

CHAPTER 7.0

ENVIRONMENTAL EFFECTS AND MITIGATION

This chapter provides a discussion of the construction and operation-related environmental effects of the flood control and ecosystem restoration alternatives. It also includes a description of the methods, assumptions, and significance criteria used in evaluating effects on each environmental resource. A description of flood control alternatives and ecosystem restoration alternatives is provided in Chapter 5.0, "Flood Control Alternatives," and Chapter 6.0, "Ecosystem Restoration for Flood Plain and Fisheries Resources," respectively. The evaluation of the effects of the ecosystem restoration alternatives was based on conceptual-level designs. Detailed designs may be further evaluated upon completion. Section 7.18, "Summary," at the end of this chapter presents a summary of effects and a comparison of effects among alternatives. A discussion of cumulative and growth-inducing effects is provided in Chapter 10.0.

7.1 Hydrology and Hydraulics

7.1.1 Introduction

This section describes the operation-related effects to hydrology and hydraulics from each alternative on Folsom Reservoir storage and releases into the Lower American River. Alternatives 2, 3, and 4 would include increasing the flood storage capacity of Folsom Reservoir. Alternatives 5 and 7 would increase the objective releases from Folsom Dam and include modifications to the Lower American River levee system as well as other downstream facilities as necessary to convey the increased objective flows. Alternative 6 includes increasing the objective release from Folsom Dam, making downstream improvements, and modifying the outlet structure of the dam so that water can be released earlier in the storm event. Under Alternative 8, the flood storage capacity of Folsom Reservoir would be increased along with the objective release to the Lower American River. Each alternative provides an increase in flood protection compared to existing conditions.

The construction of specific features to provide the necessary level of dam safety for Folsom Dam and allow safe passage of the probable maximum flood (PMF) differs among the alternatives. It was recognized in the early 1980s that Folsom Dam could pass only about 70 percent of the PMF. Although the hydrologic and hydraulic effects during the PMF are not evaluated for this report, in the event the PMF occurred, it is assumed that the Sacramento area would be exposed to catastrophic flooding. According to Corps guidance and regulations, all of the dam raise alternatives include modifications to pass 100 percent of the PMF. Included in these modifications is enlarging the spillway at L. L. Anderson Dam (French Meadows Reservoir), located upstream of Folsom Reservoir on the Middle Fork of the American River. The spillway enlargement at L. L. Anderson Dam would attenuate the peak flow rates during a PMF. Because the stepped-release alternatives do not include substantial improvements to Folsom Dam, no dam safety modifications either at Folsom Dam or at L. L. Anderson Dam are included in those alternatives.

Because the existing spillway at L. L. Anderson Dam is sufficient to pass most flows, the enlargement of the spillway to safely pass the PMF would have no effect on the flow rates in the Middle Fork of the American River during lower frequency events. Flows would be attenuated during a PMF. However, as described above, the hydrologic and hydraulic effects during the PMF are not evaluated in this report. Each of the following sections includes a brief description of the hydrologic effects of the alternative and a summary table of key hydrologic parameters.

7.1.2 Methods and Assumptions

No new hydrologic or hydraulic modeling was completed for the environmental analysis. The discussion of the operational effects of each alternative is derived from 192-hour reservoir-routing simulations for various floods from events with a range of a 1-in-50 to a 1-in-500 chance of occurring in any year. All the simulations were made with the following assumptions:

- Current operations provide a minimum flood control pool of 400,000 acre-feet.
- Additional reservoir capacity created by raising Folsom Dam would add to the flood control pool only.
- The operation plan limits flow increases from low-level outlets to 15,000 cubic feet per second (cfs) per hour to protect the levee system.
- The level of advanced releases would be moderate.

7.1.3 Criteria for Determining Significance

Effects on hydrology and hydraulics were considered significant if construction or operation of the project alternatives would:

- Result in substantial damage or loss of property from inundation.
- Substantially reduce floodflow capacities.
- Substantially increase extent or severity of flooding.
- Substantially alter channel morphology (i.e., channel down cutting).

Alterations to the hydraulic characteristics of the watercourses were considered beneficial if the alternatives resulted in reduction in the extent or severity of flooding from existing or projected future conditions or an increase in the amount of aquatic habitat.

7.1.4 Alternative 1: No Action

Under Alternative 1, no specific action would be taken to implement a specific plan to improve flood protection along the Lower American River beyond that which is already authorized. Once the proposed modifications to the outlets at Folsom Dam were completed, the

variable flood storage space would change to a range from 400,000 to 600,000 acre-feet. The outflow rate peaks at 115,000 cfs (objective release) when water levels in the reservoir reached the spillway crest and releases could be made from the main spillway gates. The operation plan restricts the maximum rate of increase in flows to 15,000 cfs per hour until outflow reaches 115,000 cfs. A maximum of 160,000 cfs can be released on a limited emergency basis without causing a downstream levee failure and flooding in Sacramento.

Under Alternative 1, Folsom Reservoir would be able to attenuate a flood event with a 1-in-164 chance of occurring in any year, assuming a moderate level of advanced release floodflow would be implemented as approved under the Folsom Dam Flood Management Plan. As shown in Table 7-1, with moderate advanced release rules in place, floodflows would not completely fill the total storage capacity of the reservoir and exceed the gross pool elevation of 466 feet for the 1-in-50- or 1-in-100-year events. Larger floodflows would require use of the reservoir's surcharge storage space above the gross pool elevation.

Plates 7.1-3 and 7.1-5 show 192-hour hydrographs in the Lower American River for the 1-in-100- and 1-in-200-year flood events for various alternatives. The Alternative 1 hydrograph shows flows contained to the 115,000-cfs objective release rate for the 1-in-100-year event and channel conveyance capacity being exceeded under the 1-in-200-year event. This is the baseline condition for measuring the comparative effects of all of the action alternatives.

7.1.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Under Alternative 2, the spillway capacity would be enlarged at the L. L. Anderson Dam on French Meadows Reservoir to allow passage of a PMF event. Increasing the Folsom Reservoir flood pool elevation to 478 feet would provide an additional 46,000 acre-feet of flood control storage. The resulting storage under Alternative 2 would vary from 446,000 to 646,000 acre-feet. The outflow rates would be the same as described for Alternative 1. Alternative 2 would provide increased flood protection for a flood event with a 1-in-189 chance of occurring in any year. As shown in Table 7-2, with moderate advanced release rules, the floodflows under Alternative 2 would reduce the total amount of flood storage in the reservoir and fewer hours of inundation compared to Alternative 1 for smaller floods with return frequencies generally lower than 1-in-150-year event. The less frequent and larger floodflows would generally result in greater storage volumes in the reservoir. Under Alternative 2, the highest water surface elevation would be approximately 478 feet during the 1-in-500-year event.

Plates 7.1-1 through 7.1-7 show 192-hour hydrographs in the Lower American River for the 1-in-20-, 1-in-50-, 1-in-100-, 1-in-150-, 1-in-200-, 1-in-250-, and 1-in-500-year flood events for Alternative 1 and alternatives involving raises to Folsom Dam. Under Alternative 2, releases during smaller events (1-in-20- and 1-in-50-year flood events) would be essentially identical to those under Alternative 1. The 115,000-cfs objective release would accommodate the 1-in-100-year event. The peak release rate would be about 146,000 cfs during the 1-in-200-year event and could be contained within the Lower American River levees. Larger events would result in releases that may not be able to be contained within downstream levees. Release rates would be ramped up to the channel carrying capacity earlier during a flood event and reduced at a faster rate near the end of the flood event compared to Alternative 1. There is no appreciable difference in the duration of peak releases compared to Alternative 1 for larger events.

- The only hydrologic effect of the modifications to the L. L. Anderson Dam spillway at French Meadows Reservoir would be to attenuate release flows to the Middle Fork of the American River during a PMF event. Increasing the spillway capacity would not change the normal reservoir storage or flood release operations for floods with a greater than 1-in-500 chance of occurring in any year.
- The proposed flood control activities under Alternative 2 would enhance flood protection along the Lower American River. Areas along the Lower American River would be protected from flood events with a 1-in-189 or greater chance of occurring in any year. This is considered a beneficial effect.
- Opportunities to refill the conservation pool water supply would be negligibly affected. Water levels during extreme floods would be higher in Folsom Reservoir. However, the frequency of the extreme flood events is very low by definition, and the proposed flood control measures would be used very infrequently. Therefore, these effects are considered less than significant.

7.1.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Under Alternative 3, the spillway capacity would be enlarged at the L. L. Anderson Dam on French Meadows Reservoir to allow passage of a PMF event. The seven-foot raise of Folsom Dam would provide an additional 95,000 acre-feet of flood control storage by increasing the flood pool elevation to 482 feet. The resulting storage under this alternative would vary from 495,000 to 695,000 acre-feet. The outflow rates would be the same as described for Alternative 1.

Alternative 3 would provide Folsom Reservoir increased flood protection for a flood event with a 1-in-213 chance of occurring in any one year, with moderate advanced release. As shown in Table 7-3, the floodflows under Alternative 3 would reduce the total amount of flood storage in the reservoir and result in fewer hours of inundation compared to Alternative 1 for smaller floods with return frequencies generally lower than a 1-in-150-year event. The less frequent and larger floodflows would generally result in greater storage volumes in the reservoir. Under Alternative 3, the floodflows would generally fill the reservoir to the maximum 481 feet during floods larger than 1-in-250-year events.

Plates 7.1-8 through 7.1-14 show 192-hour hydrographs in the Lower American River for the 1-in-20-, 1-in-50-, 1-in-100-, 1-in-150-, 1-in-200-, 1-in-250-, and 1-in-500-year flood events for Alternatives 1 through 8. Under Alternative 3, the duration of peak releases during smaller events (1-in-20- and 1-in-50-year flood events) would be slightly reduced compared to Alternative 1. The 115,000-cfs objective release would accommodate the 1-in-100-year event. The peak release rate would be about 123,000 cfs during the 1-in-200-year event and could be contained within the Lower American River levees. Larger events would result in releases that would likely not be able to be contained within downstream levees. Release rates would be ramped up to the channel carrying capacity earlier during a flood event and reduced at a faster rate near the end of the flood event compared to Alternative 1. There is no appreciable difference in the duration of peak releases compared to Alternative 1.

- The only hydrologic effect of the modifications to the L. L. Anderson Dam spillway at French Meadows Reservoir would be to attenuate release flows to the Middle Fork of the American River during a PMF event. Increasing the spillway capacity would not change the normal reservoir storage or flood release operations for floods with a greater than 1-in-500 chance of occurring in any year.
- The proposed flood control activities under Alternative 3 would enhance flood protection along the Lower American River with moderate advanced release. Areas along the Lower American River would be protected from flood events with a 1-in-213 or greater chance of occurring in any year. This is considered a beneficial effect.
- Opportunities to refill the conservation pool water supply would be negligibly affected. Water levels during extreme floods would be higher in Folsom Reservoir. However, the frequency of the extreme flood events is very low by definition and the proposed flood control measures would be used very infrequently. Therefore, these effects are considered less than significant.

7.1.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Under Alternative 4, the spillway capacity would be enlarged at the L. L. Anderson Dam on French Meadows Reservoir to allow passage of a PMF as described under Alternative 2. The dam raise would provide an additional 155,000 acre-feet of flood control storage by increasing the flood pool elevation to 487 feet. The resulting storage under this alternative would vary from 555,000 to 755,000 acre-feet. The outflow rates would be the same as described for Alternative 1.

With moderate advanced release, Alternative 4 would provide increased flood protection at Folsom Reservoir for a flood event with a 1-in-233 chance of occurring in any year. As shown in Table 7-4, there would be a reduction in the total amount of water stored in the reservoir and reduced duration of inundation compared to Alternative 1 for smaller floods with return frequencies generally lower than a 1-in-150-year event. The less-frequent and larger floodflows would generally result in greater storage volumes in the reservoir. Under Alternative 4, the highest water surface elevation would be approximately 487 feet during the 1-in-500-year event.

Plates 7.1-1 through 7.1-7 show 192-hour hydrographs in the Lower American River for the 1-in-20-, 1-in-50-, 1-in-100-, 1-in-150-, 1-in-200-, 1-in-250-, and 1-in-500-year flood events for Alternative 1 and alternatives that involve raises to Folsom Dam. Under Alternative 4, the duration of peak releases during smaller events (1-in-20- and 1-in-50-year flood events) would be slightly reduced compared to Alternative 1. The 115,000-cfs objective release would accommodate both the 1-in-100- and 1-in-200-year flood events. The peak release rate during a 1-in-250-year event would be approximately 143,000 cfs, which could be contained within downstream levees. Larger events would result in releases that may not be able to be contained within downstream levees. Release rates would be ramped up to the channel carrying capacity earlier during a flood event and reduced at a faster rate near the end of the flood event compared

to Alternative 1. There is no appreciable difference in the duration of peak releases compared to the Alternative 1 for larger events.

- The only hydrologic effect of the modifications to the L. L. Anderson Dam spillway at French Meadows Reservoir would be to attenuate release flows to the Middle Fork of the American River during a PMF event. Increasing the spillway capacity would not change the normal reservoir storage or flood release operations for floods with a greater than 1-in-500 chance of occurring in any year.
- The proposed flood control activities under Alternative 4 would enhance flood protection along the Lower American River. With moderate advance release, areas along the Lower American River would be protected from flood events with a 1-in-233 or greater chance of occurring in any year. This is considered a beneficial effect.
- Opportunities to refill the conservation pool water supply would be negligibly affected. Water levels during extreme floods would be higher in Folsom Reservoir. However, the frequency of the extreme flood events is very low by definition and the proposed flood control measures would be used very infrequently. Therefore, these effects are considered less than significant.

7.1.8 Alternative 5: Stepped Release to 160,000 cfs

Under Alternative 5, the objective release rate would be increased from 115,000 cfs to 145,000 cfs and further stepped up to 160,000 cfs, depending on the severity of the flood event. Outflow releases of 115,000 cfs would occur until water levels in the reservoir reach the spillway crest and releases can be made from the main spillway gates. The revised operation plan under Alternative 5 would restrict the maximum rate of increase in flows to 15,000 cfs per hour until outflow reached 145,000 cfs. Once 145,000 cfs is reached, it would be held until flood conditions are such that under the existing conditions, flood damages would have begun before stepping up to 160,000 cfs. As inflows continue to increase, more water would be released from the spillways to protect the safety of the dam. Improvements along the Lower American River as part of Alternative 5 would allow a maximum release of 160,000 cfs without causing a downstream levee failure and flooding in Sacramento.

Under Alternative 1, Folsom Reservoir could attenuate a flood event with a 1-in-164 chance of occurring in any year. Alternative 5 would provide increased flood protection for a flood event with a 1-in-172 chance of occurring in any year. As shown in Table 7-5, with moderate advanced release, the floodflows would not completely fill the total storage capacity of the reservoir and exceed the gross pool elevation of 466 feet for the 1-in-50-, 1-in-100-, or 1-in-150-year events as would occur under existing conditions. Under Alternative 5, smaller floods would produce a lower level of storage than Alternative 1. Larger floodflows would still completely fill the reservoir.

Plates 7.1-8 through 7.1-14 show 192-hour hydrographs in the Lower American River for the 1-in-20-, 1-in-50-, 1-in-100-, 1-in-150-, 1-in-200-, 1-in-250-, and 1-in-500-year flood events for Alternative 1 and alternatives that involve stepped release flows or combinations of dam improvements and stepped release flows. Under Alternative 5, the duration of peak releases

TABLE 7-4. Hydrologic Conditions at Folsom Reservoir during Various Flood Events under Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Flood Recurrence Interval	50-year		100-year		150-year		200-year		250-year		500-year	
Probability of exceeding event in any year	2%		1%		0.67%		0.5%		0.4%		0.2%	
Peak Inflow (cfs)	274,859		353,537		405,215		444,574		476,705		585,925	
Alternative	Alt. 1	Alt. 4	Alt. 1	Alt. 4	Alt. 1	Alt. 4	Alt. 1	Alt. 4	Alt. 1	Alt. 4	Alt. 1	Alt. 4
Peak Outflow (cfs)	115,000	115,000	115,000	115,000	115,990	115,000	190,670	115,000	302,050	142,910	553,400	484,330
Duration release is greater than or equal to objective release (hrs)	0	0	0	0	23	0	62	0	71	64	96	88
Maximum Reservoir Stage (ft)	452.39	434.95	464.04	454.74	473.53	472.78	473.99	479.83	474.77	484.69	476.63	486.69
Duration stage is greater >466<470 (hrs)	0	0	0	0	52	33	42	81	34	105	34	82
Duration stage is greater >470<478 (hrs)	0	0	0	0	31	0	20	66	18	86	22	65
Duration stage is greater >478<482 (hrs)	0	0	0	0	0	0	0	28	0	54	0	27
Duration stage is greater >482<487 (hrs)	0	0	0	0	0	0	0	0	0	29	0	13

during smaller events (1-in-20- and 1-in-50-year flood events) would be slightly reduced compared to Alternative 1. The hydrographs are similar for the 1-in-100- and 1-in-200-year events, and flows could be contained within the Lower American River levees. Larger events would result in releases that may not be able to be contained within downstream levees. Release rates would be ramped up to the channel carrying capacity earlier during a flood event and reduced at a faster rate near the end of the flood event compared to Alternative 1. There is no appreciable difference in the duration of peak releases compared to Alternative 1.

- The sustained peak flow rate in the Lower American River would increase to 160,000 cfs. The amount of flow conveyed through the Sacramento Weir to the Yolo Bypass would increase. The existing conveyance capacity of the Yolo Bypass exceeds 500,000 cfs, and the increased rate and volume associated with the proposed action would be small relative to existing conditions. However, proposed levee improvements would be designed to convey the increased flows without increasing the risk of flooding. The potential hydrologic effects would be less than significant.
- Areas along the Lower American River would be protected from floods with a 1-in-172 or greater chance of occurring in any year. This is a beneficial effect.

