Chapter 18
Recreation and Public Access

18.1 Affected Environment

This section describes recreational facilities and opportunities and public access in the primary and extended study areas.

18.1.1 Recreation

Shasta Lake and Vicinity

Shasta Lake is the centerpiece of the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA). The Shasta Unit has a total area of approximately 125,500 acres, of which 29,500 acres are currently inundated by Shasta Lake at full pool, leaving approximately 96,000 acres of land area (USFS 1996). Figure 18-1 shows the recreation facilities in the Shasta Unit of the NRA.

Recreation Setting and Activities The USFS, headquartered in Redding, manages the Shasta Unit of the NRA to be a showcase recreational area. Environmental factors such as a hot summer season, steep terrain, and sparse forest cover in some areas favor water-oriented recreation as the main attraction. The focal point of recreation in the Shasta Unit is Shasta Lake itself, with its large surface area and 370 miles of shoreline (USFS 1996). The lake has four major arms; three of the arms are more than 12 miles long at full pool, and all are a mile or more wide at their downstream ends. The main basin of the lake near the dam is about 2 miles across.

Because boating is the predominant recreation activity at Shasta Lake, the lake attracts all types and sizes of powerboats, including personal watercraft (jet skis); runabouts, ski boats, and fishing boats; and larger cabin cruisers, pontoon boats, deck boats, and houseboats (Graefe et al. 2005).

Most fishing at Shasta Lake is done by boat rather than from the shoreline. The summer stratification of the lake into an upper warm layer above a deep cold-water pool provides opportunities for anglers to catch both warm-water and cold-water fish species year-round (USFS 1996).

Because of the steep terrain around the lake, there are no suitable sites for developed beach facilities (USFS 1996), and most swimming is associated with boating. Shasta Lake is also a very popular camping destination.

The primary recreation season at Shasta Lake is the period of approximately 100 days from Memorial Day weekend to Labor Day weekend, although recreation uses occur year-round. Daytime high temperatures during the summer average in the mid to high 90s and in midwinter average in the mid-50s. Nearly all of the 30 to 70 inches of precipitation received by the lake area, mostly in the form of rain but occasionally as snowfall, occurs during late fall, winter, and spring (USFS 1996).

The Shasta Unit is bisected by Interstate 5, which provides easy access in 4 hours or less for more than five million residents of southern Oregon and Northern California (USFS 1996). The population of Shasta County was estimated to be about 181,000 in 2009 (U.S. Census Bureau 2011).

This combination of large size and plentiful water-based recreation opportunities, favorable climate, and easy access make Shasta Lake one of the most visited recreation destinations in the state and region. The Shasta Unit of the Whiskeytown-Shasta-Trinity NRA received approximately 2.4 million recreation visitor days of use in 1994 (USFS 1996). Use levels are reduced during low-water years. Boating use levels as high as 1,400 boats have been recorded on summer weekends in recent years. Houseboats have been found to compose 30 percent to 40 percent of boat traffic on summer weekends (Graefe et al. 2005).

Recreation Facilities The boating, fishing, camping, and other recreation activities enjoyed at Shasta Lake are supported by a diverse range of public, commercial, and private facilities. Table 18-1 summarizes the major types of recreation facilities present.

Recreational boating on Shasta Lake is dependent on access to the water via shoreline facilities such as boat ramps and marinas. Six USFS public boat ramps are dispersed around the lake (USFS 2010a). Total parking capacity at the six ramps is about 600 vehicles (USFS 2007). The three largest ramps also offer accessible boat loading platforms for use by disabled persons (USFS 2010a).

A two-lane low-water ramp is used only when the reservoir is at least 75 feet below full pool, making the other public ramp in that area unusable (USFS 2010a). Parking is on the lake bed, and vault toilets are provided when the ramp is in use.

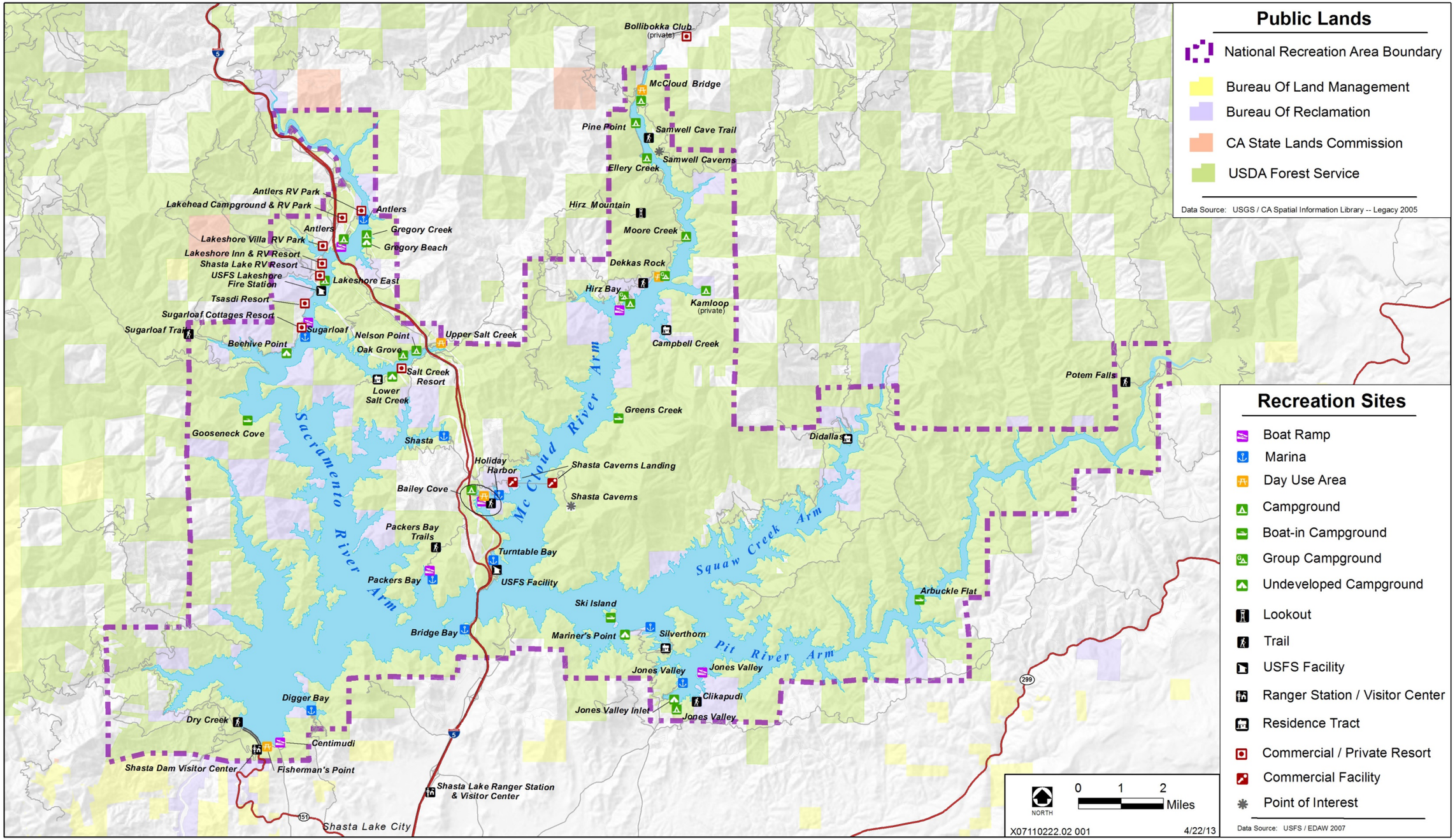

Figure 18-1. Recreation Facilities in the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area

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Table 18-1. Summary of Public, Commercial, and Private Recreation Facilities on Shasta Lake

Type of Facility	Number	Description
Public Facilities		
Boat ramp	6	Each provides parking, restrooms, and two to four paved launch lanes at full pool; there is also a two-lane low-water ramp with parking on the lake bed.
Day-use area	4	Each provides parking, picnic sites with tables and grills, and restrooms.
Family or group campground	15	Twelve family campgrounds with eight to 59 sites per campground; all have flush and/or vault toilets, most have piped water. Three group campgrounds have water and vault toilets.
Shoreline camping area	5	No designated campsites; all are provided with vault toilets, some with piped water.
Boat access campground	4	Eight to 23 sites per campground, accessible only by boat; vault toilets are provided.
Trail/trailhead	12	Twelve trails from one-third mile to 8 miles in length; several trailheads are incorporated into boat ramp or day-use parking areas, while others are stand-alone facilities.
Commercial Facilities		
Marina/marina resort	9	Wide range of sizes and services; most provide boat rentals, moorage, gas, groceries, etc.; some provide campsites and/or cabins.
Nonmarina resort/ RV park	7	Most provide cabins and/or RV and tent sites, moorage, and groceries/sundries. (Note: Five of these have shoreline infrastructure other than floating docks, two do not; additional resorts are nearby but not on the lake shoreline.)
Organization campground	1	Operated for members and the general public by California Kamloops, Inc.; tent camping, accessible only by boat, and boat dock/moorage provided for campers.
Other commercial facility	2	Shasta Lake Cavern tour; provides ferry and bus transport to caverns, moorage for private boats, and a gift shop.
		Bollibokka Club; offers lodging, meals, and guided trout fishing trips on the McCloud River upstream from the lake. (Note: This facility is not within the Whiskeytown-Shasta-Trinity National Recreation Area, but is accessed via a USFS road.)
Private Facilities		
Private cabin	~160	Located in four tracts, managed by USFS for individual recreation use with restrictions on improvements.

Source: USFS 1996

Key:
RV = recreational vehicle
USFS = U.S. Forest Service

Nine commercial marinas and marina resorts, all of which operate under USFS special-use permits, are distributed around Shasta Lake. All of the marinas offer houseboats for rent, providing a combined rental fleet of several hundred houseboats. Some marinas also rent other types of powerboats, personal watercraft, and nonpowered boats. The other primary service offered by most of the marinas is short- and long-term moorage for private boats. In addition to the rental fleets, several hundred private houseboats are moored at these marinas, along with many other powerboats. Additional commercial services are offered at most marinas/marina resorts, such as boat launching, gas sales, stores, and restaurants. Some have tent and recreational vehicle (RV) campsites and cabin or motel accommodations (ShastaLake.com 2011).

Sixteen nonmarina resorts and RV parks are located on or near Shasta Lake. These typically provide some combination of tent and/or RV campsites and cabins with other ancillary amenities such as stores, game rooms, restaurants, and swimming pools (ShastaLake.com 2011). Some of the resorts have special-use permits from USFS for use of a segment of shoreline land and/or installation of a boat dock. Other resorts are situated a short distance from the shoreline but do not provide direct access to the lake.

Thirteen USFS-constructed and concessionaire-operated and maintained family and group campgrounds are located on the lake. These range in size from 8 to 59 sites and generally provide flush and/or vault restrooms and drinking water. Several of the campgrounds are adjacent to a public boat ramp or are served by a nearby ramp. Also available to campers are five shoreline camping areas with vault toilets but no designated sites; boaters may use one of four boat-access campgrounds ranging in size from 8 to 23 sites, each with fire rings, picnic tables, and vault toilets (USFS 2010b). Four USFS day-use sites with views of the lake provide five to nine picnic sites each, along with restrooms and drinking water (USFS 2011). An additional day-use and swim area is at the upstream end of the Salt Creek inlet, but is not currently operational.

Twelve USFS hiking and mountain biking trails, totaling about 25 miles in length, are located on or near the shoreline of Shasta Lake. Several of these trails are accessed via trailheads located at boat ramp and day-use parking areas, while others are served by stand-alone trailheads (USFS 2010c).

A unique commercial recreation service offered at Shasta Lake is the Shasta Caverns Tour. The tour operator uses a parking area, gift shop, and ferry boarding facility on the west shore of the McCloud Arm, and a similar staging area on the opposite shore, where visitors board buses for the short drive to the caverns.

Four USFS-managed “recreation residence” tracts are located on Shasta Lake, with numerous private cabins near the shoreline. USFS policy is to manage these facilities for the individual recreation use of the owners and to keep the areas in a primarily natural state (USFS 1996).

Reservoir Operations and Effects on Recreation Reclamation manages Shasta Lake primarily to provide water supply, which results in an annual cycle of major water level fluctuations at the lake. Such fluctuations affect access to water-based recreation facilities and services. In the typical annual cycle, the reservoir will reach its highest elevation for the year during late spring, then will be gradually drawn down through the summer peak recreation season and into fall. Refilling begins with the arrival of substantial winter rains in the watershed and continues through spring with additional rain and snowmelt. The highest annual reservoir pool level usually occurs between mid-April and mid-May. As the reservoir is drawn down during summer and fall, the lowest elevations are typically reached in November or December (DWR 2011a).

Boating facilities on the lake are generally designed to accommodate these expected and normal fluctuations in reservoir pool levels. All but one of the six primary public boat ramps extend to at least 75 feet below full pool; four extend from 95 feet to more than 200 feet below full pool (USFS 2010a).

Certain boating safety issues are related to pool level fluctuations. Reservoir drawdown places rocks, shoals, and islands just below the water surface where they may be struck by boats. Conversely, rising water levels may put obstacles that were easily seen and avoided one day just beneath the surface the next. Because the lake level varies considerably on a seasonal basis, the pattern of submerged obstacles varies as well.

Rising water levels may also increase the amount of floating debris in the lake, primarily woody debris that may include large tree limbs and logs. The larger debris can present a hazard to boating; even smaller debris can damage props or clog water intake ports in boat-engine cooling systems.

Campers are affected to some degree by falling pool levels because the distance from the campsites to the shoreline increases as the pool level decreases. The sites nearest the shoreline at most public campgrounds will be within a few hundred feet of the water through most summers when the pool level is generally high, but they may be considerably farther from the water during the off-peak seasons or during the latter portion of the peak season in dry years. Because the shoreline terrain is steep in most areas, the drawdown zone is difficult for visitors to use. Drawdown of the reservoir also has aesthetic effects for lake users, with an expanding band of mostly bare earth and rock exposed as the pool level declines.

Upper Sacramento River (Shasta Dam to Red Bluff)

The Sacramento River corridor is an important recreation resource for the northern California region. Access and facilities are found on both public and private land. This section describes existing recreation and public access resources in the primary study area, beginning at and including the downstream side of Shasta Dam and extending to Lake Red Bluff/Red Bluff Pumping Plant

that could be affected by the project. Figure 18-2 shows the recreation facilities in the upper Sacramento River portion of the primary study area.

Shasta Dam Reclamation controls public access at Shasta Dam. For several years, access was available only by permit for security reasons; since 2010, visitors have been allowed to drive across the dam between 6 a.m. and 10 p.m. after producing a valid driver's license and vehicle registration and subjecting their vehicle and any trailer to inspection (Reclamation 2010).

The area immediately below the dam, where the Shasta Powerplant and associated infrastructure is located and where water is released from Shasta Dam and the powerplant, is closed to public use for safety and security reasons.

Shasta Dam to Keswick Dam Recreation facilities provided along this portion of the Sacramento River include the Chappie-Shasta Off Highway Vehicle (OHV) Area, Sacramento River Rail Trail and other trails, Shasta Campground, and Keswick Reservoir Boat Ramp.

Keswick Reservoir occupies nearly the full length of the narrow river gorge that stretches 9 miles from Shasta Dam to Keswick Dam. The reservoir has a healthy population of wild trout, including German browns and rainbows, and fish are occasionally planted by CDFW.

The Chappie-Shasta OHV Area, managed by the U.S. Department of the Interior, Bureau of Land Management (BLM), Redding Field Office, provides opportunities for OHV use on 200 miles of roads throughout 52,000 acres of land. Two staging areas provide access to OHV roads and trails that are rated difficult and moderate. Those roads and trails are open to two-wheeled motorcycles, all-terrain vehicles, and four-wheel-drive high-clearance vehicles (BLM 2006). The Shasta staging area and campground are situated close to the river about 1 mile below Shasta Dam. The campground has 30 campsites for tents and RVs. No water or electricity hook-ups are available (USFS 2010b).

The Sacramento River Rail Trail, a nonmotorized-use National Recreation Trail, extends more than 10 miles along an old railroad line and closely follows the west side of the river and of the shoreline of Keswick Reservoir. The wide and generally flat gravel-surface trail is open year-round to equestrians, hikers, and bicyclists. Trailheads are located at the Chappie-Shasta OHV Area, at Keswick Boat Ramp and Rock Creek, at the southern terminus of the trail, and at a location near the midpoint of the trail. The BLM lands above the east side of Keswick Reservoir have more than 20 miles of trails, primarily single-track nonmotorized trails with a dirt surface, connecting at the north end to Shasta Dam (Healthy Shasta 2009).

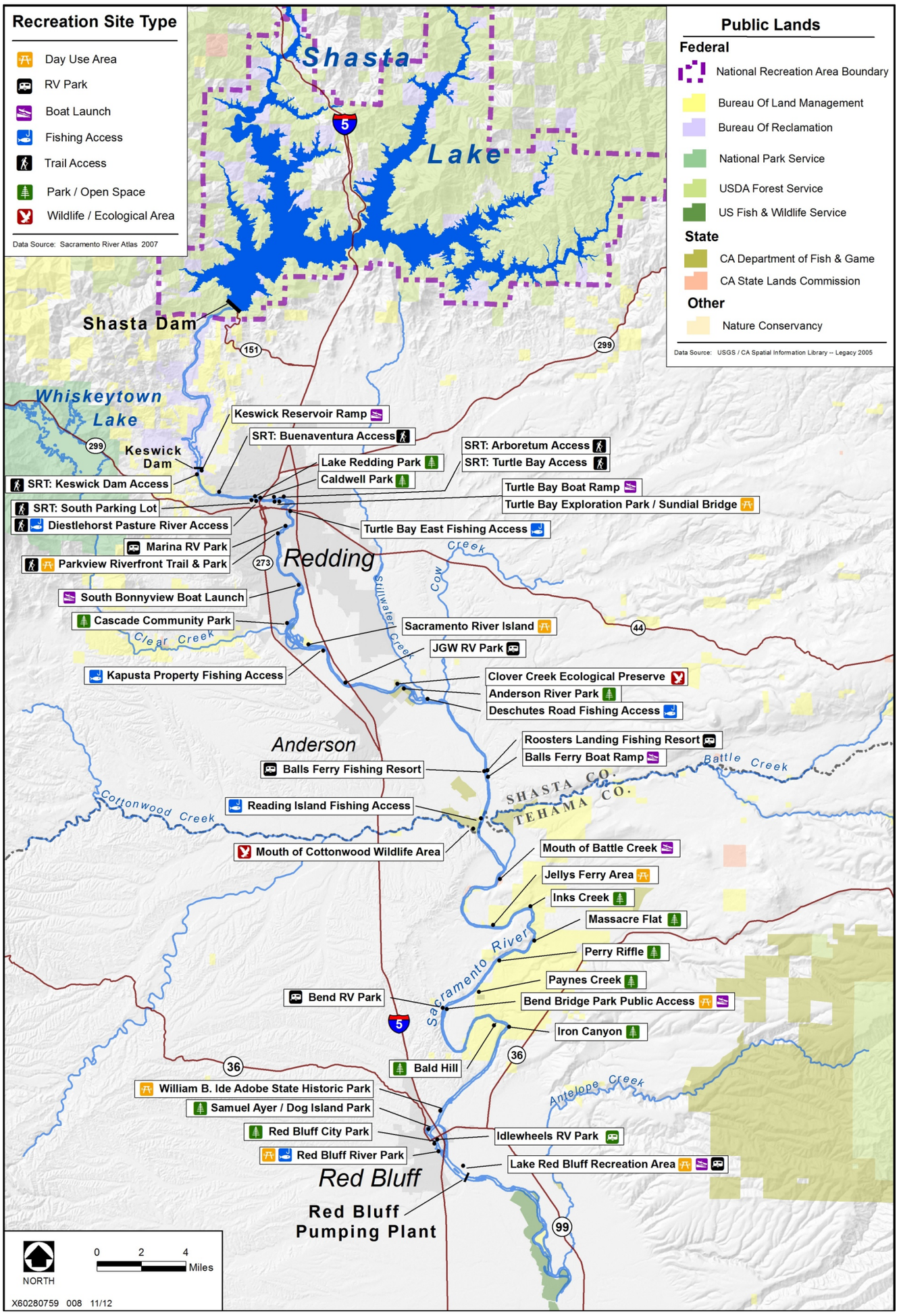

Figure 18-2. Recreation Facilities in the Upper Sacramento River Portion of the Primary Study Area

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Keswick Dam to the Red Bluff Pumping Plant This area encompasses about 60 miles of the Sacramento River and contains the majority of recreation resources and public access sites within the primary study area. Recreational activities are numerous within this area and include fishing, boating, hiking, horseback riding, biking, hunting, camping, picnicking, wildlife viewing/nature observation, viewing historic sites, and enjoying developed urban recreational activities such as soccer and baseball. The discussion below provides a brief overview of the activities supported by the Sacramento River and riverside recreation facilities, followed by additional details about recreation facilities.

Recreational Setting and Activities Between Keswick Dam and the Red Bluff Pumping Plant, the Sacramento River flows past cities and towns and both private and public lands. The riparian forests along the river, the oak woodlands and grasslands on higher ground, and riverside bluffs provide a scenic setting for river users at riverside recreation facilities and for boaters and anglers on the river. The riparian landscape between Redding and Red Bluff is described as the most unspoiled of the entire 375-mile river (DBW 2011a). BLM owns and manages much of the riverside lands between Balls Ferry and Red Bluff (approximately River Mile (RM) 250 to RM 276).

The climate of the northern Sacramento Valley is hot and dry during the summer, with daily high temperatures averaging in the upper 90s Fahrenheit and little or no precipitation. Winter climate can be described as moderate but wet, with average daily high temperatures in the mid-50s during December and January and an average of 4-8 inches of rain per month between November and March.

River use and recreation opportunities available vary throughout the year with the highly variable flow of the river. During the winter and spring, the river may have short-term peak flows of 80,000 to 90,000 cubic feet per second (cfs) and is usually flowing above 20,000 to 30,000 cfs. Flows are less variable during the summer and fall, with typical summer flows of 10,000 to 15,000 cfs and typical fall flows of 5,000 to 10,000 cfs (DWR 2011b). BLM identifies flows of 6,000 to 12,000 cfs as optimal for boating (BLM no date). River temperature is cold year-round because of the release of water from the deep cold-water layers of Keswick Reservoir, and Shasta Lake upstream. Winter water temperatures are in the 40s Fahrenheit and summer water temperatures do not rise above the mid-50s.

