine forest	2,176
Valley oak woodland	1
Total	4,675

Upper Sacramento River (Shasta Dam to Red Bluff)

Forest land in the upper Sacramento River portion of the primary study area consists of riparian forest and oak woodland and savanna. Oak woodlands present in the primary study area include blue oak woodland, blue oak savanna, foothill pine-oak woodland, and valley oak woodland. Much of the Sacramento

1 River from Shasta Dam to Redding is deeply entrenched in bedrock, which
2 precludes development of extensive areas of riparian vegetation. The river
3 corridor between Redding and Red Bluff, however, still maintains extensive
4 areas of riparian forest communities.

5 Riparian plant communities present in the primary study area are located within
6 the floodplain of the Sacramento River. These communities include Great
7 Valley cottonwood riparian forest, Great Valley mixed riparian forest, and Great
8 Valley valley oak riparian forest. Cottonwood- and willow-dominated riparian
9 forest and woodland are present along active channels and on the lower flood
10 terraces, whereas valley oak-dominated communities occur on higher flood
11 terraces. In general, only narrow remnants of these riparian forests remain, often
12 because levees are located close to river channels and the remaining riparian
13 forest habitat is primarily confined to levee slopes. Riparian vegetation exists at
14 Reading Island and some of the potential gravel augmentation sites.

15 ***Lower Sacramento River and Delta***

16 Almost all of the forest land in the lower Sacramento River and Delta consists
17 of riparian forests, including cottonwood-willow woodland and Valley oak
18 riparian woodland. These areas are typically found in the lower Sacramento
19 River and Delta as long, linear patches bordering waterways and agricultural or
20 urban land. Riparian vegetation is most extensive on the water side of levees,
21 but patches of riparian vegetation are also found on the interior of Delta islands
22 along levee toes; along drainage channels; along pond margins; and in
23 abandoned, low-lying fields. Forest land in riparian areas is managed primarily
24 for habitat and water quality values, and to a lesser extent for recreation and
25 other public benefits.

26 ***CVP/SWP Service Areas***

27 Forest resources in the CVP/SWP service areas are similar to those discussed
28 above for the upper Sacramento River and the lower Sacramento River and
29 Delta. Agricultural and urban land uses have substantially reduced the area and
30 connectivity of forest land in the CVP/SWP service areas. The region's natural
31 landscape changed substantially in the late 1800s and early 1900s as land uses
32 were converted to agriculture. In Southern California, however, the land use
33 pattern shifted more dramatically than in the Central Valley, as urban growth in
34 the region that started in the 1900s began to convert large areas of forest land to
35 developed land uses.

1 10.2 Regulatory Framework

2 10.2.1 Federal

3 Farmland Protection Policy Act The Farmland Protection Policy Act is intended
4 to minimize the effect of Federal programs with respect to the conversion of
5 farmland to nonagricultural uses. It ensures that, to the extent possible, Federal
6 programs are administered to be compatible with State, local, and private
7 programs and policies to protect farmland. The U.S. Natural Resources
8 Conservation Service (NRCS), part of the U.S. Department of Agriculture, is
9 the agency primarily responsible for implementing the Farmland Protection
10 Policy Act.

11 The Farmland Protection Policy Act established the Farmland Protection
12 Program and the Land Evaluation and Site Assessment system. The Farmland
13 Protection Program, a voluntary program administered by NRCS, provides
14 funds to help purchase development rights to keep productive farmland in
15 agricultural uses. The program provides matching funds to State, local, and
16 tribal entities and nongovernmental organizations with existing farmland
17 protection programs to purchase conservation easements. Participating
18 landowners agree not to convert the land to nonagricultural uses and retain all
19 rights to the property for future agriculture. A minimum 30-year term is
20 required for conservation easements, and priority is given to applications with
21 perpetual easements. NRCS provides up to 50 percent of the fair market value
22 of the easement (NRCS 2006).

23 The Land Evaluation and Site Assessment system is a tool used to rank lands
24 for suitability and inclusion in the Farmland Protection Program. The Land
25 Evaluation and Site Assessment evaluates several factors: soil potential for
26 agriculture, climate, location, market access, and adjacent land use. These
27 factors are used to numerically rank land parcels based on local resource
28 evaluation and site considerations (NRCS 2006).

29 10.2.2 State

30 ***California Important Farmland Inventory System and Farmland Mapping*** 31 ***and Monitoring Program***

32 DOC's Office of Land Conservation maintains a statewide inventory of
33 farmlands, which are mapped by the DOC Division of Land Resource
34 Protection as part of the FMMP. The FMMP was established by the State of
35 California in 1982 to continue the Important Farmland mapping efforts begun in
36 1975 by the U.S. Soil Conservation Service (now called NRCS). The intent of
37 the U.S. Soil Conservation Service was to produce agricultural-resource maps
38 based on soil quality and land use across the nation. DOC sponsors the FMMP
39 and is also responsible for establishing agricultural easements in accordance
40 with PRC Sections 10250-10255. The maps are updated every 2 years with the
41 use of aerial photographs, a computer mapping system, public review, and field
42 reconnaissance.

1 As part of the nationwide effort to map agricultural land uses, the U.S. Soil
2 Conservation Service/NRCS developed a series of definitions known as Land
3 Inventory and Monitoring criteria. These criteria classify the land's suitability
4 for agricultural production. Suitability includes both the physical and chemical
5 characteristics of soils and the actual land use. Important Farmland maps are
6 derived from NRCS soil survey maps using the Land Inventory and Monitoring
7 criteria and are available by county. The maps prepared by NRCS classify land
8 into one of eight categories, defined as follows (DOC 2011):

- 9 • **Prime Farmland** – Land that has the best combination of physical and
10 chemical characteristics for crop production. This land has the soil
11 quality, growing season, and moisture supply needed to produce
12 sustained high yields of crops when treated and managed.
- 13 • **Farmland of Statewide Importance** – Land other than Prime
14 Farmland that has a good combination of physical and chemical
15 characteristics for crop production. This land has minor shortcomings,
16 such as greater slopes or less ability to store soil moisture than Prime
17 Farmland.
- 18 • **Unique Farmland** – Land that does not meet the criteria for Prime
19 Farmland or Farmland of Statewide Importance, but that has been used
20 for the production of specific crops with high economic value. This
21 land is usually irrigated, but may include nonirrigated orchards or
22 vineyards as found in some climatic zones in California.
- 23 • **Farmland of Local Importance** – Land that either is currently
24 producing crops or has the capability of production, but does not meet
25 the criteria of the categories above. Farmland of Local Importance is
26 defined by each county's local advisory committee and adopted by its
27 board of supervisors.
- 28 • **Grazing Land** – Land on which the vegetation is suited to the grazing
29 of livestock. The minimum mapping unit for Grazing Land is 40 acres.
- 30 • **Urban and Built-up Lands** – Land occupied by structures with a
31 density of at least one dwelling unit per 1.5 acres.
- 32 • **Land Committed to Nonagricultural Use** – Vacant areas; existing
33 lands that have a permanent commitment to development but have an
34 existing land use of agricultural or grazing lands.
- 35 • **Other Lands** – Land that does not meet the criteria of the remaining
36 categories. This optional designation allows local governments to
37 provide detail on the nature of changes expected to occur in the future.

1 Important Farmland is classified by DOC as Prime Farmland, Farmland of
2 Statewide Importance, Unique Farmland, or Farmland of Local Importance. The
3 total acreages of Urban and Built-up Lands and Other Lands are calculated by
4 DOC and are defined by DOC as agricultural land.

5 The designations for Prime Farmland, Farmland of Statewide Importance,
6 Unique Farmland, and Farmland of Local Importance are defined together
7 under the terms “Agricultural Land” and “Important Farmland” in CEQA (PRC
8 Sections 21060.1 and 21095) and Appendix G of the State CEQA Guidelines.
9 The conversion of these types of farmland could be considered an
10 environmental impact.

11 ***Williamson Act Contracts***

12 The California Land Conservation Act of 1965, commonly known as the
13 Williamson Act, is the principal method for encouraging the preservation of
14 agricultural lands in California. The Williamson Act enables local governments
15 to enter into contracts with private landowners for the purpose of restricting
16 specific parcels of land to agricultural or related open-space use for 10 years. In
17 return, landowners receive property tax assessments that are based on farming
18 and open-space uses as opposed to full market value. Local governments
19 receive an annual subvention (subsidy) of forgone property tax revenues from
20 the State via the Open Space Subvention Act of 1971.

21 The Williamson Act empowers local governments to establish “agricultural
22 preserves” consisting of lands devoted to agricultural uses and other uses that
23 are compatible with agriculture. Upon establishing such a preserve, the locality
24 may offer to the owner of included agricultural land the opportunity to enter
25 into an annually renewable contract that restricts the land to agricultural use for
26 at least 10 years. (The contract continues to run for 10 years after the first date
27 upon which the contract is not renewed.) In return, the landowner is guaranteed
28 a relatively stable tax base, founded on the value of the land for
29 agricultural/open space use only and unaffected by its development potential.

30 Canceling a Williamson Act contract involves an extensive review and approval
31 process, in addition to payment of fees of up to 12.5 percent of the property
32 value. The local jurisdiction approving the cancellation must find that the
33 cancellation is consistent with the purpose of the California Land Conservation
34 Act or is in the public interest. Several subfindings must be made to support
35 either finding, as defined in Section 51282 of the California Government Code.

36 ***Farmland Security Zones***

37 Farmland Security Zones (FSZ), also known as Super Williamson Act lands,
38 were established by DOC with the same general intent as Williamson Act
39 contracts. Agricultural landowners in FSZs may enter into contracts with the
40 county for 20-year increments, with an additional 35 percent tax benefit over
41 and above the standard Williamson Act contract. The FSZ program has been
42 adopted by 25 counties, although not all of those counties have executed

1 contracts. FSZ contracts constitute nearly 2 percent of statewide Williamson
2 Act enrollment.

3 An FSZ must be located in an agricultural preserve (area designated as eligible
4 for a Williamson Act contract) and designated as Prime Farmland, Farmland of
5 Statewide Importance, Unique Farmland, or Farmland of Local Importance.
6 Land protected in an FSZ cannot be annexed by a city or county government or
7 school district.

8 An FSZ contract can be terminated through a nonrenewal or cancellation. The
9 nonrenewal allows a rollout process to occur over the remainder of the term of
10 the contract, when the tax rates would gradually rise to the full rate by the end
11 of the 20-year term. A cancellation must be applied for and approved by the
12 DOC director and must meet specific criteria. The cancellation must be in the
13 public interest and consistent with Williamson Act criteria. If a cancellation is
14 approved, fees equal to 25 percent of the full market value of the property must
15 be paid.