7.1.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Under Alternative 6, the objective release rate would be increased from 115,000 cfs to 145,000 cfs and further stepped up to 160,000 cfs depending on the severity of the flood event. Outflow releases of 115,000 cfs would occur until water levels in the reservoir reach a new low-level outlet that would allow earlier increases to 145,000 cfs. The revised operation plan under Alternative 6 would restrict the maximum rate of increase in flows to 15,000 cfs per hour until outflow reached 145,000. Once 145,000 cfs is reached, it would be held until flood conditions were such that under the existing conditions, flood damages would have begun before stepping up to 160,000 cfs. As inflows continued to increase, more water would be released from the spillways to protect the safety of the dam. Improvements along the Lower American River as part of Alternative 6 would allow a maximum release of 160,000 cfs without causing a downstream levee failure and flooding in Sacramento.

Alternative 6 would provide increased flood protection along the Lower American River up to flood events with a 1-in-189 chance of occurring in any year. As shown in Table 7-6, with moderate advanced release, the floodflows would not completely fill the total storage capacity of the reservoir and exceed the gross pool elevation of 466 feet for the 1-in-50-, 1-in-100-, or 1-in-150-year events as would occur under Alternative 1. Under Alternative 6, there would be a lower level of storage during smaller floods compared to Alternative 1. Larger floodflows would still completely fill the reservoir.

Plates 7.1-8 through 7.1-14 show 192-hour hydrographs in the Lower American River for the 1-in-20-, 1-in-50-, 1-in-100-, 1-in-150-, 1-in-200-, 1-in-250-, and 1-in-500-year flood events for Alternative 1 and alternatives that involve stepped release flows or combinations of dam improvements and stepped release flows. Under Alternative 6, the duration of peak releases during smaller events (1-in-20- and 1-in-50-year flood events) would be slightly reduced compared to that under Alternative 1. The hydrographs are similar for the 1-in-100- and 1-in-

200-year events, and flows could be contained within the Lower American River levees. Larger events would result in releases that may not be able to be contained within downstream levees. Release rates would be ramped up to the channel carrying capacity earlier during a flood event and reduced at a faster rate near the end of the flood event compared to Alternative 1. There is no appreciable difference in the duration of peak releases compared to Alternative 1.

- The sustained peak flow rate in the Lower American River would increase to 160,000 cfs. The amount of flow conveyed through the Sacramento Weir to the Yolo Bypass would increase. The existing conveyance capacity of the Yolo Bypass exceeds 500,000 cfs, and the increased rate and volume associated with the proposed action would be small relative to existing conditions. However, proposed levee improvements would be designed to convey the increased flows without increasing the risk of flooding. The potential hydrologic effects would be less than significant.
- Areas along the Lower American River would be protected from floods with a 1-in-189 or greater chance of occurring in any year. This is a beneficial effect.

7.1.10 Alternative 7: Stepped Release to 180,000 cfs

Under Alternative 7, the objective release rate would be increased from 115,000 cfs to 145,000 cfs and further stepped up to 180,000 cfs, depending on the severity of the flood event. Outflow releases of 115,000 cfs would occur until water levels in the reservoir reached the spillway crest and releases could be made from the main spillway gates. The revised operation plan under Alternative 7 would restrict the maximum rate of increase in flows to 15,000 cfs per hour until outflow reached 145,000 cfs. Once 145,000 cfs is reached, it would be held until flood conditions were such that under the existing conditions, flood damages would have begun. As inflows continue to increase, more water would be released from the spillways to protect the safety of the dam. Improvements along the Lower American River, as part of Alternative 7, would allow a maximum release of 180,000 cfs without causing a downstream levee failure and flooding in Sacramento.

Folsom Reservoir, under Alternative 1, could attenuate a flood event with between a 1-in-150 and 1-in-200 chance of occurring in any year. Alternative 7 would provide protection from a flood event with a 1-in-196 chance of occurring in any year. As shown in Table 7-7, with moderate advanced release, the floodflows would not completely fill the total storage capacity of the reservoir and exceed the gross pool elevation of 466 feet for the 1-in-50-, 1-in-100-, or 1-in-150-year events as would occur under existing conditions. Under Alternative 7, there would be a lower level of storage during smaller floods when compared to Alternative 1. Larger floodflows would still completely fill the reservoir.

Plates 7.1-8 through 7.1-14 show 192-hour hydrographs in the Lower American River for the 1-in-20-, 1-in-50-, 1-in-100-, 1-in-150-, 1-in-200-, 1-in-250-, and 1-in-500-year flood events for Alternative 1 and alternatives that involve stepped release flows or combinations of dam improvements and stepped release flows. Under Alternative 7, the duration of peak releases during smaller events (1-in-20- and 1-in-50-year flood events) would be slightly reduced compared to Alternative 1. The hydrographs are similar for the 1-in-100- and 1-in-200-year events, and flows could be contained within the Lower American River levees. Larger events

would result in releases that may not be able to be contained within downstream levees. Release rates would be ramped up to the channel carrying capacity earlier during a flood event and reduced at a faster rate near the end of the flood event compared to Alternative 1. There is no appreciable difference in the duration of peak releases compared to Alternative 1.

- The sustained peak flow rate in the Lower American River would increase to 180,000 cfs. The amount of flow conveyed through the Sacramento Weir to the Yolo Bypass would increase. The existing conveyance capacity of the Yolo Bypass exceeds 500,000 cfs, and the increased rate and volume associated with the proposed action would be small relative to existing conditions. However, proposed levee improvements would be designed to convey the increased flows without increasing the risk of flooding. The potential hydrologic effects would be less than significant.
- Areas along the Lower American River would be protected from floods with a 1-in-196 or greater chance of occurring in any year. This is a beneficial effect.

7.1.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

The levee raise associated with Alternative 8 would provide an additional 95,000 acre-feet of flood control storage. The resulting storage under Alternative 8 would vary from 495,000 to 695,000 acre-feet.

Under Alternative 8, the objective release rate would be increased from 115,000 cfs to 145,000 cfs and further stepped up to 160,000 cfs, depending on the severity of the flood event. Outflow releases up to 115,000 cfs would occur until water levels in the reservoir reached the spillway crest and releases could be made from the main spillway gates. The revised operation plan under Alternative 8 would restrict the maximum rate of increase in flows to 15,000 cfs per hour until outflow reached 145,000 cfs. Once 145,000 cfs were reached, it would be held until flood conditions are such that under the existing conditions, flood damages would have begun before stepping up to 160,000 cfs. As inflows continue to increase, more water would be released from the spillways to protect the safety of the dam. Improvements along the Lower American River as part of Alternative 8 would allow a maximum release of 160,000 cfs without causing a downstream levee failure and flooding in Sacramento.

Alternative 8 would provide protection from a flood event at Folsom Reservoir with a 1-in-222 chance of occurring in any year. As shown in Table 7-8, with moderate advanced release, the floodflows would not completely fill the total storage capacity of the reservoir and exceed the gross pool elevation of 466 feet for the 1-in-50-, 1-in-100-, or 1-in-150-year events as would occur under existing conditions. Under Alternative 8, there would be a lower level of storage during the smaller floods when compared to Alternative 1. Larger floodflows would still completely fill the reservoir.

Plates 7.1-8 through 7.1-14 show 192-hour hydrographs in the Lower American River for the 1-in-20-, 1-in-50-, 1-in-100-, 1-in-150-, 1-in-200-, 1-in-250-, and 1-in-500-year flood events for Alternative 1 and alternatives that involve stepped release flows or combinations of dam improvements and stepped release flows. Under Alternative 8, the duration of peak releases

during smaller events (1-in-20- and 1-in-50-year flood events) would be slightly reduced compared to Alternative 1. The hydrographs are similar for the 1-in-100- and 1-in-200-year events and flows could be contained within the Lower American River levees. Larger events would result in releases that may not be able to be contained within downstream levees. Release rates would be ramped up to the channel carrying capacity earlier during a flood event and reduced at a faster rate near the end of the flood event compared to Alternative 1. There is no appreciable difference in the duration of peak releases compared to Alternative 1.

- The sustained peak flow rate in the Lower American River would increase to 160,000 cfs. The amount of flow conveyed through the Sacramento Weir to the Yolo Bypass would increase. The existing conveyance capacity of the Yolo Bypass exceeds 500,000 cfs, and the increased rate and volume associated with the proposed action would be small relative to existing conditions. However, proposed levee improvements would be designed to convey the increased flows without increasing the risk of flooding. The potential hydrologic effects would be less than significant.
- Areas along the Lower American River would be protected from floods with a 1-in-222 or greater chance of occurring in any year. This is a beneficial effect.

7.1.12 Alternative 9.0: Ecosystem Restoration Alternatives

Alternative 9.1: Urrutia Restoration Site

Restoration activities at the Urrutia site would include ground grading and excavating soils on the flood plain and creating side channels to provide hydrology supportive of riparian habitat. Nonnative vegetation would be removed and replaced with native riparian woodland. Detailed hydraulic modeling has not been conducted to evaluate the effects of restoration activities to streamflow and hydraulic channel and flood plain characteristics. However, the restoration would not include any change to the configuration of the main river channel. The changes associated with the flood plain terraces and side channels would be relatively minor considering the width of the flood plain in this reach of the river.

- The restoration is expected to result in additional areas subject to flood plain inundation. Potential changes to hydrology and hydraulics are considered less than significant.

Alternative 9.2: Woodlake Restoration Site

Construction- and operation-related effects on hydrology and hydraulics would be the same as described under Alternative 9.1.

Alternative 9.3: Bushy Lake Restoration Site

Construction- and operation-related effects on hydrology and hydraulics would be the same as described under Alternative 9.1.

Alternative 9.4: Arden Bar Restoration Site

Construction- and operation-related effects on hydrology and hydraulics would be the same as described under Alternative 9.1.

Alternative 9.5: Fisheries Restoration

Alternative 9.5 would require modifications to the temperature control shutters to the intakes to the powerhouse penstocks, and all work would be conducted upstream of Folsom Dam.

- The construction and operation of the shutters would not change the reservoir operations or downstream hydrologic or hydraulic conditions.

7.2 Geology, Seismicity, and Soils

7.2.1 Introduction

This section presents the methods and results of the analysis of potential construction- and operation-related effects associated with geology, seismicity, and soils for each alternative. Effects associated with sedimentation are discussed in Section 7.10, “Water Quality,” of this report.

7.2.2 Methods and Assumptions

Effects associated with geology, seismicity, and soils that could result from construction activities were qualitatively evaluated based on expected construction practices, materials, location, and duration. It was assumed that the design and construction of levees and other flood control facilities would meet or exceed design standards for seismic stability, seepage, and liquefaction. It was also assumed that erosion and sediment control measures would be implemented as part of the project design.

Reservoir operations were evaluated to determine if inundation of areas around Folsom Reservoir that were not previously inundated would result in a substantial increase in erosion. Areas along the shoreline of Folsom Reservoir that have the potential for accelerated soil erosion and mass movement were identified based on a review of existing geologic, soils, and topographic information. This information was used to help support the evaluation of effects on vegetation, fish, and wildlife.

The following data sources were used in conducting the evaluation of geology, seismicity, and soils:

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7.2.3 Criteria for Determining Significance

Criteria for determining the significance of effects associated with geology, seismicity, and soils were developed based on the environmental checklist form in Appendix G of the State California Environmental Quality Act (CEQA) Guidelines. Effects were considered significant if construction or operation of the project alternatives would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic groundshaking, seismic-related ground failure, or landslides.
- Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the program.
- Be located on expansive soil that could cause significant damage to or disruption of engineered utilities or structures.
- Result in substantial soil erosion or the loss of topsoil.

7.2.4 Alternative 1: No Action

Under Alternative 1, no flood control improvements would occur at Folsom Reservoir, along the Lower American River, or in the Yolo and Sacramento bypasses. People would not be exposed to adverse seismic-related effects because no new structures would be constructed.

- No effects on topsoil or soil erosion would occur because no new construction would occur and flood control operations would remain unchanged.

7.2.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Construction activities at L. L. Anderson Dam would expose earth and potentially result in accelerated erosion during storms or an incidental release of sediment and/or hazardous substances into the Middle Fork of the American River.

- Construction-related effects on soil erosion are considered significant. Implementing Mitigation Measure WQ-2 would reduce this effect to a less-than-significant level. This mitigation measure is discussed in Section 7.10, “Water Quality.”

Folsom Reservoir. The flood control improvements around Folsom Reservoir would be subject to groundshaking from earthquakes. Wing dams and dikes may be susceptible to liquefaction during seismic groundshaking (Jones & Stokes 2000a). The flood control features must have the structural stability to withstand seismic groundshaking. To ensure public safety, proposed new levees, other flood control facilities, and proposed modifications to existing flood control facilities would be designed to withstand the maximum design earthquake and associated ground failures.

- Geology- and seismicity-related effects are considered less than significant because flood control improvements would be designed to withstand groundshaking and associated ground failures.

Construction activities at Folsom Reservoir include raising the wing dams and dikes and constructing and removing the temporary bridge downstream of the dam. Ground disturbance could result in accelerated erosion during storms or an incidental release of sediment and/or hazardous substances into the reservoir.

- Construction-related effects of soil erosion are considered significant. Implementing Mitigation Measure WQ-2 would reduce this effect to a less-than-significant level. This mitigation measure is discussed in Section 7.10, “Water Quality.”

Operation-Related Effects

Folsom Reservoir. Operation-related effects involve potential increased rates of soil erosion and slope instability, which could occur as three primary mechanisms or types in all the alternatives except Alternative 1: 1) sheet erosion caused by the loss of vegetation cover from inundation, 2) mass movement (i.e., mass wasting or landsliding) caused by the reduction of soil shear strength from saturation and rapid drawdown and by lowered shear resistance from mortality of deep-rooted, woody vegetation, and 3) erosion of areas previously not subject to inundation by wave action. Mass movements may be triggered by groundshaking or occur in the absence of groundshaking. Undercutting of slopes by wave action may undermine areas prone to mass movement, thereby increasing the potential for this type of erosion to occur.

Factors that control whether one or more of the three mechanisms of shoreline erosion occurs can be categorized as activating or passive (Reid 1993). Activating factors are those that

trigger erosion. In the context of the program, activating factors are raindrop impact, sheetflow runoff, inundation, and rapid drawdown of the portion of the inundation zone higher than 466 feet. Passive factors are properties inherent in the slope material or in the geometry of the slopes. They exist all or most of the time and cause the slope to be relatively susceptible to activating factors (Reid 1993). Passive factors include soils rich in clay (particularly expansive clays), alternating layers of weak and strong sedimentary beds, bedding plane orientation, high moisture content, steep slopes, and lack of vegetation protection from wind-driven waves.

Slopes surrounding Folsom Reservoir generally range from 5 to 25 percent. Most of the more steeply sloping areas occur along the North and South Forks of the American River, particularly at their upper ends.

The soils along the northern, eastern, and southern shorelines of the main body of the reservoir are mapped by the United States Department of Agriculture (USDA) Soil Conservation Service (SCS) (1974, 1993) as the Auburn-Argonaut and the Auberry-Ahwahnee-Sierra associations. These associations (comprising approximately 70 percent of the shoreline of the main body of the reservoir) consist of moderately deep loam and sandy loam soils over highly-fractured or weathered granite and weathered meta-andesite and schist. The western shoreline of the main body of the reservoir (comprising the remaining 30 percent of the reservoir shoreline) is mapped as the Exchequer-Inks association (U.S. Soil Conservation Service 1980). This association is characterized by a shallow loam over hard andesite breccia.

Slopes along the South Fork of the American River generally range from 5 to 25 percent. Slopes are steeper than 30 percent near Iron Mountain and Flagstaff Hill and east of Skunk Canyon. The soils along the banks of the South Fork of the American River are mapped by the SCS (U.S. Soil Conservation Service 1974) as the Auburn-Argonaut, the Rescue, and the Serpentine rock land-Delpiedra associations. The Auburn-Argonaut and the Rescue associations (comprising approximately 75 percent of the South Fork shoreline) consist of moderately deep loam and sandy loam soils over highly-fractured or weathered bedrock. The remaining South Fork shoreline area, comprised by the Serpentine rock land-Delpiedra association, is characterized by shallow, rocky soils over serpentine, and by serpentine outcrops.

Slopes along the North Fork of the American River south of Kelly Ravine are generally less than 25 percent. Slopes are greater than 30 percent north of this point. The soils along the banks of the North Fork are mapped by the SCS (Soil Conservation Service 1974, 1980) as the Andregg-Caperton-Sierra, the Auberry-Ahwahnee-Sierra, and the Auburn-Sobrante soil associations. These associations consist of shallow to moderately-deep loam and sandy loam soils over weathered granite or metamorphic rocks.

The Auburn Reservoir Project, Folsom Lake State Recreation Area General Plan (1978 and amendments) makes no mention of existing landslides or landslide hazards in Folsom Reservoir. Further, no published information of landslide hazard appears to be available for Folsom Reservoir. However, landslide hazard is expected to be relatively greatest along the North and South Forks of the American River where slopes are generally the steepest.

Based on a review of aerial photography for Folsom Reservoir and the South and North Forks of the American River, all areas that would be inundated are generally well-vegetated

either with grasses or with woody plants. As discussed in Section 7.8, “Vegetation,” vegetation mortality is not expected to occur as a result of inundation. Therefore, because the soil would remain protected by vegetation after drawdown, no significant increase in sheet erosion rates is expected.

The northern, western, and portions of the eastern shoreline are relatively unprotected from wind-driven waves, compared to that of the North and South Forks of the reservoir, which have a shorter fetch. However, because of the short duration and infrequency of inundation, any increase in shoreline erosion from wave action resulting from the program is expected to be minor.

Based on the above-described topographic, geologic, and soil characteristics and the presence of steep slopes, the portions of the program area that would be inundated and that have the greatest relative potential for mass movement are:

- Areas along the North and South Forks of the American River where slopes exceed 25 percent. These areas are found in the upper ends of the forks of the reservoir.
- Mooney Ridge from the north end of Dike 4 to the northern edge of the homes along the reservoir. This relatively steep area is sensitive because of the homes located upslope.

Owing to the lack of obvious, existing mass movements along the majority of the shoreline, any mass movements that do occur as a result of the program are likely to be small, infrequent, and isolated. As indicated above, the northern, western, and portions of the eastern shoreline of the main body of the reservoir are relatively unprotected from wind-driven waves.

- Flood control operations are expected to result in a less-than-significant effect on soils because substantial mass movement, wave erosion, and loss of vegetation within the inundation area are not expected to occur.