The Sacramento River is known for good fishing opportunities. Species such as salmon, steelhead, rainbow trout, sunfish, largemouth bass, and striped bass can be found within the river. Fly fishing is popular, especially when flows are 5,000 to 8,000 cfs, which typically occurs during fall and early winter (Fly Fishing Connection 2003).

Boating opportunities are abundant along the Sacramento River from Keswick Dam to the Red Bluff Pumping Plant. Eight sites along the river provide public boat ramps and two additional sites permit car-top launch and retrieval.

Although the Sacramento River is not generally considered a whitewater river, there are two easy whitewater runs on this section of the river. The first is from Keswick Dam to the Anderson-Cottonwood Irrigation District Diversion Dam in Redding. The second run is from Anderson River Park to William B. Ide Adobe State Historic Park. This run is 22 miles long and rated Class I to Class II. The Class II China Rapid is a few miles upstream from Red Bluff (Tuthill 2005).

Opportunities for trail activities such as walking, jogging, bicycling, and horseback riding are available throughout this stretch of the river. There are 21 sites with trails or access to trails. The most notable trails along this section of river are the Sacramento River Trail and the trails that connect BLM lands below Balls Ferry.

Hunting opportunities are located primarily on BLM land along the Sacramento River. The main hunting areas along the river are Inks Creek, Massacre Flat, Perry Riffle, Paynes Creek, Bald Hill, and Iron Canyon. Hunting is permitted on BLM land unless posted as closed (e.g., along hiking trails and at developed recreation areas). Game species found on BLM lands include quail, dove, waterfowl, deer, pig, bear, and turkey (BLM 1992).

Opportunities for developed camping along or near the river are located mainly at privately operated RV parks and fishing resorts, and are also provided at the public Lake Red Bluff Recreation Area. Most camping opportunities are for RVs, but a few tent and group camping sites are available. Primitive camping is available at five sites within the BLM Sacramento River Area, between about Battle Creek and Payne's Creek, about 10 miles upstream from the Red Bluff Pumping Plant. River visitors may also camp on undeveloped BLM land in the area. The mouth of Inks Creek and 0.75 mile above and below the mouth is closed to camping (BLM 1992).

The Sacramento River corridor provides a beautiful setting for picnickers. A total of 21 sites along this river reach provide picnicking facilities; these sites include municipal parks, RV parks and fishing resorts (private facilities), William B. Ide Adobe State Historic Park, boat ramps, and fishing access sites. Generally, facilities include picnic tables, shade structures (or trees), and barbeque pits.

Another recreation opportunity available along the Sacramento River is viewing historic sites. Historic sites or historical markers exist at a handful of sites.

The Sacramento River meanders through the small cities of Redding, Anderson, and Red Bluff. The municipal parks along this section of the river provide developed urban recreation opportunities such as horseshoes, soccer, and baseball, as well as playgrounds and a swimming pool.

Recreational Facilities More than 40 recreation/public access sites are available along the Sacramento River between Keswick Dam and the Red Bluff Pumping Plant. For this analysis, these sites have been categorized by primary use as

municipal parks, fishing access/day-use areas, boat launches, trail accesses, RV parks, wildlife areas, and undeveloped open space areas. Table 18-2 describes these facilities by type.

Table 18-2. Summary of Recreation Sites along the Sacramento River Between Keswick Dam and the Red Bluff Pumping Plant

Type of Facility	Number	Description
Public Facilities		
Municipal park	6	Managed by the Cities of Redding, Anderson, and Red Bluff. All sites provide parking and picnic sites. Most have restrooms and trails. Several also have boat ramps and two sites have hand launching. Other amenities include horseshoe pits, sports fields, swimming pools, playgrounds, a skateboard park, a fish viewing area, and a bike riding area.
Boat launch	7	Managed by the City of Redding, Shasta County, Tehama County, the State Lands Commission, and the City of Red Bluff. All provide parking and most provide restrooms. One site is a Point of Historical Interest and one site provides raft rentals.
Trail access	6	Managed by Reclamation and the City of Redding. Primarily provide access to Sacramento River Trail. All provide parking, two provide picnic sites, and one provides restrooms. One site has a historical marker and one has a historic powerhouse.
Fishing access/ day-use area	7	Managed by the City of Redding, BLM, and Shasta County. Most provide parking and access to trails. Other amenities include ponds, boat ramps, day-use facilities, group camping, and a community garden.
Wildlife area/ ecological reserve	2	Both managed by CDFW. Mouth of Cottonwood Creek Wildlife Area has parking facilities. Clover Creek Ecological Preserve has no facilities.
Open space area	6	All are managed by BLM. Most have trails, three have parking, and two have restrooms. Other amenities include hand launching, picnic sites, walk-in camping, fishing pond, and beaches. Three are trail or boat access only.
Other public park	2	Lake Red Bluff Recreation Area, administered by USFS, provides river access, day-use, and camping facilities; also includes the Sacramento River Discovery Center. William B. Ide Adobe State Historic Park is a small State Parks unit focused on a historic adobe and related structures.
Subtotal	*35*	
Private/Commercial Facilities		
Educational/nature Park	1	Turtle Bay Exploration Park; includes a museum, butterfly house, live animals, and parking, with access to a scenic pedestrian bridge over the river and the Sacramento River Trail.
RV park	7	The largest facility provides 174 RV sites, four other facilities provide from 44 to 85 RV sites; two “fishing resorts” provide 12 and 20 RV sites. Most provide a boat ramp and showers; other amenities include tent sites, restaurants, swimming pools, a store, a bar, and a group campground.
Subtotal	*8*	
Total – All Facilities	**43**	

Key:
BLM = U.S. Bureau of Land Management
CDFW = California Department of Fish and Wildlife
Reclamation = U.S. Department of the Interior, Bureau of Reclamation
RV = recreational vehicle
State Parks = California Department of Parks and Recreation
USFS = U.S. Forest Service

Municipal Parks Municipal parks in this river section consist of Lake Redding Park, Caldwell Park, and Cascade Community Park (City of Redding); Anderson River Park (City of Anderson); and Samuel Ayer/Dog Island Park and Red Bluff

City Park (City of Red Bluff) (CSUC 2006, City of Redding 2004, City of Anderson 2007). Most of the municipal parks provide facilities such as trails or trail access, restrooms, playgrounds, ball fields, swimming pools, horseshoe pits, and picnic sites. Lake Redding Park (Lake Redding is created by the Anderson-Cottonwood Irrigation District Diversion Dam) provides boating facilities, trails, picnic facilities, horseshoe pits, and restrooms. Anderson River Park provides a similar range of amenities, including a boat ramp.

Fishing Access and Day-Use Sites There are four public fishing accesses in this reach of the Sacramento River: the Turtle Bay East, Kapusta Property, Deschutes Road, and Reading Island fishing accesses. All of the fishing accesses provide parking and most provide trails as well. The sites are managed by the City of Redding, Shasta County, and BLM (CSUC 2006). Reading Island provides a cement boat ramp along a slough leading to the river, but sedimentation and dense aquatic vegetation limit use to small car-top boats. Primitive group camping is also available at Reading Island, under a special-use permit issued by BLM (BLM no date).

Three day-use sites are available on this stretch of the Sacramento River. These sites may provide both fishing and trail access, like that found at Diestlehorst Pasture River Access, managed by the City of Redding. Two BLM-managed day-use sites, Jellys Ferry and Sacramento River Island, are also available (CSUC 2006).

Boat Launch Facilities There are seven sites on this river reach that are primarily for boat launching: Turtle Bay Boat Ramp, Caldwell Park Boat Ramp, and South Bonnyview Boat Launch, operated by the City of Redding; Balls Ferry Boat Ramp, operated by Shasta County; Mouth of Battle Creek Boat Launch, owned by the State Lands Commission; Bend Bridge Park Public Access, operated by Tehama County; and Red Bluff River Park, operated by the City of Red Bluff.

Trails and Trail Access Facilities The Sacramento River Trail is a 13-mile paved urban trail system along the riparian corridor on both sides of the river from Keswick Dam to Turtle Bay Park in Redding. Two pedestrian bridges cross the river to create a loop of about 5 miles. At least six sites provide primary access to the trail and a few other sites provide connections to the trail (Healthy Shasta 2008).

Unlike the boating and day-use facilities that occur throughout this river reach, the trail access sites are primarily on the portion of the river that flows through Redding. Six specific Sacramento River Trail access sites and five other sites, all provided by the City of Redding, also provide access to the Sacramento River Trail.

RV Parks There are seven privately operated RV parks along this reach: one in Redding (Marina RV Park), three in the Anderson area (JGW RV Park, Balls Ferry Fishing Resort, and Roosters Landing Fishing Resort), one near the

community of Bend (Bend RV Park), and two in Red Bluff (Idlewheels RV Park and Durango RV Resort). The two largest parks offer 85 and 174 RV sites. Two of the parks also offer tent camping, and two parks offer group camping. All of the RV parks offer picnic facilities and most offer showers. Three of the parks offer boat launches. Two of the parks offer a restaurant and one offers a bar, swimming pool, and store. The largest park, a new facility in Red Bluff, offers a lap pool and spa, a lodge, two clubhouses for meetings, and 45 acres of surrounding land with walking trails (CSUC 2006).

Wildlife Areas There is one CDFW-owned and managed area along this river reach, the Mouth of Cottonwood Creek Wildlife Area. A parking area is the only improvement at the site. The area is excellent habitat for Swainson's hawk, bald eagle, ringtail, and river otter and provides good wildlife viewing, birding, and photography opportunities (CDFG 2011).

Undeveloped Public Lands There are six areas between Inks Creek and Iron Canyon that, for this analysis, are considered undeveloped open space areas: Inks Creek, Massacre Flat, Perry Riffle, Paynes Creek, Bald Hill, and Iron Canyon. All six areas are managed by the BLM Redding Field Office. Other than parking areas, few facilities are available at most of these areas; they are mainly large open areas available for general public use and enjoyment (CSUC 2006).

Other Public and Private Parks Turtle Bay Exploration Park in Redding is a privately operated facility that contains a museum, butterfly house, forest camp replica, arboretum, and gardens. The park provides access to the scenic Sundial pedestrian bridge over the river, and access to the Sacramento River Trail (Turtle Bay Exploration Park 2011). The 3-acre William B. Ide Adobe State Historic Park in Red Bluff focuses on several historical elements and provides parking, trails, picnic facilities, and restrooms (State Parks 1990).

Lower Sacramento River and Delta

Recreation opportunities on the Sacramento River downstream from Red Bluff Pumping Plant include hunting, fishing, boating, RV/tent/group camping, birding, wildlife viewing, picnicking, hiking, and sports activities (softball, soccer, tennis, basketball, and horseshoes). The 100-mile stretch of river down to Colusa includes many parcels of public conservation and recreation lands, as well as a few privately owned commercial recreation sites. There are two primary landowners on the river: the U.S. Fish and Wildlife Service, with more than two dozen units of the Sacramento River National Wildlife Refuge totaling more than 10,300 acres (many of which are closed to the public) (USFWS 2005); and CDFW, with more than 15 units of the Sacramento River Wildlife Area totaling more than 3,700 acres (most open to the public but accessible only by boat) (CDFG 2004). The California Department of Parks and Recreation (State Parks) operates three park units (one State park and two State recreation areas) on the river between Red Bluff and Colusa–one each near Corning (RM 218), Hamilton City (RM 193 to RM 200), and Colusa (RM 145) (CSUC 2006). An additional State recreation area is located on the Sacramento River in the Delta.

Recreation facilities are located primarily between Red Bluff and the Bidwell–Sacramento River State Park near Hamilton City, about 50 river miles downstream, because of the availability of the State park facilities and privately owned RV parks and resorts. Downstream from Bidwell–Sacramento River State Park, the variety and density of facilities are reduced. Facilities vary from boat ramps and marinas to campgrounds, picnic sites, and trails (CSUC 2006). Beyond the Red Bluff Pumping Plant, recreation and public access would not likely be affected with implementation of the project; therefore, an in-depth review of recreation activities and facilities south of the Red Bluff Pumping Plant is not presented in this analysis.

CVP/SWP Service Areas

CVP and SWP facilities and service areas are widespread throughout much of California. Facilities include multiple dams, reservoirs, and canals that provide substantial water-based recreational activities. Releases from dams on major tributaries to the Sacramento River provide numerous recreational opportunities, especially boating and fishing. Reservoirs such as Folsom, Oroville, and New Melones provide boating, fishing, camping, and other recreational activities.

18.2 Regulatory Framework

18.2.1 Federal

U.S. Forest Service

Shasta Lake and the surrounding Federal lands compose the Shasta Unit of the Whiskeytown-Shasta-Trinity NRA, established by Congress in November 1965 to provide for public outdoor recreation use and enjoyment, among other purposes. Both the Shasta and Trinity units of the NRA are within the Shasta-Trinity National Forest and are administered by USFS. The act establishing the NRA specified that it was to be administered in a manner coordinated with other purposes of the CVP. Reclamation retained management of lands and waters needed for operating the CVP, and controls operation of Shasta Dam and reservoir pool levels. The lake surface and surrounding lands are administered by USFS (an exception is the area in the immediate vicinity of the dam, which is administered by Reclamation).

USFS manages recreation within the Shasta Unit under the authority of the 1987 Master Interagency Agreement between Reclamation and USFS. Administration of the Shasta Unit of the NRA is coordinated with the administration and purposes of the CVP through a memorandum of agreement between Reclamation and USFS established December 31, 1986. The management of Shasta Lake is guided by the 1995 *Shasta-Trinity National Forest Land and Resource Management Plan* (STNF LRMP) and the *Management Guide: Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity NRA* (USFS 1996). The NRA Management Guide is currently being updated.

Shasta-Trinity National Forest Land and Resource Management Plan (1995) The STNF LRMP (USFS 1995a) guides management of both the Shasta and Trinity national forests with the goals of integrating a mixture of management activities that protect forest resources and allow use, fulfill guiding legislation, and address local, regional, and national issues. The project is located within two management units–the Shasta Unit of the Whiskeytown-Shasta-Trinity NRA, which includes Shasta Lake and surrounding lands, and the Front Unit, which includes USFS lands south of the lake. As stated in the STNF LRMP, the Shasta Unit is managed according to the current NRA Management Guide. The portion of the Front Unit located within the primary study area (south of the lake) is managed under Matrix Prescription III, Roaded Recreation. This prescription "emphasizes recreational opportunities associated with developed road systems and dispersed and developed campsites" (USFS 1995a). The STNF LRMP states that this prescription is also the primary prescription for the Shasta Unit of the NRA. The plan provides relevant recreation-related standards and guidelines to ensure road, trail, and facility development and management activities consistent with a Roaded Natural setting.

Shasta-Trinity National Recreation Area Management Guide (1996) The *Shasta-Trinity National Recreation Area Management Guide* (USFS 1996) integrates management of the NRA with and implements the direction in the STNF LRMP. The guide addresses key management concerns related to recreation and other resource management, such as the types and amounts of commercial and USFS recreation facilities to be provided. Desired future conditions for Shasta Lake are described, and management recommendations aimed at implementing the STNF LRMP and achieving desired future conditions are detailed for both lake and land-based recreation and for commercial recreation operations within the NRA.

Mendocino National Forest Land and Resource Management Plan (1995) The *Mendocino National Forest Land and Resource Management Plan* (Mendocino National Forest LRMP) (USFS 1995b) guides management of the Mendocino National Forest with the goals of integrating a mixture of management activities that protect forest resources and allow use, fulfill guiding legislation, and address local, regional, and national issues. Management Area #38, Lake Red Bluff Recreation Area, is at the extreme downstream end of the primary study area. (The Lake Red Bluff Recreation Area was transferred from Reclamation ownership in the late 1980s and is isolated from the rest of the National Forest; all other lands are well to the west of the study area.)

The Mendocino National Forest LRMP states that management and development should conform to the record of decision for the Final EIS for the Lake Red Bluff Recreational Development. Relevant recreation-related major aspects of this decision include a management direction emphasizing supplying quality water-oriented recreation experiences for the public, maintaining a safe setting for recreational users, and providing educational and interpretive opportunities. The management area is also managed under the Recreation Area prescription, which

"provides direction for maintaining attractive landscapes and recreation quality around major lakes and within other areas of concentrated recreation use" (USFS 1995b). The area is to be managed to maintain a Recreation Opportunity Spectrum (ROS) class of "Roaded Natural."

U.S. Bureau of Land Management

Overview BLM administers most of the public lands along the Sacramento River between Shasta Dam and Keswick Dam, and additional lands between Keswick Dam and the city of Redding, as part of the 23,000-acre Interlakes Special Recreation Management Area. BLM administers the Chappie-Shasta Off-Highway Vehicle Area, which encompasses 52,000 acres and 250 miles of roads and trails between the Sacramento River and Clear Creek. BLM also administers more than 17,000 acres of public lands on both sides of the river within the Sacramento River Management Area, which extends from just downstream from Redding downstream to the Tehama County/Glenn County boundary, about 25 miles south of Red Bluff. Most of the BLM lands are concentrated above Red Bluff, between Jellys Ferry and Iron Canyon. A few hundred additional acres of BLM lands are at two island parcels downstream from Red Bluff.

Proposed Redding Resource Management Plan and Final EIS (1992) The proposed resource management plan (RMP) and Final EIS (BLM 1992) for the Redding Resource Area (BLM 1992) identifies proposed management direction for BLM-administered public lands within the Redding Resource Area, totaling approximately 250,000 acres of land in north-central California. The RMP focuses on resolving four main issues: land tenure adjustment, recreation management, access, and forest management. BLM selected a preferred alternative for each of the seven management areas; collectively these preferred alternatives compose the proposed action of the RMP. The project is located within the Shasta and Sacramento River management areas. The Shasta Management Area includes the lands southwest of Shasta Lake within the Interlakes Special Recreation Management Area. General recreation management direction for the entire Redding Resource Area is also provided within the RMP and focuses on ROS designations and guidelines, camping limits, OHV designations, and wild and scenic rivers.

Recreation-related management direction for the Interlakes Special Recreation Management Area includes objectives to provide a regional opportunity for motorized recreation with a focus within the Gene Chappie/Shasta OHV Area and to enhance nonmotorized recreation opportunities within the area via a greenway connecting Redding to Shasta Dam along the Sacramento River. Motorized vehicle use is limited to designated roads and trails that may be closed between November 15 and April 15 to protect the wintering deer herd. The area is managed as Semi-Primitive, Non-Motorized, Semi-Urban, Semi-Primitive Motorized, and Roaded Natural (ROS classes).

The Sacramento River Management Area includes the Sacramento Island area, between Redding and Anderson, a large block of contiguous parcels along the

river between Balls Ferry (RM 276) and Iron Canyon (RM 250), and two islands downstream from Red Bluff. Recreation-related management direction for these areas includes management within the Semi-Primitive Motorized ROS class, closure to motorized vehicles, and an emphasis on boat-in access and use. Because of the special value of the Valley oak riparian forest at Sacramento Island, the area has been designated as a Research Natural Area/Area of Critical Environmental Concern, with special management plans to protect and improve the plant communities and habitat there.

The 25 miles of the Sacramento River between Balls Ferry and Iron Canyon have been determined to be eligible for inclusion in the National Wild and Scenic Rivers System, with recreational, scenic, and wild classifications for various segments. All public lands within one-quarter mile of normal high water will be managed to protect the outstandingly remarkable values and free-flowing character that led to their determination of eligibility.

18.2.2 State

California Department of Fish and Wildlife

CDFW manages the ecological reserve and the wildlife areas within the study area under Title 14 of the California Code of Regulations and the California Fish and Game Code. The regulations provide for various types of public uses in the wildlife areas. However, fish and wildlife protection and enhancement are the primary management purposes of the wildlife areas; recreation and public use is secondary to habitat preservation. Ecological reserves are established to provide rare, threatened, or endangered plants and wildlife and special habitat types; public entry may be restricted to protect wildlife or habitat.

The CDFW-administered wildlife areas on the Sacramento River within the primary and extended study areas are designated by the California Fish and Game Code as “Type C” areas, which generally have no or minimal developed facilities. A “Type C” area designation does not require hunters to have a permit or pass (other than a valid California hunting license and any required stamps) for most areas. General “Type C” area regulations apply to all of the wildlife areas within the study area; special regulations for each area prohibit camping and establish other restrictions on hunting and other uses (see Title 14 of the California Code of Regulations).

CDFW interacts with other management agencies in the study area to ensure that hunting and fishing regulations are enforced on public and private lands and maintains authority over all activities that have the potential to affect wildlife or wildlife habitat. CDFW administers the waterfowl hunting program on a number of Federal wildlife refuges, including the Sacramento River National Wildlife Refuge.

California Department of Parks and Recreation

State Parks manages the State park and recreation areas within the study area under Title 14 of the California Code of Regulations and the California Public Resources Code. Specific management direction and guidance is provided by general plans for individual parks. A preliminary draft general plan was completed for the Bidwell–Sacramento River State Recreation Area in 2003 (a final plan was approved by the California Park and Recreation Commission in 2006 but has not been published). The plan provides specific goals and guidelines for a range of issues related to environmental resources, visitor use and opportunities, and park administration and operations. Additional direction for facility development at each of the park's four subunits is also provided. The management recommendations in the 1990 general plan for William B. Ide Adobe State Historic Park focus on protecting the historic integrity that is the primary value of the 3-acre site, and on protecting the riparian forest in the riverbank area (State Parks 1990). No current park management plans were available for the two other small State Parks units on the river.

18.2.3 Regional and Local

Shasta County

The Open Space and Recreation Element of the *Shasta County General Plan* (Shasta County 2004) is intended to preserve open space for the economy, enjoyment of scenic beauty, recreation, and use of natural resources. The Open Space and Recreation Element addresses recreation as it relates to the tourist industry and recreation at the countywide level. Recreation is considered the active use of open space land. "Recreational areas are essentially open space lands which are designed to accommodate recreational activities such as hiking, picnicking, or camping" (Shasta County 2004). Several sites that fall under the recreation analysis herein are included under Shasta County's Open Space Inventory: the Shasta-Trinity National Forest, BLM holdings, Balls Ferry Fishing Access, Anderson River Park and Fishing Access, Lake Redding–Caldwell Memorial Park, Turtle Bay Regional Park, Turtle Bay East, privately owned and operated recreational facilities such as resorts and RV parks, and historic landmarks and points of interest (Shasta County 2004).

