CHAPTER 6

ENVIRONMENTAL CONSEQUENCES
NO-ACTION ALTERNATIVE

It is anticipated that under the No-Action Alternative, in the absence of any congressional action to improve the existing American River flood control system, the Interim Reoperation Agreement between SAFCA and Reclamation, which has secured a temporary increase in the space allocated to flood control in Folsom Reservoir, would be indefinitely extended. By virtue of this extension, the operation of Folsom Reservoir and the other CVP facilities north of the Delta would be modified, as necessary, to meet the requirements of the flood control diagram (1993 Diagram) referenced in the Agreement. The No-Action Alternative serves as the standard against which alternatives are compared to determine the impacts and mitigation requirements. Since no construction would be required to implement this plan, the discussion focuses on the operational impacts associated with adjusting CVP operations to accommodate the requirements of the 1993 Diagram.

The potential effects of a permanent reoperation are discussed in chapter 10. The primary topics described are the likely socioeconomic and environmental effects and required mitigation for changing the flood control operation at Folsom Dam from a fixed 400,000 acre-feet of storage to the permanent reoperation.

OPERATIONAL IMPACTS

The following operational impact analysis is based on (1) information contained in the "Interim Reoperation of Folsom Dam and Reservoir Final Environmental Impact Report Environmental Assessment," prepared jointly by SAFCA and Reclamation, (2) "Folsom Dam and Reservoir Permanent Reoperation" (Montgomery Watson, 1995), and (3) supporting model data.

METHODOLOGY

The PROSIM (PROject SIMulation) model was used to evaluate the impacts of modifying the flood control space in Folsom Reservoir. The model was developed by Reclamation to evaluate the effects of operating the CVP/SWP under various hydrologic conditions. The model takes into account storage in the various reservoirs, water demands for a variety of needs at various locations, including minimum flow standards and basic hydrologic parameters under various water-year conditions. Basic output from the model includes end-of-period reservoir storage, deliveries to users, and streamflow at various

points. From this information, estimates of water deliveries, reservoir storage, hydropower capacities, and water temperatures can be estimated for a variety of different conditions. The PROSIM model simulates conditions by the mass balance approach on a monthly time step over a specified data period, in this case 70 years (1922 through 1991). For purposes of this evaluation, it was assumed that:

(1) The 70-year hydrologic record (1922 through 1991) used by Reclamation and others for water planning in California represents the best information available for projecting impacts to hydrologic or hydrologically dependent resources. This period includes periods of extended drought, periods of high runoff, and variation between. To model operations as they exist today, demands for each of the study years from 1922 through 1991 were estimated based on a common level of population, acreage development, and land use. These estimated demands enable the CVP (and SWP) operations to be evaluated as if past hydrologic conditions were to recur.

(2) The operation of the three largest non-Federal reservoirs in the American River watershed (French Meadows, Hell Hole, and Union Valley) would remain unchanged for purposes of the analysis. The model studies assume that these reservoirs would continue to be used primarily as hydropower facilities to provide almost instantly available capacity and energy for northern California utilities. Reservoir storage is evacuated during the summer and fall in all three reservoirs. This vacant space is usually filled during the winter and spring because of the nature of hydrologic conditions in California. Along with consumptive water deliveries, power operations during the peak electricity demand months of the summer constantly call on the water stored in these reservoirs. By late fall, these demands lead simultaneously to a considerable reduction in water storage and a considerable increase in the space available for incidental flood control. As the demand for water and power increases over time, it is assumed that this historical pattern of operation would continue.

(3) The operation of the CVP would reflect 2020 hydrology and demands.

Important input assumptions used in the model include hydrology and a host of system constraints. Hydrology includes recorded and simulated gains (inflows) or losses (evaporation, for example) to system reservoirs and gains or losses to the streams. It also includes system demands under current and future (2020) conditions. These assumptions include:

- Use of December 1994 Bay/Delta standards in place of January 1994 EPA standards. Also, excluded from the analysis were D-1485 standards and biological opinions by NMFS (February 1993 winter-run chinook salmon) and FWS (February 1994 Delta smelt). However, it may be said that December 1994 Bay/Delta standards purport to reflect the provisions of the aforementioned standards reached through a consensus

among agricultural, municipal and industrial, and environmental interests. The December 1994 Bay/Delta standards supersede the D-1485 standards. The goal of the new Bay/Delta plan is to establish water quality control measures that will protect the beneficial uses of the Bay/Delta estuary. The plan is a comprehensive management measure for the protection of the estuary's beneficial uses that include salinity (from saltwater intrusion and agricultural drainage) as well as water project operations (flow and diversions). Details of the plan are published in the "Draft Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary" (SWRCB, 1994) and summarized in "Principles for Agreement on Bay-Delta Standards between the State of California and the Federal Government, 1994."

- Cross Valley Canal diversions were not included.

- Shasta temperature control device is completed and operational.

CHANGES IN CVP OPERATIONS

Under the No-Action Alternative, the 1993 agreement (Agreement) between SAFCA and Reclamation, which has secured a temporary increase in the space allocated to flood control in Folsom Reservoir, would be indefinitely extended. For purposes of this final SEIS/EIR, it is expected that, by virtue of this extension, the operation of Folsom Reservoir and the other CVP facilities north of the Delta would be permanently modified, as necessary, to meet the requirements of the flood control diagram (1993 Diagram) contained in the Agreement. Two models have been created to evaluate the socioeconomic and environmental consequences of these operational modifications; the "Baseline Condition Model" and the "No-Action Model." Under the Baseline condition model, it is estimated that as of October 31, 1999, the termination date of the Agreement, Folsom would revert to operation in accordance with the Corps' 1986 flood control diagram (1986 Diagram). Under this model, the recreational improvements and temperature control shutters installed at Folsom Dam required under the Agreement remain in place, and CVP operations are adjusted to reflect reasonably foreseeable water demands for consumptive use and environmental needs through 2020. Under the No-Action ("permanent reoperation"), Model year 2020 water demands are assumed, CVP operations are adopted to comply with the 1993 Diagram. The No-Action Alternative is in turn used as the basis for evaluating (1) the adverse operational impacts associated with increasing the amount of storage space allocated to flood control as proposed under the Folsom Modification Plan and (2) the positive impacts of reverting Folsom Reservoir operations to the 1986 Diagram as proposed under the Detention Dam Plan.

Various mitigation measures have been implemented for the interim reoperation agreement. Permanent reoperation would likely require the same and possibly additional mitigation measures which are described below.

WATER SUPPLY

CVP/SWP Water Deliveries

Baseline. The potential impacts of permanent reoperation on water supply were assessed by examining the changes in CVP/SWP water storage and delivery between the Baseline 1986 Diagram and the No-Action Alternative. PROSIM output for the following variables was compared to assess water supply impacts:

- CVP export pumping.
- SWP export pumping.
- CVP north of Delta deliveries.
- CVP south of Delta deliveries.
- CVP storage in Clair Engle, Shasta, and Whiskeytown Reservoirs and the CVP share of San Luis Reservoir.
- CVP storage in Folsom Reservoir.
- SWP storage in Oroville Reservoir and the SWP share of San Luis Reservoir.

No-Action Condition. Increasing the amount of flood storage in Folsom would (1) on net, reduce the amount of water the CVP/SWP systems can deliver and (2) reduce the overall ability that the system has to deliver water. On average, the changes are relatively small compared to the total delivery of the CVP and SWP. In many years, there would be little to no adverse change, since the system can refill following the winter drawdown. Modeling studies indicated that in some years the greater space requirement in Folsom Reservoir would actually result in an increase in available water supplies. However, in other years the system cannot completely recover due to reduced inflows, and resulting adverse impacts would be sizeable.