16 ***Agricultural Water Management Plans***

17 By the end of 2004, 62 water districts, 3 environmental interest groups, and
18 more than 53 other interested groups had signed the Agricultural Water
19 Management Memorandum of Understanding as members of the Agricultural
20 Water Management Council. The agricultural signatories represent more than
21 4.75 million acres of irrigated agricultural land statewide.

22 In 2004, the council endorsed an additional three agricultural water
23 management plans that had been submitted by agricultural water suppliers to the
24 council. These plans have since become the basis for the districts' water
25 conservation efforts. The districts with endorsed agricultural water management
26 plans are expected to prepare and submit a biannual progress report to the
27 Agricultural Water Management Council, starting from the date their plan was
28 endorsed. DWR staff members provide technical review and evaluation of these
29 plans. DWR also reviewed two biannual progress reports for the council. DWR
30 staff also provided technical assistance to water districts to prepare water
31 management plans and helped implement efficient water management practices,
32 as well as administrative and programmatic assistance to both the Agricultural
33 Water Management Council and water districts.

34 ***1992 Delta Protection Act***

35 The 1992 Delta Protection Act identified the Delta as a natural resource of
36 statewide significance, formalized the State's commitment to preserve its
37 diverse values, and established the Delta Protection Commission. The purpose
38 of the Delta Protection Act is to ensure protection, maintenance, and
39 enhancement of the Delta environment; ensure orderly and balanced use of
40 Delta land resources; and improve flood protection to increase public health and
41 safety. The Delta Protection Commission has planning jurisdiction over portions
42 of five counties: Contra Costa, Sacramento, San Joaquin, Solano, and Yolo.

1 In Section 29703a of the Delta Protection Act, the Delta Primary Zone is
2 designated as an area for protection from intrusion of nonagricultural uses. In
3 1995, the Delta Protection Commission adopted its regional plan, *Land Use and*
4 *Resource Management Plan for the Primary Zone of the Delta* (also known as
5 the Delta Plan). The current Delta Plan was approved by the California Office
6 of Administrative Law on October 7, 2010, and became effective
7 November 6, 2010. Policies in the Delta Plan are developed to project the
8 conversion of agricultural resources. Policy P-2 states that conversion of land to
9 non-agriculturally oriented uses should occur first where productivity and
10 agricultural values are lowest. Policy P-6 encourages acquiring agricultural
11 conservation easements from willing sellers as mitigation for projects within
12 each county. Use of environmental mitigation is to be promoted in agricultural
13 areas only when it is consistent and compatible with ongoing agricultural
14 operations and when developed in appropriate locations designated on a
15 countywide or Deltawide habitat management plan (DPC 2010).

16 10.2.3 Regional and Local

17 ***Shasta and Tehama Counties***

18 The general plans of Shasta and Tehama counties contain goals, policies, and
19 implementation measures to protect agricultural lands, as summarized below.

20 **Shasta County General Plan** The *Shasta County General Plan* (Shasta
21 County 2004) identifies goals, policies, and implementation measures aimed at
22 conserving large contiguous areas of productive agricultural land, providing
23 opportunities for the future expansion of such uses, and protecting them from
24 development pressures that would adversely affect or hinder existing or future
25 agricultural operations. This includes the objective to protect water resources
26 and supply systems vital for the continuation of agriculture.

27 **Tehama County General Plan** The *Tehama County General Plan* (2009)
28 encourages and supports agriculture and forest resources in Tehama County.
29 The policies are within the Agriculture and Timber Element of the general plan
30 and divided into the Land Use, Open Space and Conservation, and Economic
31 Development elements to aid in implementation of the general plan, but focus
32 on agriculture nonetheless.

33 ***Other***

34 **Sacramento River Conservation Area** The Sacramento River Conservation
35 Area seeks to promote the reestablishment of the 100-year floodplain along the
36 Sacramento River. In 1986, the California Legislature passed Senate Bill 1086,
37 which called for a management plan for the Sacramento River that would help
38 restore, protect, and enhance the riparian and aquatic habitat. After much
39 debate, the *Upper Sacramento River Fisheries and Riparian Habitat*
40 *Management Plan* was developed (Resources Agency 1989). This plan called
41 for fish bypass structures on the Sacramento River and its tributaries, as well as
42 the Shasta Dam temperature control structure. After implementation of these

1 projects began, the advisory council reconvened to complete additional work.
2 This effort led to the *Sacramento River Conservation Area Handbook*
3 (Resources Agency 2003), which would guide riparian habitat management
4 along the river. In 1999, a memorandum of agreement was signed by most
5 entities involved in management activities along the river. The U.S. Bureau of
6 Land Management has acquired roughly 15,000 acres of riparian lands along the
7 Sacramento River.

8 **10.3 Environmental Consequences and Mitigation Measures**

9 **10.3.1 Methods and Assumptions**

10 Implementation of the project would result in construction-related,
11 maintenance-related, and operational impacts that could substantially affect
12 agricultural and forest resources. This analysis evaluates potential construction-
13 related and operational activities that could directly or indirectly affect existing
14 agricultural and forest resources in the primary study area. Indirect impacts on
15 the extended study area could result from alteration of flow regimes
16 downstream from Shasta Lake and downstream from other reservoirs with
17 altered operations, as well as increased inundation width of the Sacramento
18 River during the growing season. In addition, water supply reliability in the
19 CVP/SWP service areas could increase, which in turn could reduce limitations
20 on growth and increase development that could adversely affect agricultural and
21 forest resources.

22 Evaluation of the project's potential impacts on agricultural resources was based
23 on a review of the planning documents pertaining to the study area, including
24 goals and policies from the general plans of Shasta and Tehama counties.
25 DOC's Important Farmland and Williamson Act maps were used to determine
26 the agricultural significance of the lands in the primary study area. In addition,
27 the results of CalSim-II simulations were reviewed to assess changes in flow
28 regime in the primary and extended study areas.

29 Forest land that could be inundated or otherwise affected by implementation of
30 any of the action alternatives was determined from vegetation mapping as
31 described in Chapter 12, "Botanical Resources and Wetlands." These forest
32 lands consist of blue oak-foothill pine, blue oak, and closed-cone pine-cypress
33 woodlands; and Douglas-fir, montane hardwood, montane hardwood-conifer,
34 montane riparian, Ponderosa pine, and valley-foothill riparian forests. The
35 following analysis summarizes information provided in Chapter 12, "Botanical
36 Resources and Wetlands," as it relates to the potential conversion of forest land
37 to nonforest uses.

38 **10.3.2 Criteria for Determining Significance of Effects**

39 An environmental document prepared to comply with NEPA must consider the
40 context and intensity of the environmental effects that would be caused by, or
41 result from, the proposed action. Under NEPA, the significance of an effect is

1 used solely to determine whether an environmental impact statement must be
2 prepared. An environmental document prepared to comply with CEQA must
3 identify the potentially significant environmental effects of a proposed project.
4 A “[s]ignificant effect on the environment” means a substantial, or potentially
5 substantial, adverse change in any of the physical conditions within the area
6 affected by the project” (State CEQA Guidelines, Section 15382). CEQA also
7 requires that the environmental document propose feasible measures to avoid or
8 substantially reduce significant environmental effects (State CEQA Guidelines,
9 Section 15126.4(a)).

10 The following significance criteria were developed based on guidance provided
11 by the State CEQA Guidelines, and consider the context and intensity of the
12 environmental effects as required under NEPA. Impacts of an alternative on
13 agriculture and Important Farmland would be significant if project
14 implementation would do any of the following:

- 15 • Convert Prime Farmland, Unique Farmland, or Farmland of Statewide
16 Importance, as shown on the maps prepared pursuant to the FMMP of
17 the California Resources Agency, to nonagricultural use
- 18 • Conflict with existing zoning for agricultural use, or a Williamson Act
19 contract
- 20 • Conflict with existing zoning for, or cause rezoning of, forest land (as
21 defined in PRC Section 12220(g)), timberland (as defined in PRC
22 Section 4526), or timberland zoned Timberland Production (as defined
23 in PRC Section 51104(g))
- 24 • Result in the loss of forest land or conversion of forest land to nonforest
25 use
- 26 • Involve other changes in the existing environment that, because of their
27 location or nature, could result in conversion of farmland, to
28 nonagricultural use or the conversion of forest land to nonforest use

29 **10.3.3 Topics Eliminated from Further Consideration**

30 None of the lands in the primary study area are zoned as forest land, timberland,
31 or timberland zoned Timberland Production by the *Shasta County General Plan*
32 (2004) or *Tehama County General Plan* (2009). Increasing water supply
33 reliability within the lower Sacramento River to the Delta and within the
34 CVP/SWP service areas would not conflict with existing zoning or directly
35 result in the rezoning of forest land, timberland, or timberland zoned
36 Timberland Production. Therefore, no effects related to conflicts with existing
37 zoning or causing rezoning of forest land are expected to occur in the study
38 area. Potential effects related to this issue area are not discussed further in this
39 DEIS.

1 **10.3.4 Direct and Indirect Effects**

2 ***No-Action Alternative***

3 Under the No-Action Alternative, the existing Shasta Dam would be operated in
4 the same manner as under current operations. Shasta Dam would not be
5 enlarged and no infrastructure would be removed, modified, or relocated.

6 Changes to the reservoir flow regime caused by changes in demand and other
7 factors would be small, with a reduction in Shasta Lake storage of 2–4 percent
8 during the fall of some years. Shasta Lake storage under the No-Action
9 Alternative would be within -2 percent and 1 percent of existing Shasta Lake
10 storage at most times.

11 Changes to the flow regime of the upper Sacramento River caused by changes
12 in demand and other factors would be small under the No-Action Alternative;
13 mean monthly flows in the Sacramento River would be within 5 percent of
14 existing flows at most times. (Flows could increase by a greater amount during
15 late summer and early fall of below-normal, dry, and critical years.)

16 In addition, Shasta Lake operations under the No-Action Alternative would not
17 change the flow regime in the lower Sacramento River and Delta. If none of the
18 project alternatives were implemented, CVP and SWP operations would likely
19 continue under existing regulatory requirements. CVP and SWP water storage,
20 conveyance, and deliveries would change because of several reasonably
21 foreseeable actions that would occur with or without enlargement of Shasta
22 Dam. Overall, CalSim-II modeling results suggest that only a very small
23 decrease in flows greater than 15,000 cubic feet per second would occur.