The Open Space and Recreation Element describes goals and objectives for protection of open space and recreation resources including the following (Shasta County 2004):

- Protection of open space through certain land-use classifications
- Coordination of parks and recreation systems planning, acquisition, development, and operation among Federal, State, county, and city governments

- Using the National Resource Protection–Recreation Resources land use designation to protect the quality of recreation resource values of national parks and recreation areas, wilderness areas, and State parks

- Permitting commercial recreation uses

- Requirement of public access and easements provided by the Subdivision Map Act along the Sacramento River (Keswick Dam to the county line) and Battle Creek (downstream from Coleman Powerhouse)

- Provision of public access and easements for recreation if riparian habitat is not significantly affected, public access is not available within a reasonable distance, or the corridor is located near urban, town, and rural community centers

The Public Facilities Element contains a discussion of recreation at the community level. The element states that the "community recreation needs of Shasta County residents and the degree to which these needs are met by County government vary with the type of community in which they live" (Shasta County 2004). Recreation needs in urban areas are primarily for publicly owned parklands. The element identifies that "recreation officials in the unincorporated urban areas of the County indicate that a substantial portion of the recreation needs of the residents of these communities is not being met" (Shasta County 2004).

An increase in recreational demand is expected as a result of the growth of urban areas over the 20-year planning period. County policy "will rely upon interagency planning efforts and providing long-term protection of resource and open space lands and features that exhibit future recreation potential" (Shasta County 2004).

The objective in the Public Facilities Element related to recreation describes developing a land use pattern that adequately serves for community recreation. The policy that supports this objective relates to designation of the locations of existing and proposed large-scale community recreation facilities as Natural Resources Protection Parklands (Shasta County 2004).

Tehama County

The Open Space and Conservation Element of the *Tehama County General Plan Update 2009 – 2029* (March 2009) (Tehama County 2009) addresses several resource areas, including Natural Resource Land and Recreation. The element includes a brief description of national forests located within the county, Lassen Volcanic National Park, BLM lands, State parks, Black Butte Lake (USACE), and county parks. The element states one overarching Natural Resource Land and Recreation goal (Goal OS-9): "To protect and enhance resource lands in the County for the continued benefit of agriculture, timber, grazing, recreation, wildlife habitat, and quality of life" (Tehama County 2009). Supporting policies aim to do all of the following:

- Protect and enhance resource lands
- Protect reasonable access to resource lands and not unreasonably deprive users of enjoyment of previously accessible areas through closure
- Coordinate natural resource practices and recreation plans of different jurisdictions and assure cooperation
- Promote recreation opportunities including agritourism, nature tourism, and environmental learning tourism

The Public Services Element of the general plan includes goals and policies related to recreation facilities. The goals and policies aim to develop local services that meet local needs in a cost-effective manner, including supporting enhanced recreation services for existing and future residents, and obtaining dedicated lands for new schools, libraries, and recreational facilities when existing facilities are not adequate.

City of Redding

The Recreation Element of the City of Redding's general plan (City of Redding 2000) contains goals, objectives, and policies addressing natural and scenic open areas, development of a regional river parkway, archaeological and historic resources related to park and recreation sites, park planning and development, compatibility with adjacent land uses, facility funding and management, recreation programs, a citywide trail system, and vandalism and user safety. The plan specifically recognizes the Sacramento River as "the backbone of the City's park system." Policies are established in the plan for a regional river parkway and for trails along the river, including continued development of the Sacramento River Trail.

The *City of Redding Parks, Trails, and Open Space Master Plan* (City of Redding 2004) includes as part of its parks strategy Goal PK4, "The Sacramento River and its major tributary streams will continue to be the focus and the organizing principle of the park, trail, and open space system." In addition, the plan establishes Goal TB1 within the Trails and Bikeway Strategy, "Promote and facilitate the development of a Citywide Trail System." A subgoal is to "continue development of the Sacramento River Trail to establish a common and continuous thread along the river corridor."

City of Anderson

The Recreation Element of the City of Anderson's general plan "addresses parks and recreation facilities throughout the Anderson Planning Area, including both those owned and maintained by the City of Anderson and those under the purview of other agencies or, selectively, private entities" (City of Anderson 2007). The element describes the city's parks, park classifications and standards, park issues, and the recreation trails network. One of the identified additional park needs is to extend, enlarge, and protect Anderson River Park, which is located within the

primary study area. Relevant recreation-related policies contained with the element aim to do all of the following:

- Allow for expanded and diverse recreational programs, areas, and opportunities
- Facilitate community and cultural opportunities
- Formalize and enhance walking trails in existing city parks
- Provide nonmotorized linkages between parks and open spaces
- Develop and promote community trails to provide health benefits for all residents
- Update the Parks and Recreation System Master Plan, incorporating appropriate provisions of the general plan (including the Trails-Sidewalks Network Concept Plan) into the master plan, and establish clear priorities and phasing plans as part of the master plan process

18.3 Environmental Consequences and Mitigation Measures

18.3.1 Methods and Assumptions

The project could affect recreation and public access resources through a variety of impact mechanisms. Primary effects on recreation facilities and recreation activities at Shasta Lake would be tied directly to the increased full pool elevation. Additional impacts could result from changes in reservoir operations that alter the magnitude, rate, or timing of reservoir drawdown; and from construction-related disruption of recreation access and activities at and near Shasta Dam. Primary conflicts with the use of recreation facilities and recreation-related activities on the Sacramento River and tributaries would be tied directly to the changes in flow regime of the rivers and the seasonal timing of those changes.

More specifically, this chapter evaluates the potential impacts on recreation and public access facilities and recreation activities resulting from the following mechanisms:

- Construction-related disruption of recreation access and activities at and near Shasta Dam
- Seasonal inundation of reservoir recreation facilities and shoreline access sites
- Changes in the magnitude, rate, or timing of reservoir drawdown
- Seasonal inundation of river recreation facilities or access sites

- Increased or decreased river flows during particular recreation use periods

- Disruption of recreation access and boating, or changes in river characteristics related to boating, caused by gravel deposition activities

The evaluation of impacts on Shasta Lake recreation facilities was based on several existing information sources. During previous phases of the project, a detailed inventory was prepared and mapping based on high-resolution aerial photographs was completed for all recreation facilities on or near the shoreline of Shasta Lake. The inventory data included descriptions and elevations for the features of each facility–buildings, paved and unpaved roads, paved and unpaved areas, and miscellaneous objects–up to an elevation 30 feet above the current full pool elevation of 1,067 feet above mean sea level. The inventory data included the lowest and highest elevations at which each feature would be affected (buildings excepted; only the lowest elevation was recorded for buildings). The inventory did not include buried infrastructure such as electric and water lines and septic systems. However, nearly all developed facilities on the lake are known to include these types of improvements, and these would also be among the features affected at most locations.

The CalSim-II computer model, SLWRI 2012 Benchmark Version, was used to aid in the evaluation of potential impacts of the project on water-related resources, including recreation resources. This computer modeling used historical California hydrology data to represent the variety of weather and hydrologic patterns, including wet periods and droughts, under which the project would be operated. Each model run represented a constant level of development (2005 for the existing case and 2030 for the future case), so that the performance of the No-Action Alternative and other alternatives could be evaluated under both existing and future conditions.

For statements based on CalSim-II modeling results (e.g., statements regarding project impacts on mean monthly flow), “existing conditions” refers to modeling runs with 2005 facilities and demands; “future conditions” refers to modeling runs with forecasted 2030 demands and reasonably foreseeable future projects and facilities. The existing and future base cases are the without-project conditions in 2005 and 2030, respectively. The No-Action Alternative represents future conditions in 2030, including other reasonably foreseeable future projects and facilities.

The results of the CalSim-II modeling provide information about the seasonal changes in Shasta Lake pool elevation associated with each dam-raise height. This information was used in combination with the inventory data described above to determine impacts of the alternatives on recreation facilities and activities.

The CalSim-II results also describe flow characteristics for the Sacramento River downstream from Shasta Dam, and for other rivers downstream from reservoirs within the CVP and SWP service areas whose operations may be affected by the project. These data were used to determine potential impacts on recreation and public access on the Sacramento River downstream from Shasta Dam and on tributary rivers and reservoirs within the CVP and SWP service areas. Both average increases and decreases in monthly pool elevation and mean monthly flows were considered with respect to impacts evaluated in this section. Preliminary assessments of impacts on public and commercial recreation facilities at Shasta Lake were reviewed by USFS and revised based on comments received.

A detailed description of the CalSim-II model, the modeling methodology used to evaluate this project, and key assumptions are provided in the Modeling Appendix. Summaries of the analysis and modeling results are provided in Chapter 6, "Hydraulics, Hydrology, and Water Management."

18.3.2 Criteria for Determining Significance of Effects

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

The following significance criteria were developed based on guidance provided by the State CEQA Guidelines, and consider the context and intensity of the environmental effects as required under NEPA. Impacts of an alternative on recreation and public access would be significant if project implementation would do any of the following:

- Substantially affect the operability or seasonal use of or otherwise affect reservoir and river recreation facilities and access sites as a result of water level changes or flow regime modifications
- Substantially increase recreation use such that existing facilities would be used beyond their capacity and degraded
- Substantially reduce recreational opportunities or substantially degrade recreational experiences
- Create hazardous or unusual conditions for boaters, swimmers, waders, or other water-contact activities as a result of increased or decreased

water levels related to flow regime modifications associated with the action alternatives

Significance statements are relative to both existing conditions (2005) and future conditions (2030) unless stated otherwise.

18.3.3 Topics Eliminated from Further Consideration

No topics related to recreation and public access that are included in the significance criteria listed above were eliminated from further consideration. All relevant topics are analyzed below.

18.3.4 Direct and Indirect Effects

No-Action Alternative

Under the No-Action Alternative, the existing Shasta Dam would be operated in the same manner as under current operations. Changes to the reservoir flow regime caused by changes in demand and other factors would be small, with a reduction in Shasta Lake storage of 2 percent to 4 percent during the fall of some years. Relative to existing conditions, the change in Shasta Lake storage under the No-Action Alternative would be minimal, ranging between -2 percent and 1 percent at most times. Also, no new project-related recreation facilities would be constructed and no existing facilities would be altered, expanded, or demolished.

If the project alternatives were not implemented, CVP and SWP operations would likely continue under existing regulatory requirements. Analysis of flow modeling indicates that there would be no significant changes in flows with the potential to affect recreation between existing conditions and future No-Action Alternative conditions.

Under the No-Action Alternative, changes to the flow regime of the upper Sacramento River caused by changes in demand and other factors would be small; mean monthly flows in the Sacramento River would be within ±5 percent of flows under existing conditions at most times. (Flows could increase by a greater amount during late summer and early fall of below-normal, dry, and critical water years[1].) Also, no new recreation facilities would be constructed and no existing facilities would be altered, expanded, or demolished.

Under the No-Action Alternative, the flow regime in the lower Sacramento River and Delta and in the CVP/SWP service areas would not change as a result of Shasta Lake operations.

Shasta Lake and Vicinity

Impact Rec-1 (No-Action): Increased Use of Shasta Lake Recreation Facilities and Demand for Recreation Opportunities on Shasta Lake and in the Vicinity

Demand for recreation facilities at Shasta Lake and in the vicinity is expected to

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

increase, but recreation opportunities would still be extensive and varied. This impact would be less than significant.

Recreational use at Shasta Lake and in the vicinity is expected to increase in the future simply based on population growth in Northern California and southern Oregon from now until 2030. The resulting increase in demands on all recreational facilities and opportunities could affect the quality of the recreational activity. Recreational opportunities would still be extensive and varied in the area, however, and USFS management of the Shasta Unit of the Whiskeytown-Shasta-Trinity NRA would continue to respond to changing recreation needs. Because no substantial hydrologic changes are anticipated under the No-Action Alternative, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Rec-2 (No-Action): Increased Use and Demand for Recreation Opportunities on the Upper Sacramento River Demand for recreation facilities along the upper Sacramento River is expected to increase, but recreation opportunities would still be extensive and varied. This impact would be less than significant.

Recreational use in the upper Sacramento River portion of the primary study area is expected to increase in the future simply based on population growth in Northern California from now until 2030. The resulting increase in demands on all recreational facilities and opportunities could affect the quality of the recreational activity. Recreational opportunities would still be extensive and varied in the area, however. Because no substantial hydrologic changes are anticipated under the No-Action Alternative, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Lower Sacramento River and Delta

Impact Rec-3 (No-Action): Increased Use and Demand for Recreation Opportunities on the Lower Sacramento River and in the Delta Demand for recreation facilities along the lower Sacramento River and in the Delta is expected to increase, but recreation opportunities would still be extensive and varied. This impact would be less than significant.

Recreational use in the lower Sacramento River and Delta portions of the extended study area is expected to increase in the future simply based on population growth in Northern and Central California from now until 2030. The resulting increase in demands on all recreational facilities and opportunities could affect the quality of the recreational activity. Recreational opportunities would still be extensive and varied in the area, however. Because no substantial hydrologic changes are anticipated under the No-Action Alternative, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

CVP/SWP Service Areas

Impact Rec-4 (No-Action): Increased Use and Demand for Recreation Opportunities in the CVP and SWP Service Areas Demand for recreation facilities in the CVP/SWP service areas is expected to increase, but recreation opportunities in the CVP/SWP service areas would still be extensive and varied. This impact would be less than significant.

Recreational use in the CVP/SWP service areas within the extended study area is expected to increase in the future simply based on population growth in California from now until 2030. The resulting increase in demands on all recreational facilities and opportunities could affect the quality of the recreational activity. Recreational opportunities would still be extensive and varied in the area, however. Because no substantial hydrologic changes are anticipated under the No-Action Alternative, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

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

By increasing storage at Shasta Lake, this alternative would change the full pool elevation and seasonal pool elevations at Shasta Lake, and the flow regime downstream in the Sacramento River and potentially several other reservoirs and downstream waterways. In turn, these alterations to reservoir pool elevations and river flows could affect the usability of several types of recreation facilities on Shasta Lake and the downstream reservoirs and waterways, particularly marinas, boat ramps, and nearshore campgrounds and day-use areas. These alterations could also affect the ability of recreationists to use the reservoirs and waterways for boating, camping, fishing, and similar activities.

The full pool elevation of Shasta Lake would increase by 8.5 feet and the pool elevation would average as much as 6 to 10 feet higher than under existing (2005) and No-Action Alternative (2030) conditions at various times of the year. The greatest change would occur during the wettest years. The surface area of the reservoir at full pool would increase by about 1,100 acres (4 percent) with a 6.5-foot dam raise. The width of the water body would not increase substantially in most areas, and much of the increase would occur during spring rather than during the high-traffic summer boating period.

At most times, flows in the upper Sacramento River within the primary study area (between Shasta Dam and the Red Bluff Pumping Plant) under CP1 would be within about ±5 percent of flows under existing (2005) and No-Action Alternative (2030) conditions.

Reservoir- and river-based recreation facilities and activities are similar in the primary and extended study areas downstream from Shasta Lake; thus, potential effects on reservoir and river recreation would be similar. However, changes to the flow regime affecting reservoirs and rivers in the extended study area would be increasingly attenuated by flows from tributary waterways and other water

sources and diversions that are unaffected by the project, reducing the level of effects downstream.

Shasta Lake and Vicinity

Impact Rec-1 (CP1): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation The 8.5-foot increase in full pool elevation associated with a 6.5-foot dam raise would cause seasonal inundation of recreation facilities or portions of facilities surrounding Shasta Lake. In many years, the reservoir would fill to an elevation greater than the current full pool elevation of 1,067 feet; in some years, it would fill to the new full pool elevation of 1,075.5 feet. In each case, portions of existing recreation facilities on the shoreline would be inundated, resulting in substantial effects. However, the affected recreation facilities would be relocated during construction and before inundation. As described in Chapter 2, Alternatives, the replacement facilities would be of equivalent overall capacity and quality to the affected facilities; would provide comparable shoreline access, where applicable; and would comply with Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) guidelines. Therefore, this impact would be less than significant.

Within each of the three arms of Shasta Lake with recreation development, effects of implementing CP1 on individual recreation facilities would vary. These effects would range from no effect to effects on several of the facilities' inventoried and mapped features (e.g., roads, parking, and restrooms or other buildings) and on features not specifically inventoried (e.g., campsites and picnic sites). Table 18-3 shows the anticipated effects of CP1 on inventoried and mapped (developed) recreation facilities.

Table 18-3. Effects of CP1 on Developed Recreation Facilities at Shasta Lake

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Sacramento Arm	
Boat Ramps	
1. Antlers Public Boat Ramp	Boat ramp length reduced but ramp usable; parking lot and restroom unaffected
2. Centimudi Public Boat Ramp	Boat ramp entirely affected, most of lower parking lot affected, access road to ramp and parking partly affected
Campgrounds	
1. Antlers Campground	No effect–all features are above full pool elevation
2. Gregory Creek Campground	One restroom affected and shoreline campsites affected
3. Lakeshore East Campground	One restroom, lower portion of access road, and some campsites affected; access substantially affected
4. Nelson Point Campground	Campground access road and possibly some campsites affected
5. Oak Grove Campground	No effect–all features are above full pool elevation

Table 18-3. Effects of CP1 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Boat-in Campgrounds	
1. Gooseneck Cove Boat-in Campground	Some shoreline campsites likely affected
Day-Use Areas	
1. Fisherman's Point Day Use Area	Access road, parking, and restroom unaffected, but part of use area affected
2. Salt Creek Swim Area (nonoperational)	Restroom and portion of paved pathway affected
Marinas	
1. Antlers Resort and Marina	One building affected, boat ramp partially affected
2. Digger Bay Marina	Bottom portion of marina road/ramp affected, but effects appear minor
3. Shasta Marina Resort	Office and equipment shed affected, parking and access roads partially affected
4. Sugarloaf Resort and Marina	Electrical service building and associated structures affected, boat ramp and unpaved parking areas partially affected
Resorts (Nonmarina)	
1. Lakeshore Inn and RV Park	Shoreline campsites and walkway may be affected; access substantially affected
2. Lakeshore Villa RV Park	No effect–entire facility is above full pool elevation
3. Salt Creek Resort and RV Park	Resort unaffected; lower part of old road bed used as boat ramp affected, but usable
4. Shasta Lake RV Resort	No effect–entire facility is above full pool elevation; access substantially affected
5. Sugarloaf Cottages Resort	Unpaved shoreline access roads affected but usable
6. Tsasdi Resort	Entrance and exit roads connecting to Lakeshore Drive affected; resort cabins appear to be unaffected
Trails[1]	
1. Dry Fork Creek Trail	Trailhead and portion of trail along shoreline affected
2. Fisherman's Point Trail	Portion of trail along shoreline affected
Other Facilities	
USFS Lakeshore Fire Station	Five buildings affected, entrance road partially affected; access substantially affected
Salt Creek Recreation Residence Track Cabins	No effect–all cabins are above full pool elevation
McCloud Arm	
Boat Ramps	
1. Bailey Cove Boat Ramp and Day Use Area	Boat ramp entirely affected, parking area, day-use area, and access road partially affected
2. Hirz Bay Public Boat Ramp	Boat ramp entirely affected; some of lower parking area likely to be affected

Table 18-3. Effects of CP1 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Campgrounds	
1. Bailey Cove Campground	Campsites appear unaffected; access road may be affected
2. Dekkas Rock Campground	Lower part of loop road affected; possibly a portion of group camp affected
3. Ellery Creek Campground	Lower portion of loop road and shoreline campsites affected
4. Hirz Bay Campgrounds	No effect–entire facility is above full pool elevation
5. Kamloop Camp (private organization)	No effect–entire facility is above full pool elevation
6. McCloud Bridge Campground	Portion of access road affected; some campsites likely affected
7. Moore Creek Campground	Lower portion of loop road and shoreline campsites affected
8. Pine Point Campground	No effect–entire facility is above full pool elevation
Boat-in Campgrounds	
1. Greens Creek Boat-in Campground	Some shoreline campsites likely affected
Day-Use Areas	
1. Dekkas Rock Day Use Area	Lower portion of loop road and some parking affected
2. McCloud Bridge Day Use Area	Part of use area affected (no permanent infrastructure present)
Marinas	
Holiday Harbor Marina	Two marina buildings and boat ramp affected, overflow parking partially affected; RV park/campground likely to be partially affected
Trails[1]	
1. Bailey Cove Trail	Portion of trail along shoreline affected
2. Hirz Bay Trail	Portion of trail along shoreline affected
3. Samwel Cave Nature Trail	Portion of trail along shoreline affected
Other Facilities	
1. Bollibokka Club	No effect–entire facility is above full pool elevation
2. Campbell Creek Residence Track cabins	At least four cabins affected, possibly others also affected
3. Shasta Caverns ferry landing	Access roads serving east and west shore landings partially affected; parking and building unaffected
4. USFS Station (Turntable Bay)	Four buildings affected and access road affected
Squaw Arm	
Other Facilities	
1. Didallas Recreation Residence Track cabins	At least one cabin affected; possibly others also affected

Table 18-3. Effects of CP1 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Pit Arm	
Boat Ramps	
1. Jones Valley Public Boat Ramp	Boat ramp entirely affected, access road from parking area partially affected
2. Packers Bay Public Boat Ramp	Boat ramp and information shelter affected, parking partially affected
Campgrounds	
1. Lower Jones Valley Campground	Footbridge associated with trail affected; culverts and creek may back up into campground during high-water periods
2. Upper Jones Valley Campground	No effect–entire facility is above full pool elevation
Boat-in Campgrounds	
1. Ski Island Boat-in Campground	Some shoreline campsites likely affected
2. Arbuckle Flat Boat-in Campground	Some shoreline campsites likely affected
Marinas	
1. Bridge Bay Resort and Marina	Seven buildings, boat ramp, parking lots, and roads affected
2. Jones Valley Resort	Three buildings and access road affected, parking area and resort roads partially affected
3. Packers Bay Marina	Boat ramp partially affected but usable
4. Silverthorn Resort	Parking and ramp mostly affected, shoreline road partially affected
Trails[1]	
1. Clikapudi Trail	Portion of trail along shoreline affected
2. Packers Bay Trails	Portion of trails (3 out of 4 trails) along shoreline affected
Other Facilities	
1. Silverthorn Recreation Residence Track cabins	No effect–all cabins are above full pool elevation

Source: Reclamation 2003

Note:
[1] For some trails, trailheads are integrated into other recreation facilities. Alternative effects identified for standalone trailheads only.

Key:
RV = recreational vehicle
USFS = U.S. Forest Service

On the Sacramento Arm, one of the two boat ramps, two of the five campgrounds, and one of the four marinas would be subjected to effects on several features or a substantial portion of the facility's use area. Access to three resorts in the Lakeshore area would be substantially affected due to accessibility despite minor direct impacts to facilities. Other facilities that would be subject to major effects are the USFS Lakeshore Fire Station, Dry Fork Creek trail and trailhead, and

Fisherman's Point trail. The only operational day-use area, one campground, and one boat-in campground would be subject to a somewhat lesser but still substantial effect, while several additional facilities would be subject to relatively minor effects.