The export and delivery quantities were computed as the average annual amount, while the storage conditions were computed as monthly averages. PROSIM was run for a 70-year database that approximates hydrologic conditions for the period 1922 through 1991. (See table 6-1.) Hydrology for this period reflects wet and dry years; therefore, using the results for the entire simulation reflects an average condition. The results for the period 1928 through 1934 were also examined to assess the impacts during an extended dry period. The purpose of displaying and discussing the January 1994 EPA standards is to demonstrate that there are very small differences between the two standards.

As indicated in table 6-1, the differences in average annual water export and delivery between the Baseline and No-Action Alternative under January 1994 EPA standards and December 1994 Bay/Delta standard are small (less that 0.2 percent).

TABLE 6-1

Water Supply Impacts for Average Years (1922-91) (1,000 acre-feet)

No-Action Alternative Less Baseline								
	January 1994 EPA Standards				December 1994 Bay/Delta Standards			
	1995		2020		1995		2020	
Annual Averages								
CVP Export Pumping	- 0.4	(0.16%)	-0.0	(0.00%)	0.0	(0.00%)	- 0.1	(<.01%)
SWP Export Pumping	0.0	(0.00%)	0.1	(<.01%)	0.0	(0.00%)	0.0	(0.00%)
CVP North of Delta	- 1.2	(0.04%)	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)
CVP South of Delta	- 4.2	(0.17%)	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)
SWP South of Delta	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)
Total Project Delivery	- 5.4	(0.07%)	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)
Averages								
CVP Storage excluding Folsom	- 2.5	(0.05%)	- 4.8	(0.09%)	- 3.3	(0.06%)	- 2.7	(0.05%)
Folsom Storage	- 9.2	(1.62%)	- 9.6	(1.76%)	-10.2	(1.71%)	- 9.0	(1.55%)
SWP Storage	- 5.9	(0.19%)	- 7.2	(0.23%)	+ 4.6	(0.14%)	- 6.6	(0.20%)
Total Storage	-17.6	(0.19%)	-21.6	(0.24%)	-18.1	(0.19%)	-18.3	(0.20%)

Note: Baseline = 400 TAF Fixed
No-Action Alternative = 400-670 TAF Flexible
Impact = No-Action Alternative less Baseline, 1,000 acre-feet, (percent of total system).

Water supply impacts were also measured in terms of available storage in CVP and SWP reservoirs. Because the Baseline and No-Action Alternative incorporate rule curves with different storage targets for Folsom Reservoir, the water supply available from that facility varies. However, since CVP reservoirs are operated together, changes in storage in Folsom may be offset by changes in other reservoirs. Table 6-1 indicates the extent of the variation in average monthly storage for Folsom Reservoir for the average condition (1922 through 1991). The average monthly storage decreases are about the same (less that 1.8 percent) under both January 1994 EPA standards and December 1994 Bay/Delta standards. Table 6-1 also indicates that although the No-Action Alternative rule curve affects Folsom Reservoir storage, the impacts on storage in the entire CVP and SWP systems are relatively small (less than 0.3 percent) under both regulatory standards.

Similarly, a comparison of the deliveries for the dry period 1928 through 1934 shows that the impacts in export and delivery are identical under January 1994 EPA standards and December 1994 Bay/Delta standards (table 6-2). In fact, under both standards, there appears

to be no impact on CVP or SWP deliveries between the Baseline and the No-Action Alternative.

An examination of table 6-2 also shows that impacts on Folsom storage are smaller (less than 1.6 percent) for the 1928 through 1934 dry period relative to those for the average condition of 1922 through 1991. The changes in storage in the remainder of the CVP and SWP system are a little higher (less than 0.6 percent) relative to those for the average condition. As indicated, these storage changes are not reflected in changes in delivery during this dry period. These conclusions are true for simulations under both the January 1994 EPA standards and the December 1994 Bay/Delta standards.

TABLE 6-2

Water Supply Impacts for Dry Years (1928-34) (1,000 acre-feet)

No-Action Alternative Less Baseline								
	January 1994 EPA Standards				December 1994 Bay/Delta Standards			
	1995		2020		1995		2020	
Annual Averages								
CVP Export Pumping	-0.4	(0.02%)	-0.8	(0.05%)	-0.8	(0.04%)	-3.0	(0.16%)
SWP Export Pumping	+4.3	(0.21%)	0.0	(0.00%)	0.1	(<.01%)	+0.3	(0.01%)
CVP North of Delta	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)
CVP South of Delta	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)
SWP South of Delta	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)
Total Project Delivery	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)	0.0	(0.00%)
Averages								
CVP Storage excluding Folsom	-12.1	(0.33%)	-3.7	(0.10%)	-11.5	(0.30%)	+1.2	(0.03%)
Folsom Storage	- 2.5	(0.49%)	-3.5	(0.73%)	-8.1	(1.55%)	-1.7	(0.35%)
SWP Storage	-12.2	(0.52%)	+6.6	(0.27%)	+9.6	(0.42%)	+4.2	(0.19%)
Total Storage	-26.8	(0.41%)	-0.6	(0.01%)	-10.0	(0.15%)	+3.7	(0.06%)

Note: Baseline = 400 TAF Fixed
No-Action Alternative = 400-670 TAF Flexible
Impact = No-Action Alternative less Baseline condition, 1,000 acre-feet, (percent of total system).

The previous discussion and tables indicate that the effects remain similar and minor regardless of the assumptions used in the analysis. In addition to the simulations shown in tables 6-1 and 6-2, simulation runs were conducted incorporating potential EBMUD demands on the American River. Water supply reoperation effects on the CVP again remained similar. Additional information on various simulations is available in the Montgomery Watson reoperation report, February 1996.

The minor effects on delivery and storage, however, can be significant to water uses in economic terms. Table 6-3 presents effects in terms of the system's ability to deliver water. It shows delivery changes derived from PROSIM as well as storage changes (from PROSIM) converted to potential deliveries. The positive and negative numbers indicate that reoperation occasionally increases delivery and storage, and some years reoperation causes reductions. For example, for the No-Action condition, the net effect of reoperation is an average reduction of 9,000 acre-feet a year. The development of table 6-3 is discussed in the SIR, chapter VII.

TABLE 6-3

Water and Power Impact[1]

Item	Reoperation Scenario		
	400 to 400/670	**400/670 to 475/720**	**400 to 475/720**
Water delivery (TAF/yr)[2]			
Indicated delivery	0	+11 and - 4	+11 and - 4
Equivalent delivery[3]	+5 and -14	+11 and -31	+12 and -38
Total	+5 and -14	-22 and -35	+23 and -42
Power			
Energy (GWh/yr)[2]	-12	- 6	-18
Capacity[4] (MW)[2]	- 3	- 12	- 16
Local Pumping (GWh/yr)	-0.1	-0.3	-0.4

[1]Based on year 2020 demands and 70-year period of analysis.
[2]TAF = 1,000 acre-feet; GWh = 1 million kilowatt hours; MW = 1 million watts
[3]Equivalent delivery is related to reservoir storage and is a measure of the ability to deliver water. The average annual potential delivery change due to storage can be positive (when storage is improved by reoperation) or negative (when storage is reduced by reoperation).
[4]Capacity is the average maximum seasonal reduction in CVP MW capacity.

