

Figure 12-3a. Special-Status Plant Species Occurring in Shasta Lake and Vicinity

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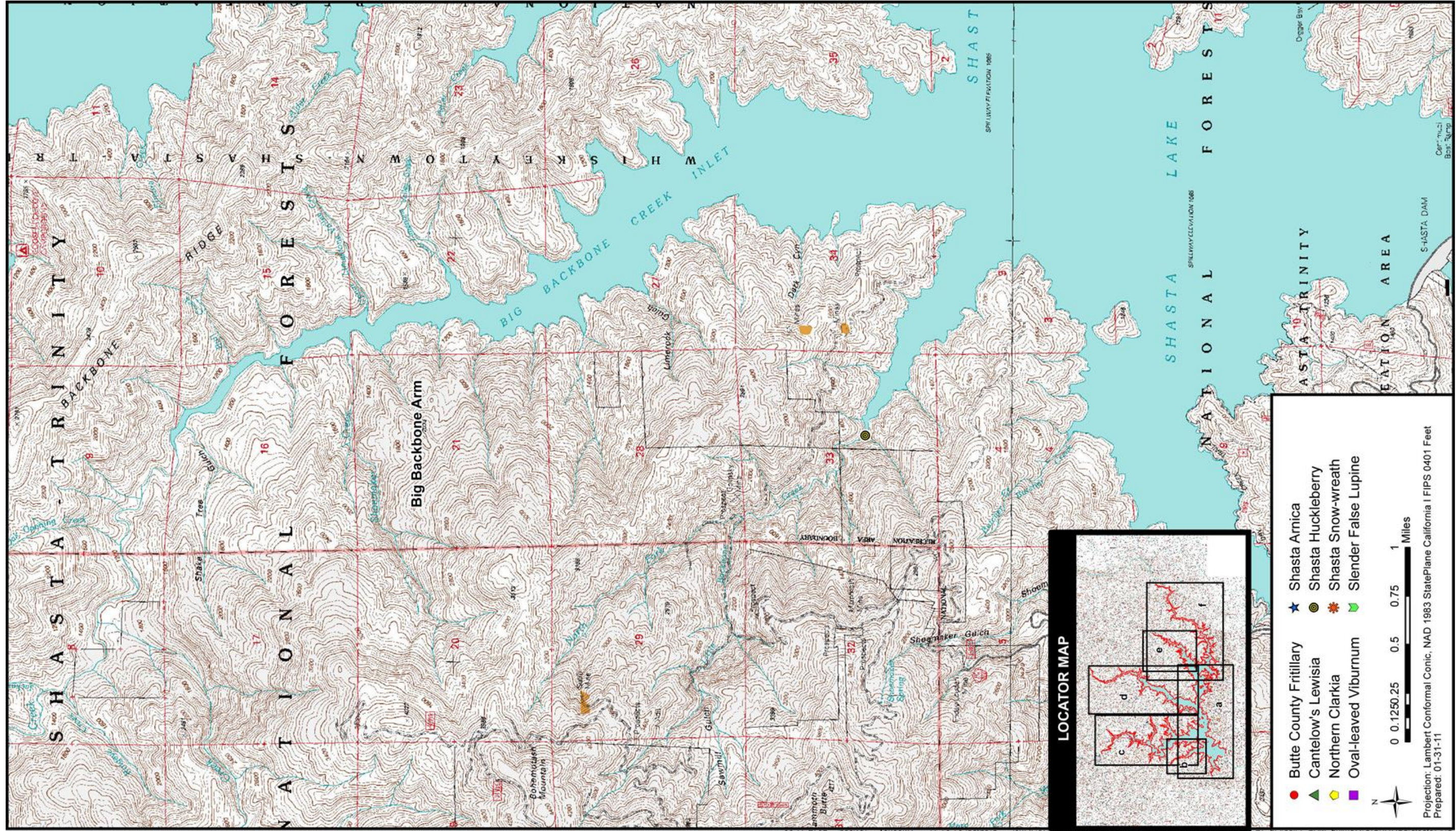


Figure 12-3b. Special-Status Plant Species Occurring in Shasta Lake and Vicinity

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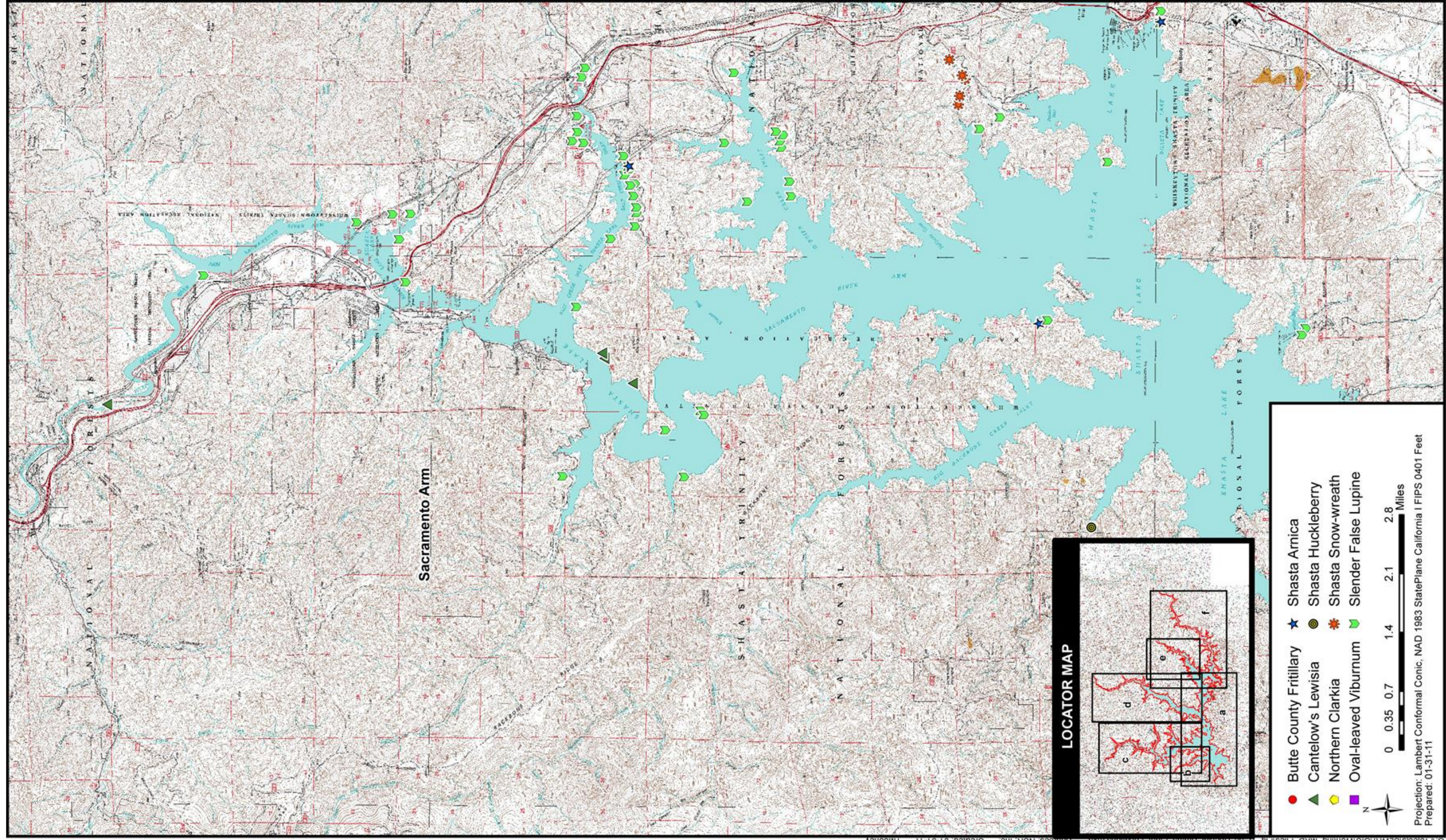


Figure 12-3c. Special-Status Plant Species Occurring in Shasta Lake and Vicinity

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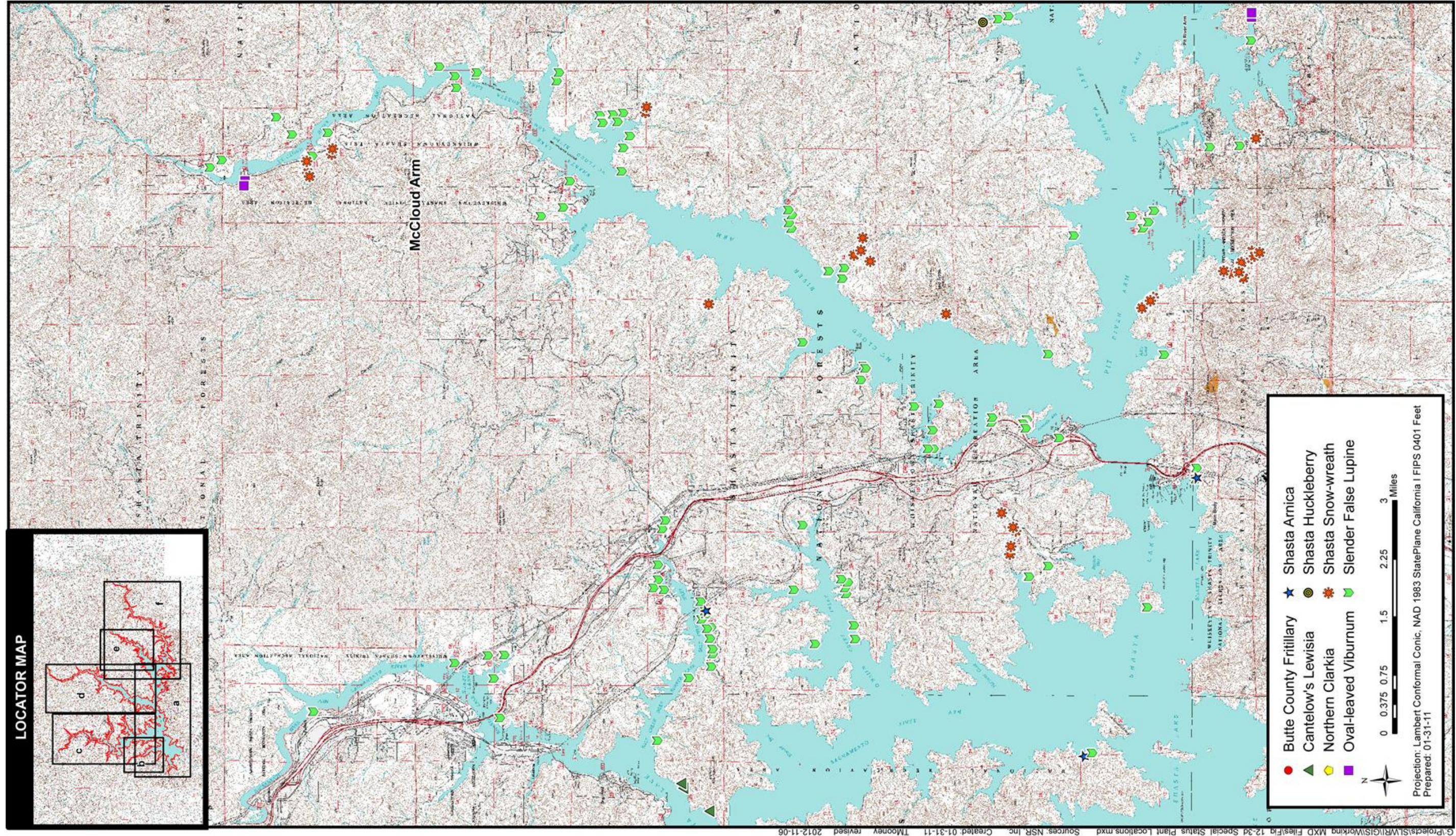


Figure 12-3d. Special-Status Plant Species Occurring in Shasta Lake and Vicinity

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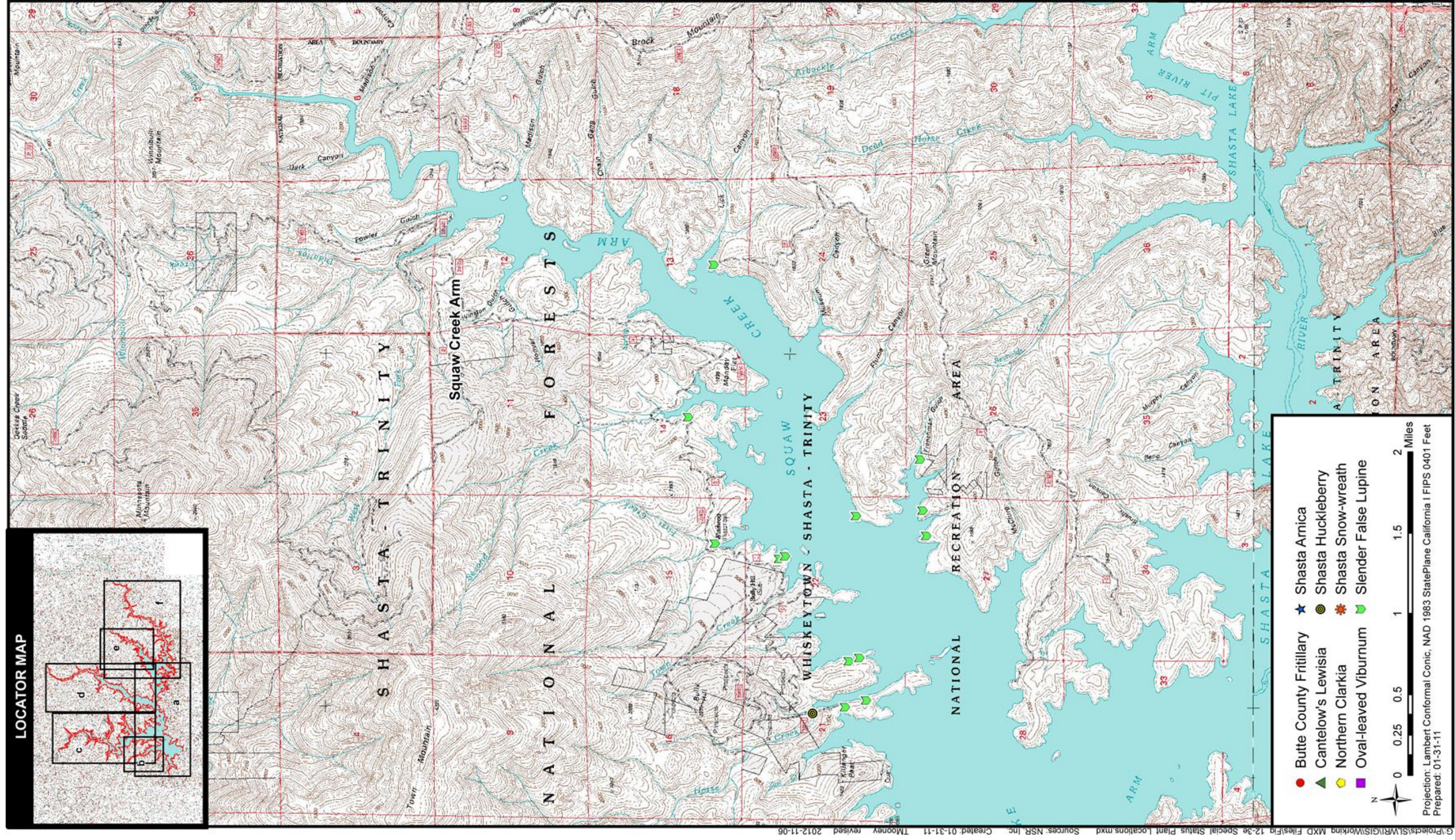
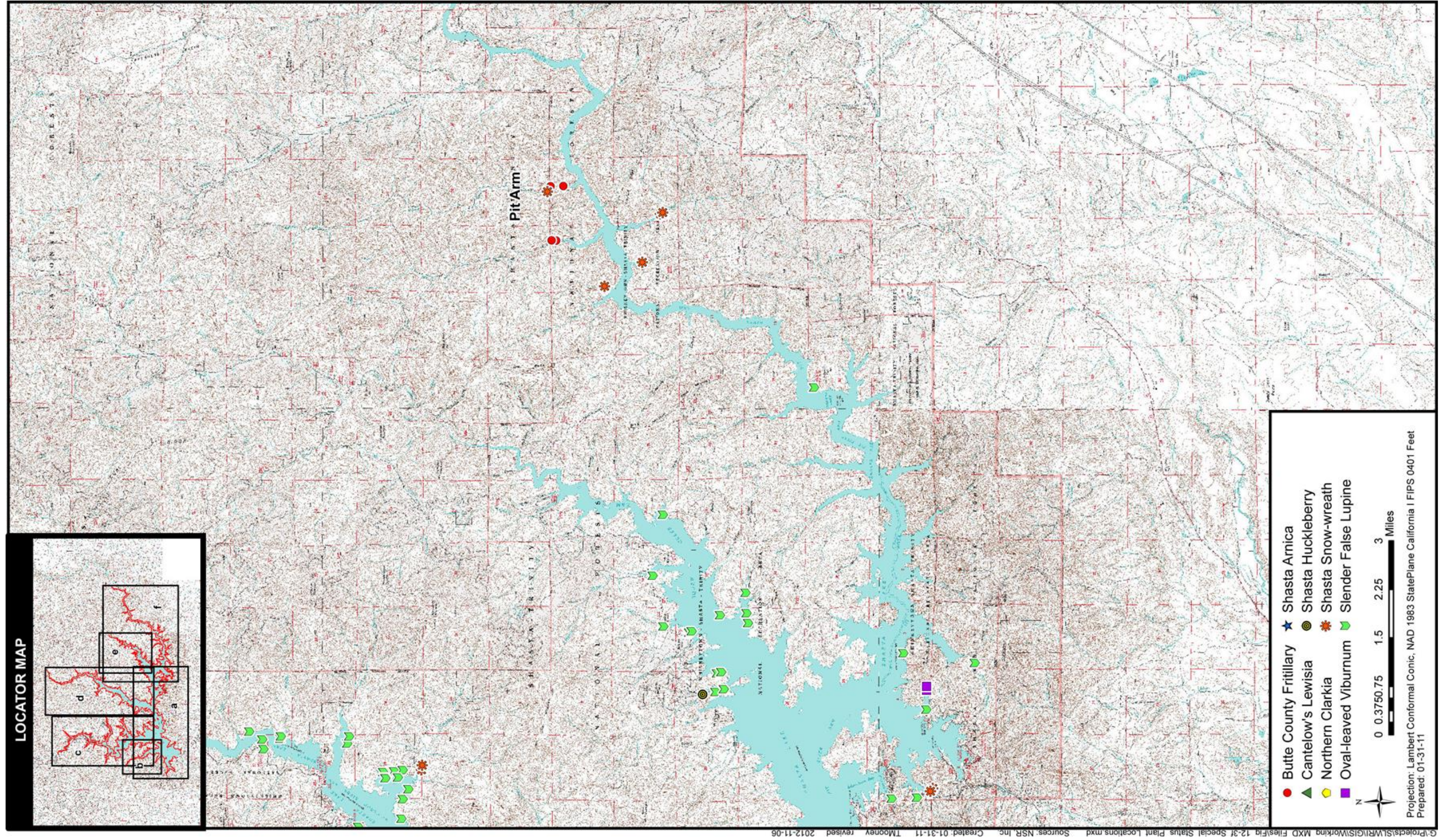


Figure 12-3e. Special-Status Plant Species Occurring in Shasta Lake and Vicinity

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G:\Projects\SWR\GIS\Working MXP Files\Fig 12-3f Special Status Plant Locations.mxd Sources: NSR, Inc Created: 01-31-11 Mooney revised 2012-11-06

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

2 Based on review of CNDDDB and CNPS database searches, a USFWS list of
3 species that could be potentially affected in this portion of the primary study
4 area, and previously prepared biological reports for the area, 25 special-status
5 plant species were identified as possibly occurring in the primary study area
6 between Shasta Dam and RBPP, and thus their potential to occur in this portion
7 of the study area was evaluated further. These special-status plant species, along
8 with the legal status, habitat, and potential for occurrence of each species, are
9 provided in Table 12-4.

10 Sixteen of the special-status plant species listed in Table 12-4 have the potential
11 to occur within habitat present along the Sacramento River between Shasta Dam
12 and RBPP. Many of these species, such as Bogg's Lake hedge hyssop (*Gratiola*
13 *heterosepala*; State endangered, MSCS m, CRPR 1B.2), Ahart's dwarf rush
14 (*Juncus leiospermus* var. *ahartii*; MSCS m, CRPR 1B.2), Ahart's paronychia
15 (*Paronychia ahartii*; MSCS m, CRPR 1B.1), dwarf downingia (*Downingia*
16 *pusilla*; CRPR 2.2), Greene's legenera (*Legenera limosa*; MSCS m, CRPR
17 1B.1), Henderson's bent grass (*Agrostis hendersonii*; MSCS m, CRPR 3.2), Red
18 Bluff dwarf rush (*Juncus leiospermus* var. *leiospermus*; CRPR 1B.2), and
19 slender Orcutt grass (*Orcuttia tenuis*; Federal endangered, state endangered,
20 MSCS m, CRPR 1B.1), typically occur in vernal pools, which are generally not
21 present within the active floodplain of regulated rivers in the extended study
22 area. Other special-status plants, however, could occur in the extended study
23 area in the freshwater marshes, swamps, and riparian woodlands that are found
24 along the river corridor. These species include rose mallow (*Hibiscus*
25 *lasiocarpus* var. *occidentalis*; MSCS m, CRPR 2), and silky cryptantha
26 (*Cryptantha crinita*; USFS SM, CRPR 1B.2). The remaining five species may
27 occur in annual grassland, chaparral, cismontane woodland, and lower montane
28 coniferous forest vegetation communities along the river corridor, including
29 adobe-lily (*Fritillaria pluriflora*; MSCS m, CRPR 1B.2), Butte County fritillary
30 (*Fritillaria eastwoodiae*; USFS S, CRPR 3.2), dubious pea (*Lathyrus*
31 *sulphureus* var. *agillaceous*; CRPR 3), mountain lady's slipper (*Cypripedium*
32 *fasciculatum*; USFS SM, CRPR 4.2), and oval-leaved viburnum (*Viburnum*
33 *ellipticum*; CRPR 2.3).

34 Of the special-status species that could occur along the upper Sacramento River,
35 four are known to occur along the edge of the Sacramento River channel, or
36 along a Sacramento River tributary within 0.2 mile of the river proper, and their
37 establishment and reproduction could potentially be affected by changes in flow
38 regime: silky cryptantha, rose mallow, and Ahart's paronychia (CNDDDB 2007,
39 University of California 2011).

1 **Table 12-4. Special-Status Plant Species Known or with Potential to Occur in the Primary**
2 **Study Area, Along the Sacramento River from Shasta Dam to Red Bluff Pumping Plant**

Species	Legal Status ¹					Habitat and Blooming Period	Potential for Occurrence
	USFWS	CDFW	MSCS	USFS	CRPR		
Shasta ageratina <i>Ageratina shastensis</i>		–		E	1B.2	Rocky carbonate outcrops in chaparral and lower montane coniferous forest; 1,300–5,900 feet elevation. Blooms June–October.	Could occur near Shasta Dam if suitable outcrops are present. Potential is low because most of the primary study area is below species' known elevation range.
Henderson's bent grass <i>Agrostis hendersonii</i>	–	–	m	–	3.2	Mesic sites in valley and foothill grassland, vernal pools; 230–1,000 feet elevation. Blooms April–May.	Could occur along the Sacramento River if suitable vernal mesic habitat is present.
Shasta County arnica <i>Arnica venosa</i>	–	–	–	E	4.2	Cismontane woodlands and lower montane coniferous forests, often in disturbed areas and roadcuts; 1,300–4,900 feet elevation. Blooms May–July.	Could occur along the Sacramento River and tributaries within the primary study area. Potential is low because most of the study area is below species' known elevation range.
Silky cryptantha <i>Cryptantha crinita</i>	–	–	m	–	1B.2	Gravelly streambeds within cismontane woodland, lower montane coniferous forest, riparian forest, riparian woodland, valley and foothill grassland; 275–4,000 feet elevation. Blooms April–May.	Could occur along the Sacramento River and tributaries within the primary study area.
Clustered lady's slipper <i>Cypripedium fasciculatum</i>	–	–	–	SM	4.2	Lower montane coniferous forest, North Coast coniferous forest; often in serpentinite seeps or on streambanks; 300–8,000 feet elevation. Blooms March–July.	Unlikely; no coniferous forest known in the primary study area.
Mountain lady's slipper <i>Cypripedium montanum</i>	–	–	–	SM	4.2	Broadleaved upland forest, cismontane woodland, lower montane coniferous forest, North Coast coniferous forest; 500–7,000 feet elevation. Blooms March–July.	Could occur at Shasta Dam or along the Sacramento River and tributaries.
Dwarf downingia <i>Downingia pusilla</i>	–	–	–	–	2.2	Mesic sites in valley and foothill grassland, vernal pools. Blooms March–May.	Could occur along the Sacramento River if suitable vernal mesic habitat is present.

1 **Table 12-4. Special-Status Plant Species Known or with Potential to Occur in the Primary**
 2 **Study Area, Along the Sacramento River from Shasta Dam to Red Bluff Pumping Plant**
 3 **(contd.)**

Species	Legal Status ¹					Habitat and Blooming Period	Potential for Occurrence
	USFWS	CDFW	MSCS	USFS	CRPR		
Butte County fritillary <i>Fritillaria eastwoodiae</i>	-	-	-	S	3.2	Openings and sometime serpentine areas in chaparral, cismontane woodland, and lower montane coniferous forest; 160–4,900 feet elevation. Blooms March–June.	Could occur along the Sacramento River and tributaries within the primary study area.
Adobe-lily <i>Fritillaria pluriflora</i>	-	-	m	-	1B.2	Chaparral, cismontane woodland, valley and foothill grassland; often in adobe soils; 200–2,300 feet elevation. Blooms February–April.	Could occur at Shasta Dam and along the Sacramento River.
Bogg's Lake hedge hyssop <i>Gratiola heterosepala</i>	-	E	m	-	1B.2	Marshes and swamps, vernal pools; 30–8,000 feet elevation. Blooms April–August.	Could occur along the Sacramento River and tributaries.
Rose mallow Hibiscus lasiocarpus var. occidentalis	-	-	m	-	1B.2	Freshwater marshes and swamps.	Could occur along the Sacramento River and tributaries.
Ahart's dwarf rush Juncus leiospermus var. ahartii	-	-	m	-	1B.2	Mesic sites in valley and foothill grassland; 100–300 feet elevation. Blooms March–May.	Could occur along the Sacramento River if suitable vernal mesic habitat is present. Shasta Dam is higher than species' known elevation range.
Red Bluff dwarf rush Juncus leiospermus var. leiospermus	-	-	-	-	1B.1	Vernally mesic sites in chaparral, cismontane woodland, meadows and seeps, valley and foothill grassland, vernal pools; 100–3,350 feet elevation. Blooms March–May.	Could occur at Shasta Dam or along the Sacramento River if suitable vernal mesic habitat is present.
Dubious pea Lathyrus sulphureus var. argillaceous	-	-	-	-	3	Cismontane woodland, lower montane coniferous forest, upper montane coniferous forest; 500–1,000 feet elevation. Blooms in April.	Could occur at Shasta Dam and along the Sacramento River.
Greene's legenere <i>Legenere limosa</i>	-	-	m	-	1B.1	Vernal pools; 1–3,000 feet elevation. Blooms April–June.	Could occur along Sacramento River if suitable vernal pool habitat is present.

1 **Table 12-4. Special-Status Plant Species Known or with Potential to Occur in the Primary**
 2 **Study Area, Along the Sacramento River from Shasta Dam to Red Bluff Pumping Plant**
 3 **(contd.)**

Species	Legal Status ¹					Habitat and Blooming Period	Potential for Occurrence
	USFWS	CDFW	MSCS	USFS	CRPR		
Cantelow's lewisia <i>Lewisia cantelovii</i>	-	-	-	S	1B.2	Mesic granitic sites within broadleaved upland forest, chaparral, cismontane woodland, and lower montane coniferous forest; 1,250–4,500 feet. Sometimes in serpentinite seeps. Blooms May–October.	Could occur in the Shasta Dam area. The remainder of the primary study area is below species' known elevation range.
Bellinger's meadowfoam <i>Limnanthes floccosa</i> ssp. <i>bellingeriana</i>	-	-	m	-	1B.2	Mesic sites in cismontane woodland, meadows and seeps; 950–3,600 feet elevation. Blooms April–June.	Could occur at Shasta Dam. Potential along Sacramento River is low because majority of the primary study area is below species known elevation range.
Shasta snow wreath <i>Neviusia cliftonii</i>	-	-	m	S	1B.2	Carbonate substrates in lower montane coniferous forest and riparian woodland; 1,000–1,600 feet elevation. Blooms May–June.	Could occur in Shasta Dam area. Unlikely to occur along Sacramento River because the primary study area is lower than species known elevation range.
Slender orcutt grass <i>Orcuttia tenuis</i>	E	E	m	-	1B.1	Vernal pools; 100–6,000 feet elevation. Blooms May–October.	Could occur along the Sacramento River if suitable vernal pool habitat is present. Federally designated critical habitat for this species occurs east of the Sacramento River, east of Cottonwood (Units 3A and 3B) and northeast of Anderson (Units 2C and 2D).
Ahart's paronychia <i>Paronychia ahartii</i>	-	-	m	-	1B.1	Cismontane woodland, valley and foothill grassland, vernal pools; 100–1,700 feet elevation. Blooms March–June.	Could occur at Shasta Dam and along the Sacramento River.
Pacific fuzzwort <i>Ptilidium californicum</i>	-	-	-	SM	4.3	An epiphytic on bark at the base of standing mature to old-growth trees or recently fallen logs; rarely on other organic substrates such as decaying logs and stumps, or humus covering boulders; 1,275–5,725 feet elevation.	Could occur along the Sacramento River and tributaries within the primary study area. Potential is low because most of the study area is below species' known elevation range.

1 **Table 12-4. Special-Status Plant Species Known or with Potential to Occur in the Primary**
 2 **Study Area, Along the Sacramento River from Shasta Dam to Red Bluff Pumping Plant**
 3 **(contd.)**

Species	Legal Status ¹					Habitat and Blooming Period	Potential for Occurrence
	USFWS	CDFW	MSCS	USFS	CRPR		
Canyon Creek stonecrop <i>Sedum paradisum</i>	–	–	–	S	1B.3	Granitic, rocky areas in broadleaved upland forest, chaparral, lower montane coniferous forest, subalpine coniferous forest; 980–6,100 feet elevation. Blooms May–June.	Could occur along the Sacramento River and tributaries within the primary study area. Potential is low because most of the study area is below species' known elevation range.
English Peak greenbriar <i>Smilax jamesii</i>	–	–	m	S	1B.3	Found along streambanks and lake margins in broadleaved upland forest, lower montane, upper montane, and north coast coniferous forests, and marshes and swamps; 1,600–8,200 feet elevation. Blooms May–July, rarely through August.	Could occur along the Sacramento River and tributaries within the primary study area. Potential is low because most of the study area is below species' known elevation range.
Oval-leaved viburnum <i>Viburnum ellipticum</i>	–	–	–	–	2.3	Chaparral, cismontane woodland, lower montane coniferous forest; 800–4,600 feet elevation. Blooms May–June.	Could occur at Shasta Dam and along the Sacramento River.

Sources: CNDDDB 2007, CNPS 2011, USFS 2007, USFWS 2011

Note:

¹Legal Status

U.S. Fish and Wildlife Service Federal Listing Categories:
 T = Threatened
 E = Endangered

California Department of Fish and Wildlife State Listing Categories:
 R = California Rare
 T = California Threatened
 E = California Endangered

U.S. Forest Service Listing Categories:
 E = Endemic to specific region or National Forest
 S = Sensitive
 SM = Species considered rare or threatened and recommended for survey and management per Northwest Forest Plan 2002

California Rare Plant Rank Categories:
 1B = Plants rare, threatened, or endangered in California and elsewhere
 2 = Plants rare, threatened, or endangered in California but more common elsewhere
 3 = Plants for which more information is needed—a review list
 4 = Plants of limited distribution—a watch list

MSCS (Multi-Species Conservation Strategy) Listing Categories:
 R = recovery
 r = contribute to recovery
 m = maintain

4 ***Lower Sacramento River and Delta***

5 Most of the special-status plant species listed in Table 12-4 have the potential to
 6 occur within the extended study area (lower Sacramento River and Delta and
 7 CVP/SWP service areas). Numerous additional special-status plant species
 8 could occur in the extended study area. Attachment 4 of the *Botanical*
 9 *Resources and Wetlands Technical Report* contains comprehensive lists of all

1 sensitive plant species in the extended study area that have been reported to the
2 CNDDDB, or that otherwise have the potential to occur in the extended study
3 area.

4 A number of special-status plant species could be affected in the lower
5 Sacramento River and Delta by changes in hydrology (CALFED 2000c). These
6 include species associated with vernal pool, riparian, marsh, and aquatic plant
7 communities; and several other species with restricted distributions on or near
8 channel banks, active floodplains, flood bypasses, and Delta waterways. These
9 assemblages of special-status species are described below.

10 **Species of Vernal Pool Communities** In addition to species that are
11 potentially present in the primary study area (Table 12-4), special-status plant
12 species that may be associated with vernal pools along the lower Sacramento
13 River and in the Delta region include alkali milk-vetch (*Astragalus tener* var.
14 *tener*; MSCS r, CRPR 1B.2), brittlescale (*Atriplex depressa*; MSCS m, CRPR
15 1B.2), Hoover's spurge (*Euphorbia hooveri*; Federal threatened, MSCS m,
16 CRPR 1B.2), Contra Costa goldfields (*Lasthenia conjugens*; Federal
17 endangered, MSCS m, CRPR 1B.1), hairy orcutt grass (*Orcuttia pilosa*; Federal
18 endangered, MSCS m, CRPR 1B.1), slender Orcutt grass (*Orcuttia tenuis*;
19 Federal threatened, MSCS m, CRPR 1B.1), bearded popcornflower
20 (*Plagiobothrys hystriculus*; CRPR 1B.1), Delta woolly-marbles (*Psilocarphus*
21 *brevissimus* var. *multiflorus*; CRPR 4.2), Crampton's tuctoria (*Tuctoria*
22 *mucronata*; Federal and State endangered, MSCS r, CRPR 1B.1), and Greene's
23 tuctoria (*Tuctoria greenei*; Federal endangered, MSCS m, CRPR 1B.1). The
24 primary threats affecting most of these species at multiple locations are habitat
25 loss because of development, nonnative species, and incompatible grazing
26 practices. Additional threats affecting some of these species at one or more
27 location include game management practices (e.g., inundation of land for
28 waterfowl during the growing season), off-road vehicle use and trampling,
29 incompatible agricultural practices, and hydrological alterations.

30 **Species of Riparian and Marsh Communities** In addition to species
31 considered potentially present in the primary study area (Table 12-4), special-
32 status plant species associated with riparian and marsh communities along the
33 lower Sacramento River or in the Delta region include bristly sedge (*Carex*
34 *comosa*; MSCS r, CRPR 2.1), Suisun thistle (*Cirsium hydrophilum* var.
35 *hydrophilum*; Federal endangered, MSCS R, CRPR 1B.1), Soft bird's-beak
36 (*Chloropyron molle* ssp. *molle*; Federal endangered, State rare, MSCS R, CRPR
37 1B.2), Delta button-celery (*Eryngium racemosum*; MSCS r, CRPR 1B.1),
38 Northern California black walnut (*Juglans hindsii*; MSCS r, CRPR 1B.1), Delta
39 tule pea (*Lathyrus jepsonii* var. *jepsonii*; MSCS r, CRPR 1B.2), Mason's
40 lilaeopsis (*Lilaeopsis masonii*; MSCS R, CRPR 1B.1), Delta mudwort
41 (*Limosella australis*; MSCS r, CRPR 2.1), Sanford's arrowhead (*Sagittaria*
42 *sanfordii*; MSCS m, CRPR 1B.2), Marsh skullcap (*Scutellaria galericulata*;
43 MSCS m, CRPR 2.2), blue skullcap (*Scutellaria lateriflora*; MSCS m, CRPR
44 2.2), and Suisun Marsh aster (*Symphotrichum lentum*; CRPR 1B.2) (CNDDDB

1 2007, CRPR 2011). The primary threats affecting these species are habitat loss,
2 competition from nonnative species, and alterations to hydrology (including
3 trenching and diking). Additional threats include grazing and trampling,
4 installation of riprap, and anthropogenic disturbances (e.g., off-road vehicles;
5 road, utility, and levee maintenance).

6 **Species of Aquatic Communities** Eel-grass pondweed (*Potamogeton*
7 *zosteriformis*; MSCS m, CRPR 2.2), a submerged aquatic plant of assorted
8 freshwater habitats, is rare in California but more common elsewhere (CNPS
9 2011). Overall, the distribution, abundance, and threats affecting this species in
10 California are not well known.

11 **CVP/SWP Service Areas**

12 Special-status plants are not likely to occur in a substantial portion of the CVP
13 and SWP service areas because the agricultural and urban land uses tend to
14 preclude suitable habitat for most native species. Although agricultural and
15 developed land uses account for most of the CVP and SWP service areas, a
16 portion of these areas still remains in natural vegetation. Because of the large
17 size of the CVP and SWP service areas, this natural vegetation is distributed
18 over a wide range of climate and soils, and is varied in structure and species
19 composition. Consequently, a large number of special-status plant species has
20 the potential to occur in the natural vegetation that remains within the CVP and
21 SWP service areas. (See the *Botanical Resources and Wetlands Technical*
22 *Report.*)

23 **12.1.1 Invasive Species**

24 **Shasta Lake and Vicinity**

25 Nonnative plant species introduced to the region are of concern in the Shasta
26 Lake and vicinity portion of the primary study area. When plants that evolved in
27 one region of the globe are moved by humans to another region, a few flourish,
28 crowding out native vegetation and wildlife that feed on the native species.
29 Some invasive plants can even change ecosystem processes such as hydrology,
30 fire regimes, and soil chemistry. These invasive plants have a competitive
31 advantage because they are no longer controlled by their natural predators and
32 can quickly spread. In California, approximately 3 percent of the plant species
33 growing in the wild are considered invasive, but they inhabit a much greater
34 proportion of the landscape (Cal-IPC 2007).

35 Plant pests are defined by law, regulation, policy, and technical organizations,
36 and are regulated by many different bodies, including the California Department
37 of Food and Agriculture (CDFA), U.S. Department of Agriculture, and the
38 California Invasive Plant Council (Cal-IPC). The CDFA uses an action-oriented
39 pest-rating system. The low rating assigned to a pest by CDFA does not
40 necessarily mean that the pest is not a problem; rather, the rating system is
41 meant to prioritize response by CDFA and county agricultural commissioners.
42 Plants on CDFA's highest priority "A" list are defined as plants "of known

1 economic importance subject to state-county enforced action involving
 2 eradication, quarantine regulation, containment, rejection or other holding
 3 action.” Cal-IPC has developed a list of plant pests specific to California
 4 wildlands. The Cal-IPC list is based on information submitted by land
 5 managers, botanists, and researchers throughout the state and on published
 6 sources. To determine plant pests potentially occurring in the Shasta Lake and
 7 vicinity portion of the primary study area, this list was reviewed and local
 8 agencies (BLM, USFS, California Department of Transportation, and Shasta
 9 County Department of Agriculture) were contacted to gather information about
 10 known weed locations (Table 12-5). Additional information about noxious
 11 weeds has been compiled by Reclamation from observations made during
 12 botanical and other technical studies. Attachment 5 describes each weed source
 13 location, the potential mode of spread, and the risk of spread at each of the
 14 known sites.

15 Management actions have been required to prevent the loss of habitat caused by
 16 some of the more invasive exotic species that out-compete native vegetation.
 17 However, these management actions have been limited and have been confined
 18 primarily to areas adjacent to campgrounds and USFS facilities.