7.2.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction- and operation-related effects under Alternative 3 would be the same as described under Alternative 2.

7.2.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Construction- and operation-related effects under Alternative 4 would be the same as described under Alternative 2.

7.2.8 Alternative 5: Stepped-Release to 160,000 cfs

Construction-Related Effects

Lower American River, Sacramento Bypass, and Yolo Bypass. Levee improvements along the lower reach of the American River and in the Sacramento and Yolo Bypasses could be

subject to groundshaking from earthquakes. These levees would be susceptible to liquefaction during seismic groundshaking and must have the structural stability to withstand seismic groundshaking. To ensure public safety, the improvements to these levees would be designed to withstand the maximum design earthquake.

- Geology and seismicity-related effects are considered less than significant because flood control improvements would be designed to withstand groundshaking.

Construction activities along the Lower American River and in the Yolo and Sacramento bypasses would expose earth and, during storms, potentially result in accelerated erosion or an incidental release of sediment and/or hazardous substances into the reservoir.

- The effect of construction activities on erosion and sedimentation rates along the Lower American River and the Yolo and Sacramento bypasses is considered significant and would be reduced to a less-than-significant level through the implementation of Mitigation Measures WQ-1 and WQ-2.

Operation-Related Effects

Lower American River. Although channel-stability modeling has not been conducted for Alternative 5, a channel-stability analysis was performed by the Corps in 1997 (Ayres Associates 1997). This analysis generally found the Lower American River to be vertically stable (i.e., resistant to channel deepening or gorging) at various flows and flood release operations. Flows above 50,000 cfs are necessary to begin mobilization of the channel bottom, with some sections of the river bottom immobile even at flows of 180,000 cfs. Furthermore, under various flows and flood release operations, the lateral stability of the channel banks was found to be jeopardized during increased duration of primarily moderate and high floodflows. The Service (U.S. Fish and Wildlife Service 2001a) noted that moderate flows (30,000–100,000 cfs) are potentially important with respect to seed distribution and support of riparian species recruitment on high terraces, gravel replacement from bank deposits, and replacement and transport of woody debris and detritus from the floodway. A modified rule restriction setting outflow at 60 percent of inflow would preserve these benefits (U.S. Fish and Wildlife Service 2001a).

- Soil-related effects along the Lower American River that would result from flow changes are considered less than significant because substantial erosion is not expected to occur.

7.2.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Construction- and operation-related effects under Alternative 6 would be the same as described under Alternative 5.

7.2.10 Alternative 7: Stepped Release to 180,000 cfs

Construction- and operation-related effects under Alternative 7 would be the same as described under Alternative 5.

7.2.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Alternative 8 incorporates all the components of Alternatives 3 and 5. Consequently, all the construction- and operation-related effects that would occur under Alternatives 3 and 5 would also occur under Alternative 8.

7.2.12 Alternative 9.0: Ecosystem Restoration Alternatives

Alternative 9.1: Urrutia Restoration Site

Construction-Related Effects. The earthwork that would be conducted to construct the various components of the Urrutia restoration alternative would result in substantial soil and vegetation disturbance on the right bank and flood plain of the Lower American River. These disturbances would increase the hazard of erosion and could thereby increase erosion and sedimentation rates during and shortly after construction.

- Soil and vegetation disturbance resulting from the construction of the Urrutia restoration alternative could increase erosion and sedimentation rates along the Lower American River during and shortly after project construction. This effect is considered significant. Implementing Mitigation Measure WQ-2 would reduce this effect to a less-than-significant level. Mitigation Measure WQ-2 is discussed in Section 7.10, “Water Quality.”

Operation-Related Effects. Under the Urrutia restoration alternative, severely eroding portions of the right bank of the Lower American River would be terraced and planted with woody riparian vegetation. The terraced topography would stabilize the grade of the riverbank, reduce overbank erosion, and provide a suitable planting area for the riparian vegetation. Once established, the woody riparian vegetation would lend structural support to the riverbank and armor it against further erosion during project operation.

- The terracing and riparian planting components of the Urrutia restoration alternative would reduce long-term erosion and sedimentation rates on the right bank of the Lower American River during project operation. This is considered a beneficial effect.

Implementation of the Urrutia restoration alternative would also require that earthwork and planting activities be conducted in the compacted and sparsely-vegetated areas surrounding the existing sand and gravel pit to revegetate these areas with native riparian vegetation. The earthwork and subsequent planting activities would substantially improve physical soil conditions (e.g., bulk density, aeration, permeability) and plant cover in these areas, which would reduce long-term erosion and sedimentation rates during project operation.

- The earthwork and subsequent planting activities that would be conducted in the compacted and sparsely-vegetated areas surrounding the existing sand and gravel pit

would reduce long-term erosion and sedimentation rates along the Lower American River during project operation. This is considered a beneficial effect.

Alternative 9.2: Woodlake Restoration Site

Construction-Related Effects. The earthwork that would be conducted to construct the various components of the Woodlake restoration alternative would result in substantial soil and vegetation disturbance on the right bank and flood plain of the Lower American River. These disturbances would increase the hazard of erosion and could thereby increase erosion and sedimentation rates during and shortly after construction.

- Soil and vegetation disturbance resulting from the construction of the Woodlake restoration alternative could increase erosion and sedimentation rates along the Lower American River during and shortly after project construction. This effect is considered significant. Implementing Mitigation Measure WQ-2 would reduce this effect to a less-than-significant level. Mitigation Measure WQ-2 is discussed in Section 7.10, “Water Quality.”

Operation-Related Effects. During project construction, the north-south portion of the incised borrow channel located adjacent to the railroad tracks at the east side of the Woodlake restoration site would be reshaped to increase the residence time of urban runoff in the channel. Additionally, the banks of the channel would be laid back to create suitable planting conditions for native riparian vegetation. These alterations are expected to arrest further incision of the borrow channel, stop the mass wasting of the oversteepened channel banks, and reduce the discharge of sediment from the channel into the Lower American River during project operation.

- The alterations made to the north-south borrow channel located near the eastern side of the restoration project site would arrest further channel incision, stop mass wasting of the channel banks, and reduce the discharge of sediment from the channel into the Lower American River during project operation. This is considered a beneficial effect.

Alternative 9.3: Bushy Lake Restoration Site

Construction-Related Effects. The earthwork that would be conducted to construct the various components of the Bushy Lake restoration alternative would result in substantial soil and vegetation disturbance on the right bank and flood plain of the Lower American River. These disturbances would increase the hazard of erosion and could thereby increase erosion and sedimentation rates during and shortly after construction.

- Soil and vegetation disturbance resulting from the construction of the Bushy Lake restoration alternative could increase erosion and sedimentation rates along the Lower American River during and shortly after project construction. This effect is considered significant. Implementing Mitigation Measure WQ-2 would reduce this effect to a less-than-significant level. Mitigation Measure WQ-2 is discussed in Section 7.10, “Water Quality.”

Operation-Related Effects. Under the Bushy Lake restoration alternative, steep portions of the right bank of the Lower American River would be terraced and planted with woody riparian vegetation. The terraced topography would stabilize the grade of the riverbank, reduce overbank erosion, and provide a suitable planting area for riparian vegetation. Once established, the woody riparian vegetation would lend structural support to the riverbank and armor it against further erosion during project operation.

- The terracing and riparian planting components of the Bushy Lake restoration alternative would reduce long-term erosion and sedimentation rates on the right bank of the Lower American River during project operation. This is considered a beneficial effect.

The Bushy Lake restoration alternative also calls for the construction of a channel from Bushy Lake to the Lower American River. Channel incision and bank erosion could occur in the constructed channels during project operation, which could, in turn, increase the discharge of sediment into the Lower American River. However, the channel would be constructed in coarse-textured sediments and would flow along relatively shallow gradients. Additionally, all of the constructed channel bank would be gently to moderately sloping and vegetated with native riparian vegetation. Consequently, the conveyance of water through the constructed channel is not expected to substantially increase erosion and sedimentation rates.

- The conveyance of water through a constructed, low-gradient channel would result in a less-than-significant effect on erosion and sedimentation rates along the Lower American River.

Alternative 9.4: Arden Bar Restoration Site

Construction-Related Impacts. The earthwork that would be needed to construct the various components of the Arden Bar restoration alternative would result in substantial soil and vegetation disturbance on the right bank and flood plain of the Lower American River. These disturbances would increase the hazard of erosion and could thereby increase erosion and sedimentation rates during and shortly after construction.

- The soil and vegetation disturbance resulting from the construction of the Arden Bar restoration alternative could increase erosion and sedimentation rates along the Lower American River during and shortly after project construction. This effect is considered significant. Implementing Mitigation Measure WQ-2 would reduce this effect to a less-than-significant level. Mitigation Measure WQ-2 is discussed in Section 7.10, “Water Quality.”

Operation-Related Impacts. Implementation of the Arden Bar restoration alternative would involve the construction of a high-flow bypass channel to divert floodflows from the Lower American River channel through the restoration area. The diversion of floodflows into the bypass during project operation could cause channel incision and bank erosion in the bypass channel, which could in turn result in the discharge of sediment into the Lower American River at the bypass outlet. However, the channel would be constructed with a relatively shallow gradient, and the bed and banks of the bypass channel would be armored with cobbles and/or

planted with woody riparian vegetation. These design provisions would likely be sufficient to prevent any substantial channel incision or bank erosion from occurring in the high-flow bypass during project operation.

- The diversion of water from the Lower American River into the high-flow bypass channel during project operation would have a less-than-significant effect on bed incision and bank erosion in the high-flow bypass channel.

Alternative 9.5: Fisheries Restoration

Construction-Related Effects. The activities associated with the construction of the fisheries restoration alternative would be limited to the Folsom Dam.

- Construction of the fisheries restoration alternative would have no effect on geologic and soil conditions or seismic hazards at Folsom Reservoir.

Operation-Related Effects. Operation of the fisheries restoration alternative would be limited to the management of the cold-water pool at Folsom Reservoir.

- The operation of the fisheries restoration alternative would have no effect on geologic and soil conditions or seismic hazards at Folsom Reservoir.

7.3 Water Supply

7.3.1 Introduction

This section describes the construction- and operation-related effects on water supply that are expected to occur under each project alternative. Additional discussion regarding potential hydrologic effects on water supply is provided in Section 7.1, “Hydrology and Hydraulics.”

This analysis discloses effects on water supply at Folsom Reservoir. Changes caused by construction-related activities or flood control operations associated with this project would not affect water supply in other areas.

7.3.2 Methods and Assumptions

Effects on water supply were evaluated qualitatively and quantitatively based on construction and operational activities that would result from implementation of project alternatives. It was generally assumed that construction activities associated with modifying Folsom Dam or the dikes around Folsom Reservoir could result in short-term effects on the delivery of local water supplies. A long-term effect would result if project operation would create a substantial disruption or reduction in the distribution or quantity of local water supply associated with Folsom Reservoir.

7.3.3 Criteria for Determining Significance

A significant adverse effect on water supply would occur if either or both of the following conditions were met:

- A reduction in supply or a substantial increase in the cost of surface water delivery is attributable to construction of project alternatives.
- A reduction in supply or substantial increase in the cost of surface water delivery is attributable to the operation of project alternatives.

7.3.4 Alternative 1: No Action

Construction-Related Effects

Alternative 1 includes completion of previously-authorized projects that would modify the outlet works at Folsom Dam, increase the surcharge storage at Folsom Reservoir, and strengthen the levees along the Lower American River. Modifications to the dam would include lowering the dam's five main spillway bays and enlarging the dam's low-level river outlets.

- No effects on water supply would occur because no new construction activities are expected to occur.

Operation-Related Effects

The increased outlet capacity at Folsom Dam would be used to release water from the reservoir during major storm events and would not affect the water conservation pool at Folsom Reservoir.

On completion of the modification to the Folsom Dam outlet works and spillway, it is expected that flood control operations would shift from the current 400,000–670,000 acre-foot flood rule curve to a 400,000–600,000 acre-foot flood rule curve. Changing flood control operations would increase the potential for the reservoir to fill at the end of the flood control season and benefit water supply.

Alternative 1 would also include an operation scenario, which would allow the advanced release of water stored in Folsom Reservoir prior to a major storm event. Release would be made based on expected inflows predicted by weather forecasts. Hydrologic modeling of major storm events indicates that after an advanced release is made, the reservoir is expected to refill nearly 100 percent of time.

- Operation of Alternative 1 could benefit water supply by increasing the potential for Folsom Reservoir to fill at the end of the flood season.

7.3.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Enlarging the size of the L. L. Anderson spillway would not require lowering the surface elevation of French Meadows Reservoir. Construction would occur during the summer months when reservoir elevations are low. Construction also would not affect the amount of water being diverted to or from French Meadows Reservoir.

- Construction of the spillway would have no effect on water supply because the surface elevation of the reservoir would not have to be lowered to accommodate construction.

Folsom Reservoir. Construction activities to raise the concrete dam, wing dams, and dikes would not require lowering the surface elevation of Folsom Reservoir. Lowering the main spillway would be accomplished by placing a watertight structure on the lakeside of the spillway bays. This would allow construction to proceed without affecting reservoir storage. Construction of the wing dams and dikes would occur after the end of the flood season and once the level of the reservoir has lowered in response to normal releases during the spring and early summer.

Raising the concrete dam and lowering the spillway would not interfere with the raw water outlet through the dam. Because the spillway is located away from the raw water outlet, construction of the spillway is not expected to affect the diversion of water through the outlet. This would ensure that these activities do not adversely affect deliveries to San Juan Water District, City of Folsom, and Folsom State Prison.

- Construction-related effects on water supply at Folsom Reservoir are considered less than significant because they would not interfere with existing supply operations or facilities.

Lower American River. Alternative 2 does not include construction activities along the Lower American River.

- No construction-related effects on diversions made from the Lower American River would occur because no construction along the river would occur.

Operation-Related Effects

Operations under Alternative 2 include short-term increases in water storage in Folsom Reservoir during major flood events. This temporary increase in storage of flood water would not affect the frequency the reservoir is considered full under normal operations (elevation above 466 feet). The infrequent use of the additional flood storage space above 474 feet during flood operations would not create a condition that would reduce water deliveries or increase the cost of existing water supply operations.

- Operation-related effects on water supply at Folsom Reservoir are considered less than significant because infrequent and temporary increases in the gross flood pool elevation of Folsom Reservoir during flood operations would not limit water deliveries or increase the cost of existing water supply operations.

7.3.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction- and operation-related effects on water supply would be the same as described under Alternative 2.

7.3.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Construction- and operation-related effects on water supply would be the same as described under Alternative 2.

7.3.8 Alternative 5: Stepped Release to 160,000 cfs

Alternative 5 includes improvements to accommodate increased objective releases from Folsom Dam up to a maximum of 160,000 cfs. Components of this alternative include modifying pumping stations and drainage facilities, widening the Sacramento Weir and Bypass, and raising and strengthening the levees in the Yolo Bypass. In addition, levee strengthening would occur on the Lower American River from the Natomas East Main Drainage Canal (NEMDC) to I-5.

Under Alternative 5, the maximum design flood control pool at Folsom Reservoir would remain at 474 feet, and no additional flood storage space would be created at Folsom Reservoir. Because the amount of water stored is not expected to change, the existing water supply and delivery conditions would also remain unchanged.

Construction-Related Effects

Folsom Reservoir. Construction activities under Alternative 5 would not include additional modifications to Folsom Dam.

- No construction-related effects on water storage at Folsom Reservoir would occur because the concrete dam, wing dams, and dikes would not be modified.

Lower American River. Construction activities that would result from levee strengthening and utility modifications are not anticipated to interfere or disturb existing water supply and delivery systems located along the Lower American River. Potential effects on hydrology and water quality are discussed in Section 7.1, “Hydrology and Hydraulics,” and Section 7.10, “Water Quality.”

- Construction-related effects on water supply along the Lower American River are considered less than significant because they would not interfere with existing water supply operations or facilities.

Operation-Related Effects

Folsom Reservoir. A maximum objective release of 160,000 cfs that would occur under flood operations during a major flood event is not anticipated to affect water supply at Folsom Reservoir. An objective release of this magnitude would occur very infrequently. As previously-noted, operations under Alternative 5 do not include changes in water conservation pool elevation at Folsom Reservoir.

- Operation-related effects on water supply at Folsom Reservoir are considered less than significant because the infrequent and temporary stepped release of up to 160,000 cfs during flood operations would not disturb existing water supply and delivery systems or the existing water conservation pool at the reservoir.

Lower American River. A maximum objective release of 160,000 cfs that would occur under flood operations during a major flood event is not anticipated to affect water supply along the Lower American River. Beyond previously-identified utilities, other water supply and delivery systems along the river are either currently designed or would be upgraded as part of the project to accommodate an increase in the objective release.

- Operation-related effects on water supply along the Lower American River are considered less than significant because the infrequent and temporary stepped release of up to 160,000 cfs during flood operations would not disturb existing water supply and delivery systems.

7.3.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Construction- and operation-related effects on water supply would be the same as described under Alternative 5. In addition, Alternative 6 would include constructing a new outlet at Folsom Dam.

Construction activities associated with adding a new outlet at Folsom Dam are not anticipated to affect water supply. Construction of the outlet would not require lowering the surface elevation of the reservoir. The new outlet would not conflict with existing local water supply or increase delivery costs because the water supply operations and facilities would remain unaffected by the construction process.

- Construction-related effects on water supply at Folsom Reservoir are considered less than significant because existing water delivery facilities would not be affected and reservoir storage would not be affected.

7.3.10 Alternative 7: Stepped Release to 180,000 cfs

Construction- and operation-related effects on water supply would be the same as described under Alternative 5.

7.3.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Alternative 8 would include all the components of Alternatives 3 and 5. Consequently, all the construction- and operation-related effects that would result from implementation of these alternatives would also occur for Alternative 8.

7.3.12 Alternative 9.0: Ecosystem Restoration Alternatives

Alternative 9.1: Urrutia Restoration Site

Construction-Related Effects. Alternative 9.1 is located off the main channel of the Lower American River and would not require lowering river flows to accommodate construction. Construction of Alternative 9.1 would not affect facilities that divert water from the American River or other water supply infrastructure.

- Construction of Alternative 9.1 would not affect water supply because no change in river flows would occur and construction would not interfere with water supply infrastructure.