Local Water Supply

Baseline. Water agencies that obtain their water from Folsom Reservoir are affected by fluctuating water-surface elevations in the reservoir in two ways. First, as the reservoir pool drops below the elevation at which water can be delivered by gravity, the water agencies need to pump to reach their distribution systems. The lower the water-surface elevation, the greater the amount of energy needed to run the pumps, increasing the water agencies' operating expenses. The six agencies that are affected by changing water levels in

Folsom Reservoir include the City of Roseville, SJWD (San Juan Water District), and PCWA (Placer County Water Agency) on the North Fork Pipeline, Folsom Prison and the City of Folsom on the Natoma Pipeline, and EID (El Dorado Irrigation District). Important water-surface elevations related to water supply from Folsom Reservoir are presented in table 6-4.

TABLE 6-4

Folsom Reservoir Water-Surface Elevations and Pumping Relationships

Surface Elevations	Storage (acre-feet)	Pumping Relationship
≤433	≤638,300	Pumping to Roseville and SJWD during irrigation season (April - October)
≤425	≤567,400	Pumping required to Roseville and SJWD during nonirrigation season
≤414	≤477,700	Pumping begins to Folsom and Folsom Prison
≤356	≤157,100	EID pumps begin to develop vortex problems
≤340	≤110,600	Potential vortex at dam intake, depending on volume of pumping
≤335	≤ 98,800	Folsom Pumping Plant limited to 70 cfs.
≤325	≤ 78,300	Lower limit of EID pumps and Folsom Pumping Plant; pumps on barges required to pump water to existing intakes
≤315	≤ 61,200	Elevation of Folsom Dam water intake; tap penstocks
≤307	≤ 49,600	Elevation of power penstocks; portable pumps placed on a barge to supply pipeline intake

Source: Corps, 1992b

Reservoir operations under the Baseline can result in conditions in which the capability of the Folsom Pumping Plant is reduced below that necessary to provide full water supplies to the North Fork and Natoma pipelines. The pumping plant's capacity is a function of reservoir elevation. During water years characterized by less than normal inflows, the elevation typically declines to levels which restrict pumping in the summer. The lowest elevation reached in the Baseline simulation is 334.9 feet, which is above the absolute minimum level needed by all agencies to pump water with their existing facilities (table 6-4). However, at this level, pump efficiencies would be severely affected, reducing the amount of water that could be pumped during a given 24-hour period while increasing pumping costs.

No-Action Condition. Under the No-Action Alternative, there would be periods when local water agencies would be affected by the lower water-surface elevations in Folsom Reservoir. More pumping (and thus greater energy consumption) would be required due to

the lower water surface. However, the reoperation would not induce very low water levels, such as occur in a drought, that would affect water supply availability. The increased energy consumption, derived from the lake level differences modeled in PROSIM, adds up to about 0.1 GWh per year on an average annual basis. The yearly impact would vary widely with the extent of drawdown done under the flexible flood space plan. At 100 mils per KWh, that total cost would be about $10,000 per year distributed as follows: North Fork Pipeline $6,000, Natoma Pipeline $2,000, EID $2,000.

HYDROPOWER

Baseline

Changes in hydropower deliveries from the No-Action Alternative can be segmented into two basic types: (1) one that affects project capacity and (2) one that affects project energy production. Hydropower impacts are experienced when CVP reservoirs are drawn down lower (reduced capacity at the powerplants and efficiency for releases), when releases are diminished (reduced energy), or when project uses are increased (increased energy and capacity requirements).

No-Action Condition

Potential hydropower changes were assessed using the power subroutine of PROSIM to describe the power generation and capacity of the CVP system north of the Delta and at Folsom Reservoir. The average annual generation is 4,700 GWh; of this total, Folsom produces 600 GWh. The average annual capacity of the CVP north of the Delta is 1,240 megawatt/month. Of this, 180 megawatt/month is from Folsom. There would be an average maximum capacity reduction of 3 megawatts and average energy reduction of 12 GWh. The northern California power grid allows alternative sources such as the 1,000 GWh and 1,000 MW hydropower facilities in the upper American River to supplement Folsom Dam power.

RECREATION

Baseline

Lower American River. Boating (rafting, canoeing, and kayaking), swimming and wading, and fishing are important water-dependent recreation activities along the lower American River. Approximately 90 percent of all boating and swimming on the lower American River takes place between Memorial Day and Labor Day. Fishing is a year-round activity.

Fishing opportunities along the lower American River are affected by the abundance of sport fish (chinook salmon and steelhead trout).

Folsom Reservoir. Folsom Reservoir supports numerous water-based activities such as boating, waterskiing, and fishing. The shoreline provides sandy swimming beaches, both formal (with lifeguard services) and informal. Surrounding Folsom Reservoir is a landscape with important scenic, natural, and cultural values. Recreational facilities include camping and picnic areas, boat launch ramps, restrooms, concessions, bicycle and mountain bike trails, and equestrian trails and staging areas.

Most visitation at Folsom Reservoir is in the summer, when recreation focuses primarily on water-based activities including swimming, windsurfing, fishing, boating, waterskiing, boat camping, jetskiing, and scuba diving. Winter visitation is substantially lower; use consists mainly of fishing and passive recreation.

Upper American River. Reclamation contracted with the Department of Parks and Recreation to provide recreation and public-use management services on the lands within the boundaries of the multipurpose Auburn Dam project, known as the ASRA (Auburn State Recreation Area). The ASRA includes 42,000 acres and 48 miles of the American River from the damsite to the Iowa Hill Bridge on the North Fork and to Oxbow Reservoir on the South Fork.

Its nearness to major population centers and diverse recreation base make the ASRA one of the most used and significant recreational resources in northern California. Local interest in recreation is very heavy. Bicycling has increased dramatically in the area. There is continuing demand for equestrian trails and other trails. The Tevis Cup horse race and the Western States Run, both 1-day, 100-mile events, use the Western States Trail from Auburn to Squaw Valley. These events draw entrants from around the world. Additionally, the Western States Trail has been included as the trans-Sierra route of the proposed coast-to-coast American Discovery National Trail. Whitewater boating on the Middle and North Forks of the American River is of State and national significance. Both forks offer overnight camping opportunities, hiking trails, cultural and natural observation sites, and a diversity of difficulty in whitewater rapids from beginning to advanced boating skill levels. The nearby South Fork of the American River offers a less challenging whitewater experience, and because of the predominance of private lands and development along the river corridor, camping is restricted. The nearest similar "wilderness" whitewater river, providing overnight trips, is the Tuolumne River, about 100 miles southeast of the recreation area. Approximately 72 miles of hiking trails, 66 miles of equestrian trails, and 15 miles of fire road are open to mountain bikes in the ASRA and provide year-round recreation opportunities.

No-Action Condition

Reoperation of Folsom Dam would alter flow patterns during nonflood periods in the lower American River from those under the without-project conditions. In general, flows would be higher in the late fall, winter, and early spring as Folsom Reservoir releases maintained required flood space. Flows would be somewhat less in the late spring as flows are decreased to allow Folsom Reservoir to fill. The principal water-dependent recreation

activities affected by these altered flows would be boating (including rafting, kayaking, and canoeing), swimming, and wading.

Approximately 2,000 cfs is the minimum flow necessary to support all forms of boating (kayaking, rafting, and canoeing), and 1,500 cfs is the minimum flow required to support wading and swimming (Watson, 1985).