19 **Table 12-5. Nonnative Plant Species Known to Occur in the Shasta Lake and Vicinity**
 20 **Portion of the Primary Study Area**

Common Name	Scientific Name	Cal-IPC Rating ¹	CDFA Ranking ²	Habitat
Silver wattle	<i>Acacia dealbata</i>	Moderate	None	Mixed woodlands, riparian
Tree of heaven	<i>Ailanthus altissima</i>	Moderate	None	Grassland, oak woodland, riparian
Slender wild oats	<i>Avena barbata</i>	Moderate	None	Coastal scrub, grassland, oak woodland, forest
Common wild oats	<i>Avena fatua</i>	Moderate	None	Coastal scrub, grassland, oak woodland, forest
Rattlesnake grass	<i>Briza maxima</i>	Limited	None	Grassland
Ripgut brome	<i>Bromus diandrus</i>	Moderate	None	Dunes, scrub, grassland, woodland, forest
Soft brome	<i>Bromus hordeaceus</i>	Limited	None	Grassland, sage brush, serpentine soils
Red brome	<i>Bromus madritensis</i> ssp. <i>rubens</i>	High	None	Interior scrub, woodlands, grassland
Cheatgrass	<i>Bromus tectorum</i>	High	None	Interior scrub, woodlands, grassland

21

1 **Table 12-5. Nonnative Plant Species Known to Occur in the Shasta Lake and Vicinity**
2 **Portion of the Primary Study Area (contd.)**

Common Name	Scientific Name	Cal-IPC Rating ¹	CDFA Ranking ²	Habitat
Lenspod whitetip	<i>Cardaria chalapensis</i>	Moderate-ALERT	B	Central Valley wetlands
Italian thistle	<i>Carduus pycnocephalus</i>	Moderate	None	Forest, scrub, grasslands, woodlands.
White knapweed	<i>Centaurea diffusa</i>	Moderate	A	Great basin scrub, coastal prairie
Spotted knapweed	<i>Centaurea maculosa</i>	High	A	Riparian, grassland, wet meadows, forests
Yellow star-thistle	<i>Centaurea solstitialis</i>	High	C	Grassland, woodlands, occasionally riparian
Squarrose knapweed	<i>Centaurea virgata</i> var. <i>squarrosa</i>	Moderate	A	Scrub, grassland, pinyon-juniper woodland
Rush skeleton weed	<i>Chondrilla juncea</i>	Moderate	A	Grassland
Canada thistle	<i>Cirsium arvense</i>	Moderate	B	Grassland, riparian areas, forests
Bull thistle	<i>Cirsium vulgare</i>	Moderate	None	Riparian areas, marshes, meadows
Field bindweed	<i>Convolvulus arvensis</i>	Evaluated, not listed	C	Agricultural weed
Bermuda grass	<i>Cynodon dactylon</i>	Moderate	C	Riparian scrub, common landscape weed
Scotch broom	<i>Cystis scoparius</i>	High	C	Coastal scrub, oak woodland
Longbeak stork's bill	<i>Erodium botrys</i>	Evaluated, not listed	None	Many upland habitats
Redstem stork's bill	<i>Erodium cicutarium</i>	Limited	None	Many upland habitats
Leafy spurge	<i>Euphorbia esula</i>	High-ALERT	A	Forests, woodlands, juniper forests
Fig	<i>Ficus carica</i>	Moderate	None	Riparian woodland
Fennel	<i>Foeniculum vulgare</i>	High	None	Grassland, scrub
French broom	<i>Genista mospessulana</i>	High	C	Coastal scrub, oak woodland, grassland
English ivy	<i>Hedera helix</i>	High	None	Coastal forest, riparian areas
Mediterranean barley, foxtail	<i>Hordeum marinum</i> , <i>H. murinum</i>	Moderate	None	Grassland

1 **Table 12-5. Nonnative Plant Species Known to Occur in the Shasta Lake and Vicinity**
2 **Portion of the Primary Study Area (contd.)**

Common Name	Scientific Name	Cal-IPC Rating ¹	CDFA Ranking ²	Habitat
Common St. John's wort	<i>Hypericum perforatum</i>	Moderate	C	Many habitats, disturbed
Dyer's woad, Marlahan mustard	<i>Isatis tinctoria</i>	Moderate	B	Great basin scrub and grassland
Dalmation toadflax	<i>Linaria dalmatica</i>	Moderate	A	Grassland, forest clearings
Italian ryegrass	<i>Lolium multiflorum</i>	Moderate	None	Grassland, oak woodlands, pinyon-juniper woodland
Oleander	<i>Nerium oleander</i>	Evaluated, not listed	None	Riparian areas
Pokeweed	<i>Phytolacca americana</i>	None	None	Riparian forest, riparian woodland
Black locust	<i>Robinia pseudoacacia</i>	Limited	None	Riparian areas, canyons
Himalayan blackberry	<i>Rubus armeniacus</i>	High	None	Riparian areas, marshes, oak woodlands
Cutleaf blackberry	<i>Rubus laciniatus</i>	None	None	Riparian areas, marshes, oak woodlands
Curly dock	<i>Rumex crispus</i>	Limited	None	Grassland, vernal pools, meadows, riparian
Tansy ragwort	<i>Senecio jacobaea</i>	Limited	B	Grassland, riparian
Johnsongrass	<i>Sorghum halepense</i>	None	C	Disturbed sites, moist places
Spanish broom	<i>Spartium junceum</i>	High	None	Coastal scrub, grassland, wetlands, oak woodland, forests
Medusa-head	<i>Taeniatherum caput-medusae</i>	High	C	Grassland, scrub, woodland
Spreading hedgeparsley	<i>Torilis arvensis</i>	Moderate	None	Widespread
Common mullein	<i>Verbascum thapsus</i>	Limited	None	Meadows, riparian, sagebrush, pinyon-juniper woodland
Periwinkle	<i>Vinca major</i>	Moderate	None	Riparian, oak woodlands, coastal scrub
Rat-tail fescue	<i>Vulpia myuros</i>	Moderate	None	Coastal sage scrub, chaparral

3

1 **Table 12-5. Nonnative Plant Species Known to Occur in the Shasta Lake and Vicinity**
2 **Portion of the Primary Study Area (contd.)**

Notes:

¹ Cal-IPC Inventory Categories:

- High Severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Widely distributed ecologically.
- Moderate Substantial and apparent ecological impacts on physical processes, plant and animal communities, and vegetation structure. Reproductive biology and other attributes are conducive to moderate to high rates of dispersal, although generally dependent on ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.
- Limited These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic (Cal-IPC 2012).

² CDFA Pest Ratings of Noxious Weed Species and Noxious Weed Seed

- A – Eradication, containment, rejection, or other holding action at the state-county level.
B – Intensive control or eradication, where feasible, at the county level.
C – Control or eradication as local conditions warrant, at the county level.
Q – Rating as “A” is pending at the state or county level.

Key:

Cal-IPC = California Invasive Plant Council

CDFA = California Department of Food and Agriculture

3 ***Upper Sacramento River (Shasta Dam to Red Bluff) and Lower***
4 ***Sacramento River and Delta***

5 A number of nonnative species have been introduced and become abundant in
6 the riparian areas and marshes (fresh emergent wetlands) of the Sacramento
7 Valley and Delta (Hunter et al. 2003). Several of these invasive nonnatives,
8 including red sesbania (*Sesbania punicea*), Himalayan blackberry (*Rubus*
9 *discolor*), giant reed (*Arundo donax*), and perennial pepperweed (*Lepidium*
10 *latifolium*), form dense, monotypic stands that preclude the establishment of
11 native species (Bossard, Randall, and Hoshovsky 2000). In general, these
12 species displace native plants, reduce biodiversity, alter river flows, and reduce
13 wildlife habitat values. Table 12-6 lists the most problematic of those species in
14 Sacramento Valley and Delta riparian areas and marshes—invasive species
15 rated by Cal-IPC; many of these species have severe ecological impacts on
16 physical processes, plant and animal communities, and vegetation structure
17 (Cal-IPC 2006).

1 **Table 12-6. Cal-IPC High-Rated Invasive Plants of Sacramento Valley and Delta Riparian**
2 **and Marsh Habitats**

Scientific Name Common Name	Cal-IPC Rating	CDFA Rating	Primary Riparian/ Marsh Habitat(s)	Plant Type
<i>Ailanthus altissima</i> Tree-of-heaven, Chinese sumac	M	C	Marsh, riparian forest/woodland/scrub	Tree
<i>Arundo donax</i> Giant reed	H	B	Riparian forest/scrub	Perennial grass
<i>Bromus diandrus</i> Ripgut brome, great brome	M	–	Riparian scrub	Annual grass
<i>Bromus madritensis</i> ssp. <i>rubens</i> Red brome, foxtail chess	H	–	Riparian woodland/scrub	Annual grass
<i>Centaurea melitensis</i> Malta starthistle, tocalote	M	C	Riparian scrub	Annual herb
<i>Centaurea solstitialis</i> Yellow starthistle	H	C	Riparian scrub	Annual herb
<i>Cirsium vulgare</i> Bull thistle	M	C	Marsh	Perennial herb
<i>Conium maculatum</i> Poison hemlock	M	–	Riparian forest	Perennial herb
<i>Cortaderia selloana</i> , <i>Cortaderia jubata</i> Pampasgrass, white pampasgrass, jubatagrass	H	B	Riparian scrub	Perennial grass
<i>Delairea odorata</i> Cape-ivy, German ivy	H	–	Riparian forest	Perennial vine
<i>Dipsacus fullonum</i> Common teasel, wild teasel	M	–	Bog and fen, riparian scrub, marsh	Perennial herb
<i>Egeria densa</i> Brazilian waterweed, egeria	H	C	Lakes, ponds, reservoirs	Perennial aquatic herb
<i>Eucalyptus globules</i> Bluegum, Tasmanian bluegum	M	–	Marsh, riparian forest/woodland	Tree
<i>Ficus carica</i> Edible fig	M	–	Riparian forest, marsh	Shrub/tree
<i>Foeniculum vulgare</i> fennel	H	–	Riparian scrub/woodland	Perennial herb
<i>Geranium dissectum</i> Cutleaf geranium	L	–	Riparian woodland	Annual herb
<i>Hedera helix</i> , <i>Hedera canariensis</i> English ivy and Algerian ivy	H	–	Riparian forest, marsh	Perennial vine/shrub

3

1 **Table 12-6. Cal-IPC High-Rated Invasive Plants of Sacramento Valley and Delta Riparian**
2 **and Marsh Habitats (contd.)**

Scientific Name Common Name	Cal-IPC Rating	CDFA Rating	Primary Riparian/ Marsh Habitat(s)	Plant Type
<i>Hypochaeris glabra</i> Smooth cat's-ear	L	–	Riparian woodland	Annual herb
<i>Hypochaeris radicata</i> Common cat's ear, rough cat's-ear	M	–	Riparian forest/woodland/scrub	Annual herb
<i>Lepidium latifolium</i> Perennial pepperweed, tall whitetop	H	B	Tidal and nontidal marsh, riparian scrub	Perennial herb
<i>Lolium multiflorum</i> , <i>Festuca perennis</i> Italian ryegrass	M	–	Riparian scrub	Annual/biennial grass
<i>Ludwigia peploides</i> Creeping waterprimrose, California waterprimrose	H	–	Rivers, streams, canals	Perennial aquatic herb
<i>Lytrum hyssopifolium</i> Hyssop loosestrife, grass poly	L	–	Marsh	Perennial herb
<i>Lythrum salicaria</i> Purple loosestrife	H	B	Tidal and nontidal marsh	Perennial herb
<i>Mentha pulegium</i> Pennyroyal, European pennyroyal	M	–	Marsh, bog and fen, riparian forest	Perennial herb
<i>Myoporum laetum</i> Ngaio tree, false sandalwood	M	–	Marsh	Shrub/tree
<i>Myriophyllum spicatum</i> Spike watermilfoil	H	C	Lakes, ponds, reservoirs	Perennial aquatic herb
<i>Potamogeton crispus</i> Curly-leaved pondweed, curled pondweed	M	–	Lakes, ponds, reservoirs, rivers, streams, canals	Perennial aquatic herb
<i>Pyracantha angustifolia</i> , <i>P. crenulata</i> , <i>P. coccinea</i> Narrowleaf firethorn, scarlet firethorn	L	–	Riparian woodland	Shrub
<i>Ranunculus repens</i> Creeping buttercup	L	–	Riparian forest/woodland	Perennial herb
<i>Rubus armeniacus</i> (= <i>R. discolor</i>) Himalayan blackberry	H	–	Riparian woodland/forest/scrub, nontidal marsh	Shrub

3

1 **Table 12-6. Cal-IPC High-Rated Invasive Plants of Sacramento Valley and Delta Riparian**
2 **and Marsh Habitats (contd.)**

Scientific Name Common Name	Cal-IPC Rating	CDFA Rating	Primary Riparian/ Marsh Habitat(s)	Plant Type
<i>Rumex acetosella</i> Sheep sorrel	M	–	Riparian scrub	Perennial herb
<i>Rumex crispus</i> Curly dock	L	–	Bog and fen, riparian forest/woodland	Perennial herb
<i>Saponaria officinalis</i> Bouncing-bet, bouncing betty	L	–	Riparian woodland	Perennial herb
<i>Sesbania punicea</i> Red sesbania, scarlet wisteria	H, A	B	Riparian woodland, marsh	Tree
<i>Tamarix chinensis</i> , <i>T. gallica</i> , <i>T. parviflora</i> , <i>T. ramosissima</i> Chinese tamarisk, French tamarisk, small flower tamarisk, salt cedar	H	B	Riparian forest/woodland, marsh	Tree, shrub
<i>Torilis arvensis</i> Hedgeparsley, spreading hedgeparsley	M	–	Riparian woodland	Annual herb
<i>Verbascum thapsus</i> Common mullein, wooly mullein	L	–	Riparian scrub	Perennial herb

Source: Cal-IPC 2006

Notes:

Cal-IPC Inventory Ratings:

- A = Alert – Plant species with the potential to spread explosively; infestations currently small and localized
- H = High – species that have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure
- M = Moderate –species that have substantial and apparent, but generally not severe, ecological impacts on physical processes, plant and animal communities, and vegetation structure
- L = Limited –species that are invasive but their impacts are minor on a statewide level or there was not enough information to justify a higher score

CDFA Weed Ratings:

- B = known to be of economic or environmental detriment, and of limited distribution, if present in California
- C = known to be of economic or environmental detriment, and usually widespread, if present in California

3 **12.1.2 Waters of the United States, Including Wetlands, in Shasta Lake and**
4 **Vicinity**

5 Reclamation delineated wetlands and other waters of the United States under
6 Federal jurisdiction (jurisdictional waters) in the impoundment area between
7 2004 and 2010. Jurisdictional waters on public lands in the relocation areas
8 were delineated between 2009 and 2010 and on private lands where access was
9 granted. Supplemental fieldwork is planned for additional private lands in the

1 relocation areas where access has recently been granted. The data from the
2 supplemental fieldwork will be incorporated into the wetland delineation report
3 prepared for submittal to the USACE and will also be included the Final EIS.
4 The wetland delineation is ongoing and has not been verified by the USACE.
5 All information regarding jurisdictional waters is preliminary.

6 Jurisdictional waters occur in the impoundment and relocation areas as wetlands
7 and other waters. Wetlands include fresh emergent/riparian wetland,
8 intermittent swale, riparian wetland, seasonal wetland, seep/spring wetland, and
9 vegetated ditch. Other waters include ephemeral, intermittent, and perennial
10 streams, roadside ditches, seep/spring waters, and lacustrine. Because some
11 construction activities associated with the impoundment and relocation areas
12 extend into Shasta Lake below the existing full pool elevation, the surface area
13 of the lake is included in the delineation results. Approximately 51 acres of
14 wetlands and 30,092 acres of other waters occur in the impoundment and
15 relocation areas. Total jurisdictional waters in the impoundment and relocation
16 areas, excluding Shasta Lake at full pool, include approximately 51 acres of
17 wetlands and 121 acres of other waters.

18 ***Main Body***

19 The wetland delineation of the impoundment area along the Main Body was
20 conducted from January to April 2010. Jurisdictional waters include
21 seep/spring, riparian, and vegetated ditch wetlands and ephemeral stream,
22 intermittent stream, and perennial stream, seep/spring, and roadside ditch
23 waters. Total acres of jurisdictional waters occurring in the Main Body are
24 summarized in Table 12-7.

1 **Table 12-7. Jurisdictional Waters in the Impoundment Area**

Jurisdictional Water Type	Area (Acres)					
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Wetlands						
Fresh emergent/riparian wetland	0.00	0.00	5.30	0.00	0.00	0.00
Intermittent swale	0.00	0.002	0.00	0.00	0.00	0.04
Riparian wetland	1.04	1.71	6.63	8.34	1.49	0.74
Seasonal wetland	0.00	0.00	0.31	0.00	0.14	0.02
Seep/spring wetland	0.77	0.23	0.80	0.31	0.16	0.47
Vegetated ditch	0.13	0.00	0.00	0.02	0.00	0.00
Total Wetlands	1.94	1.94	12.24	8.67	1.79	1.27
Other Waters of the United States						
Ephemeral stream	0.29	0.02	0.62	0.28	0.13	0.12
Intermittent stream	1.42	0.25	2.38	0.93	0.93	2.69
Perennial stream	1.55	3.00	9.76	20.26	2.37	1.48
Roadside ditch	0.00	0.00	0.03	0.00	0.00	0.00
Seep/spring other waters	0.03	0.00	0.001	0.01	0.0001	0.00
Riverine	0.00	0.00	0.00	0.00	0.01	0.00
Lacustrine	10,196.88	1,014.12	7,225.14	5,032.68	2,081.60	4,372.80
Total Other Waters	10,200.17	1,017.39	7,237.93	5,054.15	2,085.03	4,377.09
Total Waters of the U.S.	10,202.11	1,019.33	7,250.99	5,062.82	2,086.82	4,374.07

Note:

* Acreage values are approximate

2 **Big Backbone Arm**
3 The wetland delineation along the Big Backbone Arm was conducted during
4 November 2006. Jurisdictional waters included seep/spring and riparian
5 wetlands, and ephemeral stream, intermittent stream, and perennial stream
6 waters. Total acres of jurisdictional waters occurring in the Big Backbone Arm
7 are summarized in Table 12-7.

1 **Sacramento Arm**

2 The wetland delineation along the Sacramento Arm was conducted from
3 September through early December 2010 and during March, April, and June
4 2010. Jurisdictional waters include seep/spring, riparian, seasonal, and
5 riparian/fresh emergent wetlands, and ephemeral stream, intermittent stream,
6 and perennial stream, seep/spring, and roadside ditch waters. Total acres of
7 jurisdictional waters occurring in the Sacramento Arm are summarized in Table
8 12-7.

9 **McCloud Arm**

10 The wetland delineation along the McCloud Arm was conducted during
11 December 2009 and in April, June, and November 2010. Jurisdictional waters
12 include seep/spring, riparian, and vegetated ditch wetlands and ephemeral
13 stream, intermittent stream, perennial stream, and seep/spring waters. Total
14 acres of jurisdictional waters occurring in the McCloud Arm are summarized in
15 Table 12-7.

16 **Squaw Creek Arm**

17 The wetland delineation along the Squaw Creek Arm was conducted from late
18 August through September 2004. Jurisdictional waters include seep/spring,
19 riparian, and seasonal wet meadow wetlands, and ephemeral stream,
20 intermittent stream, perennial stream, and seep/spring other waters. Total acres
21 of jurisdictional waters occurring in the Squaw Creek Arm are summarized in
22 Table 12-7.

23 **Pit Arm**

24 The wetland delineation along the Pit Arm was conducted from late November
25 2006 through April 2007. Jurisdictional waters include riparian, seep/spring,
26 seasonal, and intermittent swale wetlands, and ephemeral stream, intermittent
27 stream, and perennial stream waters. Total acres of jurisdictional waters
28 occurring in the Pit Arm are summarized in Table 12-7.

29 **Relocation Areas**

30 Wetland delineations at the relocation areas were conducted between January
31 2010 and September 2011. Jurisdictional waters include wetlands and other
32 waters. Wetlands include fresh emergent, intermittent swale, riparian,
33 seep/spring, and seasonal wetlands, and vegetated ditches. Other waters present
34 include ephemeral, intermittent, and perennial streams, seep/spring, and
35 roadside ditches. Total acres of jurisdictional waters occurring in the Relocation
36 Areas are summarized in Table 12-8.

1 **Table 12-8. Jurisdictional Waters in the Relocation Areas**

Jurisdictional Water Type	Relocation Acres					
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Wetlands						
Fresh emergent wetland	0.00	N/A	0.02	0.01	0.00	0.00
Intermittent swale	0.00	N/A	0.78	0.00	0.00	0.02
Riparian wetland	0.15	N/A	5.87	3.89	0.18	0.82
Seasonal wetland	0.01	N/A	10.61	0.00	0.02	0.00
Seep/spring wetland	0.03	N/A	0.09	0.26	0.05	0.43
Vegetated ditch	0.06	N/A	0.002	0.01	0.002	0.00
Total Wetlands	0.24	N/A	17.37	4.17	0.25	1.27
Other Waters of the United States						
Ephemeral stream	0.30	N/A	1.37	1.40	0.03	0.18
Intermittent stream	0.89	N/A	4.16	2.17	0.22	1.74
Perennial stream	0.00	N/A	1.27	10.44	0.30	0.00
Roadside ditch	0.02	N/A	0.16	0.00	0.00	0.00
Seep/spring other waters	0.00	N/A	0.00	0.00	0.03	0.00
Total Other Waters	1.21	N/A	6.97	14.01	0.58	1.92
Total Waters of the U.S.	1.45	N/A	24.34	18.18	0.83	3.19

Note:

*Acreage values are approximate.

Key:

N/A = Not Applicable

2 **Characterization of Wetland Features**

3 Jurisdictional wetlands occurring in the Shasta Lake and vicinity portion of the
4 primary study area include fresh emergent/riparian wetland, intermittent swale,
5 riparian wetland, seasonal wetland, seep/spring wetland, and vegetated ditch.

6 Fresh emergent/riparian wetlands are uncommon in the Shasta Lake and vicinity
7 portion of the primary study area, occurring only at one location along the
8 Sacramento Arm. This location consists of a former USFS recreation site
9 developed at the confluence of Salt Creek and Shasta Lake, immediately east of
10 I-5. This former recreation site coupled with an undercrossing at I-5 has
11 partially impounded the flows of Salt Creek, resulting in the development of an
12 area characterized by a complex of fresh emergent and riparian wetland
13 vegetation. Dominant overstory species include Goodding's black willow
14 (OBL¹), arroyo willow (FACW), red willow (assume FACW), and shining

¹ OBL = Obligate Wetland Plants—Estimated probability of occurring in wetland >99 percent.

1 willow (OBL). Fresh emergent species include pennyroyal (*Mentha pulegium*–
2 OBL), willow dock (*Rumex salicifolius*–OBL), and broadleaf cattail (*Typha*
3 *latifolia*). Wetland hydrology and soils criteria are met through evidence of
4 frequent flooding, including sediment deposits, watermarks, drift lines, and
5 drainage patterns.

6 Intermittent swales occur along the Big Backbone and Pit arms. These features
7 are characterized as linear, or somewhat linear, drainages that lack evidence of
8 scour and are dominated by wetland plant species resulting from seasonally
9 saturated soils. Typical species occurring in these features include seep monkey
10 flower (*Mimulus guttatus*–OBL), spiny fruit buttercup (*Ranunculus muricatus*–
11 FACW), slender rush (*Juncus tenuis*–FACW), and centaury (*Centaureum*
12 *venustum*–Not Listed (NL)). Wetland hydrology and soils criteria are met
13 through evidence of long-duration saturation, including saturation in the upper
14 12 inches, aquic moisture regime, and drainage patterns.

15 Riparian wetlands are common throughout the Shasta Lake and vicinity portion
16 of the primary study area and generally occur as “stringers,” or narrow features
17 found immediately adjacent to intermittent or perennial streams. Typical species
18 found in riparian wetlands include arroyo willow (FACW), Goodding’s black
19 willow (OBL), white alder (FACW), Oregon ash (FACW), Indian rhubarb
20 (*Darmera peltata*-NL), mugwort (*Artemisia douglasiana*-FACW), California
21 wild grape (FACW), and Himalayan blackberry (FACW). Wetland hydrology
22 and soils criteria are met through evidence of frequent flooding, including
23 sediment deposits, watermarks, drift lines, and drainage patterns.

24 Seasonal wetlands occur along the Sacramento, Squaw Creek, and Pit arms.
25 These features are dominated by herbaceous vegetation and are typically
26 adjacent to other wetland features or are depressions that frequently pond.
27 Typical plant species found in these features include slender rush (FACW),
28 sword leaf rush (*Juncus ensifolius*–FACW), seep monkey flower (OBL),
29 yampah (*Perideridia californica*–FACW), annual checker bloom (*Sidalcea*
30 *calycosa*–OBL), little quaking grass (*Briza minor*–FACW), California oatgrass
31 (*Danthonia californica*–FACW), and spiny fruit buttercup (FACW). Wetland
32 hydrology and soils criteria are met through evidence of long-duration
33 saturation, including saturation in the upper 12 inches, an aquic moisture
34 regime, and drainage patterns.

35 Seep/spring wetlands are found throughout the Shasta Lake and vicinity portion
36 of the primary study area. These features form at locations where groundwater
37 flows meet the ground surface. Hydrophytic vegetation typically colonizes the

FACW = Facultative Wetland Plants—Estimated probability of occurring in wetland >67 percent to 99 percent.
FAC = Facultative Plants—Estimated probability of occurring in wetland 33 percent to 67 percent.
FACU = Facultative Upland Plants—Estimated probability of occurring in wetland 1 percent to <33 percent.
UPL = Obligate Upland Plants—Estimated probability of occurring in wetland <1 percent.
NI = No Indicator—Plants for which insufficient information was available to determine an indicator status.
NL = Not listed—Plants not listed in Reed 1988.

1 area where water is provided by the seep/spring. Typical species include white
2 alder (FACW), chain fern (*Woodwardia fimbriata*–FACW), goat’s beard
3 (*Aruncus dioicus*–FACW), Indian rhubarb (NL), seep monkey flower (OBL),
4 horsetail (*Equisetum arvense*–FAC), red stem dogwood (*Cornus stolonifera*–
5 FACW), spicebush (NL), Himalayan blackberry (FACW), and western azalea
6 (FAC). The wetland hydrology and soils criteria are met through evidence of
7 long-duration saturation, including inundation, saturation in the upper 12 inches,
8 watermarks, and drainage patterns.

9 Vegetated ditches are uncommon in the Shasta Lake and vicinity portion of the
10 primary study area and occur along the Main Body, the McCloud Arm, and in
11 several relocation areas. These features consist of ditches that have been
12 excavated to drain adjacent uplands, parking areas, roads, or railways. These
13 features are generally low gradient and provide hydrologic conditions suitable
14 for colonization by hydrophytic vegetation. Dominant plant species include
15 nutsedge (*Cyperus eragrostis*–FACW), seep monkey flower (OBL), broadleaf
16 cattail, and rush (*Juncus* sp.–assume FACW). Wetland hydrology and soil
17 criteria were met by long-duration inundation and long-duration saturation.

18 Jurisdictional waters (i.e., other waters) occurring in the Shasta Lake and
19 vicinity portion of the primary study area include ephemeral, intermittent, and
20 perennial streams, roadside ditches, and seep/spring waters.

21 Ephemeral streams are common throughout the Shasta Lake and vicinity portion
22 of the primary study area. These features are linear drainages characterized by
23 indicators of scour and deposition, minor drift lines, and sediment deposits, but
24 lack a groundwater component that contributes to their flow. The wetland
25 hydrology is provided by sheet flow and these features typically cease flowing
26 soon after storm or runoff events. Ephemeral streams are characterized by
27 poorly defined wetland hydrology indicators, and are typically found in
28 headwater areas with relatively small drainage areas.

29 Intermittent streams are the most common jurisdictional feature in the Shasta
30 Lake and vicinity portion of the primary study area. Intermittent streams range
31 from small, poorly defined tributaries to larger, well-defined streams that flow
32 into the summer. Like ephemeral streams, intermittent streams flow seasonally,
33 but, in addition to precipitation and sheet flow from adjacent slopes, these
34 features have a groundwater component to their flow regime. Intermittent
35 streams are characterized by the presence of a defined bed and bank, and scour
36 and deposition. Other characteristics, such as algae growth or hydrophytic
37 vegetation in or adjacent to the stream, indicate longer inundation periods.
38 Wetland hydrology and hydric soil criteria are met through evidence of frequent
39 flooding, including water marks, algal matting, drift lines, and sediment
40 deposits.

41 Perennial streams occur throughout the Shasta Lake and vicinity portion of the
42 primary study area. These features are characterized by perennial flow and often

1 bounded by riparian wetlands. Dominant substrates consist of boulders,
2 bedrock, cobble, sand, and gravel. Wetland hydrology and hydric soil criteria
3 are met through evidence of frequent flooding, including water marks, algal
4 matting, drift lines, and sediment deposits.

5 Roadside ditches are uncommon in the Shasta Lake and vicinity portion of the
6 primary study area but some are found along the Sacramento Arm. These ditch
7 features occur near roadways and railroad tracks and have been excavated
8 solely to drain uplands. Wetland vegetation is sparse or absent. The wetland
9 boundaries were indicated by sediment and drift deposits.

10 Seep/spring other waters are uncommon in the Shasta Lake and vicinity portion
11 of the primary study area but some are found along the Main Body, the
12 Sacramento Arm, the McCloud Arm, and the Squaw Creek Arm. These features
13 form at locations where groundwater flows meet the ground surface; however,
14 the features are not dominated by hydrophytic vegetation. The wetland
15 hydrology and soils criteria are met through evidence of long-duration
16 saturation, including inundation, saturation in the upper 12 inches, watermarks,
17 and drainage patterns.

18 **12.2 Regulatory Framework**

19 Biological resources in California are protected and/or regulated by a variety of
20 Federal and State laws and policies. In addition, in many parts of California,
21 there are local or regional habitat and species conservation planning efforts in
22 which a project applicant may participate. Key regulatory and conservation
23 planning issues applicable to the project and alternatives under consideration are
24 discussed below.

25 **12.2.1 Federal**

26 ***Endangered Species Act***

27 Pursuant to the Federal Endangered Species Act (ESA), USFWS and NMFS
28 have authority over projects that may result in “take” of a Federally listed
29 species. In general, ESA Section 7 prohibits persons (including private parties)
30 from “taking” listed endangered or threatened fish and wildlife species on
31 private property, and from “taking” listed endangered or threatened plant
32 species in areas under Federal jurisdiction or in violation of State law (16 U.S.
33 Code (USC) 1532, 50 Code of Federal Regulations (CFR) 17.3). Under the
34 ESA, the definition of “take” is to “harass, harm, pursue, hunt, shoot, wound,
35 kill, trap, capture, or collect, or to attempt to engage in any such conduct” as
36 part of an intentional or negligent act or omission. The term “harm” includes
37 acts that result in death or injury to wildlife. Such acts may include significant
38 habitat modification or degradation if it results in death or injury to wildlife by
39 significantly impairing essential behavioral patterns, including breeding,
40 feeding, or sheltering. Section 7(a) of the ESA, as amended, requires Federal

1 agencies to evaluate their actions with respect to any species that is proposed for
2 listing or is listed as endangered or threatened. Section 7(a)(2) requires Federal
3 agencies to ensure that activities they authorize, fund, or carry out are not likely
4 to jeopardize the continued existence of a listed species or to destroy or
5 adversely modify its critical habitat. If a Federal action may affect a listed
6 species or its critical habitat, the responsible Federal agency must enter into
7 formal consultation with USFWS.

8 As defined in the ESA, critical habitat is a specific geographic area that is
9 essential for the conservation of a threatened or endangered species and that
10 may require special management and protection. It may include an area that is
11 not currently occupied by the species but that will be needed for its recovery.
12 Critical habitats are designated to ensure that actions authorized by Federal
13 agencies will not destroy or adversely modify critical habitat, thereby protecting
14 areas necessary for the conservation of the species.

15 ***Clean Water Act***

16 The CWA is the major Federal legislation governing the water quality aspects
17 of the SLWRI. The objective of the act is “to restore and maintain the chemical,
18 physical, and biological integrity of the nation’s waters.” The CWA establishes
19 the basic structure for regulating discharge of pollutants into the waters of the
20 United States and gives EPA the authority to implement pollution control
21 programs, such as setting wastewater standards for industries. In certain states,
22 such as California, EPA has delegated authority to State agencies.

23 Section 303 of the CWA requires states to adopt water quality standards for all
24 surface waters of the United States. The three major components of water
25 quality standards are designated users, water quality criteria, and
26 antidegradation policy. Section 303(d) of the CWA requires states and
27 authorized Native American tribes to develop a list of water-quality-impaired
28 segments of waterways. The list includes waters that do not meet water quality
29 standards necessary to support the beneficial uses of a waterway, even after
30 point sources of pollution have had minimum required levels of pollution
31 control technology installed. Only waters impaired by “pollutants” (e.g., clean
32 sediments, nutrients such as nitrogen and phosphorus, pathogens, acids/bases,
33 temperature, metals, cyanide, and synthetic organic chemicals (EPA 2002)), not
34 those impaired by other types of “pollution” (e.g., altered flow, channel
35 modification), are to be included on the list.

36 Section 303(d) of the CWA also requires states to maintain a list of impaired
37 water bodies so that a total maximum daily load (TMDL) can be established. A
38 TMDL is a plan to restore the beneficial uses of a stream or to otherwise correct
39 an impairment. It establishes the allowable pollutant loadings or other
40 quantifiable parameters (e.g., pH, temperature) for a water body and thereby
41 provides the basis for establishing water-quality-based controls. The calculation
42 for establishing TMDLs for each water body must include a margin of safety to
43 ensure that the water body can be used for the purposes of state designation.

1 Additionally, the calculation also must account for seasonal variation in water
2 quality (EPA 2002). The Central Valley Regional Water Quality Control Board
3 (RWQCB) develops TMDLs for Shasta Lake and its tributaries.

4 Section 401 of the CWA requires entities to obtain certification from the state or
5 Native American tribes when applying for a Federal license or permit that may
6 result in increased pollutant loads to a water body. The certification is issued
7 only if such increased loads would not cause or contribute to exceedences of
8 water quality standards.

9 Section 402 created the National Pollutant Discharge Elimination System
10 (NPDES) permit program. This program covers point sources of pollution
11 discharging into a surface water body.

12 A permit must be obtained from USACE under Section 404 for the discharge of
13 dredged or fill material into “waters of the United States, including wetlands.”
14 Waters of the United States include wetlands and lakes, rivers, streams, and
15 their tributaries. Wetlands are defined for regulatory purposes as areas
16 inundated or saturated by surface water or groundwater at a frequency and
17 duration sufficient to support and, under normal circumstances do support,
18 vegetation typically adapted for life in saturated soil conditions.

19 ***Rivers and Harbors Act***

20 USACE regulates the construction of structures in, over, or under; excavation of
21 material from; or deposition of material into “navigable waters of the United
22 States” under Section 10 of the Federal Rivers and Harbors Act (33 USC 401 et
23 seq.). Navigable waters of the United States are defined as those waters subject
24 to the ebb and flow of the tide shoreward to the mean high-water mark or those
25 that are currently used, have been used in the past, or may be susceptible to use
26 to transport interstate or foreign commerce.

27 ***U.S. Forest Service Sensitive Species***

28 The National Forest Management Act requires USFS to “provide for a diversity
29 of plant and animal communities” (16 USC 1604(g)(3)(B)) as part of its
30 multiple-use mandate. USFS must maintain “viable populations of existing
31 native and desired nonnative species in the planning area” (36 CFR 219.19).
32 The Sensitive Species program is designed to meet this mandate and to
33 demonstrate USFS’s commitment to maintaining biodiversity on National
34 Forest System lands. The program is a proactive approach to conserving species
35 to prevent a trend toward listing under the ESA and to ensure the continued
36 existence of viable, well-distributed populations. A “Sensitive Species” is any
37 species of plant or animal that has been recognized by the Regional Forester to
38 need special management to prevent the species from becoming threatened or
39 endangered.

40 Shasta-Trinity National Forest Land and Resource Management Plan The
41 Shasta-Trinity National Forest (STNF) Land and Resource Management Plan

1 (LRMP) contains forest goals, standards, and guidelines designed to guide the
2 management of STNF. The following goals, standards, and guidelines related to
3 botanical resource issues associated with the primary study area were excerpted
4 from the STNF LRMP (USFS 1995).

5 **Biological Diversity**

6 *Goals (LRMP, p. 4-4)* Integrate multiple resource management on a landscape
7 level to provide and maintain diversity and quality of habitats that support
8 viable populations of plants, fish, and wildlife.

9 *Standards and Guidelines (LRMP, p. 4-14)*

- 10 • **Natural Openings** – Management of natural openings will be
11 determined at the project level consistent with desired future
12 conditions.
- 13 • **Snags** – Over time, provide the necessary number of replacement snags
14 to meet density requirements as prescribed for each land allocation
15 and/or management prescription. Live, green culls and trees exhibiting
16 decadence and/or active wildlife use are preferred.
- 17 • **Hardwood** – Apply the following standards in existing hardwood
18 types:
 - 19 – Manage hardwood types for sustainability.
 - 20 – Conversion to conifers will only take place to meet desired future
21 ecosystem conditions.
 - 22 – Where hardwoods occur naturally within existing conifer types on
23 suitable timber lands, manage for a desired future condition for
24 hardwoods as identified during ecosystem analysis consistent with
25 management prescription standards and guidelines. Retain groups
26 of hardwoods over single trees.

27 *Threatened, Endangered, and Sensitive Species (Plants and Animals)*

28 *Goals (LRMP, p. 4-5)*

- 29 • Monitor and protect habitat for Federally listed threatened and
30 endangered and candidate species. Assist in recovery efforts for
31 threatened and endangered species. Cooperate with the State to meet
32 objectives for state listed species.
- 33 • Manage habitat for sensitive plants and animals in a manner that will
34 prevent any species from becoming a candidate for threatened and
35 endangered status.

1 *Botany (Sensitive and Endemic Plants)*

2 *Standards and Guidelines (LRMP, pp. 4-14 through 4-16)*

- 3 • Map, record, and protect essential habitat for known and newly
4 discovered sensitive and endemic plant species until conservation
5 strategies are developed.

- 6 • Analyze the potential effects of all ground-disturbing projects on
7 sensitive and endemic plants and their habitat. Mitigate project effects
8 to avoid a decline in species viability at the Forest level.

- 9 • Monitor the effects of management activities on sensitive and endemic
10 plants. If monitoring results show a decline in species viability, alter
11 management strategy.

- 12 • Provide reports of sensitive plant populations to the CDFW annually.

- 13 • Coordinate sensitive plant inventory and protection efforts with CDFW,
14 USFWS, The Nature Conservancy, the California Native Plant Society,
15 and other concerned agencies, organizations, and adjacent landowners.

- 16 • Protect type localities of sensitive and endemic plants for their
17 scientific value.

18 ***U.S. Forest Service Survey and Manage***

19 **Standards and Guidelines** The 1994 Record of Decision for Amendments to
20 USFS and Bureau of Land Management Planning Documents Within the Range
21 of the Northern Spotted Owl and Standards and Guidelines for Management for
22 Late-Successional and Old-Growth Related Species in the Range of the
23 Northern Spotted Owl (Northwest Forest Plan (NWFP) Record of Decision
24 (ROD)) amended or was incorporated into BLM and USFS land management
25 plans to require certain actions for rare amphibians, mammals, bryophytes,
26 mollusks, vascular plants, fungi, lichens, and arthropods that occupy late-
27 successional and old-growth forests (USFS and BLM 1994). These rare species
28 were identified in Appendix C of the NWFP ROD collectively as Survey and
29 Manage (S&M) Species. The NWFP ROD also established protection buffers
30 on matrix lands for certain species (i.e., protection buffer species) that were not
31 on the 1994 S&M list and required that those buffers be managed as part of the
32 Late Successional Reserve network. Four survey strategies were developed to
33 guide management of S&M species: (1) manage known sites; (2) survey before
34 ground-disturbing activities; (3) conduct extensive surveys; and (4) conduct
35 general regional surveys.

36 The NWFP ROD also established overall objectives for managing S&M species
37 populations that were referred to as “persistence objectives.” These objectives
38 were based on the USFS viability provision in the 1982 National Forest System
39 Land and Resource Management Planning Regulation for the National Forest

1 Management Act of 1976. This provision is targeted toward vertebrate species,
2 but was also applied to nonvertebrate species to the extent practicable, as
3 described in the NWFP ROD. The provision generally states that the USFS
4 shall manage habitat “to maintain viable populations of existing native and
5 desired non-native vertebrate species in the planning area” (36 CFR 219.19).
6 Although the viability standard is part of the USFS planning regulations, the
7 protections for S&M species were also applied to BLM lands in the NWFP
8 ROD with a goal of protecting the long-term health and sustainability of all
9 Federal forests within the range of the northern spotted owl and the species that
10 inhabit them. Because of the uncertainty associated with the continued
11 persistence of species due to natural factors, the NWFP ROD noted that
12 compliance with the planning regulations is not subject to precise numerical
13 interpretations and cannot be fixed at any single threshold; rather, “as in any
14 administrative field, common sense and agency expertise must be applied”
15 (NWFP ROD, p. 44).

16 In 2001, the Record of Decision and Standards and Guidelines for Amendments
17 to the Survey and Manage, Protection Buffer, and other Mitigation Measures
18 Standards and Guidelines (2001 ROD) (USFS and BLM 2001) modified the
19 management direction provided in the NWFP ROD for S&M and protection
20 buffer species and amended BLM and USFS land management plans in the
21 range of the northern spotted owl accordingly. The list of S&M species was also
22 modified to remove 72 species in all or part of their range because new
23 information indicated they were secure or otherwise did not meet the basic
24 criteria for S&M. Species remaining on the list were assigned to one of six
25 categories using the following criteria: their relative rarity, the ability to
26 reasonably and consistently locate occupied sites during surveys before habitat-
27 disturbing activities, and the level of information known about the species or
28 group of species. The 2001 ROD also removed the direction specific to
29 protection buffer species, excluding these species from S&M Standards and
30 Guidelines requirements. As part of the 2001 Standards and Guidelines,
31 objectives, criteria, and management direction were defined for each category.
32 Specific criteria were also established to add, remove, or change species
33 categories based on new information and as part of the annual species review
34 processes.

35 In 2004 and again in 2007, the BLM and USFS issued a ROD to eliminate the
36 S&M requirements of the 2001 ROD and to provide protection for species on
37 the S&M lists by managing them under the agencies’ special-status species
38 programs. As a result of litigation, the requirements of the 2001 S&M ROD
39 were reinstated. In a subsequent court-mandated settlement agreement (USFS
40 and BLM 2011), the list of S&M species was modified. The settlement
41 agreement also made the following modifications: (1) acknowledged existing
42 exemption categories (2006 Pechman Exemptions), (2) updated the 2001 S&M
43 species list, (3) established a transition period for application of the species list,
44 and (4) established new exemption categories (2011 Exemptions). Agency
45 decisions made after September 30, 2012, are required to use the 2011 S&M

1 list. Some species considered in the S&M program also occur on non-Federal
2 lands. The requirements of the 1994 NWFP and 2001 RODs as modified under
3 the 2011 Settlement Agreement apply only to lands managed by the BLM and
4 USFS within the range of the northern spotted owl. Currently, the BLM and
5 USFS are implementing the January 2001 ROD as modified by the 2011
6 Settlement Agreement.

7 ***Management Guide for the Shasta and Trinity Units of the Whiskeytown-***
8 ***Shasta-Trinity National Recreation Area***

9 A portion of the Shasta Unit of the Whiskeytown-Shasta-Trinity National
10 Recreation Area is included in the Shasta Lake and vicinity portion of the
11 primary study area. The Management Guide for the Whiskeytown-Shasta-
12 Trinity National Recreation Area, including the Shasta Unit, contains
13 management strategies intended to achieve or maintain a desired condition.
14 These strategies take into account opportunities, management recommendations
15 for specific projects, and mitigation measures needed to achieve specific goals.
16 The following strategies related to botanical and wetland resource issues
17 associated with the Shasta Lake and vicinity portion of the primary study area
18 were excerpted from the Management Guide (USFS 1996).

19 **Vegetation (Management Guide, pp. IV-18 through IV-19)**

- 20 • Prescribed burning, fuel break construction, and other forms of
21 vegetation manipulation will be used to reduce fire hazards and
22 improve forest health.
- 23 • Hazard trees in traditionally high-use recreation areas which pose
24 safety hazards to people or property will be identified and removed.
- 25 • Recreation sites will be inventoried and vegetative management plans
26 will be developed to ensure healthy and safe vegetation complexes are
27 maintained over time.
- 28 • Protect known populations of Threatened and Endangered Species
29 plant species and their habitat and implement mitigation measures if
30 necessary to maintain or enhance their continued viability.
31 Conservation strategies for Threatened and Endangered Species plant
32 species will be utilized as they are developed.
- 33 • Implement management practices which promote restoration of native
34 plant diversity.
- 35 • Implement a program to restore native vegetation to highly disturbed or
36 degraded areas using native plants. Local in-kind, on-site seed or other
37 propagation sources will be used in order to maintain genetic integrity.
- 38 • Chaparral and woodland habitat management will occur to meet
39 wildlife objectives.