24 **Shasta Lake and Vicinity**

25 *Impact Ag-1 (No-Action): Direct and Indirect Conversion of Important*
26 *Farmland to Nonagricultural Uses and Cancellation of Williamson Act*
27 *Contracts in the Vicinity of Shasta Lake* No new facilities would be
28 constructed at Shasta Lake and no operational changes would occur that would
29 directly convert Important Farmland to nonagricultural uses or result in the
30 cancellation of Williamson Act contracts in the vicinity of Shasta Lake.
31 However, California’s demand for water for irrigation and other uses is
32 expected to continue to increase while the water supply will likely become less
33 reliable. This trend could lead to increased pressure to convert Important
34 Farmland to other nonagricultural uses and cancel Williamson Act contracts,
35 resulting in an indirect impact. Therefore, this impact would be potentially
36 significant.

37 Under the No-Action Alternative, Shasta Dam would not be enlarged; no
38 infrastructure would be removed, modified, or relocated; and Reclamation’s
39 Shasta operations would not change. Changes to the reservoir flow regime and
40 reservoir storage caused by changes in demand and other factors would be
41 small, and generally the same as under existing conditions at most times.
42 Therefore, implementing the No-Action Alternative would not directly convert

1 agricultural land to nonagricultural uses or result in the cancellation of
2 Williamson Act contracts.

3 The demand for water for irrigation and other uses in California is expected to
4 continue to increase in the future. At the same time, the water supply may
5 become less reliable because of increasing environmental water requirements
6 for special-status species, decreasing water quality, and climate change.
7 Therefore, the No-Action Alternative could have an indirect, adverse impact on
8 agricultural land uses and Important Farmland in the primary study area.
9 Insufficient water supply, especially during drought periods, could indirectly
10 lead to increased pressure on farmers to convert Important Farmland to other
11 nonagricultural uses, or could cause land designated as Important Farmland to
12 be fallowed. Additionally, the conversion of Important Farmland could involve
13 cancellation or expiration of many Williamson Act contracts.

14 The magnitude and extent of the agricultural land that could be converted from
15 changes in water supply is unknown; however, any loss of Important Farmland
16 would be significant because there are no measures to fully mitigate the loss of
17 Important Farmland. Based on a review of future demand projections used in
18 CalSim-II modeling and estimated deliveries under the No-Action Alternative,
19 this impact would be potentially significant. Mitigation is not required for the
20 No-Action Alternative.

21 *Impact Ag-2 (No-Action): Direct and Indirect Conversion of Forest Land to*
22 *Nonforest Uses in the Vicinity of Shasta Lake* No new facilities would be
23 constructed at Shasta Lake and no operational changes would occur that would
24 result in the direct or indirect conversion of forest land to nonforest uses. No
25 impact would occur.

26 Under the No-Action Alternative, Shasta Dam would not be enlarged; no
27 infrastructure would be removed, modified, or relocated; and Reclamation's
28 Shasta operations would not change. Changes to the reservoir flow regime and
29 reservoir storage caused by changes in demand and other factors would be small
30 and generally the same as under existing conditions at most times. Therefore,
31 the No-Action Alternative would not result in the direct or indirect conversion
32 to nonforest uses of blue oak-foothill pine, blue oak, and closed-cone pine-
33 cypress woodlands; Douglas-fir, montane hardwood, montane hardwood-
34 conifer, montane riparian, Ponderosa pine, and valley-foothill riparian forests;
35 or other forest land. No impact would occur. Mitigation is not required for the
36 No-Action Alternative.

37 **Upper Sacramento River (Shasta Dam to Red Bluff)**

38 *Impact Ag-3 (No-Action): Direct and Indirect Conversion of Important*
39 *Farmland to Nonagricultural Uses and Cancellation of Williamson Act*
40 *Contracts Along the Upper Sacramento River* Changes to the flow regime of
41 the upper Sacramento River caused by changes in demand and other factors
42 would be small under the No-Action Alternative; mean monthly flows in the

1 Sacramento River would be within 5 percent of flows under existing conditions
2 at most times. Implementing the No-Action Alternative would not directly
3 convert Important Farmland to nonagricultural uses or result in the cancellation
4 of Williamson Act contracts in the upper Sacramento River portion of the
5 primary study area. However, California's demand for water for irrigation and
6 other uses is expected to continue to increase while the water supply will likely
7 become less reliable. This trend could lead to increased pressure to convert
8 Important Farmland to other nonagricultural uses and cancel Williamson Act
9 contracts, resulting in an indirect impact. Therefore, this impact would be
10 potentially significant.

11 Changes to the flow regime of the upper Sacramento River resulting from
12 changes in demand and other factors would be small under the No-Action
13 Alternative; mean monthly flows in the Sacramento River would be within 5
14 percent of flows under existing conditions at most times. Therefore,
15 implementing the No-Action Alternative would not directly convert agricultural
16 land to nonagricultural uses or result in the cancellation of Williamson Act
17 contacts.

18 California's demand for water for irrigation and other uses is expected to
19 continue to increase in the future. At the same time, the water supply may
20 become less reliable because of increasing environmental water requirements
21 for special-status species, population growth that places further demands on
22 existing water supply resources, decreasing water quality, and climate change.
23 Therefore, the No-Action Alternative could have an indirect adverse impact on
24 agricultural land uses and Important Farmland in the primary study area.
25 Insufficient water supply, especially during drought periods, could indirectly
26 lead to increased pressure on farmers to convert Important Farmland to other
27 nonagricultural uses or cause land designated as Important Farmland to be
28 fallowed. Additionally, conversion of Important Farmland could involve
29 canceling many Williamson Act contracts or allowing such contracts to expire.

30 The magnitude and extent of the agricultural land that could be converted from
31 changes in water supply is unknown; however, any loss of Important Farmland
32 would be significant because there are no measures to fully mitigate the loss of
33 Important Farmland. Based on a review of future demand projections used in
34 CalSim-II modeling and estimated deliveries under the No-Action Alternative,
35 this impact would be potentially significant. Mitigation is not required for the
36 No-Action Alternative.

37 *Impact Ag-4 (No-Action): Direct and Indirect Conversion of Forest Land to*
38 *Nonforest Uses Along the Upper Sacramento River* No operational changes
39 would occur that would directly convert forest land to nonforest uses along the
40 upper Sacramento River. However, water storage, conveyance, and deliveries
41 would change because of several reasonably foreseeable actions that would
42 occur with or without enlargement of Shasta Dam. The resulting changes in the
43 flow regime would likely result in minimal adverse effects on riparian forest

1 and oak woodland habitats. Furthermore, management and restoration plans and
2 programs would implement actions that would largely offset those adverse
3 effects. Therefore, this impact would be less than significant.

4 Under the No-Action Alternative, no changes in Reclamation's Shasta
5 operations would occur that would directly convert riparian and oak woodland
6 habitats along the upper Sacramento River to nonforest uses. However, water
7 storage, conveyance, and deliveries would change because of several reasonably
8 foreseeable actions that would occur with or without enlargement of Shasta
9 Dam. As a consequence of these actions, the flow regime of the upper
10 Sacramento River would change between 2005 and 2030. As described in
11 Chapter 12, "Botanical Resources and Wetlands," this change in flow regime
12 would likely result in minimal adverse effects on forest land, which along the
13 upper Sacramento River consist of riparian forest and oak woodlands, and these
14 effects would not be sufficient to alter the extent of these forest lands.

15 As also discussed in Chapter 12, several management and restoration plans and
16 programs would be implemented under the No-Action Alternative. These
17 actions would cause beneficial effects likely to be of a magnitude similar to or
18 greater than the anticipated adverse effects of small changes in flow regime;
19 thus, implementation of the plans and programs would largely offset those
20 adverse effects. Therefore, this impact would be less than significant. Mitigation
21 is not required for the No-Action Alternative.

22 **Lower Sacramento River and Delta and CVP/SWP Service Areas**
23 *Impact Ag-5 (No-Action): Direct and Indirect Conversion of Important*
24 *Farmland to Nonagricultural Uses and Cancellation of Williamson Act*
25 *Contracts in the Extended Study Area* Changes to the flow regime of the lower
26 Sacramento River, Delta, and CVP/SWP service areas caused by changes in
27 demand and other factors would be small under the No-Action Alternative;
28 mean monthly flows in the Sacramento River would be within 5 percent of
29 flows under existing conditions at most times. Implementing the No-Action
30 Alternative would not directly convert Important Farmland to nonagricultural
31 uses or result in the cancellation of Williamson Act contracts along the lower
32 Sacramento River, in the Delta, or in the CVP/SWP service areas. However,
33 California's demand for water for irrigation and other uses is expected to
34 continue to increase while the water supply will likely become less reliable.
35 This trend could lead to increased pressure to convert Important Farmland to
36 other nonagricultural uses and cancel Williamson Act contracts, resulting in an
37 indirect impact. Therefore, this impact could be potentially significant.

38 This impact would be similar to Impact Ag-3 (No-Action) for the upper
39 Sacramento River (Shasta Dam to Red Bluff). For the same reasons as
40 described above for Impact Ag-3 (No-Action), this impact would be potentially
41 significant. Mitigation is not required for the No-Action Alternative.

1 *Impact Ag-6 (No-Action): Direct and Indirect Conversion of Forest Land to*
2 *Nonforest Uses in the Extended Study Area* No operational changes would
3 occur under the No-Action Alternative that would directly convert forest land to
4 nonforest uses along the upper Sacramento River. However, water storage,
5 conveyance, and deliveries would change because of several reasonably
6 foreseeable actions that would occur with or without enlargement of Shasta
7 Dam. The resulting changes in the flow regime would likely result in minimal
8 adverse effects on forest land, which consists of riparian forest and oak
9 woodlands along the lower Sacramento River and in the Delta. Management
10 and restoration plans and programs would implement actions that would largely
11 offset those adverse effects. Therefore, this impact would be less than
12 significant.

13 This impact would be similar to Impact Ag-4 (No-Action) for the upper
14 Sacramento River (Shasta Dam to Red Bluff). For the same reasons as
15 described above for Impact Ag-4 (No-Action), this impact would be less than
16 significant. Mitigation is not required for the No-Action Alternative.

17 ***CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply***
18 ***Reliability***

19 By increasing storage at Shasta Lake, this alternative would change the full pool
20 elevation and seasonal pool elevations at Shasta Lake, and the flow regime
21 downstream in the Sacramento River and potentially several other reservoirs
22 and downstream waterways. By raising Shasta Dam 6.5 feet, CP1 would
23 increase the height of the reservoir's full pool elevation by 8.5 feet, enlarge the
24 total storage capacity in the reservoir by 256,000 acre-feet, and increase the
25 reservoir's surface area at full pool by about 1,110 acres (4 percent). Areas at
26 this elevation could be periodically inundated; existing facilities within the
27 inundation zone would be relocated to higher areas to accommodate the
28 periodic inundation. In general, the effect of this increase would be slight, given
29 that the reservoir would exceed the current full pool elevation only during
30 wetter-than-normal years.