Operation-Related Effects. Once constructed, the restoration site would operate an irrigation system until such time as the restoration plantings become self-sustaining (approximately 3 years). Water would be pumped from the Lower American River or other available sources. The amount of water needed to sustain the plantings would be very small compared to the volume of water in the Lower American River.

- Operation of Alternative 9.1 would not affect water supply because it would not change the operations of Folsom Reservoir or the Lower American River.

Alternative 9.2: Woodlake Restoration Site

Construction- and operation-related effects on water supply would be the same as described under Alternative 9.1.

Alternative 9.3: Bushy Lake Restoration Site

Construction- and operation-related effects on water supply would be the same as described under Alternative 9.1.

Alternative 9.4: Arden Bar Restoration Site

Construction- and operation-related effects on water supply would be the same as described under Alternative 9.1.

Alternative 9.5: Fisheries Restoration

Construction-Related Effects. Construction of the Alternative 9.5 would include modifications to the temperature control shutters for the intakes to the powerhouse penstocks. If necessary, construction would occur under water and would occur independent of the amount of water stored in Folsom Reservoir. Construction would not require lowering the surface elevation of the reservoir.

- Construction of the Alternative 9.5 would not affect water supplies because construction would not require lowering the surface elevation of Folsom Reservoir.

Operation-Related Effects. Once constructed, Alternative 9.5 would enable dam operators to better manage the cold-water pool at Folsom Reservoir. Enhancing the ability to manage the cold-water pool would not affect reservoir storage or water supply because the amount of water released from the reservoir would not change.

- Operation of Alternative 9.5 would not affect water supplies because operation would affect only the temperature of water released from the reservoir and not the amount of water released.

7.4 Hydropower

7.4.1 Introduction

This section describes the construction- and operation-related effects on hydropower generation that are expected to occur under each project alternative. This analysis discloses effects on hydropower generation at Folsom Dam and Pacific Gas and Electric (PG&E's) Newcastle Powerhouse at the northeastern shoreline of Folsom Reservoir. Construction-related activities or flood control operations associated with this project would not result in effects on hydropower facilities in other areas.

7.4.2 Methods and Assumptions

Effects on hydropower were evaluated qualitatively based on construction- and operation-related activities that would occur under each alternative. Construction-related activities associated with modifying Folsom Dam could result in a short-term loss of power-generation capacity if the surface elevation of the reservoir were lowered to accommodate construction. Operation-related effects could occur if storage of floodwaters would result in inundation of the Newcastle Powerhouse. The hydropower facility at Nimbus Dam was not evaluated in this analysis because it is not associated with construction or operation of the project under evaluation and would not require modification under any of the project alternatives.

7.4.3 Criteria for Determining Significance

For the purpose of this analysis, a significant adverse effect on hydropower would occur if either or both of the following conditions occur:

- A reduction in hydropower capacity or power generation attributable to construction of project alternatives.
- A reduction in hydropower capacity or power generation attributable to increased flood control storage elevations.

7.4.4 Alternative 1: No Action

Alternative 1 includes completion of previously-authorized projects that enhance flood protection by modifying the outlet works and spillway at Folsom Dam and increase the surcharge storage space at Folsom Reservoir. Modifications to Folsom Dam would allow the additional surcharge storage space at Folsom Reservoir to be used for short-term storage during extremely large flood events. These modifications would enhance flood control operation at the reservoir and are not expected to affect the water conservation pool and in turn, the potential for hydropower production at Folsom Dam.

On completion of the modifications to the Folsom Dam outlet works and spillway, it is expected that flood control operations would shift from the current 400,000–670,000 acre-foot flood rule curve to a 400,000–600,000 acre-foot flood rule curve. Changing flood control operations would increase the potential to fill Folsom Reservoir at the end of the flood season. Maximizing reservoir storage could enhance power production by also maximizing the amount of water that could be run through the powerplant generators.

- Operation of Alternative 1 could benefit hydropower production by increasing the amount of water stored in Folsom Reservoir.

7.4.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Alternative 2 includes increasing the spillway capacity at L. L. Anderson Dam and raising the height of Folsom Dam to accommodate an increased flood pool storage elevation of 478 feet. As discussed in Section 7.3, “Water Supply,” construction and operation of Alternative 2 is not expected to change the existing storage capacity of Folsom Reservoir for water supply purposes or other beneficial uses. Implementation of this alternative would involve only short-term increases in storage during major flood events and the subsequent release of that floodwater in order to minimize flood risk to Sacramento. Therefore, the overall reservoir base-level storage capacity would remain unchanged.

Construction-Related Effects

L. L. Anderson Dam. Enlarging the size of the L. L. Anderson Dam spillway would not require lowering the surface elevation of French Meadows Reservoir. Construction would be limited to the spillway and would not affect the amount of water that is diverted to the reservoir from Duncan Creek or the amount of water that is transferred to Hell Hole Reservoir.

- Construction activities would not affect hydropower production because it would not affect storage in French Meadows Reservoir or diversion to or from the reservoir.

Folsom Reservoir. Construction activities that would occur at Folsom Reservoir under Alternative 2 include earthmoving, grading, and cement work necessary to physically raise the existing concrete structure and wing dams. Construction elements would also involve replacement or modifications to the spillway gates and bridge piers. These activities are not expected to conflict with power generation because the intakes, penstocks, and generators would not be modified or affected. In addition, the surface elevation of Folsom Reservoir would not be lowered to accommodate construction activities.

- No construction-related effects on hydropower are expected as a result of raising Folsom Dam because the surface elevation of the reservoir would not be affected and the hydropower-generating facilities would not be modified.

Operation-Related Effects

L. L. Anderson Dam. Under Alternative 2, the enlarged spillway at L. L. Anderson Dam would not change water level operations at French Meadows Reservoir.

- There would be no operation-related effects on hydropower generation from operation of the enlarged spillway at L. L. Anderson Dam because normal water levels and associated water diversions through the French Meadows Tunnel would not be altered.

Folsom Reservoir. Operations under Alternative 2 would involve short-term increases in water storage in Folsom Reservoir during major flood events. The increase in storage capacity and temporary storage of floodwater at elevations higher than 474 feet are not expected to change the frequency the reservoir fills under normal operations (elevation 466 feet). Storage of water at elevations higher than 474 feet would not affect the ability to divert water to the powerplant from the reservoir. The infrequent and temporary storage of floodwaters above 474 feet during flood operations would not affect the potential for hydropower generation.

- No operation-related effects on hydropower generation at Folsom Dam are expected because powerplant operations would not be affected and storage of floodwaters above 474 feet would be infrequent and would not affect the frequency the reservoir fills.

A temporary increase in flood pool elevation to 478 feet associated with Alternative 2 would result in inundation of the Newcastle Powerhouse. As described under Section 7.1, "Hydrology and Hydraulics," the frequency of extreme flood events that would bring the flood pool elevation to 478 feet is very low by definition and the Newcastle Powerhouse would not be inundated very frequently. Loss in power production by the hydropower facility would be minor.

- Loss of hydropower generation at Newcastle Powerhouse is considered a less-than-significant effect because the frequency of extreme flood events is considered very low and the loss of power production would be minor.

7.4.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

The plan components for Alternative 3 are essentially identical to those of Alternative 2, with the exception that structural improvements to Folsom Dam and other surrounding dikes would be performed to the extent necessary to accommodate a flood pool elevation of 482 feet at Folsom Reservoir.

- Construction- and operation-related effects on hydropower production under Alternative 3 would be the same as described under Alternative 2.

7.4.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

The plan components for Alternative 4 are essentially identical to those of Alternative 2, with the exception that structural improvements to Folsom Dam and other surrounding dikes would be performed to the extent necessary to accommodate a flood pool elevation of 487 feet at Folsom Reservoir.

- Construction- and operation-related effects on hydropower production under Alternative 4 would be the same as described under Alternative 2.

7.4.8 Alternative 5: Stepped Release to 160,000 cfs

Construction-Related Effects

Lower American River. Construction activities necessary to increase the conveyance capacity of the Lower American River, Sacramento Bypass, and Yolo Bypass would not require changing hydropower generation at Folsom Reservoir.

- No effect on hydropower generation at Folsom Dam powerhouse would occur during levee construction because no changes in operation of Folsom Reservoir would be required.

Operation-Related Effects

Folsom Reservoir. The maximum objective release of 160,000 cfs during a major flood event is not anticipated to affect hydropower generation at the Folsom Dam powerplant. The maximum design flood control pool at Folsom Reservoir would remain at 474 feet and no additional flood storage space would be created at Folsom Reservoir. As discussed in Section 7.3, “Water Supply,” construction and operation of Alternative 5 is not expected to affect storage at Folsom Reservoir for water supply purposes. Because the amount of water stored is not expected to change, the potential for hydropower production would also remain unchanged.

- No effect on hydropower generation at the Folsom Dam powerhouse is expected because the powerplant could remain in production during flood control operation and flood control operations would not affect the frequency the reservoir fills.

7.4.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Alternative 6 incorporates all components of Alternative 5 with the addition of a new outlet to be constructed within the auxiliary spillway of Folsom Dam. This plan would also require modifications to the flip bucket and stilling basin under the auxiliary spillway. The effect of these changes would be to increase the efficiency at which a stepped release of 160,000 cfs could be reached in order to maximize potential flood protection.

Under Alternative 6, the maximum design flood control pool at Folsom Reservoir would remain at 474 feet, and no additional flood storage space would be created at Folsom Reservoir. As discussed in Section 7.3, “Water Supply,” construction and operation of Alternative 6 is not expected to affect storage at Folsom Reservoir for water supply purposes. Because the amount of water stored is not expected to change, the potential for hydropower production would also remain unchanged.

Construction-Related Effects

Construction of a new outlet at Folsom Dam would not involve any disturbance to the powerhouse penstocks or generators. Construction would not require lowering the surface elevation of Folsom Reservoir or require any interruption of hydropower generation operations.

- No effects on hydropower production at the Folsom Dam powerplant would occur because construction would not interfere with the powerhouse or require lowering the surface elevation of Folsom Reservoir.

Effects on hydropower production as a result of strengthening levees along the Lower American River would be the same as described under Alternative 5.

Operation-Related Effects

Effects on hydropower production as a result of operating Alternative 6 would be the same as described under Alternative 5.

7.4.10 Alternative 7: Stepped Release to 180,000 cfs

Construction- and operation-related effects on hydropower production under Alternative 7 would be the same as described under Alternative 5.

7.4.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Alternative 8 would incorporate all the components of Alternatives 3 and 5. Consequently, all the construction- and operation-related effects that result from implementation of Alternatives 3 and 5 would also occur under Alternative 8.

7.4.12 Alternative 9.0: Ecosystem Restoration Alternatives

Alternative 9.1: Urrutia Restoration Site

Construction-Related Effects. Alternative 9.1 is located off the main channel of the Lower American River and would not require lowering river flows or reducing the amount of water released from Folsom or Nimbus dams to accommodate construction. Construction would not affect the amount or timing of water that is diverted through the Folsom Dam or Nimbus Dam powerplants.

- Construction of Alternative 9.1 would have no affect on hydropower production at Folsom Dam or Nimbus Dam powerplants.

Operation-Related Effects. Operation of Alternative 9.1 would not affect releases from Folsom Dam or Nimbus Dam or the amount of water that passes through the dam's powerplant.

- Operation of Alternative 9.1 would have no affect on hydropower production at Folsom Dam or Nimbus Dam powerplants.

Alternative 9.2: Woodlake Restoration Site

Construction- and operation-related effects on hydropower would be the same as described under Alternative 9.1.

Alternative 9.3: Bushy Lake Restoration Site

Construction- and operation-related effects on hydropower would be the same as described under Alternative 9.1.

Alternative 9.4: Arden Bar Restoration Site

Construction- and operation-related effects on hydropower would be the same as described under Alternative 9.1.

Alternative 9.5: Fisheries Restoration

Construction-Related Effects. Under Alternative 9.5, the temperature control shutters for the inlets to the powerplant penstocks at Folsom Dam would be modified. Construction activities would require occasional interruption of powerplant operations. These interruptions would occur during the fall and winter after the summer peak power demand period is over.

- Construction-related effects of Alternative 9.5 on power production from Folsom Dam would be less than significant because interruptions would be short term and would occur when the demand for Central Valley Project (CVP) power is low.

Operation-Related Effects. The modified shutters on the intakes to the powerhouse penstocks would be designed and operated to ensure that the amount and control of flow through

the shutters would be sufficient for minimum powerplant operation and that equal flow to each penstock would be maintained. Operation of the shutters would not affect the amount of water that is diverted to the powerplant.

- No operation-related effects on hydropower generation at Folsom Dam would occur under Alternative 9.5.

7.5 Land Use and Socioeconomics

7.5.1 Introduction

This section describes the construction- and operation-related effects on land use that are expected under each project, the methods and assumptions used to conduct the analysis, and criteria for determining the significance of effects.

The analysis discloses effects on land uses at L. L. Anderson Dam, at Folsom Reservoir, along the Lower American River within the Yolo and Sacramento bypasses, and along the Sacramento River and Delta sloughs that could occur as a result of conflicts with existing land uses or inconsistencies with applicable Federal, State, or local land use plans and policies.

7.5.2 Methods and Assumptions

The effects of each alternative on land use around Folsom Reservoir and along the Lower American River were evaluated for their consistency with land use requirements outlined in the Folsom Lake State Recreation Area (FLSRA) General Plan and the Parkway Plan. Although the FLSRA General Plan does not specify how flood control improvements conform to designated land uses within the FLSRA, the plan does require that any modifications continue to provide a venue for recreational uses. Similarly, the Parkway Plan requires that levee protection be used only as required to protect the community.

Construction-Related Effects

Construction-related effects were analyzed for each alternative based on the following assumptions:

- Modifications to the L. L. Anderson Dam spillway would be completed within one construction season.
- Modifications to dikes and dams around Folsom Reservoir would occur in phases, limiting the extent of construction at any one time.
- Raising or strengthening levees would occur in phases, and modification of any single levee segment would take no more than one season to complete.

Operation-Related Effects

The evaluation of operation-related effects on land uses around Folsom Reservoir assumes that the project would affect only lands at an elevation higher than 474 feet. Operation of Folsom Reservoir for water supply purposes would not change, and any increase in storage attributable to the project would be used for flood control purposes only. To assess potential effects, the elevation of important land uses occurring around the reservoir were estimated and then compared to the maximum flood storage elevation that could occur under each alternative. (Section 7.1, “Hydrology and Hydraulics,” describes the hydrological characteristics of each project alternative.)

No changes in land uses along the Lower American River or within the Sacramento and Yolo Bypasses attributable to flood control operations are expected because these areas are designated as floodways and the frequency these areas would be inundated is not expected to change.

7.5.3 Criteria for Determining Significance

The criteria used for determining the significance of an effect on existing or planned land uses are based on the environmental checklist form in Appendix G of the State CEQA Guidelines and the Council on Environmental Quality (CEQ) National Environmental Protection Agency (NEPA) regulations.

According to the CEQA checklist, effects on land use are considered significant if implementation of an alternative would:

- Physically divide an established community.
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.
- Convert prime farmland, unique farmland, or farmland of Statewide importance to nonagricultural use.

Section 1502 of the CEQ regulations states that an Environmental Impact Statement (EIS) must acknowledge and describe the extent of any conflicts with Federal, State, or local land use plans, policies, and controls and that such conflicts must be considered in decision making.

7.5.4 Alternative 1: No Action

Construction-Related Effects

Alternative 1 does not include construction of any new flood control improvements. Therefore, no construction-related effects on land use would occur.

- Land use would not be affected because construction would not occur.

Operation-Related Effects

Folsom Reservoir. Under Alternative 1, flood control operations at Folsom Reservoir would not change. No changes in land use would occur as a result of this alternative, and development and other land uses are expected to continue in accordance with current plans and policies.

- Land use around Folsom Reservoir would not be affected because current flood control operations would not change.

Lower American River. Under Alternative 1, lands along the Lower American River would continue to be managed under the Parkway Plan guidelines. No changes in land use would occur as a result of this alternative, and development and other land uses would continue in accordance with current plans and policies.

- Land use along the Lower American River would not be affected because current flood control operations would not change.

Yolo and Sacramento bypasses. Under Alternative 1, lands within the Yolo and Sacramento bypasses would not be modified. No changes in land use would occur as a result of this alternative, and development and other land uses would continue in accordance with current plans and policies.

- Land use within the Sacramento and Yolo Bypasses would not be affected because current flood control operations would not change.

7.5.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Construction activities would be limited to the existing spillway and areas immediately adjacent to the spillway. With the exception of the upstream end of the spillway, no new lands outside the spillway or spoils pile would be disturbed. Access to the spillway would be over existing roadways. Material excavated from the spillway would be placed in an existing spoils pile adjacent to the dam. Construction would occur within the boundaries of Placer County Water Agency (PCWA's) American River Development and would not conflict with the management objectives of the Tahoe National Forest (TNF).

- Land uses in the vicinity of the L. L. Anderson Dam spillway would not be affected because construction would be limited to the spillway and areas immediately adjacent to the spillway.

Folsom Reservoir. Under Alternative 2, construction activities associated with flood control facilities at Folsom Reservoir would occur on Federal land managed as the FLSRA and designated for recreational use. (Effects on recreation use are described in more detail in Section 7.6, “Recreation.”) Equipment staging areas and a borrow site would be located within the FLSRA, and access to some trails, boat ramps, and beaches could be restricted during construction. Construction would be phased over several years, and the amount of land directly affected would not be substantial compared to the total lands within the FLSRA. Staging areas would either be located within the inundation zone of the reservoir or landside at an adequate distance so as to not conflict with private land uses.

A large borrow site would be located within the reservoir inundation zone to the northwest of Peninsula campground. Excavating material from this site would not conflict with surrounding land uses because the borrow site would be located entirely on Federal lands, which are isolated from private lands surrounding the FLSRA.

A temporary construction maintenance bridge would be erected on Federal land located downstream of the dam. Public access to this land is not allowed without permission from the Bureau.

- Construction-related effects on land uses that occur near the wing dams, dikes, staging areas, Peninsula borrow site, and temporary construction bridge alignment are considered less than significant because all construction activities would occur on Federal land, would be short in duration, and would be consistent with land use plans and policies for surrounding lands.