On the McCloud Arm, the one marina and both boat ramps would be subject to major effects, as would the USFS station at Turntable Cove, and Bailey Cove trail. At least four of the cabins in the recreation residence tract at Campbell Creek would be affected. Effects would be less, but still substantial at four of the seven public campgrounds and one of the two day-use areas. The other day-use area, boat-in campground, and other two trails would have less-than-substantial effects.

On the Squaw Creek Arm, one private cabin in the Didallas recreation residence tract would be affected. On the Pit Arm, both of the boat ramps, three of the four marinas, and Clikapudi and Packers Bay trails would be subject to major effects, whereas one campground and two boat-in campgrounds would experience a lesser effect.

Although they are not included in the table because of a lack of permanent infrastructure, shoreline camping areas at Beehive Point (Sacramento Arm), Gregory Beach (Sacramento Arm), Lower Salt Creek (Sacramento Arm), Jones Valley Inlet (Pit Arm), and Mariner's Point (Pit Arm) would also be subject to substantial effects with the inundation of access roads and use areas.

It is important to note that effects on roads and bridges that are outside of the recreation facilities themselves but are used to access the facilities would also affect recreation at Shasta Lake. (Effects on roads and bridges are discussed in more detail in Chapter 20, "Transportation and Traffic.") A prominent example is the effect on a long stretch of Lakeshore Drive, the primary route on the west side of the Sacramento Arm providing visitors access to several commercial recreation facilities (marinas and nonmarina resorts) and a campground. Effects on the road would begin at a small segment near the north end of the Doney Creek Bridge and extend about 2 miles south to the Sugarloaf area. Two major bridges over inlets of the lake would be affected as well. (These roads and bridges are also used to access private homes and nonrecreation businesses.) Numerous segments of Shasta County and USFS roads that provide access to facilities or the shoreline on each of the lake's arms would also be affected.

In summary, the most prominent direct effects on recreation facilities and public access at Shasta Lake and in the vicinity from the 6.5-foot dam raise would be the major effects on five of six boat ramps, six of 15 family and group campgrounds, five of nine commercial marinas, three of six resorts, two of four recreation residence tracks, and USFS stations on both the Sacramento and McCloud arms. A lesser effect would occur at several day-use areas, campgrounds, and boat-in campgrounds, and minor effects would occur at several additional facilities. Table

18-4 summarizes the number of recreation facilities of specific types substantially affected.

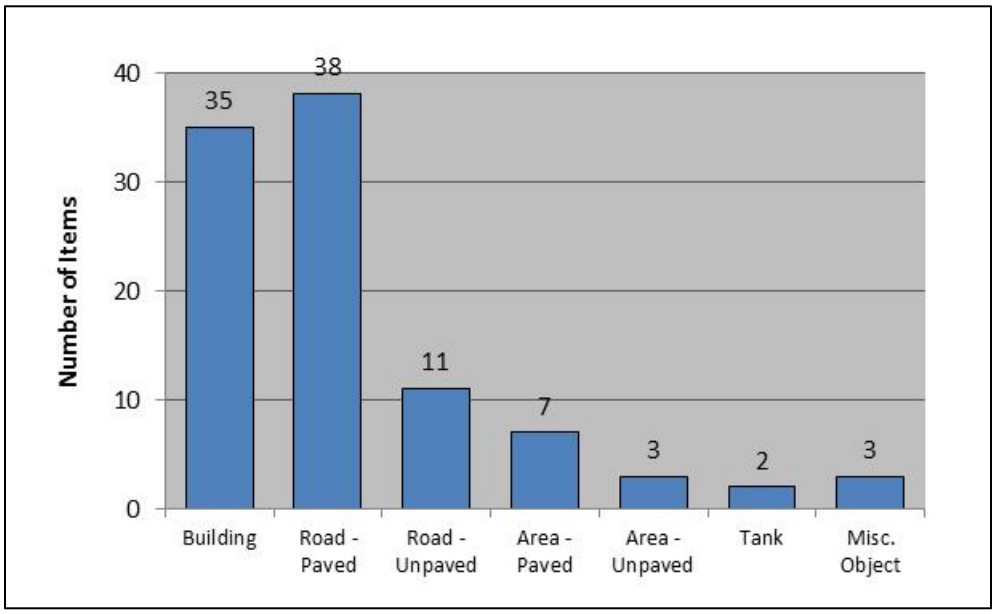
Table 18-4. Summary of Shasta Lake Recreation Facilities Substantially Affected by CP1

Type of Facility	Number of Facilities Affected
Boat ramp	5
Marina	5
Resorts	3
Campground (family and group)	6
Day-use area	1
USFS operations	2
Trailhead/Trails	1/5
Recreation residence tract	2

Source: Reclamation 2003

Key:
USFS = U.S. Forest Service

Figure 18-3 depicts the total number of inventoried Shasta Lake recreation facility items, at all recreation facilities combined, that would be affected by inundation under CP1. A total of 99 facility and infrastructure elements would be affected, with nearly three-fourths of those being buildings and segments of paved roads. A lesser number of unpaved road segments, paved and unpaved areas (usually parking areas), tanks, and miscellaneous objects would also be affected.



Source: Reclamation 2003

Figure 18-3. Number of Recreation Facility Infrastructure Items Affected by a 6.5-Foot Dam Raise Under CP1

As described in Section 2.3.8 in Chapter 2, "Alternatives," affected recreation facilities would be relocated as part of the construction activities for all action alternatives. This could include relocation of affected portions of facilities within existing use areas, in adjacent undeveloped areas, or at new sites in the general vicinity of the lake. Because of the possible consolidation of facilities, the total number of facilities of specific types may be reduced. However, all affected recreation capacity would be replaced. Replacement facilities would be of equivalent overall capacity and quality to affected facilities and would provide comparable shoreline access, where applicable. With the relocation of affected facilities, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-2 (CP1): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam Construction activity that would be necessary to raise Shasta Dam and complete related modifications would prevent recreation visitors from crossing the dam, and thus could affect other recreation activities in the area. These effects are expected only during the construction period. However, this impact would be potentially significant.

One of the primary routes used by recreation visitors to the Chappie-Shasta OHV Area, situated below Shasta Dam on the west side of Keswick Reservoir, crosses Shasta Dam. It is assumed that public access to the road crossing the dam would be temporarily suspended during the construction phase of the project. An alternative route to the Chappie-Shasta OHV Area from the south exists; however, that route requires several more miles of travel on unpaved roads than the route across the dam, and it may not be suitable for some visitors to the OHV area who bring OHVs to the area on trailers.

The road across the dam is also the primary access route to the Dry Fork Creek trailhead near the west end of Shasta Dam, used by hikers and anglers to access the Dry Fork Creek Trail, which follows the shoreline of Shasta Lake. Access to this trailhead and trail would be disrupted during the project construction period. (As noted under Impact Rec-1 (CP1) above, the trailhead itself would be destroyed by modifications to the dam and portions of the trail would be affected by the increased reservoir elevation.)

Construction at Shasta Dam would also result in a temporary cessation of Reclamation's public tours of the dam and powerhouse. In addition, noise, dust, and aesthetic changes would disturb recreation visits to the Shasta Dam Visitor Center (situated just below the east end of the dam).

For the reasons described above, this impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5.

Impact Rec-3 (CP1): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir An increase in the magnitude or rate or changes in the timing of the

annual summer and fall drawdown of Shasta Lake could adversely affect boating enjoyment and safety on the reservoir. Conversely, a reduced or slower drawdown could have beneficial effects. However, under CP1, reservoir operations would be similar to existing operations, except during dry and critical water years. Little change would occur in the annual magnitude, rate, or timing of reservoir drawdown associated with any water year type. Therefore, this impact would be less than significant.

Over the past decade, Shasta Lake has had an average drawdown of about 67 feet from the annual high pool. (The annual high pool is typically reached in April or May; the reservoir is drawn down during summer and fall, before the winter rains arrive.) During most of those years, the drawdown has been in the range of 50 to 85 feet, but it has been as much as 108 feet and as little as 38 feet. Total drawdown, as compared to the full pool elevation of 1,067 feet (which the reservoir does not reach every year), has averaged about 77 feet and has been as great as 130 feet.

Both public launch ramps and commercial recreation facilities such as marinas and shoreline resorts on the lake are designed and operated to remain functional at a wide range of pool elevations, although some facilities are closed or have restricted use below certain pool elevations. Table 18-5 shows simulated exceedences for public boat ramp availability for selected months. Boaters familiar with the lake generally know to expect a substantial annual drawdown and are aware of the effects of drawdown on facilities and navigation on the lake. Signs at boat ramps and marinas warn boaters of the potential for rapidly changing conditions on the lake as a result of regular seasonal drawdowns.

Table 18-5. Simulated Percent Exceedence of Shasta Lake Public Boat Ramp Availability for Future Conditions

		May					
Public Boat Ramp	**Minimum Ramp Elevation (feet)**	**No-Action**	**CP1**	**CP2**	**CP3**	**CP4**	**CP5**
Antlers	991	90%	90%	90%	90%	93%	90%
Bailey Cove	1013	86%	87%	87%	88%	90%	87%
Centimudi	844	100%	100%	100%	100%	100%	100%
Hirz Bay	920	99%	99%	99%	99%	99%	99%
Jones Valley	852	100%	100%	100%	100%	100%	100%
Packers Bay	947	96%	98%	98%	98%	99%	98%
Sugarloaf	914	99%	99%	99%	99%	99%	99%

Table 18-5. Simulated Percent Exceedence of Shasta Lake Public Boat Ramp Availability for Future Conditions (contd.)

July							
Public Boat Ramp	**Minimum Ramp Elevation (feet)**	**No-Action**	**CP1**	**CP2**	**CP3**	**CP4**	**CP5**
Antlers	991	81%	81%	82%	82%	88%	83%
Bailey Cove	1013	63%	66%	68%	73%	79%	73%
Centimudi	844	99%	99%	100%	99%	100%	100%
Hirz Bay	920	94%	94%	94%	94%	96%	94%
Jones Valley	852	98%	99%	99%	99%	100%	99%
Packers Bay	947	91%	90%	90%	91%	93%	90%
Sugarloaf	914	95%	95%	94%	95%	97%	94%
September							
Public Boat Ramp	**Minimum Ramp Elevation (feet)**	**No-Action**	**CP1**	**CP2**	**CP3**	**CP4**	**CP5**
Antlers	991	63%	70%	71%	73%	80%	74%
Bailey Cove	1013	32%	46%	55%	60%	64%	60%
Centimudi	844	96%	96%	97%	97%	100%	97%
Hirz Bay	920	91%	91%	91%	91%	92%	90%
Jones Valley	852	96%	96%	95%	96%	100%	95%
Packers Bay	947	86%	87%	88%	88%	91%	88%
Sugarloaf	914	91%	91%	91%	91%	93%	91%

Potential adverse effects of an increase in the magnitude or rate of drawdown include an increase in seasonally exposed shoals and other boating hazards, and increased navigation challenges compared to what boaters have typically experienced in past years. Other potential adverse effects of such changes in drawdown include a need to more frequently adjust docks and moorings at boat launches and marinas and other locations, and an increase in the distance between developed shoreline campsites and day-use areas and the water's edge. Facilities that operate only above a certain pool level would be usable for a shorter period of time each year. Aesthetically, an increased drawdown would result in a less appealing recreation setting characterized by a wider unvegetated inundation zone.

Conversely, a reduced drawdown or slower drawdown during the primary summer boating season could have beneficial effects by reducing the adverse effects described above, which normally occur to some degree each year under existing conditions and would continue under the No-Action Alternative.

Under CP1, storage would increase but reservoir operations would be similar to existing operations, except during dry and critical water years; therefore, the

character of the annual reservoir drawdown would not be expected to change greatly in most years. This conclusion is confirmed by CalSim-II modeling results, which indicate that the reservoir elevation would be as much as 10 feet higher at various points in the year, but that the magnitude, rate, and timing of the annual drawdown would be essentially unchanged relative to the existing (2005) and No-Action Alternative (2030) conditions. As a result, no effects related to drawdown changes are expected under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-4 (CP1): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone At full pool, the increased pool elevation would result in approximately 730 acres of newly inundated area where the existing trees and other vegetation would not be removed. Anglers would generally benefit from the associated enhancement of fish habitat; however, the standing trees and stumps remaining in these areas would increase the number of areas and total acreage where this type of hazard to boaters and other recreation visitors would exist. Therefore, this impact would be significant.

Approximately 730 acres (66 percent) of the 1,100 acres of newly inundated area that would result from the 6.5-foot dam raise at full pool would receive no vegetation treatment (no vegetation removed), to maximize the habitat benefits of inundated and residual vegetation. The remaining 370 acres would be subject to either complete vegetation removal or overstory removal. In areas of overstory removal, all trees greater than 10 inches in diameter at breast height would be removed, with stumps cut to within 24 inches of the ground surface. The intent of these treatments would be to minimize the risk to boaters and other visitors from snags and water hazards. These treatments would be targeted for areas adjacent to developed recreation sites and houseboat mooring areas, and other areas where snags pose the greatest risk to boaters.

Because no vegetation would be removed from portions of the newly inundated area, the area at Shasta Lake where boaters would be exposed to potential hazards from standing timber and stumps would increase. The hazards may increase as the trees die and decay, leaving stumps that may be at or just below the water surface. The hazard represented by the standing timber and stumps would exist only when the reservoir surface elevation is above the current full pool elevation, which would occur only during the highest pool elevation period (generally late spring and early summer) of wetter-than-normal years.

Although the number and acreage of areas where this hazard would be present would expand, the hazard already exists on portions of the Pit and Squaw Creek arms of the lake, where vegetation was not cleared when the reservoir was constructed and where numerous inundated trees still exist. The Shasta Lake Boating Safety brochure provided to Shasta Lake boaters by USFS warns that numerous underwater obstacles (as well as floating debris and shallows) are present and not marked, and that responsibility for boating safety rests with each

individual vessel operator. Also, the Shasta County ordinance that limits boat speeds on Shasta Lake to 5 miles per hour within 100 feet or the shoreline would serve to reduce the hazard. Finally, the standing timber and other remaining vegetation would provide structural diversity that is attractive to fish; therefore, these areas are likely to be attractive to anglers, who could benefit from the increase in uncleared areas and may consider them a recreation enhancement rather than a hindrance.

Despite these factors, the untreated areas of the new inundation zone would represent an increased hazard to boaters and potentially other types of recreationists. For this reason, this impact would be significant. Mitigation for this impact is proposed in Section 18.3.5.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Rec-5 (CP1): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows Within the upper Sacramento River portion of the primary study area, increased mean monthly river flows associated with project implementation and operation could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. In general, the flow increases that would occur in some years would be expected to be small (6 percent or less); likewise, only a small additional area would be inundated relative to the area inundated under existing conditions or the No-Action Alternative. As a result, the adverse effects are unlikely to be substantial. This impact would be less than significant.

Increased river flows associated with project implementation could temporarily inundate portions of developed recreation facilities used by boaters, anglers, and other recreationists to access the upper Sacramento River between Shasta Dam and Red Bluff. Any of the more than 15 boat ramps at public and privately operated parks on the river would be affected if increased river flows were to cause overtopping of the ramps, which are generally designed to be used at a range of river elevations. These facilities are often associated with picnic areas, shoreline fishing access areas, and similar day-use facilities, as well as campgrounds. The portions of these areas nearest to the riverbank could also be affected. Many of these facilities are used year-round, but the peak period for boating on the river is late spring through fall (May to November), when river flows are most likely to be in the optimum range of 6,000 to 12,000 cfs. Although existing average monthly flows are within this range year-round, in most winter and spring seasons the river experiences much higher peak flows of 30,000 to 50,000 cfs or more that may last several weeks.

Many of the locations that recreationists use to access the river and to hand-launch watercraft are informal sites, where conditions such as gradually sloping and sandy riverbanks create beaches that are conducive to recreation use. Like developed sites, these undeveloped and informal use areas could be affected

by increased river flows if increased flows were to result in temporary inundation of the area.

CalSim-II model simulations indicate that at nearly all times, Sacramento River flows below Keswick Dam under CP1 would be within about ±5 percent of flows under existing (2005) and No-Action Alternative (2030) conditions. Regarding increases to river stage, the CalSim-II model simulations indicate that mean monthly river stage below Keswick Dam would increase by 0.1 to 0.3 foot during fall months (September through November) relative to existing (2005) and No-Action Alternative (2030) conditions. (River stage during the summer below Keswick Dam is typically 10 to 11 feet under existing conditions.) The modeling results also indicate the potential for lower river levels during winter and spring in some years. Effects of decreased river flows are addressed below under Impact Rec-7 (CP1).

River stage information was not assessed for points within the primary study area downstream from Keswick Dam. However, the effects of the project on river stage at those locations would be expected to be moderated by inflows from tributaries, and would therefore be less than the potential changes below Keswick Dam. As a result, potential effects of the project on recreation facilities would be progressively less as one moves downstream from Keswick Dam.

Because most recreation facilities are designed to be used well above the highest annual river stage elevations that commonly occur during late summer and spring, the stage increases cited above would not affect the functionality of those facilities. Likewise, the small fall increases in river stage would be unlikely to have noticeable adverse effects on informal use sites, because those sites exist at a range of elevations and at many river locations. During periods of very high flows that may occur during winter and spring, boat ramps and other recreation facilities on the river may close, and safety warnings may be issued to boaters to stay off the river until the flow subsides.

It is important to note that for this assessment of environmental consequences, specific information was not available regarding how specific river stages affect specific recreation facilities. The assessment has also not considered the riverbank slope in specific river reaches, which would determine how much increased inundation would result from river stage increases at undeveloped recreation sites. Additional analysis would be required to provide accurate projections of effects at specific recreation sites or specific stretches of riverbank. Overall, however, the hydrologic changes in the Sacramento River's high flows that would result from CP1 would be relatively small and within the variability of flows that already occur in the river.

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

Impact Rec-6 (CP1): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the primary study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River. Depending on the time of year and base river flows, increased flow may also have beneficial effects. Because the magnitude of flow increases associated with CP1 would be small (averaging less than 8 percent for any month or water year type), adverse effects on boaters within the primary study area are unlikely. This impact would be less than significant.

Increased river flows associated with project implementation could affect boating conditions on the upper Sacramento River between Shasta Dam and Red Bluff. Increased flows can make boating on the river more difficult, particularly for nonmotorized boats such as canoes and dories or "drift boats." Drift boats are controlled by oars; these boats are commonly used by anglers and commercial angling guide services, primarily during summer, before lower flows during fall make their use more difficult. Canoeing, kayaking, and similar forms of nonmotorized boating are also most common on the river during summer, but are less affected by low flows than drift boating. Boating activity occurs on the river year-round, but the peak period for boating is late spring through fall (May to November), when river flows are most likely to be in the optimum range.

As described above under Impact Rec-5 (CP1), CalSim-II model simulations indicate that at nearly all times, Sacramento River flow below Keswick Dam under CP1 would be within about ±5 percent of flows under existing (2005) and No-Action Alternative (2030) conditions. The CalSim-II model simulations indicate that mean monthly river stage below Keswick Dam could increase by as much as 0.3 foot relative to existing (2005) and No-Action Alternative (2030) conditions during fall months (September through November) of some years. Changes in flows farther downstream within the primary study area would be expected to be progressively smaller as the influence of tributary streams increases.

The generally small flow increases that would occur as a result of the project in some years would be unlikely to adversely affect boating, which occurs primarily during summer and fall. These flow increases may have small beneficial effects during dry years by reducing exposure of sand bars and shallows and thus increasing navigability on the river. Although boating activity is lower during winter, particularly during peak-flow periods when facilities may be closed and conditions are hazardous, increased flows during dry years and decreased flows during wet years could have similarly minor beneficial effects during those months.

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

Impact Rec-7 (CP1): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the upper Sacramento River, particularly during summer when swimming activity is most likely, and during fall and winter nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. Increased flows can make swimming and wading more challenging and potentially more hazardous. The magnitude of flow increases associated with CP1 would be small (averaging less than 8 percent for any month or water year type), and the timing of the increases would be such that adverse effects on angling waders within the primary study area are unlikely. Swimming is not a common activity on the main channel of the river because of cold-water temperatures. As a result, this impact would be less than significant.

Increased river flows associated with project implementation could affect swimming and wading conditions on the upper Sacramento River between Shasta Dam and Red Bluff. Increased flows can make swimming and wading more difficult. Because of cold-water temperatures (a maximum of less than 60 degrees during summer), swimming is not a major activity on the Sacramento River; however, it does occur, particularly in association with other activities like tubing and nonmotorized boating. Anglers commonly wade in the river; their use is particularly focused on the months of September and October, when flows typically decrease substantially from summer levels and the opportunities for wading correspondingly increase.

As described above under Impact Rec-5 (CP1), CalSim-II model simulations indicate that at nearly all times, Sacramento River flow below Keswick Dam under CP1 would be within about ±5 percent of flows under existing (2005) and No-Action Alternative (2030) conditions. However, CalSim-II model simulations indicate that mean monthly river stage below Keswick Dam could increase by as much as 0.3 foot relative to existing (2005) and No-Action Alternative (2030) conditions during fall months (September through November). Changes in flows farther downstream within the primary study area would be expected to be progressively smaller as the influence of tributary streams increases.

The small magnitude of river stage increases during the fall peak period for wading by anglers indicates that adverse effects of the project on wading anglers are unlikely. Likewise, the generally small increases in summer flows throughout the primary study area that would occur as a result of the project in some years (generally smaller than the increases in fall flows described above) would be unlikely to adversely affect the limited amount of swimming that occurs during those months.

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

Impact Rec-8 (CP1): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows Decreased

mean monthly flows within the primary study area, particularly during summer when boating and swimming activity is most likely and during fall and winter low-flow periods when wade angling activity is most likely, could result in enhanced boating, swimming, and wading conditions. Decreased flows during normally high-flow periods can make boating less challenging and potentially less hazardous. The magnitude of flow decreases associated with the project would be small (averaging less than 7 percent for any month or water year type), and the timing of the decreases (fall and winter months) would be such that effects on boaters, swimmers, and waders within the primary study area are unlikely. As a result, this impact would be less than significant.