- 1 • Interpretive materials will address the need to conserve rare plant
2 communities in accordance with the National Recreation Area
3 Interpretive Plan.
- 4 • Rare plants in or near camping areas will be monitored on a regular
5 basis.
- 6 • Diversity of native species will be emphasized. Eradication program
7 will be implemented for nonnative, introduced species in areas where
8 healthy, botanically diverse plant communities are necessary to meet
9 ecosystem management objectives.
- 10 • Native plants from local gene pools will be utilized when landscaping
11 campgrounds, interpretive facilities, etc.
- 12 • Partnerships will be used to assist with collection of seed, propagation
13 of seeds/propagules, and planting.

14 ***U.S. Forest Service Noxious Weed Management Policy 20900***

15 USFS Manual Policy 20900, Noxious Weed Management (USFS 2011),
16 includes the following policy for the management of aquatic and terrestrial
17 invasive species (including vertebrates, invertebrates, plants, and pathogens),
18 based on an integrated pest management approach, throughout the National
19 Forest System:

- 20 1. Initiate, coordinate, and sustain actions to prevent, control, and
21 eliminate priority infestations of invasive species in aquatic and
22 terrestrial areas of the National Forest System using an integrated pest
23 management approach, and collaborate with stakeholders to implement
24 cooperative invasive species management activities in accordance with
25 law and policy.
- 26 2. When applicable, invasive species management actions and standards
27 should be incorporated into resource management plans at the forest
28 level, and in programmatic environmental planning and assessment
29 documents at the regional or national levels.
- 30 3. Determine the vectors, environmental factors, and pathways that favor
31 the establishment and spread of invasive species in aquatic and
32 terrestrial areas of the National Forest System, and design management
33 practices to reduce or mitigate the risk for introduction or spread of
34 invasive species in those areas.
- 35 4. Determine the risk of introducing, establishing, or spreading invasive
36 species associated with any proposed action, as an integral component
37 of project planning and analysis, and where necessary provide for

- 1 alternatives or mitigation measures to reduce or eliminate that risk
2 before project approval.
- 3 5. Ensure that all Forest Service management activities are designed to
4 minimize or eliminate the possibility of establishment or spread of
5 invasive species on the National Forest System, or to adjacent areas.
6 Integrate visitor use strategies with invasive species management
7 activities on aquatic and terrestrial areas of the National Forest System.
8 At no time are invasive species to be promoted or used in site
9 restoration or re-vegetation work, watershed rehabilitation projects,
10 planted for bio-fuels production, or other management activities on
11 national forests and grasslands.
- 12 6. Use contract and permit clauses to require that the activities of
13 contractors and permittees are conducted to prevent and control the
14 introduction, establishment, and spread of aquatic and terrestrial
15 invasive species. For example, where determined to be appropriate, use
16 agreement clauses to require contractors or permittees to meet Forest
17 Service-approved vehicle and equipment cleaning
18 requirements/standards before using the vehicle or equipment in the
19 National Forest System.
- 20 7. Make every effort to prevent the accidental spread of invasive species
21 carried by contaminated vehicles, equipment, personnel, or materials
22 (including plants, wood, plant/wood products, water, soil, rock, sand,
23 gravel, mulch, seeds, grain, hay, straw, or other materials).
- 24 a. Establish and implement standards and requirements for vehicle
25 and equipment cleaning to prevent the accidental spread of aquatic
26 and terrestrial invasive species on the National Forest System or to
27 adjacent areas.
- 28 b. Make every effort to ensure that all materials used on the National
29 Forest System are free of invasive species and/or noxious weeds
30 (including free of reproductive/propagative material such as seeds,
31 roots, stems, flowers, leaves, larva, eggs, veligers, and so forth).
- 32 8. Where States have legislative authority to certify materials as weed-free
33 (or invasive-free) and have an active State program to make those
34 State-certified materials available to the public, forest officers shall
35 develop rules restricting the possession, use, and transport of those
36 materials unless proof exists that they have been State-certified as
37 weed-free (or invasive-free), as provided in 36 CFR 261 and
38 Departmental Regulation 1512-1.

- 1 9. Monitor all management activities for potential spread or establishment
2 of invasive species in aquatic and terrestrial areas of the National Forest
3 System.

- 4 10. Manage invasive species in aquatic and terrestrial areas of the National
5 Forest System using an integrated pest management approach to
6 achieve the goals and objectives identified in Forest Land and Resource
7 Management plans, and other Forest Service planning documents, and
8 other plans developed in cooperation with external partners for the
9 management of natural or cultural resources.

- 10 11. Integrate invasive species management funding broadly across a variety
11 of National Forest System programs, while associating the funding with
12 the specific aquatic or terrestrial invasive species that is being
13 prioritized for management, as well as the purpose and need of the
14 project or program objective.

- 15 12. Develop and use site-based and species-based risk assessments to
16 prioritize the management of invasive species infestations in aquatic
17 and terrestrial areas of the National Forest System. Where appropriate,
18 use a structured decision making process and adaptive management or
19 similar strategies to help identify and prioritize invasive species
20 management approaches and actions.

- 21 13. Comply with the Forest Service performance accountability system
22 requirements for invasive species management to ensure efficient use
23 of limited resources at all levels of the Agency and to provide
24 information for adapting management actions to meet changing
25 program needs and priorities. When appropriate, use a structured
26 decision-making process to address invasive species management
27 problems in changing conditions, uncertainty, or when information is
28 limited.

- 29 14. Establish and maintain a national record keeping database system for
30 the collection and reporting of information related to invasive species
31 infestations and management activities, including invasive species
32 management performance, associated with the National Forest System.
33 Require all information associated with the National Forest System
34 invasive species management (including inventories, surveys, and
35 treatments) to be collected, recorded, and reported consistent with
36 national program protocols, rules, and standards.

- 37 15. Where appropriate, integrate invasive species management activities,
38 such as inventory, survey, treatment, prevention, monitoring, and so
39 forth, into the National Forest System management programs. Use
40 inventory and treatment information to help set priorities and select
41 integrated management actions to address new or expanding invasive

1 species infestations in aquatic and terrestrial areas of the National
2 Forest System.

3 16. Assist and promote cooperative efforts with internal and external
4 partners, including private, State, tribal, and local entities, research
5 organizations, and international groups to collaboratively address
6 priority invasive species issues affecting the National Forest System.

7 17. Coordinate as needed with Forest Service Research and Development
8 and State and Private Forestry programs, other agencies included under
9 the National Invasive Species Council, and external partners to identify
10 priority/high-risk invasive species that threaten aquatic and terrestrial
11 areas of the National Forest System. Encourage applied research to
12 develop techniques and technology to reduce invasive species impacts
13 to the National Forest System.

14 18. As appropriate, collaborate and coordinate with adjacent landowners
15 and other stakeholders to improve invasive species management
16 effectiveness across the landscape. Encourage cooperative partnerships
17 to address invasive species threats within a broad geographical area.

18 ***U.S. Bureau of Land Management Resource Management Plan***

19 BLM manages a number of public lands within the primary study area,
20 including the Chappie-Shasta Off-Highway Vehicle Area west of Shasta Dam.
21 These areas fall under the Northern California BLM district and the resource
22 management plan of the Redding BLM field office. The purpose of BLM's
23 resource management plan is to provide an overall direction for managing and
24 allocating public resources in the planning area. BLM is responsible for
25 administering the following strategies related to resource issues common to the
26 portion of the Redding District lands located in the primary study area (BLM
27 1992, 1993).

- 28 • Provide a regional opportunity for motorized recreation with a focus
29 within the Chappie-Shasta Off-Highway Vehicle Area.
- 30 • Enhance non-motorized recreation opportunities within the area via a
31 greenway connecting Redding to Shasta Dam along the Sacramento
32 River.
- 33 • Maintain or improve the long-term sustained yield of forest products
34 available from commercial forest lands.
- 35 • Improve the long-term condition and protection of deer winter range
36 habitat.
- 37 • Maintain special-status species habitat.

- 1 • Maintain the existing scenic quality of the areas.
- 2 • Maintain opportunities to explore and develop freely available minerals
- 3 on public lands.

4 ***Executive Order 11990: Protection of Wetlands***

5 Executive Order 11990 established the protection of wetlands and riparian
6 systems as the official policy of the Federal government. It requires all Federal
7 agencies to consider wetland protection as an important part of their policies
8 and take action to minimize the destruction, loss, or degradation of wetlands,
9 and to preserve and enhance the natural and beneficial values of wetlands.

10 ***Executive Order 11312: Invasive Species***

11 Executive Order 11312 directs all Federal agencies to prevent and control
12 introductions of invasive nonnative species in a cost-effective and
13 environmentally sound manner to minimize their economic, ecological, and
14 human health impacts. Executive Order 11312 established a national Invasive
15 Species Council made up of Federal agencies and departments and a supporting
16 Invasive Species Advisory Committee composed of State, local, and private
17 entities. The Invasive Species Council and Advisory Committee oversee and
18 facilitate implementation of the Executive Order, including preparation of a
19 National Invasive Species Management Plan.

20 **12.2.2 State**

21 ***California Endangered Species Act***

22 Under the California Endangered Species Act (CESA), CDFW has the
23 responsibility for maintaining a list of endangered and threatened species
24 (California Fish and Game Code, Section 2070). CDFW also maintains a list of
25 “candidate species,” which are species for which CDFW has issued a formal
26 notice that they are under review for addition to the list of endangered or
27 threatened species. Pursuant to the requirements of CESA, an agency reviewing
28 a proposed project within its jurisdiction must determine whether any State-
29 listed endangered or threatened species may be present in the project study area
30 and, if so, whether the proposed project would have a potentially significant
31 impact on any of these species. In addition, CDFW encourages informal
32 consultation on any proposed project that may affect a species that is a
33 candidate for state listing.

34 Project-related impacts on species listed as endangered or threatened under the
35 CESA would be considered significant. “Take” of protected species incidental
36 to otherwise lawful management activities may be authorized under Section
37 2081 of the California Fish and Game Code. Under the CESA, “take” is defined
38 as an activity that would directly or indirectly kill an individual of a species, but
39 the definition does not include “harm” or “harass,” as the Federal act does.
40 Therefore, the threshold for take may be higher under CESA than under ESA
41 because habitat modification is not necessarily considered take under CESA.

1 Authorization from CDFW would be in the form of an incidental take permit or
2 as a consistency determination (Section 2080.1(a) of the Fish and Game Code).
3 Section 2080.1(a) of the Fish and Game Code authorizes CDFW to accept a
4 Federal biological opinion as the take authorization for a state-listed species
5 when a species is listed under both the ESA and the CESA.

6 ***California Native Plant Protection Act***

7 The Native Plant Protection Act (California Fish and Game Code, Sections
8 1900–1913) prohibits the taking, possessing, or sale within the state of any
9 plants with a State designation of rare, threatened, or endangered, as defined by
10 CDFW. The Act’s definition of “endangered” and “rare” closely parallel the
11 CESA definitions of “endangered” and “threatened” plant species.

12 ***Section 1602 of the California Fish and Game Code—Streambed***
13 ***Alteration***

14 Diversions, obstructions, or changes to the natural flow or bed, channel, or bank
15 of any river, stream, or lake in California that supports wildlife resources are
16 subject to regulation by CDFW, pursuant to Section 1602 of the California Fish
17 and Game Code. The regulatory definition of stream is a body of water that
18 flows at least periodically or intermittently through a bed or channel that has
19 banks and supports wildlife, fish, or other aquatic life. This includes
20 watercourses that have a surface or subsurface flow that supports or has
21 supported riparian vegetation. CDFW’s jurisdiction within altered or artificial
22 waterways is based on the value of those waterways to fish and wildlife. A
23 CDFW streambed alteration agreement must be obtained for a project that
24 would result in an impact on a river, stream, or lake.

25 ***Porter-Cologne Water Quality Control Act***

26 The Porter-Cologne Water Quality Control Act requires that each of the nine
27 RWQCBs prepare and periodically update basin plans for water quality control.
28 Each basin plan sets forth water quality standards for surface water and
29 groundwater and actions to control nonpoint and point sources of pollution to
30 achieve and maintain these standards. Basin plans offer an opportunity to
31 protect wetlands through the establishment of water quality objectives. The
32 RWQCB’s jurisdiction includes Federally protected waters as well as areas that
33 meet the definition of “waters of the state.” Waters of the state is defined as any
34 surface water or groundwater, including saline waters, within the boundaries of
35 the state. The RWQCB has the discretion to take jurisdiction over areas not
36 Federally protected under Section 401 provided they meet the definition of
37 waters of the state. Mitigation requiring no net loss of wetlands functions and
38 values of waters of the state is typically required by the RWQCB.

39 ***California Department of Fish and Wildlife Species Designations***

40 CDFW maintains an informal list of species called “species of special concern.”
41 These are broadly defined as plant and wildlife species that are of concern to
42 CDFW because of population declines and restricted distributions, and/or
43 because they are associated with habitats that are declining in California. These

1 species are inventoried in the CNDDDB regardless of their legal status. Impacts
2 on species of special concern may be considered significant.

3 ***California Department of Fish and Wildlife/California Native Plant Society***
4 ***Plant Species Designations***

5 CNPS is a statewide nonprofit organization that seeks to increase understanding
6 of California's native flora and to preserve this rich resource for future
7 generations. CDFW and CNPS assign rare plant ranks through the collaborative
8 efforts of the Rare Plant Status Review Group composed of over 300 botanical
9 experts from government, academia, non-government organizations, and the
10 private sector and managed jointly by CDFW and CNPS. California native
11 plants meeting the rarity or endangerment criteria are assigned a CRPR. These
12 plants were formerly referred to as CNPS listed species; however, in March
13 2010, CDFW adopted the name CRPR for the rarity and endangerment
14 categories to eliminate the false impression that these assignments are the
15 exclusive work of CNPS and that CNPS has had undue influence over the
16 regulatory process. CRPR 1 and 2 species generally qualify as endangered, rare,
17 or threatened within the definition of State CEQA Guidelines CCR Section
18 15380. In general, CRPR 3 and 4 species do not meet the definition of
19 endangered, rare, or threatened pursuant to CEQA Section 15380; however,
20 these species may be evaluated by the lead agency on a case-by-case basis to
21 determine significance criteria under CEQA.

22 **12.2.3 Local**

23 Shasta, Tehama, Glenn, Sutter, Sacramento, and Yolo counties and the cities of
24 Redding, Colusa, and Sacramento have established codes and policies that
25 address protection of natural resources, including vegetation, sensitive species,
26 and trees, and are applicable to the project.

27 Shasta County's general plan emphasizes that the maintenance and
28 enhancement of quality fish and wildlife habitat is critical to the recreation and
29 tourism industry, and acknowledges that any adverse and prolonged decline of
30 these resources could result in negative impacts on an otherwise vibrant
31 industry. The general plan identifies efforts to protect and restore these habitats
32 to sustain the long-term viability of the tourism and recreation industry (Shasta
33 County 2004).

34 The City of Redding's general plan strives to strike a balance between
35 development and conservation by implementing several measures such as
36 creek-corridor protection, sensitive hillside development, habitat protection, and
37 protection of prominent ridge lines that provide a backdrop to the city (City of
38 Redding 2000).

39 Tehama County's general plan (Tehama County 2009) update provides an
40 overarching guide to future development and establishes goals, policies, and
41 implementation measures designed to address potential changes in county land

1 use and development. The general plan identifies the importance of retaining
2 agriculture as one of the primary uses of land in Tehama County.

3 Glenn County's general plan provides a comprehensive plan for growth and
4 development in Glenn County for the next 20 years (2007 to 2027). This plan
5 recognizes that public lands purchased for wildlife preservation generate
6 economic activity as scientists and members of the public come to view and
7 study remnant ecosystems (Glenn County 1993).

8 The City of Colusa's general plan seeks to promote its natural resources through
9 increased awareness and improved public access (City of Colusa 2007).

10 Sutter County's general plan contains policies that generally address
11 preservation of natural vegetation, including wetlands. It requires that new
12 development mitigate the loss of Federally protected wetlands to achieve "no
13 net loss," but it does not include any other specific requirements.

14 Sacramento County's general plan contains policies that promote protection of
15 marsh and riparian areas, including specification of setbacks and "no net loss"
16 of riparian woodland or marsh acreage (Sacramento County 1993). It also
17 addresses the need to conserve vernal pools and ephemeral wetlands to ensure
18 no net loss of vernal pool acreage. Several policies specifically promote
19 protection of native oak trees, and, in some areas of the county, seek to ensure
20 that there is no net loss of canopy area. The general plan for the County of
21 Sacramento is currently under revision.

22 The City of Sacramento Municipal Code addresses the protection of trees within
23 the city boundaries, including general protection of all trees on city property and
24 specific protection of heritage trees.

25 Yolo County's general plan aims to provide an active and productive buffer of
26 farmland and open space separating the Bay Area from Sacramento, and
27 integrating green spaces into its communities.

28 **12.2.4 Federal, State, and Local Programs and Projects**

29 ***California Bay-Delta Authority***

30 The California Bay-Delta Authority (CBDA) was established as a State agency
31 in 2003 to oversee implementation of CALFED for the 25 Federal and State
32 agencies working cooperatively to improve the quality and reliability of
33 California's water supplies while restoring the Bay-Delta ecosystem. The July
34 2000 CALFED *Final Programmatic EIS/EIR* (CALFED 2000b) analyzed a
35 range of alternatives to address these needs and included a Multi-Species
36 Conservation Strategy (MSCS) to provide a framework for compliance with
37 ESA, CESA, and Natural Community Conservation Planning Act. The August
38 2000 CALFED Programmatic ROD identified 12 action plans, including
39 Ecosystem Restoration, Watersheds, and Water Supply Reliability, among
40 others (CALFED 2000d). The CALFED Ecosystem Restoration Program has

1 provided a funding source for projects that include those involving acquisition
2 of lands within the Sacramento River Conservation Area, initial baseline
3 monitoring and preliminary restoration planning, and preparation of long-term
4 habitat restoration management and monitoring plans. In 2009, the California
5 Legislature passed sweeping water reform legislation, including the
6 establishment of the Delta Stewardship Council (DSC). The DSC was
7 transferred all the responsibilities, programs, staff and most of the funding from
8 the CBDA, and the CBDA was dissolved. The DSC was also given additional
9 mandates, including the development of a Delta Plan to guide activities and
10 programs of State and local programs in the legal Delta through a consistency
11 determination process. The Delta Plan is currently undergoing the final public
12 review.

13 ***Cantara Trustee Council***

14 The Cantara Trustee Council administers a grant program that has provided
15 funding for numerous environmental restoration projects in the primary study
16 area, including programs in the Fall River watershed, Sulphur Creek, the upper
17 Sacramento River, Middle Creek, lower Clear Creek, Battle Creek, Salt Creek,
18 and Olney Creek. The Cantara Trustee Council is a potential local sponsor for
19 future restoration actions in the primary study area. The Cantara Trustee
20 Council includes representatives from CDFW, USFWS, the Central Valley
21 RWQCB, California Sportfishing Protection Alliance, and Shasta Cascade
22 Wonderland Association.

23 ***Resource Conservation Districts***

24 Numerous resource conservation districts (RCD) are within the primary study
25 area. Once known as soil conservation districts, RCDs were established under
26 California law with a primary purpose to implement local conservation
27 measures. Although RCDs are locally governed agencies with locally
28 appointed, independent boards of directors, they often have close ties to county
29 agencies and the National Resources Conservation Service. RCDs are
30 empowered to conserve resources within their districts by implementing
31 projects on public and private lands and to educate landowners and the public
32 about resource conservation. They are often involved in the formation and
33 coordination of watershed working groups and other conservation alliances.
34 In the Shasta Lake and upper Sacramento River vicinity, districts include the
35 Western Shasta County RCD and the Tehama County RCD. To the east are the
36 Fall River and Pit River RCDs, and to the west and north are the Trinity County
37 and Shasta Valley RCDs.

38 ***Riparian Habitat Joint Venture***

39 The Riparian Habitat Joint Venture (RHJV) was initiated in 1994 and includes
40 signatories from 18 Federal, State, and private agencies. The RHJV promotes
41 conservation and the restoration of riparian habitat to support native bird
42 populations through three goals:

- 1 • Promote an understanding of the issues affecting riparian habitat
2 through data collection and analysis
- 3 • Double riparian habitat in California by funding and promoting on-the-
4 ground conservation projects
- 5 • Guide land managers and organizations to prioritize conservation
6 actions

7 RHJV conservation and action plans are documented in the Riparian Bird
8 Conservation Plan (RHJV 2004). The conservation plan targets 14 “indicator”
9 species of riparian-associated birds and provides recommendations for habitat
10 protection, restoration, management, monitoring, and policy. The report notes
11 habitat loss and degradation as one of the most important factors causing the
12 decline of riparian birds in California. The RHJV has participated in monitoring
13 efforts within the Sacramento National Wildlife Refuge Complex and other
14 conservation areas. The RHJV’s conservation plan identifies lower Clear Creek
15 as a prime breeding area for yellow warblers and song sparrows, advocating a
16 continuous riparian corridor along lower Clear Creek. Other recommendations
17 of the conservation plan apply to the North Delta Offstream Storage
18 Investigation study area in general.

19 ***Sacramento River Conservation Area Program***

20 Senate Bill 1086 called for a management plan for the Sacramento River and its
21 tributaries to protect, restore, and enhance both fisheries and riparian habitat.
22 The Sacramento River Conservation Area Program has an overall goal of
23 preserving remaining riparian habitat and reestablishing a continuous riparian
24 ecosystem along the Sacramento River between Redding and Chico, and
25 reestablishing riparian vegetation along the river from Chico to Verona. The
26 program is to be accomplished through an incentive-based, voluntary river
27 management plan. The Upper Sacramento River Fisheries and Riparian Habitat
28 Management Plan (Resources Agency 1989) identifies specific actions to help
29 restore the Sacramento River fishery and riparian habitat between the Feather
30 River and Keswick Dam. The Sacramento River Conservation Area Forum
31 Handbook (Resources Agency 2003) is a guide to implementing the program.
32 The Keswick Dam-to-Red Bluff portion of the conservation area includes areas
33 within the 100-year floodplain, existing riparian bottomlands, and areas of
34 contiguous valley oak woodland, totaling approximately 22,000 acres. The 1989
35 fisheries restoration plan recommended several actions specific to the primary
36 study area:

- 37 • Fish passage improvements at RBPP (under way; project final
38 EIS/Environmental Impact Report released May 2008)
- 39 • Modification of the Spring Creek Tunnel intake for temperature control
40 (completed)

- 1 • Spawning gravel replacement program (ongoing)
- 2 • Development of side-channel spawning areas, such as those at Turtle
- 3 Bay in Redding (ongoing)
- 4 • Structural modifications to Anderson-Cottonwood Irrigation District
- 5 Dam to eliminate short-term flow fluctuations (completed)
- 6 • Maintaining instream flows through coordinated operation of water
- 7 facilities (ongoing)
- 8 • Improvements at Coleman National Fish Hatchery (partially complete)
- 9 • Measures to reduce acute toxicity caused by acid mine drainage and
- 10 heavy metals (ongoing)
- 11 • Various fisheries improvements on Clear Creek (partially complete)
- 12 • Flow increases, fish screens, and revised gravel removal practices on
- 13 Battle Creek (beginning summer 2006)
- 14 • Control of gravel mining, improvements of spawning areas,
- 15 improvements of land management practices in the watershed, and
- 16 protection and restoration of riparian vegetation along Cottonwood
- 17 Creek

18 ***Sacramento River National Wildlife Refuge***

19 The Sacramento River National Wildlife Refuge (SRNWR) is composed of

20 many units between the cities of Red Bluff and Princeton. The SRNWR along

21 the middle Sacramento River is part of the Sacramento National Wildlife

22 Refuge Complex, consisting of five refuges and three wildlife management

23 areas within the Sacramento Valley. Reaches and subreaches of the river are

24 delineated based generally on transitions in fluvial geomorphic riverine

25 conditions, although county boundaries were considered as well. The middle

26 Sacramento River region between Red Bluff and Colusa includes three units

27 within the Chico Landing Subreach that contain restoration project sites

28 addressed in the Sacramento River–Chico Landing Subreach Habitat

29 Restoration Draft Environmental Impact Report (CBDA 2005). In addition,

30 three areas proposed for restoration in this area occur within the larger SRNWR

31 units that were evaluated in the Environmental Assessment for Proposed

32 Restoration Activities on the Sacramento River National Wildlife Refuge

33 (USFWS 2001; CBDA 2005).

34 In June 2005, USFWS issued the Sacramento River National Wildlife Refuge

35 Draft Comprehensive Conservation Plan and Environmental Assessment and

36 Finding of No Significant Impact (USFWS 2005) to serve as an integrated

37 management plan for land that it acquires and manages for inclusion in the

1 SRNWR. The SRNWR final comprehensive conservation plan includes goals,
2 objectives, and strategies to guide management of lands within the SRNWR. It
3 also includes assessments of and establishes parameters for “compatible uses,”
4 which are uses that are considered compatible with the primary purposes for
5 which the area was established. Riparian habitat restoration projects are being
6 implemented under cooperative agreements between USFWS and other entities
7 such as The Nature Conservancy (TNC) in accordance with the SRNWR final
8 comprehensive conservation plan.

9 ***Sacramento River Preservation Trust***

10 The Sacramento River Preservation Trust is a private, nonprofit organization
11 active in environmental education and advocacy to preserve the natural
12 environmental values of the Sacramento River. The trust has participated in
13 various conservation and land acquisition projects, including securing lands for
14 the SRNWR. The group is pursuing designation of a portion of the Sacramento
15 River between Redding and Red Bluff as a national conservation area.

16 ***Sacramento River Watershed Program***

17 The Sacramento River Watershed Program is an effort to bring stakeholders
18 together to share information and work together to address water quality and
19 other water-related issues within the Sacramento River watershed. The group is
20 funded congressionally through the U.S. Environmental Protection Agency. The
21 program’s primary goal is “to ensure that current and potential uses of
22 Sacramento River watershed resources are sustained, restored, and where
23 possible, enhanced while promoting the long-term social and economic vitality
24 of the region.” The Sacramento River Watershed Program manages grants for
25 the Sacramento River Toxic Pollutants Control Program; performs extensive
26 water quality monitoring, data collection, and data management for the
27 watershed; and is instrumental in the study and monitoring of toxic pollutants.
28 Although the program does not implement restoration projects, it is a potential
29 partner for coordinating research and monitoring through consensus-based
30 collaborative partnerships and promoting mutual education among the
31 stakeholders of the Sacramento River watershed.

32 ***Sacramento Watersheds Action Group***

33 The Sacramento Watersheds Action Group is a nonprofit corporation that
34 secures funding for, designs, and implements projects that provide watershed
35 restoration, streambank and slope stabilization, erosion control, watershed
36 analysis, and road removal. Sacramento Watersheds Action Group has
37 successfully worked with local groups, agencies, and organizations to fund and
38 complete restoration projects on the Sacramento River and tributaries
39 downstream from Keswick Dam. Their projects include development of the
40 Sulphur Creek Watershed Analysis and Action Plan, the Whiskeytown Lake
41 Shoreline Erosion Control Project, the Sulphur Creek Crossing Restoration
42 Project, and the Lower Sulphur Creek Realignment and Riparian Habitat
43 Enhancement Project. Sacramento Watersheds Action Group is a potential local
44 sponsor for watershed restoration actions in the study area.

1 ***Shasta Land Trust***

2 The Shasta Land Trust is a regional, nonprofit organization dedicated to
3 conserving open space, wildlife habitat, and agricultural land. The trust works
4 with public agencies and private landowners and is funded primarily through
5 membership dues and donations. It employs various voluntary programs to
6 protect and conserve valuable lands using conservation easements, land
7 donations, and property acquisitions. The trust is a potential local partner for
8 restoration activities in the Shasta Dam-to-Red Bluff area.

9 ***The Nature Conservancy***

10 TNC is a private, nonprofit organization involved in environmental restoration
11 and conservation throughout the United States and the world. TNC approaches
12 environmental restoration primarily through strategic land acquisition from
13 willing sellers and obtaining conservation easements. Some of the lands are
14 retained by TNC for active restoration, research, or monitoring activities, while
15 others are turned over to government agencies such as USFWS or CDFW for
16 long-term management. Lower in the Sacramento River basin, TNC has been
17 instrumental in acquiring and restoring lands in the SRNWR and managing
18 several properties along the Sacramento River. It also has pursued conservation
19 easements on various properties at tributary confluences, including Cottonwood
20 and Battle creeks.

21 ***The Trust for Public Land***

22 The Trust for Public Land is a national, nonprofit organization involved in
23 preserving lands with natural, historic, cultural, or recreational value, primarily
24 through conservation real estate. The trust's Western Rivers Program has been
25 involved in conservation efforts along the Sacramento River between Redding
26 and Red Bluff (BLM's Sacramento River Bend Management Area), Battle
27 Creek, Paynes Creek, Inks Creek, and Fenwood Ranch in Shasta County. The
28 group promotes public ownership of conservation lands to ensure public access
29 and enjoyment.

30 **12.3 Environmental Consequences and Mitigation Measures**

31 This section describes the methods of environmental evaluation, assumptions,
32 and specific criteria that were used to determine significance for botanical
33 resources and wetlands, and then discusses effects of the project and proposes
34 mitigation where necessary.

35 **12.3.1 Methods and Assumptions**

36 The following sections describe the methods, processes, procedures, and
37 assumptions used to formulate and conduct the environmental impact analysis.
38 Data for the following analysis were taken from the use of modeling, existing
39 reports on local and site-specific biology, and on site assessments during field
40 reviews.

1 **CalSim Modeling**

2 The CalSim-II computer model, SLWRI 2012 Benchmark Version, was used to
3 aid in the evaluation of potential impacts of the project alternatives on water-
4 related resources, including riparian habitats along the upper and lower
5 Sacramento River and in the Delta. This computer modeling used historical data
6 on California hydrology to represent the variety of weather and hydrologic
7 patterns, including wet periods and droughts, under which water storage and
8 conveyance facilities would be operated. Two scenarios (base cases) of
9 demands for, and storage and conveyance of, water were used in model runs:
10 2005 facilities and demands (“existing conditions”) and forecasted 2030
11 demands and reasonably foreseeable projects and facilities (“future
12 conditions”). A model run was conducted for each of these base cases combined
13 with each alternative, so that the effects of the No-Action Alternative and other
14 alternatives could be evaluated relative to both existing and future conditions.
15 CalSim-II is a useful tool for this type of comparative analysis where the model
16 is run twice, once to represent a base condition (no action) and a second time
17 with a specific change (action) to assess the change in the outcome due to the
18 input change.

19 The hydrologic analysis conducted for this DEIS used the SLWRI 2012
20 Benchmark Version CalSim-II model, to approximate system-wide changes in
21 storage, flow, salinity, and reservoir system reoperation associated with the
22 SLWRI alternatives. The historical flow record of October 1921 to September
23 2003, adjusted for the influences of land use changes and upstream flow
24 regulation, is used to represent the possible range of water supply conditions.
25 Major Central Valley rivers, reservoirs, and CVP/SWP facilities are represented
26 by a network of arcs and nodes. CalSim-II uses a mass balance approach to
27 route water through this network. Simulated flows are mean flows for the
28 month; reservoir storage volumes correspond to end-of-month storage. Monthly
29 flow results were also used to simulate mean daily flows. A more detailed
30 description of the SLWRI 2012 Benchmark Version CalSim-II model, the
31 modeling methodology used to evaluate this project, and key assumptions are
32 provided in the Modeling Appendix. Summaries of the analysis and modeling
33 results are provided in Chapter 6, “Hydrology, Hydraulics, and Water
34 Management.”

35 **Vegetation and Habitat Types**

36 The impact mechanisms of construction-related activities are evaluated in the
37 sections addressing Shasta Lake and its vicinity. Besides construction-related
38 activities, the project could potentially affect vegetation and habitat types
39 through any of the following impact mechanisms:

- 40 • Increased inundated width of the river during the active growing season
- 41 • Reduced frequency and/or magnitude of peak flows

- 1 • Altered geomorphic processes (e.g., meander, channel avulsion) along
2 rivers
- 3 • Altered availability of groundwater
- 4 • Altered rates of stage decline during seed dispersal or germination-
5 establishment

6 For each vegetation type, environmental effects potentially resulting from each
7 of these impact mechanisms were assessed. This assessment was based on a
8 review of the results of CalSim simulations of mean monthly flows, aerial
9 photographs, background information on the upper Sacramento River and
10 adjacent uplands, and scientific literature on the ecology of each vegetation
11 type. Results of hydraulic modeling of the project's potential effects on peak
12 flows and analyses of the project's potential effects on geomorphic processes
13 along the Sacramento River were not available to support this analysis.

14 In addition to these impact mechanisms, increased water supplies or increased
15 supply reliability also could reduce a limitation on urban growth and
16 development or on other activities that could affect vegetation in the primary
17 and extended study areas, resulting in potentially significant impacts. The
18 effects of this growth would be analyzed in general plan environmental impact
19 reports and in project-level CEQA compliance documents for the local
20 jurisdictions in which the growth would occur. Mitigation of these impacts
21 would be the responsibility of these local jurisdictions, and not Reclamation.
22 The expected increase in water yield relative to the entire CVP and SWP would
23 be small, however, and assuming that this new yield could be provided to any
24 number of geographic areas within the CVP and SWP service areas (and in part
25 would substitute for ongoing groundwater pumping), the project's impact on
26 urban growth and development that could affect vegetation would be minor.

27 Similarly, projects potentially affecting streambeds, wetlands, and listed species
28 would require permits from the CDFW, USACE, and USFWS, respectively;
29 impacts on these resources would be avoided, minimized, and/or mitigated
30 during those agency consultations.

31 Because the extent, location, and timing of induced growth are currently highly
32 uncertain, and in the future the impacts of this growth would be analyzed and
33 mitigated during land use planning and environmental review for specific
34 projects, growth-inducing effects on vegetation and habitat types are not
35 discussed further in this section. However, additional discussion of growth-
36 inducing effects specific to the alternative actions is provided in Chapter 26,
37 "Other Required Disclosures," of this DEIS.

38 For the purposes of the impact analysis for the loss of general habitats in the
39 Shasta Lake and vicinity portion of the primary study area, California Wildlife

1 Habitat Relationship (CWHR) types are used to describe the affected habitats.
2 Table 12-9 provides a crosswalk between MCV and CWHR habitat types.

3 **Table 12-9. Comparison between MCV Vegetation Types and CWHR**
4 **Habitat Types**

MCV Type	CWHR Type
Barren	Barren
Birch-leaf mountain-mahogany chaparral	Mixed chaparral
Black willow thicket	Montane riparian
Blue oak woodland	Blue oak woodland
Brewer oak scrub	Mixed chaparral
Buck brush chaparral	Mixed chaparral
California annual grassland	Annual grassland
California ash chaparral	Mixed chaparral
California black oak forest	Montane hardwood
California buckeye groves	Mixed chaparral
California yerba santa scrub	Mixed chaparral
Canyon live oak forest	Montane hardwood
Deer brush chaparral	Mixed chaparral
Douglas-fir	Douglas-fir
Fremont cottonwood	Montane riparian
Ghost pine woodland	Montane hardwood–conifer, Blue oak–foothill pine
Himalayan blackberry brambles	Montane riparian
Interior live oak chaparral	Mixed chaparral
Interior live oak woodland	Montane hardwood
Knobcone pine forest	Closed-cone pine–cypress
Lacustrine	Lacustrine
Mixed willow	Montane riparian
Oregon ash groves	Montane riparian
Oregon white oak woodland	Montane hardwood
Ponderosa pine–Douglas-fir forest	Montane hardwood–conifer
Ponderosa pine forest	Ponderosa pine

5

1
2

Table 12-9. Comparison between MCV Vegetation Types and CWHR Habitat Types (contd.)

MCV Type	CWHR Type
Red osier thickets	Montane riparian
Riverine	Riverine
Sandbar willow thickets	Montane riparian
Spicebush thickets	Montane riparian
Valley oak woodland	Montane hardwood
Urban	Urban
White alder groves	Montane riparian
White leaf manzanita chaparral	Mixed chaparral

Key:
CWHR = California Wildlife Habitat Relationship
MCV = A Manual of California Vegetation

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4
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7

Special-Status Species

The project could affect special-status plant species through the same impact mechanisms potentially affecting vegetation and habitat types, and also by altering the structure and species composition of vegetative communities, particularly within river corridors.

8
9
10
11
12

Potential impacts resulting from these impact mechanisms were assessed for special-status plant species that may occur in the project area. This assessment was based on the potential impacts on vegetation and habitat types for each alternative and on available information about the distribution, ecology, and reproductive biology of each special-status species.

13
14
15

Assumptions

The following assumptions have been made for the purposes of the impact analysis:

16
17

- Activity areas (construction areas for infrastructure and relocation areas) would be completely cleared.

18
19

- Mechanized equipment would be used for discrete areas where total clearing would occur.

20
21
22

- All trees would be removed along other areas of the lake, including those that could be considered a hazard in coves used by houseboats for moorage; other vegetation would be left.

23

Trees would be removed using helicopters and barges.

1 **12.3.2 Criteria for Determining Significance of Effects**

2 An environmental document prepared to comply with NEPA must consider the
3 context and intensity of the environmental effects that would be caused by, or
4 result from, the proposed action. Under NEPA, the significance of an effect is
5 used solely to determine whether an EIS must be prepared. An environmental
6 document prepared to comply with CEQA must identify the potentially
7 significant environmental effects of a proposed project. A “[s]ignificant effect
8 on the environment” means a substantial, or potentially substantial, adverse
9 change in any of the physical conditions within the area affected by the project”
10 (State CEQA Guidelines, Section 15382). CEQA also requires that the
11 environmental document propose feasible measures to avoid or substantially
12 reduce significant environmental effects (State CEQA Guidelines, Section
13 15126.4(a)).

14 ***Vegetation and Habitat Types***

15 The following significance criteria were developed based on guidance provided
16 by the State CEQA Guidelines, and consider the context and intensity of the
17 environmental effects as required under NEPA. Impacts of an alternative on
18 vegetation and habitat types would be significant if project implementation
19 would do any of the following:

- 20 • Result in a substantial adverse effect on any riparian vegetation or
21 habitat, oak woodlands or savannas, or other sensitive natural
22 community identified in local or regional plans, policies, regulations, or
23 by CDFW or USFWS
- 24 • Conflict with a local policy or ordinance that protects vegetation
25 resources, such as a tree preservation policy or ordinance
- 26 • Conflict with or violate the provisions of an adopted habitat
27 conservation plan, natural community conservation plan, or other
28 approved local, regional, State, or Federal habitat conservation plan
29 relating to the protection of plant resources
- 30 • Result in the potential for spread of nonnative and invasive plant
31 species

32 ***Special-Status Species***

33 Impacts of an alternative on special-status species would be significant if
34 project implementation would do any of the following:

- 35 • Result in a substantial adverse effect, either directly or through habitat
36 modifications, on any plant species identified as a candidate, sensitive,
37 or special-status species in local or regional plans, policies, or
38 regulations or by CDFW or USFWS

- 1 • Have the potential to substantially reduce the number or restrict the
2 range of an endangered or threatened plant species or a plant species
3 that is a candidate for State listing or proposed for Federal listing as
4 endangered or threatened

- 5 • Have the potential for substantial reductions in the habitat of an
6 endangered or threatened plant species or a plant species that is a
7 candidate for State listing or proposed for Federal listing as endangered
8 or threatened

- 9 • Substantially reduce the number or restrict the range of an endangered,
10 rare, or threatened species, cause a native plant population to drop
11 below self-sustaining levels, or threaten to eliminate a plant community

- 12 • Have the potential to cause a native plant population to drop below
13 self-sustaining levels

14 **Wetlands**

15 Impacts of an alternative on wetlands would be significant if project
16 implementation would do any of the following:

- 17 • Have a substantial adverse effect on Federally protected wetlands as
18 defined by Section 404 of the CWA (including, but not limited to,
19 marsh, vernal pool, etc.) through direct removal, filling, hydrological
20 interruption, flooding, or other means

- 21 • Conflict with any State or local policies or ordinances protecting
22 wetland and/or riparian resources

- 23 • Conflict with or violate the provisions of an adopted habitat
24 conservation plan, natural community conservation plan, or other
25 approved local, regional, State, or Federal habitat conservation plan
26 relating to the protection of wetland resources

27 **Shasta-Trinity National Forest Land and Resource Management Plan**

28 In addition to the above significance criteria, the *Shasta-Trinity National Forest*
29 *Land and Resource Management Plan* (USFS 1995) contains forest goals,
30 standards, and guidelines designed to guide the management of the biological
31 resources within the Shasta-Trinity National Forest, located in the Shasta Lake
32 and vicinity portion of the primary study area. To comply with NEPA, this
33 assessment of impacts evaluates the project’s compliance with the STNF LRMP
34 forest goals, standards, and guidelines listed in the “Regulatory Framework”
35 section listed above. Mitigation measures are provided (as needed) to move
36 project actions toward compliance with the STNF LRMP.

1 **12.3.3 Topics Eliminated from Further Consideration**

2 No topics related to botanical resources and wetlands that are included in the
3 significance criteria listed above were eliminated from further consideration. All
4 relevant topics are analyzed below.

5 **12.3.4 Direct and Indirect Effects**

6 This section identifies how specific vegetation types could be affected by the
7 project. The project could affect vegetation by doing any of the following:

- 8 • Causing construction-related effects at Shasta Dam and around Shasta
9 Lake
- 10 • Altering flow regimes downstream from Shasta Lake and downstream
11 from other reservoirs with altered operations
- 12 • Increasing water supply reliability that, in turn, could contribute to
13 growth or changes in agricultural land uses in the CVP and SWP
14 service areas

15 By altering storage and reservoir operations, the project would change flow
16 regimes in downstream waterways. In turn, these alterations to the flow regime
17 could affect vegetation, particularly riparian and wetland vegetation along
18 several waterways.