31 Shasta Dam's operational guidelines would continue essentially unchanged,
32 except during dry and critical years, when 70 TAF and 35 TAF, respectively, of
33 the increased storage capacity in Shasta Reservoir would be reserved to
34 specifically focus on increasing M&I deliveries. Implementing CP1 would help
35 reduce estimated future agricultural water shortages in the CVP/SWP service
36 areas by increasing firm yield for agricultural deliveries by at least 22,500 acre-
37 feet per year in dry and critical years and increasing average annual yield by
38 about 20,300 acre-feet per year.

39 Potential impacts of CP1 on the upper Sacramento River's flow and stages and
40 on deliveries of water supplies to the CVP/SWP service areas would be small.
41 On average, in each month, changes in mean monthly flow relative to existing
42 (2005) and No-Action Alternative (2030) conditions would be reductions or
43 increases of about 5 percent or less. Generally, the relative magnitude of effects

on river flows diminishes with distance downstream because of the influence of inflows from tributaries and the effects of diversions and flood bypasses.

Shasta Lake and Vicinity

Impact Ag-1 (CP1): Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts in the Vicinity of Shasta Lake No lands adjacent to Shasta Lake or in the immediate vicinity above Shasta Dam are designated by DOC as Important Farmland or under Williamson Act contracts. No impact would occur.

No lands adjacent to Shasta Lake or in the immediate vicinity above Shasta Dam are designated by DOC as Important Farmland or under Williamson Act contracts. Therefore, inundation of land and removal, modification, or relocation of infrastructure under CP1 would not directly or indirectly convert agricultural land to nonagricultural uses or result in the cancellation of Williamson Act contacts. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Ag-2 (CP1): Direct and Indirect Conversion of Forest Land to Nonforest Uses in the Vicinity of Shasta Lake Inundation of land and removal, modification, or relocation of infrastructure under CP1 would result in the conversion of forest land to nonforest uses. This impact would be significant.

A total of 1,032 acres of forest land would be affected by inundation under CP1 (Table 10-5). Also, up to 844 acres of land in the relocation areas would be affected by removal, modification, relocation, or inundation of roadways, bridges, utilities, and campgrounds under CP1 (Table 10-6); most of this acreage would be converted from forest land to nonforest uses. This impact would be significant. Mitigation for this impact is not proposed in Section 10.3.5 because no feasible mitigation is available to reduce the impact to a less-than-significant level.

Table 10-5. Acreage of Forest Land that Would Be Affected by Inundation Under CP1

Forest Land	Area (Acres)
Blue oak–foothill pine	10
Blue oak woodland	1
Closed-cone pine–cypress	247
Douglas-fir	<1
Montane hardwood	190
Montane hardwood–conifer	239
Ponderosa pine	345
Total	1,032

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Table 10-6. Maximum Acreage of Forest Land that Would Be Affected in Relocation Areas Under CP1–CP5

Forest Land	Area (Acres)
Blue oak–foothill pine	22
Blue oak woodland	5
Closed-cone pine–cypress	90
Douglas-fir	3
Montane hardwood	715
Montane hardwood–conifer	9
Ponderosa pine	<1
Total	844

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Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Ag-3 (CP1): Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts Along the Upper Sacramento River Agricultural lands in the upper Sacramento River portion of the primary study area, including Important Farmland and Williamson Act contract lands, could be inundated as a result of increases in mean monthly river flows. The flow increases that would occur in some years would generally be small (5 percent or less) and would affect areas periodically inundated under existing conditions or the No-Action Alternative. The effects of increased flows would diminish with distance downstream as tributary inflows, and the effects of diversions and flood bypasses, affect flows in the Sacramento River. CP1 also would increase the reliability of the water supply by increasing firm water supplies for irrigation purposes, primarily during drought periods. Therefore, implementing CP1 would not directly or indirectly result in the conversion of Important Farmland to nonagricultural uses or the cancellation of Williamson Act contracts. This impact would be less than significant.

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Agricultural lands in the upper Sacramento River portion of the primary study area, including Important Farmland and Williamson Act contract lands, could be inundated or could undergo soil saturation as a result of project-related increases in mean monthly river flows. Based on CalSim-II model simulations, the flow increases that would occur in some years under CP1 would likely be small (5 percent or less) relative to existing (2005) and No-Action Alternative (2030) conditions. These increased flows would affect small areas periodically inundated under existing conditions or the No-Action Alternative. In addition, the effects would diminish with distance downstream because of the influence of inflows from tributaries and the effects of diversions and flood bypasses. As a result, implementing CP1 would not directly result in the conversion of Important Farmland to nonagricultural uses or the cancellation of Williamson Act contracts.

1 Implementing CP1 would increase the reliability of the water supply by
2 increasing firm water supplies in the upper Sacramento River portion of the
3 primary study area for irrigation purposes, primarily during drought periods. A
4 substantial portion of this water would be used instead of groundwater, would
5 allow for changes in agricultural irrigation practices, or would enable farmers to
6 return idle cropland to production. Therefore, implementing CP1 would not
7 indirectly result in the conversion of Important Farmland to nonagricultural uses
8 or the cancellation of Williamson Act contracts.

9 For the reasons described above, this impact would be less than significant.
10 Mitigation for this impact is not needed, and thus not proposed.

11 *Impact Ag-4 (CP1): Direct and Indirect Conversion of Forest Land to*
12 *Nonforest Uses Along the Upper Sacramento River* Altered flow regimes
13 associated with project implementation under CP1 could adversely affect forest
14 land along the upper Sacramento River. The altered flow regime could affect
15 oak woodland communities by prolonging inundation and changing the
16 availability of soil moisture; however, these effects are unclear and may not all
17 prove to be adverse. Changes in the magnitude of intermediate and large flows
18 would likely be sufficient to alter the dynamics and structure of forests in the
19 riparian corridor along the upper Sacramento River in the future. However,
20 changes in the flow regime would not reduce the extent of riparian forest.
21 Therefore, implementing CP1 would not result in the conversion of forest land
22 to nonforest uses. This impact would be less than significant.

23 Forest land along the upper Sacramento River consists of riparian forest and oak
24 woodlands. These habitats could be affected by changes in river flow and stage
25 in some years. In most years, changes in mean monthly flow would be
26 reductions or increases of 5 percent or less. The areas affected would be areas
27 periodically inundated under existing conditions and the No-Action Alternative.
28 Generally, these effects diminish with distance downstream because of the
29 influence of inflows from tributaries, and the effects of diversions and flood
30 bypasses.

31 The altered flow regime of the upper Sacramento River associated with
32 implementation of CP1 could affect oak woodland communities by prolonging
33 inundation and changing the availability of soil moisture. This effect would
34 occur during years when mean monthly stage during March–October would
35 differ from existing and No-Action Alternative conditions. Implementing CP1
36 could slightly increase the average elevation of the water surface in this zone
37 (but would not increase the zone’s elevational range). Because of the important
38 influence of water availability and soil aeration on plant growth and survival,
39 these changes have the potential to result in the loss of oak woodlands. These
40 effects are unclear, however, and may not all prove to be adverse.

1 The flow regime of a river or stream strongly influences the structure and
2 species composition of riparian forests. Implementing CP1 would not alter the
3 general annual pattern of flows but would reduce the magnitude, duration, and
4 frequency of intermediate and large flows. Reductions in the magnitude of
5 intermediate and large flows would likely be sufficient to alter the dynamics and
6 structure of forests in the riparian corridor along the upper Sacramento River;
7 however, changes in the flow regime would not reduce the extent of riparian
8 forest.

9 For the reasons described above, implementing CP1 would not result in the
10 conversion of forest land to nonforest uses. Therefore, this impact would be less
11 than significant. Mitigation for this impact is not needed, and thus not proposed.

12 **Lower Sacramento River and Delta and CVP/SWP Service Areas**

13 *Impact Ag-5 (CP1): Direct and Indirect Conversion of Important Farmland to*
14 *Nonagricultural Uses and Cancellation of Williamson Act Contracts in the*
15 *Extended Study Area* Agricultural lands in the extended study area, including
16 Important Farmland and Williamson Act contract lands, could be inundated or
17 undergo soil saturation as a result of increased mean monthly river flows.
18 Increases in Sacramento River stage (elevation) would be small. These
19 increased flows would affect areas periodically inundated or saturated under
20 existing conditions or the No-Action Alternative. The effects of this inundation
21 would diminish with distance downstream. CP1 also would increase the
22 reliability of the water supply by increasing firm water supplies for irrigation
23 purposes, primarily during drought periods. Therefore, implementing CP1
24 would not directly or indirectly result in the conversion of Important Farmland
25 to nonagricultural uses or the cancellation of Williamson Act contracts. This
26 impact would be less than significant.

27 Agricultural lands in the extended study area, including Important Farmland and
28 Williamson Act contract lands, could experience more extensive inundation or
29 soil saturation during some months as a result of project-related increases in
30 mean monthly river flows. However, these increased flows would affect areas
31 periodically inundated or saturated under existing conditions and/or the No-
32 Action Alternative. In addition, the effects of inundation would diminish with
33 distance downstream because of the influence of inflows from tributaries and
34 the effects of diversions and flood bypasses. As a result, the direct conversion of
35 agricultural land to nonagricultural uses or cancellation of Williamson Act
36 contacts is unlikely to be substantial.

37 During dry and critical years, 70 TAF and 35 TAF, respectively, of the
38 increased storage capacity in Shasta Reservoir would be reserved to specifically
39 focus on increasing M&I deliveries. Implementing CP1 would help reduce
40 estimated future agricultural water shortages in the CVP/SWP service areas by
41 increasing firm yield for agricultural deliveries by at least 22,500 acre-feet per
42 year in dry and critical years and increasing average annual yield by about
43 20,300 acre-feet per year. The majority of increased firm yield would be for

1 south-of-Delta agricultural deliveries. A substantial portion of this water would
2 be used instead of groundwater, would allow for changes in agricultural
3 irrigation practices, or would enable farmers to return idle cropland to
4 production. Therefore, implementing CP1 would not indirectly result in the
5 conversion of Important Farmland to nonagricultural uses or the cancellation of
6 Williamson Act contracts.

7 For the reasons described above, this impact would be less than significant.
8 Mitigation for this impact is not needed, and thus not proposed.