Decreased river flows associated with project implementation could benefit boating conditions on the Sacramento River in the primary study area, between Shasta Dam and Red Bluff. Decreased flows can make boating on the river easier, particularly for nonmotorized boats such as canoes and dories or "drift boats." BLM has identified an optimum range of 6,000 to 12,000 cfs for boating on the Sacramento River in the primary study area. Boating may benefit if the decrease in river flows lowers the flows below the high end of the optimum range. Under existing conditions, average monthly flows below Keswick Dam and below Cottonwood Creek are above the optimum level during midsummer most years and during much of the winter and early spring of wet years.

Decreased river flows associated with project implementation could also benefit conditions for swimming and wading, although boating conditions could be adversely affected if flows were to fall below the low end of the optimum range of 6,000 cfs. Decreased flow could make swimming and wading easier and may lengthen the period when these activities are best pursued. For example, wading anglers typically concentrate their activity in the fall months, when flows are lowest, whereas fishing from a boat is more common in summer, when flows are higher. Reduced flows in late summer or early fall may extend the wading season.

As described above under Impact Rec-5 (CP1), CalSim-II model simulations indicate that at nearly all times, Sacramento River flows below Keswick Dam under CP1 would be within about ±5 percent of flows under existing (2005) and No-Action Alternative (2030) conditions. The CalSim-II model simulations indicate that mean monthly river stage below Keswick Dam could decrease by as much as 0.5 foot relative to existing (2005) and No-Action Alternative (2030) conditions during winter (December through February) of wetter-than-normal years. Again, changes in flows farther downstream within the primary study area would be expected to be progressively smaller as the influence of tributary streams increases.

The reduction in mean monthly flows during winter months of wetter-than-normal years would have minimal effects on boating because the existing mean flows during those months are usually within the optimum range. However, the decreased flow could have a beneficial effect on boating during the winter months of some wet years, when the existing mean flows are above the optimum range.

The small reduction in flows and corresponding decrease in river stage during some spring months during both wetter-than-normal and drier-than-normal years could have a beneficial effect on wading. Flows could be reduced to a level that is similar to existing fall conditions, when wading by anglers is most popular. However, because the spring months are not the period when most wading anglers are present, and because swimming activity is low in the spring months, the effects are likely to be minimal.

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

Impact Rec-9 (CP1): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures Project operation would result in improved flow and water temperature conditions in the upper Sacramento River, which would benefit Chinook salmon populations. This would result in enhanced populations of these game fish in the river, which would provide enhanced sport angling opportunities. This impact would be beneficial.

Chinook salmon contribute to the popular sport fishery in the upper Sacramento River. (The salmon season has been closed on the upper Sacramento River in recent years, but may be reopened if the health of the runs improves.) With increased flows and cooler water temperatures resulting from project operation, salmon populations would benefit from reduced mortality. These beneficial effects on Chinook salmon could result in enhanced angling opportunities on the upper Sacramento River, which would have a beneficial effect on recreation. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-10 (CP1): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program The proposed gravel augmentation program would not be implemented under CP1. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-11 (CP1): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites The proposed restoration of flow through various sites along the upper Sacramento River, rehabilitation of the Reading Island boat ramp for use by motorized boats, and construction of a handicap fishing access area would not be implemented under CP1. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Rec-12 (CP1): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Within the extended study area, if increased mean monthly river flows were to occur in some months of some years as a result of project implementation and

operation under CP1, the increased flows could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. However, even with the increases, flows on the Sacramento, American, and Feather rivers would remain moderate and well below normal winter and spring high flows. As a result, adverse effects on river facilities or informal use areas within the extended study area are unlikely. This impact would be less than significant.

Increases in Sacramento River stage (elevation) within the extended study area associated with increased flows under CP1 would be small (averaging less than 0.3 foot). Likewise, only a small additional area would be inundated relative to the area inundated under existing conditions and the No-Action Alternative. On the Feather River below Thermalito Afterbay and on the lower American River (at the H Street Bridge), the increase in flows would be larger during some months of some years, with some increases exceeding 25 percent. However, the largest increases on the lower American River would occur during late summer of critical water years, when flows are generally low, and the largest increases on the Feather River would occur during early fall of dry years, when flows are generally moderate. On both rivers, flows would remain well below winter and spring high flows experienced in most years. Therefore, adverse effects on river recreation facilities and informal use areas appear unlikely.

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

Impact Rec-13 (CP1): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly flows within the extended study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River and other rivers affected by the project. Depending on the time of year and base river flows, increased flow may also have beneficial effects on boating by reducing shallow bars and riffles, thus improving navigability. However, the timing and flow conditions under which the flow increases are likely to occur on the Sacramento, Feather, and American rivers under CP1, and the continuation of moderate flows even with the increase, suggest that adverse effects on boaters within the extended study area are unlikely. This impact would be less than significant.

CalSim-II modeling results indicate that the magnitude of flow increases in the lower Sacramento River associated with CP1 would be generally small, averaging less than 6 percent in any month in all water year types. Also, the largest changes would occur primarily during fall months (September through November) of dry and critical water years, when flows are normally relatively low. Thus, even with the flow increases, flows would remain moderate (7,500 to 11,000 cfs at Verona and 7,500 to 13,000 cfs below Freeport, on average) during those periods.

CalSim-II modeling results indicate that the magnitude of flow increases in the Feather River below Thermalito Afterbay associated with CP1 may occasionally exceed 100 percent. More typically, however, the largest increases would be in the range of 20 percent to 30 percent and would occur during mid- and late summer and fall and primarily during drier-than-normal years, when flows are often lower than average. Flows would remain moderate (1,500 to 4,500 cfs) with the increases. CalSim-II modeling results also indicate that flows in the American River at the H Street Bridge (below Folsom Lake) would also substantially increase during some months of some years, but would remain moderate. Although some of the potential flow increases in the Sacramento, Feather, and American rivers would be substantial, adverse effects on boating appear to be unlikely.

Hydrologic changes in more distant areas of the CVP and SWP service areas resulting from CP1 cannot be accurately predicted but would be small. Such slight changes occur on a dynamic and daily basis under existing conditions as water is moved throughout California. Other CVP and SWP reservoir elevations, canal flows, and flows below the reservoirs could be slightly modified, but any resulting effects on recreation would be negligible and speculative.

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

Impact Rec-14 (CP1): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly river flows within the extended study area during some months of some years, particularly during summer when swimming activity is most likely and nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. These activities could become more hazardous, and thus less attractive to river users. However, given the timing of the likely flow increases under CP1, the conditions under which such increases would occur, and the continuation of moderate flows even with the increase, adverse effects on swimmers and waders in the extended study area are unlikely. This impact would be less than significant.

Even during the lowest flow months of late summer and early fall, average flow in the more downstream portions of the Sacramento River is around 10,000 cfs; average flow is much higher at other times of the year. As a result, swimming and wading are not common activities on the river in much of the extended study area, where the most common uses are boating and bank angling.

CalSim-II modeling results indicate that the magnitude of flow increases in the lower Sacramento River associated with CP1 would be generally small, averaging less than 6 percent for any month in all water year types. Also, the largest changes would occur primarily during fall months (September through November) of dry and critical water years, when flows are normally relatively low. Thus, even with

the flow increases, flows would remain moderate (7,500 to 11,000 cfs at Verona and 7.500 to 13,000 cfs below Freeport, on average) during those periods.

CalSim-II modeling results indicate that the magnitude of flow increases in the Feather River below Thermalito Afterbay associated with CP1 exceeds 100 percent in two Septembers during the simulation period of 1922 to 2003. Flow increases occur sporadically, typically during mid- and late-summer and fall, are usually in the range of 0 to 20 percent, and primarily occur during drier-than-normal years when flows are typically lower than average. Flows would remain moderate (1,500 to 4,500 cfs) with the increases. CalSim-II modeling results also indicate that flows in the American River at the H Street Bridge (below Folsom Lake) would increase by more than 100 percent once during the simulation period, with flow increases more typically in the range of 0 to 30 percent. Even with these increases, flows would remain moderate. While a few of the simulated flow increases in the Sacramento, Feather, and American rivers would be substantial, adverse effects on swimming and wading appear to be unlikely. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-15 (CP1): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows Decreased mean monthly flows below CVP and SWP reservoirs during fall and winter low-flow periods when wade angling activity is most common, and during summer and fall when boating and river floating is popular in some areas, could have adverse effects if reduced flows were to reduce fishing success or boating navigability. Given the modest flow decreases in the Sacramento River associated with CP1 and the timing of the changes, effects on these recreation uses of the Sacramento River in the extended study area are unlikely. However, given the magnitude and timing of the largest flow decreases during some years on the Feather and American rivers below CVP and SWP reservoirs in the extended study area, adverse effects may occur. This impact would be potentially significant.

CalSim-II results indicate that the magnitude of mean monthly flow decreases that would occur in some years in the Sacramento River below Wilkins Slough, at Verona, and below Freeport associated with CP1 would be small (averaging less than 2 percent for any month in all water year types) and would equate to elevation (stage) decreases of no more than about 6 inches. The occasional larger decreases would occur during mid- and late fall and early winter (October through December) rather than in the summer months, when boating activity is highest. Wade angling is not common on most of the river in the extended study area because of the depth and volume of the river, among other factors. As a result of these factors, adverse effects on boating or angling from the flow decreases appear to be unlikely.

CalSim-II results indicate that mean monthly flows in the Feather River below Thermalito Afterbay would be reduced in some years by as much as 32 percent

during mid-summer through mid-fall (June through October), particularly during drier-than-normal years. However, the reduction in flow would average 6 percent or less in all months of those years, with the exception of the month of June in dry years, when the reduction would average 10 percent. The boating and angling activity that occurs on the Feather River during summer and fall months could be adversely affected if navigability or angling success were to be hampered by reduced flow and shallower water.

CalSim-II results indicate that mean monthly flows in the American River at the H Street Bridge (below Folsom Lake) would also be reduced by as much as 20 percent to 50 percent in some months of some years, primarily during mid-summer to mid-fall (June through October). Many of these reductions would occur during wetter-than-average years, when flows would typically be high, and the average reduction in flow would be 10 percent or less for any months in all water year types. However, in drier-than-average years, the effect would be to reduce flows during periods when the flows are already below average. This may adversely affect boating and angling on the river if navigability or angling success is hampered by reduced flow and shallower water.

For the reasons described above, this impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5.

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

Like CP1, CP2 would increase storage at Shasta Lake, thus changing the full pool elevation at Shasta Lake, and the seasonal pool elevations and the flow regime in the Sacramento River and potentially several other reservoirs and downstream waterways. In turn, these alterations to reservoir pool elevations and river flows could affect the usability of some types of recreation facilities on the lake and downstream waterways, particularly marinas, boat ramps, and nearshore campgrounds and day-use areas. These alterations could also affect the ability of recreationists to use the reservoirs and waterways for boating, camping, fishing, and similar activities.

The full pool elevation of Shasta Lake would increase by 14.5 feet and the pool elevation would average as much as 12 to 17 feet higher than under existing (2005) and No-Action Alternative (2030) conditions at various times of the year. The greatest change would occur during the wettest years.

Raising the dam by 12.5 feet would increase the surface area of the reservoir at full pool by about 1,750 acres (6 percent). The width of the water body would not increase substantially in most areas, and much of the increase would occur during spring rather than during the high-traffic summer boating period.

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

Reservoir- and river-based recreation facilities and activities in the primary and extended study areas downstream from Shasta Lake are similar; thus, potential reservoir and river recreation impacts would be similar. However, changes to the flow regime affecting reservoirs and rivers in the extended study area would be increasingly attenuated by flows from tributary waterways and other water sources and diversions that are unaffected by the project, reducing the level of impacts.

Shasta Lake and Vicinity

Impact Rec-1 (CP2): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation The 14.5-foot increase in full pool elevation associated with a 12.5-foot dam raise would cause seasonal inundation of recreation facilities or portions of facilities at Shasta Lake. In many years, the reservoir would fill to an elevation greater than the current full pool elevation of 1,067 feet; in some years, it would fill to the new full pool elevation of 1,081.5 feet. In each case, portions of existing recreation facilities on the shoreline would be inundated, resulting in substantial effects. However, the affected recreation facilities would be relocated during construction and before inundation. The replacement facilities would be of equivalent overall capacity and quality to the affected facilities; would provide comparable shoreline access, where applicable; and would comply with ADA and ABA guidelines. Therefore, this impact would be less than significant.

Within each of the three arms of Shasta Lake with recreation development, effects of implementing CP2 on individual recreation facilities would vary. These effects would range from no effect to effects on several of the facilities' inventoried and mapped features (e.g., roads, parking, and restrooms or other buildings) and on features not specifically inventoried (e.g., campsites and picnic sites). Table 18-6 shows the anticipated effects of CP2 on inventoried and mapped (developed) recreation facilities.

Table 18-6. Effects of CP2 on Developed Recreation Facilities at Shasta Lake

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Sacramento Arm	
Boat Ramps	
1. Antlers Public Boat Ramp	Boat ramp length shortened but usable; courtesy dock and rail would also be affected
2. Centimudi Public Boat Ramp	Boat ramp and lower parking entirely affected, part of access road to ramp and lower parking affected

Table 18-6. Effects of CP2 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Campgrounds	
1. Antlers Campground	All features are above full pool elevation; shoreline erosion may threaten portions of site
2. Gregory Creek Campground	One restroom, part of campground road, and shoreline campsites affected
3. Lakeshore East Campground	One restroom, lower half of campground road, and several campsites affected; access substantially affected
4. Nelson Point Campground	Campground road and some campsites affected
5. Oak Grove Campground	All features are above full pool elevation; access road affected
Boat-in Campgrounds	
1. Gooseneck Cove Boat-in Campground	Some shoreline campsites likely affected
Day-Use Areas	
1. Fisherman's Point Day Use Area	Parking and restroom unaffected but most picnic sites affected; also loss of access to shoreline trail
2. Salt Creek Swim Area (nonoperational)	Restroom and portion of paved pathway affected
Marinas	
1. Antlers Resort and Marina	Generator/pumphouse building and boat ramp/dock access road affected
2. Digger Bay Marina	Bottom portion of marina access road/ramp affected, but appears to remain usable
3. Shasta Marina Resort	Two buildings (office and equipment shed) affected, most of parking and access roads affected
4. Sugarloaf Resort and Marina	Electrical service building and associated structures affected, boat ramp and unpaved parking areas partially affected
Resorts (Nonmarina)	
1. Lakeshore Inn and RV Park	Shoreline campsites and walkway, and underground septic system may be affected; access substantially affected
2. Lakeshore Villa RV Park	No effect–entire facility is above full pool elevation
3. Salt Creek Resort and RV Park	Resort unaffected; old road bed used as boat ramp (outside resort) affected
4. Shasta Lake RV Resort	Entire facility appears to be unaffected; access substantially affected
5. Sugarloaf Cottages Resort	Four cottages and large portion of unpaved shoreline access roads affected
6. Tsasdi Resort	Three cabins and entrance and exit roads connecting to Lakeshore Drive affected

Table 18-6. Effects of CP2 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Trails[1]	
1. Dry Fork Creek Trail	Trailhead and portion of trail along shoreline affected
2. Fisherman's Point Trail	Portion of trail along shoreline affected
Other Facilities	
1. USFS Lakeshore Fire Station	Five buildings and entrance road affected (entire facility)
2. Salt Creek Recreation Residence Track cabins	At least one cabin affected; possibly others also affected
McCloud Arm	
Boat Ramps	
1. Bailey Cove Boat Ramp and Day Use Area	Boat ramp entirely affected, parking area, day-use area, and access road partially affected
2. Hirz Bay Public Boat Ramp	Boat ramp and lower parking area, restroom, entirely affected
Campgrounds	
1. Bailey Cove Campground	No effect–entire facility is above full pool elevation
2. Dekkas Rock Campground	Lower part of loop road and portion of group camp affected
3. Ellery Creek Campground	Lower portion of loop road and shoreline campsites affected
4. Hirz Bay Campgrounds	No effect–entire facility is above full pool elevation
5. Kamloop Camp (private organization)	No effect–entire facility is above full pool elevation
6. McCloud Bridge Campground	One restroom, lower part of camp loop and shoreline campsites affected
7. Moore Creek Campground	Lower portion of loop road, shoreline campsites likely affected
8. Pine Point Campground	Possible that some shoreline campsites affected
Boat-in Campgrounds	
1. Greens Creek Boat-in Campground	Some shoreline campsites likely affected
Day-Use Areas	
1. Dekkas Rock Day Use Area	Lower portion of loop road and parking affected
2. McCloud Bridge Day Use Area	Most of picnic sites affected
Marinas	
1. Holiday Harbor Marina	Three buildings, boat ramp, and tank affected, some overflow parking affected; RV park and road to RV park affected
Trails[1]	
Bailey Cove Trail	Portion of trail along shoreline affected
Hirz Bay Trail	Portion of trail along shoreline affected
Samwel Cave Nature Trail	Portion of trail along shoreline affected

Table 18-6. Effects of CP2 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Other Facilities	
1. Bollibokka Club	No effect–entire facility is above the full pool elevation
2. Campbell Creek Residence Track cabins	At least seven cabins affected; possibly others also affected
3. Shasta Caverns ferry landing	Two buildings at east landing affected, access roads serving east and west shore landings partially affected
4. USFS Station (Turntable Bay)	Four buildings and access road affected
Squaw Arm	
Other Facilities	
1. Didallas Recreation Residence Track cabins	At least one cabin affected; possible others also affected
Pit Arm	
Boat Ramps	
1. Jones Valley Public Boat Ramp	Boat ramp and turnaround area at top of ramp entirely affected, access road to parking lot partially affected
2. Packers Bay Public Boat Ramp	Boat ramp and restroom, information shelter, and pump house buildings affected, portion of parking affected
Campgrounds	
1. Lower Jones Valley Campground	One restroom building and trail footbridge affected, camp loop road and campsites partially affected
2. Upper Jones Valley Campground	No effect–entire facility is above full pool elevation
Boat-in Campgrounds	
1. Ski Island Boat-in Campground	Some shoreline campsites likely affected
2. Arbuckle Flat Boat-in Campground	Some shoreline campsites likely affected
Marinas	
1. Bridge Bay Resort and Marina	Most of facility–including eight buildings, boat ramp, parking lots, and roads–affected
2. Jones Valley Resort	Three buildings, parking area, ramp, and shoreline access roads affected
3. Packers Bay Marina	Access road from public ramp affected, boat ramp partially affected
4. Silverthorn Resort	Parking and ramp affected, shoreline access road partially affected

Table 18-6. Effects of CP2 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Trails[1]	
1. Clikapudi Trail	Trailhead and portion of trail along shoreline affected
2. Packers Bay Trails	Portion of trails (3 out of 4 trails) along shoreline affected
Other Facilities	
1. Silverthorn Recreation Residence Track cabins	No effect–entire facility is above full pool elevation

Source: Reclamation 2003

Note:
[1] For some trails, trailheads are integrated into other recreation facilities. Alternative effects identified for standalone trailheads only.

Key:
RV = recreational vehicle
USFS = U.S. Forest Service

Under CP2, the recreation facilities on the Sacramento Arm that would be subject to effects on several features or a substantial portion of the facility's use area are one of the two boat ramps, three of the five campgrounds, two of the four marinas, four of the six nonmarina resorts, and the only operational day-use area. The USFS Lakeshore Fire Station, Dry Fork Creek trail and trailhead, Fisherman's Point trail, and at least one private cabin in the Salt Creek recreation residence tract would also be subject to major effects. One boat-in campground would be subject to a somewhat lesser but still substantial effect, while several additional facilities would be subject to relatively minor effects.

On the McCloud Arm, many of the major facilities would be subject to effects on several features or on a substantial portion of the facility's use area: both public boat ramps, both day-use areas, the one marina, four of seven public campgrounds, and the one boat-in campground. Other facilities affected to a similar degree are the USFS station at Turntable Cove, the Shasta Caverns Tour facilities on the east and west shores, Bailey Cove trail, and several of the cabins within the recreation residence tract on the east shore at Campbell Creek.

On the Squaw Creek Arm, one private cabin within the Didallas recreation residence tract would be affected. All but one of the public and commercial recreation facilities on the Pit Arm would be subject to major effects under CP2–both boat ramps, all four marinas, one of the two campgrounds, and both boat-in campgrounds.

Although they are not included in the table because of a lack of permanent infrastructure, shoreline camping areas at Beehive Point (Sacramento Arm), Gregory Beach (Sacramento Arm), Lower Salt Creek (Sacramento Arm), Jones

Valley Inlet (Pit Arm), and Mariner's Point (Pit Arm) would also be subject to substantial effects with the inundation of access roads and use areas.

Thus, the most prominent direct effects on recreation facilities and public access at Shasta Lake and in the vicinity under CP2 would be the major effects on five of six boat ramps, seven of nine marinas, four of six resorts, eight of 15 family and group campgrounds, all four boat-in campgrounds, and three of four day-use areas. Other facilities subject to major effects are USFS stations on the Sacramento and McCloud arms; trails and trailheads on the Sacramento, McCloud, and Pit arms (most located at day-use areas or boat ramps addressed above); the Shasta Caverns ferry landing; and several private cabins on the Sacramento, McCloud, and Squaw arms. Table 18-7 summarizes the number of recreation facilities of specific types substantially affected.

Table 18-7. Summary of Shasta Lake Recreation Facilities Substantially Affected by CP2

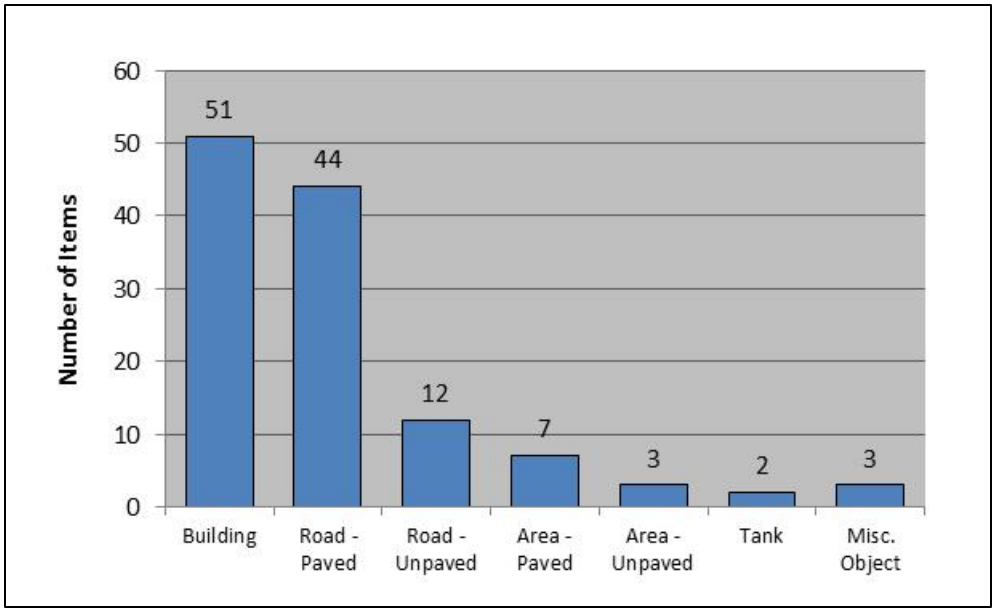
Type of Facility	Number of Facilities Affected
Boat ramp	5
Marina	7
Resort	4
Campground (family and group)	8
Day-use area	3
Boat-in campground	4
USFS operations	2
Trailhead/trail	2/7
Recreation residence tract	3
Commercial tour	1

Source: Reclamation 2003

Key:
USFS = U.S. Forest Service

Somewhat lesser effects would occur at several campgrounds and one marina. Minor effects would occur at additional facilities of several types.