Operation-Related Effects

Folsom Reservoir. As indicated in Section 7.1, “Hydrology and Hydraulics,” the additional flood storage capacity at Folsom Reservoir would be used only during severe storms. The use of this additional flood storage capacity would occur infrequently and would be compatible with land uses within and in the vicinity of the FLSRA.

Flood control operations under Alternative 2 could encroach on private lands located on the reservoir side of Mooney Ridge near Granite Bay. Floodwaters would encroach onto eight parcels, but would not directly affect any structures. As indicated in Chapter 5, “Flood Control Alternatives,” the Corps would obtain flowage easements from these property owners and ensure that building foundations are modified to avoid damage in the event the surface elevation of the reservoir reaches these properties.

Development and other land use within and adjacent to the FLSRA would continue in accordance with current land use plans and policies.

- Land uses within and adjacent to the FLSRA would not be affected because reservoir and dam operations would be consistent with existing plans and policies.

Lower American River. Operation of the project would not change the floodway designation of the American River Parkway. Occasional inundation of the parkway would continue as a result of flood control operations.

- Land uses within the American River Parkway would not be affected because no change in the use of the Parkway for flood control purposes would occur.

Yolo and Sacramento bypasses. Operation of the project would not change the floodway designation of the Yolo and Sacramento bypasses. Inundation of lands within the bypasses would continue as a result of continued flood control operations. Land uses within the bypasses would not be affected because no change in the use of the bypasses for flood control purposes would occur.

- Land uses within the Sacramento and Yolo Bypasses would not be affected because the bypasses would continue to be occasionally flooded.

7.5.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction-Related Effects

Folsom Reservoir. Under Alternative 3, construction-related effects on land uses would include those described for Alternative 2. In addition, a 1/3-mile segment of Folsom Dam Road would be raised in place and borrow material for the raising of wing dams and dikes would be excavated and transported from Mississippi Bar.

Raising the 1/3-mile segment of Folsom Dam Road in the vicinity of Observation Point would occur within the existing road right-of-way. Construction would not require purchasing a new right-of-way. Roadway improvements would be limited to lands under Federal ownership.

- Construction-related effects on land use as a result of raising Folsom Dam Road are considered less than significant because all construction activities would occur on Federal land, would be short in duration, and would be consistent with existing land use plans and policies.

Lake Natoma. A borrow site for material needed to raise the wing dams and dikes at Folsom Reservoir would be established at Mississippi Bar. Construction may also include barging material from Mississippi Bar across Lake Natoma and offloading at Willow Creek Recreation Area. The borrow site, haul routes to the barge loading site on Lake Natoma, and Willow Creek Recreation Area are located entirely on Federal land managed as part of the FLSRA and are not located immediately adjacent to the boundary of Federal lands. The borrow site also would be located far enough away from the bike trail and lake so as to avoid any substantial conflicts with recreation uses of the site. However, the offloading and transfer site would result in the loss of access to the recreation site, but is not expected to conflict with surrounding land uses. (Effects on recreation use are described in more detail in Section 7.6,

“Recreation.”) Once construction of the wing dams and dikes are completed, the Mississippi Bar borrow site and the Willow Creek Recreation Area would be restored and public access would be allowed.

- Conflicts with land uses at and near Lake Natoma as a result of excavating and transporting material from Mississippi are considered less than significant because the borrow activities would be limited to Federal land and would not conflict with adjacent land uses on Federal or private property.

Operation-Related Effects

All operation-related effects on land uses around Folsom Reservoir, along the Lower American River, and within the Sacramento and Yolo Bypasses would be the same as the effects described for Alternative 2.

7.5.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Construction-Related Effects

Construction-related effects on land uses at L. L. Anderson Dam, around Folsom Reservoir, and at Lake Natoma would be the same as the effects described for Alternative 3.

Operation-Related Effects

All operation-related effects on land uses at Folsom Reservoir, along the Lower American River, and within the Sacramento and Yolo Bypasses would include the effects described for Alternative 3. In addition, private land located around the perimeter of the FLSRA could be inundated.

The occasional short-term storage of floodwaters at reservoir elevations higher than 485 feet could result in inundation of some private lands adjacent to the Federal property around Folsom Reservoir. Inundation of non-Federal lands would occur around the entire reservoir, but would be most pronounced along the South Fork Arm. Although no buildings would be affected, some parcels in the Lakeview Estates development on the north shore of the reservoir could be inundated. As indicated in Chapter 5.0, “Flood Control Alternatives,” the Corps would secure flowage easements on private lands that could be inundated during flood control operations.

- Effects on land uses within and adjacent to the FLSRA as a result of flood control operations are considered less than significant because inundation would be infrequent and would not conflict with surrounding land uses.

7.5.8 Alternative 5: Stepped Release to 160,000 cfs

Construction-Related Effects

Folsom Reservoir. Under Alternative 5, no construction activities would occur at Folsom Reservoir.

- Land uses around Folsom Reservoir would not be affected because no construction would occur.

Lower American River. Stability berms would be constructed along the existing north bank levee from the NEMDC to the confluence with the Sacramento River. The berms would be located on existing easements and are not expected to conflict with adjacent land uses.

Local drainage and water intake facilities, along with approximately 50 utility pipes, would be relocated. These modifications are expected to be of short duration and would occur within existing easements.

- The effect of constructing a stability berm and modifying water and drainage facilities on land uses within and adjacent to the American River Parkway is considered less than significant because the modifications would occur within existing easements.

Yolo and Sacramento Bypasses. Increasing the capacity of the Yolo Bypass and strengthening levees in the Yolo Bypass and in the Delta would result in the loss of agricultural production in Sacramento, Yolo, and Solano Counties. Approximately 183 acres of farmland would be affected by widening the Sacramento Bypass and strengthening levees in the Yolo Bypass and Delta (Table 7-9). Most of this loss is attributable to widening the Sacramento Bypass.

Crop types affected include grapes and pears in Solano County; grapes, pears, wheat, and corn in Sacramento County; and corn in Yolo County. These losses would be very small, representing substantially less than 0.1 percent of the land in Solano County, Sacramento County, and Yolo County planted to the crop types that would be affected by the project (Table 7-9).

- Increasing the size of the Sacramento Bypass and strengthening levees in the Yolo Bypass and in the Delta would result in a less-than-significant effect on agricultural production within Sacramento, Yolo, and Solano Counties because the total loss of acreage planted to the affected crop types is very small.

Expanding the size of the Sacramento Weir and strengthening levees in the Yolo Bypass and Delta would result in the conversion of prime farmland. Construction would result in the estimated loss of 4, 6, and 173 acres of prime farmland in Solano, Sacramento, and Yolo Counties, respectively. These losses are small and represent less than 1 percent of farmland classified as prime in each county. In addition, widening the Sacramento Bypass would not preclude use of the widened bypass for agricultural production once construction is completed.

- Increasing the size of the Sacramento Bypass and strengthening levees along the Yolo Bypass, Sacramento River, and Delta sloughs would result in a less-than-significant effect on prime farmland because the total loss of prime farmland represents a very small percentage of land classified as prime farmland in each county.

Operation-Related Effects

Folsom Reservoir. Flood control operations under Alternative 5 do not include increasing the flood storage capacity of Folsom Reservoir.

- Land use at and around the FLSRA would not be affected because reservoir operations would not change.

Lower American River. Under Alternative 5, no operation-related effects on land use along the Lower American River would occur because floodwaters would continue to be conveyed within an existing floodways.

- Land uses along the Lower American River would not be affected because flood control operations would not conflict with existing land uses, plans, or policies.

Yolo and Sacramento Bypasses. Under Alternative 5, no operation-related effects on land uses within the Yolo and Sacramento Bypasses would occur because floodwaters would continue to be contained within the existing floodways.

- Land uses within the Yolo and Sacramento Bypasses would not be affected because flood control operations would not conflict with existing land uses, plans, or policies.

7.5.9 Alternative 6: Stepped-Release to 160,000 cfs and New Outlet at Folsom Dam

Construction-Related Effects

Constructing a new outlet at Folsom Dam would be limited to modifying the existing concrete structure. No conflict with surrounding land uses would occur because Folsom Dam is surrounded by Federal lands managed as open space to which access is strictly controlled.

- No effect on land use as a result of constructing a new outlet at Folsom Dam is expected because modifications would be limited to the existing structure.

Construction of Alternative 6 would include all the effects on land uses along the Lower American River, within the Yolo and Sacramento Bypasses, and along the Sacramento River and Delta sloughs described under Alternative 5.

Operation-Related Effects

Operation-related effects on lands uses around Folsom Reservoir, along the Lower American River, within the Yolo and Sacramento Bypasses, and along the Sacramento River and Delta sloughs would be the same as described under Alternative 5.

TABLE 7-9. Agricultural Land Uses Affected in the Yolo and Sacramento Bypasses

Location	Site ID	Crop Type	Acres
Sacramento County			
Sacramento River	3-00-6	Wheat	1.03
Steamboat Slough	3-00-1	Pears	0.69
Steamboat Slough	3-2	Pears	0.55
Steamboat Slough	3-3	Corn	1.72
Sutter Slough	349-00-01	Vineyard	1.27
Sutter Slough	349-1	Pears	0.62
Sutter Slough	349-1	Pears	0.44
Solano County			
Steamboat Slough	501-00-1	Vineyard	0.63
Steamboat Slough	501-8	Vineyard	2.34
Steamboat Slough	501-9	Pears	0.44
Yolo County			
Sacramento Bypass	N/A	Corn	173

Note: All affected agricultural land is classified by the California Department of Conservation as Prime.

7.5.10 Alternative 7: Stepped Release to 180,000 cfs

Construction-Related Effects

Folsom Reservoir. Under Alternative 7, no construction activities would occur at Folsom Reservoir.

- Land uses around Folsom Reservoir would not be affected because no construction would occur.

Lower American River. Under Alternative 7, substantial levee, floodwall, and bridge improvements would occur, which could affect residents and recreationists. Along some levee sections, it would be necessary to acquire temporary construction easements on the landside of the levees. Some permanent facilities would be constructed on land currently used for recreation. This effect is discussed in detail in Section 7.6, "Recreation."

The average waterward toe expansion for levee improvements is estimated at 10.5 feet. Because this expansion is encroaching on the waterside of the levees, there would be no conflict with adjacent land uses on the landside of the levees. Construction of the new floodwall and levees would be completed within the Parkway and would meet all requirements of the Parkway Plan.

Modifications to the Guy West and Howe Avenue bridges and the Union Pacific Railroad (UPRR) trestle bridge would occur within the appropriate rights-of-way and would not conflict with existing land uses.

From Nimbus Dam to Discovery Park, 24 staging areas have been identified. The staging areas would be used as necessary to construct the new levees and floodwalls. Use of these staging areas would have some short-term effects, but they would not be substantial. Use of the staging areas would have no long-term effects.

- Effects on land uses within the American River Parkway are considered less than significant because construction of levee and bridge modifications would be short term and modifications would be consistent with the plans and policies in the Parkway Plan.

Yolo and Sacramento Bypasses. Construction-related effects in the Yolo and Sacramento Bypasses and along the Sacramento River and Delta sloughs would be the same as those described for Alternative 5.

Operation-Related Effects

Operation-related effects on lands uses around Folsom Reservoir, along the Lower American River, within the Yolo and Sacramento Bypasses, and along the Sacramento River and Delta sloughs would be the same as described under Alternative 5.

7.5.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Under Alternative 8, the construction- and operation-related effects on land use at Folsom Reservoir would be the same as those discussed for Alternative 3. The construction- and operation-related effects on land use along the Lower American River within the Sacramento and Yolo Bypasses and along the Sacramento River and Delta sloughs would be the same as those discussed for Alternative 5.

7.5.12 Alternative 9.0: Ecosystem Restoration Alternatives

This section describes the construction-related effects on land use that would occur under each restoration alternative. Operation of Alternatives 9.1 through 9.5 would not affect land use. Therefore, operation-relation effects are not analyzed.

Alternative 9.1: Urrutia Restoration Site

- Alternative 9.1 is located entirely within the American River Parkway. Construction would be limited to the restoration site and would not affect surrounding land uses. The American River Parkway Plan designates land uses in the vicinity of the restoration site as “limited recreation” (Sacramento County Planning Department 1985). The limited recreation designation applies to all lands on which active recreation may occur without the development of extensive recreation facilities. Alternative 9.1 would be compatible with the existing designated land use because informal recreation would be allowed on the restoration site once construction is completed.
- Alternative 9.1 would be compatible with the goals and polices of the American River Parkway Plan. These include protecting and enhancing the Parkway for public use, providing public access, and improving the natural resources of the Parkway (Sacramento County Planning Department 1985).

Construction of Alternative 9.1 would not affect land use within the American River Parkway because the restoration site would not conflict with surrounding land uses and would meet the goals of the Parkway Plan.

Alternative 9.2: Woodlake Restoration Site

- Alternative 9.2 is located entirely within the American River Parkway. Construction would be limited to the restoration site and would not affect surrounding land uses. The American River Parkway Plan designates land uses in the vicinity of the restoration site as “limited recreation” and “protected area” (Sacramento County Planning Department 1985). The “limited recreation” designation applies to all lands on which active recreation may occur without the development of extensive recreation facilities. “Protected areas” are areas that can sustain light to moderate use. Alternative 9.2 would be compatible with the existing designated land use

because informal recreation would be allowed on the restoration site once construction is completed.

- Alternative 9.2 would be compatible with the goals and policies of the American River Parkway Plan. These include protecting and enhancing the Parkway for public use, providing public access, and improving the natural resources of the Parkway (Sacramento County Planning Department 1985).

Alternative 9.2 would not affect land use within the American River Parkway because the restoration site would not conflict with surrounding land uses and would meet the goals of the Parkway Plan.

Alternative 9.3: Bushy Lake Restoration Site

- Alternative 9.3 is located entirely within the American River Parkway. Construction would be limited to the restoration site and would not affect surrounding land uses, including the overflow parking area used by Cal Expo. The American River Parkway Plan designates land uses in and adjacent to the restoration site as “protected area” and “nature study area” (Sacramento County Planning Department 1985). “Protected areas” are areas that can sustain light to moderate recreation use. Recreation or other public uses are restricted in “nature study areas” and are allowed only if they would not be detrimental to environmental quality or features. Alternative 9.3 would be compatible with the existing designated land use because informal recreation would be allowed on the restoration site once construction is completed and restoration would enhance environmental quality and features of the site.
- Alternative 9.3 would be compatible with the goals and policies of the American River Parkway Plan. These include protecting and enhancing the Parkway for public use, providing public access, and improving the natural resources of the Parkway (Sacramento County Planning Department 1985).

Alternative 9.3 would not affect land use within the American River Parkway because the restoration site would not conflict with surrounding land uses and would meet the goals of the Parkway Plan.

Alternative 9.4: Arden Bar Restoration Site

- Alternative 9.4 is located entirely within the American River Parkway. Construction would be limited to the restoration site and would not affect surrounding land uses, including the Sheriff’s training facility or the developed recreation area directly north of the training facility. The American River Parkway Plan designates land uses in the restoration site as “limited recreation” and “protected area” (Sacramento County Planning Department 1985). Alternative 9.4 would be compatible with the existing designated land use because informal recreation would be allowed on the restoration site once construction is completed and restoration would enhance environmental quality and features of the site. Other uses, including fishing and wildlife viewing at

the fishing pond and along the river would be allowed once construction is completed.

- Alternative 9.4 would be compatible with the goals and polices of the American River Parkway Plan. These include protecting and enhancing the Parkway for public use, providing public access, and improving the natural resources of the Parkway (Sacramento County Planning Department 1985).
- Alternative 9.4 would not affect land use within the American River Parkway because the restoration site would not conflict with surrounding land uses and would meet the goals of the Parkway Plan.

Alternative 9.5: Fisheries Restoration

Construction of Alternative 9.5 would be limited to modifying the temperature control shutters at Folsom Dam. Construction activities would be limited to the dam road and the inlets to the powerplant penstocks and would not conflict with surrounding land uses.

- Construction of Alternative 9.5 would have no affect on land uses within the FLSRA because modifications would be limited to Folsom Dam.

7.6 Recreation

7.6.1 Introduction

This section describes the construction- and operation-related effects on recreation that are expected to occur under each project alternative. The following discussion also includes a description of the methods and assumptions used to conduct the analysis and the criteria for determining the significance of effects.

The analysis discloses effects on recreation opportunities at French Meadows Reservoir, at Folsom Reservoir and Lake Natoma, along the Lower American River, and within the Yolo and Sacramento bypasses. No effect on recreation in other areas is expected because no project-related construction activities or changes in flood control operations would occur.

7.6.2 Methods and Assumptions

Construction-Related Effects

Effects on recreation that could occur during construction of the flood control improvements were evaluated qualitatively. Generally, construction activities could result in a short-term loss of recreation opportunities by disrupting use of recreation areas or facilities. A long-term effect could occur if a recreation opportunity is eliminated as a result of construction of a flood control improvement.

A feasibility level analysis of borrow site alternatives was performed as part of the current phase of the project planning process. This analysis indicated that most of the material

needed to raise Folsom Dam could be obtained from Federally-owned land near the Peninsula Campground. Analysis was also performed for the Mississippi Bar site in the event that additional borrow material would be required. Project costs were developed for the Mississippi Bar site assumed two load and unload cycles: one to barge the material across Lake Natoma and one to truck the material to the construction sites around Folsom Reservoir. Because of the expense of this operation, alternatives to the Mississippi Bar site will be carefully re-examined during the pre-construction engineering and design phase of the project. Final site selection will be based on several considerations including cost, operational flexibility and local acceptability.

For Alternatives 3 and 4, the analysis assumed that borrow material from Mississippi Bar would be barged to the Willow Creek Recreation Area and loaded onto haul trucks. The Corps is currently considering an alternative transfer site located west of the Willow Creek Recreational Area. Use of this site would avoid adverse effects on recreation at the Willow Creek Recreation Area during the 4-year construction period. The environmental effects of this or other alternatives to transporting material from the Mississippi Bar borrow site would be evaluated as part of subsequent environmental documentation. The Corps and local sponsor will continue to work with DPR to investigate ways to reduce construction-related effects on recreation within the FLSRA.