9 *Impact Ag-6 (CP1): Direct and Indirect Conversion of Forest Land to*
10 *Nonforest Uses in the Extended Study Area* Altered flow regimes associated
11 with project implementation under CP1 could adversely affect riparian forest
12 and oak woodlands. The altered flow regime could affect oak woodlands by
13 prolonging inundation and changing soil moisture in some years; however,
14 these effects are unclear and may not all prove to be adverse. Changes in the
15 magnitude of intermediate and large flows would likely be sufficient to alter the
16 dynamics and structure of the riparian forests along the upper Sacramento River
17 in the future. However, changes in flow regime would not reduce the extent of
18 riparian forest. Therefore, implementing CP1 would not result in the conversion
19 of forest land to nonforest uses. This impact would be less than significant.

20 This impact would be similar to Impact Ag-4 (CP1) for the upper Sacramento
21 River. For the same reasons as described above for Impact Ag-4 (CP1), this
22 impact would be less than significant. Mitigation for this impact is not needed,
23 and thus not proposed.

24 ***CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply***
25 ***Reliability***

26 Like CP1, CP2 would increase storage at Shasta Lake, thus changing the
27 reservoir's full pool elevation and seasonal pool elevations, and the flow regime
28 in the Sacramento River and potentially several other reservoirs and
29 downstream waterways.

30 By raising Shasta Dam 12.5 feet, CP2 would increase the reservoir's full pool
31 elevation by 14.5 feet and enlarge its total storage capacity by 443,000 acre-
32 feet. Raising the dam 12.5 feet would increase the reservoir's surface area at full
33 pool by about 1,900 acres (6 percent). In general, the effect of this increase
34 would be slight, given that the reservoir would exceed the current full pool
35 elevation only during wetter-than-normal years.

36 Shasta Dam's operational guidelines would continue essentially unchanged,
37 except during dry and critical years, when 120 TAF and 60 TAF, respectively,
38 of the increased storage capacity in Shasta Reservoir would be reserved to
39 specifically focus on increasing M&I deliveries. Implementing CP2 would help
40 reduce estimated future agricultural water shortages in the CVP/SWP service
41 areas by increasing firm yield for agricultural deliveries by at least 37,600 acre-

1 feet per year in dry and critical years and increasing average annual yield by
 2 about 31,400 acre-feet per year.

3 In general, the proposed changes in flow and river stage on the upper
 4 Sacramento River associated with CP2 would be similar to but slightly greater
 5 than the changes associated with CP1, as outlined above.

6 **Shasta Lake and Vicinity**

7 *Impact Ag-1 (CP2): Direct and Indirect Conversion of Important Farmland to*
 8 *Nonagricultural Uses and Cancellation of Williamson Act Contracts in the*
 9 *Vicinity of Shasta Lake* No lands adjacent to Shasta Lake or in the immediate
 10 vicinity above Shasta Dam are designated by DOC as Important Farmland or
 11 under Williamson Act contracts. No impact would occur.

12 This impact would be the same as Impact Ag-1 (CP1). No impact would occur.
 13 Mitigation for this impact is not needed, and thus not proposed.

14 *Impact Ag-2 (CP2): Direct and Indirect Conversion of Forest Land to*
 15 *Nonforest Uses in the Vicinity of Shasta Lake* Inundation of land and removal,
 16 modification, or relocation of infrastructure under CP2 would result in the
 17 conversion of forest land to nonforest uses. This impact would be significant.

18 A total of 1,440 acres of forest land would be affected by inundation under CP2
 19 (Table 10-7). Also, up to 844 acres of land in the relocation areas would be
 20 affected by removal, modification, relocation, or inundation of roadways,
 21 bridges, utilities, and campgrounds under CP2 (Table 10-6); most of this
 22 acreage would be converted from forest land to nonforest uses. This impact
 23 would be significant. Mitigation for this impact is not proposed in Section
 24 10.3.5 because no feasible mitigation is available to reduce the impact to a less-
 25 than-significant level.

26 **Table 10-7. Acreage of Forest Land that Would Be Affected by Inundation**
 27 **Under CP2**

Forest Land	Area (Acres)
Blue oak–foothill pine	15
Blue oak woodland	2
Closed-cone pine–cypress	343
Douglas-fir	<1
Montane hardwood	263
Montane hardwood–conifer	329
Ponderosa pine	488
Total	1,440

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1 **Upper Sacramento River (Shasta Dam to Red Bluff)**

2 *Impact Ag-3 (CP2): Direct and Indirect Conversion of Important Farmland to*
3 *Nonagricultural Uses and Cancellation of Williamson Act Contracts Along the*
4 *Upper Sacramento River* Agricultural lands in the upper Sacramento River
5 portion of the primary study area, including Important Farmland and
6 Williamson Act contract lands, could be inundated as a result of increases in
7 mean monthly river flows. The flow increases that would occur in some years
8 would generally be small and would affect areas periodically inundated under
9 existing conditions or the No-Action Alternative. The effects of increased flows
10 would diminish with distance downstream. CP2 also would increase the
11 reliability of the water supply by increasing firm water supplies for irrigation
12 purposes, primarily during drought periods. Therefore, implementing CP2
13 would not directly or indirectly result in the conversion of Important Farmland
14 to nonagricultural uses or the cancellation of Williamson Act contracts. This
15 impact would be less than significant.

16 This impact would be similar to but slightly greater than Impact Ag-3 (CP1),
17 because alteration of the flow regime of the Sacramento River would be slightly
18 greater under CP2 than under CP1. This impact would be less than significant.
19 Mitigation for this impact is not needed, and thus not proposed.

20 *Impact Ag-4 (CP2): Direct and Indirect Conversion of Forest Land to*
21 *Nonforest Uses Along the Upper Sacramento River* Altered flow regimes
22 associated with project implementation under CP2 could adversely affect forest
23 land along the upper Sacramento River. The altered flow regime could affect
24 oak woodland communities by prolonging inundation and changing the
25 availability of soil moisture; however, these effects are unclear and may not all
26 prove to be adverse. Changes in the magnitude of intermediate and large flows
27 would likely be sufficient to alter the dynamics and structure of forests in the
28 riparian corridor along the upper Sacramento River in the future. However,
29 changes in the flow regime would not reduce the extent of riparian forest.
30 Therefore, implementing CP2 would not result in the conversion of forest land
31 to nonforest uses. This impact would be less than significant.

32 This impact would be similar to but slightly greater than Impact Ag-4 (CP1),
33 because alteration of the flow regime of the Sacramento River would be slightly
34 greater under CP2 than under CP1. This impact would be less than significant.
35 Mitigation for this impact is not needed, and thus not proposed.

36 **Lower Sacramento River and Delta and CVP/SWP Service Areas**

37 *Impact Ag-5 (CP2): Direct and Indirect Conversion of Important Farmland to*
38 *Nonagricultural Uses and Cancellation of Williamson Act Contracts in the*
39 *Extended Study Area* Agricultural lands in the extended study area, including
40 Important Farmland and Williamson Act contract lands, could be inundated or
41 undergo soil saturation as a result of increased mean monthly river flows.
42 Increases in Sacramento River stage (elevation) would be small. These
43 increased flows would affect areas periodically inundated or saturated under

1 existing conditions or the No-Action Alternative. The effects of this inundation
2 would diminish with distance downstream. CP2 also would increase the
3 reliability of the water supply by increasing firm water supplies for irrigation
4 purposes, primarily during drought periods. Therefore, implementing CP2
5 would not directly or indirectly result in the conversion of Important Farmland
6 to nonagricultural uses or the cancellation of Williamson Act contracts. This
7 impact would be less than significant.

8 This impact would be similar to but slightly greater than Impact Ag-5 (CP1),
9 because alteration of the flow regime of the Sacramento River would be slightly
10 greater under CP2 than under CP1. In addition, CP2 would include reserving
11 more storage capacity in Shasta Reservoir to specifically focus on increasing
12 M&I deliveries during dry and critical years and a greater volume of firm and
13 average annual water supply for agricultural water deliveries for the CVP/SWP
14 service areas. This impact would be less than significant. Mitigation for this
15 impact is not needed, and thus not proposed.

16 *Impact Ag-6 (CP2): Direct and Indirect Conversion of Forest Land to*
17 *Nonforest Uses in the Extended Study Area* Altered flow regimes associated
18 with project implementation under CP2 could adversely affect riparian forest
19 and oak woodlands. The altered flow regime could affect oak woodlands by
20 prolonging inundation and changing soil moisture in some years; however,
21 these effects are unclear and may not all prove to be adverse. Changes in the
22 magnitude of intermediate and large flows would likely be sufficient to alter the
23 dynamics and structure of the riparian forests along the upper Sacramento River
24 in the future. However, changes in flow regime would not reduce the extent of
25 riparian forest. Therefore, implementing CP2 would not result in the conversion
26 of forest land to nonforest uses. This impact would be less than significant.

27 This impact would be similar to but slightly greater than Impact Ag-6 (CP1),
28 because alteration of the flow regime of the Sacramento River would be slightly
29 greater under CP2 than under CP1. This impact would be less than significant.
30 Mitigation for this impact is not needed, and thus not proposed.

31 ***CP3 – 18.5-Foot Dam Raise, Agricultural Water Supply Reliability and***
32 ***Anadromous Fish Survival***

33 Like both of the alternatives discussed above, CP3 would increase storage at
34 Shasta Lake, thus changing the reservoir's full pool elevation and seasonal pool
35 elevations and the flow regime in the Sacramento River and potentially several
36 other reservoirs and downstream waterways.

37 By raising Shasta Dam 18.5 feet, CP3 would increase the reservoir's full pool
38 elevation by 20.5 feet and enlarge its total storage capacity by 634,000 acre-
39 feet. Raising the dam 18.5 feet would increase the reservoir's surface area at full
40 pool by about 2,570 acres (9 percent). In general, the effect of this increase
41 would be slight, given that the reservoir would exceed the current full pool
42 elevation only during wetter-than-normal years.

1 Implementing CP3 would increase water supply reliability by increasing firm
2 water supplies for CVP irrigation deliveries. None of the increased storage
3 capacity in Shasta Reservoir would be reserved for increasing M&I deliveries.
4 However, CP3 would help reduce estimated future water shortages for CVP
5 agricultural water users by increasing the reliability of firm water supplies for
6 agricultural deliveries by at least 70,600 acre-feet per year in dry and critical
7 years and increasing average annual yield by about 62,200 acre-feet per year.

8 In general, the changes in flow and river stage on the upper Sacramento River
9 associated with CP3 would be more substantial than the changes associated with
10 CP1 and CP2. However, these anticipated changes would still be within a few
11 percentage points of the changes associated with CP1 and CP2, as outlined
12 above.