Figure 18-4 depicts the total number of inventoried Shasta Lake recreation facility items, at all recreation facilities combined, that would be affected by inundation under CP2. A total of 122 facility and infrastructure elements would be affected, with more than three-fourths of those being buildings and segments of paved roads. A lesser number of unpaved road segments, paved and unpaved areas (usually parking areas), tanks, and miscellaneous objects would also be affected.



Source: Reclamation 2003

Figure 18-4. Number of Recreation Facility Infrastructure Items Affected by a 12.5-Foot Dam Raise Under CP2

As described in Section 2.3.8 in Chapter 2, "Alternatives," affected recreation facilities would be relocated as part of the construction activities for all action alternatives. This could include relocation of affected portions of facilities within existing use areas, in adjacent undeveloped areas, or at new sites in the general vicinity of the lake. Because of the possible consolidation of facilities, the total number of facilities of specific types may be reduced. However, all affected recreation capacity would be replaced. Replacement facilities would be of equivalent overall capacity and quality to affected facilities and would provide comparable shoreline access, where applicable. With the relocation of affected facilities, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-2 (CP2): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam Construction activity that would be necessary to raise Shasta Dam and complete related modifications would prevent recreation visitors from crossing the dam, and thus could affect other recreation activities in the area. These effects are expected only during the construction period. However, this impact would be potentially significant.

This impact would be similar to Impact Rec-2 (CP1). If the increased dam-raise height relative to CP1 (12.5 feet versus 6.5 feet under CP1) would substantially lengthen the period during which construction would occur or would otherwise increase construction-related disruption in the dam area, the effects described under CP1 could be increased. This impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5.

Impact Rec-3 (CP2): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir An increase in the magnitude or rate or changes in the timing of the annual summer and fall drawdown of Shasta Lake could adversely affect boating enjoyment and safety on the reservoir. Conversely, a reduced or slower drawdown could have beneficial effects. However, under CP2, reservoir operations would be similar to existing operations, exception during dry and critical water years. Little change would occur in the annual magnitude, rate, or timing of reservoir drawdown associated with any water year type. Therefore, this impact would be less than significant.

This impact would be similar to Impact Rec-3 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-4 (CP2): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone At full pool, the increased pool elevation would result in approximately 1,167 acres of newly inundated area where the existing trees and other vegetation would not be removed. Anglers would generally benefit from the associated enhancement of fish habitat; however, the standing trees and stumps that would remain in these areas would increase the number of areas and total area where this type of hazard to boaters and other recreation visitors would exist. Therefore, this impact would be significant.

Approximately 1,167 acres (67 percent) of the 1,750 acres of newly inundated area that would result from the 12.5-foot dam raise at full pool would receive no vegetation treatment (no vegetation removed), to maximize the habitat benefits of inundated and residual vegetation. In general, this impact would be similar to Impact Rec-4 (CP1), although the total area of potential hazard from remaining trees and stumps would be greater under CP2. Because the untreated areas of the new inundation zone would represent an increased hazard to boaters and potentially other types of recreationists, this impact would be significant. Mitigation for this impact is proposed in Section 18.3.5.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Rec-5 (CP2): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows Within the upper Sacramento River portion of the primary study area, increased mean monthly river flows associated with project implementation and operation could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. In general, the flow increases that would occur in some years would be expected to be small (averaging 14 percent or less for any month in all water year types); likewise, only a small additional area would be inundated relative to the area inundated under existing conditions and the No-Action Alternative. As a result, the adverse effects are unlikely to be substantial. This impact would be less than significant.

This impact would be similar to but slightly greater than Impact Rec-5 (CP1), because the alteration of the flow regime of the Sacramento River would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-6 (CP2): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the primary study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River. Depending on the time of year and base river flows, increased flow may also have beneficial effects. Because the magnitude of flow increases associated with CP2 would be small (averaging less than 14 percent for any month or water year type), adverse effects on boaters within the primary study area are unlikely. This impact would be less than significant.

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

Impact Rec-7 (CP2): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the upper Sacramento River, particularly during summer when swimming activity is most likely and during fall and winter nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. Increased flows can make swimming and wading more challenging and potentially more hazardous. The magnitude of flow increases associated with CP2 would be small (averaging less than 14 percent for any month and water year type), and the timing of the increases would be such that adverse effects on angling waders within the primary study area are unlikely. Swimming is not a common activity on the main channel of the river because of cold-water temperatures. As a result, this impact would be less than significant.

This impact would be similar to but slightly greater than Impact Rec-7 (CP1), because the alteration of the flow regime of the Sacramento River would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-8 (CP2): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows Decreased mean monthly flows within the primary study area, particularly during summer when boating and swimming activity is most likely and during fall and winter low-flow periods when wade angling activity is most likely, could result in enhanced boating, swimming, and wading conditions. Decreased flows during normally high-flow periods can make boating less challenging and potentially less hazardous. The magnitude of flow decreases associated with CP2 would be small

(averaging less than 10 percent for any month or water year type), and the timing of the decreases (fall and winter months) would be such that effects on boaters, swimmers, and waders within the primary study area are unlikely. As a result, this impact would be less than significant.

This impact would be similar to but slightly greater than Impact Rec-8 (CP1), because the alteration of the flow regime of the Sacramento River would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-9 (CP2): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures Project operation would result in improved flow and water temperature conditions in the upper Sacramento River, which would benefit Chinook salmon populations. This would result in enhanced populations of these game fish in the river, which would provide enhanced sport angling opportunities. This impact would be beneficial.

This impact would be similar to Impact Rec-9 (CP1) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-10 (CP2): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program The proposed gravel augmentation program would not be implemented under CP2. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-11 (CP2): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites The proposed restoration of flow through various sites along the upper Sacramento River, rehabilitation of the Reading Island boat ramp for use by motorized boats, and construction of a handicap fishing access area would not be implemented under CP2. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Rec-12 (CP2): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Within the extended study area, if increased mean monthly river flows were to occur in some months of some years as a result of project implementation and operation under CP2, the increased flows could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. However, even with the increases, flows on the Sacramento, Feather, and American rivers would remain moderate and well below normal winter and spring high flows. As a result, adverse effects on river facilities or informal use areas within the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but slightly greater than Impact Rec-12 (CP1), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-13 (CP2): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly flows within the extended study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River and other rivers affected by the project. Depending on the time of year and base river flows, increased flow may also have beneficial effects on boating by reducing shallow bars and riffles, thus improving navigability. However, the timing and flow conditions under which the flow increases are likely to occur on the Sacramento, Feather, and American rivers under CP2, and the continuation of moderate flows even with the increase, suggest that adverse effects on boaters within the extended study area are unlikely. This impact would be less than significant.

Hydrologic changes in more distant areas of the CVP/SWP service areas resulting from CP2 cannot be accurately predicted but would be small. Such slight changes occur on a dynamic and daily basis under existing conditions as water is moved throughout California. Other CVP and SWP reservoir elevations, canal flows, and flows below the reservoirs could be modified slightly, but any resulting impacts on recreation would be negligible and speculative.

This impact would be similar to but slightly greater than Impact Rec-13 (CP1), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-14 (CP2): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly river flows within the extended study area during some months of some years, particularly during summer when swimming activity is most likely and nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. These activities could become more hazardous and thus less attractive to river users. However, given the timing of the likely flow increases under CP2, the flow conditions under which such increases would occur, and the continuation of moderate flows even with the increase, adverse effects on swimmers and waders within the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but slightly greater than Impact Rec-14 (CP1), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-15 (CP2): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows Decreased mean monthly flows below CVP and SWP reservoirs during fall and winter low-flow periods when wade angling activity is most common, and during summer and fall when boating and river floating is popular in some areas, could have adverse effects if reduced flows were to reduce fishing success or boating navigability. Given the modest flow decreases in the Sacramento River associated with CP2 and the timing of the changes, effects on these recreation uses of the Sacramento River within the extended study area are unlikely. However, given the magnitude and timing of the largest flow decreases during some years on the Feather and American rivers below CVP and SWP reservoirs in the extended study area, adverse effects may occur. This impact would be potentially significant.

This impact would be similar to but slightly greater than Impact Rec-15 (CP1), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be more substantial under CP2 than under CP1. This impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5.

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

Like each of the alternatives discussed above, CP3 would alter storage and operations at Shasta Lake, thus changing the full pool elevation at Shasta Lake, and the seasonal pool elevations and the flow regime in the Sacramento River and potentially several other reservoirs and downstream waterways. In turn, these alterations to reservoir pool elevations and river flows could affect the usability of some types of recreation facilities on the lake and downstream waterways, particularly marinas, boat ramps, and nearshore campgrounds and day-use areas. These alterations could also affect the ability of recreationists to use the reservoirs and waterways for boating, camping, fishing, and similar activities.

The full pool elevation of Shasta Lake would increase by 20.5 feet and the pool elevation would average as much as 18 to 24 feet higher than under existing (2005) and No-Action (2030) conditions at various times of the year. The greatest change would occur during the wettest years. Raising the dam by 18.5 feet would increase the surface area of the reservoir at full pool by about 2,570 acres (9 percent). The width of the water body would not increase substantially in most areas, and much of the increase would occur during spring rather than during the high-traffic summer boating period.

In general, the proposed changes in flow and river stage on the upper Sacramento River associated with CP3 are more substantial than the changes associated with CP1 and CP2. However, these changes are still within a few percentage points of the changes associated with CP1 and CP2, as outlined above.

Reservoir- and river-based recreation facilities and activities in the primary and extended study areas downstream from Shasta Lake are similar; thus, potential reservoir and river recreation impacts would be similar. However, changes to the flow regime affecting reservoirs and rivers in the extended study area would be increasingly attenuated by flows from tributary waterways and other water sources and diversions that are unaffected by the project, reducing the level of impacts.

Shasta Lake and Vicinity

Impact Rec-1 (CP3): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation The 20.5-foot increase in full pool elevation associated with an 18.5-foot dam raise would cause seasonal inundation of recreation facilities or portions of facilities at Shasta Lake, such as boat launch ramps, campgrounds, marinas, and day-use areas. In many years, the reservoir would fill to an elevation greater than the current full pool elevation of 1,067 feet; in some years, it would fill to the new full pool elevation of 1,087.5 feet. In each case, portions of existing recreation facilities on the shoreline would be inundated, resulting in substantial effects. However, the affected recreation facilities would be relocated during construction and before inundation. The replacement facilities would be of equivalent overall capacity and quality to the affected facilities; would provide comparable shoreline access, where applicable; and would comply with ADA and ABA guidelines. Therefore, this impact would be less than significant.

Within each of the three arms of Shasta Lake with recreation development, effects of implementing CP3 on individual recreation facilities would vary. These effects would range from no effect to effects on several of the facilities' inventoried and mapped features (e.g., roads, parking, and restrooms or other buildings) and on features not specifically inventoried (e.g., campsites and picnic sites). Table 18-8 shows the anticipated effects of CP3 on inventoried and mapped (developed) recreation facilities.

Table 18-8. Effects of CP3 on Developed Recreation Facilities at Shasta Lake

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Sacramento Arm	
Boat Ramps	
1. Antlers Public Boat Ramp	Boat ramp entirely affected; courtesy dock and rail would also be affected; restroom may be affected; parking lot is primarily unaffected
2. Centimudi Public Boat Ramp	Boat ramp and lower parking entirely affected, part of access road to ramp and lower parking affected
Campgrounds	
1. Antlers Campground	Amphitheater may be affected; shoreline erosion may threaten portions of site
2. Gregory Creek Campground	Two restrooms, lower half of campground road, and associated campsites affected
3. Lakeshore East Campground	One restroom and majority of campground road and campsites affected; access substantially affected
4. Nelson Point Campground	Most of campground road and several campsites affected
5. Oak Grove Campground	All features are above full pool elevation; access road affected
Boat-in Campgrounds	
1. Gooseneck Cove Boat-in Campground	Most shoreline campsites likely affected
Day-Use Areas	
1. Fisherman's Point Day Use Area	Parking and restroom unaffected but most picnic sites affected; also loss of access to shoreline trail
2. Salt Creek Swim Area (nonoperational)	Two restrooms, bathhouse, and paved pathways affected
Marinas	
1. Antlers Resort and Marina	Generator/pumphouse building and boat ramp/dock access road affected
2. Digger Bay Marina	One building affected; lower portion of marina access road/ramp affected, but appears to remain usable
3. Shasta Marina Resort	Three buildings (office, equipment shed, residence) affected; most parking and access roads affected
4. Sugarloaf Resort and Marina	Electrical service building and associated structures affected, boat ramp and unpaved parking areas partially affected

Table 18-8. Effects of CP3 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Resorts (Nonmarina)	
1. Lakeshore Inn and RV Park	Shoreline campsites and walkway, storage building, cabin, covered patio area affected; underground septic system may be affected; access substantially affected
2. Lakeshore Villa RV Park	No effect–entire facility is above full pool elevation
3. Salt Creek Resort and RV Park	Resort unaffected; old road bed used as boat ramp (outside resort) affected
4. Shasta Lake RV Resort	Resort office affected; access substantially affected
5. Sugarloaf Cottages Resort	Seven cottages and large portion of unpaved cabin and shoreline access roads affected
6. Tsasdi Resort	Five cabins and entrance and exit roads connecting to Lakeshore Drive affected
Trails[1]	
1. Dry Fork Creek Trail	Trailhead and portion of trail along shoreline affected
2. Fisherman's Point Trail	Portion of trail along shoreline affected
Other Facilities	
1. USFS Lakeshore Fire Station	Five buildings and entrance road affected (entire facility)
2. Salt Creek Recreation Residence Track cabins	At least one cabin affected; possibly others also affected
McCloud Arm	
Boat Ramps	
1. Bailey Cove Boat Ramp and Day Use Area	Boat ramp, parking area, day-use area, and access road entirely affected
2. Hirz Bay Public Boat Ramp	Boat ramp and lower parking area, restroom entirely affected
Campgrounds	
1. Bailey Cove Campground	Access road from ramp/day-use area affected
2. Dekkas Rock Campground	Loop road and associated portion of group camp affected
3. Ellery Creek Campground	Most of loop road and associated campsites affected
4. Hirz Bay Campgrounds	No effect entire facility is above full pool elevation
5. Kamloop Camp (private organization)	One building affected
6. McCloud Bridge Campground	Entire facility–two restrooms, camp loop road, and associated campsites–affected

Table 18-8. Effects of CP3 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
7. Moore Creek Campground	Lower portion of loop road and shoreline campsites appear to be affected
8. Pine Point Campground	Possible that some shoreline campsites affected
Boat-in Campgrounds	
1. Greens Creek Boat-in Campground	Most shoreline campsites likely affected
Day-Use Areas	
1. Dekkas Rock Day Use Area	Loop road and associated picnic sites and parking affected
2. McCloud Bridge Day Use Area	Entire facility, including picnic sites and restroom, affected
Marinas	
1. Holiday Harbor Marina	Entire facility, including three buildings, boat ramp, and tank affected; most parking, RV park, and road to RV park affected
Trails[1]	
Bailey Cove Trail	Portion of trail along shoreline affected
Hirz Bay Trail	Portion of trail along shoreline affected
Samwel Cave Nature Trail	Portion of trail along shoreline affected
Other Facilities	
1. Bollibokka Club	Facility appears to be unaffected; McCloud Arm would extend near one building and one miscellaneous object, which may be affected
2. Campbell Creek Recreation Residence Track cabins	At least eight cabins affected; possibly others also affected
3. Shasta Caverns ferry landing	Most of east and west side landings affected; two buildings at east landing, and access roads serving east and west shore landings also affected
4. USFS Station (Turntable Bay)	Entire facility, including four buildings and access road, affected
Squaw Arm	
Other Facilities	
1. Didallas Recreation Residence Track cabins	At least one cabin affected; possibly others also affected

Table 18-8. Effects of CP3 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Pit Arm	
Boat Ramps	
1. Jones Valley Public Boat Ramp	Boat ramp and turnaround area at top of ramp entirely affected, access road to parking lot partially affected
2. Packers Bay Public Boat Ramp	Boat ramp and restroom, information shelter, and pump house buildings affected; large portion of parking affected
Campgrounds	
1. Lower Jones Valley Campground	he restroom building, trail footbridge, and large portion of camp loop road and associated campsites affected
2. Upper Jones Valley Campground	No effect–entire facility is above full pool elevation
Boat-in Campgrounds	
1. Ski Island Boat-in Campground	Most shoreline campsites likely affected
2. Arbuckle Flat Boat-in Campground	Most shoreline campsites likely affected
Marinas	
1. Bridge Bay Resort and Marina	Nearly entire facility–eight buildings, boat ramp, parking lots, and access roads–affected
2. Jones Valley Resort	Most of facility–five buildings, parking area, ramp, and shoreline access roads – affected
3. Packers Bay Marina	Access road from public ramp and marina ramp affected
4. Silverthorn Resort	Most of facility–resort office and restaurant building, parking, ramp, and shoreline access road – affected
Trails[1]	
1. Clikapudi Trail	Trailhead and portion of trail along shoreline affected
2. Packers Bay Trails	Portion of trails (3 out of 4 trails) along shoreline affected
Other Facilities	
1. Silverthorn Recreation Residence Track cabins	No effect–entire facility is above full pool elevation

Source: Reclamation 2003

Note:
[1] For some trails, trailheads are integrated into other recreation facilities. Alternative effects identified for standalone trailheads only.

Key:
RV = recreational vehicle
USFS = U.S. Forest Service

Under CP3, nearly all of the public and commercial recreation facilities on the Sacramento Arm would be subject to effects on several features or a substantial portion of the facility's use area. Both boat ramps, three of the five campgrounds, two of the four marinas, four of the six nonmarina resorts, one boat-in campground, and the one operational day-use area would all be subject to these major effects. The USFS Lakeshore Fire Station and the Dry Fork Creek trail and trailhead, Fisherman's Point trail, and at least one private cabin in the Salt Creek recreation residence tract would also be subject to major effects. Salt Creek Swim Area would also be subject to major effects, which is currently not operational but is used occasionally for overflow camping and as a base camp for firefighting crews. One marina would be subject to lesser but still substantial effects and several of the remaining facilities would be subject to minor effects.

On the McCloud Arm, both public boat ramps, both day-use areas, the one marina, five of eight campgrounds, and the one boat-in campground would be subject to major effects. Other facilities that would experience major effects are the USFS station at Turntable Cove, the Shasta Caverns Tour facilities on the east and west shores, Bailey Cove trail, and at least eight cabins on the east shore within the Campbell Creek recreation residence tract.

On the Squaw Creek Arm, one cabin within the Didallas recreation residence tract would be affected. Anticipated effects on recreation facilities on the Pit Arm under CP3 are similar to those that would occur under CP2. All but one of the public and commercial recreation facilities–both boat ramps, all four marinas, one of the two campgrounds, and both boat-in campground–would be subject to major effects.

Shoreline camping areas at Beehive Point (Sacramento Arm), Gregory Beach (Sacramento Arm), Lower Salt Creek (Sacramento Arm), Jones Valley Inlet (Pit Arm), and Mariner's Point (Pit Arm) would also be subject to substantial effects, with the unpaved access roads and use areas mostly inundated.

The most prominent direct effects on recreation facilities and public access at Shasta Lake and in the vicinity under CP3 would be the major effects on all six boat ramps, eight of nine marinas, four of six nonmarina resorts, nine of 15 family and group campgrounds, all four boat-in campgrounds, and all four day-use areas. Other facilities subject to major effects are USFS stations on the Sacramento and McCloud arms; trails and trailheads on the Sacramento, McCloud, and Pit arms (most located at day-use areas or boat ramps addressed above); the Shasta Caverns ferry landing; and several private cabins on the Sacramento, McCloud, and Squaw arms. Many of these facilities would be entirely or nearly inundated at the new full pool elevation associated with CP3. Table 18-9 summarizes the number of recreation facilities of specific types affected.

Table 18-9. Tally of Shasta Lake Recreation Facilities Substantially Affected by CP3

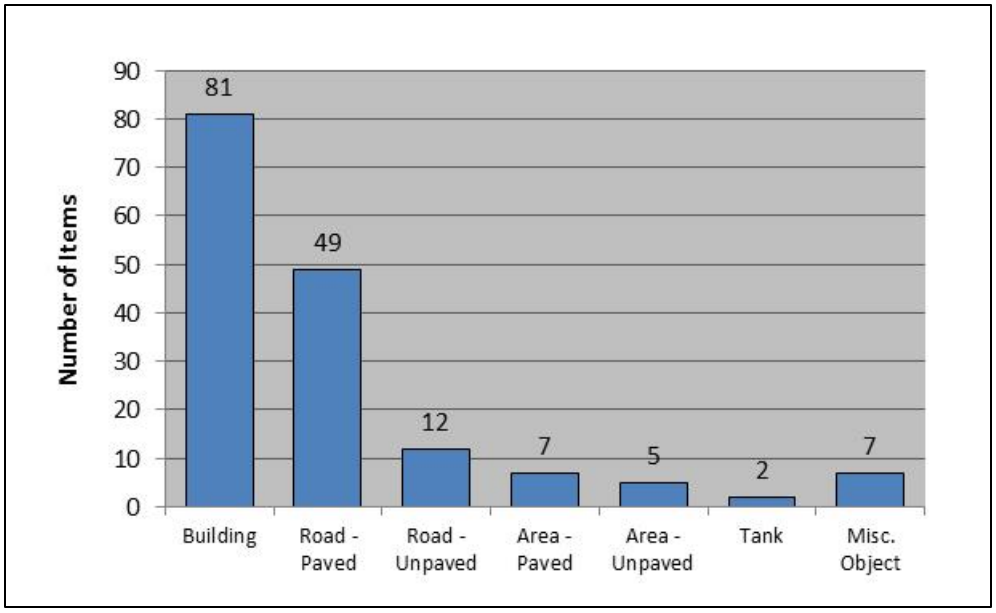
Type of Facility	Number of Facilities Affected
Boat ramp	6
Marina	8
Resort	4
Campground (family and group)	8
Private campground	1
Day-use area	4
Boat-in campground	4
USFS operations	2
Trailhead/trail	2/7
Recreation residence tract	3
Commercial tour	1

Source: Reclamation 2003

Key:
USFS = U.S. Forest Service

Somewhat lesser but still considerable effects would occur at one campground and one marina, while relatively minor effects would occur at additional facilities of several types.