Operation-Related Effects

L. L. Anderson Dam. Increasing the capacity of the spillway at L. L. Anderson Dam to allow passage of the PMF would not affect the operation of French Meadows Reservoir.

Folsom Reservoir. The evaluation of operation-related effects on recreation assumed that the project would affect only recreation-related resources around Folsom Reservoir that are higher than 474 feet above and that operation of the reservoir for water supply purposes would not change. Any increase in reservoir storage would be used only for flood control purposes. Storing floodwaters in the reservoir higher than 474 feet would occur infrequently and would last for a short period of time. A detailed discussion of reservoir operations is provided in Section 7.1, "Hydrology and Hydraulics."

The elevations of important recreation facilities were identified and compared to the maximum flood storage elevation that could occur under each project alternative. The frequency recreation facilities would be inundated was also considered along with the seasonal characteristics of recreation use.

The project would not change water conservation at Folsom Reservoir. It was assumed that the seasonal fluctuation of the reservoir below 466 feet would not change and that water-dependent and water-enhanced recreation dependent on reservoir storage would not be affected.

North and South Forks of the American River. Storing water in Folsom Reservoir above 474 feet could affect recreation that occurs on the extreme lower reaches of the North and South Forks of the American River. Effects on recreation were determined by evaluating the frequency and duration these reaches would be inundated.

Lower American River. An increase of the objective release for Folsom Dam could affect recreation that occurs along the Lower American River. Effects on recreation activities and facilities were evaluated by comparing the timing, duration, and size of releases that could occur under each project alternative with existing operations.

Yolo and Sacramento Bypass Areas. An increase of the objective release from Folsom Dam could affect recreation that occurs in and along the Yolo and Sacramento Bypasses. Effects on recreation were evaluated by comparing the timing, duration, and size of releases that could occur under each alternative with existing operations.

7.6.3 Criteria for Determining Significance

Development of criteria for determining the significance of operation-related effects on recreation was based on CEQA Guidelines and the CEQ's NEPA regulations. Effects on both water-dependent and water-enhanced recreation opportunities were considered significant if either of the following conditions applied:

- Changes in river flows or reservoir surface elevations would result in substantial changes in recreation opportunities when compared to Alternative 1.
- Activities related to the placement of project facilities would cause substantial disruption of any institutionally-recognized recreational activity.

7.6.4 Alternative 1: No Action

Construction-Related Effects

Alternative 1 does not include construction of new flood control improvements. Therefore, no construction-related effects would occur.

Operation-Related Effects

Folsom Reservoir. Under Alternative 1, the existing maximum surcharge storage level of 474 feet would not change. The surcharge storage space between 466 and 474 feet would be used less frequently under Alternative 1 than under existing conditions, thus reducing the frequency that reservoir and river recreation sites and facilities located between 466 and 474 feet would be inundated.

- The existing maximum surcharge storage level of 474 feet would not change. The surcharge storage space would be used less frequently under Alternative 1 than under existing conditions. The frequency of inundation for recreation sites and facilities would be reduced, which is a beneficial effect.

Lower American River. Under Alternative 1, changes in flows associated with flood control operations would occur infrequently and only during the off-peak recreation season.

- Recreation opportunities on and along the Lower American River would not be significantly affected by these changes.

Yolo and Sacramento Bypasses. Under Alternative 1, the Sacramento and Yolo Bypasses would not be modified and existing flood control operations would not change.

- Recreation opportunities that occur in the Yolo and Sacramento Bypasses would not be affected because the flood control operations would not change.

7.6.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Construction activities at the L. L. Anderson Dam are not expected to adversely affect recreation activities that occur at French Meadows Reservoir. Construction activities would be limited to the existing spillway and would not require lowering the surface elevation of the reservoir. Construction would not directly conflict with recreation that occurs at French Meadows Reservoir because most recreation is associated with boating and fishing or with camping in the two campgrounds located on the north and south shore of the reservoir approximately 2 miles from L. L. Anderson Dam. Boating and fishing would not be affected during construction of the spillway because access to the reservoir is not expected to be restricted and the surface elevation of the reservoir would not be affected. Camping opportunities would not be affected because the two campgrounds would remain open during construction. In addition, construction activities at the spillway would be located far enough away from the campgrounds so as not to disturb campers.

Some fishing does occur downstream of the L. L. Anderson Dam, and public access to the segment of the Middle Fork American River immediately downstream of the dam could be restricted during construction of the spillway. However, access would be restricted to only a small segment of the river and would be reestablished once construction is completed.

- Construction-related effects on recreation that occurs at French Meadows Reservoir is considered less than significant because construction would be limited to the existing spillway, would not conflict with recreation activities that occur at the reservoir, and would be completed in one season.

Folsom Reservoir. Construction activities at Folsom Reservoir could affect recreation that occurs on the American River Bike Trail, on and adjacent to wing dams and dikes, near the Peninsula borrow site, and near staging areas.

Construction of the temporary bridge and the other segments of the approach roads to the bridge would generally not affect recreation because the alignment crosses an area that is not accessible by the public. However, the northern approach to the bridge would cross the American River Bike Trail near the proposed intersection of the approach road with Folsom-Auburn Road. This segment of the American River Bike Trail provides an important link between Folsom Reservoir and Lake Natoma for pedestrians and cyclists. The trail provides the

only access to Folsom Reservoir for pedestrians and cyclists that is isolated from vehicular traffic.

- Construction-related effects on recreation that occurs on the segment of the American River Bike Trail between Negro Bar and Beals Point are considered significant because construction would result in closure of the trail. To reduce the short-term construction-related effects on recreation, but not to a less-than-significant level, the Corps would implement Mitigation Measure R-1. To reduce the long-term construction-related effects on recreation to a less-than-significant level, the Corps would implement Mitigation Measure R-2.

Mitigation Measure R-1: Provide notification of trail closures and establish alternative access routes. Mitigation Measure R-1 would consist of a closure and detour notification program for the segment of the American River Bike Trail between Negro Bar and Beals Point. Notification would include signage in the vicinity of the construction site that indicates when the trail would be closed and an alternative trail route. An alternative trail route could consist of routing trail users to and from the bike path to Folsom-Auburn Road in the vicinity of the proposed intersection of the bridge approach road with Folsom-Auburn Road and return to the bike path near the intersection of Folsom-Auburn Road and Folsom Dam Road.

Mitigation Measure R-2: Ensure the segment of the American River Bike Trail between Beals Point and Negro Bar is reestablished. Mitigation Measure R-2 would consist of ensuring that the portion of the American River Bike Trail crossed by the approach road to the temporary construction bridge is reestablished. Constructing a separated grade crossing of the approach road would be included. Constructing an undercrossing similar to the existing trail undercrossing of Folsom Dam Road could attain this. Construction of a separated grade crossing would reduce the effect on recreation to a less-than-significant level.

Increasing the height of the dikes on the west shore of Folsom Reservoir would directly affect biking, hiking, and horseback riding opportunities between Beals Point and Granite Bay. The biking and hiking trail located on the crest of Dikes 4, 5, and 6 would not be accessible during the construction period. Access to the crest of the Right Wing Dam would also not be allowed during construction. Raising Dikes 2 and 3 would restrict access to boat ramps and beaches at the Granite Bay recreation area and disrupt the use of the trail system that passes through the area. Raising Dike 1 would require closing the access road between Granite Bay and Beeks Bight, eliminating roadway access to Beeks Bight, Dotons Point, and other informal recreation sites along the shore of the reservoir.

Raising the height of Mormon Island Dam would affect the trail on the crest of the dam that connects Browns Ravine and Folsom Point. There are no formal trails on the crest of Dikes 7 or 8, although public access is allowed. An increase of the height of these structures is not expected to substantially affect recreation activities because the trails that cross these structures are not part of a formal or heavily used trail system.

Construction and equipment staging areas would be located near the Granite Bay parking area, Granite Bay boat ramp, Dike 4, Beals Point, Left Wing Dam, Dikes 7 and 8, and near Mormon Island Dam. The staging areas near the Granite Bay parking area and boat ramp would not affect use of these facilities or the trail system that passes through the Granite Bay recreation area. The staging areas at Dike 4 would be located in the inundation zone of the reservoir and would not directly conflict with recreation. The staging area at Beals Point would be located in the inundation zone and could conflict with informal recreation on the lakeshore. The staging areas below the Left Wing Dam are not accessible to the public. The staging area next to Dikes 7 and 8 and Mormon Island Dam would not conflict with recreation near these structures.

To minimize effects on recreation, construction on Dikes 1–4, 7, and 8 would occur outside of the Memorial Day through Labor Day recreation season. Work on other sites that may occur during the recreation season would be limited to weekdays.

A borrow site for material needed to raise the wing dams and dikes would be located near Peninsula campground. The borrow site would be located in the reservoir's inundation zone and would not directly affect campground facilities. Excavation at this borrow site would only occur when the surface elevation of the reservoir is far enough below 466 feet to allow equipment to operate. This would typically occur during the off-peak recreation season. In addition, construction activities would be located far enough away from the campground to minimize direct conflicts with recreationists.

Construction at Folsom Dam, including the spillway work and modifications to the spillway gates, would be accomplished by installing a watertight bulkhead or stoplog system. This would allow work to proceed without requiring the surface elevation of the reservoir to be below the spillway crest. As a result, construction activities at Folsom Dam would not affect recreation dependent on reservoir storage. However, trail detours at Dikes 5 and 6 and Mormon Island will likely occur during the peak recreation season.

- Construction-related effects on water-dependent recreation activities are not expected to occur because construction activities would not require lowering the level of Folsom Reservoir.
- Construction-related effects on recreation that occurs near Mormon Island Dam and Dikes 7 and 8 are considered less than significant because trails that cross the tops of the dam and dikes are not part of a continuous trail system and because other trails near the dam and dikes would remain accessible during construction.
- Construction-related effects on recreation near Peninsula campground are considered less than significant because these activities would be away from the major campground and would primarily occur during the off-peak recreation season.
- Construction-related effects on recreation that occurs between Beals Point and Beeks Bight are considered significant because construction would result in the loss of roadway access to recreation areas between Beeks Bight and Granite Bay and would substantially disrupt use of the trail system between Granite Bay and Beals Point. The effect on the trail system between Beals Point and Granite Bay is considered

unavoidable because of the lack of an easily accessible alternative trail route. The disruption of access to the area between Granite Bay and Beeks Bight during construction of Dike 1 could be addressed by constructing a temporary road around the construction site. To reduce these effects, the Corps and Reclamation Board would implement Mitigation Measure R-3.

- Use of barges to transport material from the Peninsula borrow site to construction locations around the lake is not expected to significantly affect boating or other water-dependent activities due to timing of work during the off-peak season, working on weekdays only, and the low number of barge trips that will be made per work day.

Mitigation Measure R-3. Provide notification of trail and road closures and establish alternative access routes. Mitigation Measure R-3 would consist of a trail and road closure and detour notification program for trails and roads between Beals Point and Beeks Bight. Trails that are subject to temporary closure will be temporarily relocated during the project construction process. These trail detours will remain in use for short periods (less than one year per detour) and, to the extent feasible, will occur outside of the peak recreation season. Alternative trail routes between Beals Point and Granite Bay could include Folsom-Auburn Road or a trail across the exposed lake bottom during low water. To ensure access to Beeks Bight is maintained during construction, a temporary road would be constructed around Dike 1. The temporary road would connect the west end of Old County Road with Granite Bay Road near the west end of Dike 1. The temporary road would cross the reservoir inundation zone and would be located to avoid trees and shrubs and other sensitive resources. On completion of construction, the roadway would be removed and any disturbed area would be restored. The Corps will work closely with California Department of Parks and Recreation (DPR) staff to develop a detailed detour strategy as the closure requirements are better defined during the pre-construction engineering and design phase of the project.

This measure would reduce the effect on recreation as a result of closing the road between Granite Bay and Beeks Bight to a less than significant level by maintaining access. This measure would not reduce the effect on recreation activities associated with using the trail system between Beals Point and Granite Bay to a less-than-significant level because of the lack of easily accessible alternative trails.

Operation-Related Effects

Folsom Reservoir. Under Alternative 2, use of the additional flood control pool storage capacity between 474 and 478 feet would be expected to occur only during severe storms. These storms, which historically occur during the winter months, coincide with the off-peak recreation season. As indicated in Section 7.1, "Hydrology and Hydraulics," the surface elevation of Folsom Reservoir is not expected to exceed 474 feet during events with a 1-in-125 or less chance of occurring in any year. The maximum surface elevation Folsom Reservoir would reach under Alternative 2 would be 478 feet during an event with a 1-in-500 chance of occurring in any year. The longest period the surface elevation of the reservoir would be between 470 and 478 feet above is 48 hours during an event with a 1-in-175 chance of occurring in any year. The infrequent occurrence and short duration of storing water between 474 and 478 feet in

combination with the off-peak season in which flood control operations would occur indicates that operation of the project would not directly affect recreation opportunities at the FLSRA.

Operation of the flood control project could affect recreation by damaging recreation facilities that were constructed in the area between 474 and 478 feet. Facilities could be rendered unusable because of damage caused by water and waves. Facilities at all recreation areas could be affected during flood control operations (Table 7-10 and Plates 7.6-1, 7.6-2, 7.6-3, and 7.6-4). Most of these facilities are located between 466 and 476 feet. Some of these facilities, including boat ramps, parking areas, and trails, would experience little or no damage if inundated, whereas other facilities, including marinas, concession stands, and restrooms, could be damaged.

Operation of the project would result in inundation of the area between 474 and 478 feet during events with a 1-in-150 or less chance of occurring in any year. Flood control operations under Alternative 2 could result in floodwaters inundating recreation facilities that would not be affected under Alternative 1. These facilities are campsites at Peninsula campground. Inundation is not expected to damage campsites and cleanup after an inundation event would be part of normal campground operation and maintenance.

- Flood control operations under Alternative 2 would result in a less-than-significant effect on recreation opportunities at Folsom Reservoir because no additional major recreation facilities would be affected and inundation higher than 474 feet would be infrequent and of short duration.

North and South Forks of the American River. Operation of Alternative 2 could affect recreation on the North and South Forks of the American River by occasionally inundating a small segment of each river. On the South Fork, the last set of rapids (Recovery Room) would be inundated during a flood event. Boating is not allowed on the segment of the North Fork that would be inundated. Operation of Alternative 2 is not expected to affect whitewater rafting or other recreation opportunities because inundation would occur infrequently, last for a short time, and occur during the off-peak rafting season.

- Operation-related effects on recreation opportunities on the North and South Forks of the American River are considered less than significant because inundation would occur infrequently and only during the off-peak recreation season.

Lower American River. Flows in the Lower American River, up to and including events with a 1-in-150 chance of occurring in any year, would be very similar to flows described under Alternative 1. Under Alternative 2, flows would be contained between the Lower American River levees up to events with a 1-in-200 chance of occurring in any year. Operation of Alternative 2 would not adversely affect recreation opportunities along the Lower American River because high flow events would be of the same frequency and duration as Alternative 1 and would occur during the off-peak recreation period.

- Operation-related effects on recreation use along the Lower American River are considered less than significant because flood control operations would be the same as under Alternative 1 and would occur during the off-peak recreation season.

Yolo and Sacramento Bypasses. The Yolo and Sacramento Bypasses can be flooded at any time during the winter months. Recreation activities that occur in the bypasses during the winter are primarily associated with waterfowl hunting and observation. Operation of Alternative 2, which would be very similar to Alternative 1, is not expected to adversely affect recreation activities in the bypasses.

- Operation-related effects on recreation that occurs in Sacramento and Yolo bypasses are considered less than significant because existing recreation opportunities are limited and no change in the frequency or duration of flooding in the bypasses would be expected.

7.6.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction-Related Effects

Construction-related effects described under Alternative 2 would also occur under Alternative 3. In addition, borrow material would be excavated at Mississippi Bar and transported to the wing dams and dikes.

Lake Natoma. A portion of Mississippi Bar may be used as a borrow site for material needed to raise the wing dams and dikes at Folsom Reservoir. Currently, material would be excavated from the site and barged across Lake Natoma to a transfer facility located at the Willow Creek Recreation Area. As indicated in Section 7.6.2, “Methods and Assumptions,” the Corps will evaluate alternatives for transporting material from Mississippi Bar. This could include use of a conveyor system to connect Mississippi Bar with the south side of Lake Natoma and transfer facility located west of the Willow Creek Recreation Area.

The Mississippi Bar borrow site would be located away from existing recreation facilities. Although the borrow site would be adjacent to the American River Bike Trail, use of the trail would not be affected by borrow activities. Rowing, sailing, swimming, and other water-dependent activities that occur on Lake Natoma are not expected to be substantially affected by activities at the borrow site because the intervening topography and vegetation would screen the borrow site from the lake.

Transfer of borrow material to the south side of Lake Natoma would require a barge-loading facility at Mississippi Bar and an off-loading and transfer facility at the Willow Creek Recreation Area. Transporting material from Mississippi Bar to the transfer facility and from the recreation area to Folsom Reservoir would require crossing the American River Bike Trail and the equestrian trail on the north side of Lake Natoma and the bike trail on the south side of the lake. Flagmen would be used to temporarily halt traffic when material needs to cross the path. Due to the amount of material excavated, three to four trips between the borrow site and the loading facility would occur on a daily basis. This would result in frequent crossings of the bike and equestrian trails by haul trucks.