19 ***No-Action Alternative***

20 Under the No-Action Alternative, the Federal Government would take
21 reasonably foreseeable actions, as defined in Chapter 2, “Alternatives,” but
22 would take no additional action toward implementing a specific plan to help
23 increase anadromous fish survival in the upper Sacramento River, nor help
24 address the growing water reliability issues in California. Shasta Dam would not
25 be modified, and the CVP would continue operating similar to the existing
26 condition. Changes in regulatory conditions and water supply demands would
27 result in differences in flows on the Sacramento River and at the Delta between
28 existing and future conditions. Possible changes include the following:

- 29 • Firm Level 2 Federal refuge deliveries
- 30 • SWP deliveries based on full Table A amounts
- 31 • Full implementation of the Grassland Bypass Project
- 32 • Implementation of salinity management actions similar to the Vernalis
33 Adaptive Management Plan
- 34 • Implementation of the South Bay Aqueduct Improvement and
35 Enlargement Project

- 1 • Increased San Joaquin River diversions for water users in the Stockton
2 Metropolitan Area after completion of the Delta Water Supply Project
- 3 • Increased Sacramento River diversions by Freeport Regional Water
4 Project agencies
- 5 • Operation of RBPP with gates out year round
- 6 • San Joaquin River Restoration Program Full Restoration Flows

7 This alternative is used as a basis of comparison for future condition
8 comparisons.

9 **Shasta Lake and Vicinity**

10 *Impact Bot-1 (No-Action): Loss of Federally or State Listed Plant Species*
11 Habitat for Federally or State-listed plant species does not occur at Shasta Lake
12 or in the vicinity. No species are known or expected to occur. Therefore, no
13 impact would occur. Mitigation is not required for the No-Action Alternative.

14 *Impact Bot-2 (No-Action): Loss of MSCS Covered Species* Species covered by
15 the MSCS would not be lost as a result of inundation, vegetation removal, or
16 construction activities. Therefore, no impact would occur. Mitigation is not
17 required for the No-Action Alternative.

18 *Impact Bot-3 (No-Action): Loss of USFS Sensitive, BLM Sensitive, or CRPR*
19 *Species* USFS sensitive, BLM sensitive or CRPR listed species would not be
20 lost as a result of inundation, vegetation removal, or construction activities.
21 Therefore, no impact would occur. Mitigation is not required for the No-Action
22 Alternative.

23 *Impact Bot-4 (No-Action): Loss of Jurisdictional Waters* Waters of the United
24 States would not be lost as a result of inundation, vegetation removal, or
25 construction activities. Therefore, no impact would occur. Mitigation is not
26 required for the No-Action Alternative.

27 *Impact Bot-5 (No-Action): Loss of General Vegetation Habitats* General
28 vegetation habitats would not be lost as a result of inundation, vegetation
29 removal, or construction activities. Therefore, no impact would occur.
30 Mitigation is not required for the No-Action Alternative.

31 *Impact Bot-6 (No-Action): Spread of Noxious and Invasive Weeds* Noxious
32 and invasive weeds would not be spread as a result of inundation, vegetation
33 removal, or construction activities. Therefore, no impact would occur.
34 Mitigation is not required for the No-Action Alternative.

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

36 *Impact Bot-7 (No-Action): Altered Structure and Species Composition and Loss*
37 *of Sensitive Plant Communities and Special-Status Plant Species Resulting from*

1 *Altered Flow Regimes* Altered flow regimes associated with the No-Action
2 Alternative could alter the structure and species composition or cause the loss of
3 riparian, wetland, and oak communities along the upper Sacramento River, and
4 of habitat for special-status plant species. Vernal pool plant communities and
5 associated special-status species likely would not be affected. Effects on oak
6 communities and upland habitats for special-status plants may not all be
7 adverse. Adverse effects on riparian and wetland communities and associated
8 special-status plants would be small, and beneficial effects are also anticipated
9 to result from other management and restoration actions. Thus, this impact
10 would be less than significant.

11 Although Shasta Dam would not be altered under the No-Action Alternative,
12 CVP and SWP water storage, conveyance, and deliveries would change because
13 of several reasonably foreseeable actions that would occur with or without
14 enlarging Shasta Dam. As a consequence of these actions, the flow regime of
15 the upper Sacramento River would change between 2005 and 2030. The
16 CalSim-II modeling results that simulate these changes are provided in the
17 *Hydrology, Hydraulics, and Water Management Technical Report*. CalSim-II
18 mean monthly results used to simulate mean daily values also indicate the
19 relative magnitude of changes to the flow regime. The simulated change in
20 mean daily discharges greater than 30,000 cubic feet per second (cfs) below
21 Keswick Dam, RBPP, and Hamilton City are summarized on Figure 12-4.
22 Overall, these modeling results suggest there would be only very small changes
23 in flows greater than 30,000 cfs. Flows of this magnitude strongly affect bank
24 erosion and meander migration, and are related to other geomorphic processes
25 affecting the extent of different riparian communities. These relationships are
26 described in greater detail under CP1.

27 This change might not be sufficient to cause significant effects on riparian and
28 wetland communities, or on associated special-status species.

29 In addition to causing small changes in flow regime, the No-Action Alternative
30 would continue to alter the structure and species composition of riparian and
31 wetland vegetation resulting from continued operation of Shasta Dam. Before
32 the construction of Shasta Dam, river flow and stage would decrease gradually
33 during the period of cottonwood and willow seed dispersal. In many years, this
34 flow pattern would facilitate establishment of these early-successional species
35 along the Sacramento River throughout the primary study area.

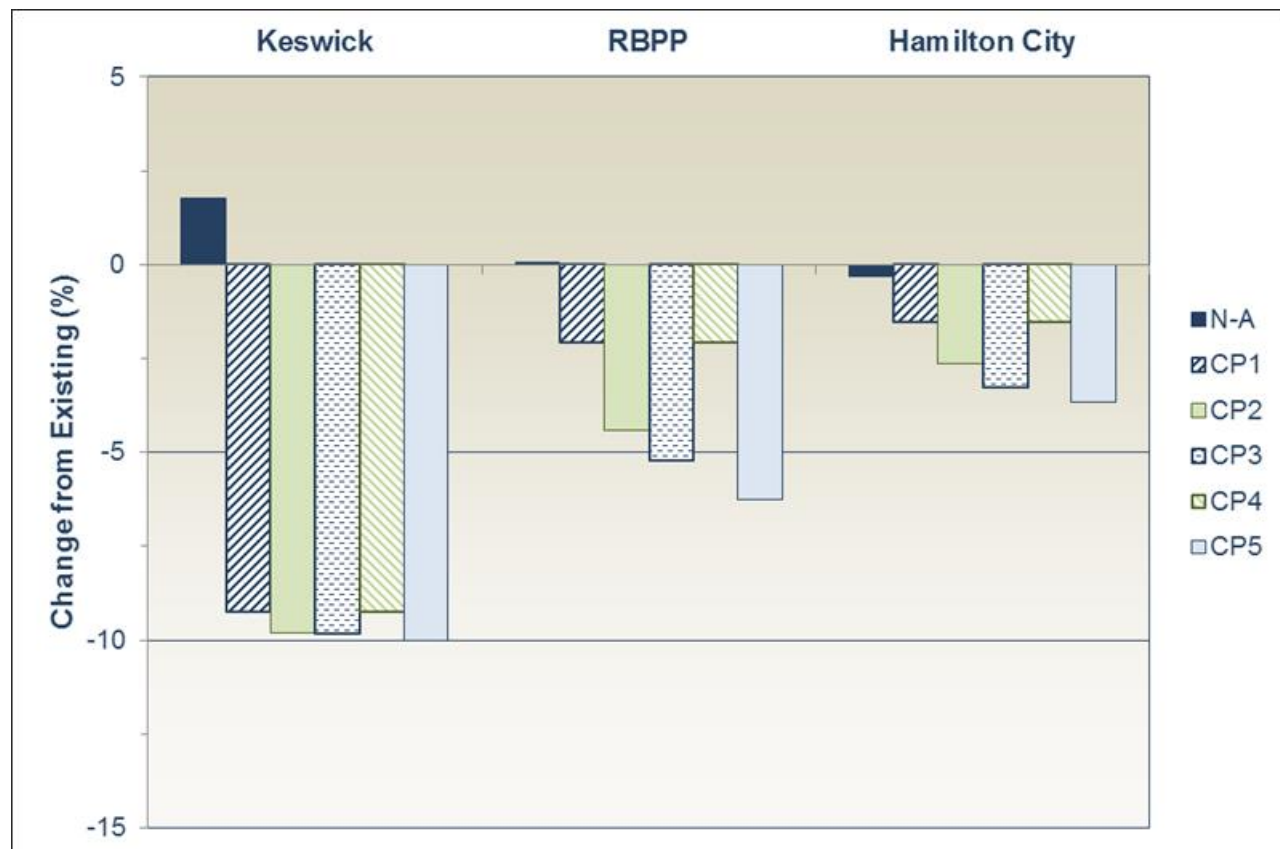


Figure 12-4. Simulated Changes in Mean Daily Flows Greater than 30,000 cfs

Operation of Shasta Dam has increased flow volumes from mid-spring to early summer. Consequently, in most years, operation of the dam precludes or substantially reduces opportunities for establishment of cottonwoods and opportunities for willow establishment. As a result of this (and other alterations to the flow regime of the Sacramento River), the structure and species composition of riparian vegetation has been changing within the primary study area (Fremier 2003, Roberts et al. 2002). The extent of early-successional riparian communities (e.g., cottonwood forest) has been decreasing while the extent of mid-successional communities (e.g., mixed riparian forest) has been increasing. Such changes would continue under the No-Action Alternative for several decades, but would diminish with time.

However, under the No-Action Alternative a number of management and restoration plans and programs would be implemented. These actions are described in Section 12.2, "Regulatory Framework," of this DEIS. These actions would cause beneficial effects that would likely be of similar magnitude as the anticipated adverse effects of small changes in flow regime and of continued effects from past actions, and thus would largely offset those adverse effects.

1 For the reasons described above, this impact would be less than significant.
2 Mitigation is not required for the No-Action Alternative.

3 *Impact Bot-8 (No-Action): Conflict with Approved Local or Regional Plans with*
4 *Objectives of Riparian Habitat Protection or Watershed Management*

5 Numerous local and regional plans promote the conservation of riparian
6 vegetation and associated habitats along the upper Sacramento River. Expected
7 future effects of the No-Action Alternative on riparian communities have
8 largely been considered in the existing plans. The No-Action Alternative would
9 not conflict with approved local or regional plans. This impact would be less
10 than significant.

11 Numerous local and regional plans address and promote the conservation of
12 riparian vegetation and associated habitats along the upper Sacramento River in
13 the primary study area. These plans, which are discussed in more detail in the
14 “Regulatory Setting” section of this DEIS, include the Sacramento River
15 Conservation Area Program, which promotes the conservation and the
16 restoration of riparian habitat. Under the No-Action Alternative, adverse effects
17 would result from the continued consequences of past actions (e.g., construction
18 of Shasta Dam and the introduction of nonnative species) and from the effects
19 of reasonably foreseeable actions. Most adverse effects that are the continued
20 consequences of past actions have been considered in the development of
21 existing local and regional plans. In addition, foreseeable water resources and
22 levee actions are expected to be consistent with local and regional plans, and
23 anticipated adverse effects are likely to be fully mitigated and not conflict with
24 a local or regional plan. Therefore, the No-Action Alternative would not
25 conflict with approved local or regional plans with objectives of riparian habitat
26 protection or watershed management. This impact would be less than
27 significant. Mitigation is not required for the No-Action Alternative.

28 *Impact Bot-9 (No-Action): Disturbance or Removal of Designated Critical*
29 *Habitat for Special-Status Species* Designated critical habitat for vernal pool
30 species in the upper Sacramento River area is not expected to be adversely
31 affected. This impact would be less than significant.

32 Designated critical habitat for four vernal pool special-status plant species exists
33 in the upper Sacramento River portion of the primary study area: slender orcutt
34 grass, Hoover’s spurge, hairy orcutt grass, and Greene’s tuctoria. Critical habitat
35 for these species in the primary study area is confined to vernal pool
36 communities (USFWS 2006). Vernal pools are generally not present within the
37 active floodplain. However, if vernal pool habitats for these special-status
38 species are present in the active floodplain of the upper Sacramento River, they
39 could be affected by the small reduction in the frequency and magnitude of
40 overbank flows. It is not known if this would be an adverse or beneficial effect.
41 Because this effect of the No-Action Alternative is somewhat speculative and
42 not necessarily adverse, this impact would be less than significant. Mitigation is
43 not required for the No-Action Alternative.

1 *Impact Bot-10 (No-Action): Loss of Sensitive Plant Communities and Special-*
2 *Status Plant Species Resulting from Induced Growth* Although Shasta Dam
3 would not be altered, water storage, conveyance, and deliveries to water
4 districts would likely increase because of reasonably foreseeable projects.
5 However, environmental regulations would continue to provide protection for
6 botanical resources and wetlands, and the effects of future growth would be
7 analyzed and mitigated during land use planning and environmental review for
8 specific projects. Therefore, this impact would be less than significant.

9 Although Shasta Dam would not be altered under the No-Action Alternative,
10 CVP and SWP water storage, conveyance, and deliveries would change because
11 of several reasonably foreseeable projects that would occur with or without
12 enlarging Shasta Dam. Consequently, deliveries to water districts along the
13 upper Sacramento River in the primary study area would likely increase
14 between now and 2030, and this could reduce a limitation on urban growth and
15 development. However, environmental regulations would continue to protect
16 wetlands, riparian habitats, other sensitive botanical communities, and special-
17 status plant species, and the effects of future growth would be analyzed and
18 mitigated during land use planning and environmental review for specific
19 projects. Furthermore, CVP water delivered in this area would primarily be for
20 agricultural purposes, and agricultural acreages are not expected to expand. For
21 the reasons described above, this impact would be less than significant.
22 Mitigation is not required for the No-Action Alternative.

23 **Lower Sacramento River and Delta**

24 *Impact Bot-11 (No-Action): Loss of Sensitive Natural Communities or Habitats*
25 *Resulting from Implementing the Gravel Augmentation Program or Restoring*
26 *Riparian, Floodplain, and Side Channel Habitats* The proposed gravel
27 augmentation program and riparian, floodplain, and side channel restoration
28 activities would not be implemented under the No-Action Alternative.
29 Therefore, no impact would occur. Mitigation is not required for the No-Action
30 Alternative.

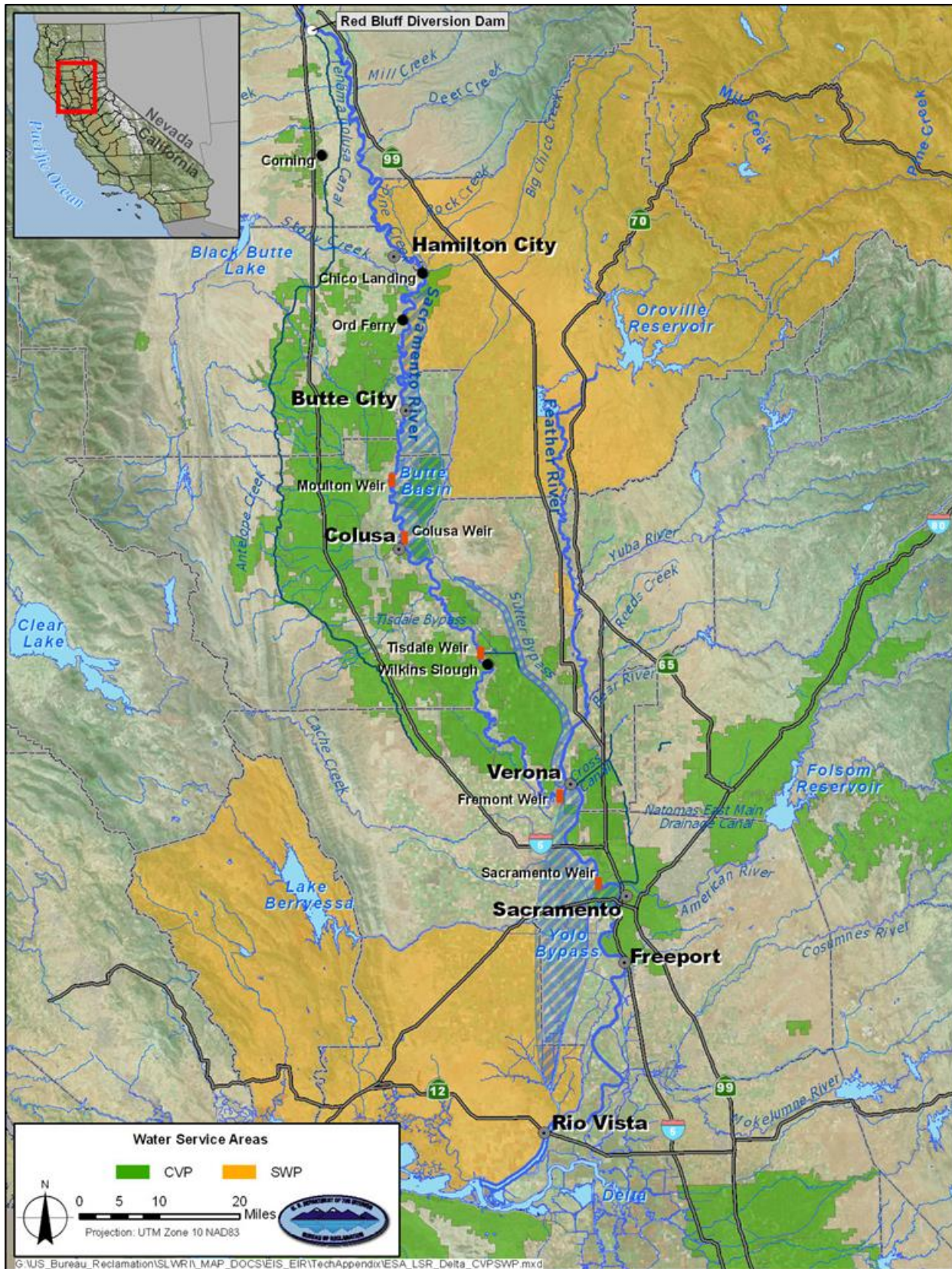
31 *Impact Bot-12 (No-Action): Loss of Special-Status Plants Resulting from*
32 *Implementing the Gravel Augmentation Program or Restoring Riparian,*
33 *Floodplain, and Side Channel Habitats* The proposed gravel augmentation
34 program and riparian, floodplain, and side channel restoration activities would
35 not be implemented under the No-Action Alternative. Therefore, no impact
36 would occur. Mitigation is not required for the No-Action Alternative.

37 *Impact Bot-13 (No-Action): Spread of Noxious and Invasive Weeds Resulting*
38 *from Implementing the Gravel Augmentation Program or Restoring Riparian,*
39 *Floodplain, and Side Channel Habitats* The proposed gravel augmentation
40 program and riparian, floodplain, and side channel restoration activities would
41 not be implemented under the No-Action Alternative. Therefore, no impact
42 would occur. Mitigation is not required for the No-Action Alternative.

1 *Impact Bot-14 (No-Action): Altered Structure and Species Composition and*
2 *Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting*
3 *from Altered Flow Regimes on the Lower Sacramento River* Altered flow
4 regimes associated with the No-Action Alternative could alter the structure and
5 species composition or cause the loss of riparian, wetland, and oak communities
6 along the lower Sacramento River and in the Delta, and of habitat for special-
7 status plant species. Vernal pool plant communities and associated special-
8 status plant species likely would not be affected. Effects on oak communities
9 and upland habitats for special-status plants may not all be adverse. Adverse
10 effects on riparian and wetland communities and associated special-status plants
11 would be small, and beneficial effects are also anticipated to result from
12 management and restoration actions. Thus, this impact would be less than
13 significant.

14 Although Shasta Dam would not be altered under the No-Action Alternative,
15 CVP and SWP water storage, conveyance, and deliveries would change because
16 of several reasonably foreseeable actions that would occur with or without
17 enlarging Shasta Dam. As a consequence of these actions, the flow regime of
18 the lower Sacramento River could change between 2005 and 2030. The CalSim-
19 II modeling results that simulate these changes are provided in the *Hydrology,*
20 *Hydraulics, and Water Management Technical Report*. CalSim-II results
21 temporally downscaled to mean daily values also indicate the relative
22 magnitude of changes to the flow regime. The simulated change in mean daily
23 discharges greater than 30,000 cfs below RBPP and Hamilton City are
24 summarized on Figure 12-4. (These locations are shown on Figure 12-5.) Flows
25 of this magnitude strongly affect bank erosion and meander migration, and are
26 related to other geomorphic processes affecting the extent of different riparian
27 communities. (These relationships are described in greater detail under CP1.)
28 Overall, these modeling results suggest only a very small change in flows
29 greater than 30,000 cfs along the uppermost portion of the lower Sacramento
30 River. This change might not be sufficient to cause significant effects on
31 riparian and wetland communities, or on associated special-status species.

32 However, besides causing additional, very small changes in flow regime, the
33 No-Action Alternative would continue to alter the structure and species
34 composition of riparian and wetland vegetation along the lower Sacramento
35 River resulting from the continued operation of Shasta Dam. Before the
36 construction of Shasta Dam, flow volume would decrease gradually during the
37 period of cottonwood and willow seed dispersal. In many years, this flow
38 pattern would facilitate establishment of these early- successional species along
39 the Sacramento River throughout the extended study area. As described for the
40 upper Sacramento River above, along the lower Sacramento River, the extent of
41 early-successional riparian communities would continue decreasing while the
42 extent of mid-successional communities would continue increasing under the
43 No-Action Alternative.



1
 2 **Figure 12-5. Locations Along the Lower Sacramento River**

3

1 However, under the No-Action Alternative, a number of management and
2 restoration plans and programs carried out by a large number of agencies would
3 be implemented. These actions are described in the “Regulatory Setting” section
4 of this DEIS. These actions would cause beneficial effects that would likely be
5 of similar magnitude as the anticipated adverse effects of small changes in flow
6 regime and of continued effects from past actions, and thus would largely offset
7 those adverse effects.

8 For the reasons described above, this impact would be less than significant.
9 Mitigation is not required for the No-Action Alternative.

10 *Impact Bot-15 (No-Action): Conflict with Approved Local or Regional Plans*
11 *with Objectives of Riparian Habitat Protection or Watershed Management*
12 *along the Lower Sacramento River* Adopted local and regional plans address
13 and promote the conservation of riparian vegetation and associated habitats
14 along the lower Sacramento River. In the development of regional and local
15 plans, most ongoing adverse effects of past actions were considered, but not all
16 effects of reasonably foreseeable actions. Unmitigated effects from these actions
17 could be sufficient to conflict with these plans. Therefore, the No-Action
18 Alternative could conflict with approved local or regional plans. This impact
19 would be potentially significant.

20 Adopted local and regional plans address and promote the conservation of
21 riparian vegetation and associated habitats along the lower Sacramento River
22 and in the Delta in the extended study area. These plans, which are discussed in
23 more detail in the “Regulatory Framework” section of this DEIS, include the
24 Sacramento River Conservation Area Program and the CALFED Ecosystem
25 Restoration Program, both of which promote the conservation and the
26 restoration of riparian habitat. Under the No-Action Alternative, adverse effects
27 would result from the continued consequences of past actions (e.g., construction
28 of Shasta Dam and the introduction of nonnative species) and from the effects
29 of foreseeable actions. Most adverse effects that are the continued consequences
30 of past actions have been considered in the development of existing local and
31 regional plans. However, the adverse effects of all foreseeable water resource
32 and levee actions were not considered in the development of local and regional
33 plans, and these adverse effects are not likely to be completely avoided or fully
34 mitigated. The unmitigated effects of these actions could be sufficient overall to
35 conflict with a local or regional plan. Therefore, the No-Action Alternative
36 could conflict with approved local or regional plans with objectives of riparian
37 habitat protection or watershed management. This impact would be potentially
38 significant. Mitigation is not required for the No-Action Alternative.

39 *Impact Bot-16 (No-Action): Loss of Sensitive Plant Communities and Special-*
40 *Status Plant Species Resulting from Induced Growth along the Lower*
41 *Sacramento River and in the Delta* Although Shasta Dam would not be altered,
42 water storage, conveyance, and deliveries to water districts would likely
43 increase because of reasonably foreseeable actions. However, environmental

1 regulations would continue to provide protection for botanical resources and
2 wetlands, and the effects of future growth would be analyzed and mitigated
3 during land use planning and environmental review for site-specific projects.
4 Therefore, this impact would be less than significant.

5 Although Shasta Dam would not be altered under the No-Action Alternative,
6 CVP and SWP water storage, conveyance, and deliveries would likely increase
7 because of several reasonably foreseeable actions that would occur with or
8 without enlarging Shasta Dam. Thus, deliveries to water districts in the
9 extended study area along the lower Sacramento River and in the Delta would
10 likely increase between now and 2030, and this could reduce a limitation on
11 urban growth and development. However, environmental regulations would
12 continue to protect wetlands, riparian habitats, other sensitive botanical
13 communities, and special-status plant species, and the effects of future growth
14 would be analyzed and mitigated during land use planning and environmental
15 review for site-specific projects. Therefore, this impact would be less than
16 significant. Mitigation is not required for the No-Action Alternative.

17 **CVP/SWP Service Areas**

18 *Impact Bot-17 (No-Action): Altered Structure and Species Composition and*
19 *Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting*
20 *from Altered Flow Regimes in the CVP/SWP Service Areas* Altered flow
21 regimes associated with the No-Action Alternative could alter the structure and
22 species composition or cause the loss of riparian, wetland, and oak communities
23 in the CVP and SWP service areas, and of habitat for special-status plant
24 species. However, alteration of flow regimes below CVP and SWP reservoirs
25 would be less than below Shasta Dam along the Sacramento River, and may not
26 be sufficient to alter the distribution of plant communities, or the extent or
27 quality of associated special-status species habitat. Therefore, this impact would
28 be less than significant.

29 Altered flow regimes associated with the No-Action Alternative could alter the
30 structure and species composition or cause the loss of riparian, wetland, and oak
31 communities, and of habitat for special-status plant species. Vernal pool plant
32 communities and associated special-status plant species likely would not be
33 affected by the altered flow regime. Effects on oak communities and upland
34 habitats for special-status plants would be somewhat speculative and may not
35 all be adverse; thus, on oak communities and special-status plants of upland
36 habitats, this impact would be less than significant. Although riparian and
37 wetland communities could be affected, alteration of flow regimes below CVP
38 and SWP reservoirs in the extended study area would be less than below Shasta
39 Dam along the upper and lower Sacramento River. Below CVP and SWP
40 reservoirs, these alterations may not be sufficient to alter the extent of early-
41 successional riparian and wetland communities, or the extent or quality of
42 associated special-status species habitat. Therefore, this impact would be less
43 than significant below CVP and SWP reservoirs in the extended study area.
44 Mitigation is not required for the No-Action Alternative.

1 *Impact Bot-18 (No-Action): Conflict with Approved Local or Regional Plans*
2 *with Objectives of Riparian Habitat Protection or Watershed Management in*
3 *the CVP/SWP Service Areas* The No-Action Alternative would not have
4 substantial effects on riparian vegetation and habitats, and thus, would not
5 conflict with existing local and regional plans in the CVP and SWP service
6 areas. This impact would be less than significant.

7 Adopted local and regional plans address and promote the conservation of
8 riparian vegetation and associated habitats along rivers below reservoirs in the
9 CVP and SWP service areas. However, implementation of the No-Action
10 Alternative would not have substantial effects on riparian vegetation and
11 habitats. Therefore, implementation of this alternative would not conflict with
12 existing local and regional plans focused on preserving riparian habitats. Thus,
13 this impact in the CVP and SWP service areas would be less than significant.
14 Mitigation is not required for the No-Action Alternative.

15 *Impact Bot-19 (No-Action): Loss of Sensitive Plant Communities and Special-*
16 *Status Plant Species Resulting from Induced Growth in the CVP/SWP Service*
17 *Areas* Although Shasta Dam would not be altered, water storage, conveyance,
18 and deliveries to the CVP and SWP service areas would likely increase because
19 of reasonably foreseeable actions. However, environmental regulations would
20 continue to protect botanical resources and wetlands, and the effects of future
21 growth would be analyzed and mitigated during land use planning and
22 environmental review for specific projects. Therefore, this impact would be less
23 than significant.

24 Although Shasta Dam would not be altered under the No-Action Alternative,
25 CVP and SWP water storage, conveyance, and deliveries to the CVP and SWP
26 service areas would likely increase because of several reasonably foreseeable
27 actions that would occur with or without enlarging Shasta Dam. Thus, CVP and
28 SWP deliveries would likely increase between now and 2030, and this could
29 reduce a limitation on growth. However, environmental regulations would
30 continue to protect wetlands, riparian habitats, other sensitive botanical
31 communities, and special-status plant species, and the effects of future growth
32 would be analyzed and mitigated during land use planning and environmental
33 review for specific projects. Therefore, this impact would be less than
34 significant. Mitigation is not required for the No-Action Alternative.

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

37 CP1 focuses on increasing water supply reliability and increasing anadromous
38 fish survival. This plan primarily consists of raising Shasta Dam by 6.5 feet,
39 which, in combination with spillway modifications, would increase the height of
40 the reservoir's full pool by 8.5 feet and enlarge the total storage capacity in the
41 reservoir by 256,000 acre-feet. The existing TCD would also be extended to
42 achieve efficient use of the expanded cold-water pool. Shasta Dam operational

1 guidelines would continue essentially unchanged, except during dry years² and
2 critical years, when 70 TAF and 35 TAF, respectively, of the increased storage
3 capacity in Shasta Reservoir would be reserved to specifically focus on
4 increasing M&I deliveries. CP1 would help reduce future water shortages
5 through increasing drought year and average year water supply reliability for
6 agricultural and M&I deliveries. In addition, the increased depth and volume of
7 the cold-water pool in Shasta Reservoir would contribute to improving seasonal
8 water temperatures for anadromous fish in the upper Sacramento River.

9 **Shasta Lake and Vicinity**

10 *Impact Bot-1 (CP1): Loss of Federally or State-Listed Plant Species* Habitat
11 for Federally or State-listed plant species does not occur at Shasta Lake or in the
12 vicinity. No species are known or expected to occur. Therefore, no impact
13 would occur. Mitigation for this impact is not needed, and thus not proposed.

14 *Impact Bot-2 (CP1): Loss of MSCS Covered Species* Implementation of the
15 project would result in the loss of MSCS-covered species as a result of
16 inundation, vegetation removal, or construction activities. Therefore, this impact
17 would be significant.

18 The only MSCS species known to occur in the project area is Shasta snow-
19 wreath. Inundation caused by a 6.5-foot dam raise could affect all or portions of
20 nine of the Shasta snow-wreath populations found along the McCloud River and
21 Pit arms and the Main Body of the lake. Additionally, a portion of one Shasta
22 snow-wreath population occurs within the relocation area at Ellery Creek and
23 activities to decommission the campground could affect portions of that
24 population. Collectively, 10 of the 23 known (43 percent) Shasta snow-wreath
25 populations could be affected by a 6.5-foot dam raise.

26 Because complete surveys have not been conducted in the entire impoundment
27 area, other MSCS plant species may be present. In these areas, all or portions of
28 MSCS plant populations could be inundated. Additional analysis of impacts will
29 be conducted in relation to suitable habitats present in the Shasta Lake
30 watershed. An analysis of indirect impacts and temporary impacts will be
31 provided in the Final EIS. Potential mitigation lands containing comparable
32 habitat have been identified adjacent to the project. Additional discussion of
33 how these lands may be applied as mitigation and at what ratios will be
34 provided in the Final EIS.

35 This loss of MSCS-covered species and their habitat would be substantial; the
36 impact would be significant. Mitigation for this impact is proposed in Section
37 12.3.5.

38 *Impact Bot-3 (CP1): Loss of USFS Sensitive, BLM Sensitive, or CRPR Species*
39 Implementation of the project would result in the loss of USFS sensitive, BLM

² Throughout this document, water year types are defined according to the Sacramento Valley Index Water Year Hydrologic Classification unless specified otherwise.

1 sensitive, or CRPR species as a result of inundation, vegetation removal, or
2 construction activities. Therefore, this impact would be potentially significant.

3 For areas where botanical surveys have been conducted, direct impacts have
4 been determined using geographic information systems to ascertain the
5 populations within the impoundment area, relocation areas, and construction
6 footprints.

7 Based on results of surveys to date, special-status plant species known to occur
8 in the primary study area include Shasta County arnica, northern clarkia,
9 Cantelow's lewisia, Shasta snow-wreath, slender false lupine, Shasta
10 huckleberry, and oval-leaved viburnum.

11 Direct impacts on Shasta snow-wreath under CP1 are addressed in Impact Bot-2
12 (CP1). As a Forest Service sensitive species, the Shasta snow-wreath is
13 recognized by the Forest Service to require special management to prevent the
14 species from becoming threatened or endangered. Because the snow-wreath is a
15 Shasta County endemic species, the impacts will result in a decline in
16 populations and habitat and may result in a trend towards listing.

17 Inundation caused by a 6.5-foot dam raise and vegetation removal could impact
18 all or portions of Shasta County arnica, northern clarkia, Cantelow's lewisia,
19 slender false lupine, Shasta huckleberry, and oval-leaved viburnum populations
20 occurring in the impoundment and relocation areas. Potential populations
21 occurring in the unsurveyed portions of the impoundment area could be flooded
22 and would result in a potentially significant impact. Impacts on known
23 populations are provided below.

24 Inundation of the impoundment area would impact all or portions of the Shasta
25 arnica population south of Bridge Bay Resort on the Main Body of the lake and
26 the population north of Slaughterhouse Island on the Sacramento Arm.
27 Vegetation removal may impact the Shasta arnica population near the privately
28 owned cabins on USFS lands on the Salt Creek inlet on the Sacramento Arm.

29 Inundation of the impoundment area and vegetation removal in the relocation
30 areas would impact all or portions of northern clarkia populations in Bailey
31 Cove (McCloud Arm) and in Sugarloaf Cove west of Beehive Point
32 (Sacramento Arm).

33 Inundation of the impoundment area would impact all or portions of the
34 Cantelow's lewisia population on a rock outcrop on the right bank of the Upper
35 Sacramento River riverine reach near the Shasta Lake/upper Sacramento River
36 transition zone. Inundation will also impact populations found along the
37 Sacramento Arm near Elmore Mountain.

38 Inundation of the impoundment area and vegetation removal in the relocation
39 areas would impact all or portions of slender false lupine populations
40 throughout these areas.

1 Shasta huckleberry is known from 21 general locations. Inundation caused by a
2 6.5-foot dam raise would impact small portions of four Shasta huckleberry
3 populations located on the Squaw Creek Arm and the Main Body. These
4 populations extend beyond the project boundary at each location and no
5 population will be completely lost as a result of CP1.

6 Because complete surveys have not been conducted in the entire impoundment
7 area, other of USFS sensitive, BLM sensitive, and CRPR species plant species
8 may be present. In these areas, all or portions of USFS sensitive, BLM
9 sensitive, and CRPR species plant populations could be inundated. This would
10 be a potentially significant impact.

11 Collectively, the loss of USFS sensitive, BLM sensitive, and CRPR species and
12 their habitat would therefore be potentially significant. Mitigation for this
13 impact is proposed in Section 12.3.5.

14 *Impact Bot-4 (CP1): Loss of Jurisdictional Waters* Implementation of the
15 project will result in the loss of jurisdictional waters caused by flooding the
16 impoundment area and discharge of fill associated with the relocation of
17 facilities and dam construction. Flooding caused by implementation of the
18 project would result in the conversion of jurisdictional water types (e.g.,
19 wetlands and streams to lacustrine habitat). Therefore, this impact would be
20 significant.

21 Direct impacts would occur by conversion of jurisdictional waters (e.g.,
22 wetlands and streams) to lacustrine habitat with implementation of CP1. All
23 features within the impoundment area would be converted to lacustrine habitat.
24 Under CP1, approximately 14 acres of wetlands and 19 acres of other waters
25 would be converted to lacustrine habitat (Table 12-10). This will result in a net
26 loss of approximately 14 acres of wetlands. No net loss of other waters will
27 occur under CP1, as lacustrine waters will replace riverine waters; however,
28 lacustrine and riverine waters provide many different functions and values and
29 are separate aquatic resources. The loss of wetlands and the conversion of
30 approximately 19 acres of riverine waters to lacustrine waters would be a
31 significant impact.

32 Direct impacts on wetlands and other waters that will be filled as a result of
33 relocation of facilities or dam construction will be determined. Additionally,
34 some fill may be placed in the existing full pool of Shasta Lake for restoration
35 and enhancement activities. Preliminary impacts to jurisdictional waters based
36 on the assumption of 100 percent loss of features occurring in the relocation
37 areas are summarized in Table 12-11. A complete analysis of impacts on
38 jurisdictional waters in the full pool and relocation areas as well as indirect and
39 temporary impacts will be provided in the Final EIS.

40 The impact would be significant. Mitigation for this impact is proposed in
41 Section 12.3.5.

1 *Impact Bot-5 (CPI): Loss of General Vegetation Habitats* Implementation of
 2 the project would result in a loss of general vegetation habitats because of
 3 inundation, vegetation removal, or construction activities. Therefore, this impact
 4 would be potentially significant.

5 **Table 12-10. Impacts to Jurisdictional Waters (Acres*) in the Impoundment Area (6.5-Foot**
 6 **Dam Raise)**

Jurisdictional Water Type	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Wetlands						
Fresh emergent/ riparian wetland	0.00	0.00	5.16	0.00	0.00	0.00
Intermittent swale	0.00	0.001	0.00	0.00	0.00	0.02
Riparian wetland	0.38	0.47	3.60	1.85	0.35	0.41
Seasonal wetland	0.00	0.00	0.14	0.00	0.00	0.02
Seep/spring wetland	0.44	0.14	0.45	0.16	0.05	0.25
Vegetated ditch	0.00	0.00	0.00	0.003	0.00	0.00
Total Wetlands	0.87	0.61	9.35	2.01	0.40	0.68
Other Waters of the United States						
Ephemeral stream	0.13	0.01	0.29	0.13	0.06	0.05
Intermittent stream	0.67	0.12	1.10	0.41	0.39	1.25
Perennial stream	0.82	1.00	5.09	5.77	1.11	0.75
Roadside ditch	0.00	0.00	0.01	0.00	0.00	0.00
Seep/spring other waters	0.01	0.00	0.001	0.01	0.00	0.00
Total Other Waters	1.63	1.13	6.49	6.32	1.56	2.05
Total Waters of the U.S	2.46	1.74	15.84	8.33	1.96	2.73

Note: *Acreage values are approximate.

7

1 **Table 12-11. Impacts to Jurisdictional Waters (Acres*) in the Relocation Areas (6.5-Foot**
 2 **Dam Raise)**

Jurisdictional Water Type	Relocation Acres					
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Wetlands						
Fresh emergent wetland	0.00	N/A	0.02	0.01	0.00	0.00
Intermittent swale	0.00	N/A	0.78	0.00	0.00	0.02
Riparian wetland	0.15	N/A	5.87	3.89	0.18	0.82
Seasonal wetland	0.01	N/A	10.61	0.00	0.02	0.00
Seep/spring wetland	0.03	N/A	0.09	0.26	0.05	0.43
Vegetated ditch	0.06	N/A	0.002	0.01	0.002	0.00
Total Wetlands	0.24	N/A	17.37	4.17	0.25	1.27
Other Waters of the United States						
Ephemeral stream	0.30	N/A	1.37	1.40	0.03	0.18
Intermittent stream	0.89	N/A	4.16	2.17	0.22	1.74
Perennial stream	0.00	N/A	1.27	10.44	0.30	0.00
Roadside ditch	0.02	N/A	0.16	0.00	0.00	0.00
Seep/spring other waters	0.00	N/A	0.00	0.00	0.03	0.00
Total Other Waters	1.21	N/A	6.97	14.01	0.58	1.92
Total Waters of the U.S.	1.45	N/A	24.34	18.18	0.83	3.19

Note:

*Acreage values are approximate.

3 Under CP1, 1,221 acres of general vegetation habitat will be directly impacted
 4 by the inundation of the impoundment area and 3,127 acres of general
 5 vegetation habitat will be impacted by vegetation removal in the construction
 6 footprints of the relocation areas (Table 12-12 and Table 12-13).

7 Additional analysis of impacts will be conducted in relation to suitable habitats
 8 in the Shasta Lake watershed. An analysis of indirect impacts and temporary
 9 impacts will be provided in the Final EIS.

10 This impact would be potentially significant. Mitigation for this impact is
 11 proposed in Section 12.3.5.

12

1 **Table 12-12. Impacts to CWHR Habitats in the Impoundment Area (6.5-Foot Dam Raise)**

Habitat	Area (Acres*)					
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Annual grassland	0.44	0.00	3.10	0.70	0.00	0.00
Barren	2.30	0.00	10.60	3.56	0.00	4.13
Blue oak–foothill pine	10.36	0.00	0.00	0.00	4.29	1.94
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	6.81
Closed-cone pine–cypress	32.68	0.00	12.95	20.89	44.72	373.48
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00
Mixed chaparral	29.19	13.64	161.04	15.14	10.35	59.50
Montane hardwood	73.49	38.76	171.01	70.55	19.43	2.49
Montane hardwood–conifer	70.68	0.99	150.42	136.36	111.63	10.55
Montane riparian	4.16	6.67	26.16	13.91	1.53	1.57
Ponderosa pine	215.11	30.72	188.19	161.64	49.56	57.50
Riverine	0.00	0.88	5.24	15.43	1.41	0.00
Urban	21.95	0.00	1.95	7.96	0.00	1.92
Total	460.37	91.67	730.66	446.49	242.92	519.90

Note:

*Acreage values are approximate.

2 **Table 12-13. Impacts to CWHR Habitats in the Relocation Areas**

Habitat	Area (Acres*)					
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Annual grassland	5.05	0.00	28.84	10.40	0.84	0.88
Barren	23.81	0.00	86.26	36.37	11.53	20.91
Blue oak–foothill pine	3.61	0.00	0.00	0.00	0.00	18.17
Blue oak woodland	0.00	0.00	0.00	3.68	0.00	1.08
Closed-cone pine–cypress	0.11	0.00	56.90	10.06	1.94	20.99
Douglas-fir	0.00	0.00	0.00	3.02	0.00	0.00
Lacustrine	25.63	0.00	119.21	44.65	4.44	93.01
Mixed chaparral	48.17	0.00	198.56	212.60	6.34	1.24
Montane hardwood	121.63	0.00	203.65	309.12	42.22	37.85
Montane hardwood–conifer	0.34	0.00	4.28	3.93	0.23	0.37

1 **Table 12-13. Impacts to CWHR Habitats in the Relocation Areas (contd.)**

Habitat	Area (Acres*)					
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Montane riparian	185.04	0.00	466.77	402.08	43.08	36.00
Ponderosa pine	0.00	0.00	0.39	0.00	0.00	0.00
Riverine	21.71	0.00	230.21	0.48	0.00	0.57
Urban	434.11	0.00	1395.07	1036.68	110.61	219.03
Total	5.05	0.00	28.84	10.40	0.84	0.88

Note:

*Acreage values are approximate.