Figure 18-5 depicts the total number of inventoried Shasta Lake recreation facility items, at all recreation facilities combined, that would be affected by inundation under CP3. A total of 163 facility and infrastructure elements would be affected, with more than three-fourths of those being buildings and segments of paved roads. A lesser number of unpaved road segments, paved and unpaved areas (usually parking areas), tanks, and miscellaneous objects would also be affected.



Source: Reclamation 2003

Figure 18-5. Number of Recreation Facility Infrastructure Items Affected by an 18.5-Foot Dam Raise Under CP3

As described in Section 2.3.8 in Chapter 2, "Alternatives," affected recreation facilities would be relocated as part of the construction activities for all action alternatives. This could include relocation of affected portions of facilities within existing use areas, in adjacent undeveloped areas, or at new sites in the general vicinity of the lake. Because of the possible consolidation of facilities, the total number of facilities of specific types may be reduced. However, all affected recreation capacity would be replaced. Replacement facilities would be of equivalent overall capacity and quality to affected facilities and would provide comparable shoreline access, where applicable. With the relocation of affected facilities, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-2 (CP3): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam Construction activity that would be necessary to raise Shasta Dam and complete related modifications would prevent recreation visitors from crossing the dam, and thus could affect other recreation activities in the area. These effects are expected only during the construction period. However, this impact would be potentially significant.

This impact would be similar to Impact Rec-2 (CP1). If the increased dam raise height relative to CP1 (18.5 feet versus 6.5 feet under CP1) would substantially lengthen the period during which construction would occur or would otherwise increase construction-related disruption in the dam area, the effects described under CP1 could be increased. This impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5.

Impact Rec-3 (CP3): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir An increase in the magnitude or rate or changes in the timing of the annual summer and fall drawdown of Shasta Lake could adversely affect boating enjoyment and safety on the reservoir. Conversely, a reduced or slower drawdown could have beneficial effects. However, under CP3, reservoir operations would be similar to existing operations. Little change would occur in the annual magnitude, rate, or timing of reservoir drawdown. Therefore, this impact would be less than significant.

This impact would be similar to Impact Rec-3 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-4 (CP3): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone At full pool, the increased pool elevation would result in approximately 1,738 acres of newly inundated area where the existing trees and other vegetation would not be removed. Anglers would generally benefit from the associated enhancement of fish habitat; however, the standing trees and stumps that would remain in these areas would increase the number of areas and total area where this type of hazard to boaters and other types of recreation visitors would exist. Therefore, this impact would be significant.

Approximately 1,738 acres (68 percent) of the 2,570 acres of newly inundated area that would result from the 18.5-foot dam raise at full pool would receive no vegetation treatment (no vegetation removed), to maximize the habitat benefits of inundated and residual vegetation. In general, this impact would be similar to Impacts Rec-4 (CP1) and Rec-4 (CP2), although the total area of potential hazard resulting from remaining trees and stumps would be greater under CP3 than under CP1 or CP2. Because the untreated areas of the new inundation zone would represent an increased hazard to boaters and potentially other types of recreationists, this impact would be significant. Mitigation for this impact is proposed in Section 18.3.5.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Rec-5 (CP3): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows Within the upper Sacramento River portion of the primary study area, increased mean monthly river flows associated with project implementation and operation could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. In general, the flow increases that would occur in some years would be expected to be small (averaging 15 percent or less for any month in all water year types); likewise, only a small additional area would be inundated relative to the area inundated under existing conditions or the No-Action Alternative. As a result, the adverse effects are unlikely to be substantial. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-5 (CP1) and Rec-5 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-6 (CP3): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the primary study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River. Depending on the time of year and base river flows, increased flow may also have beneficial effects. Because the magnitude of flow increases associated with CP3 would be small (averaging less than 15 percent for any month or water year type), adverse effects on boaters within the primary study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-6 (CP1) and Rec-6 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-7 (CP3): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the upper Sacramento River, particularly during summer when swimming activity is most likely and during fall and winter nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. Increased flows can make swimming and wading more challenging and potentially more hazardous. The magnitude of flow increases associated with CP3 would be small (averaging less than 15 percent for any month or water year type), and the timing of the increases would be such that adverse effects on angling waders within the primary study area are unlikely. Swimming is not a common activity on the main channel of the river because of cold-water temperatures. As a result, this impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-7 (CP1) and Rec-7 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-8 (CP3): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows Decreased mean monthly flows within the primary study area, particularly during summer when boating and swimming activity is most likely and during fall and winter low-flow periods when wade angling activity is most likely, could result in

enhanced boating, swimming, and wading conditions. Decreased flows during normally high-flow periods can make boating less challenging and potentially less hazardous. The magnitude of flow decreases associated with CP3 would be small (averaging less than 12 percent for any month or water year type), and the timing of the decreases (fall and winter months) would be such that effects on boaters, swimmers, and waders within the primary study area are unlikely. As a result, this impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-8 (CP1) and Rec-8 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-9 (CP3): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures Project operation would result in improved flow and water temperature conditions in the upper Sacramento River, which would benefit Chinook salmon populations. This would result in enhanced populations of these game fish in the river, which would provide enhanced sport angling opportunities. This impact would be beneficial.

This impact would be similar to Impact Rec-9 (CP1) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-10 (CP3): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program The proposed gravel augmentation program would not be implemented under CP3. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-11 (CP3): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites The proposed restoration of flow through various sites along the upper Sacramento River, rehabilitation of the Reading Island boat ramp for use by motorized boats, and construction of a handicap fishing access area would not be implemented under CP3. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Rec-12 (CP3): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Within the extended study area, if increased mean monthly river flows were to occur in some months of some years as a result of project implementation and operation under CP3, the increased flows could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. However, even with

the increases, flows on the Sacramento and Feather rivers would remain moderate and well below normal winter and spring high flows. As a result, adverse effects on river facilities or informal use areas within the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-12 (CP1) and Rec-12 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-13 (CP3): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly flows within the extended study area, particularly during summer and fall when boating activity is most likely, could result in more difficult boating launching and boating conditions on the Sacramento River and other rivers affected by the project. Depending on the time of year and base river flows, increased flow may also have beneficial effects on boating by reducing shallow bars and riffles, thus improving navigability. However, the timing and flow conditions under which the flow increases are likely to occur on the Sacramento, Feather, and American rivers under CP3, and the continuation of moderate flows even with the increase, suggest that adverse effects on boaters within the extended study area are unlikely. This impact would be less than significant.

Hydrologic changes in more distant areas of the CVP and SWP service areas resulting from CP3 cannot be accurately predicted but would be small. Such slight changes occur on a dynamic and daily basis under existing conditions as water is moved throughout California. Other CVP and SWP reservoir elevations, canal flows, and flows below the reservoirs could be modified slightly, but any resulting effects on recreation would be negligible and speculative.

This impact would be similar to but greater than Impacts Rec-13 (CP1) and Rec-13 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-14 (CP3): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly river flows within the extended study area during some months of some years, particularly during summer when swimming activity is most likely and during nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. These activities could become more hazardous and thus less attractive to river users. However, given the timing of the likely flow increases under CP3, the conditions under which such increases would occur, and the

continuation of moderate flows even with the increase, adverse effects on swimmers and waders in the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-14 (CP1) and Rec-14 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-15 (CP3): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows Decreased mean monthly flows below CVP and SWP reservoirs during fall and winter low-flow periods when wade angling activity is most common, and during summer and fall when boating and river floating is popular in some areas, could have adverse effects if reduced flows were to reduce fishing success or boating navigability. Given the modest flow decreases in the Sacramento River associated with CP3 and the timing of the changes, effects on these recreation uses of the Sacramento River in the extended study area are unlikely. However, given the magnitude and timing of the largest flow decreases during some years on the Feather and American rivers below CVP and SWP reservoirs in the extended study area, adverse effects may occur. This impact would be potentially significant.

This impact would be similar to but greater than Impacts Rec-15 (CP1) and Rec-15 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5.

CP4 – 18.5-Foot Dam Raise, Anadromous Fish Focus With Water Supply Reliability

Like each of the alternatives discussed above, CP4 would increase storage at Shasta Lake, thus changing the full pool elevation at Shasta Lake, and the seasonal pool elevations and the flow regime in the Sacramento River and potentially several other reservoirs and downstream waterways. In turn, these alterations to reservoir pool elevations and river flows could affect the usability of some types of recreation facilities on the lake and downstream waterways, particularly marinas, boat ramps, and nearshore campgrounds and day-use areas. These alterations could also affect the ability of recreationists to use the reservoirs and waterways for boating, camping, fishing, and similar activities.

As under CP3, under CP4, the full pool elevation of Shasta Lake would increase by 20.5 feet and the pool elevation would average as much as 18 to 24 feet higher than under existing (2005) and No-Action Alternative (2030) conditions at various times of the year. The greatest change would occur during the driest years. However, the dedicated Shasta Lake storage of 378 thousand acre-feet

(TAF) is unique to CP4 and would result in a different drawdown scenario than under CP3.

Raising the dam by 18.5 feet would increase the surface area of the reservoir at full pool by about 2,570 acres (9 percent). In general, the effect of this increase would be slight, given that the reservoir would exceed the current full pool elevation only during wetter-than-normal years. Also, the increase in acreage would be distributed around the several hundred miles of the reservoir's rim. The width of the water body would not increase substantially in most areas, and much of the increase would occur during spring rather than during the high-traffic summer boating period.

The changes in flow and river stage on the upper Sacramento River associated with CP4 would be the same as the changes associated with CP1, as outlined above, in that the operated storage of 256 TAF would be the same for CP1 and CP4.

Reservoir- and river-based recreation facilities and activities are similar in the primary and extended study areas downstream from Shasta Lake; thus, potential reservoir and river recreation impacts would be similar. However, changes to the flow regime affecting reservoirs and rivers in the extended study area would be increasingly attenuated by flows from tributary waterways and other water sources and diversions that are unaffected by the project, reducing the level of effects.

Shasta Lake and Vicinity

Impact Rec-1 (CP4): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation The 20.5-foot increase in full pool elevation associated with an 18.5-foot dam raise would cause inundation of recreation facilities or portions of facilities at Shasta Lake. In many years, the reservoir would fill to an elevation greater than the current full pool elevation of 1,067 feet; in some years, it would fill to the new full pool elevation of 1,087.5 feet. In each case, portions of existing recreation facilities on the shoreline would be inundated, resulting in substantial effects. However, the affected recreation facilities would be relocated during construction and before inundation. The replacement facilities would be of equivalent overall capacity and quality to the affected facilities; would provide comparable shoreline access, where applicable; and would comply with ADA and ABA guidelines. Therefore, this impact would be less than significant.

This impact would be the same as Impact Rec-1 (CP3) because the full pool elevation would increase by the same amount under CP4 as under CP3. The same developed recreation facilities would be inundated under CP4 as under CP3 (see Tables 18-8 and 18-9 and Figure 18-5).

As described in Section 2.3.8 in Chapter 2, "Alternatives," affected recreation facilities would be relocated as part of the construction activities for all action alternatives. This could include relocation of affected portions of facilities within existing use areas, in adjacent undeveloped areas, or at new sites in the general vicinity of the lake. Because of the possible consolidation of facilities, the total number of facilities of specific types may be reduced. However, all affected recreation capacity would be replaced. Replacement facilities would be of equivalent overall capacity and quality to affected facilities and would provide comparable shoreline access, where applicable. With the relocation of affected facilities, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-2 (CP4): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam Construction activity that would be necessary to raise Shasta Dam and complete related modifications would prevent recreation visitors from crossing the dam, and could affect other recreation activities in the area. These effects are expected only during the construction period. However, this impact would be potentially significant.

This impact would be similar to Impact Rec-2 (CP1). If the increased dam-raise height relative to CP1 (18.5 feet versus 6.5 feet under CP1) would substantially lengthen the period during which construction would occur or otherwise increase construction-related disruption in the dam area, the effects described under CP1 could be increased. This impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5.

Impact Rec-3 (CP4): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir An increase in the magnitude or rate or changes in the timing of the annual summer and fall drawdown of Shasta Lake could adversely affect boating enjoyment and safety on the reservoir. Conversely, a reduced or slower drawdown could have beneficial effects. However, under CP4, reservoir operations would be similar to existing operations, except during dry and critical water years. Little change would occur in the annual magnitude, rate, or timing of reservoir drawdown associated with any water year type. Therefore, this impact would be less than significant.

This impact would be similar to Impact Rec-3 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-4 (CP4): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone At full pool, the increased pool elevation would result in approximately 1,738 acres of newly inundated area where the existing trees and other vegetation would not be removed. Anglers would generally benefit from the associated enhancement of fish habitat; however, the standing trees and stumps that would remain in these areas would increase the number of areas and total

area where this type of hazard to boaters and other types of recreation visitors would exist. Therefore, this impact would be significant.

This impact would be the same as Impact Rec-4 (CP3) and would be significant. Mitigation for this impact is proposed in Section 18.3.5.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Rec-5 (CP4): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows Within the upper Sacramento River portion of the primary study area, increased mean monthly river flows associated with project implementation and operation could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. In general, the flow increases that would occur in some years would be expected to be small (8 percent or less for any month in all water year types); likewise, only a small additional area would be inundated relative to the area inundated under existing conditions and the No-Action Alternative. As a result, the adverse effects are unlikely to be substantial. This impact would be less than significant.

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

Impact Rec-6 (CP4): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the primary study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River. Depending on the time of year and base river flows, increased flow may also have beneficial effects. Because the magnitude of flow increases associated with CP4 would be small (averaging less than 8 percent for any month in all water year types), adverse effects on boaters within the primary study area are unlikely. As a result, this impact would be less than significant.

This impact would be the same as Impact Rec-6 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-7 (CP4): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the upper Sacramento River, particularly during summer when swimming activity is most likely and during fall and winter nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. Increased flows can make swimming and wading more challenging and potentially more hazardous. The magnitude of flow increases associated with CP4 would be small (averaging less than 8 percent for any month in any water year type), and the timing of the increases would be such that adverse effects on angling waders within the primary study area are unlikely.

Swimming is not a common activity on the main channel of the river because of cold-water temperatures. As a result, this impact would be less than significant.

This impact would be the same as Impact Rec-7 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-8 (CP4): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows Decreased mean monthly flows within the primary study area, particularly during the summer months when boating and swimming activity is most likely and during fall and winter low-flow periods when wade angling activity is most likely, could result in enhanced boating, swimming, and wading conditions. Decreased flows during normally high-flow periods can make boating less challenging and potentially less hazardous. The magnitude of flow decreases associated with CP4 is small (averaging less than 7 percent for any month or water year type), and the timing of the decreases (fall and winter months) is such that effects on boaters, swimmers, and waders within the primary study area are unlikely. As a result, this impact would be less than significant.

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

Impact Rec-9 (CP4): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures Project operation would result in improved flow and water temperature conditions in the upper Sacramento River, which would benefit Chinook salmon populations, as well as steelhead, American shad, and striped bass. This would result in enhanced populations of these game fish in the river, which would provide enhanced sport angling opportunities. This impact would be beneficial.

Chinook salmon, steelhead, American shad, and striped bass all contribute to the popular sport fishery in the upper Sacramento River. (The salmon season has been closed on the upper Sacramento River in recent years, but may be reopened if the health of the runs improves.) With increased flows and cooler water temperature resulting from project operation, salmon populations would benefit from reduced mortality. Cooler water temperatures would also create more suitable conditions in the river for steelhead, American shad, and striped bass. These beneficial effects on game fish species could result in enhanced angling opportunities on the upper Sacramento River, which would have a beneficial effect on recreation. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-10 (CP4): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program Access to and boating on the upper Sacramento River may be affected temporarily while gravel is placed in the river under the proposed gravel augmentation program. However, gravel placement would occur during only a 1-month period and most augmentation sites would not be adjacent to public river access sites; further, the method of gravel

deposition would have little effect on boating. The program could increase the number of shallows encountered by boaters, but shallows are normal characteristics of the targeted river reaches. Therefore, this impact would be less than significant.

The proposed gravel augmentation program could affect boating on the upper Sacramento River by increasing the number of shallow riffles where boating could be made more difficult or hazardous, or where boats may drag the bottom during low-water periods. In the short term, river access and boating may be affected while the gravel is being placed in the river. However, the program would affect only a few sites between Keswick Dam and Clear Creek each year, and the sites under consideration are well distributed along more than 10 miles of the river. Gravel placement would most likely occur only during an approximately 1-month period of late summer (late August to late September), limiting the time during which access or boating could be disrupted. Only a few of the gravel augmentation sites under consideration are adjacent to public river access sites, where access could be disrupted for 1 or 2 days during gravel placement. Deposition of gravel at most sites would occur using a talus cone or lateral berm method, which would use dump trucks or conveyors to place gravel near the riverbank, and would have little effect on boating. Only a few sites would use a direct placement method, which would use front-end loaders to deposit gravel directly in the river channel, and which could conflict with boating during the 1 or 2 days of gravel deposition.

The gravel augmentation program would increase the number of shallows that boaters on the river could encounter. However, shallows as well as rocks and other obstructions are normal characteristics of the targeted reaches of the river (Tuthill 2005). As a result, the boats most commonly used on the upper river (e.g., shallow-draft prop and jet-driven power boats, canoes, kayaks, and rafts) are able to navigate shallow waters, and published boating guides warn boaters of depth changes caused by shifting sands and silts, shallowness, snags, and other obstructions they may encounter (DBW 2011b). For these reasons, both short- and long-term effects on river access and boating are likely to be minimal. As a result, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-11 (CP4): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites Restoring flow through various sites along the upper Sacramento River would increase boating and fishing access and opportunities for day-use visitors to the park. This impact would be beneficial.

Several options for restoring the upper Sacramento River to enhance habitat for anadromous salmonid fish species exist, including restoring flow through Anderson Slough at Reading Island. The restoration at Anderson Slough would deepen the slough and flush out the aquatic vegetation that now clogs the waterway and renders the Reading Island boat ramp on the slough nearly

unusable. Also under consideration are rehabilitation of the boat ramp for motorized boat use and construction of a handicap fishing access area. These actions to restore habitat and rehabilitate and enhance recreation facilities would increase boating and fishing access and opportunities for day-use visitors to the park. They would also make the park more functional and attractive for river float trip groups that occasionally camp at the island under BLM special-use permits. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Rec-12 (CP4): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Within the extended study area, if increased mean monthly river flows were to occur in some months of some years as a result of project implementation and operation under CP4, the increased flows could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. However, even with the increases, flows on the Sacramento, Feather, and American rivers would remain moderate and well below normal winter and spring high flows. As a result, adverse effects on river facilities or informal use areas within the extended study area are unlikely. This impact would be less than significant.

This impact would be the same as Impact Rec-12 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-13 (CP4): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly flows within the extended study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River and other rivers affected by the project. Depending on the time of year and base river flows, increased flow may also have beneficial effects on boating by reducing shallow bars and riffles, thus improving navigability. However, the timing and flow conditions under which the flow increases are likely to occur on the Sacramento, Feather, and American rivers under CP4, and the continuation of moderate flows even with the increase, suggest that adverse effects on boaters within the extended study area are unlikely. This impact would be less than significant.

Hydrologic changes in more distant areas of the CVP/SWP service areas resulting from CP4 cannot be accurately predicted but would be small. Such slight changes occur on a dynamic and daily basis under existing conditions as water is moved throughout California. Other CVP and SWP reservoir elevations, canal flows, and flows below the reservoirs could be slightly modified, but any resulting impacts on recreation would be negligible and speculative.

This impact would be the same as Impact Rec-13 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-14 (CP4): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly river flows within the extended study area during some months of some years, particularly during summer when swimming activity is most likely and during nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. These activities could become more hazardous and thus less attractive to river users. However, given the timing of the likely flow increases under CP1, the conditions under which such increases would occur, and the continuation of moderate flows even with the increase, adverse effects on swimmers and waders within the extended study area are unlikely. This impact would be less than significant.

This impact would be the same as Impact Rec-14 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-15 (CP4): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows Decreased mean monthly flows below CVP and SWP reservoirs during fall and winter low-flow periods when wade angling activity is most common, and during summer and fall when boating and river floating is popular in some areas, could have adverse effects if reduced flows were to reduce fishing success or boating navigability. Given the modest flow decreases in the Sacramento River associated with CP4 and the timing of the changes, effects on these recreation uses of the Sacramento River in the extended study area are unlikely. However, given the magnitude and timing of the largest flow decreases during some years on the Feather and American rivers below CVP and SWP reservoirs in the extended study area, adverse effects may occur. This impact would be potentially significant.

This impact would be the same as Impact Rec-15 (CP1) and would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5.

CP5 – 18.5-Foot Dam Raise, Combination Plan

Like each of the alternatives discussed above, CP5 would increase storage at Shasta Lake, thus increasing the full pool elevation at Shasta Lake, and the seasonal pool elevations and the flow regime in the Sacramento River and potentially several other reservoirs and downstream waterways. In turn, these alterations to reservoir pool elevations and river flows could affect the usability of some types of recreation facilities on the lake and downstream waterways, particularly marinas, boat ramps, and nearshore campgrounds and day-use areas. These alterations could also affect the ability of recreationists to use the reservoirs and waterways for boating, camping, fishing, and similar activities.

The full pool elevation of Shasta Lake would increase by 20.5 feet and the pool elevation would average as much as 18 to 24 feet higher than under existing (2005) and No-Action Alternative (2030) conditions at various times of the year. The greatest change would occur during the wettest years. Raising the dam by 18.5 feet would increase the surface area of the reservoir at full pool by about 2,570 acres (9 percent). In general, the effect of this increase would be slight, given that the reservoir would exceed the current full pool elevation only during wetter-than-normal years. Also, the increase in acreage would be distributed around the several hundred miles of the reservoir's rim. The width of the water body would not increase substantially in most areas, and much of the increase would occur during spring rather than during the high-traffic summer boating period.