After high flows, recreational use of trails and parks would be interrupted until repairs were made or cleanup completed. This would particularly affect low-lying portions of the bicycle trail that are prone to wash out at high flows. Some vegetation would also be altered due to higher flows affecting, at least temporarily, the visual resource value of the riverine environment to recreationists.

Boating, swimming, and wading are affected by flows and water temperature. Low flows typically affect boating by reducing stream velocity, so river-travel time and congestion increase. Swimming and wading opportunities can be limited by the number of usable areas along the river, which decrease during periods of low flow, and low water temperatures during periods of high flow.

Water-surface elevations directly affect the availability and quality of boat ramps, beaches, berth sites, and other facilities which depend largely on water depth or surface area. As these facilities become unavailable to users, use patterns and visitation are altered. In addition, visual resource values closely associated with the recreational experience are affected by water-surface elevations and influence how, and the degree to which, recreationalists use the resources of Folsom Reservoir.

Recreational resources in the upper American River area would not be affected under the No-Action Alternative.

FISHERIES

Baseline

Lower American River. The Baseline in the lower American River is considered to be only marginal for anadromous fish production, especially during low-flow years. Increased water temperature, decreased water quality, reductions in the quantity and quality of spawning gravel, and a decline in hatchery production contribute to this potential reduction of the anadromous fishery resource.

Fall-run chinook salmon continue to be the primary species of management concern in the lower American River. This approach reflects the consensus reached by participants in Environmental Defense Fund et al. versus East Bay Municipal Utility District (Hodge Decision)—a consensus which included as management priorities ". . . maximize the in-river production (that is, spawning, juvenile survival) of chinook salmon in the Lower American

River" and ". . . maximize the in-river production of steelhead trout to the extent that it does not interfere with chinook salmon management." However, because NMFS received a petition on February 14, 1994, to list steelhead trout throughout its range in Washington, Idaho, Oregon, and California, the issue of management priorities in the lower American River merits additional discussion.

High water temperature above during summer and fall is the environmental factor that is the most limiting to natural production of steelhead trout in the lower American River (Snider and Gerstung, 1986; DFG, 1991c). Historically, steelhead trout migrated upstream to their primary spawning and rearing areas in the upper forks of the American River and its tributaries. In these upper reaches of the American River system, juvenile steelhead trout reared for at least 1 year before migrating downstream to the Pacific Ocean. Cool water temperatures in the upper reaches of the system made this extended rearing component of their life history possible. Today, the historical spawning and rearing areas are inaccessible to steelhead trout, and, due to dam construction, spawning and rearing in the American River system is restricted to the lower American River—an area subjected to elevated water temperatures. Consequently, it is believed that few juvenile steelhead trout survive through the summer and fall (DFG, 1991c).

In addition to the river itself, high water temperatures at the Nimbus Fish Hatchery during late summer and fall are problematic for rearing steelhead trout, even during good water years. High water temperatures promote the growth of disease organisms. Treatments for these diseases are expensive and contribute significantly to the cost and ineffectiveness of raising steelhead trout to yearling size (DFG, 1991c). Currently, modernization plans for the hatchery do not address the problems of high water temperatures during summer and fall at the hatchery. There are no formal plans or processes under way to resolve the problem of high water temperatures (DFG, 1991c).

Folsom Reservoir. Folsom Reservoir operations under the Baseline adversely affect resident warmwater species in two ways. First, the water-surface elevation in Folsom Reservoir is reduced by an average of 39.3 feet between June and September, a critical time in year-class development. Such drawdowns eliminate an average of 2,567 surface acres of water (25.6 percent of total), much of which is in sheltered coves containing flooded terrestrial vegetation. This loss of juvenile rearing habitat resulting from summer drawdown is thought to have the greatest negative effect on annual production of fish in Folsom Reservoir (D. Lee, DFG pers. comm., 1994). Second, fluctuations in water levels cause dewatering and flooding of nests and reduce the spawning success. As a result, annual production of bass, sunfish, crappie, bullhead, and catfish is low, and the population of these species tends to be marginal compared to those found in similar natural reservoirs that do not suffer such wide fluctuations in water level.

Upper Sacramento River. NMFS has determined that a daily average water temperature of less than or equal to 56 °F is required in the Sacramento River between Keswick Dam and Bend Bridge from April 15 through September 30 to protect winter-run

chinook salmon spawning and incubation. NMFS, in its 1993 biological opinion, specified a minimum flow release criteria for October through March of 3,250 cfs at Keswick Dam.

No-Action Condition

Lower American River

Flow Impacts. Under the No-Action Alternative, the frequency with which lower American River flows would meet or exceed the Hodge flows would increase by 5 percent in October through February (165 out of 350 months), decrease by 1 percent in March through June (146 out of 280 months), and remain unchanged in July through September (160 out of 210 months) compared to the Baseline condition (see table 6-5). Chinook salmon spawning flows may improve slightly. In general, flow impacts on physical habitat in the lower American River would be similar to those under the Baseline.

TABLE 6-5

Exceedence Frequencies of Recommended Flows (using average monthly flows) for the Lower American River (Hodge flows)

		Exceedence Frequencies in Months	
Fisheries Impact Threshold Flows	Number of Months (Relevant Period - 70-Year Period of Analysis)	400 TAF (Baseline Condition)	400-670 TAF (No-Action Alternative)
2,000 cfs	350 (Oct-Feb)	147 (42%)	165 (47%)
3,000 cfs	280 (Mar-Jun)	148 (53%)	146 (52%)
1,750 cfs	210 (Jul-Sep)	160 (76%)	160 (76%)

Water Temperature Impacts. An analysis of daily exceedence frequencies based on the historical relationship between reservoir storage, lower American River discharge, and maximum daily water temperatures in the lower American River was not required because the alternatives to be analyzed include operation of the temperature control device at Folsom Dam, which is expected to alter the relationship among lake level, discharge, and water temperature.

Chinook Salmon. Under the No-Action Alternative, the frequency with which monthly water temperatures would exceed optimal water temperatures for chinook salmon spawning and incubation (56°F) in October and November would be increased by zero to 2 percent (123-113 out of 138 months) (depending on distance downstream from Nimbus

Dam) compared to the Baseline. The frequency with which temperatures at Nimbus Hatchery would exceed 56 °F (based on monthly water temperatures at Nimbus Dam) would increase by 2 percent (123 out of 207 months). Therefore, no significant changes would occur in temperature impacts on in-river and hatchery production of chinook salmon.

A slight decrease or no change in exceedence frequencies would occur in the spring relative to the chinook salmon rearing and emigration threshold (60 °F). Therefore, water temperature impacts on chinook salmon rearing and emigration success would not change significantly relative to the Baseline.

Steelhead Trout. Under the No-Action Alternative, the frequency with which monthly water temperatures would exceed optimal water temperatures for steelhead trout spawning and incubation (52 °F) would decrease by 3 percent (111 out of 207 months) at Nimbus Dam and remain unchanged at the downstream stations relative to the Baseline.

As under the Baseline, monthly water temperatures in summer would continue to exceed the rearing threshold (60 °F) in all years. A 2 percent increase (178 out of 276 months) or no change would occur in exceedence frequencies relative to the steelhead trout emigration threshold. Therefore, there would be no significant adverse impacts on steelhead trout rearing and emigration success.

American Shad, Striped Bass, and Sacramento Splittail. Under the No-Action Alternative, no changes would occur in the frequency with which monthly water temperatures would exceed spawning temperature thresholds (68 °F) for American shad, striped bass, and Sacramento splittail. Therefore, water temperature impacts on the spawning success of these species would be similar to those under the Baseline.