2 *Impact Bot-6 (CPI): Spread of Noxious and Invasive Weeds* Implementation
 3 of the project could result in the spread of noxious and invasive weeds as a
 4 result of ground-disturbing activities during construction and an increased
 5 number of vectors (means of dispersal). Therefore, this impact would be
 6 potentially significant.

7 Noxious and invasive weeds are abundant around Shasta Lake specifically in
 8 the relocation areas. Vectors that would increase as a result of project
 9 implementation include weed seed and seed parts brought in on tools, vehicles,
 10 and workers' clothing and boots. The extent of the risk would depend on the
 11 construction methods used and site-specific actions implemented to complete
 12 the project. As access into specific project areas is improved, road construction,
 13 temporary roads, and road maintenance would increase the number of vectors in
 14 an area. As traffic along new and existing corridors increases, the risk for weed
 15 dispersal would increase. Seed mixtures and mulches may be used during
 16 erosion control efforts and revegetation of areas. These mixtures and mulches
 17 are potential vectors for noxious weed and invasive plant dispersal.

18 Construction of the dam would result in inundation of shoreline habitat.
 19 Depending on the extent of colonization, many populations of noxious weeds
 20 could be inundated. However, there would be no increase in vector traffic and
 21 no soil disturbance due to inundation. Therefore, the risk of weed spread from
 22 the inundation of habitat is low.

23 However, vegetation removal in areas to be inundated may increase risk of
 24 weed spread. Habitat vulnerability and project-associated vectors in inundation
 25 zones would be variable, based on the extent of the vegetation removal and the
 26 location of the proposed activity. All habitats are vulnerable when canopies are
 27 opened and soil is disturbed. Increased traffic and soil disturbance coupled with
 28 an adjacent, high-ranking noxious weed may result in a moderate to high risk of
 29 weed spread.

30 Because of the dam expansion, other ground-disturbing projects would be
 31 implemented to relocate displaced roads, railways, utilities, homes, and

1 recreation facilities. The potential for disturbance of noxious weeds is highly
2 variable, based on the proposed activity and the abundance of weeds present.
3 Depending on the location of high-ranking noxious weeds, the extent of ground-
4 disturbing activities, and the amount of traffic entering a project site, the risk of
5 noxious weed infestation would vary.

6 This impact would be potentially significant. Mitigation for this impact is
7 proposed in Section 12.3.5.

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

9 *Impact Bot-7 (CP1): Altered Structure and Species Composition and Loss of*
10 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
11 *Altered Flow Regimes* Altered flow regimes associated with project
12 implementation under CP1 could alter the structure and species composition or
13 cause the loss of riparian, wetland, and oak communities, and of habitat for
14 special-status plant species. Vernal pool plant communities and associated
15 special-status species likely would not be affected. Effects on oak communities
16 and upland habitats for special-status plants may not all be adverse. Adverse
17 effects on riparian and wetland communities and associated special-status plants
18 could be substantial; thus, this impact would be significant.

19 Potential impacts on flow and stages of the upper Sacramento River from CP1
20 would be small. On average, in each month, changes in mean monthly flow
21 would be reductions or increases of several percent. Generally, these effects
22 diminish with distance downstream because of the influence of inflows from
23 tributaries and of diversions and flood bypasses.

24 In average and wet years, river flows would decrease during the November
25 through February period of some years. This would be because of the increased
26 storage space that could be filled in some years, usually following dry or critical
27 water years.

28 During March through May, changes in mean monthly flows would be small
29 reductions or increases (generally less than 2 percent) typically transitional
30 between small reductions in winter flows and small increases in summer flows.
31 During the June through August period of some years, flow and stage would
32 increase. This increase would be most pronounced during some dry years as
33 more water is released from Shasta Dam for water supply reliability purposes.
34 During March, September, and October, mean monthly flows would generally
35 be increased 1 to 6 percent.

36 Northern hardpan vernal pools and Northern volcanic mudflow vernal pools are
37 not present at Shasta Dam and are generally not present within the active
38 floodplain immediately adjacent to the channel of the upper Sacramento River
39 or its tributaries in the primary study area. Therefore, northern hardpan vernal
40 pools and associated special-status plant species would likely not be affected by
41 the altered flows in the primary study area downstream from Shasta Dam.

1 The altered flow regime of the upper Sacramento River associated with
2 implementation of CP1 could affect oak communities and upland habitat for
3 special-status plant species by prolonging inundation and changing the
4 availability of soil moisture. Prolonged inundation during the growing season
5 kills most upland plants. This effect would occur during years when mean
6 monthly stage during March – October is greater than in preceding years.
7 Interannual fluctuations in stage during the growing season already cause
8 upland vegetation to become removed from (or prevent its establishment within)
9 a zone along rivers downstream from Shasta Dam. CP1 could increase the
10 average elevation of this zone slightly (by, on average, increasing stage during
11 the growing season of most years), but it would not increase the zone's
12 elevational range. For some upland vegetation, greater summer flows in some
13 years also could increase summer soil moisture, and reduced intermediate and
14 large flows during winter in some years could reduce spring soil moisture.
15 Because of the important influence of water availability on plant growth and
16 survival, these changes in the availability of moisture could change the structure
17 and species composition of oak communities or affect special-status plants of
18 upland habitats.

19 These effects, however, are speculative, and may not all prove to be adverse
20 with project implementation and operation. For example, greater summer flows
21 in some years could increase summer soil moisture; in dry years, increased soil
22 moisture could sustain plants that otherwise would be damaged or die.
23 Therefore, the impact on oak communities and on upland habitat for special-
24 status plants resulting from altered flow regimes on the upper Sacramento River
25 within the primary study area would be less than significant.

26 The flow regime of a river or stream strongly influences the structure and
27 species composition of the riparian and wetland communities associated with it.
28 For this reason, the altered flow regimes resulting from project implementation
29 would affect riparian and wetland vegetation. These effects are described below.

30 River flows strongly affect the growth and survival of riparian plants. Riparian
31 plants are strongly affected by the timing and duration of inundation; abrasion
32 and burial by water-borne sediment; and by water table fluctuations (Toner and
33 Keddy 1997; Friedman and Auble 1999; Karrenberg, Edwards, and Kollmann
34 2002; Bagstad, Stromberg, and Lite 2005; Lite and Stromberg 2005; Williams
35 and Cooper 2005). As a result, riparian communities often differ in structure
36 and species composition along gradients of elevation or flooding frequency and
37 intensity (Conard, MacDonald, and Holland 1977; Harris 1987; Toner and
38 Keddy 1997; Bagstad, Stromberg, and Lite 2005; Vaghti and Greco 2007).

39 River flows not only affect the survival and growth of established riparian
40 vegetation, but also create sites for establishment of early-successional
41 vegetation. The geomorphic processes of channel meander migration, avulsion,
42 and deposition of sediment on floodplains, which result primarily from
43 intermediate and large flows, bury and uproot herbaceous vegetation and uproot

1 or undercut trees and shrubs. These disturbances also create opportunities for
2 early-successional vegetation to establish, including willow and cottonwood
3 seedlings that grow to form willow scrub and Great Valley cottonwood riparian
4 forest.

5 Early successional riparian communities change rapidly in structure and species
6 composition (Tu 2000, Fremier 2003, Vaghti and Greco 2007). Over several
7 decades, early-successional vegetation develops into mid- and late-successional
8 vegetation with less willow and cottonwood and a greater abundance of other
9 trees, including box-elder, Oregon ash, black walnut, and valley oak (e.g., Great
10 Valley mixed riparian forest) (Fremier 2003).

11 Thus, for riparian vegetation, the rates of geomorphic processes strongly affect
12 the extent of different riparian communities; and, these rates are strongly related
13 to flow regime. For example, bank erosion, and the average rate of meander
14 migration are closely related to the cumulative portion of flow above a threshold
15 volume. On portions of the Sacramento River, this threshold may be around
16 30,000 cfs (Larsen, Fremier, and Greco 2006; Stillwater Sciences 2007), which
17 is well below the bankfull discharge but well above flows during spring and
18 summer. However, other important thresholds for bank erosion and channel
19 avulsion along the Sacramento River have been estimated within the range from
20 10,000 to 80,000 cfs (Stillwater Sciences 2007). (For additional discussion of
21 the relationship of geomorphic processes to flow along the Sacramento River,
22 see the *Fisheries and Aquatic Ecosystem Technical Report*.)

23 Flow regimes during the period of seed dispersal also strongly influence
24 establishment of seedlings of riparian trees and shrubs, particularly willows and
25 cottonwoods. In general, seeds of riparian plants can only successfully
26 germinate and establish on exposed surfaces; prolonged inundation of a surface
27 during the growing season prevents establishment. Willows and cottonwoods
28 have very small, short-lived seed and are shade-intolerant plants; thus, their
29 seeds must disperse to exposed, moist surfaces that are largely free of
30 vegetation. Such surfaces are often created by channel migration, avulsion, and
31 sediment deposition during larger winter and spring flows. They are then
32 exposed by declining flows during the seed dispersal period of willow and
33 cottonwood species. These seed dispersal periods are staggered across spring
34 and summer; for example, March through April for arroyo willow, April–June
35 for cottonwood, and May through August for black willow. Once willow and
36 cottonwood seeds germinate, slowly declining flows are necessary to maintain
37 their roots in contact with saturated soils, which in turn is necessary for
38 establishment. Rapidly declining flows (i.e., those greater than 1 to 1.5 inches
39 per day) result in desiccation and mortality of seedlings (Mahoney and Rood
40 1998, Stillwater Sciences 2007). Conversely, flows that increase during the
41 growing season kill many seedlings (e.g., by burial, uprooting, or scouring).

42 Consequently, reductions in the magnitude, duration, and frequency of
43 intermediate and large flows could reduce opportunities for cottonwood and

1 willow species to establish and thus limit the extent of early and mid-
2 successional riparian communities. The absence of slowly declining spring
3 flows also would reduce cottonwood establishment.

4 The operation of Shasta Dam has limited the frequency, magnitude, and
5 duration of intermediate and larger flows during fall and winter, since the dam's
6 construction, and flow volumes have been greater during the growing season.
7 The operation of Shasta Dam also produces increasing flow volumes during the
8 period of cottonwood seed dispersal (rather than flow volume decreasing during
9 this period), largely precluding establishment of cottonwoods (and to a lesser
10 extent willows) throughout much of the riparian zone (Roberts et al. 2002). The
11 combined effect of these changes in flow regime has been a decrease in early-
12 and mid-successional communities along the Sacramento River that is still
13 ongoing (Fremier 2003).

14 CP1 would lead to a further reduction in the magnitude, duration, and frequency
15 of intermediate and large flows, but it would not alter the general annual pattern
16 of flows increasing during the cottonwood seed dispersal period. However,
17 CP1's effects on larger flows could further reduce the frequency or extent of
18 suitable conditions for cottonwoods to establish from seed. Overall, the project
19 would increase the existing, ongoing impacts on riparian vegetation resulting
20 from the operation of Shasta Dam. This could reduce the area of riparian
21 vegetation slightly, and reduce the proportion of riparian vegetation that is in
22 early- and mid-successional stages (e.g., willow- and cottonwood-dominated
23 communities) while increasing the extent of mid-successional communities
24 (e.g., mixed riparian forest). This would be an exacerbation of an ongoing
25 transition (which is described under Impact Bot-7 (No-Action)). These effects
26 would not substantially alter the establishment and spread of invasive plant
27 species. There would, however, be some reduction in the magnitude, duration,
28 and frequency of overbank flows that facilitate the dispersal and establishment
29 of invasive plants, and some reduction in the amount of early successional
30 vegetation that provides suitable habitat for many invasive plant species.

31 These effects would likely occur along the upper Sacramento River throughout
32 the primary study area. Reductions in the magnitude of intermediate and large
33 flows would likely be sufficient to alter the dynamics and structure of the
34 riparian corridor along the upper Sacramento River, downstream from Shasta
35 Dam, throughout the primary study area. These effects on flows greater than
36 30,000 cfs downstream from Keswick Dam, RBPP, and Hamilton City are
37 shown on Figure 12-4. As described previously, flows of this magnitude
38 strongly affect bank erosion and meander migration, and are related to other
39 geomorphic processes affecting the extent of different riparian communities. In
40 the primary study area, there would be a small reduction in the number of mean
41 daily flows greater than 30,000 cfs. Downstream of Keswick and the RBPP the
42 number of days with mean flows greater than 30,000 cfs would be reduced by
43 approximately 9 and 2 percent, respectively.

1 Although the establishment of most wetland plants is less strongly influenced
2 by specific attributes of the flow regime than willows and cottonwoods, flow
3 regime still plays an important role in wetland communities. In general, wetland
4 communities on floodplains are strongly influenced by timing and duration of
5 inundation, scour and deposition of sediment, and fluctuations in water table
6 elevations within and among years (Keddy 2000; Leyer 2005; van Eck et al.
7 2006). Changes in flow during some years would change the extent of some
8 wetland communities (e.g., seeps, seasonal wetlands) during that year and/or
9 subsequent years, and thus the average extent of those communities. Overall,
10 wetland communities could experience effects similar to those described for
11 riparian communities.

12 For the reasons outlined above, and because riparian and wetland communities
13 are sensitive natural communities, this impact would be significant.

14 Ten special-status plant species could occur in riparian or wetland habitats in
15 the primary study area (including mesic upland-associated species; Table 12-4).
16 Of these, within the primary study area and nearby counties (Butte and Glenn),
17 three are known to occur along the edge of the Sacramento River channel, or
18 along a Sacramento River tributary within 0.2 mile of the river proper, and their
19 establishment and reproduction could potentially be affected by changes in flow
20 regime: silky cryptantha (CRPR 1B), rose mallow (CRPR 2), and Ahart's
21 paronychia (CRPR 1B) (CNDDDB 2007; University of California 2011). Because
22 altered flow regimes associated with the project could modify habitat for these
23 special-status species, this impact would be significant.

24 Mitigation for this impact is proposed in Section 12.3.5.

25 *Impact Bot-8 (CP1): Conflict with Approved Local or Regional Plans with*
26 *Objectives of Riparian Habitat Protection or Watershed Management*

27 Numerous local and regional plans promote the conservation of riparian
28 vegetation and associated habitats along the upper Sacramento River. Because
29 CP1 would adversely affect riparian communities, this alternative could conflict
30 with existing local and regional plans focused on preserving riparian habitats.
31 Therefore, this impact would be potentially significant.

32 Local and regional plans addressing riparian habitats in the primary study area
33 are discussed in more detail in the "Regulatory Setting" section of this DEIS
34 and include the RHJV and the Sacramento River Conservation Area Program,
35 both of which promote the conservation and the restoration of riparian habitat.
36 As described for Impact Bot-7 (CP1), implementation of this alternative could
37 cause substantial adverse effects on riparian and wetland communities by
38 altering the flow regime of the upper Sacramento River and could, therefore,
39 conflict with existing local and regional plans that aim to conserve riparian
40 habitats. Therefore, this impact would be potentially significant. Mitigation for
41 this impact is proposed in Section 12.3.5.

1 *Impact Bot-9 (CP1): Disturbance or Removal of Designated Critical Habitat*
2 *for Special-Status Species* Designated critical habitat for four vernal pool
3 special-status plant species exists within the primary study area. However, such
4 critical habitat is not expected to be adversely affected by CP1. This impact
5 would be less than significant.

6 Critical habitat for four special-status species – slender orcutt grass, Hoover’s
7 spurge, hairy orcutt grass, and Greene’s tuctoria – exists within the primary
8 study area. Critical habitat for these species in the primary study areas is
9 confined to vernal pool communities (USFWS 2006). Vernal pools are
10 generally not present within the active floodplain. However, if vernal pool
11 habitats for these special-status species are present in the active floodplain of
12 the upper Sacramento River, they could be affected by the small reduction in the
13 frequency and magnitude of overbank flows. It is not known if this would be an
14 adverse or beneficial effect. Because this effect of CP1 is somewhat speculative
15 and not necessarily adverse, this impact would be less than significant.
16 Mitigation for this impact is not needed, and thus not proposed.

17 *Impact Bot-10 (CP1): Loss of Sensitive Plant Communities and Special-Status*
18 *Plant Species Resulting from Induced Growth* Implementing CP1 could
19 increase water yield for water districts in the primary study area along the upper
20 Sacramento River. This increase in water yield could reduce a limitation on
21 urban growth and development that could affect sensitive plant communities
22 and special-status plant species. However, this increase in water yield for
23 growth that could affect these resources would be small, and in the future the
24 effects of this growth would be analyzed and mitigated during land use planning
25 and environmental review for specific projects. For these reasons, this impact
26 would be less than significant.

27 Along the upper Sacramento River, the CVP and SWP service areas contain
28 wetland, riparian, oak, and other sensitive plant communities, and a large
29 number of special-status plant species (Attachment 4). Increased water supplies
30 or increased supply reliability could reduce a limitation on urban growth and
31 development or on other activities that could affect sensitive plant communities
32 or special-status plants in the primary and extended study areas.

33 The expected increase in water yield relative to the entire CVP and SWP service
34 areas would be small (i.e., less than 1 percent), however, and this new yield
35 would be provided to a number of geographic areas within the CVP and SWP
36 service areas. Also, a substantial portion of this water would substitute for
37 groundwater pumping, allow for changes in crop type or agricultural irrigation
38 practices, or return idle cropland to production. Consequently, this alternative’s
39 effect on growth that could affect vegetation would be minor.

40 Furthermore, the effects of this growth would be analyzed in general plan
41 Environmental Impact Reports and in project-level CEQA compliance
42 documents for the local jurisdictions in which the growth would occur.

1 Mitigation of these effects would be the responsibility of these local
2 jurisdictions, and not of Reclamation. Similarly, projects potentially affecting
3 riparian and wetland habitats and listed species would require permits from
4 CDFW, USACE, and USFWS; it is anticipated that effects on these resources
5 would be avoided, minimized, and/or mitigated during those agency
6 consultations.

7 The extent of induced growth that could affect botanical resources and wetlands
8 would likely be minor, and in the future the effects of this growth would be
9 analyzed and mitigated during land use planning and environmental review for
10 specific projects. Therefore, this impact would be less than significant.
11 Mitigation for this impact is not needed, and thus not proposed.

12 *Impact Bot-11 (CP1): Loss of Sensitive Natural Communities or Habitats*
13 *Resulting from Implementing the Gravel Augmentation Program or Restoring*
14 *Riparian, Floodplain, and Side Channel Habitats* The proposed gravel
15 augmentation program and riparian, floodplain, and side channel restoration
16 activities would not be implemented under CP1. Therefore, no impact would
17 occur. Mitigation for this impact is not needed, and thus not proposed.

18 *Impact Bot-12 (CP1): Loss of Special-Status Plants Resulting from*
19 *Implementing the Gravel Augmentation Program or Restoring Riparian,*
20 *Floodplain, and Side Channel Habitats* The proposed gravel augmentation
21 program and riparian, floodplain, and side channel restoration activities would
22 not be implemented under CP1. Therefore, no impact would occur. Mitigation
23 for this impact is not needed, and thus not proposed.

24 *Impact Bot-13 (CP1): Spread of Noxious and Invasive Weeds Resulting from*
25 *Implementing the Gravel Augmentation Program or Restoring Riparian,*
26 *Floodplain, and Side Channel Habitats* The proposed gravel augmentation
27 program and riparian, floodplain, and side channel restoration activities would
28 not be implemented under CP1. Therefore, no impact would occur. Mitigation
29 for this impact is not needed, and thus not proposed.

30 **Lower Sacramento River and Delta**

31 *Impact Bot-14 (CP1): Altered Structure and Species Composition and Loss of*
32 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
33 *Altered Flow Regimes on the Lower Sacramento River* Altered flow regimes
34 associated with project implementation under CP1 could alter the structure and
35 species composition or cause the loss of riparian, wetland, and oak
36 communities, and loss of habitat for special-status plant species. Vernal pool
37 plant communities and associated special-status plant species likely would not
38 be affected. Effects on oak communities and upland habitats for special-status
39 plants may not all be adverse. Adverse effects on riparian and wetland
40 communities and associated special-status plants could be substantial on the
41 lower Sacramento River, but these effects are unlikely to extend to the Delta;

1 thus, this impact would be significant on the lower Sacramento River, and less
2 than significant in the Delta.

3 This impact would be similar to Impact Bot-7 (CP1) for the upper Sacramento
4 River, but alteration of the Sacramento River's flow regime would be attenuated
5 in the lower river by the effects of inflows from tributaries and of diversions and
6 flood bypasses. Measurable effects on riparian and wetland plant communities
7 are unlikely to extend as far downstream as the Delta, in part because releases
8 from Shasta Dam account for a smaller fraction of total flow with increasing
9 distance downstream as tributaries cumulatively add to the Sacramento River's
10 flow.

11 Nonetheless, significant impacts on riparian and wetland communities, and
12 associated special-status plants, would be caused on the lower Sacramento
13 River, particularly near the upper Sacramento River. South of RBPP, the portion
14 of the Sacramento River's total annual flow that is accounted for by flows
15 greater than 30,000 cfs would still be reduced, and also the frequency of flows
16 greater than 60,000 to 80,000 cfs (i.e., roughly the size of the current 1.5- to 2-
17 year events) would be reduced. , Changes in the number days with mean daily
18 flows greater than 30,000 cfs downstream from RBPP and Hamilton City are
19 summarized on Figure 12-4. (These two locations are shown on Figure 12-5.)
20 As described for Impact Bot-7 (CP1) (and in the *Fisheries and Aquatic*
21 *Ecosystem Technical Report*), flows above about 30,000 cfs and 1.5- to 2-year
22 events cause substantial changes in riparian ecosystems. These changes indicate
23 that although they would be small, the alterations to the lower Sacramento
24 River's flow regime could be sufficient to cause significant impacts in the Red
25 Bluff-to-Chico Landing reach. This reach is immediately downstream from the
26 primary study area but upstream from the flood bypasses and the Feather and
27 American rivers, which substantially attenuate the effects of flows released
28 from Shasta Dam. This reach is mostly unleveed and has few other constraints
29 to channel movement, river meander, and flooding; consequently, it has an
30 extensive acreage of early-, mid-, and late-successional riparian communities
31 (Resources Agency 2003).

32 Effects are unlikely to extend to the Delta because the flood bypasses and the
33 Feather and American rivers attenuate the effects of flows released from Shasta
34 Dam. In addition, much of the Sacramento River's length south of Colusa, and
35 almost all Delta sloughs, are leveed (often close to the channel) with extensive
36 reinforcement of channel banks with revetment, restricting channel movement,
37 river meander and flooding. Further; the acreage of early-, mid-, and late-
38 successional riparian communities is much less extensive along the Sacramento
39 River south of Colusa and in the Delta.

40 Effects of flow alterations are also unlikely to extend to the Delta because the
41 Central Valley's reservoirs and diversions are managed as a single integrated
42 system (consisting of the CVP and SWP). The guidelines for this management,
43 which are described in the CVP Operations Criteria and Plan, have been

1 designed to maintain standards for Delta inflow. CVP and SWP operations must
2 be consistent with the Operations Criteria and Plan to allow coverage by the
3 Operations Criteria and Plan biological opinion. Thus, implementation of CP1 is
4 not anticipated to alter Sacramento River flows to the Delta sufficiently to alter
5 the dynamics or structure of vegetation in the Delta. Thus, impacts on the Delta
6 portion of the extended study area would be less than significant.

7 This impact would be significant along the lower Sacramento River and less
8 than significant in the Delta. Mitigation for this impact along the lower
9 Sacramento River is proposed in Section 12.3.5.

10 *Impact Bot-15 (CP1): Conflict with Approved Local or Regional Plans with*
11 *Objectives of Riparian Habitat Protection or Watershed Management along the*
12 *Lower Sacramento River* Adopted local and regional plans address and
13 promote the conservation of riparian vegetation and associated habitats along
14 the lower Sacramento River. Because CP1 would adversely affect riparian
15 communities, this alternative could conflict with existing local and regional
16 plans focused on preserving riparian habitats. Therefore, this impact would be
17 potentially significant.

18 Numerous local and regional plans address and promote the conservation of
19 riparian vegetation and associated habitats along the lower Sacramento River
20 and in the Delta. These plans, which are discussed in more detail in the
21 “Regulatory Framework” of this DEIS, include the Riparian Habitat Joint
22 Venture and the Sacramento River Conservation Area Program, both of which
23 promote the conservation and the restoration of riparian habitat. As described
24 for Impact Bot-14 (CP1), implementation of this alternative could cause
25 substantial adverse effects on riparian and wetland communities along a portion
26 of the lower Sacramento River by altering its flow regime, but such effects
27 would not occur in the Delta. Because the project has the potential to result in
28 substantial adverse effects on riparian communities, it could conflict with
29 existing local and regional plans. Therefore, on the lower Sacramento River,
30 this impact would be potentially significant. Mitigation for this impact is
31 proposed in Section 12.3.5.

32 *Impact Bot-16 (CP1): Loss of Sensitive Plant Communities and Special-Status*
33 *Plant Species Resulting from Induced Growth along the Lower Sacramento*
34 *River and in the Delta* Implementation of CP1 could increase water yield for
35 water districts in the extended study area along the lower Sacramento River.
36 This increase in water yield could reduce a limitation on urban growth and
37 development that could affect sensitive plant communities and special-status
38 plant species. However, this increase in water yield for growth that could affect
39 these resources would be small, and in the future the effects of this growth
40 would be analyzed and mitigated during land use planning and environmental
41 review for specific projects. For these reasons, this impact would be less than
42 significant.

1 This impact would be similar to Impact Bot-10 (CP1) for the upper Sacramento
2 River, but the increased water yield available along the lower Sacramento River
3 would differ from that along the upper Sacramento River. However, for the
4 same reasons as Impact Bot-10 (CP1), this impact would also be less than
5 significant. Mitigation for this impact is not needed, and thus not proposed.

6 **CVP/SWP Service Areas**

7 *Impact Bot-17 (CP1): Altered Structure and Species Composition and Loss of*
8 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
9 *Altered Flow Regimes in the CVP/SWP Service Areas* Altered flow regimes
10 associated with project implementation under CP1 could alter the structure and
11 species composition or cause the loss of sensitive plant communities and of
12 habitat for special-status plant species. However, alteration of flow regimes
13 below CVP and SWP reservoirs in the extended study area would be less than
14 below Shasta Dam along the upper and lower Sacramento River. These
15 alterations may not be sufficient to alter the extent of early successional riparian
16 and wetland communities or of associated habitat for special-status species.
17 Therefore, below CVP and SWP reservoirs in the extended study area, this
18 impact would be less than significant.

19 Because CVP and SWP reservoirs and diversions are managed as a single
20 integrated system, changing releases from Shasta Dam can result in offsetting
21 releases from other reservoirs (e.g., to meet Delta inflow standards). The effects
22 from CP1 on CVP and SWP reservoir elevations, filling, spilling, and planned
23 releases, and the resulting flows downstream from those reservoirs, would be
24 small and within the range of variability that commonly occurs in these
25 reservoirs and downstream. These alterations may not be sufficient to alter the
26 extent of early successional riparian and wetland communities or of associated
27 habitat for special-status species. Therefore, this impact would be less than
28 significant. Mitigation for this impact is not needed, and thus not proposed.

29 *Impact Bot-18 (CP1): Conflict with Approved Local or Regional Plans with*
30 *Objectives of Riparian Habitat Protection or Watershed Management in the*
31 *CVP/SWP Service Areas* Adopted local and regional plans address and
32 promote the conservation of riparian vegetation and associated habitats along
33 rivers below reservoirs in the CVP and SWP service areas. However,
34 implementing CP1 would not cause a significant impact on riparian vegetation
35 and habitats. Therefore, CP1 would not conflict with existing local and regional
36 plans focused on preserving riparian habitats. Thus, in the CVP and SWP
37 service areas, this impact would be less than significant.

38 Local and regional plans address and promote the conservation of riparian
39 vegetation and associated habitats in the CVP and SWP service areas. (These
40 plans are discussed in more detail in Section 12.2, "Regulatory Framework.")
41 However, as described for Impact Bot-17 (CP1), implementation of CP1 would
42 not cause significant impacts on riparian and wetland communities in the CVP
43 and SWP service areas. Therefore, CP1 would not conflict with existing local

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

3 *Impact Bot-19 (CP1): Loss of Sensitive Plant Communities and Special-Status*
4 *Plant Species Resulting from Induced Growth in the CVP/SWP Service Areas*
5 Implementation of CP1 could increase water yield for water districts in the CVP
6 and SWP service areas. This increase in water yield could reduce a limitation on
7 urban growth and development that could affect sensitive plant communities
8 and special-status plant species. However, this increase in water yield for
9 growth that could affect these resources would be small, and in the future the
10 effects of this growth would be analyzed and mitigated during land use planning
11 and environmental review for specific projects. For these reasons, this impact
12 would be less than significant.

13 This impact would be similar to Impact Bot-10 (CP1) for the upper Sacramento
14 River, but the increased water yield available in the CVP and SWP service areas
15 would differ from that along the upper Sacramento River. However, for the
16 same reasons as Impact Bot-10 (CP1), this impact would be less than
17 significant. Mitigation for this impact is not needed, and thus not proposed.

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

20 As with CP1, CP2 focuses on increasing water supply reliability and increasing
21 anadromous fish survival. CP2 primarily consists of raising Shasta Dam by 12.5
22 feet, which, in combination with spillway modifications, would increase the
23 height of the reservoir's full pool by 14.5 feet and enlarge the total storage
24 capacity in the reservoir by 443,000 acre-feet. The existing TCD would also be
25 extended to achieve efficient use of the expanded cold-water pool. Shasta Dam
26 operational guidelines would continue essentially unchanged, except during dry
27 years and critical years, when 120 TAF and 60 TAF, respectively, of the
28 increased storage capacity in Shasta Reservoir would be reserved to specifically
29 focus on increasing M&I deliveries. CP2 would help reduce future water
30 shortages through increasing drought year and average year water supply
31 reliability for agricultural and M&I deliveries. In addition, the increased depth
32 and volume of the cold-water pool in Shasta Reservoir would contribute to
33 improving seasonal water temperatures for anadromous fish in the upper
34 Sacramento River.

35 **Shasta Lake and Vicinity**

36 *Impact Bot-1 (CP2): Loss of Federally or State-Listed Plant Species* Habitat
37 for Federally or State-listed plant species does not occur at Shasta Lake or in the
38 vicinity. No species are known or expected to occur. Therefore, no impact
39 would occur. Mitigation for this impact is not needed, and thus not proposed.

40 *Impact Bot-2 (CP2): Loss of MSCS Covered Species* Implementation of the
41 project would result in the loss of MSCS covered species because of inundation,
42 vegetation removal, or construction activities. Therefore, this impact would be

1 significant. Impacts related to dam construction and vegetation clearing within
2 the relocation areas would be similar to but greater than CP1. However,
3 inundation caused by a 12.5-foot raise of Shasta Dam could result in the loss of
4 more individual plants. Inundation caused by a 12.5-foot dam raise could affect
5 all or portions of ten of the known Shasta snow-wreath populations found along
6 the McCloud River and Pit arms and the Main Body of the lake. Additionally, a
7 portion of one Shasta snow-wreath population occurs within the relocation area
8 at Ellery Creek and activities to decommission the campground could affect
9 portions of that population. Collectively, 11 of the 23 known (48 percent)
10 Shasta snow-wreath populations could be affected by a 12.5-foot dam raise.

11 Additional analysis of impacts will be conducted in relation to suitable habitats
12 in the Shasta Lake watershed. An analysis of indirect impacts and temporary
13 impacts will be provided in the Final EIS. Potential mitigation lands containing
14 comparable habitat have been identified adjacent to the project. Additional
15 discussion of how these lands may be applied as mitigation and at what ratios
16 will be provided in the Final EIS.

17 The impact would be significant. Mitigation for this impact is proposed in
18 Section 12.3.5.

19 *Impact Bot-3 (CP2): Loss of USFS Sensitive, BLM Sensitive, or CRPR Species*
20 Implementation of the project would result in the loss of USFS sensitive, BLM
21 sensitive, or CRPR species as a result of inundation, vegetation removal, or
22 construction activities. Therefore, this impact would be potentially significant.

23 Impacts related to dam construction and vegetation clearing within the
24 relocation areas would be similar to but greater than CP1. However, inundation
25 caused by a 12.5-foot raise of Shasta Dam could result in the loss of more
26 individual plants and their suitable habitat.

27 Additional analysis of impacts will be conducted in relation to suitable habitats
28 in the Shasta Lake watershed. An analysis of indirect impacts and temporary
29 impacts will be provided in the Final EIS. Potential mitigation lands containing
30 comparable habitat have been identified adjacent to the project. Additional
31 discussion of how these lands may be applied as mitigation and at what ratios
32 will be provided in the Final EIS.

33 Therefore, this impact would be potentially significant. Mitigation for this
34 impact is proposed in Section 12.3.5.

35 *Impact Bot-4 (CP2): Loss of Jurisdictional Waters* Implementation of the
36 project will result in the loss of jurisdictional waters caused by flooding the
37 impoundment area and discharge of fill associated with the relocation of
38 facilities and dam construction. Flooding caused by implementation of the
39 project would result in the conversion of jurisdictional water types (e.g.,

1 wetlands and streams to lacustrine habitat). Therefore, this impact would be
2 significant.

3 Direct impacts would incur by conversion of jurisdictional waters (e.g.,
4 wetlands and streams) to lacustrine habitat with implementation of CP2. All
5 features within the impoundment area would be converted to lacustrine habitat.
6 Under CP2, approximately 19 acres of wetlands and 26 acres of other waters
7 would be converted to lacustrine habitat (Table 12-14). This will result in a net
8 loss of approximately 19 acres of wetlands and loss of approximately 26 acres
9 of riverine waters by conversion to lacustrine waters.

10 **Table 12-14. Impacts to Jurisdictional Waters (Acres*) in the Impoundment Area (12.5-**
11 **Foot Dam Raise)**

Jurisdictional Water Type	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Wetlands						
Fresh emergent/riparian wetland	0.00	0.00	5.29	0.00	0.00	0.00
Intermittent swale	0.00	0.001	0.00	0.00	0.00	0.02
Riparian wetland	0.70	0.66	5.33	2.83	0.67	0.62
Seasonal wetland	0.00	0.00	0.18	0.00	0.08	0.02
Seep/spring wetland	0.58	0.17	0.60	0.21	0.10	0.37
Vegetated ditch	0.08	0.00	0	0.01	0.00	0.00
Total Wetlands	1.36	0.84	11.4	3.05	0.85	1.03
Other Waters of the United States						
Ephemeral stream	0.19	0.01	0.41	0.19	0.09	0.08
Intermittent stream	1.00	0.15	1.57	0.59	0.61	1.75
Perennial stream	1.16	1.32	7.42	7.55	1.57	0.88
Roadside ditch	0.00	0.00	0.01	0.00	0.00	0.00
Seep/spring other waters	0.02	0.00	0.001	0.01	0.00	0.00
Total Other Waters	2.37	1.48	9.41	8.34	2.18	2.71
Total Waters of the U.S.	3.73	2.32	20.81	11.39	3.03	3.74

Note:

*Acreage values are approximate.

1 Direct impacts on wetlands and other waters that will be filled as a result of
2 relocation of facilities or dam construction will be determined. Additionally,
3 some fill may be placed in the existing full pool of Shasta Lake for restoration
4 and enhancement activities. Preliminary impacts to jurisdictional waters based
5 on the assumption of 100 percent loss of features occurring in the relocation
6 areas would be similar to but greater than those under CP1. A complete analysis
7 of impacts on jurisdictional waters in the full pool and the relocation areas as
8 well as indirect and temporary impacts will be provided in the Final EIS.

9 The impact would be significant. Mitigation for this impact is proposed in
10 Section 12.3.5.

11 *Impact Bot-5 (CP2): Loss of General Vegetation Habitats* Implementation of
12 the project would result in a loss of general vegetation habitats because of
13 inundation, vegetation removal, or construction activities. Therefore, this impact
14 would be potentially significant.

15 Under CP2, a total of 1,715 acres of general vegetation habitats will be directly
16 impacted by the inundation of the impoundment area (Table 12-15).

17 **Table 12-15. Impacts to CWHR Habitats (Acres*) in the Impoundment Area (12.5-Foot**
18 **Dam Raise)**

Habitat	Area (Acres*)					
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Annual grassland	0.36	0.00	1.53	0.53	0.00	0.00
Barren	1.40	0.00	5.58	1.86	0.00	2.56
Blue oak – foothill pine	7.05	0.00	0.00	0.00	2.46	5.27
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	1.65
Closed-cone pine – cypress	24.40	0.00	8.95	14.96	32.72	262.31
Douglas-fir	0.00	0.00	0.00	0.06	0.00	0.00
Mixed chaparral	20.58	9.56	112.76	11.02	7.35	40.11
Montane hardwood	53.30	25.75	120.48	48.59	13.31	1.77
Montane hardwood – conifer	48.77	0.70	99.06	94.36	78.41	7.73

1 **Table 12-15. Impacts to CWHR Habitats (Acres*) in the Impoundment Area (12.5-Foot**
2 **Dam Raise) (contd.)**

Habitat	Area (Acres*)					
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Montane riparian	2.72	3.23	20.57	6.12	1.00	1.19
Ponderosa pine	152.04	21.54	123.71	114.71	35.08	40.92
Riverine	0.00	0.42	4.02	4.51	0.84	0.00
Urban	16.65	0.00	1.63	6.42	0.00	1.24
Total	327.28	61.20	498.30	303.14	171.18	364.75

Note:

*Acreage values are approximate.

3 Additional analysis of impacts will be conducted in relation to suitable habitats
4 in the Shasta Lake watershed. An analysis of indirect impacts and temporary
5 impacts will be provided in the Final EIS. Potential mitigation lands containing
6 comparable habitat have been identified adjacent to the project. Additional
7 discussion of how these lands may be applied as mitigation and at what ratios
8 will be provided in the Final EIS.

9 The impact would be potentially significant. Mitigation for this impact is
10 proposed in Section 12.3.5.

11 *Impact Bot-6 (CP2): Spread of Noxious and Invasive Weeds* Implementation
12 of the project could result in the spread of noxious and invasive weeds as a
13 result of ground-disturbing activities during construction and an increased
14 number of vectors (means of dispersal). Therefore, this impact would be
15 potentially significant.

16 Impacts resulting from the spread of noxious weeds under CP2 are anticipated
17 to be similar to, but greater than, those described for CP1. This impact would be
18 potentially significant. Mitigation for this impact is proposed in Section 12.3.5.

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

20 *Impact Bot-7 (CP2): Altered Structure and Species Composition and Loss of*
21 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
22 *Altered Flow Regimes* Altered flow regimes associated with project
23 implementation under CP2 could alter the structure and species composition or
24 cause the loss of riparian, wetland, and oak communities, and of habitat for
25 special-status plant species. Vernal pool plant communities and associated
26 special-status species likely would not be affected. Effects on oak communities

1 and upland habitats for special-status plants may not all be adverse. For
2 example, greater summer flows in some years could increase summer soil
3 moisture, especially during some dry and critical years as more water is released
4 from Shasta Dam for water supply reliability purposes. (Shasta Dam operations
5 historically have increased flow volumes from mid-spring to early summer.)
6 This increased soil moisture in dry years could reduce losses of upland
7 vegetation during drought years. Adverse effects on riparian and wetland
8 communities and associated special-status plants could be substantial; thus, this
9 impact would be significant.

10 This impact would be similar to Impact Bot-7 (CP1). The extent of the impact
11 under CP2 would be greater than that under CP1 and CP4, but less than that
12 under CP3 and CP5, which would entail more substantial alterations of flow
13 regimes. (The relative magnitude of changes to larger flows (which are most
14 important for riparian and wetland vegetation) simulated for each alternative
15 below Keswick Dam and RBPP are summarized on Figure 12-4.) This impact
16 would be significant. Mitigation for this impact is proposed in Section 12.3.5.

17 *Impact Bot-8 (CP2): Conflict with Approved Local or Regional Plans with*
18 *Objectives of Riparian Habitat Protection or Watershed Management*
19 Numerous local and regional plans promote the conservation of riparian
20 vegetation and associated habitats along the upper Sacramento River. Because
21 CP2 would adversely affect riparian communities, this alternative could conflict
22 with existing local and regional plans focused on preserving riparian habitats.
23 Therefore, this impact would be potentially significant.

24 This impact would be the same as Impact Bot-8 (CP1), and would be potentially
25 significant. Mitigation for this impact is proposed in Section 12.3.5.

26 *Impact Bot-9 (CP2): Disturbance or Removal of Designated Critical Habitat*
27 *for Special-Status Species* Designated critical habitat for four vernal pool
28 special-status plant species exists within the primary study area. However,
29 critical habitat for vernal pool species is not expected to be adversely affected
30 by CP2 because vernal pools are generally not present within the active
31 floodplain. For this reason, this impact would be less than significant.

32 This impact would be similar to Impact Bot-9 (CP1). The extent of the impact
33 under CP2 would be greater than that under CP1 and CP4, but less than that
34 under CP3 and CP5, which would entail greater alterations of flow regimes. For
35 the same reasons as Impact Bot-9 (CP1), this impact would be less than
36 significant. Mitigation for this impact is not needed, and thus not proposed.

37 *Impact Bot-10 (CP2): Loss of Sensitive Plant Communities and Special-Status*
38 *Plant Species Resulting from Induced Growth* Implementation of CP2 could
39 increase water yield for water districts in the primary study area along the upper
40 Sacramento River. This increase in water yield could reduce a limitation on
41 urban growth and development that could affect sensitive plant communities

1 and special-status plant species. However, this increase in water yield for
2 growth that could affect these resources would be small, and in the future the
3 effects of this growth would be analyzed and mitigated during land use planning
4 and environmental review for specific projects. For these reasons, this impact
5 would be less than significant.

6 This impact would be similar to Impact Bot-10 (CP1). The extent of the impact
7 under CP2 would be greater than that under CP1 and CP 4, but less than that
8 under CP3 and CP5, which would result in a greater increase in water yield.
9 This impact would be less than significant. Mitigation for this impact is not
10 needed, and thus not proposed.

11 *Impact Bot-11 (CP2): Loss of Sensitive Natural Communities or Habitats*
12 *Resulting from Implementing the Gravel Augmentation Program or Restoring*
13 *Riparian, Floodplain, and Side Channel Habitats* The proposed gravel
14 augmentation program and riparian, floodplain, and side channel restoration
15 activities would not be implemented under CP2. Therefore, no impact would
16 occur. Mitigation for this impact is not needed, and thus not proposed.

17 *Impact Bot-12 (CP2): Loss of Special-Status Plants Resulting from*
18 *Implementing the Gravel Augmentation Program or Restoring Riparian,*
19 *Floodplain, and Side Channel Habitats* The proposed gravel augmentation
20 program and riparian, floodplain, and side channel restoration activities would
21 not be implemented under CP2. Therefore, no impact would occur. Mitigation
22 for this impact is not needed, and thus not proposed.