13 **Shasta Lake and Vicinity**

14 *Impact Ag-1 (CP3): Direct and Indirect Conversion of Important Farmland to*
15 *Nonagricultural Uses and Cancellation of Williamson Act Contracts in the*
16 *Vicinity of Shasta Lake* No lands adjacent to Shasta Lake or in the immediate
17 vicinity above Shasta Dam are designated by DOC as Important Farmland or
18 under Williamson Act contracts. No impact would occur.

19 This impact would be the same as Impact Ag-1 (CP1). No impact would occur.
20 Mitigation for this impact is not needed, and thus not proposed.

21 *Impact Ag-2 (CP3): Direct and Indirect Conversion of Forest Land to*
22 *Nonforest Uses in the Vicinity of Shasta Lake* Inundation of land and removal,
23 modification, or relocation of infrastructure under CP3 would result in the
24 conversion of forest land to nonforest uses. This impact would be significant.

25 A total of 2,069 acres of forest land would be affected by inundation under CP3
26 (Table 10-8). Also, up to 844 acres of land in the relocation areas would be
27 affected by removal, modification, or relocation of infrastructure under CP3
28 (Table 10-6); most of this acreage would be converted from forest land to
29 nonforest uses. This impact would be significant. Mitigation for this impact is
30 not proposed in Section 10.3.5 because no feasible mitigation is available to
31 reduce the impact to a less-than-significant level.

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Table 10-8. Acreage of Forest Land that Would Be Affected by Inundation Under CP3

Forest Land	Area (Acres)
Blue oak–foothill pine	17
Blue oak woodland	7
Closed-cone pine–cypress	485
Douglas-fir	<1
Montane hardwood	376
Montane hardwood–conifer	481
Ponderosa pine	703
Total	2,069

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Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Ag-3 (CP3): Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts Along the Upper Sacramento River Agricultural lands in the upper Sacramento River portion of the primary study area, including Important Farmland and Williamson Act contract lands, could be inundated as a result of increases in mean monthly river flows. The flow increases that would occur in some years would generally be small (5 percent or less) and would affect areas periodically inundated under existing conditions or the No-Action Alternative. The effects of increased flows would diminish with distance downstream. CP3 also would increase the reliability of the water supply by increasing firm water supplies for irrigation purposes, primarily during drought periods. Therefore, implementing CP3 would not directly or indirectly result in the conversion of Important Farmland to nonagricultural uses or the cancellation of Williamson Act contracts. This impact would be less than significant.

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This impact would be similar to Impact Ag-3 (CP1); however, the extent of the impact would be greater under CP3 than under CP1 and CP2 because alteration of the flow regime of the Sacramento River would be greater. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

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Impact Ag-4 (CP3): Direct and Indirect Conversion of Forest Land to Nonforest Uses Along the Upper Sacramento River Altered flow regimes associated with project implementation under CP3 could adversely affect forest land along the upper Sacramento River. The altered flow regime could affect oak woodland communities by prolonging inundation and changing the availability of soil moisture; however, these effects are unclear and may not all prove to be adverse. Changes in the magnitude of intermediate and large flows would likely be sufficient to alter the dynamics and structure of forests in the riparian corridor along the upper Sacramento River in the future. However, changes in the flow regime would not reduce the extent of riparian forest.

1 Therefore, implementing CP3 would not result in the conversion of forest land
2 to nonforest uses. This impact would be less than significant.

3 This impact would be similar to Impact Ag-4 (CP1); however, the extent of the
4 impact would be greater under CP3 than under CP1 and CP2 because alteration
5 of the flow regime of the Sacramento River would be greater. This impact
6 would be less than significant. Mitigation for this impact is not needed, and thus
7 not proposed.

8 **Lower Sacramento River and Delta and CVP/SWP Service Areas**

9 *Impact Ag-5 (CP3): Direct and Indirect Conversion of Important Farmland to* 10 *Nonagricultural Uses and Cancellation of Williamson Act Contracts in the*

11 *Extended Study Area* Agricultural lands in the extended study area, including
12 Important Farmland and Williamson Act contract lands, could be inundated or
13 undergo soil saturation as a result of increased mean monthly river flows.
14 Increases in Sacramento River stage (elevation) would be small. These
15 increased flows would affect areas periodically inundated or saturated under
16 existing conditions or the No-Action Alternative. The effects of this inundation
17 would diminish with distance downstream. CP3 also would increase the
18 reliability of the water supply by increasing firm water supplies for irrigation
19 purposes primarily during drought periods. Therefore, implementing CP3 would
20 not directly or indirectly result in the conversion of Important Farmland to
21 nonagricultural uses or the cancellation of Williamson Act contracts. This
22 impact would be less than significant.

23 This impact would be similar to Impact Ag-5 (CP1); however, the extent of the
24 impact would be greater under CP3 than under CP1 and CP2 because alteration
25 of the flow regime of the Sacramento River would be greater. In addition, CP3
26 would not include reserving storage capacity in Shasta Reservoir for increasing
27 M&I deliveries during dry and critical years. This impact would be less than
28 significant. Mitigation for this impact is not needed, and thus not proposed.

29 *Impact Ag-6 (CP3): Direct and Indirect Conversion of Forest Land to*

30 *Nonforest Uses in the Extended Study Area* Altered flow regimes associated
31 with project implementation under CP3 could adversely affect riparian forest
32 and oak woodlands. The altered flow regime could affect oak woodlands by
33 prolonging inundation and changing soil moisture in some years; however,
34 these effects are unclear and may not all prove to be adverse. Changes in the
35 magnitude of intermediate and large flows would likely be sufficient to alter the
36 dynamics and structure of the riparian forests along the upper Sacramento River
37 in the future. However, changes in flow regime would not reduce the extent of
38 riparian forest. Therefore, implementing CP3 would not result in the conversion
39 of forest land to nonforest uses. This impact would be less than significant.

40 This impact would be similar to Impact Ag-6 (CP1); however, the extent of the
41 impact would be greater under CP3 than under CP1 and CP2 because alteration
42 of the flow regime of the Sacramento River would be greater. This impact

1 would be less than significant. Mitigation for this impact is not needed, and thus
2 not proposed.

3 **CP4 – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply**
4 **Reliability**

5 Like each of the alternatives discussed above, CP4 would increase storage at
6 Shasta Lake, thus changing the reservoir’s full pool elevation and seasonal pool
7 elevations, and the flow regime in the Sacramento River and potentially several
8 other reservoirs and downstream waterways.

9 As under CP3, raising Shasta Dam 18.5 feet under CP4 would increase the
10 reservoir’s full pool elevation by 20.5 feet and enlarge the reservoir’s total
11 storage capacity by 634,000 acre-feet. The dedicated Shasta Lake storage of
12 378 TAF is unique to CP4 and Shasta Lake storage would be about 100–140
13 TAF greater under CP4 than under CP3 at various times of the year, with the
14 greatest difference occurring during October and November. Raising the dam
15 18.5 feet would increase the reservoir’s surface area at full pool by about 2,570
16 acres (9 percent). In general, the effect of this increase would be slight, given
17 that the reservoir would exceed the current full pool elevation only during
18 wetter-than-normal years.

19 Operations for a portion of increased storage (approximately 256,000 acre-feet)
20 would be the same as under CP1, with 70 TAF and 35 TAF reserved to
21 specifically focus on increasing M&I deliveries during dry and critical years,
22 respectively. Water supply reliability under CP4 would be the same as under
23 CP1. Implementing CP4 would help reduce estimated future agricultural water
24 shortages in the CVP/SWP service areas by increasing firm yield for
25 agricultural deliveries by at least 22,500 acre-feet per year in dry and critical
26 years and increasing average annual yield by about 20,300 acre-feet per year.

27 The changes in flow and river stage on the upper Sacramento River associated
28 with CP4 would be the same as the changes associated with CP1, as outlined
29 above, in that the operated storage of 256 TAF would be the same for CP1 and
30 CP4. CP4 also would involve augmenting spawning gravel and restoring
31 riparian, floodplain, and side-channel habitat at up to six potential locations in
32 the upper Sacramento River.

33 **Shasta Lake and Vicinity**

34 *Impact Ag-1 (CP4): Direct and Indirect Conversion of Important Farmland to*
35 *Nonagricultural Uses and Cancellation of Williamson Act Contracts in the*
36 *Vicinity of Shasta Lake* No lands adjacent to Shasta Lake or in the immediate
37 vicinity above Shasta Dam are designated by DOC as Important Farmland or
38 under Williamson Act contracts. No impact would occur.

39 This impact would be the same as Impact Ag-1 (CP1). No impact would occur.
40 Mitigation for this impact is not needed, and thus not proposed.

1 *Impact Ag-2 (CP4): Direct and Indirect Conversion of Forest Land to*
2 *Nonforest Uses in the Vicinity of Shasta Lake* Inundation of land and removal,
3 modification, or relocation of infrastructure under CP4 would result in the
4 conversion of forest land to nonforest uses. This impact would be significant.

5 This impact would be the same as Impact Ag-2 (CP3) and would be significant.
6 Mitigation for this impact is not proposed in Section 10.3.5 because no feasible
7 mitigation is available to reduce the impact to a less-than-significant level.

8 **Upper Sacramento River (Shasta Dam to Red Bluff)**

9 *Impact Ag-3 (CP4): Direct and Indirect Conversion of Important Farmland to*
10 *Nonagricultural Uses and Cancellation of Williamson Act Contracts Along the*
11 *Upper Sacramento River* Agricultural lands in the upper Sacramento River
12 portion of the primary study area, including Important Farmland and
13 Williamson Act contract lands, could be inundated as a result of increases in
14 mean monthly river flows. The flow increases that would occur in some years
15 would generally be small (5 percent or less) and would affect areas periodically
16 inundated under existing conditions or the No-Action Alternative. The effects of
17 increased flows would diminish with distance downstream. CP4 also would
18 increase the reliability of the water supply by increasing firm water supplies for
19 irrigation purposes, primarily during drought periods. In addition, there is no
20 Important Farmland or Williamson Act contract land in the area proposed for
21 gravel augmentation or within any of the potential restoration areas. Therefore,
22 implementing CP4 would not directly or indirectly result in the conversion of
23 Important Farmland to nonagricultural uses or the cancellation of Williamson
24 Act contracts. This impact would be less than significant.

25 This impact would be similar to Impact Ag-3 (CP1). In addition, none of the
26 lands in the area proposed for gravel augmentation or the proposed restoration
27 areas are Important Farmland or Williamson Act contract lands. This impact
28 would be less than significant. Mitigation for this impact is not needed, and thus
29 not proposed.