Flow Fluctuation Impacts. Under the No-Action Alternative, the frequency of flow reductions of 50 percent or more during the chinook salmon spawning and incubation period would remain unchanged in October through January and increase by 1 percent in November through February and December through March. The frequency of 50 percent flow reductions during the steelhead trout spawning and incubation period would increase by 1 percent in January through April and 6 percent in February through May. Therefore, redd stranding impacts on chinook salmon and steelhead trout were considered less than significant.

Potential stranding impacts on Sacramento splittail would be similar to those under the Baseline. The frequency of reductions in river stage of 1 foot or more would decrease by 1 percent during the principal splittail spawning and early rearing period.

Folsom Reservoir

Black Bass Spawning and Rearing Habitat. Under the No-Action Alternative, differences in annual black bass (spotted bass and largemouth bass) spawning and rearing habitat values would range from a 13 percent decrease in largemouth bass spawning habitat to a 20 percent increase in black bass rearing habitat relative to the Baseline. Under Baseline conditions, black bass spawning habitat values would range from 563 to 3,734 acres for largemouth bass spawning habitat, 1,502 to 5,514 acres for spotted bass spawning habitat, and 1,376 to 7,605 acres for black bass rearing habitat. Median differences in black bass habitat values would be zero to 1 percent. There would be no significant changes in black bass spawning and rearing success.

Spawning Success of Warmwater Fish. Under the No-Action Alternative, the frequency of reservoir drawdowns of 2 feet or more per month during the primary spawning months for warmwater game fish (March through July) was reduced by 1 percent during the 70-year simulation period. Such drawdowns eliminate an average of 2,567 surface acres of water (25.6 percent of total), much of which is in sheltered coves containing flooded terrestrial vegetation. Because these drawdowns occur infrequently, impacts on spawning success of warmwater game fish would be similar to those under the Baseline.

Coldwater Fish Habitat. Under the No-Action Alternative, average monthly reservoir storage would be reduced by 2 to 7 percent in December through March, increased by 2 percent in September and October, and reduced by zero to 1 percent in the remaining months. Reductions in reservoir storage during winter are not expected to cause significant adverse impacts on the reservoir trout fishery because coldwater habitat is unlikely to be limiting the abundance of stocked trout, especially during the cooler months when the reservoir is thermally mixed. Lower reservoir storage during the winter may actually improve feeding opportunities for rainbow trout by increasing prey availability.

Upper Sacramento River. Under the No-Action Alternative, flow impacts on fishery resources in the upper Sacramento River would be similar to those under the Baseline. No change would occur in the frequency with which flows would meet the October through March minimum release criterion of 3,250 cfs at Keswick Dam.

A slight decrease or no change would occur in the frequency with which monthly water temperatures would exceed the chinook salmon spawning and rearing thresholds in the upper Sacramento River, including those established for winter-run chinook salmon spawning and incubation thresholds (56 °F) and rearing threshold (60 °F). Therefore, temperature impacts on chinook salmon spawning and rearing success in the upper Sacramento River would be similar to those under the Baseline.

Downstream From American River. Implementing the No-Action Alternative would have little or no effect on flow and water temperature impacts on fisheries resources in the lower Sacramento River; impacts would be similar to those under the Baseline. Changes in average monthly flow at Freeport would be 1 percent or less in all months.

Impacts of Delta outflows and total Banks and Tracy exports on fisheries resources would be similar to those under the Baseline. Changes in average monthly Delta outflow and exports would be 1 percent or less in all months.

Shasta Reservoir. Implementing the No-Action Alternative would have little or no effect on Shasta Reservoir fish habitat and populations. Average monthly reservoir storage differed by less than 1 percent from storage levels under the Baseline. Under the Baseline condition, the September carryover storage at Shasta Reservoir is 1.9 million acre-feet.

No change would occur in the frequency with which September storage levels would meet the carryover storage criteria for water temperature control in the upper Sacramento River. Therefore, storage-related water temperature impacts on winter-run salmon spawning success would be similar to those under the Baseline.

Clair Engle Reservoir. Implementing the No-Action Alternative would have little or no effect on changes in reservoir storage on reservoir fish habitat or populations. Changes in average reservoir storage would be less than 1 percent in all months.

VEGETATION AND WILDLIFE

Lower American River

Baseline. The natural processes that support and maintain stands of riparian vegetation and the associated riparian wildlife community were substantially altered in the lower American River by the construction of Folsom and Nimbus Dams. The flow regime and typical annual hydrograph for which the riparian vegetation was adapted has changed such that annual high flows no longer coincide with the time many of the riparian species such as cottonwood and willow shed their seed. In addition, the dams have blocked the transport of much of the upstream sediment. Consequently, deposition of sediment along the banks of the lower American River during high flows, which is necessary for providing an adequate seed bed suitable for the establishment of riparian plants, has been minimized. The elimination of sediment transported from upstream has also resulted in increased erosion and transport of sediment out of the lower American River and incision of the river channel. This condition has led to the migration of the river away from the existing riparian community. Hence, the dams have impaired natural regeneration of the riparian community along the lower American River and the ability of the river to support existing vegetation.

Wetland areas in the river's side channels and isolated ponds have also been affected by changes in the river's flow regime over time. As the river channel continues to meander, wetlands dependent upon recharge from floodwaters and/or ground water supported by streamflow may be eliminated or flooded permanently. Similarly, long-term abundance and distribution of sensitive plant and wildlife species associated with riverine and riparian habitats, as well as the wildlife community as a whole, may change in response to changes in the riparian community.

No-Action Condition. The No-Action Alternative would generally result in increased flows during late fall and early winter as flood storage is increased in the reservoir and reduced flows during the spring while the reservoir is refilled. This change in the existing flow regime would not influence, either detrimentally or beneficially, the riparian community's ability to regenerate. Therefore, the focus of the impact analysis is on maintenance of existing vegetation and wetlands.

Existing riparian vegetation can be affected by changes in flow in several ways:

(1) Reduction in spring flow that prevents recharge of backwater channels and isolated ponds;

(2) Inundation for extended periods during the growing season;

(3) Change in the flow regime such that the frequency of low-flow conditions during the growing season is increased; and

(4) Change in the frequency, duration, and depth of peak floodflows that promote cottonwood and willow regeneration on flood plain terraces.

Based on the requirements of the 1993 Diagram, flows under the No-Action Alternative would differ from those under the Baseline only infrequently ($\leq$12 years) during January and May through December. Additionally, the flow differences during these months were generally minor. In February, March, and April, flows under the No-Action Alternative differed from the Baseline in 43, 33, and 20 of the 70 years evaluated, respectively. Although February showed the highest frequency of flow differences, the magnitude of the flow change would be minor.

An analysis of the frequency of modeled flows (at 500 cfs intervals) during each month over the entire period of record indicated that the frequency of flow levels between 3,000 and 3,500 cfs during March and April is higher under the No-Action Alternative than under the Baseline and lower for flows between 3,500 and 8,500 cfs. There were no differences at flows below 3,000 cfs.

Pond and Backwater Recharge. The riparian vegetation associated with the numerous side channels and isolated ponds along the lower American River is dependent in large part on annual recharge of these areas by high flows in the spring. Reduced spring flows could affect the ability of these areas to recharge. From field studies conducted on the lower American River, Sands (1985) concluded that flows of 2,750 cfs and 4,000 cfs were necessary to recharge the ponds closest to and farthest from the river channel, respectively. The physical solution outlined by Judge Hodge in the EDF et al. vs. EBMUD decision, which took into consideration the study results of Sands (1985) and others, requires maintaining a flow level of at least 3,000 cfs during the spring to protect lower American River resources, including riparian vegetation and adjacent pond communities. This flow level was used as the threshold criterion for significance.