Activities at the Mississippi Bar borrow site are not expected to impact use of the horse stables in the area. The trail between the stables and Lake Natoma would remain in service during the borrow operation. Material would be conveyed from the borrow site to lakeside

TABLE 7-10. Estimated Inundation Levels of Recreation Facilities at Folsom Reservoir

Recreation Area	Recreation Facility	Facility Elevation (feet above msl)	Inundation of Recreation Facilities Alternatives ^a							
			1	2	3	4	5	6	7	8
Granite Bay	Main (12-lane) Boat Ramps	400 to 470	X	X	X	X	X	X	X	X
	Two Lane Boat Ramp	425 to 470	X	X	X	X	X	X	X	X
	Recreational Facilities (i.e. Picnic Areas, Beach, Dressing Room, Restroom, etc.)	- 467	X	X	X	X	X	X	X	X
	Concession Stand	- 475		X	X	X				X
	Parking Area	- 470	X	X	X	X	X	X	X	
	Access Road	- 475		X	X	X				X
Beals Point	Recreational Facilities (i.e. Picnic Areas, Beach, Concession Stand, Restroom etc.)	- 467	X	X	X	X	X	X	X	X
Folsom Point	Boat Ramp	400 to 475	X	X	X	X	X	X	X	X
	Picnic Area	- 470	X	X	X	X	X	X	X	X
Brown's Ravine	Boat Launch	415 to 470	X	X	X	X	X	X	X	X
	Low Water (Hobie cat) Launch	410 to 470	X	X	X	X	X	X	X	X
	Picnic Area	- 470	X	X	X	X	X	X	X	X
	Marina	425 to 470	X	X	X	X	X	X	X	X
	Boat Storage Area (East)	- 467	X	X	X	X	X	X	X	X
	Boat Storage Area (West)	- 470	X	X	X	X	X	X	X	X
	Access Road	- 467	X	X	X	X	X	X	X	X
	Equestrian Staging Area	- 475		X	X	X				X
Observation Point	Vista and Parking Facilities	- 476		X	X	X				X
Peninsula	Southern Boat Ramp	420-470	X	X	X	X	X	X	X	X
	Northern Boat Ramp	430-460	X	X	X	X	X	X	X	X
	Low-level Campsites	- 475		X	X	X				X
Salmon Falls	Recreational Facilities (i.e., Restroom facilities, parking lot, trail access points)	- 475		X	X	X				X
Rattlesnake Bar	Boat Launch	- 465	X	X	X	X	X	X	X	X
Beeks Bight	Trailhead and Lake access	- 465	X	X	X	X	X	X	X	X
Pioneer Express Historic Trail	Equestrian and Hiking Trail	Below 470	X	X	X	X	X	X	X	X
South Side Trail	Equestrian and Hiking Trail	Below 470	X	X	X	X	X	X	X	X

^a The American River Long Term Study Project includes the following alternatives:

Alternative 1: No Action: Maximum flood pool elevation (FPE) remains at 474 feet above msl

Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Alternative 5: Stepped Release to 160,000 cfs

Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam—maximum FPE remains at 474 feet msl

Alternative 7: Stepped Release to 180,000 cfs—maximum FPE remains at 474 feet msl

Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

An “X” in the box associated with any project alternative indicates that the referenced facility would be inundated with water if the maximum flood pool is utilized.

transport barges by truck or automated conveyor. The conveyor system would be designed to pass over the trail. Flagmen would control any trucks crossing the trail. Alternative equestrian trails will be provided to the extent that trails used by the stables are impacted.

The borrow material will be barged across Lake Natoma to a transfer facility at the Willow Creek Recreation Area where it will be loaded onto trucks and moved along local roadways to construction sites around Folsom Reservoir. This operation is expected to generate 3–4 barge trips per day. These trips will be scheduled for weekdays only, will occur as much as possible outside of the peak recreation season, and will be specifically designed to minimize the inconveniences associated with temporarily halting boating traffic in the shipping lane established for the barge operation.

Establishing a borrow material transfer facility at the Willow Creek Recreation Area would require closing the area to the public during the period in which borrow activities occur. The site could be closed up to four years and would be reopened to the public once borrow and transfer activities were completed. The site, which is easily accessible from Folsom Boulevard, is used primarily for access to Lake Natoma and includes an informal boat ramp. The recreation area is also accessible by the bike trail along the north side of Lake Natoma.

- Excavating material from the Mississippi Bar borrow site would be less than significant on recreation on the American River Bike Trail or on Lake Natoma because these activities would not be directly affected and the borrow site would be far enough from recreation sites to avoid indirect effects.
- Transporting borrow material from the Mississippi Bar borrow site to the barge-loading site and from the Willow Creek Recreation Area to Folsom Boulevard would result in a significant effect on recreation by disrupting use of the trail and pathway system that is a major element of the recreation facilities around Lake Natoma. To reduce the effect to a less-than-significant level, implement Mitigation Measure R-4.
- Barging material across Lake Natoma is not expected to substantially affect water-dependent recreation because barge trips will be scheduled for weekdays only and will require 3 to 4 trips per day.

Mitigation Measure R-4: Provide notification of trail closure, establish alternative trail routes, and signalize or flag intersection of the bike trail and haul road. Mitigation Measure R-4 includes preparing and posting a trail detour plan for trails around Mississippi Bar and Willow Creek Recreation Area that may be crossed by heavy equipment and trucks during borrow activities. To ensure that trails remain open during construction, trails would be fenced in the vicinity of the borrow and transfer site. At locations where trails would be crossed by haul trucks, flaggers would be posted to ensure safe operation of trail crossings. This mitigation measure would reduce the short-term impact of construction-related activities on recreation opportunities at the Willow Creek Recreation Area. However, because other access to the lake is limited, this impact would remain significant.

Operation-Related Effects

Folsom Reservoir. Under Alternative 3, use of the additional storage capacity of the flood control pool between 474 and 482 feet would be expected only during severe storms. These storms have historically occurred during the winter months coinciding with the off-peak recreation season. As indicated in Section 7.1, “Hydrology and Hydraulics,” the surface elevation of Folsom Reservoir is not expected to exceed 474 feet during events with a 1-in-125 or less chance of occurring in any year. The maximum surface elevation Folsom Reservoir would reach under Alternative 2 would be approximately 481 feet with a 1-in-500 chance of occurring in any year. The longest period the surface elevation of the reservoir would be between 470 and 482 feet would be 64 hours during events with a 1-in-200 and 1-in-225 chance of occurring in any year. The infrequent occurrence and short duration of storing water between 474 and 478 feet, in combination with the off-peak season in which flood control operations would occur, indicates that operation of the project would not directly affect recreation opportunities at the FLSRA.

Operation of the flood control project under Alternative 3 could affect recreation by damaging recreation facilities in the area between 474 and 482 feet. Facilities could be rendered unusable by damage caused by water and waves. (Most of these facilities are located between 466 and 476 feet. Table 7-10 and Plates 7.6-1, 7.6-2, 7.6-3, and 7.6-4). Some of these facilities, including boat ramps, parking areas, and trails, would experience little or no damage if inundated, whereas other facilities, including marinas, concession stands, and restrooms, could sustain damage.

Operation of the project would result in occasional inundation of the area between 474 and 482 feet during events with a 1-in-150 or less chance of occurring in any year. Flood control operations would inundate facilities that would not be affected under Alternative 1. These facilities are campsites at Peninsula campground. Inundation is not expected to damage campsites, and cleanup after an inundation event would be part of normal campground operation and maintenance.

- Flood control operations under Alternative 3 would result in a less-than-significant effect on recreation opportunities at Folsom Reservoir because no additional major recreation facilities would be affected and inundation higher than 474 feet would be infrequent and of short duration.

North and South Forks of the American River. Operation under Alternative 3 could affect recreation on the North and South Forks of the American River by occasionally inundating a small segment of each river. On the South Fork, the last two rapids (Recovery Room and Hospital Bar) would be inundated during a flood event. Boating is not allowed on the segment of the North Fork that would be inundated. Operation of Alternative 3 is not expected to affect whitewater rafting or other recreation opportunities because inundation would occur infrequently, last for a short period of time, and occur during the off-peak rafting season.

- Operation-related effects on recreation opportunities on the North and South Forks of the American River are considered less than significant because inundation would occur infrequently and only during the off-peak recreation season.

Lower American River. Effects on recreation along the Lower American River as a result of operation of Alternative 3 would be the same as described under Alternative 2.

Yolo and Sacramento Bypasses. Effects on recreation in the Yolo and Sacramento Bypasses as a result of operation of Alternative 3 would be the same as described under Alternative 2.

7.6.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Construction-Related Effects

Construction-related effects on recreation at Folsom Reservoir, Lake Natoma, and French Meadows Reservoir would be the same as described for Alternative 3.

Operation-Related Effects

Folsom Reservoir. Under Alternative 4, use of the additional storage capacity of the flood control pool between 474 and 487 feet would be expected only during severe storms. These storms have historically occurred during the winter months coinciding with the off-peak recreation season. As indicated in Section 7.1, "Hydrology and Hydraulics," the surface elevation of Folsom Reservoir would not exceed 474 feet during events with a 1-in-150 or greater chance of occurring in any year. The maximum surface elevation of Folsom Reservoir is expected to reach nearly 487 feet during an event with a 1-in-500 chance of occurring in any year. The longest period the surface elevation of Folsom Reservoir would be between 470 and 487 feet is 86 hours during an event with a 1-in-250 chance of occurring in any year. The infrequent occurrence and short duration of storing water between 474 and 487 feet in combination with the off-peak season in which flood control operations would occur indicates that operation of the project would not directly affect recreation opportunities at the FLSRA.

Operation of the flood control project could affect recreation by damaging recreation facilities in the area between 474 and 487 feet. Facilities could be rendered unusable because of damage caused by water and waves. However, most are located between 466 and 476 feet (Table 7-10 and Plates 7.6-1, 7.6-2, 7.6-3, and 7.6-4). Some of these facilities, including boat ramps, parking areas, and trails, would experience little or no damage if inundated, whereas other facilities, including marinas, concession stands, and restrooms, could sustain damage.

Operation of the flood control project would result in inundation of the area between 474 and 487 feet during events with a 1-in-175 or less chance of occurring in any year. Flood control operations under Alternative 4 could also result in floodwaters inundating recreation sites that would not be affected under Alternative 1. These facilities are limited campsites at Peninsula campground. Inundation is not expected to damage campsites, and cleanup after an inundation event would be part of normal campground operation and maintenance.

- Flood control operations under Alternative 4 would result in a less-than-significant effect on recreation opportunities at Folsom Reservoir because no additional major recreation facilities would be affected and inundation higher than 474 feet would be infrequent and of short duration.

North and South Forks of the American River. Effects on recreation on the North and South Forks of the American River would be the same as described for Alternative 3.

Lower American River. Effects on recreation along the Lower American River under Alternative 4 would be the same as described under Alternative 3.

Yolo and Sacramento Bypasses. Effects on recreation in the Yolo and Sacramento Bypasses under Alternative 4 would be the same as described under Alternative 3.

7.6.8 Alternative 5: Stepped Release to 160,000 cfs

Construction-Related Effects

Folsom Reservoir. No construction activities would occur at Folsom Reservoir under Alternative 5.

Lower American River. Construction activities that could disrupt recreation would be limited to modifying local drainage systems and strengthening the north levee between I-5 and a point approximately 5,000 feet upstream of the NEMDC.

The north levee would be strengthened by either constructing a stability berm on the landside of the levee or by constructing a seepage cutoff wall. Construction is not expected to adversely affect recreation because no recreation sites or facilities are located on this portion of the levee.

Modification and relocation of pump stations, drainage facilities, and other utilities along the Lower American River to accommodate the increased objective releases could temporarily affect portions of pedestrian and cyclist pathways on and adjacent to levees in the Parkway. Although the disruption would be limited to the construction phase of the project and would be of short duration, these activities could substantially affect commonly used recreation routes. Construction activities would occur during the summer and fall months before the beginning of the flood season. This also coincides with the peak recreation period for the Parkway.

- The construction-related effects of modifying drainage and pumping facilities along the Lower American River is considered significant because construction would disrupt use of the trail and pathway system that is a major element of the recreation facilities within the Parkway. To reduce this effect to a less-than-significant level, implement Mitigation Measure R-5.

Mitigation Measure R-5: Provide notification of trail and road closures and establish alternative access routes within the Parkway. Mitigation Measure R-5 would consist of the preparation of a trail detour plan and the establishment of a trail closure notification program for trails within the Parkway that would be temporarily affected during construction.

Yolo and Sacramento Bypasses. Alternative 5 would include widening the Sacramento Bypass and strengthening some of the levees along the Yolo Bypass, Sacramento River,

Steamboat Slough, and Sutter Slough. Most recreation in the Sacramento River, Steamboat Slough, and Sutter Slough is associated with boating.

Most recreation that occurs in the bypasses is associated with waterfowl observation and hunting or fishing. Waterfowl hunting and observation within the bypasses primarily occurs during the winter months. Levee construction would not occur during this period because the bypasses may be required to convey floodwaters at any time. Because the presence of waterfowl does not coincide with the period of time that construction would occur, construction is not expected to affect waterfowl hunting or observation.

Levee construction along the Sacramento River, Steamboat Slough, and Sutter Slough would occur on the landside of the levees. Because construction would occur on the landside of the levees, it would not affect boating or other water-dependent recreation activities that occur on the river or sloughs.

- The effect of levee construction on recreation in the Yolo and Sacramento Bypasses, Sacramento River, Steamboat Slough, and Sutter Slough is considered less than significant because construction would occur only during the off peak season for waterfowl hunting and observation and would not conflict with water-dependent recreation that occurs on the river and sloughs.

Operation-Related Effects

Folsom Reservoir. No changes in operation of Folsom Reservoir would occur.

Lower American River. Under Alternative 5, changes in flows in the Lower American River would occur during events with a 1-in-50 or less chance of occurring in any year. Compared to Alternative 1, flows would be greater than 115,000 cfs during events with a 1-in-50, 1-in-100, and 1-in-150 chance of occurring in any year. Flows also would exceed 115,000 cfs under both Alternative 1 and Alternative 5 during an event with a 1-in-200 chance of occurring in any year. However, during a flood event of this magnitude, levees would fail under Alternative 1.

Heavy storms and resulting high flows in the Lower American River occur during winter months. The storms are usually of short duration and coincide with the off-peak recreation season. These high flow events are not expected to substantially affect recreation opportunities in the Parkway because facilities have been designed and are managed to accommodate high flow events.

- Operation-related effects on recreation use along the Lower American River are considered less than significant because changes attributable to flood control operations would be infrequent and of short duration and would occur during the off-peak recreation season.

Yolo and Sacramento Bypasses. The Yolo and Sacramento Bypasses can be flooded at any time during the winter months. Recreation activities that occur in the bypasses during the winter are primarily associated with waterfowl hunting and observation. During the flood

season, recreation opportunities within the bypasses are limited because of the potential for the bypasses to be flooded. Therefore, operation of Alternative 5 is not expected to adversely affect recreation opportunities.

- Operation of Alternative 5 would result in a less-than-significant effect on recreation in the Yolo and Sacramento Bypasses because flood control operations would not substantially change in the event the bypasses are conveying floodwaters.

7.6.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Construction-Related Effects

Construction-related effects on recreation that occurs along the Lower American River and within the Yolo and Sacramento Bypasses would be the same as described under Alternative 5. In addition, Alternative 6 includes constructing a new outlet at Folsom Dam.

Construction of a new outlet at Folsom Dam would be accomplished by installing a watertight bulkhead or stoplog system. This would allow work to proceed without requiring lowering the surface elevation of the reservoir. Construction activities would be limited to the roadway on top of the dam and inside the dam. No recreation occurs or is allowed in these areas.

- Construction of new outlets at Folsom Dam would not affect recreation because reservoir storage would not change and recreation does not occur within the construction area.

Operation-Related Effects

Operation-related effects on recreation would be the same as described under Alternative 5.

7.6.10 Alternative 7: Stepped Release to 180,000 cfs

Construction-Related Effects

- Construction-related effects on recreation along the Lower American River and within the Yolo and Sacramento Bypass would be the same as described under Alternative 5. In addition, Alternative 7 includes increasing the height of levees and constructing floodwalls along the Lower American River.

Folsom Reservoir. No construction activities would occur under Alternative 7.

Lower American River. Increasing the height of existing levees, constructing new levees and floodwalls, and modifying and relocating pump stations, drainage facilities, and other utilities could both temporarily and permanently affect recreation that occurs in the American River Parkway. Temporary effects could occur as a result of damaging or disrupting access to recreation sites, pathways, and trails during project construction. Construction of facilities could result in permanent effects on important recreation areas.

The 1996 Supplemental Information Report (SIR) concluded that the construction of levees and floodwalls would result in significant adverse effects on recreation because of temporary loss of access to portions of the Parkway trail system. The 1996 SIR also concluded that raising the Guy West and Howe Avenue bridges would affect recreation because trails that pass under the bridges would be closed and because cyclists cross over the bridges. Finally, the 1996 SIR found that construction could also adversely affect recreation as a result of temporary closings of some parking and access sites. Mitigation measures proposed to reduce these effects included a trail and detour plan that would provide information on trail closures and detours and that would identify alternative parking areas. These effects and mitigation measures would be the same under Alternative 7.

- As discussed in the 1996 SIR, construction of levees and floodwalls along the Lower American River would result in a significant adverse effect on recreation by restricting the use of trails in the American River Parkway and by restricting access to the Lower American River. To reduce this effect, but not to a less-than-significant level, the Corps would implement Mitigation Measure R-5 and R-6.

Mitigation Measure R-5: Provide notification of trail and road closures and establish alternative access routes within the Parkway. Mitigation Measure R-5 would consist of the preparation of a trail detour plan and the establishment of a trail closure notification program for trails within the Parkway that would be temporarily affected during construction.

Mitigation Measure R-6: Provide notification of parking lot closures and identify alternative parking areas located nearest the affected area. Mitigation Measure R-6 would consist of the preparation of a parking lot closure notification program. The Corps would ensure that signs are placed at the entrance to each parking area to indicate how long the parking area would be closed and to identify the location of alternative recreation and parking areas.

Some of the elements of Alternative 7 are different from the elements evaluated in the 1996 SIR. The elements include a single borrow area located in West Sacramento, new construction staging areas, and a new floodwall around the Nimbus Fish Hatchery.

The floodwall around the Nimbus Fish Hatchery would conflict with a trail that runs between the hatchery and the river and provides access to the river and points downstream. The trail is frequently used by anglers and other users for access to the reach of the river near the fish hatchery.

Staging areas to support construction of levees and floodwalls would be located at 24 sites that extend from the Nimbus Fish Hatchery to Discovery Park. Most of these areas would be located away from popular recreation areas and would not directly conflict with recreation within the Parkway. Staging areas that could conflict with recreation are located at Discovery Park, Glen Hall Park, the Guy West Bridge, Watt Avenue, Goethe Park, Ancil Hoffman Park, the Old Fair Oaks Bridge, and the Nimbus Fish Hatchery.