23 *Impact Bot-13 (CP2): Spread of Noxious and Invasive Weeds Resulting from*
24 *Implementing the Gravel Augmentation Program or Restoring Riparian,*
25 *Floodplain, and Side Channel Habitats* The proposed gravel augmentation
26 program and riparian, floodplain, and side channel restoration activities would
27 not be implemented under CP2. Therefore, no impact would occur. Mitigation
28 for this impact is not needed, and thus not proposed.

29 **Lower Sacramento River and Delta**

30 *Impact Bot-14 (CP2): Altered Structure and Species Composition and Loss of*
31 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
32 *Altered Flow Regimes on the Lower Sacramento River* Altered flow regimes
33 associated with project implementation under CP2 could alter the structure and
34 species composition or cause the loss of riparian, wetland, and oak
35 communities, and of habitat for special-status plant species. Vernal pool plant
36 communities and associated special-status plant species likely would not be
37 affected. Effects on oak communities and upland habitats for special-status
38 plants may not all be adverse. Adverse effects on riparian and wetland
39 communities and associated special-status plants could be substantial on the
40 lower Sacramento River, but these effects are unlikely to extend to the Delta;
41 thus, for riparian and wetland communities and special-status plants, this impact

1 would be significant on the lower Sacramento River, and less than significant in
2 the Delta.

3 This impact would be similar to Impact Bot-14 (CP1). The extent of the impact
4 under CP2 would be greater than that under CP1 and CP4, but less than that
5 under CP3 and CP5, which would entail more substantial alterations of flow
6 regimes. (The relative magnitude of changes to larger flows (which are most
7 important for riparian and wetland vegetation) simulated for each alternative
8 below RBPP and Hamilton City are summarized on Figure 12-4.) Therefore, for
9 riparian and wetland plant communities and associated special-status plant
10 species on the lower Sacramento River, the impact would be significant, but in
11 the Delta, the impact would be less than significant. Mitigation for this impact is
12 proposed in Section 12.3.5.

13 *Impact Bot-15 (CP2): Conflict with Approved Local or Regional Plans with*
14 *Objectives of Riparian Habitat Protection or Watershed Management along the*
15 *Lower Sacramento River* Adopted local and regional plans address and
16 promote the conservation of riparian vegetation and associated habitats along
17 the lower Sacramento River. Because CP2 would adversely affect riparian
18 communities, this alternative could conflict with existing local and regional
19 plans focused on preserving riparian habitats. Therefore, this impact would be
20 potentially significant.

21 This impact would be the same as Impact Bot-15 (CP1) and would be
22 potentially significant. Mitigation for this impact is proposed in Section 12.3.5.

23 *Impact Bot-16 (CP2): Loss of Sensitive Plant Communities and Special-Status*
24 *Plant Species Resulting from Induced Growth along the Lower Sacramento*
25 *River and in the Delta* Implementation of CP2 could increase water yield for
26 water districts in the extended study area along the lower Sacramento River.
27 This increase in water yield could reduce a limitation on urban growth and
28 development that could affect sensitive plant communities and special-status
29 plant species. However, this increase in water yield for growth that could affect
30 these resources would be small, and in the future the effects of this growth
31 would be analyzed and mitigated during land use planning and environmental
32 review for specific projects. For these reasons, this impact would be less than
33 significant.

34 This impact would be similar to Impact Bot-16 (CP1). The extent of the impact
35 under CP2 would be greater than that under CP1 and CP4 but less than that
36 under CP3 and CP5, which would result in greater increases in water yield. This
37 impact would be less than significant. Mitigation for this impact is not needed,
38 and thus not proposed.

39 **CVP/SWP Service Areas**

40 *Impact Bot-17 (CP2): Altered Structure and Species Composition and Loss of*
41 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*

1 *Altered Flow Regimes in the CVP/SWP Service Areas* Altered flow regimes
2 associated with project implementation under CP2 could alter the structure and
3 species composition or cause the loss of sensitive plant communities and of
4 habitat for special-status plant species. However, alteration of flow regimes
5 below CVP and SWP reservoirs in the extended study area would be less than
6 below Shasta Dam along the upper and lower Sacramento River. These
7 alterations may not be sufficient to affect the extent of early-successional
8 riparian and wetland communities or of associated habitats for special-status
9 plant species. Therefore, below CVP and SWP reservoirs in the extended study
10 area, this impact would be less than significant.

11 This impact would be similar to Impact Bot-17 (CP1). The extent of the impact
12 under CP2 would be greater than that under CP1 and CP4, but less than that
13 under CP3 and CP5, which would entail more substantial alterations of flow
14 regimes. Nonetheless, for the same reasons as Impact Bot-17 (CP1), this impact
15 would be less than significant. Mitigation for this impact is not needed, and thus
16 not proposed.

17 *Impact Bot-18 (CP2): Conflict with Approved Local or Regional Plans with*
18 *Objectives of Riparian Habitat Protection or Watershed Management in the*
19 *CVP/SWP Service Areas* Adopted local and regional plans address and
20 promote the conservation of riparian vegetation and associated habitats along
21 rivers below reservoirs in the CVP and SWP service areas. However,
22 implementation of CP2 would not cause a significant impact on riparian
23 vegetation and habitats. Therefore, CP2 would not conflict with existing local
24 and regional plans focused on preserving riparian habitats. Thus, in the CVP
25 and SWP service areas, this impact would be less than significant.

26 This impact would be to the same as Impact Bot-18 (CP1); the impact would be
27 less than significant. Mitigation for this impact is not needed, and thus not
28 proposed.

29 *Impact Bot-19 (CP2): Loss of Sensitive Plant Communities and Special-Status*
30 *Plant Species Resulting from Induced Growth in the CVP/SWP Service Areas*
31 Implementation of CP2 could increase water yield to water districts in the CVP
32 and SWP service areas. This increase in water yield could reduce a limitation on
33 growth that could affect sensitive plant communities and special-status plant
34 species. However, this increase in water yield for growth that could affect these
35 resources would be small, and in the future the effects of this growth would be
36 analyzed and mitigated during land use planning and environmental review for
37 specific projects. For these reasons, this impact would be less than significant.

38 This impact would be similar to Impact Bot-19 (CP1). The extent of the impact
39 under CP2 would be greater than that under CP1 and CP4 but less than that
40 under CP3 and CP5, which would result in greater increases in water yield. This
41 impact would be less than significant. Mitigation for this impact is not needed,
42 and thus not proposed.

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

3 CP3 focuses on increasing agricultural water supply reliability while also
4 increasing anadromous fish survival. This plan primarily consists of raising
5 Shasta Dam by 18.5 feet, which, in combination with spillway modifications,
6 would increase the height of the reservoir’s full pool by 20.5 feet and enlarge
7 the total storage capacity in the reservoir by 634,000 acre-feet. The existing
8 TCD would also be extended to achieve efficient use of the expanded cold-
9 water pool. Because CP3 focuses on increasing agricultural water supply
10 reliability, none of the increased storage capacity in Shasta Reservoir would be
11 reserved for increasing M&I deliveries. Operations for water supply,
12 hydropower, and environmental and other regulatory requirements would be
13 similar to existing operations, with the additional storage retained for water
14 supply reliability and to expand the cold-water pool for downstream
15 anadromous fisheries.

16 Simulations of CP3 did not involve any changes to the modeling logic for
17 deliveries or flow requirements; all rules for water operations were updated to
18 include the new storage, but were not otherwise changed.

19 The botany and wetland impact analysis previously presented for CP1 assumes
20 maximum vegetation clearing within the relocation areas. Vegetation clearing
21 impacts within the relocation areas would be under CP3 would be greater than
22 under CP1 and CP2, but would not exceed those acreages of impacts presented
23 under CP1.

24 **Shasta Lake and Vicinity**

25 *Impact Bot-1 (CP3): Loss of Federally or State-Listed Plant Species* Habitat
26 for Federally or State-listed plant species does not occur at Shasta Lake or in the
27 vicinity. No species are known or expected to occur. Therefore, no impact
28 would occur. Mitigation for this impact is not needed, and thus not proposed.

29 *Impact Bot-2 (CP3): Loss of MSCS Covered Species* Implementation of the
30 project would result in the loss of MSCS covered species as a result of
31 inundation, vegetation removal, or construction activities. Therefore, this impact
32 would be significant.

33 Impacts related to dam construction and vegetation clearing within the
34 relocation areas would be similar to but greater than CP2. However, inundation
35 caused by an 18.5-foot raise of Shasta Dam could result in the loss of more
36 individual plants.

37 Additional analysis of impacts will be conducted in relation to suitable habitats
38 in the Shasta Lake watershed. An analysis of indirect impacts and temporary
39 impacts will be provided in the Final EIS. Potential mitigation lands containing
40 comparable habitat have been identified adjacent to the project. Additional

1 discussion of how these lands may be applied as mitigation and at what ratios
2 will be provided in the Final EIS.

3 This impact would be significant. Mitigation for this impact is proposed in
4 Section 12.3.5.

5 *Impact Bot-3 (CP3): Loss of USFS Sensitive, BLM Sensitive, or CRPR Species*
6 Implementation of the project would result in the loss of USFS sensitive, BLM
7 sensitive, or CRPR species because of inundation, vegetation removal, or
8 construction activities. Therefore, this impact would be potentially significant.

9 Impacts related to dam construction and vegetation clearing within the
10 relocation areas would be similar to but greater than CP2. However, inundation
11 caused by an 18.5-foot raise of Shasta Dam could result in the loss of more
12 individual plants.

13 Additional analysis of impacts will be conducted in relation to suitable habitats
14 in the Shasta Lake watershed. An analysis of indirect impacts and temporary
15 impacts will be provided in the Final EIS. Potential mitigation lands containing
16 comparable habitat have been identified adjacent to the project. Additional
17 discussion of how these lands may be applied as mitigation and at what ratios
18 will be provided in the Final EIS. This impact would be potentially significant.
19 Mitigation for this impact is proposed in Section 12.3.5.

20 *Impact Bot-4 (CP3): Loss of Jurisdictional Waters* Implementation of the
21 project will result in the loss of jurisdictional waters caused by flooding the
22 impoundment area and discharge of fill associated with the relocation of
23 facilities and dam construction. Flooding caused by implementation of the
24 project would result in the conversion of jurisdictional water types (e.g.,
25 wetlands and streams to lacustrine habitat). Therefore, this impact would be
26 significant.

27 Direct impacts would incur by conversion of jurisdictional waters (e.g.,
28 wetlands and streams) to lacustrine habitat with implementation of CP3. All
29 features within the impoundment area would be converted to lacustrine habitat.
30 Under CP3, approximately 28 acres of wetlands and 49 acres of other waters
31 would be converted to lacustrine habitat (Table 12-16). This will result in a net
32 loss of approximately 28 acres of wetlands and loss of approximately 49 acres
33 of riverine waters by conversion to lacustrine waters.

1 **Table 12-16. Impacts to Jurisdictional Waters (Acres*) in the Impoundment Area (18.5-**
2 **Foot Dam Raise)**

Jurisdictional Water Type	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Wetlands						
Fresh emergent/riparian wetland	0.00	0.00	5.30	0.00	0.00	0.00
Intermittent swale	0.00	0.01	0.00	0.00	0.00	0.04
Riparian wetland	1.04	1.71	6.63	8.34	1.49	0.74
Seasonal wetland	0.00	0.00	0.31	0.00	0.14	0.02
Seep/spring wetland	0.77	0.23	0.80	0.31	0.16	0.47
Vegetated ditch	0.13	0.00	0.00	0.02	0.00	0.00
Total Wetlands	1.94	1.95	12.24	8.67	1.79	1.27
Other Waters of the United States						
Ephemeral stream	0.29	0.02	0.62	0.28	0.13	0.12
Intermittent stream	1.42	0.25	2.38	0.93	0.93	2.69
Perennial stream	1.55	3.00	9.76	20.26	2.37	1.48
Roadside ditch	0.00	0.00	0.03	0.00	0.00	0.00
Seep/spring other waters	0.03	0.00	0.001	0.01	0.0001	0.00
Total Other Waters	3.29	3.27	12.79	21.47	3.43	4.29
Total	5.23	5.21	25.03	30.14	5.22	5.56

Note:

*Acreage values are approximate.

3 Direct impacts on wetlands and other waters that will be filled as a result of
4 relocation of facilities or dam construction will be determined. Additionally,
5 some fill may be placed in the existing full pool of Shasta Lake for restoration
6 and enhancement activities. Preliminary impacts to jurisdictional waters based
7 on the assumption of 100 percent loss of features occurring in the relocation
8 areas would be similar to but greater than those under CP2. A complete analysis
9 of impacts on jurisdictional waters in the full pool and the relocation areas as
10 well as indirect and temporary impacts will be provided in the Final EIS.

11 The impact would be significant. Mitigation for this impact is proposed in
12 Section 12.3.5.

13 *Impact Bot-5 (CP3): Loss of General Vegetation Habitats* Implementation of
14 the project would result in a loss of general vegetation habitats because of
15 inundation, vegetation removal, or construction activities. Therefore, this impact
16 would be potentially significant.

1 Under CP3, 2,472 acres of general vegetation habitats will be directly impacted
2 by the inundation of the impoundment area (Table 12-17).

3 **Table 12-17. Impacts to CWHR Habitats (Acres*) in the Impoundment Area**
4 **(18.5-Foot Dam Raise)**

Habitat	Area (Acres*)					
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Main Body	Pit Arm
Annual grassland	0.44	0.00	3.10	0.70	0.00	0.00
Barren	2.30	0.00	10.60	3.56	0.00	4.13
Blue oak – foothill pine	10.36	0.00	0.00	0.00	4.29	1.94
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	6.81
Closed-cone pine – cypress	32.68	0.00	12.95	20.89	44.72	373.48
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00
Mixed chaparral	29.19	13.64	161.04	15.14	10.35	59.50
Montane hardwood	73.49	38.76	171.01	70.55	19.43	2.49
Montane hardwood – conifer	70.68	0.99	150.42	136.36	111.63	10.55
Montane riparian	4.16	6.67	26.16	13.91	1.53	1.57
Ponderosa pine	215.11	30.72	188.19	161.64	49.56	57.50
Riverine	0.00	0.88	5.24	15.43	1.41	0.00
Urban	21.95	0.00	1.95	7.96	0.00	1.92
Total	460.37	91.67	730.66	446.49	242.92	519.90

Note:

*Acreage values are approximate.

5 Additional analysis of impacts will be conducted in relation to suitable habitats
6 in the Shasta Lake watershed. An analysis of indirect impacts and temporary
7 impacts will be provided in the Final EIS.

8 The impact would be potentially significant. Mitigation for this impact is
9 proposed in Section 12.3.5.

10 *Impact Bot-6 (CP3): Spread of Noxious and Invasive Weeds* Implementation
11 of the project could result in the spread of noxious and invasive weeds because
12 of ground-disturbing activities during construction and an increased number of
13 vectors (means of dispersal). Therefore, this impact would be potentially
14 significant.

15 Impacts resulting from the spread of noxious weeds under CP3 are anticipated
16 to be similar to, but greater than, those described for CP1. Therefore, this

1 impact would be potentially significant. Mitigation for this impact is proposed
2 in Section 12.3.5.

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

4 *Impact Bot-7 (CP3): Altered Structure and Species Composition and Loss of*
5 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
6 *Altered Flow Regimes* Altered flow regimes associated with project
7 implementation under CP3 could alter the structure and species composition or
8 cause the loss of riparian, wetland, and oak communities, and of habitat for
9 special-status plant species. Vernal pool plant communities and associated
10 special-status species likely would not be affected. Effects on oak communities
11 and upland habitats for special-status plants may not all be adverse. Adverse
12 effects on riparian and wetland communities and associated special-status plants
13 could be substantial; thus, this impact would be significant.

14 This impact would be similar to Impact Bot-7 (CP1). The extent of the impact
15 would be greater under CP3 than under CP1, CP2, and CP4, but less than under
16 CP5, which would entail more substantial alterations of flow regimes. (The
17 relative magnitude of changes to larger flows (which are most important for
18 riparian and wetland vegetation) simulated for each alternative below Keswick
19 Dam and RBPP are summarized on Figure 12-4.) This impact would be
20 significant. Mitigation for this impact is proposed in Section 12.3.5.

21 *Impact Bot-8 (CP3): Conflict with Approved Local or Regional Plans with*
22 *Objectives of Riparian Habitat Protection or Watershed Management*
23 Numerous local and regional plans address and promote the conservation of
24 riparian vegetation and associated habitats along the upper Sacramento River.
25 Because CP3 would adversely affect riparian communities, this alternative
26 could conflict with existing local and regional plans focused on preserving
27 riparian habitats. Therefore, this impact would be potentially significant.

28 This impact would be the same as Impact Bot-8 (CP1) and would be potentially
29 significant. Mitigation for this impact is proposed in Section 12.3.5.

30 *Impact Bot-9 (CP3): Disturbance or Removal of Designated Critical Habitat*
31 *for Special-Status Species* Designated critical habitat for four vernal pool
32 special-status plant species exists within the primary study area. However, such
33 critical habitat is not expected to be adversely affected by CP3. For this reason,
34 this impact would be less than significant.

35 This impact would be similar to Impact Bot-9 (CP1). The extent of the impact
36 would be greater than under CP1, CP2, and CP4, but less than under CP5,
37 which would entail a greater alteration of flow regimes. However, for the same
38 reasons as Impact Bot-9 (CP1), this impact would be less than significant.
39 Mitigation for this impact is not needed, and thus not proposed.

1 *Impact Bot-10 (CP3): Loss of Sensitive Plant Communities and Special-Status*
2 *Plant Species Resulting from Induced Growth* Implementation of CP3 could
3 increase water yield for water districts in the primary study area along the upper
4 Sacramento River. This increase in water yield could reduce a limitation on
5 growth that could affect sensitive plant communities and special-status plant
6 species. However, this increase in water yield for growth that could affect these
7 resources would be small, and in the future the effects of this growth would be
8 analyzed and mitigated during land use planning and environmental review for
9 specific projects. For these reasons, this impact would be less than significant.

10 This impact would be similar to Impact Bot-10 (CP1). The extent of the impact
11 would be greater under CP3 than under CP1, CP2, and CP4, but less than under
12 CP5, which would result in a greater increase in water yield. This impact would
13 be less than significant. Mitigation for this impact is not needed, and thus not
14 proposed.

15 *Impact Bot-11 (CP3): Loss of Sensitive Natural Communities or Habitats*
16 *Resulting from Implementing the Gravel Augmentation Program or Restoring*
17 *Riparian, Floodplain, and Side Channel Habitats* The proposed gravel
18 augmentation program and riparian, floodplain, and side channel restoration
19 activities would not be implemented under CP3. Therefore, no impact would
20 occur. Mitigation for this impact is not needed, and thus not proposed.

21 *Impact Bot-12 (CP3): Loss of Special-Status Plants Resulting from*
22 *Implementing the Gravel Augmentation Program or Restoring Riparian,*
23 *Floodplain, and Side Channel Habitats* The proposed gravel augmentation
24 program and riparian, floodplain, and side channel restoration activities would
25 not be implemented under CP3. Therefore, no impact would occur. Mitigation
26 for this impact is not needed, and thus not proposed.

27 *Impact Bot-13 (CP3): Spread of Noxious and Invasive Weeds Resulting from*
28 *Implementing the Gravel Augmentation Program or Restoring Riparian,*
29 *Floodplain, and Side Channel Habitats* The proposed gravel augmentation
30 program and riparian, floodplain, and side channel restoration activities would
31 not be implemented under CP3. Therefore, no impact would occur. Mitigation
32 for this impact is not needed, and thus not proposed.

33 **Lower Sacramento River and Delta**

34 *Impact Bot-14 (CP3): Altered Structure and Species Composition and Loss of*
35 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
36 *Altered Flow Regimes on the Lower Sacramento River* Altered flow regimes
37 associated with project implementation under CP3 could alter the structure and
38 species composition or cause the loss of riparian, wetland, and oak
39 communities, and of habitat for special-status plant species. Vernal pool plant
40 communities and associated special-status plant species likely would not be
41 affected. Effects on oak communities and upland habitats for special-status
42 plants may not all be adverse. Adverse effects on riparian and wetland

1 communities and associated special-status plants could be substantial on the
2 lower Sacramento River, but these effects are unlikely to extend to the Delta;
3 thus, for riparian and wetland communities and special-status plants, this impact
4 would be significant on the lower Sacramento River, and less than significant in
5 the Delta.

6 This impact would be similar to Impact Bot-14 (CP1). The extent of the impact
7 would be greater under CP3 than under CP1, CP2, and CP4, but would be less
8 than under CP5, which would entail more substantial alterations of flow
9 regimes. (The relative magnitude of changes to larger flows (which are most
10 important for riparian and wetland vegetation) simulated for each alternative
11 below RBPP and Hamilton City are summarized on Figure 12-4.) This impact
12 would be significant on the lower Sacramento River and less than significant in
13 the Delta. Mitigation for this impact on the lower Sacramento River is proposed
14 in Section 12.3.5.

15 *Impact Bot-15 (CP3): Conflict with Approved Local or Regional Plans with*
16 *Objectives of Riparian Habitat Protection or Watershed Management along the*
17 *Lower Sacramento River* Adopted local and regional plans address and
18 promote the conservation of riparian vegetation and associated habitats along
19 the lower Sacramento River in the extended study area. Because CP3 would
20 adversely affect riparian communities, this alternative could conflict with
21 existing local and regional plans focused on preserving riparian habitats.
22 Therefore, this impact would be potentially significant.

23 This impact would be the same as Impact Bot-15 (CP1) and would be
24 potentially significant. Mitigation for this impact is proposed in Section 12.3.5.

25 *Impact Bot-16 (CP3): Loss of Sensitive Plant Communities and Special-Status*
26 *Plant Species Resulting from Induced Growth along the Lower Sacramento*
27 *River and in the Delta* Implementation of CP3 could increase water for water
28 districts in the extended study area along the lower Sacramento River. This
29 increase in water yield could reduce a limitation on growth that could affect
30 sensitive plant communities and special-status plant species. However, this
31 increase in water yield for growth that could affect these resources would be
32 small, and in the future the effects of this growth would be analyzed and
33 mitigated during land use planning and environmental review for specific
34 projects. For these reasons, this impact would be less than significant.

35 This impact would be similar to Impact Bot-16 (CP1). The extent of the impact
36 under CP3 would be greater than under CP1, CP2, and CP4, but less than that
37 under CP5, which would result in a greater increase in water yield. This impact
38 would be less than significant. Mitigation for this impact is not needed, and thus
39 not proposed.

1 **CVP/SWP Service Areas**

2 *Impact Bot-17 (CP3): Altered Structure and Species Composition and Loss of*
3 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
4 *Altered Flow Regimes in the CVP/SWP Service Areas* Altered flow regimes
5 associated with project implementation under CP3 could alter the structure and
6 species composition or cause the loss of sensitive plant communities and of
7 habitat for special-status plant species. However, alteration of flow regimes
8 below CVP and SWP reservoirs in the extended study area would be less than
9 below Shasta Dam along the upper and lower Sacramento River. These
10 alterations may not be sufficient to alter the extent of early-successional riparian
11 and wetland communities or associated habitats for special-status plant species.
12 Therefore, this impact would be less than significant.

13 This impact would be similar to Impact Bot-17 (CP1). The extent of the impact
14 would be greater under CP3 than under CP1, CP2, and CP4, but less than that
15 under CP5, which would entail more substantial alterations of flow regimes.
16 Nonetheless, for the same reasons as Impact Bot-17 (CP1), this impact would be
17 less than significant. Mitigation for this impact is not needed, and thus not
18 proposed.

19 *Impact Bot-18 (CP3): Conflict with Approved Local or Regional Plans with*
20 *Objectives of Riparian Habitat Protection or Watershed Management in the*
21 *CVP/SWP Service Areas* Adopted local and regional plans address and
22 promote the conservation of riparian vegetation and associated habitats along
23 rivers below reservoirs in the CVP and SWP service areas. However,
24 implementation of CP3 would not cause a significant impact on riparian
25 vegetation and habitats. Therefore, CP3 would not conflict with existing local
26 and regional plans focused on preserving riparian habitats. Thus, this impact
27 would be less than significant.

28 This impact would be the same as Impact Bot-18 (CP1) and would be less than
29 significant. Mitigation for this impact is not needed, and thus not proposed.

30 *Impact Bot-19 (CP3): Loss of Sensitive Plant Communities and Special-Status*
31 *Plant Species Resulting from Induced Growth in the CVP/SWP Service Areas*
32 Implementation of CP3 could increase water yield to water districts in the
33 extended study area in the CVP and SWP service areas. This increase in water
34 yield could reduce a limitation on growth that could affect sensitive plant
35 communities and special-status plant species. However, this increase in water
36 yield for growth that could affect these resources would be small, and in the
37 future the effects of this growth would be analyzed and mitigated during land
38 use planning and environmental review for specific projects. For these reasons,
39 this impact would be less than significant.

40 This impact would be similar to Impact Bot-19 (CP1). The extent of the impact
41 under CP3 would be greater than that under CP1, CP2, and CP4, but less than
42 that under CP5, which would result in a greater increase in water yield. This

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

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

5 CP4 focuses on increasing anadromous fish survival while also increasing water
6 supply reliability. By raising Shasta Dam 18.5 feet, in combination with
7 spillway modifications, CP4 would increase the height of the reservoir full pool
8 by 20.5 feet and enlarge the total storage capacity in the reservoir by 634,000
9 acre-feet. The existing TCD would also be extended to achieve efficient use of
10 the expanded cold-water pool. The additional storage created by the 18.5-foot
11 dam raise would be used to improve the ability to meet temperature objectives
12 and habitat requirements for anadromous fish during drought years and increase
13 water supply reliability. Of the increased reservoir storage space, about 378,000
14 acre-feet would be dedicated to increasing the supply of cold water for
15 anadromous fish survival purposes. Operations for the remaining portion of
16 increased storage (approximately 256,000 acre-feet) would be the same as in
17 CP1, with 70 TAF and 35 TAF reserved to specifically focus on increasing
18 M&I deliveries during dry and critical years, respectively.

19 CP4 also includes augmenting spawning gravel and restoring riparian,
20 floodplain, and side channel habitat in the upper Sacramento River. Gravel
21 placement would occur at one or more sites per year over a 10-year period and
22 would be accomplished by one of three methods; lateral berms, talus cone,
23 direct placement in river; as appropriate depending on specific conditions,
24 including geomorphology, of the augmentation site. To the extent available,
25 existing river access points would be used to deliver gravel to the river;
26 however, temporary new access roads would be needed in some cases, mostly
27 adjacent to the river. In addition, riparian, floodplain, and side channel habitat
28 restoration would be constructed at up to six sites identified along the upper
29 Sacramento River: Henderson Open Space, Tobiasson Island, Shea Island
30 Complex, Kapusta Island, Anderson River Park, and Reading Island. These
31 restoration projects could involve some vegetation clearing.

32 Impacts under CP4 associated with vegetation clearing within the relocation
33 areas would be the same under CP3. However, additional vegetation clearing
34 would result under CP4 as a result of clearing to access gravel augmentation
35 sites and to construct the identified riparian, floodplain, and side channel
36 restoration projects.

37 **Shasta Lake and Vicinity**

38 *Impact Bot-1 (CP4): Loss of Federally or State-Listed Plant Species* Habitat
39 for Federally or State-listed plant species does not occur at Shasta Lake or in the
40 vicinity. No species are known or expected to occur. Therefore, no impact
41 would occur. Mitigation for this impact is not needed, and thus not proposed.

1 *Impact Bot-2 (CP4): Loss of MSCS Covered Species* Implementation of the
2 project would result in the loss of MSCS covered species as a result of
3 inundation, vegetation removal, or construction activities. Therefore, this impact
4 would be significant.

5 This impact would be similar to Impact Bot-2 (CP3); however, inundation
6 caused by an 18.5-foot dam raise could affect all or portions of 10 of the Shasta
7 snow-wreath populations found along the McCloud River and Pit arms and the
8 Main Body of the lake. Additionally, a portion of one Shasta snow-wreath
9 population occurs within the relocation area at Ellery Creek and activities to
10 decommission the campground could affect portions of that population.
11 Collectively, 12 of the 23 known (52 percent) Shasta snow-wreath populations
12 could be affected by a 18.5-foot dam raise. This impact would be significant.
13 Mitigation for this impact is proposed in Section 12.3.5.

14 *Impact Bot-3 (CP4): Loss of USFS Sensitive, BLM Sensitive, or CRPR Species*
15 Implementation of the project would result in the loss of USFS sensitive, BLM
16 sensitive, or CRPR species as a result of inundation, vegetation removal, or
17 construction activities. Therefore, this impact would be potentially significant.

18 This impact would be similar to Impact Bot-3 (CP3) and would be potentially
19 significant. Mitigation for this impact is proposed in Section 12.3.5.

20 *Impact Bot-4 (CP4): Loss of Jurisdictional Waters* Implementation of the
21 project will result in the loss of jurisdictional waters because of flooding the
22 impoundment area and fill associated with the relocation of facilities and dam
23 construction. Flooding caused by implementation of the project would result in
24 the conversion of jurisdictional water types (e.g., wetlands and streams to
25 lacustrine habitat). Therefore, this impact would be significant.

26 This impact would be similar to Impact Bot-4 (CP3) and would be significant.
27 Mitigation for this impact is proposed in Section 12.3.5.

28 *Impact Bot-5 (CP4): Loss of General Vegetation Habitats* Implementation of
29 the project would result in a loss of general vegetation habitats because of
30 inundation, vegetation removal, or construction activities.

31 This impact would be similar to Impact Bot-5 (CP3) and would be potentially
32 significant. Mitigation for this impact is proposed in Section 12.3.5.

33 *Impact Bot-6 (CP4): Spread of Noxious and Invasive Weeds* Implementation
34 of the project could result in the spread of noxious and invasive weeds as a
35 result of ground-disturbing activities during construction and an increased
36 number of vectors (means of dispersal). This impact would be potentially
37 significant.

1 Impacts resulting from the spread of noxious weeds under CP4 are anticipated
2 to be similar to those described for CP3. This impact would be potentially
3 significant. Mitigation for this impact is proposed in Section 12.3.5.

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

5 *Impact Bot-7 (CP4): Altered Structure and Species Composition and Loss of*
6 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
7 *Altered Flow Regimes* Altered flow regimes associated with project
8 implementation under CP4 could alter the structure and species composition or
9 cause the loss of riparian, wetland, and oak communities, and of habitat for
10 special-status plant species. Vernal pool plant communities and associated
11 special-status species likely would not be affected. Effects on oak communities
12 and upland habitats for special-status plants may not all be adverse. Adverse
13 effects on riparian and wetland communities and associated special-status plants
14 could be substantial; thus, for riparian and wetland communities and special-
15 status plants, this impact would be significant.

16 This impact would be the same as Impact Bot-7 (CP1) and would be significant.
17 Mitigation for this impact is proposed in Section 12.3.5.

18 *Impact Bot-8 (CP4): Conflict with Approved Local or Regional Plans with*
19 *Objectives of Riparian Habitat Protection or Watershed Management*
20 Numerous local and regional plans address and promote the conservation of
21 riparian vegetation and associated habitats along the upper Sacramento River.
22 Because CP4 would adversely affect riparian communities, this alternative
23 could conflict with existing local and regional plans focused on preserving
24 riparian habitats. Therefore, this impact would be potentially significant.

25 This impact would be the same as Impact Bot-8 (CP1) and would be potentially
26 significant. Mitigation for this impact is proposed in Section 12.3.5.

27 *Impact Bot-9 (CP4): Disturbance or Removal of Designated Critical Habitat*
28 *for Special-Status Species* Designated critical habitat for four vernal pool
29 special-status plant species exists within the primary study area. However, such
30 critical habitat is not expected to be adversely affected by CP4. This impact
31 would be less than significant.

32 This impact would be the same as Impact Bot-9 (CP1) and would be less than
33 significant. Mitigation for this impact is not needed, and thus not proposed.

34 *Impact Bot-10 (CP4): Loss of Sensitive Plant Communities and Special-Status*
35 *Plant Species Resulting from Induced Growth* Implementation of CP4 could
36 increase water yield for water districts in the primary study area along the upper
37 Sacramento River. This increase in water yield could reduce a limitation on
38 growth that could affect sensitive plant communities and special-status plant
39 species. However, this increase in water yield for growth that could affect these
40 resources would be small, and in the future the effects of this growth would be

1 analyzed and mitigated during land use planning and environmental review for
2 specific projects. For these reasons, this impact would be less than significant.

3 This impact would be the same as Impact Bot-10 (CP1) and would be less than
4 significant. Mitigation for this impact is not needed, and thus not proposed.

5 *Impact Bot-11 (CP4): Loss of Sensitive Natural Communities or Habitats*
6 *Resulting from Implementing the Gravel Augmentation Program or Restoring*
7 *Riparian, Floodplain, and Side Channel Habitats* Implementing the gravel
8 augmentation program could result in the removal of riparian and wetland
9 vegetation or the degradation of riparian and wetland habitats, including
10 wetlands qualifying as waters of the United States. In addition, actions to restore
11 riparian, floodplain, and side channel habitats would remove riparian
12 vegetation, and could result in discharge of fill material into waters of the
13 United States. This impact would be potentially significant.

14 A gravel augmentation program would be implemented under CP4, as described
15 in Chapter 2, "Alternatives." Gravel placement falls under Nationwide Permit
16 (NWP) 27, "Aquatic Habitat Restoration, Establishment, and Enhancement."
17 Activities qualifying for NWPs have been determined by USACE to have no
18 more than minimal adverse effects on the aquatic environment (72 Federal
19 Register 11092). Therefore, the direct placement of gravel into the Sacramento
20 River would not be considered a significant impact on waters of the United
21 States. No vernal pools or other seasonal wetlands are present at any of the
22 proposed augmentation sites. However, gravel augmentation could result in
23 removal of riparian vegetation during construction of access routes to the gravel
24 placement sites. To the extent feasible, existing access roads would be used, but
25 access to some of the proposed placement sites does not currently exist.
26 Clearing and grubbing would be needed to create access to these gravel
27 placement sites, and in some areas, vegetation clearing along banks would be
28 used to allow gravel to fall easily from the banks into the river. These activities
29 could result in removal of riparian vegetation.

30 In addition, actions would be implemented to restore riparian, floodplain, and
31 side channel habitats by increasing connectivity between the Sacramento River
32 and one or more side channels. As described in Chapter 2, "Alternatives," these
33 actions would involve excavation and grading to modify side channel and
34 adjacent floodplain topography, and subsequent revegetating of disturbed
35 floodplain with native riparian vegetation. This is expected to provide a
36 beneficial effect on floodplain and riparian habitat along these side channels.
37 However, some construction activities associated with restoring river
38 connectivity or removing or rehabilitating existing facilities could result in the
39 long-term removal of riparian vegetation.

40 Modifying or these side channels and the openings connecting them to the
41 Sacramento River would fall under NWP 27, "Aquatic Habitat Restoration,
42 Establishment, and Enhancement." Relocation or rehabilitation of the existing

1 power line and poles at the Henderson Open Space, and of the existing boat
2 ramp at Reading Island would also qualify for an NWP. Activities qualifying
3 for NWPs have been determined by USACE to have no more than minimal
4 adverse effects on the aquatic environment (72 Federal Register 11092).
5 Therefore, these activities would not be considered to have a significant impact
6 on waters of the United States. With implementation of the gravel augmentation
7 program and riparian, floodplain, and side channel habitat restoration at up to
8 six sites, the impact on sensitive natural communities would be potentially
9 significant. Mitigation for this impact is proposed in Section 12.3.5.

10 *Impact Bot-12 (CP4): Loss of Special-Status Plants Resulting from*
11 *Implementing the Gravel Augmentation Program or Restoring Riparian,*
12 *Floodplain, and Side Channel Habitats* The gravel augmentation program
13 would involve vegetation removal and gravel placement that could result in the
14 loss of special-status plants if they are present at the gravel placement sites.
15 Similarly, restoring riparian, floodplain, and side channel habitats would
16 involve excavation, grading, and vegetation clearing that could result in the loss
17 of special-status plants if they are present at the restoration sites. This impact
18 would be potentially significant.

19 Special-status plant species could be killed during vegetation clearing and
20 grubbing or gravel placement if they are present at the gravel placement sites or
21 areas that would be cleared for access. Similarly, special-status plants could be
22 killed during vegetation clearing excavation and grading if they are present at
23 the riparian, floodplain, and side channel restoration sites or areas disturbed for
24 access.

25 The impact would be potentially significant. Mitigation for this impact is
26 proposed in Section 12.3.5.

27 *Impact Bot-13 (CP4): Spread of Noxious and Invasive Weeds Resulting from*
28 *Implementing the Gravel Augmentation Program or Restoring Riparian,*
29 *Floodplain, and Side Channel Habitats* Implementing the gravel augmentation
30 program could result in the spread of noxious and invasive weeds as a result of
31 vegetation clearing and grubbing and an increased number of vectors. Similarly,
32 actions to restore riparian, floodplain, and side channel habitats could also
33 spread noxious and invasive weeds as a result of vegetation clearing and
34 grubbing and an increased number of vectors. This impact would be potentially
35 significant.

36 Vegetation removal and grubbing at gravel placement sites and access routes
37 could result in increased risk of introduction and spread of noxious and invasive
38 weeds. Riparian, floodplain, and side channel restoration projects also could
39 result in increased risk of introduction and spread of noxious and invasive
40 weeds.

1 The risk of introducing or spreading noxious weeds would vary depending on
2 the proximity of existing noxious weed infestations, extent of ground-disturbing
3 activities, and the amount of traffic entering a project site. Vectors that would
4 increase as a result of project implementation include weed seed and seed parts
5 brought in on tools, vehicles, and workers' clothing and boots. The number of
6 weed vectors in an area would be increased by vegetation clearing and
7 construction of temporary access routes for gravel placement, and associated
8 with modifying side channels and adjacent floodplain. As traffic along new and
9 existing corridors increases, the risk for weed dispersal would increase. Seed
10 mixtures and mulches may be used during erosion control efforts and
11 revegetation of disturbed areas. These mixtures and mulches are potential
12 vectors for noxious weed and invasive plant dispersal.

13 This impact would be potentially significant. Mitigation for this impact is
14 proposed in Section 12.3.5.

15 **Lower Sacramento River and Delta**

16 *Impact Bot-14 (CP4): Altered Structure and Species Composition and Loss of*
17 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
18 *Altered Flow Regimes on the Lower Sacramento River* Altered flow regimes
19 associated with project implementation under CP4 could alter the structure and
20 species composition or cause the loss of riparian, wetland, and oak
21 communities, and of habitat for special-status plant species. Vernal pool plant
22 communities and associated special-status plant species likely would not be
23 affected. Effects on oak communities and upland habitats for special-status
24 plants may not all be adverse. Adverse effects on riparian and wetland
25 communities and associated special-status plants could be substantial on the
26 lower Sacramento River. This impact would be significant.

27 This impact would be the same as Impact Bot-14 (CP1) and would be
28 significant. Mitigation for this impact is proposed in Section 12.3.5.

29 *Impact Bot-15 (CP4): Conflict with Approved Local or Regional Plans with*
30 *Objectives of Riparian Habitat Protection or Watershed Management along the*
31 *Lower Sacramento River* Adopted local and regional plans address and
32 promote the conservation of riparian vegetation and associated habitats along
33 the lower Sacramento River. Because CP4 would adversely affect riparian
34 communities, this alternative could conflict with existing local and regional
35 plans focused on preserving riparian habitats. Therefore, this impact would be
36 potentially significant.

37 This impact would be the same as Impact Bot-15 (CP1) and would be
38 potentially significant. Mitigation for this impact is proposed in Section 12.3.5.

39 *Impact Bot-16 (CP4): Loss of Sensitive Plant Communities and Special-Status*
40 *Plant Species Resulting from Induced Growth along the Lower Sacramento*
41 *River and in the Delta* Implementation of CP4 could increase water yield to

1 water districts in the extended study area along the lower Sacramento River.
2 This increase in water yield could reduce a limitation on growth that could
3 affect sensitive plant communities and special-status plant species. However,
4 this increase in water yield for growth that could affect these resources would
5 be small, and in the future the effects of this growth would be analyzed and
6 mitigated during land use planning and environmental review for specific
7 projects. For these reasons, this impact would be less than significant.

8 This impact would be the same as Impact Bot-16 (CP1) and would be less than
9 significant. Mitigation for this impact is not needed, and thus not proposed.

10 **CVP/SWP Service Areas**

11 *Impact Bot-17 (CP4): Altered Structure and Species Composition and Loss of*
12 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
13 *Altered Flow Regimes in the CVP/SWP Service Areas* Altered flow regimes
14 associated with implementation of CP4 could alter the structure and species
15 composition or cause the loss of sensitive plant communities and of habitat for
16 special-status plant species. However, alteration of flow regimes below CVP
17 and SWP reservoirs in the extended study area would be less than below Shasta
18 Dam along the upper and lower Sacramento River. These alterations may not be
19 sufficient to alter the extent of early-successional riparian and wetland
20 communities or associated habitats for special-status plant species. Therefore,
21 this impact would be less than significant.

22 This impact would be the same as Impact Bot-17 (CP1) and would be less than
23 significant. Mitigation for this impact is not needed, and thus not proposed.

24 *Impact Bot-18 (CP4): Conflict with Approved Local or Regional Plans with*
25 *Objectives of Riparian Habitat Protection or Watershed Management in the*
26 *CVP/SWP Service Areas* Adopted local and regional plans address and
27 promote the conservation of riparian vegetation and associated habitats along
28 rivers below reservoirs in the CVP and SWP service areas. However,
29 implementation of CP4 would not cause a significant impact on riparian
30 vegetation and habitats. Therefore, CP4 would not conflict with existing local
31 and regional plans focused on preserving riparian habitats. Thus, this impact
32 would be less than significant.

33 This impact would be the same as Impact Bot-18 (CP1) and would be less than
34 significant. Mitigation for this impact is not needed, and thus not proposed.

35 *Impact Bot-19 (CP4): Loss of Sensitive Plant Communities and Special-Status*
36 *Plant Species Resulting from Induced Growth in the CVP/SWP Service Areas*
37 Implementation of CP4 could increase water yield for water districts in the
38 extended study area along the lower Sacramento River. This increase in water
39 yield could reduce a limitation on growth that could affect sensitive plant
40 communities and special-status plant species. However, this increase in water
41 yield for growth that could affect these resources would be small, and in the

1 future the effects of this growth would be analyzed and mitigated during land
2 use planning and environmental review for specific projects. For these reasons,
3 this impact would be less than significant.