In dry water years when pond recharge may be reduced, riverflows under the No-Action Alternative would not differ from the Baseline. Specifically, reservoir operations under the 1993 Diagram would not increase the frequency of flows below 3,000 cfs. In wetter years, flow levels may be reduced, but would not fall below 3,000 cfs during March through June, the growing season for vegetation along the ponds. Accordingly, no significant adverse impacts to riparian vegetation are anticipated as a result of failure to recharge backwater areas under the No-Action Alternative.

Seasonal Inundation. During the primary growing season, March through June, the frequency of inundation of nearshore vegetation would not increase under the No-Action Alternative. In all modeled years, flows were equal to or less than those under the Baseline during March through June. Hence, no adverse impacts on riparian vegetation are expected. During periods of reduced activity (September through January), the No-Action Alternative would result in only minor changes in flow which would not significantly alter the frequency of inundation.

The maximum objective release from Folsom Reservoir would remain at 115,000 cfs. During extreme storms, the overbank areas would be flooded to near the levee tops, as happens under the 1986 operating diagram. When this happens, mobile wildlife species escape to dry areas outside the levees. Nonmobile or hibernating individuals would be killed. This is no change from the Baseline.

Water Availability. Because of past channel incision and the migration of the river channel away from stands of riparian vegetation, extreme low-flow conditions may reduce moisture in the root zone in areas supporting existing riparian vegetation. As with backwater and pond recharge, the 3,000 cfs flow level contained in the Hodge flows was intended to provide an adequate level of protection for existing riparian vegetation. Therefore, the 3,000 cfs flow level was used as the criterion for maintaining existing vegetation. Under the No-Action Alternative, flow levels during March through June are identical to the Baseline in dry years when flows are below 3,000 cfs. In the remaining years, flows are always equal or in excess of 3,000 cfs. Therefore, the No-Action Alternative is not expected to adversely affect riparian vegetation.

Wildlife. The riparian plant community and wetlands along the lower American River would not be significantly affected under the No-Action Alternative. The wildlife community associated with these habitats is not expected to change. With respect to the riparian and open water species such as piscivorous birds (for example, mergansers, herons, egrets, and kingfishers) which are dependent upon fisheries, a no-impact finding is appropriate based on the determination (discussed above) that the No-Action Alternative would not adversely affect lower American River fisheries.

Lake Natoma. Lake Natoma serves as a regulating afterbay that moderates releases from Folsom Reservoir. Operation of Lake Natoma would not change as a result of the No-Action Alternative, and fluctuations in water-surface elevation would not differ from the

Baseline. Therefore, no significant impact on the riparian vegetation, wetlands, and wildlife associated with Lake Natoma is expected.

Folsom Reservoir. As described in the environmental setting, Folsom Reservoir supports a minimal amount of riparian vegetation in the drawdown zone because of the widely fluctuating water-surface elevations resulting from reservoir operation. Typical riparian vegetation does exist where tributary streams enter the reservoir; however, this vegetation is supported primarily by streamflow rather than reservoir level. Because of periods of drought, portions of the drawdown zone have been exposed for a sufficient duration to allow the temporary establishment of some vegetation (primarily willows). These vegetated areas would be lost when reservoir levels rise in response to wetter hydrologic conditions. Accordingly, the No-Action Alternative would not affect riparian vegetation at Folsom Reservoir.

Wetlands do not exist within the drawdown zone, although the FWS (1992) identified established backwater marsh areas in the reservoir that are normally inundated but may become dewatered under reoperation. These areas, which exist primarily near the upper arms, provide habitat for migrating waterfowl during winter. In wet years, these backwater marsh areas may not be inundated due to an increased drawdown. However, the frequency of dewatering of these areas would not substantially increase under the No-Action Alternative. Therefore, there would be no significant impact to this vegetation or to waterfowl using these habitats.

ENDANGERED SPECIES

Baseline

A complete discussion of listed species which may be affected by the No-Action Alternative may be found in chapter 4. Table 4-2 lists sensitive plant and wildlife species, their scientific names, and their status.

No-Action Condition

Lower American River.

Winter-run chinook salmon (*Oncorhynchus tshawytscha*, Federal and State Endangered). The winter-run chinook salmon inhabits the Sacramento River and possibly the American River up to Nimbus Dam. Successful spawning has been recorded between Keswick Dam and the Red Bluff Diversion Dam. This species should not be adversely affected by the No-Action Alternative because changes in the Sacramento River flows are not expected to differ substantially from the Baseline.

Delta smelt (*Hypomesus transpacificus*, Federal and State Threatened). The Delta smelt spends most of its life in the shallow waters of the estuarine mixing zone where

salinities range from zero to 2 grams per thousand. The fish spawns in dead-end sloughs and the shallow edge-waters of channels in the freshwater zone. This species should not be adversely affected by the No-Action Alternative because changes in flow are not expected to differ substantially from the Baseline.

Sacramento splittail (*Pogonichtys macrolepidotus*, Federal Proposed Threatened). The Sacramento splittail lives mostly in the slow-moving stretches of the Sacramento River and Delta and in small shallow sloughs and marshes. The splittail spawns between early March and mid-May. This species should not be adversely affected by the No-Action Alternative because changes in flow are not expected to differ substantially from the Baseline.

Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*, Federal Threatened). Significant impacts to the beetle may result if substantial numbers of their host plant, elderberry shrubs, are affected by the flow changes associated with the No-Action Alternative. However, as described in the discussion of riparian vegetation, the riparian community as a whole, of which elderberry is a component, is not expected to be adversely affected by permanent reoperation. Despite the expected persistence of the elderberry plants, individual beetles may be adversely affected if high flows inundate habitat during May and June when the adult beetles emerge. These high flows during the spring, however, would be reduced under the No-Action Alternative.

Bald eagle. (*Haliaeetus leucocephalus*, Federal and State Endangered). During winter, bald eagles are known to use Folsom Reservoir and may occasionally be observed foraging along the lower American River. The bald eagle is not a common species along the lower American River, nor is the river considered important habitat. Nevertheless, use of the river by bald eagles under the No-Action Alternative is not expected to differ from use under the Baseline.

Swainson's hawk (*Buteo swainsoni*, State Threatened). Swainson's hawk nesting sites are not believed to be limiting in the project area. Large trees suitable for nests are abundant along the river channel. Although cottonwoods are declining along the lower American River in general, it is not expected that the No-Action Alternative would either accelerate or decelerate this process by altering the overall flow regime. Therefore, no significant adverse impacts on potential Swainson's hawks nesting habitat along the lower American River are expected.

Folsom Reservoir. The sensitive species described for the lower American River, with the exception of the bald eagle, either do not occur in or near the reservoir or would not be affected by permanent reoperation.

Bald eagle. Bald eagles are known to use Folsom Reservoir during winter. Impacts resulting from the No-Action Alternative could be expected if the project caused a substantial reduction in the warmwater or coldwater fishery in Folsom Reservoir. The No-Action Alternative would not result in a substantial reduction in the Folsom Reservoir

fishery. Therefore, a reduction in the bald eagle prey base is not expected. Although habitat suitability at Folsom reservoir may be decreased, a significant impact on bald eagles is not expected for two reasons. First, the number of eagles and the extent to which the area is used is very low. Second, wintering bald eagles are extremely mobile and have the ability to exploit food sources over a wide geographic range. Thus, it is doubtful that the potential reduction in habitat suitability at Folsom Reservoir would inhibit the ability of wintering bald eagles to obtain food.