30 *Impact Ag-4 (CP4): Direct and Indirect Conversion of Forest Land to*
31 *Nonforest Uses Along the Upper Sacramento River* Altered flow regimes
32 associated with project implementation under CP4 could adversely affect forest
33 land along the upper Sacramento River. The altered flow regime could affect
34 oak woodland communities by prolonging inundation and changing the
35 availability of soil moisture; however, these effects are unclear and may not all
36 prove to be adverse. Changes in the magnitude of intermediate and large flows
37 would likely be sufficient to alter the dynamics and structure of forests in the
38 riparian corridor along the upper Sacramento River in the future. However,
39 changes in the flow regime would not reduce the extent of riparian forest.
40 Therefore, implementing CP4 would not result in the conversion of forest land
41 to nonforest uses. This impact would be less than significant.

1 This impact would be similar to Impact Ag-4 (CP1) and would be less than
2 significant. Mitigation for this impact is not needed, and thus not proposed.

3 **Lower Sacramento River and Delta and CVP/SWP Service Areas**

4 *Impact Ag-5 (CP4): Direct and Indirect Conversion of Important Farmland and*
5 *Cancellation of Williamson Act Contracts to Nonagricultural Uses in the*

6 *Extended Study Area* Agricultural lands in the extended study area, including
7 Important Farmland and Williamson Act contract lands, could be inundated or
8 undergo soil saturation as a result of increased mean monthly river flows.

9 Increases in Sacramento River stage (elevation) would be small. These
10 increased flows would affect areas periodically inundated or saturated under
11 existing conditions or the No-Action Alternative. The effects of this inundation
12 would diminish with distance downstream. CP4 also would increase the
13 reliability of the water supply by increasing firm water supplies for irrigation
14 purposes, primarily during drought periods. Therefore, implementing CP4
15 would not directly or indirectly result in the conversion of Important Farmland
16 to nonagricultural uses or the cancellation of Williamson Act contracts. This
17 impact would be less than significant.

18 This impact would be similar to Impact Ag-5 (CP1) and would be less than
19 significant. Mitigation for this impact is not needed, and thus not proposed.

20 *Impact Ag-6 (CP4): Direct and Indirect Conversion of Forest Land to*

21 *Nonforest Uses in the Extended Study Area* Altered flow regimes associated
22 with project implementation under CP4 could adversely affect riparian forest
23 and oak woodlands. The altered flow regime could affect oak woodlands by
24 prolonging inundation and changing soil moisture in some years; however,
25 these effects are unclear and may not all prove to be adverse. Changes in the
26 magnitude of intermediate and large flows would likely be sufficient to alter the
27 dynamics and structure of the riparian forests along the upper Sacramento River
28 in the future. However, changes in flow regime would not reduce the extent of
29 riparian forest. Therefore, implementing CP4 would not result in the conversion
30 of forest land to nonforest uses. This impact would be less than significant.

31 This impact would be similar to Impact Ag-6 (CP1) and would be less than
32 significant. Mitigation for this impact is not needed, and thus not proposed.

33 **CP5 – 18.5-Foot Dam Raise, Combination Plan**

34 Like each of the alternatives discussed above, CP5 would increase storage at
35 Shasta Lake, thus increasing the reservoir's full pool elevation and seasonal
36 pool elevations and changing the flow regime in the Sacramento River and
37 potentially several other reservoirs and downstream waterways.

38 As under CP3, raising Shasta Dam 18.5 feet under CP5 would increase the
39 reservoir's full pool elevation by 20.5 feet and enlarge its total storage capacity
40 by 634,000 acre-feet. Raising the dam 18.5 feet would increase the reservoir's
41 surface area at full pool by about 2,570 acres (9 percent). In general, the effect

1 of this increase would be slight, given that the reservoir would exceed the
2 current full pool elevation only during wetter-than-normal years.

3 Shasta Dam's operational guidelines would continue essentially unchanged,
4 except during dry and critical years, when 150 TAF and 75 TAF, respectively,
5 of the increased storage capacity in Shasta Reservoir would be reserved to
6 specifically focus on increasing M&I deliveries. Implementing CP5 would help
7 reduce estimated future agricultural water shortages in the CVP/SWP service
8 areas by increasing firm yield for agricultural deliveries by at least 66,100 acre-
9 feet per year in dry and critical years and increasing average annual yield by
10 about 50,900 acre-feet per year. Of all the alternatives, CP5 would provide the
11 greatest water supply reliability for the CVP/SWP service areas and the largest
12 amount of storage capacity reserved for increasing M&I deliveries. CP5 also
13 would involve augmenting spawning gravel and restoring riparian, floodplain,
14 and side-channel habitat at up to six potential locations in the upper Sacramento
15 River. CP5 would also involve constructing additional fish habitat in and along
16 the shoreline of Shasta Lake and along the lower reaches of its tributaries and
17 increasing recreation opportunities at Shasta Lake.

18 **Shasta Lake and Vicinity**

19 *Impact Ag-1 (CP5): Direct and Indirect Conversion of Important Farmland to*
20 *Nonagricultural Uses and Cancellation of Williamson Act Contracts in the*
21 *Vicinity of Shasta Lake* No lands adjacent to Shasta Lake or in the immediate
22 vicinity above Shasta Dam are designated by DOC as Important Farmland or
23 under Williamson Act contracts. No impact would occur.

24 This impact would be the same as Impact Ag-1 (CP1). No impact would occur.
25 Mitigation for this impact is not needed, and thus not proposed.

26 *Impact Ag-2 (CP5): Direct and Indirect Conversion of Forest Land to*
27 *Nonforest Uses in the Vicinity of Shasta Lake* Inundation of land and removal,
28 modification, or relocation of infrastructure under CP5 would result in the
29 conversion of forest land to nonforest uses. This impact would be significant.

30 This impact would be similar to Impact Ag-2 (CP3) and would be significant.
31 Mitigation for this impact is not proposed in Section 10.3.5 because no feasible
32 mitigation is available to reduce the impact to a less-than-significant level.

33 **Upper Sacramento River (Shasta Dam to Red Bluff)**

34 *Impact Ag-3 (CP5): Direct and Indirect Conversion of Important Farmland to*
35 *Nonagricultural Uses and Cancellation of Williamson Act Contracts Along the*
36 *Upper Sacramento River* Agricultural lands in the upper Sacramento River
37 portion of the primary study area, including Important Farmland and
38 Williamson Act contract lands, could be inundated as a result of increases in
39 mean monthly river flows. The flow increases that would occur in some years
40 would generally be small (5 percent or less) and would affect areas periodically
41 inundated under existing conditions or the No-Action Alternative. The effects of

1 increased flows would diminish with distance downstream. CP5 also would
2 increase the reliability of the water supply by increasing firm water supplies for
3 irrigation purposes, primarily during drought periods. There is no Important
4 Farmland or land under Williamson Act contract within the areas proposed for
5 gravel augmentation, restoration, and improvements to recreational facilities.
6 Therefore, implementing CP5 would not directly or indirectly result in the
7 conversion of Important Farmland to nonagricultural uses or the cancellation of
8 Williamson Act contracts. This impact would be less than significant.

9 This impact would be similar to Impact Ag-3 (CP1). In addition, none of the
10 land in the areas proposed for gravel augmentation, restoration areas, and
11 recreational facility improvements are Important Farmland or Williamson Act
12 contract lands. This impact would be less than significant. Mitigation for this
13 impact is not needed, and thus not proposed.

14 *Impact Ag-4 (CP5): Direct and Indirect Conversion of Forest Land to*
15 *Nonforest Uses Along the Upper Sacramento River* Altered flow regimes
16 associated with project implementation under CP5 could adversely affect forest
17 land along the upper Sacramento River. The altered flow regime could affect
18 oak woodland communities by prolonging inundation and changing the
19 availability of soil moisture; however, these effects are unclear and may not all
20 prove to be adverse. Changes in the magnitude of intermediate and large flows
21 would likely be sufficient to alter the dynamics and structure of forests in the
22 riparian corridor along the upper Sacramento River in the future. However,
23 changes in the flow regime would not reduce the extent of riparian forest.
24 Therefore, implementing CP5 would not result in the conversion of forest land
25 to nonforest uses. This impact would be less than significant.

26 This impact would be similar to Impact Ag-4 (CP1) and would be less than
27 significant. Mitigation for this impact is not needed, and thus not proposed.

28 **Lower Sacramento River and Delta and CVP/SWP Service Areas**

29 *Impact Ag-5 (CP5): Direct and Indirect Conversion of Important Farmland to*
30 *Nonagricultural Uses and Cancellation of Williamson Act Contracts in the*
31 *Extended Study Area* Agricultural lands in the extended study area, including
32 Important Farmland and Williamson Act contract lands, could be inundated for
33 undergo soil saturation as a result of increased mean monthly river flows.
34 Increases in Sacramento River stage (elevation) would be small. These
35 increased flows would affect areas periodically inundated or saturated under
36 existing conditions or the No-Action Alternative. The effects of this inundation
37 would diminish with distance downstream. CP5 also would increase the
38 reliability of the water supply by increasing firm water supplies for irrigation
39 purposes, primarily during drought periods. Therefore, implementing CP5
40 would not directly or indirectly result in the conversion of Important Farmland
41 to nonagricultural uses or the cancellation of Williamson Act contracts. This
42 impact would be less than significant.

1 This impact would be similar to Impact Ag-5 (CP1); however, CP5 would
2 provide the greatest water supply reliability for the CVP/SWP service areas and
3 the largest amount of storage capacity in Shasta Reservoir reserved to focus on
4 increasing M&I deliveries. This impact would be less than significant.
5 Mitigation for this impact is not needed, and thus not proposed.

6 *Impact Ag-6 (CP5): Direct and Indirect Conversion of Forest Land to*
7 *Nonforest Uses in the Extended Study Area* Altered flow regimes associated
8 with project implementation under CP5 could adversely affect riparian forest
9 and oak woodlands. The altered flow regime could affect oak woodlands by
10 prolonging inundation and changing soil moisture in some years; however,
11 these effects are unclear and may not all prove to be adverse. Changes in the
12 magnitude of intermediate and large flows would likely be sufficient to alter the
13 dynamics and structure of the riparian forests along the upper Sacramento River
14 in the future. However, changes in flow regime would not reduce the extent of
15 riparian forest. Therefore, implementing CP5 would not result in the conversion
16 of forest land to nonforest uses. This impact would be less than significant.

17 This impact would be similar to Impact Ag-6 (CP1) and would be less than
18 significant. Mitigation for this impact is not needed, and thus not proposed.