4 This impact would be the same as Impact Bot-19 (CP1) and would be less than
5 significant. Mitigation for this impact is not needed, and thus not proposed.

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

7 CP5 primarily focuses on increasing water supply reliability, anadromous fish
8 survival, Shasta Lake area environmental resources, and recreation
9 opportunities. By raising Shasta Dam 18.5 feet, in combination with spillway
10 modifications, CP5 would increase the height of the reservoir full pool by 20.5
11 feet and enlarge the total storage capacity in the reservoir by 634,000 acre-feet.
12 The existing TCD would be extended to achieve efficient use of the expanded
13 cold-water pool. Shasta Dam operational guidelines would continue essentially
14 unchanged, except during dry years and critical years, when 150 TAF and 75
15 TAF, respectively, of the increased storage capacity in Shasta Reservoir would
16 be reserved to specifically focus on increasing M&I deliveries.

17 CP5 would help reduce future water shortages through increasing drought year
18 and average year water supply reliability for agricultural and M&I deliveries. In
19 addition, the increased depth and volume of the cold-water pool in Shasta
20 Reservoir would contribute to improving seasonal water temperatures for
21 anadromous fish in the upper Sacramento River.

22 At Shasta Lake, CP5 would also include (1) implementing environmental
23 restoration features along the lower reaches of major tributaries, (2)
24 constructing shoreline fish habitat, and (3) constructing either additional or
25 improved recreation features at various locations around Shasta Lake to increase
26 the value of the recreational experience. Formulation of specific environmental
27 restoration features and increased recreation components is included in the Plan
28 Formulation Appendix.

29 Along the upper Sacramento River, CP5 would also include implementing the
30 same gravel augmentation program and the same riparian, floodplain, and side
31 channel habitat restoration as described for CP4.

32 **Shasta Lake and Vicinity**

33 *Impact Bot-1 (CP5): Loss of Federally or State-Listed Plant Species* Habitat
34 for Federally or State-listed plant species does not occur at Shasta Lake or in the
35 vicinity. No species are known or expected to occur. Therefore, no impact
36 would occur. Mitigation for this impact is not needed, and thus not proposed.

37 *Impact Bot-2 (CP5): Loss of MSCS Covered Species* Implementation of the
38 project would result in the loss of MSCS covered species as a result of ground-
39 disturbing construction activities or inundation. Therefore, this impact would be
40 significant.

1 Additional impacts may occur depending on specific restoration and recreation
2 enhancement details. These impacts will be quantified when the details of the
3 proposed actions are developed.

4 This impact would be similar to Impact Bot-2 (CP4) and would be significant.
5 Mitigation for this impact is proposed in Section 12.3.5.

6 *Impact Bot-3 (CP5): Loss of USFS Sensitive, BLM Sensitive, or CRPR Species*
7 Implementation of the project would result in the loss of USFS Sensitive, BLM
8 Sensitive, or CRPR species as a result of inundation, vegetation removal, or
9 construction activities. Therefore, this impact would be potentially significant.

10 Additional impacts may occur depending on specific restoration and recreation
11 enhancement details. These impacts will be quantified when the details of the
12 proposed actions are developed.

13 This impact would be similar to Impact Bot-3 (CP3) and would be potentially
14 significant. Mitigation for this impact is proposed in Section 12.3.5.

15 *Impact Bot-4 (CP5): Loss of Jurisdictional Waters* Implementation of the
16 project would result in the loss of jurisdictional waters because of flooding the
17 impoundment area and fill associated with the relocation of facilities and dam
18 construction. Flooding caused by implementation of the project would result in
19 the conversion of jurisdictional water types (e.g., wetlands and streams to
20 lacustrine habitat). This impact would be significant.

21 Additional impacts may occur depending on specific restoration and recreation
22 enhancement details. These impacts will be quantified when the details of the
23 proposed actions are developed.

24 This impact would be similar to Impact Bot-4 (CP3) and would be significant.
25 Mitigation for this impact is proposed in Section 12.3.5.

26 *Impact Bot-5 (CP5): Loss of General Vegetation Habitats* Implementation of
27 the project would result in a loss of general vegetation habitats because of
28 inundation, vegetation removal, or construction activities. This impact would be
29 potentially significant.

30 Additional impacts may occur depending on specific restoration and recreation
31 enhancement details. These impacts will be quantified when the details of the
32 proposed actions are developed.

33 This impact would be similar to Impact Bot-5 (CP3) and would be potentially
34 significant. Mitigation for this impact is proposed in Section 12.3.5.

35 *Impact Bot-6 (CP5): Spread of Noxious and Invasive Weeds* Implementation
36 of the project could result in the spread of noxious and invasive weeds because

1 of ground-disturbing activities during construction and an increased number of
2 vectors (means of dispersal). This impact would be potentially significant.

3 Impacts resulting from the spread of noxious weeds under CP5 are anticipated
4 to be similar to those described for CP3.

5 Additional impacts may occur depending on specific restoration and recreation
6 enhancement details. These impacts will be quantified when the details of the
7 proposed actions are developed.

8 This impact would be potentially significant. Mitigation for this impact is
9 proposed in Section 12.3.5.

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

11 *Impact Bot-7 (CP5): Altered Structure and Species Composition and Loss of*
12 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
13 *Altered Flow Regimes* Altered flow regimes associated with project
14 implementation under CP5 could alter the structure and species composition or
15 cause the loss of riparian, wetland, and oak communities, and of habitat for
16 special-status plant species. Vernal pool plant communities and associated
17 special-status species likely would not be affected. Effects on oak communities
18 and upland habitats for special-status plants may not all be adverse. Adverse
19 effects on riparian and wetland communities and associated special-status plants
20 could be substantial; thus, this impact would be significant.

21 This impact would be similar to Impact Bot-7 (CP1). The extent of the impact
22 would be greater under CP1 through CP4, because CP5 would entail more
23 substantial alterations of flow regimes. (The relative magnitude of changes to
24 larger flows (which are most important for riparian and wetland vegetation)
25 simulated for each alternative below Keswick Dam and RBPP are summarized
26 on Figure 12-4). This impact would be significant. Mitigation for this impact is
27 proposed in Section 12.3.5.

28 *Impact Bot-8 (CP5): Conflict with Approved Local or Regional Plans with*
29 *Objectives of Riparian Habitat Protection or Watershed Management*
30 Numerous local and regional plans address and promote the conservation of
31 riparian vegetation and associated habitats along the upper Sacramento River.
32 Because CP5 would adversely affect riparian communities, this alternative
33 could conflict with existing local and regional plans focused on preserving
34 riparian habitats. Therefore, this impact would be potentially significant.

35 This impact would be the same as Impact Bot-8 (CP1) and would be potentially
36 significant. Mitigation for this impact is proposed in Section 12.3.5.

37 *Impact Bot-9 (CP5): Disturbance or Removal of Designated Critical Habitat*
38 *for Special-Status Species* Designated critical habitat for four vernal pool
39 special-status plant species exists within the primary study area. However, such

1 critical habitat is not expected to be adversely affected by CP5. This impact
2 would be less than significant.

3 This impact would be similar to Impact Bot-9 (CP1). The extent of the impact
4 would be greater than under CP1 through CP4, because CP5 would entail a
5 greater alteration of flow regimes. However, for the same reasons as Impact
6 Bot-9 (CP1), this impact would be less than significant. Mitigation for this
7 impact is not needed, and thus not proposed.

8 *Impact Bot-10 (CP5): Loss of Sensitive Plant Communities and Special-Status*
9 *Plant Species Resulting from Induced Growth* Implementation of CP5 could
10 increase water yield to water districts in the primary study area along the upper
11 Sacramento River. This increase in water yield could reduce a limitation on
12 growth that could affect sensitive plant communities and special-status plant
13 species. However, this increase in water yield for growth that could affect these
14 resources would be small, and in the future the effects of this growth would be
15 analyzed and mitigated during land use planning and environmental review for
16 specific projects. For these reasons, this impact would be less than significant.

17 This impact would be similar to Impact Bot-10 (CP1). The extent of the impact
18 under CP5 would be greater than that under CP1 through CP4, because it would
19 result in a greater increase in water yield. This impact would be less than
20 significant. Mitigation for this impact is not needed, and thus not proposed.

21 *Impact Bot-11 (CP5): Loss of Sensitive Natural Communities or Habitats*
22 *Resulting from Implementing the Gravel Augmentation Program or Restoring*
23 *Riparian, Floodplain, and Side Channel Habitats* Implementing the gravel
24 augmentation program could result in the removal of riparian and wetland
25 vegetation or the degradation of riparian and wetland habitats, including
26 wetlands qualifying as waters of the United States. In addition, actions to restore
27 riparian, floodplain, and side channel habitats would remove riparian
28 vegetation, and could result in discharge of fill material into waters of the
29 United States. This impact would be potentially significant.

30 This impact would be the same as Impact Bot-11 (CP4) and would be
31 potentially significant. Mitigation for this impact is proposed in Section 12.3.5.

32 *Impact Bot-12 (CP5): Loss of Special-Status Plants Resulting from*
33 *Implementing the Gravel Augmentation Program or Restoring Riparian,*
34 *Floodplain, and Side Channel Habitats* The gravel augmentation program
35 would involve vegetation removal and gravel placement that could result in the
36 loss of special-status plants if they are present at the gravel placement sites.
37 Similarly, restoring riparian, floodplain, and side channel habitats would
38 involve excavation, grading, and vegetation clearing that could result in the loss
39 of special-status plants if they are present at the restoration sites. This impact
40 would be potentially significant.

1 This impact would be the same as Impact Bot-12 (CP4) and would be
2 potentially significant. Mitigation for this impact is proposed in Section 12.3.5.

3 *Impact Bot-13 (CP5): Spread of Noxious and Invasive Weeds Resulting from*
4 *Implementing the Gravel Augmentation Program or Restoring Riparian,*
5 *Floodplain, and Side Channel Habitats* Implementing the gravel augmentation
6 program could result in the spread of noxious and invasive weeds as a result of
7 vegetation clearing and grubbing and an increased number of vectors. Similarly,
8 actions to restore riparian, floodplain, and side channel habitats could also
9 spread noxious and invasive weeds as a result of vegetation clearing and
10 grubbing and an increased number of vectors. This impact would be potentially
11 significant.

12 This impact would be the same as Impact Bot-13 (CP4) and would be
13 potentially significant. Mitigation for this impact is proposed in Section 12.3.5.

14 **Lower Sacramento River and Delta**

15 *Impact Bot-14 (CP5): Altered Structure and Species Composition and Loss of*
16 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
17 *Altered Flow Regimes on the Lower Sacramento River* Altered flow regimes
18 associated with project implementation under CP1 could alter the structure and
19 species composition or cause the loss of riparian, wetland, and oak
20 communities, and of habitat for special-status plant species. Vernal pool plant
21 communities and associated special-status plant species likely would not be
22 affected. Effects on oak communities and upland habitats for special-status
23 plants may not all be adverse. Adverse effects on riparian and wetland
24 communities and associated special-status plants could be substantial on the
25 lower Sacramento River. Thus, this impact would be significant.

26 This impact would be similar to Impact Bot-14 (CP1). The extent of the impact
27 would be greater under CP5 than under CP1 through CP4, because CP5 would
28 entail more substantial alterations of flow regimes. (The relative magnitude of
29 changes to larger flows (which are most important for riparian and wetland
30 vegetation) simulated for each alternative below RBPP and Hamilton City are
31 summarized on Figure 12-4). This impact would be significant. Mitigation for
32 this impact is proposed in Section 12.3.5.

33 *Impact Bot-15 (CP5): Conflict with Approved Local or Regional Plans with*
34 *Objectives of Riparian Habitat Protection or Watershed Management along the*
35 *Lower Sacramento River* Adopted local and regional plans address and
36 promote the conservation of riparian vegetation and associated habitats along
37 the lower Sacramento River. Because CP5 would adversely affect riparian
38 communities, this alternative could conflict with existing local and regional
39 plans focused on preserving riparian habitats. Therefore, this impact would be
40 potentially significant.

1 This impact would be the same as Impact Bot-15 (CP1) and would be
2 potentially significant. Mitigation for this impact is proposed in Section 12.3.5.

3 *Impact Bot-16 (CP5): Loss of Sensitive Plant Communities and Special-Status*
4 *Plant Species Resulting from Induced Growth along the Lower Sacramento*
5 *River and in the Delta* Implementation of CP5 could increase water yield for
6 water districts in the extended study area along the lower Sacramento River.
7 This increase in water yield could reduce a limitation on growth that could
8 affect sensitive plant communities and special-status plant species. However,
9 this increase in water yield for growth that could affect these resources would
10 be small, and in the future the effects of this growth would be analyzed and
11 mitigated during land use planning and environmental review for specific
12 projects. For these reasons, this impact would be less than significant.

13 This impact would be similar to Impact Bot-16 (CP1). The extent of the impact
14 under CP5 would be greater than that under CP1 through CP4, because it would
15 result in a greater increase in water yield. This impact would be less than
16 significant. Mitigation for this impact is not needed, and thus not proposed.

17 **CVP/SWP Service Areas**

18 *Impact Bot-17 (CP5): Altered Structure and Species Composition and Loss of*
19 *Sensitive Plant Communities and Special-Status Plant Species Resulting from*
20 *Altered Flow Regimes in the CVP/SWP Service Areas* Altered flow regimes
21 associated with project implementation under CP5 could alter the structure and
22 species composition or cause the loss of sensitive plant communities and of
23 habitat for special-status plant species. However, alteration of flow regimes
24 below CVP and SWP reservoirs in the extended study area would be less than
25 below Shasta Dam along the upper and lower Sacramento River. These
26 alterations may not be sufficient to alter the extent of early-successional riparian
27 and wetland communities or associated habitats for special-status plant species.
28 Therefore, this impact would be less than significant.

29 This impact would be similar to Impact Bot-17 (CP1). The extent of the impact
30 under CP5 would be greater than that under CP1 through CP4, because it would
31 entail more substantial alterations of flow regimes. Nonetheless, for the same
32 reasons as Impact Bot-17 (CP2), this impact would be less than significant.
33 Mitigation for this impact is not needed, and thus not proposed.

34 *Impact Bot-18 (CP5): Conflict with Approved Local or Regional Plans with*
35 *Objectives of Riparian Habitat Protection or Watershed Management in the*
36 *CVP/SWP Service Areas* Adopted local and regional plans address and
37 promote the conservation of riparian vegetation and associated habitats along
38 rivers below reservoirs in the CVP and SWP service areas. However,
39 implementation of CP5 would not cause a significant impact on riparian
40 vegetation and habitats. Therefore, CP5 would not conflict with existing local
41 and regional plans focused on preserving riparian habitats. Thus, this impact
42 would be less than significant.

1 This impact would be the same as Impact Bot-18 (CP1) and would be less than
2 significant. Mitigation for this impact is not needed, and thus not proposed.

3 *Impact Bot-19 (CP5): Loss of Sensitive Plant Communities and Special-Status*
4 *Plant Species Resulting from Induced Growth in the CVP/SWP Service Areas*
5 Implementation of CP5 could increase water yield for water districts in the CVP
6 and SWP service areas. This increase in water yield could reduce a limitation on
7 growth that could affect sensitive plant communities and special-status plant
8 species. However, this increase in water yield for growth that could affect these
9 resources would be small, and in the future the effects of this growth would be
10 analyzed and mitigated during land use planning and environmental review for
11 specific projects. For these reasons, this impact would be less than significant.

12 This impact would be similar to Impact Bot-19 (CP1). The extent of the impact
13 under CP5 would be greater than that under CP1 through CP4, because it would
14 result in a greater increase in water yield. This impact would be less than
15 significant. Mitigation for this impact is not needed, and thus not proposed.

16 **12.3.5 Mitigation Measures**

17 Table 12-18 presents a summary of mitigation measures for botanical resources
18 and wetlands.

Table 12-18. Summary of Mitigation Measures for Botanical Resources and Wetlands

Impact		No-Action Alternative	CP1	CP2	CP3	CP4	CP5
Impact Bot-1: Loss of Federally or State Listed Plant Species	LOS before Mitigation	NI	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	NI	NI
Impact Bot-2: Loss of MSCS Covered Species	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Bot-2: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate MSCS Plants; and Revegetate Affected Areas.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Bot-3: Loss of USFS Sensitive, BLM Sensitive, or CRPR Species	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Bot-3: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate USFS Sensitive, BLM Sensitive, and CRPR Plants and Revegetate Affected Areas.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Bot-4: Loss of Jurisdictional Waters	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Bot-4: Mitigate Loss of Jurisdictional Waters.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Bot-5: Loss of General Vegetation Habitats	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Bot-5: Acquire and Preserve Mitigation Lands for Loss of General Vegetation Habitats.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU

Table 12-18. Summary of Mitigation Measures for Botanical Resources and Wetlands (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4	CP5
Impact Bot-6: Spread of Noxious and Invasive Weeds	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Bot-6: Develop and Implement a Weed Management Plan in Conjunction with Stakeholders.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Bot-7: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes	LOS before Mitigation	LTS	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Bot-7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Bot-8: Conflict with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management	LOS before Mitigation	LTS	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Bot-8: Implement Mitigation Measure Bot-7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Bot-9: Disturbance or Removal of Designated Critical Habitat for Special-Status Species	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 Bot-10: Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Induced Growth	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

Table 12-18. Summary of Mitigation Measures for Botanical Resources and Wetlands (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4	CP5
Impact Bot-11: Loss of Sensitive Natural Communities or Habitats Resulting from Implementing the Gravel Augmentation Program or Restoring Riparian, Floodplain, and Side Channel Habitats	LOS before Mitigation	NI	NI	NI	NI	PS	PS
	Mitigation Measure	None required.	None needed; thus, none proposed.			Mitigation Measure Bot-11: Revegetate Disturbed Areas, Consult with CDFW.	
	LOS after Mitigation	NI	NI	NI	NI	LTS	LTS
Impact Bot-12: Loss of Special-Status Plants Resulting from Implementing the Gravel Augmentation Program Restoring Riparian, Floodplain, and Side Channel Habitats	LOS before Mitigation	NI	NI	NI	NI	PS	PS
	Mitigation Measure	None required.	None needed; thus, none proposed.			Mitigation Measure Bot-12: Conduct Preconstruction Surveys for Special-Status Plants and Avoid Special-Status Plant Populations during Construction.	
	LOS after Mitigation	NI	NI	NI	NI	LTS	LTS
Impact Bot-13: Spread of Noxious and Invasive Weeds Resulting from Implementing the Gravel Augmentation Program Restoring Riparian, Floodplain, and Side Channel Habitats	LOS before Mitigation	NI	NI	NI	NI	PS	PS
	Mitigation Measure	None required.	None needed; thus, none proposed.			Mitigation Measure Bot-13: Implement Weed Management Measures and Revegetation.	
	LOS after Mitigation	NI	NI	NI	NI	LTS	LTS
Impact Bot-14: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes on the Lower Sacramento River	LOS before Mitigation	LTS	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Bot-14: Implement Mitigation Measure Bot-7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS

Table 12-18. Summary of Mitigation Measures for Botanical Resources and Wetlands (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4	CP5
Impact Bot-15: Conflict with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management along the Lower Sacramento River	LOS before Mitigation	PS	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Bot-15: Implement Mitigation Measure Bot-7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.				
	LOS after Mitigation	PS	LTS	LTS	LTS	LTS	LTS
Impact Bot-16: Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Induced Growth along the Lower Sacramento River and in the Delta	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 Bot-17: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes in the CVP/SWP Service Areas	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 Bot-18: Conflict with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management in the CVP/SWP Service Areas	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

Table 12-18. Summary of Mitigation Measures for Botanical Resources and Wetlands (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4	CP5
Impact Bot-19: Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Induced Growth in CVP/SWP Service Areas	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

Key:

LOS = level of significance

LTS = less than significant

NA = not applicable

NI = no impact

PS = potentially significant

S = significant

SU = significant and unavoidable

1 **No-Action Alternative**

2 No mitigation measures are required for this alternative.

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

5 No mitigation is needed for Impacts Bot-1 (CP1), Bot-9 (CP1) through Bot-13
6 (CP1), and Bot-16 (CP1) through Bot-19 (CP1). Mitigation is provided below
7 for the remaining impacts of CP1 on botanical resources and wetlands.

8 **Mitigation Measure Bot-2 (CP1): Acquire and Preserve Mitigation Lands;**
9 **Avoid Populations; Relocate MSCS Plants; and Revegetate Affected Areas**

10 The following mitigation measures will reduce impacts on MSCS plants:

- 11 • When feasible in relocation areas, avoid or minimize actions that can
12 result in harm or mortality to individuals or to the viability of
13 populations.
- 14 • When feasible, Reclamation will relocate populations of MSCS plants
15 that will be directly affected to suitable habitat within undisturbed
16 portions of the Shasta Lake and vicinity portion of the primary study
17 area.
- 18 • When feasible, Reclamation will use seed banking and other *ex situ* (off
19 site) conservation methods for MSCS populations that will be directly
20 affected.
- 21 • When feasible, Reclamation will restore/enhance populations of other
22 MSCS plants in the project vicinity.
- 23 • A mitigation and monitoring plan will be developed to monitor success
24 of MSCS plant populations that have been relocated or revegetated.
25 The plan will identify suitable sites for mitigation, species to be
26 planted, and numbers and sizes of plantings. It will describe planting
27 techniques, prescribe methods to remove existing noxious weeds, and
28 establish reasonable performance standards and contingency measures.
29 Furthermore, it will establish conservation easements as appropriate.
30 The vegetation restoration plan will be developed in consultation with
31 the USACE, USFWS, USFS, and CDFW.
- 32 • Where appropriate, MSCS covered plant species will be used for
33 revegetation.

34 Implementation of this mitigation measure would reduce impacts on MSCS
35 plant species; however, because successful relocation, transplanting, and
36 artificial propagation of Shasta snow-wreath are unproven, impacts would
37 remain significant and unavoidable.

1 Potential mitigation lands containing comparable habitat have been identified
2 adjacent to the project. Additional discussion of how these lands may be applied
3 as mitigation and at what ratios will be provided in the Final EIS. A discussion
4 of mitigation for loss of habitat through preservation and enhancement in
5 mitigation areas will be included in the Final EIS.

6 **Mitigation Measure Bot-3 (CP1): Acquire and Preserve Mitigation Lands;**
7 **Avoid Populations; Relocate USFS Sensitive, BLM Sensitive and CRPR**
8 **Plants and Revegetate Affected Areas** The following mitigation measures
9 will reduce impacts on USFS sensitive, BLM sensitive and CRPR plants:

10 When feasible in relocation areas, avoid or minimize actions that can result in
11 harm or mortality to individuals or to the viability of populations.

- 12 • When feasible, Reclamation will relocate populations of USFS
13 sensitive, BLM sensitive and CRPR plants that will be directly affected
14 to suitable habitat within undisturbed portions of the Shasta Lake and
15 vicinity portion of the primary study area.
- 16 • When feasible, Reclamation will use seed banking and other *ex situ* (off
17 site) conservation methods for MSCS populations that will be directly
18 affected.
- 19 • When feasible, Reclamation will restore/enhance populations of other
20 MSCS plants in the project vicinity.
- 21 • A mitigation and monitoring plan will be developed to monitor success
22 of USFS sensitive, BLM sensitive, and CRPR plant populations that
23 have been relocated or revegetated. The plan will identify suitable sites
24 for mitigation, species to be planted, and numbers and sizes of
25 plantings. It will describe planting techniques, prescribe methods to
26 remove existing noxious weeds, and establish reasonable performance
27 standards and contingency measures. Furthermore, it will establish
28 conservation easements as appropriate. The vegetation restoration plan
29 will be developed in consultation with USACE, USFWS, USFS, and
30 CDFW.
- 31 • To the extent feasible, USFS sensitive, BLM sensitive, and CRPR plant
32 species will be used for revegetation.

33 Implementation of this mitigation measure would reduce impacts on USFS
34 sensitive, BLM sensitive, and CRPR plant species; however, because successful
35 relocation and transplantation of these species are unproven, impacts would
36 remain potentially significant and unavoidable.

37 Potential mitigation lands containing comparable habitat have been identified
38 adjacent to the project. Additional discussion of how these lands may be applied

1 as mitigation and at what ratios will be provided in the Final EIS. A discussion
2 of mitigation for loss of habitat through preservation and enhancement in
3 mitigation areas will be included in the Final EIS.

4 **Mitigation Measure Bot-4 (CP1): Mitigate Loss of Jurisdictional Waters**

5 Specific mitigation measures have not been determined for this impact. Within
6 relocation areas, jurisdictional waters of the United States would be avoided
7 when feasible. Potential mitigation lands containing comparable habitat have
8 been identified adjacent to the project. Additional discussion of how these lands
9 may be applied as mitigation will be provided in the Final EIS. A discussion of
10 mitigation for loss of habitat through preservation and enhancement in
11 mitigation areas will be included in the Final EIS.

12 Until the details of this mitigation measure are developed, Impact Bot-4 (CP1)
13 would remain significant and unavoidable.

14 **Mitigation Measure Bot-5 (CP1): Acquire and Preserve Mitigation Lands**
15 **for Loss of General Vegetation Habitats** Mitigation lands will be acquired
16 and placed in conservation easements to mitigate for the loss of vegetation
17 habitat. Additionally, opportunities for restoration and enhancement of habitat
18 will be explored and defined.

19 Potential mitigation lands containing comparable habitat in locations where
20 these species are known to occur have been identified, adjacent to the project.
21 Additional discussion of how these lands can be applied as mitigation will be
22 presented in the Final EIS. However, the effectiveness of providing
23 compensatory mitigation by acquiring and conserving habitat mitigation lands
24 to mitigate inundation impacts cannot be accurately determined without
25 additional details.

26 Until the details of this mitigation measure are developed, Impact Bot-5 (CP1)
27 would remain significant and unavoidable.

28 **Mitigation Measure Bot-6 (CP1): Develop and Implement a Weed**
29 **Management Plan In Conjunction with Stakeholders**

30 Reclamation will develop and implement a weed management plan in conjunction with
31 stakeholders to avoid or minimize the potential for project-related impacts from
32 noxious and invasive plants. This plan will include:

- 33 • Conduct annual weed monitoring of relocation and construction areas
34 for three seasons after project completion.
- 35 • Design and implement appropriate USFS-approved eradication
36 methods for weed species detected.
- 37 • Treat and monitor existing source weed populations within and
38 adjacent to construction and relocation areas.

- 1 • In relocation areas, seed disturbed soils with native grass and forb seeds
- 2 to discourage occupation by noxious weeds.
- 3 • Include C Provision 6.35, Equipment Cleaning (4/04), in all contracts.
- 4 • Use only weed-free road fill, gravel, mulches, and seed sources.

5 Implementation of these measures would reduce Impact Bot-6 (CP1) to a less-
6 than-significant level.

7 **Mitigation Measure Bot-7 (CP1): Develop and Implement a Riverine**
8 **Ecosystem Mitigation and Adaptive Management Plan to Avoid and**
9 **Compensate for the Impact of Altered Flow Regimes on Riparian and**
10 **Wetland Communities** Reclamation will develop and implement a riverine
11 ecosystem mitigation and adaptive management plan to mitigate to the extent
12 feasible any identified impacts of an altered Sacramento River flow regime on
13 existing riparian and wetland communities, and associated instream, riparian,
14 and wetland habitat values for aquatic and terrestrial special-status species along
15 the Sacramento River from Shasta Dam to Colusa (River Mile 144). The plan
16 will be consistent with and will support implementation of the Senate Bill 1086
17 program, and will be developed in coordination with USFWS, NMFS, CDFW,
18 and the Sacramento River Conservation Area Forum. The Plan will be
19 developed before project construction. The plan will be limited to the
20 Sacramento River from Shasta Dam to Colusa (River Mile 144). The existing
21 conditions as of 2010 will be the baseline conditions.

22 The goals of the plan, which will also serve as performance standards, will be to
23 result in no net reduction in the average amount of any of the following along
24 the Sacramento River from Shasta Dam to Colusa:

- 25 • Channel migration in selected areas of natural vegetation dominated by
- 26 native species
- 27 • Overbank inundation of natural vegetation dominated by native species
- 28 in selected areas
- 29 • Regeneration of early-successional riparian vegetation (e.g.,
- 30 cottonwood regeneration) in selected areas

31 The riverine ecosystem mitigation plan will include all of the following
32 elements:

- 33 • Modeling or monitoring at representative locations to quantify direct
- 34 and indirect impacts resulting from adaptive management of project
- 35 implementation. A method of quantifying impacts will be used that
- 36 ensures repeatability.

- 1 • An evaluation of feasible modifications to the procedures for operating
2 Shasta Dam (e.g., ramping rates) to do any of the following:
- 3 – Reduce or eliminate adverse impacts on ecologically important
4 bankfull and overbank flows (as feasible within existing flood
5 reduction constraints)
- 6 – Reduce or eliminate adverse impacts (e.g., reduction) on meander
7 migration rates
- 8 – Facilitate establishment of cottonwoods and early-successional
9 vegetation at intervals sufficient to sustain cottonwoods and early-
10 successional riparian vegetation along the Sacramento River
11 riparian corridor and floodplain (e.g., at 5- to 15-year intervals)
- 12 – Avoid any increase in flood risk from implementing this mitigation
13 measure. Feasible modifications to operational procedures are
14 those not in conflict with applicable laws, agreements, and
15 regulations, or with the purpose of the project.
- 16 • A specific combination of mitigation actions will be developed and
17 implemented to attain the plan's goals. Mitigation actions will consist
18 of feasible modifications of dam operation procedures and/or funding
19 of appropriate and feasible restoration actions that have been developed
20 by Reclamation, other federal agencies, state or local governments, or
21 private nonprofits and received applicable federal and state permits.
22 Appropriate and feasible restoration actions could include actions to do
23 any of the following:
- 24 – Enhance connectivity of river side channels (e.g., by modifying the
25 elevation of secondary channels, remnant oxbows, or meander
26 scars)
- 27 – Expand the river meander zone at selected locations (e.g., by
28 assisting in funding projects that meet this objective)
- 29 – Increase floodplain connectivity (e.g., by assisting in funding
30 projects that meet this objective)
- 31 – Control and remove nonnative, invasive plant species from riparian
32 areas to shift dominance to native species
- 33 – Create riparian and wetland communities (e.g., through plantings)
- 34 – Increase shaded riverine aquatic habitat (e.g., through plantings)

- 1 • The methods and results of an analysis demonstrating that a specified
2 combination of mitigation actions will attain the plan's goals.
- 3 • The location of restoration actions specified in the combination of
4 mitigation actions. Restoration actions will be performed on preserved
5 sites and with funding for management in perpetuity. (Preserved sites
6 will include sites previously preserved by other entities.)
- 7 • Implementation mechanisms (i.e., mechanisms by which Reclamation
8 will fund implementation) and criteria for implementing dam operation
9 procedures that provide mitigation
- 10 • Parameters for preparation and content of restoration and management
11 plans, or existing applicable plans.

12 At a minimum, mitigation in this plan will include the following:

- 13 • Feasible modifications to dam operation procedures identified as
14 reducing adverse impacts on meander migration or ecologically
15 important bankfull and overbank flows, or as facilitating cottonwood
16 establishment
- 17 • Either of the following elements:
 - 18 – Provide actions or funding to increase meander migration, side-
19 channel connectivity, or floodplain connectivity along the
20 Sacramento River, and creation (or conversion of nonnative-
21 dominated to native-dominated) of riparian or wetland
22 communities
- 23 or
 - 24 – Provide mitigation that has been determined by USFWS, NMFS,
25 and CDFW to be of comparable or greater value and is included in
26 the terms and conditions of permits for impacts on species listed as
27 threatened or endangered by the State or Federal governments

28 Implementation of this mitigation measure would mitigate the impact of altered
29 flow regimes on instream, riparian, and wetland communities, and thus would
30 reduce Impact Bot-7 (CP1) to a less-than-significant level.

31 **Mitigation Measure Bot-8 (CP1): Implement Mitigation Measure Bot-7**
32 **(CP1): Develop and Implement a Riverine Ecosystem Mitigation and**
33 **Adaptive Management Plan to Reduce Conflicts with Approved Local or**
34 **Regional Plans with Objectives of Riparian Habitat Protection or**
35 **Watershed Management** Reclamation will implement Mitigation Measure
36 Bot-7 (CP1) as described above.

1 As described under Mitigation Measure Bot-7 (CP1), developing and
2 implementing a riverine ecosystem mitigation plan would reduce conflicts with
3 approved local and regional plans that address and promote the conservation of
4 riparian vegetation communities along the upper Sacramento River in the
5 primary study area. Consequently, implementation of the previous mitigation
6 measure would reduce Impact Bot-8 (CP1) to a less-than-significant level.

7 **Mitigation Measure Bot-14 (CP1): Implement Mitigation Measure Bot-7**
8 **(CP1): Develop and Implement a Riverine Ecosystem Mitigation and**
9 **Adaptive Management Plan to Avoid and Compensate for the Impact of**
10 **Altered Flow Regimes on Riparian and Wetland Communities** This
11 measure is identical to Mitigation Measure Bot-7 (CP1) as described above.
12 Reclamation will develop and implement a riverine ecosystem mitigation plan.

13 Implementation of this mitigation measure would reduce Impact Bot-14 (CP1)
14 to a less-than-significant level.

15 **Mitigation Measure Bot-15 (CP1): Implement Mitigation Measure Bot-7**
16 **(CP1): Develop and Implement a Riverine Ecosystem Mitigation and**
17 **Adaptive Management Plan to Reduce Conflicts with Approved Local or**
18 **Regional Plans with Objectives of Riparian Habitat Protection or**
19 **Watershed Management** Reclamation will implement Mitigation Measure
20 Bot-7 (CP1) as described above.

21 As described under Mitigation Measure Bot-7 (CP1), developing and
22 implementing a riverine ecosystem mitigation plan would reduce conflicts with
23 approved local and regional plans that address and promote the conservation of
24 riparian vegetation communities along the lower Sacramento River in the
25 extended study area. Consequently, implementing the previous mitigation
26 measure would reduce Impact Bot-15 (CP1) to a less-than-significant level.

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

29 No mitigation is needed for Impacts Bot-1 (CP2), Bot-9 (CP2) through Bot-13
30 (CP2), and Bot-16 (CP2) through Bot-19 (CP2). Mitigation is provided below
31 for the remaining impacts of CP2 on botanical resources and wetlands.

32 **Mitigation Measure Bot-2 (CP2): Acquire and Preserve Mitigation Lands;**
33 **Avoid Populations; Relocate MSCS Plants; and Revegetate Affected Areas**
34 This mitigation measure is identical to Mitigation Measure Bot-2 (CP1).
35 Implementation of this mitigation measure would reduce impacts on MSCS
36 species; however, because relocation of these species is unproven, the impact
37 would remain significant and unavoidable.

38 Potential mitigation lands containing comparable habitat have been identified
39 adjacent to the project. Additional discussion of how these lands may be applied
40 as mitigation and at what ratios will be provided in the Final EIS. A discussion

1 of mitigation for loss of habitat through preservation and enhancement in
2 mitigation areas will be included in the Final EIS.

3 **Mitigation Measure Bot-3 (CP2): Acquire and Preserve Mitigation Lands;**
4 **Avoid Populations; Relocate USFS Sensitive, BLM Sensitive and CRPR**
5 **Plants and Revegetate Affected Areas** This mitigation measure is identical to
6 Mitigation Measure Bot-3 (CP1). Implementation of this mitigation measure
7 would reduce impacts on USFS sensitive, BLM sensitive and CRPR plant
8 species; however, because relocation of these species is unproven, the impact
9 would remain significant and unavoidable.

10 Potential mitigation lands containing comparable habitat have been identified
11 adjacent to the project. Additional discussion of how these lands may be applied
12 as mitigation and at what ratios will be provided in the Final EIS. A discussion
13 of mitigation for loss of habitat through preservation and enhancement in
14 mitigation areas will be included in the Final EIS.

15 **Mitigation Measure Bot-4 (CP2): Mitigate Loss of Jurisdictional Waters**
16 This mitigation measure is identical to Mitigation Measure Bot-4 (CP1).

17 Specific mitigation measures have not been determined for this impact. Within
18 relocation areas, jurisdictional waters of the United States would be avoided
19 when feasible. Potential mitigation lands containing comparable habitat have
20 been identified adjacent to the project. Additional discussion of how these lands
21 may be applied as mitigation and at what ratios will be provided in the Final
22 EIS. A discussion of mitigation for loss of habitat through preservation and
23 enhancement in mitigation areas will be included in the Final EIS.

24 Until the details of this mitigation measure are developed, Impact Bot-4 (CP2)
25 would remain significant and unavoidable.

26 **Mitigation Measure Bot-5 (CP2): Acquire and Preserve Mitigation Lands**
27 **for Loss of General Vegetation Habitats** This mitigation measure is identical
28 to Mitigation Measure Bot-3 (CP1).

29 Specific mitigation measures have not been determined for this impact.
30 Potential mitigation lands containing comparable habitat have been identified
31 adjacent to the project. Additional discussion of how these lands may be applied
32 as mitigation and at what ratios will be provided in the Final EIS. A discussion
33 of mitigation for loss of habitat through preservation and enhancement in
34 mitigation areas will be included in the Final EIS.

35 Until the details of this mitigation measure are developed, Impact Bot-5 (CP2)
36 would remain significant and unavoidable.

37 **Mitigation Measure Bot-6 (CP2): Develop and Implement a Weed**
38 **Management Plan in Conjunction with Stakeholders** This mitigation
39 measure is identical to Mitigation Measure Bot-6 (CP1). Implementation of this

1 mitigation measure would reduce Impact Bot-6 (CP2) to a less-than-significant
2 level.

3 **Mitigation Measure Bot-7 (CP2): Develop and Implement a Riverine**
4 **Ecosystem Mitigation and Adaptive Management Plan to Avoid and**
5 **Compensate for the Impact of Altered Flow Regimes on Riparian and**
6 **Wetland Communities** This mitigation measure is identical to Mitigation
7 Measure Bot-7 (CP1), except that mitigation in the riverine ecosystem
8 mitigation plan will include either of the following elements:

- 9
 - Increased meander migration, side-channel connectivity, or floodplain
10 connectivity along the Sacramento River, and creation (or conversion
11 from nonnative-dominated to native-dominated) of riparian or wetland
12 communities

13 or

- 14
 - Mitigation that has been determined by USFWS, NMFS, and CDFW to
15 be of comparable or greater value and is included in the terms and
16 conditions of permits for impacts on species listed as threatened or
17 endangered by the State or Federal government

18 Implementation of this mitigation measure would reduce Impact Bot-7 (CP2) to
19 a less-than-significant level.

20 **Mitigation Measure Bot-8 (CP2): Implement Mitigation Measure Bot-7**
21 **(CP2): Develop and Implement a Riverine Ecosystem Mitigation and**
22 **Adaptive Management Plan to Reduce Conflicts with Approved Local or**
23 **Regional Plans with Objectives of Riparian Habitat Protection or**
24 **Watershed Management** Reclamation will implement Mitigation Measure
25 Bot-7 (CP2) as described above.

26 Developing and implementing this riverine ecosystem mitigation plan would
27 reduce conflicts with approved local and regional plans that address and
28 promote the conservation of riparian vegetation communities along the upper
29 Sacramento River in the primary study area. Implementation of this mitigation
30 measure would reduce Impact Bot-8 (CP2) to a less-than-significant level.

31 **Mitigation Measure Bot-14 (CP2): Implement Mitigation Measure Bot-7**
32 **(CP2): Develop and Implement a Riverine Ecosystem Mitigation and**
33 **Adaptive Management Plan to Avoid and Compensate for the Impact of**
34 **Altered Flow Regimes on Riparian and Wetland Communities** This
35 mitigation measure is identical to Mitigation Measure Bot-7 (CP2). Reclamation
36 will develop and implement a riverine ecosystem mitigation plan.

37 Implementation of this mitigation measure would reduce Impact Bot-14 (CP2)
38 to a less-than-significant level.

1 **Mitigation Measure Bot-15 (CP2): Implement Mitigation Measure Bot-7**
2 **(CP2): Develop and Implement a Riverine Ecosystem Mitigation and**
3 **Adaptive Management Plan to Reduce Conflicts with Approved Local or**
4 **Regional Plans with Objectives of Riparian Habitat Protection or**
5 **Watershed Management** Reclamation will implement Mitigation Measure
6 Bot-7 (CP2) as described above.

7 Developing and implementing this riverine ecosystem mitigation plan would
8 reduce conflicts with approved local and regional plans that address and
9 promote the conservation of riparian vegetation communities along the lower
10 Sacramento River in the extended study area. Implementation of this mitigation
11 measure would reduce Impact Bot-15 (CP2) to a less-than-significant level.

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

14 No mitigation is needed for Impacts Bot-1 (CP3), Bot-9 (CP3) through Bot-13
15 (CP3), and Bot-16 (CP3) through Bot-19 (CP3). Mitigation is provided below
16 for the remaining impacts of CP3 on botanical resources and wetlands.

17 **Mitigation Measure Bot-2 (CP3): Acquire and Preserve Mitigation Lands;**
18 **Avoid Populations; Relocate MSCS Plants; and Revegetate Affected Areas**

19 This mitigation measure is identical to Mitigation Measure Bot-2 (CP1).
20 Implementation of this mitigation measure would reduce impacts on MSCS
21 species; however, because relocation of these species is unproven, the impact
22 would remain significant and unavoidable.

23 Potential mitigation lands containing comparable habitat have been identified
24 adjacent to the project. Additional discussion of how these lands may be applied
25 as mitigation and at what ratios will be provided in the Final EIS. A discussion
26 of mitigation for loss of habitat through preservation and enhancement in
27 mitigation areas will be included in the Final EIS.

28 **Mitigation Measure Bot-3 (CP3): Acquire and Preserve Mitigation Lands;**
29 **Avoid Populations; Relocate USFS Sensitive, BLM Sensitive and CRPR**
30 **Plants and Revegetate Affected Areas** This mitigation measure is identical to

31 Mitigation Measure Bot-3 (CP1). Implementation of this mitigation measure
32 would reduce impacts on USFS sensitive, BLM sensitive and CRPR plant
33 species; however, because relocation of these species is unproven, the impact
34 would remain significant and unavoidable.

35 Potential mitigation lands containing comparable habitat have been identified
36 adjacent to the project. Additional discussion of how these lands may be applied
37 as mitigation and at what ratios will be provided in the Final EIS. A discussion
38 of mitigation for loss of habitat through preservation and enhancement in
39 mitigation areas will be included in the Final EIS.