Shasta Reservoir. The No-Action Alternative could alter water-surface elevations and storage levels in Shasta Reservoir. Changes in water-surface elevations would affect nearshore habitats and the distance between upland habitats and the water's edge. Nearshore areas of Shasta Reservoir support little vegetation and, consequently, are of limited value to wildlife. Changes in the distance between upland habitats and the water's edge, however, could affect bald eagle foraging at the reservoir.

Bald eagle. In most years, water-surface elevations would not differ between the No-Action Alternative and the Baseline. In the few years that water-surface elevations would be reduced, the reductions would be minor. The maximum reduction in water-surface elevation was 7.5 feet. However, water-surface elevations were less than 3 feet in most years when reductions occurred. In only 5 months of the entire period of record were water-surface elevations reduced by more than 5 feet. These minor and infrequent reductions in water-surface elevations would not result in a significant impact to bald eagle foraging.

Clair Engle Reservoir.

Bald eagle. As with Shasta Reservoir, potential impacts to wildlife at Clair Engle Reservoir would be limited to potential adverse effects on bald eagle foraging success. Bald eagles nest and overwinter at Clair Engle Reservoir, and, therefore, could be affected by reduced water-surface elevations throughout the year. In most years, water-surface elevations in Clair Engle Reservoir would not differ between the No-Action Alterative and the Baseline. In the few years that reoperation would reduce water-surface elevations, the reductions would be minor, less than 3 feet. The minor and infrequent reductions in water-surface elevations would not result in a significant impact to bald eagle foraging.

CULTURAL RESOURCES

Baseline

Lower American River. In the lower American River area, 42 archeological sites, 7 historic properties and 3 potentially historic railroad bridges have been identified. Because the entire area has not been systematically inventoried, many more previously unidentified sites are certain to exist there. Four properties are listed in or eligible to be listed in the National Register of Historic Places, and few of the remaining properties have been

evaluated for National Register eligibility. Under the Baseline, these properties, particularly the archeological sites, are subject to numerous adverse impacts, many of which are severe, including alluvial erosion and vandalism. In addition, flooding in excess of the current level of protection could cause significant damage to a number of the prehistoric and historic archeological sites along the terraces of the lower American River. Similarly, emergency discharges in excess of the current objective release of 115,000 cfs could result in significant damage to sites.

Folsom Reservoir. Several surveys and studies have been conducted since the construction of the dam. At least 123 prehistoric sites and approximately 52 historic-era properties have been recorded. Primary archival and secondary sources suggest that more than 200 other potential sites or features may exist in the reservoir (Peak and Associates, 1990). Because the entire area has not been systematically inventoried, many more previously unidentified properties may be present. The Folsom Powerhouse is the sole property at the reservoir which is listed or eligible to be listed on the National Register of Historic Places. Under the Baseline, these sites are subject to numerous adverse impacts, many of which are severe, including erosion caused by wave action, vandalism, alternate drying and inundation, and damage by offroad vehicles.

Upper American River. Previous studies have documented 1,589 historic and 125 prehistoric archeological sites in the Auburn area. Among the cultural properties in this area are numerous manmade structures, including the No Hands Bridge and the portion of the Western States Trail which are within the project area of potential effect and which must be evaluated for National Register of Historic Places eligibility. Under the Baseline, these resources are subject to the effects of pluvial, eolian, and, to a lesser extent, alluvial erosion. In addition, they are under moderate to severe pressure from vandalism and recreational activities.

Downstream From American River. Two prehistoric archeological sites and a single historic period archeological site exist within the area downstream from American River. In addition, numerous historic period structures exist there, including the Sacramento Weir, a National Register of Historic Places-eligible property, and other unevaluated properties. No notable adverse impacts are known to be occurring with respect to these cultural properties under the current operating regime.

No-Action Condition

Lower American River. The vast majority of sites along the lower American River corridor are currently undergoing severe erosion associated with both natural processes, such as root and rodent intrusion, as well as man-induced effects such as fluctuating river levels. Increased population, land use, and related urban growth along the river corridor would continue generally as described in current local plans. Vandalism has been noted at several sites and is expected to continue. Similarly, the recreational opportunities afforded by the American River Parkway introduce additional elements of looting and collecting. Thus, the above-listed factors would continue to subject historic properties to adverse impacts.

Folsom Reservoir. Changes in water-surface elevations in Folsom Reservoir under the current operating regime have severely damaged most of the cultural sites within the inundation zone of the reservoir (Waechter and Mikesell, 1994). This would continue under the No-Action Alternative.

Based on information from the California Historical Resources Information Center, 143 known sites in the Folsom Reservoir inundation zone could be affected under without-project conditions. Additional sites that have not been identified in previous surveys also may exist. Of the 143 known sites, 35 are within 0.25 mile of designated recreation areas and are therefore subject to a higher degree of disturbance than those farther away.

Under the No-Action Alternative, all the 143 known sites and any unidentified sites would continue to be subjected to effects caused by wave action, vandalism, alternating drying and inundation, and inadvertent damage by offroad vehicles. The only difference between baseline conditions and the No-Action Alternative is the slightly increased likelihood of impact. However, a review of the hydrologic modeling for baseline conditions and the No-Action Alternative indicates that the differences in the level of impacts would be minor. In general, sites at higher elevations would be exposed to the greatest levels of impact, both from wave action and from human actions.

Under the No-Action Alternative, one known site in the Folsom Reservoir inundation zone would not be affected by exposure-related impacts. The remaining 142 sites would continue to be affected by wave action and exposure similar to the effects described under Baseline conditions. An unknown number of additional cultural resource sites that have not been identified also could be similarly affected.

Downstream From American River. No adverse impacts are anticipated to historic properties in the Sacramento River area.

Shasta Reservoir. Changes in water-surface elevations in Shasta Reservoir under the No-Action Alternative would be less than those experienced in Folsom Reservoir. In about 85 percent of the 840 months of the period of record, water-surface elevations would differ from the Baseline by less than 1 foot. In about 10.5 percent of the months, water-surface elevations would be 1 to 3 feet lower; and in the remaining 4.5 percent of the months, water-surface elevations under the No-Action Alternative would be 3 to 8 feet lower. Due to the low magnitude and infrequent differences in water-surface elevations between the No-Action Alternative and the Baseline, sites of historical or cultural significance along the shoreline of Shasta Reservoir would not be subjected to a substantial increase in exposure or wave action.

Clair Engle Reservoir. Changes in water-surface elevations in Clair Engle Reservoir under the No-Action Alternative relative to the Baseline would be minor and infrequent. In about 96.4 percent of the 840 months of the period of record, water-surface elevations would differ from the Baseline by less than 1 foot. In the remaining 3.6 percent of the months, water-surface elevations under the No-Action Alternative would be 1 to 3 feet

lower. Due to the low magnitude and infrequent differences in water-surface elevations, sites of historical or cultural significance along the shoreline of Clair Engle Reservoir would not be subjected to a substantial increase in exposure or wave action.

WATER QUALITY

Baseline

Water quality along the lower American River is generally good to excellent for all beneficial uses. However, dissolved oxygen and temperature do not meet some beneficial objectives during low-water years when flows in the river are reduced. These low flows periodically result in high water temperatures that may jeopardize juvenile fish. Runoff from the portions of the lower American River area north of the river is collected and discharged into the American River. Runoff from areas south of the river is collected and discharged into the Sacramento River.