19 **10.3.5 Mitigation Measures**

20 Table 10-9 presents a summary of mitigation measures for agricultural and
21 forest resources.

22 ***No-Action Alternative***

23 Under the No-Action Alternative, no action would be taken, including
24 implementation of mitigation measures; rather, existing conditions would
25 continue to change into the future. No mitigation measures are required for the
26 No-Action Alternative. Thus, Impacts Ag-1 (No-Action), Ag-3 (No-Action),
27 and Ag-5 (No-Action) would be significant and unavoidable.

Table 10-9. Summary of Mitigation Measures for Agriculture and Important Farmland

Impact		No-Action Alternative	CP1	CP2	CP3	CP4	CP5
Impact Ag-1: Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts in the Vicinity of Shasta Lake	LOS before Mitigation	PS	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	SU	NI	NI	NI	NI	NI
Impact Ag-2: Direct and Indirect Conversion of Forest Land to Nonforest Uses in the Vicinity of Shasta Lake	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	No feasible mitigation is available to reduce impact.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Ag-3: Direct and Indirect Conversions of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts Along the Upper Sacramento River	LOS before Mitigation	PS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	SU	LTS	LTS	LTS	LTS	LTS

Table 10-9. Summary of Mitigation Measures for Agriculture and Important Farmland (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4	CP5
Impact Ag-4: Direct and Indirect Conversion of Forest Land to Nonforest Uses Along the Upper Sacramento River	LOS before Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Ag-5: Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts in the Extended Study Area	LOS before Mitigation	PS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	SU	LTS	LTS	LTS	LTS	LTS
Impact Ag-6: Direct and Indirect Conversion of Forest Land to Nonforest Uses in the Extended Study Area	LOS before Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS

Notes:
 LOS = level of significance
 LTS = less than significant
 NI = no impact
 PS = potentially significant
 S = significant
 SU = significant and unavoidable

1 ***CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply***
2 ***Reliability***

3 No mitigation is required for Impact Ag-1 (CP1) or for Impacts Ag-3 (CP1)
4 through Ag-6 (CP1). No feasible mitigation measures are available at the time
5 of preparation of this DEIS to reduce Impact Ag-2 (CP1) to a less-than-
6 significant level (i.e., to mitigate conversion of forest land to nonforest uses in
7 the vicinity of Shasta Lake). Therefore, Impact Ag-2 (CP1) would be significant
8 and unavoidable.

9 ***CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply***
10 ***Reliability***

11 No mitigation is required for Impact Ag-1 (CP2) or for Impacts Ag-3 (CP2)
12 through Ag-6 (CP2). As discussed above for CP1, no feasible mitigation
13 measures are available at the time of preparation of this DEIS to reduce Impact
14 Ag-2 (CP2) to a less-than-significant level (i.e., to mitigate conversion of forest
15 land to nonforest uses in the vicinity of Shasta Lake). Therefore, Impact Ag-2
16 (CP2) would be significant and unavoidable.

17 ***CP3 – 18.5-Foot Dam Raise, Agricultural Water Supply Reliability and***
18 ***Anadromous Fish Survival***

19 No mitigation is required for Impact Ag-1 (CP3) or for Impacts Ag-3 (CP3)
20 through Ag-6 (CP3). As discussed above for CP1, no feasible mitigation
21 measures are available at the time of preparation of this DEIS to reduce Impact
22 Ag-2 (CP3) to a less-than-significant level (i.e., to mitigate conversion of forest
23 land to nonforest uses in the vicinity of Shasta Lake). Therefore, Impact Ag-2
24 (CP3) would be significant and unavoidable.

25 ***CP4 – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply***
26 ***Reliability***

27 No mitigation is required for Impact Ag-1 (CP4) or for Impacts Ag-3 (CP4)
28 through Ag-6 (CP4). As discussed above for CP1, no feasible mitigation
29 measures are available at the time of preparation of this DEIS to reduce Impact
30 Ag-2 (CP4) to a less-than-significant level (i.e., to mitigate conversion of forest
31 land to nonforest uses in the vicinity of Shasta Lake). Therefore, Impact Ag-2
32 (CP4) would be significant and unavoidable.

33 ***CP5 – 18.5-Foot Dam Raise, Combination Plan***

34 No mitigation is required for Impact Ag-1 (CP5) or for Impacts Ag-3 (CP5)
35 through Ag-6 (CP5). As discussed above for CP1, no feasible mitigation
36 measures are available at the time of preparation of this DEIS to reduce Impact
37 Ag-2 (CP5) to a less-than-significant level (i.e., to mitigate conversion of forest
38 land to nonforest uses in the vicinity of Shasta Lake). Therefore, Impact Ag-2
39 (CP5) would be significant and unavoidable.

40 **10.3.6 Cumulative Effects**

41 California's demand for water for irrigation and other uses is expected to
42 continue to increase, while the water supply will likely become less reliable.

1 Future implementation of the related projects considered in this analysis of
2 cumulative impacts would convert agricultural land, including Important
3 Farmland, to nonagricultural uses. With or without implementation of the
4 proposed action, the significant cumulative losses of agricultural resources,
5 including Important Farmland, that have occurred in the primary and extended
6 study areas from past projects—and that would continue as a result of planned
7 future projects—are considerable.

8 Agricultural lands in the upper Sacramento River portion of the primary study
9 area and in the extended study area, including Important Farmland and
10 Williamson Act contract lands, could be inundated as a result of increases in
11 mean monthly river flows under any of the five project alternatives. The flow
12 increases that would occur in some years would generally be expected to be
13 small (5 percent or less) and would affect areas periodically inundated under
14 existing conditions or the No-Action Alternative. The effects of increased flows
15 would diminish with distance downstream. Any of the five project alternatives
16 also would increase the reliability of the water supply by increasing firm water
17 supplies for irrigation purposes, primarily during drought periods. Therefore,
18 implementing any of the five project alternatives would not directly or
19 indirectly result in the conversion of Important Farmland to nonagricultural uses
20 or the cancellation of Williamson Act contracts. This impact would be less than
21 significant. Implementation of any of the five project alternatives would not
22 result in a considerable incremental contribution to a cumulatively significant
23 impact associated with the conversion of Important Farmland to nonagricultural
24 uses or the cancellation of Williamson Act contracts.

25 No operational changes would occur that would directly convert forest land to
26 nonforest uses along the upper Sacramento River. However, CVP and SWP
27 water storage, conveyance, and deliveries would change because of several
28 reasonably foreseeable actions that would occur with or without enlargement of
29 Shasta Dam. The resulting changes in flow regime would likely result in
30 minimal adverse effects on riparian forest and oak woodlands. Several
31 management and restoration plans and programs would implement actions that
32 would largely offset those adverse effects. Although there would be reasonably
33 foreseeable projects that would restore forest land or put land into agricultural
34 production, there would be an overall significant cumulative effect on Important
35 Farmlands and forest lands. The effects of climate change on operations at
36 Shasta Lake could potentially cause changes in conditions for agricultural land
37 and forest land in downstream areas. As described in the Climate Change
38 Projection Appendix, climate change could affect future demand for agricultural
39 water by leading to increased rates of evapotranspiration and increasing the
40 length of the growing season. On the other hand, increased precipitation could
41 decrease overall water demand, depending on which adaptation strategies are
42 used by agriculture and municipalities and how much more efficiently plants
43 use water when carbon dioxide concentrations are higher. Crop types, planting
44 cycles, time of planting, and crop productivity may change as a result of climate
45 change, although a consensus has not been reached on how changes will occur.

1 As stated previously in this section, increases in California’s demand for water
2 and forecast reductions in water supply could lead to increased pressure to
3 convert Important Farmland to other nonagricultural uses and cancel
4 Williamson Act contracts.

5 In addition, changes to forest land and land cover could affect climate change.
6 As stated in the Climate Change Projection Appendix, deforestation and land
7 cover conversion have also been identified as contributing to global warming by
8 reducing the Earth’s capacity to remove carbon dioxide from the air and altering
9 the Earth’s albedo or surface reflectance, allowing more solar radiation to be
10 absorbed.

11 In the primary study area, forest land would be affected by inundation of land
12 and removal, modification, or relocation of infrastructure in the vicinity of
13 Shasta Dam. Implementing any of the five project alternatives (CP1–CP5)
14 would result in the conversion of forest land to nonforest uses in the vicinity of
15 Shasta Dam. No feasible mitigation exists to create a similar area of forest land
16 to replace the area of forest land that would be inundated or converted to
17 nonforest uses by relocation of facilities. Although reforestation could occur at a
18 small scale over hundreds of years, the acreage of forest land converted to
19 nonforest uses, including by reservoir inundation, is too large of a scale for
20 successful and feasible reforestation. Therefore, implementing any of the five
21 project alternatives would result in a cumulatively considerable incremental
22 contribution to a cumulative impact related to conversion of forest land to
23 nonforest uses. However, most of this area remains substantially in forest land
24 and has not been converted to nonforest uses. Therefore, the overall impact
25 would not be cumulatively significant.

26 In the extended study area, altered flow regimes associated with implementation
27 of any of the five project alternatives could affect forest land. The altered flow
28 regime could affect oak woodlands by prolonging inundation and changing the
29 availability of soil moisture in some years; however, these effects are unclear
30 and may not all prove to be adverse. Changes in the magnitude of intermediate
31 and large flows would likely be sufficient to alter the dynamics and structure of
32 the riparian forest along the upper Sacramento River in the future. However,
33 changes in flow regime would not reduce the extent of riparian forest.
34 Therefore, implementing any of the five project alternatives would not result in
35 the conversion of forest land to nonforest uses. Therefore, the five project
36 alternatives would not result in a cumulatively considerable incremental
37 contribution to a significant cumulative impact related to conversion of forest
38 land to nonforest uses.

39 As stated previously, climate change could result in changes to conditions for
40 agricultural land and forest land in downstream areas. However, implementing
41 any of the five project alternatives would promote improvements in the
42 reliability of CVP water supply deliveries. Thus, the project alternatives would
43 not result in a cumulatively considerable incremental contribution to a

1 significant cumulative impact related to future demands for, and availability of,
2 agricultural water.

3 Implementing any of the five project alternatives would result in a cumulatively
4 considerable incremental contribution to a cumulative impact related to
5 conversion of forest land to nonforest uses. However, most of this area remains
6 substantially in forest land and has not been converted to nonforest uses. Thus,
7 when added to the anticipated effects of climate change, raising Shasta Dam
8 would not have a significant cumulative effect on climate change resulting from
9 changes to forest land and land cover.

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