Changes in flow and river stage on the upper Sacramento River associated with CP5 would be similar to those associated with CP3, as outlined above.

Reservoir- and river-based recreation facilities and activities in the primary and extended study areas downstream from Shasta Lake are similar; thus potential reservoir and river recreation impacts would be similar. However, changes to the flow regime affecting reservoirs and rivers in the extended study area would be increasingly attenuated by flows from tributary waterways and other water sources and diversions that are unaffected by the project, reducing the level of impacts.

Shasta Lake and Vicinity

Impact Rec-1 (CP5): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation The 20.5-foot increase in full pool elevation associated with an 18.5-foot dam raise would cause seasonal inundation of recreation facilities or portions of facilities at Shasta Lake. In many years, the reservoir would fill to an elevation greater than the current full pool elevation of 1,067 feet; in some years, it would fill to the new full pool elevation of 1,087.5 feet. In each case, portions of existing recreation facilities on the shoreline would be inundated, resulting in substantial effects. However, the affected recreation facilities would be relocated during construction and before inundation. The replacement facilities would be of equivalent overall capacity and quality to the affected facilities; would provide comparable shoreline access, where applicable; and would comply with ADA and ABA guidelines. Therefore, this impact would be less than significant.

This impact would be the same as Impact Rec-1 (CP3) because the full pool elevation would increase by the same amount under CP5 as under CP3. The same developed recreation facilities would be inundated under CP5 as under CP3 (see Tables 18-8 and 18-8 and Figure 18-5).

As described in Section 2.3.8 in Chapter 2, "Alternatives," affected recreation facilities would be relocated as part of the construction activities for all action

alternatives. This could include relocation of affected portions of facilities within existing use areas, in adjacent undeveloped areas, or at new sites in the general vicinity of the lake. Because of the possible consolidation of facilities, the total number of facilities of specific types may be reduced. However, all affected recreation capacity would be replaced. Replacement facilities would be of equivalent overall capacity and quality to affected facilities and would provide comparable shoreline access, where applicable. With the relocation of affected facilities, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-2 (CP5): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam Construction activity that would be necessary to raise Shasta Dam and complete related modifications would prevent recreation visitors from crossing the dam, and could affect other recreation activities in the area. These effects are expected only during the construction period. However, this impact would be potentially significant.

This impact would be similar to Impact Rec-2 (CP1). If the increased dam-raise height relative to CP1 (18.5 feet versus 6.5 feet under CP1) would substantially lengthen the period during which construction would occur or otherwise increase construction-related disruption in the dam area, the effects described under CP1 could be increased. This impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5.

Impact Rec-3 (CP5): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir An increase in the magnitude or rate or changes in the timing of the annual summer and fall drawdown of Shasta Lake could adversely affect boating enjoyment and safety on the reservoir. Conversely, a reduced or slower drawdown could have beneficial effects. However, under CP5, reservoir operations would be similar to existing operations, except during dry and critical water years. Little change would occur in the annual magnitude, rate, or timing of reservoir drawdown associated with any water year type. Therefore, the impact would be less than significant.

This impact would be similar to Impact Rec-3 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-4 (CP5): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone At full pool, the increased pool elevation would result in approximately 1,738 acres of newly inundated area where the existing trees and other vegetation would not be removed. Anglers would generally benefit from the associated enhancement of fish habitat; however, the standing trees and stumps that would remain in these areas would increase the number of areas and total area where this type of hazard to boaters and other recreation visitors would exist. Therefore, this impact would be significant.

This impact would be the same as Impact Rec-4 (CP3) and would be significant. Mitigation for this impact is proposed in Section 18.3.5.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Rec-5 (CP5): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows Within the upper Sacramento River portion of the primary study area, increased mean monthly river flows associated with project implementation and operation could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. In general, the flow increases that would occur in some years would be expected to be small (19 percent or less for any month in all water year types); likewise, only a small additional area would be inundated relative to the area inundated under existing conditions or the No-Action Alternative. As a result, the adverse effects are unlikely to be substantial. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-5 (CP1), Rec-5 (CP2), and Rec-5 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-6 (CP5): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the primary study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River. Depending on the time of year and base river flows, increased flow may also have beneficial effects. Because the magnitude of flow increases associated with CP5 would be small (averaging less than 19 percent for any month in all water year types), adverse effects on boaters within the primary study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-6 (CP1), Rec-6 (CP2), and Rec-6 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-7 (CP5): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the upper Sacramento River, particularly during summer when swimming activity is most likely and during fall and winter nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. Increased flows can make swimming and wading more challenging and potentially more hazardous. The magnitude of flow

increases associated with CP5 would be small (averaging less than 19 percent for any month in all water year types), and the timing of the increases would be such that adverse effects on angling waders within the primary study area are unlikely. Swimming is not a common activity on the main channel of the river because of cold-water temperatures. As a result, this impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-7 (CP1), Rec-7 (CP2), and Rec-7 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-8 (CP5): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows Decreased mean monthly flows within the primary study area, particularly during summer when boating and swimming activity is most likely and during fall and winter low-flow periods when wade angling activity is most likely, could result in enhanced boating, swimming, and wading conditions. Decreased flows during normally high-flow periods can make boating less challenging and potentially less hazardous. The magnitude of flow decreases associated with CP5 would be small (averaging less than 12 percent for any month or water year type), and the timing of the decreases (fall and winter months) would be such that effects on boaters, swimmers, and waders within the primary study area are unlikely. As a result, this impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-8 (CP1), Rec-8 (CP2), and Rec-8 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-9 (CP5): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures Project operation would result in improved flow and water temperature conditions in the upper Sacramento River, which would benefit Chinook salmon populations. This would result in enhanced populations of these game fish in the river, which would provide enhanced sport angling opportunities. This impact would be beneficial.

This impact would be the same as Impact Rec-9 (CP2) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-10 (CP5): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program Access to and boating on the upper Sacramento River may be affected temporarily while gravel is placed in the river under the proposed gravel augmentation program. However, gravel placement would occur during only a 1-month period and most augmentation sites would not be adjacent to public river access sites; further, the method of gravel

deposition would have little effect on boating. The program could increase the number of shallows encountered by boaters, but shallows are normal characteristics of the targeted river reaches. Therefore, this impact would be less than significant.

This impact would be the same as Impact Rec-10 (CP4) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-11 (CP5): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites Restoring flow through various sites along the upper Sacramento River would increase boating and fishing access and opportunities for day-use visitors to the park. This impact would be beneficial.

This impact would be the same as Impact Rec-11 (CP4) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Rec-12 (CP5): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Within the extended study area, if increased mean monthly river flows were to occur in some months of some years as a result of project implementation and operation under CP5, the increased flows could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. However, even with the increases, flows on the Sacramento, Feather, and American rivers would remain moderate and well below normal winter and spring high flows. As a result, adverse effects on river facilities or informal use areas within the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-12 (CP1), Rec-12 (CP2), and Rec-12 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-13 (CP5): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly flows within the extended study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River and other rivers affected by the project. Depending on the time of year and base river flows, increased flow may also have beneficial effects on boating by reducing shallow bars and riffles, thus improving navigability. However, the timing and flow conditions under which the flow increases are likely to occur on the Sacramento, American, and Feather rivers under CP5, and

the continuation of moderate flows even with the increase, suggest that adverse effects on boaters within the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-13 (CP1), Rec-13 (CP2), and Rec-13 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-14 (CP5): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly river flows within the extended study area during some months of some years, particularly during summer when swimming activity is most likely and during nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. These activities could become more hazardous and thus less attractive to river users. However, given the timing of the likely flow increases under CP5, the conditions under such increases would occur, and the continuation of moderate flows even with the increase, adverse effects on swimmers and waders in the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-14 (CP1), Rec-14 (CP2), and Rec-14 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-15 (CP5): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows Decreased mean monthly flows below CVP and SWP reservoirs during fall and winter low-flow periods when wade angling activity is most common, and during summer and fall when boating and river floating is popular in some areas, could have adverse effects if reduced flows were to reduce fishing success or boating navigability. Given the modest flow decreases in the Sacramento River associated with CP5 and the timing of the changes, effects on these recreation uses of the Sacramento River within the extended study area are unlikely. However, given the magnitude and timing of the largest flow decreases during some years on the Feather and American rivers below CVP and SWP reservoirs in the extended study area, adverse effects may occur. This impact would be potentially significant.

This impact would be similar to but greater than Impacts Rec-15 (CP1), Rec-15 (CP2), and Rec-15 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater

under CP5 than under CP1, CP2, or CP3. This impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5.

18.3.5 Mitigation Measures

Table 18-10 presents a summary of mitigation measures for recreation and public access.

Table 18-10. Summary of Mitigation Measures for Recreation and Public Access

Impact		No-Action Alternative	CP1	CP2	CP3	CP4	CP5
Impact Rec-1 (No-Action): Increased Use of Shasta Lake Recreation Facilities and Demand for Recreation Opportunities on Shasta Lake and in the Vicinity Impact Rec-1 (CP1–CP5): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation	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 Rec-2 (No-Action): Increased Use and Demand for Recreation Opportunities on the Upper Sacramento River Impact Rec-2 (CP1–CP5): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam	LOS before Mitigation	LTS	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Rec-2: Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Rec-3 (No-Action): Increased Use and Demand for Recreation Opportunities on the Lower Sacramento River and in the Delta Impact Rec-3 (CP1–CP5): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir	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 Rec-4 (No-Action): Increased Use and Demand for Recreation Opportunities in the CVP and SWP Service Areas Impact Rec-4 (CP1–CP5): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone	LOS before Mitigation	LTS	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Rec-4: Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS

Table 18-10. Summary of Mitigation Measures for Recreation and Public Access (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4	CP5
Impact Rec-5 (CP1–CP5): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Rec-6 (CP1–CP5): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Rec-7 (CP1–CP5): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Rec-8 (CP1–CP5): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Rec-9 (CP1–CP5): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures	LOS before Mitigation	NI	B	B	B	B	B
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	B	B	B	B	B

Table 18-10. Summary of Mitigation Measures for Recreation and Public Access (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4	CP5
Impact Rec-10 (CP1–CP5): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program	LOS before Mitigation	NI	NI	NI	NI	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	LTS	LTS
Impact Rec-11 (CP1–CP5): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites	LOS before Mitigation	NI	NI	NI	NI	B	B
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	B	B
Impact Rec-12 (CP1–CP5): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Rec-13 (CP1–CP5): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Table 18-10. Summary of Mitigation Measures for Recreation and Public Access (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4	CP5
Impact Rec-14 (CP1–CP5): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Rec-15 (CP1–CP5): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None Required.	Mitigation Measure Rec-15: Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Key:
B = beneficial
LOS = level of significance
LTS = less than significant
NI = no impact
PS = potentially significant
S = significant

No-Action Alternative

No mitigation measures are needed for this alternative.

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

No mitigation is needed for Impact Rec-1 (CP1), Impact Rec-3 (CP1), and Impacts Rec-5 (CP1) through Rec-14 (CP1). Mitigation is provided below for Impacts Rec-2 (CP1) and Rec-4 (CP1), which would affect recreation at Shasta Lake recreation facilities, and for Impact Rec-15 (CP1), which would affect recreation on rivers in the extended study area.

Mitigation Measure Rec-2 (CP1): Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam Reclamation will inform recreation users of the Chappie-Shasta OHV Area about an alternate route to the area from the south, and will improve this alternative route (e.g., by grading unpaved portions) if necessary for vehicles pulling trailers to use the road. To mitigate the temporary disruption in public tours of Shasta Dam during construction, Reclamation will develop and provide enhanced information about the dam and its operation at the Reclamation Visitor Center at the dam, which would remain open. Mitigation for temporary loss of access to the trailhead at the west end of Shasta Dam is not necessary because the trailhead itself would be affected by construction.

Implementation of this mitigation measure would reduce Impact Rec-2 (CP1) to a less-than-significant level.

Mitigation Measure Rec-4 (CP1): Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps To mitigate impacts on visitor safety from remaining trees and stumps in untreated areas of the newly inundated zone, Reclamation will work with USFS to provide maps, bulletins, informational postings, and other media as deemed appropriate by USFS at boat ramps, marinas, and other developed Shasta Lake recreation sites. Similar information could be provided at public meetings and events and at USFS and other Web sites used by Shasta Lake visitors to learn about conditions at the lake. The information provided will identify the general areas of the shoreline where the hazard exists. It will also inform boaters or the nature of the hazard, the periods of time when the hazard is of concern (i.e., when the reservoir elevation is above the current full pool elevation), and best practices to avoid the hazard while recreating on the lake. Implementation of this mitigation measure would reduce Impact Rec-4 (CP1) to a less-than-significant level.

Mitigation Measure Rec-15 (CP1): Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements

and Agreements This measure is identical to Mitigation Measure Aqua-15 (CP1), described in Chapter 11, "Fisheries and Aquatic Ecosystems."

This measure would also protect recreation uses on these rivers by ensuring that any potential changes in flow would be within the current range of variability. Implementation of this mitigation measure would reduce Impact Rec-15 (CP1) to a less-than-significant level.

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

No mitigation is needed for Impact Rec-1 (CP2), Impact Rec-3 (CP2), and Impacts Rec-5 (CP1) through Rec-14 (CP2). Mitigation is provided below for Impacts Rec-2 (CP2) and Rec-4 (CP2), which would affect recreation at Shasta Lake recreation facilities, and for Impact Rec-15 (CP2), which would affect recreation on rivers in the extended study area.

Mitigation Measure Rec-2 (CP2): Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam This mitigation measure is identical to Mitigation Measure Rec-2 (CP1). Implementation of this mitigation measure would reduce Impact Rec-2 (CP2) to a less-than-significant level.

Mitigation Measure Rec-4 (CP2): Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps This mitigation measure is identical to Mitigation Measure Rec-4 (CP1). Implementation of this mitigation measure would reduce Impact Rec-4 (CP2) to a less-than-significant level.

Mitigation Measure Rec-15 (CP2): Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements This mitigation measure is identical to Mitigation Measure Rec-15 (CP1). Implementation of this mitigation measure would reduce Impact Rec-15 (CP2) to a less-than-significant level.

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

No mitigation is needed for Impact Rec-1 (CP3), Impact Rec-3 (CP3), and Impacts Rec-5 through Rec-14 (CP3). Mitigation is provided below for Impacts Rec-2 (CP3) and Rec-4 (CP3), which would affect recreation at Shasta Lake recreation facilities, and for Impact Rec-15 (CP3), which would affect recreation on rivers in the extended study area.

Mitigation Measure Rec-2 (CP3): Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam This mitigation measure is identical to Mitigation Measure Rec-2

(CP1). Implementation of this mitigation measure would reduce Impact Rec-2 (CP3) to a less-than-significant level.

Mitigation Measure Rec-4 (CP3): Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps This mitigation measure is identical to Mitigation Measure Rec-4 (CP1). Implementation of this mitigation measure would reduce Impact Rec-4 (CP3) to a less-than-significant level.

Mitigation Measure Rec-15 (CP3): Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements This mitigation measure is identical to Mitigation Measure Rec-15 (CP1). Implementation of this mitigation measure would reduce Impact Rec-15 (CP3) to a less-than-significant level.

CP4 – 18.5-Foot Dam Raise, Anadromous Fish Focus With Water Supply Reliability

No mitigation is needed for Impact Rec-1 (CP4), Impact Rec-3 (CP4), and Impacts Rec-5 through Rec-14 (CP4). Mitigation is provided below for Impacts Rec-2 (CP4) and Rec-4 (CP4), which would affect recreation at Shasta Lake recreation facilities, and for Impact Rec-15 (CP4), which would affect recreation on rivers in the extended study area.

Mitigation Measure Rec-2 (CP4): Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam This mitigation measure is identical to Mitigation Measure Rec-2 (CP1). Implementation of this mitigation measure would reduce Impact Rec-2 (CP4) to a less-than-significant level.

Mitigation Measure Rec-4 (CP4): Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps This mitigation measure is identical to Mitigation Measure Rec-4 (CP1). Implementation of this mitigation measure would reduce Impact Rec-4 (CP4) to a less-than-significant level.

Mitigation Measure Rec-15 (CP4): Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements This mitigation measure is identical to Mitigation Measure Rec-15 (CP1). Implementation of this mitigation measure would reduce Impact Rec-15 (CP4) to a less-than-significant level.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation is needed for Impact Rec-1 (CP5), Impact Rec-3 (CP5), and Impacts Rec-5 (CP5) through Rec-14 (CP5). Mitigation is provided below for

Impacts Rec-2 (CP5) and Rec-4 (CP5), which would affect recreation at Shasta Lake recreation facilities, and for Impact Rec-15 (CP5), which would affect recreation on rivers in the extended study area.

Mitigation Measure Rec-2 (CP5): Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam This mitigation measure is identical to Mitigation Measure Rec-2 (CP1). Implementation of this mitigation measure would reduce Impact Rec-2 (CP5) to a less-than-significant level.

Mitigation Measure Rec-4 (CP5): Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps This mitigation measure is identical to Mitigation Measure Rec-4 (CP1). Implementation of this mitigation measure would reduce Impact Rec-4 (CP5) to a less-than-significant level.

Mitigation Measure Rec-15 (CP5): Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements This mitigation measure is identical to Mitigation Measure Rec-15 (CP1). Implementation of this mitigation measure would reduce Impact Rec-15 (CP5) to a less-than-significant level.

18.3.6 Cumulative Effects

A diverse variety of programs that have been developed or are under development by Federal, State, and local agencies–individually and in conjunction with other agencies–are among the other past, present, and reasonably foreseeable future projects that may affect environmental conditions in the primary and extended study areas and therefore may contribute to cumulative effects.

These projects include construction and operation of projects or implementation of programs that may have the potential to adversely affect both land- and water-based recreation and, in combination, to cause an existing significant cumulative effect. For example, construction of some projects or implementation of programs may temporarily constrain boat navigation. Some of these project facilities may displace recreation facilities or activities, or may cause a long-term impediment to navigation on waterways. Water-based recreation may also be indirectly affected because of changes in reservoir water storage or changes in river flows downstream from reservoirs attributable to these projects. To the extent possible, foreseeable actions have been incorporated in the CalSim-II model and data developed for analysis of operational impacts on reservoir elevations and river flows under the project alternatives.

Several programs provide only general plans or frameworks for potential future projects or actions; no construction or other implementation of the programs has yet occurred, and no site-specific projects have been identified or undergone environmental analysis. Therefore, no effects of past or present projects are associated with these programs, and future projects that may occur are uncertain. Some of the programs or projects may result in temporary construction effects; however, the exact locations of these projects are unknown at this time. Many ongoing and future programs include public access or recreation objectives or measures, or would protect or enhance water quality, fisheries, wildlife habitat, and other biological resources that support recreation uses. These programs have the potential to result in beneficial effects on recreation, which could help reduce potentially significant cumulative effects.

The effects of climate change on operations at Shasta Lake could potentially affect water-based recreation opportunities both at the lake and downstream. As described in the Climate Change Appendix, climate change could result in higher reservoir releases in the future because of an increase in winter and early-spring inflow into the lake from high-intensity storm events. The change in reservoir releases could be necessary to manage for flood events resulting from these potentially larger storms. The potential increase in releases from the reservoir could lead to long-term changes in downstream channel equilibrium, which could affect the Sacramento River's ease of use for water-based recreation.

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

As described in Section 18.3.4 above, without mitigation, CP1 could cause significant and potentially significant effects on recreation and public access. These effects consist of temporary construction-related disruption of recreation access and activities at and near Shasta Dam; increased hazards to boaters and other recreationists at Shasta Lake from standing timber and stumps remaining in untreated areas of the inundation zone; and increased difficulty for boaters and anglers in using the Sacramento River and rivers below CVP and SWP reservoirs as a result of decreased river flows. These contributing adverse effects from CP1 would be cumulatively considerable. With implementation of Mitigation Measures Rec-2 (CP1), Rec-4 (CP1), and Rec-15 (CP1), adverse effects from CP1 would be reduced to a less-than-significant level. These adverse effects would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on recreation and public access. This would not be a cumulatively significant effect.

As stated previously, effects of climate change on operations at Shasta Lake could include a higher frequency of high-flow events, potentially resulting in changes to water-based recreation opportunities downstream. As described in the Climate Change Appendix, climate warming could result in more intense rainstorms, an increased occurrence of high-intensity rainfall, earlier melting of seasonal snowpack, and more events of rain or snow. These expected

consequences of climate change may create more frequent and severe flooding associated with lakes and rivers, and thus greater challenges to water-based recreation in the Sacramento River in the primary and extended study areas.

However, as noted in the Climate Change Appendix, studies also generally predict that climate change may cause Shasta Lake to be unable to stay above the 550 TAF dead pool in some critical years. With the lake at such a low level, an increase in adverse effects on recreation on the lake could result in critical years.

Implementation of CP1 could potentially diminish the effects of increased flows and potential flooding on downstream recreation in the Sacramento River by providing additional reservoir storage capacity after construction; however, it would not likely increase the anticipated adverse effects on recreation on Shasta Lake in critical years. When added to the anticipated effects of climate change, raising Shasta Dam would not have a significant cumulative effect on recreation.

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

The cumulative effects of CP2 would be similar to those of CP1, but greater in magnitude. With implementation of Mitigation Measures Rec-2 (CP2), Rec-4 (CP2), and Rec-15 (CP2), adverse effects from CP2 would be reduced to a less-than-significant level. These adverse effects would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on recreation and public access. This would not be a cumulatively significant effect.

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

The cumulative effects of CP3 would be similar to those of CP1, but greater in magnitude. With implementation of Mitigation Measures Rec-2 (CP3), Rec-4 (CP3), and Rec-15 (CP3), adverse effects from CP3 would be reduced to a less-than-significant level. These adverse effects would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on recreation and public access. This would not be a cumulatively significant effect.

CP4 – 18.5-Foot Dam Raise, Anadromous Fish Focus With Water Supply Reliability

The cumulative effects of CP4 would be similar to those of CP1, but greater in magnitude. With implementation of Mitigation Measures Rec-2 (CP4), Rec-4 (CP4), and Rec-15 (CP4), adverse effects from CP4 would be reduced to a less-than-significant level. These adverse effects would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on recreation and public access. This would not be a cumulatively significant effect.

CP5 – 18.5-Foot Dam Raise, Combination Plan

The cumulative effects of CP5 would be similar to those of CP1, but greater in magnitude. With implementation of Mitigation Measures Rec-2 (CP5), Rec-4 (CP5), and Rec-15 (CP5), adverse effects from CP5 would be reduced to a less-than-significant level. These adverse effects would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on recreation and public access. This would not be a cumulatively significant effect.