1 **Mitigation Measure Bot-4 (CP3): Mitigate Loss of Jurisdictional Waters**

2 This mitigation measure is identical to Mitigation Measure Bot-4 (CP1).

3 Specific mitigation measures have not been determined for this impact. Within
4 relocation areas, jurisdictional waters of the United States would be avoided
5 when feasible. Potential mitigation lands containing comparable habitat have
6 been identified adjacent to the project. Additional discussion of how these lands
7 may be applied as mitigation and at what ratios will be provided in the Final
8 EIS. A discussion of mitigation for loss of habitat through preservation and
9 enhancement in mitigation areas will be included in the Final EIS.

10 Until the details of this mitigation measure are developed, Impact Bot-4 (CP3)
11 would remain significant and unavoidable.

12 **Mitigation Measure Bot-5 (CP3): Acquire and Preserve Mitigation Lands**
13 **for Loss of General Vegetation Habitats** This mitigation measure is identical
14 to Mitigation Measure Bot-3 (CP1).

15 Specific mitigation measures have not been determined for this impact.
16 Potential mitigation lands containing comparable habitat have been identified
17 adjacent to the project. Additional discussion of how these lands may be applied
18 as mitigation and at what ratios will be provided in the Final EIS. A discussion
19 of mitigation for loss of habitat through preservation and enhancement in
20 mitigation areas will be included in the Final EIS.

21 Until the details of this mitigation measure are developed, Impact Bot-5 (CP3)
22 would remain significant and unavoidable.

23 **Mitigation Measure Bot-6 (CP3): Develop and Implement a Weed**
24 **Management Plan in Conjunction with Stakeholders** This mitigation
25 measure is identical to Mitigation Measure Bot-6 (CP1). Implementation of this
26 mitigation measure would reduce Impact Bot-6 (CP3) to a less-than-significant
27 level.

28 **Mitigation Measure Bot-7 (CP3): Develop and Implement a Riverine**
29 **Ecosystem Mitigation and Adaptive Management Plan to Avoid and**
30 **Compensate for the Impact of Altered Flow Regimes on Riparian and**
31 **Wetland Communities** This mitigation measure is identical to Mitigation
32 Measure Bot-7 (CP1), except that mitigation in the riverine ecosystem
33 mitigation plan will include either of the following elements:

- 34 • Increased meander migration, side-channel connectivity, or floodplain
35 connectivity along the Sacramento River, and creation (or conversion
36 from nonnative-dominated to native-dominated) of riparian or wetland
37 communities

38 or

- Mitigation that has been determined by USFWS, NMFS, and CDFW to be of comparable or greater value and is included in the terms and conditions of permits for impacts on species listed as threatened or endangered by the State or Federal government.

Implementation of this mitigation measure would reduce Impact Bot-7 (CP3) to a less-than-significant level.

Mitigation Measure Bot-8 (CP3): Implement Mitigation Measure Bot-7 (CP3): Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Reduce Conflicts with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management Reclamation will implement Mitigation Measure Bot-7 (CP3) as described above.

The development and implementation of this riverine ecosystem mitigation plan would reduce conflicts with approved local and regional plans that address and promote the conservation of riparian vegetation communities along the upper Sacramento River in the primary study area. Implementation of this mitigation measure would reduce Impact Bot-8 (CP3) to a less-than-significant level.

Mitigation Measure Bot-14 (CP3): Implement Mitigation Measure Bot-7 (CP3): Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities This mitigation measure is identical to Mitigation Measure Bot-7 (CP3). Reclamation will develop and implement a riverine ecosystem mitigation plan.

Implementation of this mitigation measure would reduce Impact Bot-14 (CP3) to a less-than-significant level.

Mitigation Measure Bot-15 (CP3): Implement Mitigation Measure Bot-7 (CP3): Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Reduce Conflicts with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management Reclamation will implement Mitigation Measure Bot-7 (CP3) as described above.

The development and implementation of this riverine ecosystem mitigation plan would reduce conflicts with approved local and regional plans that address and promote the conservation of riparian vegetation communities along the lower Sacramento River in the extended study area. Implementation of this mitigation measure would reduce Impact Bot-15 (CP3) to a less-than-significant level.

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

3 No mitigation is needed for Impacts Bot-1 (CP4), Bot-9 (CP4), Bot-10 (CP4),
4 and Bot-16 (CP4) through Bot-19 (CP4). Mitigation is provided below for the
5 remaining impacts of CP4 on botanical resources and wetlands.

6 **Mitigation Measure Bot-2 (CP4): Acquire and Preserve Mitigation Lands;**
7 **Avoid Populations; Relocate MSCS Plants; and Revegetate Affected Areas**
8 This mitigation measure is identical to Mitigation Measure Bot-2 (CP1).

9 Implementation of this mitigation measure would reduce impacts on MSCS
10 species; however, because relocation of these species is unproven, the impact
11 would remain significant and unavoidable.

12 Potential mitigation lands containing comparable habitat have been identified
13 adjacent to the project. Additional discussion of how these lands may be applied
14 as mitigation and at what ratios will be provided in the Final EIS. A discussion
15 of mitigation for loss of habitat through preservation and enhancement in
16 mitigation areas will be included in the Final EIS.

17 **Mitigation Measure Bot-3 (CP4): Acquire and Preserve Mitigation Lands;**
18 **Avoid Populations; Relocate USFS Sensitive, BLM Sensitive and CRPR**
19 **Plants and Revegetate Affected Areas** This mitigation measure is identical to
20 Mitigation Measure Bot-3 (CP1).

21 Implementation of this mitigation measure would reduce impacts on USFS
22 sensitive, BLM sensitive and CRPR plant species; however, because relocation
23 of these species is unproven, the impact would remain significant and
24 unavoidable.

25 Potential mitigation lands containing comparable habitat have been identified
26 adjacent to the project. Additional discussion of how these lands may be applied
27 as mitigation and at what ratios will be provided in the Final EIS. A discussion
28 of mitigation for loss of habitat through preservation and enhancement in
29 mitigation areas will be included in the Final EIS.

30 **Mitigation Measure Bot-4 (CP4): Mitigate Loss of Jurisdictional Waters**
31 This mitigation measure is identical to Mitigation Measure Bot-4 (CP1).

32 Specific mitigation measures have not been determined for this impact. Within
33 relocation areas, jurisdictional waters of the United States will be avoided when
34 feasible. Potential mitigation lands containing comparable habitat have been
35 identified adjacent to the project. Additional discussion of how these lands may
36 be applied as mitigation and at what ratios will be provided in the Final EIS. A
37 discussion of mitigation for loss of habitat through preservation and
38 enhancement in mitigation areas will be included in the Final EIS.

1 Until the details of this mitigation measure are developed, Impact Bot-4 (CP4)
2 would remain significant and unavoidable.

3 **Mitigation Measure Bot-5 (CP4): Acquire and Preserve Mitigation Lands**
4 **for Loss of General Vegetation Habitats** This mitigation measure is identical
5 to Mitigation Measure Bot-3 (CP1).

6 Specific mitigation measures have not been determined for this impact.
7 Potential mitigation lands containing comparable habitat have been identified
8 adjacent to the project. Additional discussion of how these lands may be applied
9 as mitigation and at what ratios will be provided in the Final EIS. A discussion
10 of mitigation for loss of habitat through preservation and enhancement in
11 mitigation areas will be included in the Final EIS.

12 Until the details of this mitigation measure are developed, Impact Bot-5 (CP4)
13 would remain significant and unavoidable.

14 **Mitigation Measure Bot-6 (CP4): Develop and Implement a Weed**
15 **Management Plan in Conjunction with Stakeholders** This mitigation
16 measure is identical to Mitigation Measure Bot-6 (CP1).

17 Implementation of this mitigation measure would reduce Impact Bot-6 (CP4) to
18 a less-than-significant level.

19 **Mitigation Measure Bot-7 (CP4): Develop and Implement a Riverine**
20 **Ecosystem Mitigation and Adaptive Management Plan to Avoid and**
21 **Compensate for the Impact of Altered Flow Regimes on Riparian and**
22 **Wetland Communities** This mitigation measure is identical to Mitigation
23 Measure Bot-7 (CP1).

24 Implementation of this mitigation measure would reduce Impact Bot-7 (CP4) to
25 a less-than-significant level.

26 **Mitigation Measure Bot-8 (CP4): Implement Mitigation Measure Bot-7**
27 **(CP1): Develop and Implement a Riverine Ecosystem Mitigation and**
28 **Adaptive Management Plan to Reduce Conflicts with Approved Local or**
29 **Regional Plans with Objectives of Riparian Habitat Protection or**
30 **Watershed Management** This mitigation measure is identical to Mitigation
31 Measure Bot-7 (CP1).

32 Implementation of this mitigation measure would reduce Impact Bot-8 (CP4) to
33 a less-than-significant level.

34 **Mitigation Measure Bot-11 (CP4): Revegetate Disturbed Areas, Consult**
35 **with CDFW** Reclamation will implement the following measures to reduce
36 and compensate for loss of sensitive natural communities:

- 1 • Before removing any vegetation at the augmentation sites and access
2 areas, a survey will be conducted to map and classify the natural
3 communities present in these areas, including wetland communities.
- 4 • Augmentation access will be designed to avoid disturbing wetland plant
5 communities to the extent feasible. Removal of mature riparian
6 vegetation and other sensitive vegetation will be minimized to the
7 extent possible while still allowing access to gravel augmentation sites.
- 8 • CDFW will be consulted with to determine if a Section 1602 streambed
9 alteration agreement will be required for the gravel augmentation
10 activities affecting the bed and bank of the Sacramento River and side
11 channels.
- 12 • Staging and gravel and equipment storage will be confined to
13 developed or disturbed areas to the extent feasible.
- 14 • A revegetation plan will be prepared to restore native vegetation in all
15 areas cleared to implement the gravel augmentation program
16 immediately following completion of the gravel augmentation activities
17 at each augmentation site. The revegetation plan will include
18 performance standards and success criteria to ensure that mitigation
19 habitat would be successfully maintained and result in no net loss of
20 sensitive natural communities, including riparian vegetation.
- 21 • All conditions of the streambed alteration agreement will be
22 implemented to the satisfaction of CDFW, subject to limitations on its
23 authority set forth in Fish and Game Code Section 1600 et seq.

24 In addition, Reclamation will implement the following measures to reduce and
25 compensate for potential loss of sensitive natural communities from the
26 riparian, floodplain, and side channel restoration actions:

- 27 • A survey will be conducted before removing any vegetation at the
28 augmentation sites and access areas, to map and classify the natural
29 communities present in restoration and potential construction areas at
30 restoration sites.
- 31 • CDFW will be consulted with to determine if a Section 1602 streambed
32 alteration agreement will be required for the restoration and
33 construction activities at each restoration site affecting the bed and
34 bank of the Sacramento River and side channel.
- 35 • Relocated and/or rehabilitated facilities (e.g., power poles) will be
36 designed to avoid disturbing sensitive plant communities to the extent
37 feasible.

- 1 • A 100-foot no disturbance buffer will be established around sensitive
2 plant communities that are to be avoided during construction. Removal
3 of mature riparian vegetation and other sensitive vegetation will be
4 minimized to the extent possible.

- 5 • Staging, equipment storage, and construction access will be designed to
6 avoid disturbing vegetation to the extent feasible.

- 7 • Native riparian and other sensitive vegetation, if any, removed from
8 restoration sites will be replaced on a no-net-loss basis. Riparian
9 vegetation will be replaced through planting and establishment of
10 comparable native riparian vegetation on-site. Other sensitive plant
11 communities may be replaced through restoration of comparable native
12 vegetation at other sites if necessary.

- 13 • Planting mix, composition, and density will be determined by a more
14 detailed site analysis, but could include native cottonwood, willow, box
15 elder, valley oak, western sycamore, elderberry, and a variety of
16 understory brush species. Temporary irrigation will be provided on an
17 as-needed basis, where feasible.

- 18 • All conditions of the streambed alteration agreement will be
19 implemented to the satisfaction of CDFW, subject to limitations on its
20 authority set forth in Fish and Game Code Section 1600 et seq.

21 Implementation of this mitigation measure would reduce Impact Bot-11 (CP4)
22 to a less-than-significant level.

23 **Mitigation Measure Bot-12 (CP4): Conduct Preconstruction Surveys for**
24 **Special-Status Plants and Avoid Special-Status Plant Populations during**
25 **Construction** Reclamation will implement the following measures to avoid
26 impacts on special-status plants from resulting from the gravel augmentation
27 program:

- 28 • Botanists will be hired to conduct protocol-level special-status plant
29 surveys before commencing any construction activities that could
30 disturb vegetation.

- 31 • All special-status plants identified within 250 feet of the proposed
32 augmentation sites will be mapped and identified for avoidance. Access
33 routes and gravel placement will be designed to avoid impacts on
34 special-status plants.

- 35 • Fencing will be installed a minimum of 100 feet from special-status
36 plants, and no project activity will be permitted within the area
37 occupied by special-status plants or the 100-foot buffer area around
38 these plants.

- Insecticides, herbicides, fertilizers, or other chemicals that might harm special-status plants will not be used within 100 feet of the plants. Roadways and disturbed areas within 100 feet of special-status plants will be watered at least twice a day and as needed to minimize dust emissions.

In addition, Reclamation will implement the following measures to avoid impacts on special-status plants resulting from the riparian, floodplain, and side channel restoration actions:

- Qualified botanists will be hired to conduct protocol-level special-status plant surveys before commencing any construction activities that could disturb vegetation.
- All special-status plants identified within 250 feet of the proposed augmentation sites will be mapped and avoided to the extent feasible. Protective fencing will be installed around special-status plant locations and a 100-foot buffer zone during construction activities.
- Insecticides, herbicides, fertilizers, or other chemicals that might harm special-status plants will not be used within 100 feet of special-status plants. Roadways and disturbed areas within 100 feet of special-status plants will be watered at least twice a day and as needed to minimize dust emissions.

Implementation of this mitigation measure would reduce Impact Bot-12 (CP4) to a less-than-significant level.

Mitigation Measure Bot-13 (CP4): Implement Weed Management Measures and Revegetation Reclamation will implement the following measures to reduce the risk of introducing and spreading noxious weeds or invasive plant species during gravel augmentation and riparian, floodplain, and side channel restoration:

- Before conducting gravel augmentation activities, invasive plant and noxious weed infestations will be identified and mapped within the augmentation sites, including vegetation clearing sites.
- Noxious weeds will be removed at the onset of construction and disposed of properly. If noxious weeds are not removed at the onset of construction, they will be fenced and avoided during construction.
- Any clothing, footwear, and equipment used during construction will be ensured free of soil, seeds, vegetative matter or other debris or potential seed-bearing material before entering the project sites or before moving from infested sites to uninfested sites.

- 1 • Mitigation Measure Bot-11 (CP4) will be implemented to restore native
2 vegetation in all areas disturbed by gravel placement and construction
3 of access routes immediately following completion of the gravel
4 augmentation activities at each augmentation site.

- 5 • Only weed-free gravel, fill soil, mulch, seed mixes, and straw materials
6 will be used during construction; best management practices will be
7 implemented; and postconstruction revegetation will be conducted.
8 Certified weed-free material will be used if available.

9 Implementation of this mitigation measure would reduce Impact Bot-13 (CP4)
10 to a less-than-significant level.

11 **Mitigation Measure Bot-14 (CP4): Implement Mitigation Measure Bot-7**
12 **(CP1): Develop and Implement a Riverine Ecosystem Mitigation and**
13 **Adaptive Management Plan to Avoid and Compensate for the Impact of**
14 **Altered Flow Regimes on Riparian and Wetland Communities** This
15 mitigation measure is identical to Mitigation Measure Bot-7 (CP1).
16 Implementation of this mitigation measure would reduce Impact Bot-14 (CP4)
17 to a less-than-significant level.

18 **Mitigation Measure Bot-15 (CP4): Implement Mitigation Measure Bot-7**
19 **(CP1): Develop and Implement a Riverine Ecosystem Mitigation and**
20 **Adaptive Management Plan to Reduce Conflicts with Approved Local or**
21 **Regional Plans with Objectives of Riparian Habitat Protection or**
22 **Watershed Management** This mitigation measure is identical to Mitigation
23 Measure Bot-7 (CP1). Implementation of this mitigation measure would reduce
24 Impact Bot-15 (CP4) to a less-than-significant level.

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

26 No mitigation is needed for Impacts Bot-1 (CP5), Bot-9 (CP5), Bot-10 (CP5),
27 and Bot-16 (CP5) through Bot-19 (CP5). Mitigation is provided below for the
28 remaining impacts of CP5 on botanical resources and wetlands.

29 **Mitigation Measure Bot-2 (CP5): Acquire and Preserve Mitigation Lands;**
30 **Avoid Populations; Relocate MSCS Plants; and Revegetate Affected Areas**
31 This mitigation measure is identical to Mitigation Measure Bot-2 (CP1).
32 Implementation of this mitigation measure would reduce impacts on MSCS
33 species; however, because relocation of these species is unproven, the impact
34 would remain significant and unavoidable.

35 Potential mitigation lands containing comparable habitat have been identified
36 adjacent to the project. Additional discussion of how these lands may be applied
37 as mitigation and at what ratios will be provided in the Final EIS. A discussion
38 of mitigation for loss of habitat through preservation and enhancement in
39 mitigation areas will be included in the Final EIS.

1 **Mitigation Measure Bot-3 (CP5): Acquire and Preserve Mitigation Lands;**
2 **Avoid Populations; Relocate USFS Sensitive, BLM Sensitive and CRPR**
3 **Plants and Revegetate Affected Areas** This mitigation measure is identical to
4 Mitigation Measure Bot-3 (CP1). Implementation of this mitigation measure
5 would reduce impacts on USFS sensitive, BLM sensitive and CRPR plant
6 species; however, because relocation of these species is unproven, the impact
7 would remain significant and unavoidable.

8 Potential mitigation lands containing comparable habitat have been identified
9 adjacent to the project. Additional discussion of how these lands may be applied
10 as mitigation and at what ratios will be provided in the Final EIS. A discussion
11 of mitigation for loss of habitat through preservation and enhancement in
12 mitigation areas will be included in the Final EIS.

13 **Mitigation Measure Bot-4 (CP5): Mitigate Loss of Jurisdictional Waters**
14 This mitigation measure is identical to Mitigation Measure Bot-4 (CP1).

15 Specific mitigation measures have not been determined for this impact. Within
16 relocation areas, jurisdictional waters of the United States would be avoided
17 when feasible. Potential mitigation lands containing comparable habitat have
18 been identified adjacent to the project. Additional discussion of how these lands
19 may be applied as mitigation and at what ratios will be provided in the Final
20 EIS. A discussion of mitigation for loss of habitat through preservation and
21 enhancement in mitigation areas will be included in the Final EIS.

22 Until the details of this mitigation measure are developed, Impact Bot-4 (CP5)
23 is considered significant and unavoidable.

24 **Mitigation Measure Bot-5 (CP5): Acquire and Preserve Mitigation Lands**
25 **for Loss of General Vegetation Habitats** This mitigation measure is identical
26 to Mitigation Measure Bot-3 (CP1).

27 Specific mitigation measures have not been determined for this impact.
28 Potential mitigation lands containing comparable habitat have been identified
29 adjacent to the project. Additional discussion of how these lands may be applied
30 as mitigation and at what ratios will be provided in the Final EIS. A discussion
31 of mitigation for loss of habitat through preservation and enhancement in
32 mitigation areas will be included in the Final EIS.

33 Until the details of this mitigation measure are developed, Impact Bot-5 (CP5)
34 would remain significant and unavoidable.

35 **Mitigation Measure Bot-6 (CP5): Develop and Implement a Weed**
36 **Management Plan in Conjunction with Stakeholders** This mitigation
37 measure is identical to Mitigation Measure Bot-6 (CP1). Implementation of this
38 mitigation measure would reduce Impact Bot-6 (CP5) to a less-than-significant
39 level.

1 **Mitigation Measure Bot-7 (CP5): Develop and Implement a Riverine**
2 **Ecosystem Mitigation and Adaptive Management Plan to Avoid and**
3 **Compensate for the Impact of Altered Flow Regimes on Riparian and**
4 **Wetland Communities** This mitigation measure is identical to Mitigation
5 Measure Bot-7 (CP3). Implementation of this mitigation measure would reduce
6 Impact Bot-7 (CP5) to a less-than-significant level.

7 **Mitigation Measure Bot-8 (CP5): Implement Mitigation Measure Bot-7**
8 **(CP3): Develop and Implement a Riverine Ecosystem Mitigation and**
9 **Adaptive Management Plan to Reduce Conflicts with Approved Local or**
10 **Regional Plans with Objectives of Riparian Habitat Protection or**
11 **Watershed Management** This mitigation measure is identical to Mitigation
12 Measure Bot-7 (CP3). Implementation of this mitigation measure would reduce
13 Impact Bot-8 (CP5) to a less-than-significant level.

14 **Mitigation Measure Bot-11 (CP5): Revegetate Disturbed Areas; Consult**
15 **with CDFW** This mitigation measure is identical to Mitigation Measure Bot-
16 11 (CP4). Implementation of this mitigation measure would reduce Impact Bot-
17 11 (CP5) to a less-than-significant level.

18 **Mitigation Measure Bot-12 (CP5): Conduct Preconstruction Surveys for**
19 **Special-Status Plants and Avoid Special-Status Plant Populations during**
20 **Construction** This mitigation measure is identical to Mitigation Measure Bot-
21 12 (CP4). Implementation of this mitigation measure would reduce Impact Bot-
22 12 (CP5) to a less-than-significant level.

23 **Mitigation Measure Bot-13 (CP5): Implement Weed Management**
24 **Measures and Revegetation** This mitigation measure is identical to
25 Mitigation Measure Bot-13 (CP4). Implementation of this mitigation measure
26 would reduce Impact Bot-13 (CP5) to a less-than-significant level.

27 **Mitigation Measure Bot-14 (CP5): Implement Mitigation Measure Bot-7**
28 **(CP3): Develop and Implement a Riverine Ecosystem Mitigation and**
29 **Adaptive Management Plan to Avoid and Compensate for the Impact of**
30 **Altered Flow Regimes on Riparian and Wetland Communities** This
31 mitigation measure is identical to Mitigation Measure Bot-7 (CP3).
32 Implementation of this mitigation measure would reduce Impact Bot-14 (CP5)
33 to a less-than-significant level.

34 **Mitigation Measure Bot-15 (CP5): Implement Mitigation Measure Bot-7**
35 **(CP3): Develop and Implement a Riverine Ecosystem Mitigation and**
36 **Adaptive Management Plan to Reduce Conflicts with Approved Local or**
37 **Regional Plans with Objectives of Riparian Habitat Protection or**
38 **Watershed Management** This mitigation measure is identical to Mitigation
39 Measure Bot-7 (CP3). Implementation of this mitigation measure would reduce
40 Impact Bot-15 (CP5) to a less-than-significant level.

1 **12.3.6 Cumulative Effects**

2 A large number of past actions has occurred in the primary and extended study
3 areas. These past actions have substantially degraded botanical resources and
4 wetlands within the study areas. This degradation is indicated by the number of
5 species that have been listed as threatened or endangered under the CESA and
6 Federal ESA, and by the large portion of all native plant species that are now
7 assigned a CRPR, listed by CDFW and CNPS. Consequently, there is an
8 existing significant cumulative impact on botanical resources.

9 Past actions have caused these effects by converting habitat to developed or
10 agricultural land uses, altering biotic interactions or physical processes, and
11 damaging or causing mortality from human activities (e.g., vegetation removal
12 during road, levee, or utility maintenance).

13 Most botanical resources and wetlands in the study areas have been adversely
14 affected by most of the mechanisms described above (i.e., conversion of habitat
15 to developed or agricultural land uses, the spread of invasive species, alteration
16 of physical processes, and human disturbance). Overall, these botanical
17 resources and wetlands have been substantially degraded by past actions, and
18 past actions are continuing to affect them. In particular, the geographic range
19 and abundance (and thus the effects) of many nonnative, invasive plant species
20 that were introduced into the study areas in the past are still rapidly increasing.

21 The construction of Shasta Dam and the subsequent flooding of the area now
22 known as Shasta Lake affected botanical and wildlife resources endemic to the
23 region. For example, based on existing population locations, Shasta snow-
24 wreath populations may have connected at the confluence of the Pit, Squaw,
25 McCloud, and Sacramento rivers before inundation. The creation of Shasta
26 Lake fragmented this species habitat and populations. As a result, these
27 populations are more vulnerable to extirpation.

28 The effects of climate change on operations at Shasta Lake could potentially
29 affect botanical resources both at the lake and downstream. As described in the
30 Climate Change Projection Appendix, climate change could result in higher
31 reservoir releases in the future because of an increase in winter and early-spring
32 inflow into the lake from high-intensity storm events. The change in reservoir
33 releases could be necessary to manage for flood events resulting from these
34 potentially larger storms. The potential increase in releases from the reservoir
35 could lead to long-term changes in flooding frequency and acreages and
36 distribution of vegetation.

37 ***Shasta Lake and Vicinity***

38 As described in Section 12.3, without mitigation, CP1 through CP5 could cause
39 potentially significant effects on botanical and wetland resources in the primary
40 and extended study areas. These effects could be caused by project construction
41 activities; increased elevations of the water surface of Shasta Lake; and
42 alteration of the flow regime of the Sacramento River and associated

1 geomorphic processes, and thus of riparian vegetation. Although causing similar
2 effects, CP1 through CP5 differ in the magnitude of their effects. At Shasta
3 Lake and its vicinity, these potential adverse effects would be similar for all
4 alternatives, but differ with the height of the dam raise: the effects of CP2
5 would be greater than CP1, but less than CP3 through CP5 (which would be
6 identical). Along the upper Sacramento River and in the extended study area,
7 potential adverse effects would be the result of altered flow regimes and would
8 differ with both the height of the dam raise and operation of the dam: the effects
9 of CP2 would be greater than CP1 and CP4 (which would be identical), but less
10 than CP3 and CP5 (which also would have identical effects).

11 At Shasta Lake and vicinity, CP1 through CP5 would cause the loss of MSCS
12 Covered Species, USFS sensitive, BLM sensitive, or CRPR Species,
13 Jurisdictional Waters, and general habitats, and could cause the spread of
14 noxious and invasive weeds. The mitigation measures described in Section
15 12.3.6 would reduce impacts on botanical and wetland resources. However, the
16 adverse effects of CP1 through CP5 caused by construction activities and
17 inundation would not be eliminated, with the exception of noxious and invasive
18 weed impacts (Impact Bot-6). Because the overall effect of past actions on
19 botanical resources and wetlands has been cumulatively significant, and the
20 likely additional effects of reasonably foreseeable future actions on these at
21 Shasta Lake and in its vicinity, the adverse effects under CP1 through CP5
22 (except Impact Bot-6) would potentially be cumulatively considerable and these
23 effects would be potentially cumulatively significant. Because mitigation
24 measures to control the spread of weeds would effectively address the project's
25 impact, however; CP1 through CP5 would not make a cumulatively
26 considerable incremental contribution to an overall significant cumulative
27 impact on plants and wetlands.

28 ***Upper Sacramento River and Extended Study Area***

29 Along the Sacramento River and other rivers downstream from CVP and SWP
30 reservoirs, substantial past alterations to geomorphic processes, vegetation, and
31 associated habitats have resulted in an overall significant and substantial effect
32 on these resources. For example, as a result of past actions, wetland and riparian
33 vegetation occupies less than 10 percent of its historical extent in the Central
34 Valley (DWR 2012). Therefore, additional adverse effects that are considered to
35 be cumulatively considerable incremental contributions would increase the
36 existing significant cumulative impact. This adverse effect would be the result
37 of the continued consequences of past actions (e.g., construction of Shasta Dam
38 and introduction of nonnative species), and of present and foreseeable water
39 resource and levee actions whose adverse effects may not be fully mitigated.

40 Most adverse effects that are the continued consequences of past actions have
41 been considered in the development of existing local and regional plans.
42 Consequently, with respect to local and regional plans, an overall significant
43 cumulative effect does not already exist. However, the adverse effects of all
44 present and reasonably foreseeable water resources and levee actions are not

1 likely to be avoided or fully mitigated. The unmitigated impact of these actions
2 could be sufficiently considerable to result in a significant cumulative impact
3 overall.

4 Habitat loss along the upper Sacramento River and in the extended study
5 area already has resulted in an overall effect on sensitive communities and
6 special-status plants that is significant and substantial. (This is the primary
7 reason that a large number of plant species along the upper Sacramento River
8 and in the extended study area have been listed as threatened or endangered by
9 the State or Federal governments, or have been assigned a CRPR by CDFW and
10 CNPS.)

11 **CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply**
12 **Reliability** As described in Chapter 2, “Alternatives,” without mitigation, by
13 altering the flow regime and associated geomorphic processes on the
14 Sacramento River, CP1 could affect sensitive plant communities and special-
15 status species (Impact Bot-7 (CP1) and Bot-14 (CP1)) and could potentially
16 affect regional or local plans with objectives of riparian habitat protection or
17 watershed management (Impact Bot-8 (CP1) and Bot-15 (CP1)). These effects
18 could occur on the upper Sacramento River and portions of the lower
19 Sacramento River. Because substantial past alterations to geomorphic processes,
20 vegetation, and associated habitats along the Sacramento River have resulted in
21 an overall significant cumulative effect on these resources, additional
22 incremental adverse effects would likely be cumulatively considerable.
23 However, with the implementation of Mitigation Measure Bot-7 (CP1), adverse
24 effects from CP1 on botanical resources and wetlands along the Sacramento
25 River would be fully mitigated. Thus, CP1 would not result in a cumulatively
26 considerable incremental impact on these resources, and the potential to affect
27 regional or local plans would also be eliminated. Therefore, the impacts of CP1
28 would not make a cumulatively considerable incremental contribution to a
29 significant cumulative impact.

30 By altering the flow regimes below CVP and SWP reservoirs in the extended
31 study area, CP1 could possibly cause similar effects on these rivers as along the
32 Sacramento River. (These effects were identified as Impacts Bot-17 (CP1) and
33 Bot-18 (CP1).) However, the alteration of these flow regimes would be less
34 extensive than along the Sacramento River. Even without mitigation, the effects
35 of CP1 on these rivers might not be sufficient to alter the extent or species
36 composition of sensitive communities or to alter the habitats of special-status
37 plant species. In addition, Mitigation Measure Aqua-15 (CP1), “Maintain Flows
38 in the Feather River, American River, and Trinity River Consistent with
39 Existing Regulatory and Operational Requirements and Agreements,” would
40 reduce these effects to a level that is unlikely to alter the extent or species
41 composition of sensitive communities or to alter the extent or quality of habitat
42 for special-status plant species. Therefore, the impacts of CP1 would not make a
43 cumulatively considerable incremental contribution to a significant cumulative
44 impact.

1 By altering flow regimes on the upper Sacramento River, CP1 also could affect
2 designated critical habitat for special-status species of vernal pool habitats
3 (Impact Bot-9 (CP1)). However, vernal pool plant communities and associated
4 special-status species likely would not be affected by any of the alternatives.
5 Therefore, the project would not make a cumulatively considerable incremental
6 contribution to a significant cumulative impact on critical habitat for special-
7 status species of vernal pool habitats.

8 Along the upper Sacramento River and in the extended study area, CP1 could
9 induce growth that results in the loss of sensitive plant communities and
10 special-status plant species (Impacts Bot-10 (CP1), Bot-16 (CP1), and Bot-19
11 (CP1)). Habitat loss has resulted in an overall significant cumulative effect on
12 sensitive communities and special-status plants that is substantial. (It is the
13 primary reason that a large number of plant species along the upper Sacramento
14 River and in the extended study area have been listed as threatened or
15 endangered by the State or Federal governments, or have been assigned a CRPR
16 by CDFW and CNPS.) CP1 could induce growth-related effects because it
17 would increase water yield to water districts, and this could reduce a limitation
18 on growth. For example, most CVP water supports agricultural purposes, and
19 agricultural acreages are not expected to increase substantially over time.

20 However, some increment of the CVP water could be used for municipal and
21 industrial contractors, such as Contra Costa Water District or Santa Clara Valley
22 Water District, as would SWP water. In this case, some growth-related effects
23 could occur from development and have an incremental effect on botanical
24 resources and wetlands. Present and foreseeable future projects are also likely to
25 add to this habitat loss. Although the future effects of any growth-related effects
26 induced by CP1 would be analyzed and mitigated during land use planning and
27 environmental review for site-specific development projects, it is unlikely that
28 all effects would be avoided or fully mitigated. Therefore, CP1 would make a
29 small incremental, but cumulatively considerable, contribution to an existing
30 significant cumulative impact. This would be a cumulatively significant and
31 unavoidable impact.

32 As stated previously, effects of climate change on operations at Shasta Lake
33 could include a higher frequency of high flow events, potentially resulting in
34 changes to downstream vegetation. Potentially significant effects on vegetation
35 and special-status species that would occur with implementation of CP1 could
36 contribute to potentially significant impacts of climate change on habitat
37 acreages and distribution. Although the mitigation measures listed above would
38 be implemented to reduce project-related impacts of CP1, CP1 would still make
39 a cumulatively considerable incremental contribution to a significant cumulative
40 impact on botanical resources and wetlands. This would be a cumulatively
41 significant and unavoidable impact.

42 **CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply**
43 **Reliability** The cumulative effects of CP2 would be similar to those of CP1,

1 but greater in magnitude (because CP2 would entail more substantial alterations
2 of flow regimes). Although greater in magnitude than the effects of CP1, the
3 effects of CP2 on sensitive plant communities and special-status species along
4 the upper Sacramento River and in the extended study area (Impacts Bot-7
5 (CP2), Bot-14 (CP2), and Bot-17 (CP2)), and potential effects on regional or
6 local plans with objectives of riparian habitat protection or watershed
7 management (Impacts Bot-8 (CP2), Bot-15 (CP2), and Bot-18 (CP2)) would not
8 make a cumulatively considerable incremental contribution to a significant
9 cumulative impact, for the same reasons given for CP1.

10 Similarly, although greater in magnitude than the effects of CP1, the impact of
11 CP2 on designated critical habitat for special-status species of vernal pool
12 habitats (Impact Bot-9 (CP2)) would not be a cumulatively considerable
13 incremental contribution to a significant cumulative impact for the same reasons
14 given for CP1.

15 Also similar to CP1, along the upper Sacramento River and in the extended
16 study area, CP2 could cause growth-related effects that result in the loss of
17 sensitive plant communities and special-status plant species (Impacts Bot-10
18 (CP2), Bot-16 (CP2), and Bot-19 (CP2)). However, the potential for CP2 to
19 cause growth-related effects would be greater than for CP1. For the same
20 reasons given for CP1, CP2 would make a small incremental, but cumulatively
21 considerable, contribution to an existing significant cumulative impact. This
22 would be a cumulatively significant and unavoidable impact.

23 As stated previously, effects of climate change on operations at Shasta Lake
24 could include a higher frequency of high flow events, potentially resulting in
25 changes to downstream vegetation. Potentially significant effects on vegetation
26 and special-status species that would occur with implementation of CP2 could
27 contribute to potentially significant impacts of climate change on habitat
28 acreages and distribution. Although mitigation measures listed above would be
29 implemented to reduce project-related impacts of CP2, CP2 would still make a
30 cumulatively considerable incremental contribution to a significant cumulative
31 impact on botanical resources and wetlands. This would be a cumulatively
32 significant and unavoidable impact.

33 **CP3 – 18.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply**

34 The cumulative effects of CP3 would be similar to those of CP1 and CP2, but
35 greater in magnitude. Although greater in magnitude than the effects of CP1 or
36 CP2 (because CP3 would entail more substantial alterations of flow regimes),
37 the effects of CP3 on sensitive plant communities and special-status species
38 along the upper Sacramento River and in the extended study area (Impacts Bot-
39 7 (CP3), Bot-14 (CP3), and Bot-17 (CP3)), and potential effects on regional or
40 local plans with objectives of riparian habitat protection or watershed
41 management (Impacts Bot-8 (CP3), Bot-15 (CP3), and Bot-18 (CP3)) would not
42 make a cumulatively considerable incremental contribution to a significant
43 cumulative impact, for the same reasons given for CP1.

1 Similarly, although greater in magnitude than the effects of CP1 or CP2, the
2 effects of CP3 on designated critical habitat for special-status species of vernal
3 pool habitats (Impact Bot-9 (CP3)) would not make a cumulatively considerable
4 incremental contribution to a significant cumulative impact, for the same
5 reasons given for CP1.

6 Also similar to CP1 and CP2, along the upper Sacramento River and in the
7 extended study area, CP3 could cause growth-related effects that result in the
8 loss of sensitive plant communities and special-status plant species (Impacts
9 Bot-10 (CP3), Bot-16 (CP3), and Bot-19 (CP3)). However, because CP3 would
10 not reserve any storage capacity to specifically focus on increasing M&I
11 deliveries, the potential for CP3 to cause growth-related effects would be less
12 than for CP1 or CP2. For the same reasons given for CP1, CP3 would make a
13 small incremental, but cumulatively considerable, contribution to an existing
14 significant cumulative impact. This would be a cumulatively significant and
15 unavoidable impact.

16 As stated previously, effects of climate change on operations at Shasta Lake
17 could include a higher frequency of high flow events, potentially resulting in
18 changes to downstream vegetation. Potentially significant effects on vegetation
19 and special-status species that would occur with implementation of CP3 could
20 contribute to potentially significant impacts of climate change on habitat
21 acreages and distribution. Although mitigation measures listed above would be
22 implemented to reduce project-related impacts of CP3, CP3 would still make a
23 cumulatively considerable incremental contribution to a significant cumulative
24 impact on botanical resources and wetlands. This would be a cumulatively
25 significant and unavoidable impact.

26 **CP4 – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply**
27 **Reliability** The cumulative effects of CP4 would be the same as CP1, except
28 that CP4 would also result in effects from the gravel augmentation program, and
29 riparian, floodplain, and side channel restoration in the primary study area.

30 However, the gravel augmentation program, and riparian, floodplain, and side
31 channel restoration actions would not make a cumulatively considerable
32 incremental contribution to a significant cumulative impact on botanical
33 resources and wetlands. These additional actions would not cause growth-
34 related effects or effects on vernal pool habitats, but could affect sensitive plant
35 communities, special-status species, and invasive plants. To sensitive
36 communities, the overall, long-term effect of the gravel augmentation program
37 and riparian, floodplain, and side channel restoration actions would be
38 beneficial, and Mitigation Measure Bot-11 (CP4), Revegetate Disturbed Areas;
39 Consult with CDFW, would substantially reduce the effects of any localized,
40 short-term vegetation removal during their implementation. Without additional
41 mitigation, however, these actions could adversely affect special-status species
42 and facilitate the spread of invasive plants. Implementing mitigation measures
43 Bot-12 (CP4), Conduct Preconstruction Surveys for Special-Status Plants and

1 Avoid Special-Status Plant Populations during Construction, and Bot-13 (CP4),
2 Implement Weed Management Measures and Revegetation, would avoid effects
3 on special-status plants and effectively prevent facilitation of the spread of
4 invasive plants.

5 As stated previously, effects of climate change on operations at Shasta Lake
6 could include a higher frequency of high-flow events, potentially resulting in
7 changes to downstream vegetation. Potentially significant effects on vegetation
8 and special-status species that would occur with implementation of CP4 could
9 contribute to potentially significant impacts of climate change on habitat
10 acreages and distribution. However, the gravel augmentation program and the
11 riparian, floodplain, and side channel restoration actions would not make a
12 cumulatively considerable incremental contribution to a significant cumulative
13 impact on botanical resources and wetlands. The overall, long-term effect of the
14 gravel augmentation program and riparian, floodplain, and side channel
15 restoration actions would be beneficial. Further, the mitigation measures
16 described immediately above would be implemented and avoid effects on
17 special-status plants and effectively prevent facilitation of the spread of invasive
18 plants, including during climate change and an expected increase in high-flow
19 events.

20 Consequently, the gravel augmentation and riparian, floodplain, and side
21 channel restoration actions would not make a cumulatively considerable
22 incremental contribution to a potentially significant cumulative impact on
23 botanical resources and wetlands.

24 **CP5 – 18.5-Foot Dam Raise, Combination Plan** The cumulative effects of
25 CP5 would be similar to those of CP1, CP2, CP3, and CP4, but greater in
26 magnitude. Although greater in magnitude than the effects of CP1 through CP4
27 (because CP5 would entail more substantial alterations of flow regimes), the
28 effects of CP5 on sensitive plant communities and special-status species along
29 the upper Sacramento River and in the extended study area (Impacts Bot-7
30 (CP5), Bot-14 (CP5), and Bot-17 (CP5)), and potential effects on regional or
31 local plans with objectives of riparian habitat protection or watershed
32 management (Impacts Bot-8 (CP5), Bot-15 (CP5), and Bot-18 (CP5)) would not
33 make a cumulatively considerable incremental contribution to a significant
34 cumulative impact, for the same reasons given for CP1.

35 Similarly, although greater in magnitude than the effects of CP1 through CP4,
36 the effects of CP5 on designated critical habitat for special-status species of
37 vernal pool habitats (Impact Bot-9 (CP5)) would not make a cumulatively
38 considerable incremental contribution to a significant cumulative impact, for the
39 same reasons given for CP1.

40 CP5 includes the same gravel augmentation program and riparian, floodplain,
41 and side channel restoration actions included in CP4. For the same reasons
42 given for CP4, the effects of the gravel augmentation program and the

1 restoration actions on sensitive communities, special-status species, and spread
2 of invasive plants would not make a cumulatively considerable incremental
3 contribution to a significant cumulative impact.

4 Similar to CP1 through CP4, along the upper Sacramento River and in the
5 extended study area, CP5 could cause growth-related effects that result in the
6 loss of sensitive plant communities and special-status plant species (Impacts
7 Bot-10 (CP5), Bot-16 (CP5), and Bot-19 (CP5)). However, the potential for
8 CP5 to cause growth-related effects would be greater than for CP1 through CP4,
9 because it would result in a greater increase in average annual water yield. For
10 the same reasons given for CP1, CP5 would make a small incremental, but
11 cumulatively considerable, contribution to an existing significant cumulative
12 impact. This would be a cumulatively significant and unavoidable impact.

13 As stated previously, effects of climate change on operations at Shasta Lake
14 could include a higher frequency of high flow events, potentially resulting in
15 changes to downstream vegetation. Potentially significant effects on vegetation
16 and special-status species that would occur with implementation of CP5 could
17 contribute to potentially significant impacts of climate change on habitat
18 acreages and distribution. Although mitigation measures listed above would be
19 implemented to reduce project-related impacts of CP5, CP5 would still make a
20 cumulatively considerable incremental contribution to a significant cumulative
21 impact on botanical resources and wetlands.

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