No-Action Condition

Lower American River.

Water quality in the lower American River is also affected by elevated water temperatures. The instances when elevated temperatures would occur are extremely rare. Therefore, the No-Action Alternative would not significantly increase the potential for conditions detrimental to water quality in the lower American River. The situation for water temperatures in the river would be improved as a result of the temperature shutters being installed by SAFCA.

Folsom Reservoir. Water-quality problems, including low dissolved oxygen concentrations and microorganism blooms that contribute to taste and odor problems in domestic water supplies, are largely attributable to elevated water temperatures. In Folsom Reservoir, these problems occur during the summer when storage falls below about 400,000 acre-feet and water temperatures exceed about 70 °F. The No-Action Alternative would not significantly increase the frequency at which these conditions would be expected.

Upper American River. Historically, water-quality parameters for the American River have generally been well within acceptable limits to achieve water-quality objectives and beneficial uses mandated by the Central Valley Regional Water Quality Control Board.

Sacramento River Basin/Delta. Reclamation is required under the 1994 Bay Delta Standards to maintain water-quality standards in the Delta. Compliance with the conditions in the 1994 Bay Delta Standards was an inherent assumption in the hydrologic modeling performed in connection with this final SEIS/EIR.

Shasta and Clair Engle Reservoirs. Water quality at these reservoirs would remain unchanged under the No-Action Alternative.

VISUAL RESOURCES

Baseline

Lower American River. The lower American River provides a variety of visual experiences, which include steep bluffs, terraces, islands, backwater areas, and riparian vegetation. The natural environment is a refreshing contrast to the urban development of the surrounding Sacramento area.

Folsom Reservoir. The visual resources of Folsom Reservoir have been demonstrably negative in their natural appearance for much of the last decade, to the extent that the existing "bathtub ring" of exposed shoreline is an unappealing, and therefore negative, viewscape.

Upper American River. There would be no adverse effects to visual resources in the upper American River area.

Downstream From American River. The visual resource values of the Sacramento River system are varied and represent a complex setting of geomorphic landscapes, vegetative communities, and open and confined waterways.

Shasta and Clair Engle Reservoirs. Both Shasta and Clair Engle Reservoirs are conserved under the National Recreation Area objectives which protect lands of recreational and scenic value (U.S. Department of Agriculture, 1987). Although human-made, these reservoirs have been established for many years and, when full, appear essentially natural. Both are surrounded by coniferous forest. Typically, though, the reservoirs have not been full due to drought. The visual quality of the reservoirs is degraded during low-water years, since the drawdown zone detracts from the scenery. Because Shasta Reservoir can be viewed by passers-by on Interstate 5, it is exposed to significantly more viewers than is Clair Engle Reservoir.

No-Action Condition

Folsom Reservoir. Under the No-Action Alternative, visual resource values of Folsom Reservoir and the State Recreation Area would remain subject to the same natural and operational regimes to which they are now subject. Visual resource impacts would not exceed that range normally expected. The visual resources of the area have been impaired for some time due to drought conditions.

Summer Season Change. Under the No-Action Alternative, reservoir water-surface elevations would only be reduced in 6 months of the summer recreation period of

record (350 months [April-August for 70 years]) by an amount ranging from 2.4 to 6.1 feet. This low frequency of occurrence (1.4 percent) and low magnitude (up to 6.1 feet) of reduced elevations does not represent a significant adverse effect to visual resources.

Winter Season Change. In the winter recreation season (September-March), reservoir surface elevations would be reduced in 41 months of the corresponding 490-month period of record, or about 8 percent of the winter months.

- In 24 of these 41 months, or about 4.9 percent of the total months in the winter recreation season, discernible reservoir water-surface elevation reductions of 10 or more feet would result.

- In 19 of these 41 months, or about 3.9 percent of the total months in the winter recreation season, demonstrably negative reservoir water-surface elevation reductions of 20 or more feet would occur under this alternative.

- In 15 of these 41 months, or about 3.1 percent of the total months in the winter recreation season, definitively negative water-surface elevation reductions of 30 or more feet would occur under this alternative.

Based on the modeled output for the 70-year period of record, the duration of elevation reductions of 10 or more feet could have extended for one 8-month period in water year 1984, two 5-month periods in water years 1951 and 1970, and one 4-month period in water year 1965. These periods equate to 22 of the 41 winter months in which such differences could have occurred. The remaining 19 months occurred in periods of three or less consecutive months.

The data reflect the potential duration of visual resource impacts under the No-Action Alternative and support a very small probability (1 in 70, or 1.4 percent) that such elevation reductions would persist for longer than 8 months. There would only be a 2.8 percent probability that such elevation reductions would persist for more than 5 months.

Impacts to visual resources would, therefore, be short-lived. Although the No-Action Alternative would induce, at times, substantial demonstrable negative visual effects, those effects would be temporary and would disappear as the reservoir refills to levels that would have occurred in the absence of the project (probably in about 3 months or less). As a result, the No-Action Alternative would not result in the creation of a visually offensive site and would not permanently change the visual quality of the region or permanently eliminate visual resources, since the reservoir retains the capability to refill. Visual resource impacts are, therefore, found not to be significant.

Shasta Reservoir. Under the No-Action Alternative, visual resource values of Shasta Reservoir would remain subject to the same natural and operational regimes to which they are now subject. There would be no additional impacts to visual resource values.

Summer Season Change. The No-Action Alternative could negatively affect visual resource values of Shasta Reservoir if water-surface elevations in the reservoir were substantially lowered or the frequency or duration of low water-surface elevations substantially increased.

In most years, water-surface elevations during April through August would not differ between the No-Action Alternative and the Baseline. Water-surface elevations would be reduced by more than 1 foot in 32 months of the 350-month summer recreation period of record, with a maximum reduction of 7.3 feet. In all but 3 months during the summer period of record, water-surface elevations would change by less than 5 feet. Water-surface elevations were reduced by greater than 5 feet during June, July, and August of a single year, 1970. In no years would water-surface elevations be reduced by 10 feet or more. The infrequency and low magnitude of potential reductions in water-surface elevations in Shasta Reservoir during April through August does not constitute a significant adverse impact to visual resource values.

Winter Season Change. Water-surface elevations were reduced more frequently during the winter (September through March) than during the summer. However, as with the summer season, water-surface elevations under the No-Action Alternative would not differ from the Baseline in most years. Reductions in water-surface elevations of greater than 1 foot would occur in 64 months of the 490-month period of record for the winter season. In one winter season (September 1970 through November 1971), however, water-surface elevations were reduced by greater than 5 feet, but in no years were reductions in water-surface elevation greater than 10 feet.

Clair Engle Reservoir. Under the No-Action Condition, visual resource values of Clair Engle Reservoir would remain subject to the same natural and operational regimes to which they have been subject under the Baseline.

Summer Season Change. In most years, water-surface elevations in Clair Engle Reservoir during the summer season (April through August) would not differ between the No-Action Alternative and the Baseline. In only 9 months out of 350 months of the 70-year period of record for summer months would water-surface elevations be reduced by greater than 1 foot. In August 1985, the maximum reduction was 2.5 feet.

Winter Season Change. In most years, water-surface elevations in Clair Engle Reservoir during September through March would not differ between the No-Action Alternative and the Baseline. In only 20 months out of 490 months of the 70-year period of record for the winter season would water-surface elevations be reduced by greater than 1 foot. In October 1986, the maximum reduction was 2.9 feet.