The staging areas at Discovery Park and Glenn Hall Park would not substantially change recreation opportunities at these areas because the staging areas would be located within sites that are not heavily used by recreationists. The staging area at Watt Avenue could affect access to the river upstream of the bridge. However, river access immediately downstream of the bridge would not be affected. The staging areas at Goethe Park would be located on the parking area and near the bridge across the American River. The Goethe Park staging areas could substantially affect recreation at the park by reducing the size of the parking area and reducing the number of formal picnic sites. The Ancil Hoffman Park, Old Fair Oaks Bridge, and Nimbus Fish Hatchery staging areas would be located on parking areas. These staging areas could substantially affect recreation that occurs at the parks and hatchery by reducing the available number of parking spaces.

- Construction of the floodwall near the Nimbus Fish Hatchery would result in a significant effect on recreation by restricting access to a heavily used segment of the Lower American River. To reduce this effect to a less-than-significant level, the Corps would implement Mitigation Measure R-5.

Mitigation Measure R-5: Provide notification of trail and road closures and establish alternative access routes within the Parkway. Mitigation Measure R-5 would consist of the preparation of a trail detour plan and the establishment of a trail closure notification program for trails within the Parkway that would be temporarily affected during construction.

- Staging areas at Goethe Park, Ancil Hoffman Park, the Old Fair Oaks Bridge, and the Nimbus Fish Hatchery would result in a significant adverse effect on recreation by reducing the number of available parking spaces. To reduce this effect, but not to a less-than-significant level, the Corps would implement Mitigation Measure R-6.

Mitigation Measure R-6: Provide notification of parking lot closures and identify alternative parking areas located nearest the affected area. Mitigation Measure R-6 would consist of the preparation of a parking lot closure notification program. The Corps would ensure that signs are placed at the entrance to each parking area to indicate how long the parking area would be closed and to identify the location of alternative recreation and parking areas.

Operation-Related Effects

The operation-related effects on Folsom Reservoir, Lower American River, and the Yolo and Sacramento Bypasses would be the same as described under Alternative 6.

7.6.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

The operation- and construction-related effects on recreation at Folsom Reservoir, north and south of the American River, and French Meadows Reservoir would be the same as discussed under Alternative 3. The operation- and construction-related effects on recreation

along the Lower American River and within the Sacramento and Yolo Bypasses would be the same as discussed under Alternative 5.

7.6.12 Alternative 9.0: Ecosystem Restoration Alternatives

This section describes the construction-related effects on recreation that occurs at the ecosystem restoration sites. Once constructed, operation of Alternatives 9.1 through 9.5 would not affect recreation that occurs on or near each site and, therefore, is not analyzed further.

Alternative 9.1: Urrutia Restoration Site

Construction of Alternative 9.1 would require realigning a 4,200-foot segment of the Jedediah Smith Trail that runs along the northern edge of the restoration site (Plate 6-2). The segment would remain open until a replacement trail is constructed and opened to recreationists. Relocation of the trail is expected to enhance recreation because it would be designed to be less subject to closure and damage from high flows in the American River. No other formal recreation activities occur within the restoration site.

- The effect on recreation along the Lower American River as a result of construction of Alternative 9.1 is considered less than significant because recreation trails would be relocated prior to construction and no other formal recreation activities occur within the site.

Alternative 9.2: Woodlake Restoration Site

Construction of Alternative 9.2 would require realignment of a 5,800-foot segment of horse trail that runs along the top of bank near the American River (Plate 6-3). The segment would remain open until a replacement trail is constructed and opened to horseback riders. The Jedediah Smith Trail runs along the northern edge of the recreation site. This segment of the trail would not be affected by restoration activities. No other formal recreation activities occur within the restoration site.

- The effect on recreation along the Lower American River as a result of construction of Alternative 9.2 is considered less than significant because recreation trails would be relocated prior to construction and no other formal recreation activities occur within the site.

Alternative 9.3: Bushy Lake Restoration Site

Construction of Alternative 9.3 would require realignment of a 2,940-foot segment of the Jedediah Smith Trail that runs through the restoration site (Plate 6-4). Construction would also require realignment of approximately 6,700 feet of trail and road used by horseback riders. The Jedediah Smith Trail and the horse trails would remain open until replacement trails are constructed and opened. No other formal recreation activities occur within the restoration site.

- The effect on recreation along the Lower American River as a result of construction of Alternative 9.3 is considered less than significant because recreation trails would

be relocated prior to construction and no other formal recreation activities occur within the site.

Alternative 9.4: Arden Bar Restoration Site

Construction of Alternative 9.4 would require realignment of a 3,900-foot segment of the Jedediah Smith Trail that runs through the restoration site (Plate 6-5). Construction would also require realignment of approximately 6,100 feet of trails and roads used by horseback riders. The Jedediah Smith Trail and the horse trails would remain open until replacement trails are constructed and opened.

Constructing the Alternative 9.4 would also affect access to the American River for fishing. Fishing access to Arden Pond would be closed temporarily during the construction period, which is expected to last up to 6 months.

- The effect on recreation along the Lower American River as a result of construction Alternative 9.4 is considered less than significant because recreation trails would be relocated prior to construction. The loss of fishing access would be short term, and alternative fishing sites along the river are available.

Alternative 9.5: Fisheries Restoration

Constructing Alternative 9.5 would be accomplished through the use of a barge anchored near the Folsom Dam intake structure. The barge would be launched at either Browns Ravine or Beals Point. The barge would be launched during the week to avoid conflicts with weekend boaters. Construction would not affect water-dependent recreation activities that occur within the FLSRA because it would be limited to a very small area and would not require lowering the surface elevation of the reservoir. The nearest major recreation site to the temperature control shutters is Beals Point. Recreation that occurs at this site would not be affected because it is well away from the construction site.

- No effects on recreation that occurs at Folsom Reservoir are expected as a result of modifying the temperature control shutters because construction activities would occur away from recreation sites and would not require lowering the surface elevation of the reservoir.

7.7 Fisheries

7.7.1 Introduction

This section discusses the methods and results of the analysis of potential construction- and operation-related effects on fish resources under the different alternatives.

This section identifies those potential impacts that could affect species that are listed as threatened or endangered under the Federal Endangered Species Act (ESA) and California Endangered Species Act (CESA). For French Meadows Reservoir, Folsom Reservoir, the Lower American River, and areas downstream in the Sacramento River and Yolo Bypass, the listed

species of concern include chinook salmon (winter-run and spring-run), Central Valley steelhead, and Sacramento splittail.

7.7.2 Methods and Assumptions

This assessment is based in part on previous environmental documents prepared for Sacramento area flood protection measures. In addition, the assessment is based on current information on the status and distribution of special-status fish species and the potential for physical changes in the environment resulting from implementation of the alternatives. Information used in developing this analysis includes:

- The American and Sacramento River, California Project: Geomorphic, Sediment Engineering, and Channel Stability Analyses (Ayres Associates 1997).
- The Program Environmental Impact Report on Flood Control Improvements along the Main Stem of the American River (Jones & Stokes 2000a) (PEIR).
- The American River Watershed Project, California Final Supplemental Environmental Impact Statement/Environmental Impact Report, Part II (U.S. Army Corps of Engineers, et al. 1996).

A Biological Data Report (BDR) was also prepared for the project to address potential effects of the alternatives under evaluation on species listed and proposed for listing under the Federal ESA and State CESA. The BDR identifies the occurrence of these species and their habitats in areas to be affected by project activities. The BDR also identifies mitigation measures or other actions that could avoid or minimize effects if incidental take, as defined under the ESA regulations, were to occur.

The BDR is designed to provide the project sponsors with sufficient information to prepare a Biological Assessment (BA) for consultation with the Service and National Marine Fisheries Service (NMFS) under Section 7 of the Federal ESA and with the Department of Fish and Game (DFG) under the CESA.

It is assumed that following the selection of a preferred action, a detailed Biological Assessment would be prepared and formal consultation with the Service and NMFS would be conducted. These agencies would then issue Biological Opinions (BOs) that identify the allowable incidental take (if any) that may occur from the project and stipulate reasonable and prudent measures required to be implemented to reduce significant effects to fisheries. The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) also set forth new mandates for NMFS and Federal action agencies to protect Essential Fish Habitat (EFH) of marine and anadromous fish. EFH is defined as “waters and substrate necessary to fish spawning, breeding, feeding, or growth to maturity.” Activities that may adversely affect EFH are required to consult with NMFS and either implement EFH Conservation Recommendations stipulated by NMFS or respond and explain its reasons and scientific justification for any disagreements with the recommendations.

7.7.3 Criteria for Determining Significance

Adverse effects on fisheries are considered significant if they would result in any of the following:

- Direct or indirect reduction in the growth, survival, or reproductive success of species listed or proposed for listing as threatened or endangered under the Federal ESA.
- Direct or indirect reduction in the growth, survival, or reproductive success of substantial populations of Federal species of concern, State-listed endangered or threatened species, or species of special concern or regionally-important commercial or game species.
- Substantial reduction in the quality and quantity of important habitat or access to such habitat for these species.
- Substantial net loss of state recreation area (SRA) over the project life compared to the existing conditions.

7.7.4 Alternative 1: No Action

Construction-Related Effects

Alternative 1 does not include construction or operations of new flood control improvements. Because no construction or change in operations would occur, there would be no change in fish habitat in Folsom Reservoir, the Lower American River, or in the Yolo or Sacramento Bypasses.

- No construction-related effects on fish habitat would occur because no new construction activities would occur.

Operation-Related Effects

On completion of the modifications to the Folsom Dam outlet works, it is expected that flood control operations at Folsom Dam would shift from the 400,000–670,000 acre-foot flood rule curve to a 400,000–600,000 acre-foot flood rule curve. Changing flood control operations would increase the potential for the reservoir to fill at the end of flood season. As discussed in Section 7.10, “Water Quality,” this could result in cooler water temperatures in the Lower American River.

- Operation of Alternative 1 could benefit fish habitat in the Lower American River by providing cooler water temperatures.

7.7.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Alternative 2 involves excavating material from the lower portion of the spillway and constructing a temporary haul road across the Middle Fork of the American River. Most construction involves removing rock from the upper portion of the spillway and would not require working in water. Only a small amount of work would be conducted in water as a result of constructing a temporary haul road across the Middle Fork of the American River. A small segment of river channel would be dewatered to allow construction of the roadway. This activity is not expected to reduce downstream flows. There are no threatened or endangered fish species within the project area. As indicated in Section 7.10, "Water Quality," construction-related effects on water quality would be addressed by implementing Mitigation Measure WQ-1.

- Effects on fish habitat in the Middle Fork of the American River are considered less than significant because only a small segment of river would be temporarily affected, downstream flows would be maintained, and construction-related effects on water quality would be avoided through implementation of the Mitigation Measure WQ-1.

Folsom Dam. Construction activities under Alternative 2 would occur when reservoir levels are low enough to allow land access to the wing dams, dikes, and the Peninsula borrow site. This would avoid any in-water construction and associated effects on fish habitat. Placing fill and operation of heavy equipment could result in an indirect effect on fish as a result of sedimentation of rearing areas or the release of fuels or lubricants into the reservoir. There are no threatened or endangered fish species within the project area.

- Construction-related effects on fisheries resources in Folsom that could result under Alternative 2 are considered significant because of the potential for sedimentation of rearing areas and release of fuels and lubricants. These effects would be reduced to a less-than-significant level by implementing water pollution-prevention measures indicated in Mitigation Measures WQ-1 and WQ-2.

Operation-Related Effects

L. L. Anderson Dam. Operation of the enlarged spillway would not affect storage of water in French Meadows Reservoir and would not affect the amount of water diverted to Hell Hole Reservoir or released to the Middle Fork American River. Increasing the size of the spillway would not affect the frequency of spills from French Meadows Reservoir.

- Operation of the L. L. Anderson Dam spillway would not affect fish habitat because it would not affect storage of water in French Meadows Reservoir or the frequency of spills from the reservoir.

Folsom Reservoir. Under Alternative 2, the maximum design flood control pool elevation would be increased from 474 feet to 478 feet. This increased flood capacity would result in infrequent increases in reservoir elevation during flood events. Modeling data show that reservoir elevation would exceed existing conditions only during large flood events and that

inundation would be over a short period, lasting up to 1 to 2 days. Large floods are rare and typically occur before the critical spawning and rearing periods for warmwater fish (March through July) and result in short-term effects on reservoir levels. Similarly, coldwater fisheries habitat and food resources would most likely not be affected because of the low frequency, seasonal occurrence, and short duration of these flood events.

- The effect of flood control operations at Folsom Reservoir on warmwater and coldwater fish is considered less than significant because of the seasonal occurrence and short-term effect of flood control operations.

Lower American River. Releases to the Lower American River are expected to be similar to Alternative 1. These releases were previously evaluated by the Corps as part of the Folsom Dam outlet modification project (U.S. Army Corps of Engineers 2001). Based on input from the U.S. Fish and Wildlife Service (USFWS), the Corps modified the operation of the proposed outlets to ensure that fish habitat within the Lower American River would not be substantially affected during flood control operations (U.S. Army Corps of Engineers 2001). Because releases to the Lower American River would be similar to Alternative 1, no change in fish habitat is expected.

Changes in Lower American River flows under Alternative 2 would be relatively minor, temporary, and infrequent and would occur only during major storm and flood events. Alternative 2 would not result in changes in Folsom Reservoir storage levels during non-flood control operations and would therefore not result in any flow or temperature effects on sensitive fish species.

There would be no construction or operation-related effects to special-status fish species or EFH because there would be no in-water disturbances and no riparian vegetation would be removed. Infrequent flood-related changes in flow characteristics would not affect fish habitat or water quality conditions.

- The effect of operation of Alternative 2 on fish habitat in the Lower American River is considered less than significant because releases from Folsom Reservoir during flood operations would be similar to Alternative 1. Releases to the Lower American River during normal reservoir operations would be the same as under Alternative 1. There would be no adverse effects to special-status fish species or EFH.

7.7.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Control Pool Elevation

Construction-Related Effects

Construction-related effects on fish habitat at L. L. Anderson Dam would be the same as described under Alternative 2.

Alternative 3 would include raising Folsom Dam seven feet and excavating and transporting material from Mississippi Bar to the wing dams and dikes. The effects on fish and fish habitat at Folsom Reservoir as result of raising the dam, wing dams, and dikes seven feet would be the same as discussed under Alternative 2.

No in-water work would be necessary as part of excavating material from Mississippi Bar. Material excavated from Mississippi Bar would be transported by barge across Lake Natoma. This would require dredging material from the bed of the lake to allow the barge to reach the loading area at Mississippi Bar and the unloading area at Willow Creek Recreation. Fish habitat in Lake Natoma could be affected as a result of sedimentation and spills of fuel or lubricants during dredging, loading, barging, and unloading operations. Suspended sediment could travel downstream and cause adverse effects to fish habitat in the Lower American River, including that of threatened and endangered chinook salmon, steelhead, and Sacramento splittail.

- Construction-related effects on fish habitat in Lake Natoma are considered significant because of the potential for discharge of sediments and spills of fuels and lubricants. Implementation of Mitigation Measure WQ-1 and WQ-2 would reduce this effect to a less-than-significant level.

Operation-Related Effects

Operation-related effects on fish would be the same as discussed under Alternative 2.

7.7.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

The construction- and operation-related effects on fish and fish habitat in French Meadows Reservoir and the Middle Fork of the American River, Folsom Reservoir, and the Lower American River would be the same as discussed under Alternative 3.

7.7.8 Alternative 5: Stepped Release to 160,000 cfs

Construction-Related Effects

Lower American River. Construction activities along the Lower American River are not expected to directly affect fish habitat because levee construction would be limited to the landside of the levee between the mouth of the American River and the NEMDC. Modifications to stormwater outfalls through the American River levees would also not require in-water work. However, as discussed in Section 7.10, “Water Quality,” ground-disturbing activities could adversely affect water quality as a result of discharge of sediments and spills of fuels and lubricants. These discharges could also adversely affect fish habitat, including habitat for threatened and endangered chinook salmon, steelhead, and Sacramento splittail, in the Lower American River.

- Construction-related effects on fish habitat in the Lower American River is considered significant because of the potential for discharge of sediments and spills of fuels and lubricants. Implementation of Mitigation Measure WQ-1 and WQ-2 would reduce this effect to a less-than-significant level.
- There would not be any adverse effects to special-status fish species or EFH because no riparian vegetation or in-water habitat would be disturbed.

Yolo and Sacramento Bypasses. Construction activities in the Yolo Bypass, Sacramento Bypass, Sacramento River, and Delta sloughs are not expected to directly affect fish habitat because levee construction would be limited to the landside of the levees or would not require in-water work. However, as discussed in Section 7.10, “Water Quality,” ground-disturbing activities could adversely affect water quality as a result of discharge of sediments and spills of fuels and lubricants. These discharges could also adversely affect fish habitat within the bypasses, sloughs, and the Sacramento River.

- Construction-related effects on fish habitat in the Yolo and Sacramento Bypasses, the Sacramento River, and the Delta sloughs are considered significant because of the potential for discharge of sediments and spills of fuels and lubricants. Implementation of Mitigation Measure WQ-1 and WQ-2 would reduce this effect to a less-than-significant level.
- There would not be any adverse effects to special-status fish species or EFH because no riparian vegetation or in-water habitat would be disturbed.

As indicated in Section 7.8, “Vegetation,” construction activities within the Yolo and Sacramento Bypass, Sacramento River, and Delta sloughs would result in the loss of vegetation located on the landside of the levees. Because these modifications would be made to the landside of levees, construction is not expected to substantially affect SRA cover or associated fish spawning or rearing habitat. Any indirect loss of SRA cover would be a small portion of the total amount of available spawning and rearing habitat in the Yolo Bypass. Section 7.8, “Vegetation,” describes mitigation measures to offset the loss of vegetation that would occur during levee strengthening. This includes construction of 141 acres of wetlands at Egbert Tract, located in the lower portion of the Yolo Bypass. The wetlands would compensate for potential effects on fish, including Delta smelt and splittail.

- The effect on fish habitat within the Sacramento and Yolo Bypasses as a result of the loss of vegetation is considered less than significant because the construction activities would affect only a small portion of the total amount of available habitat and because the loss of vegetation would be mitigated. Section 7.8, “Vegetation,” describes mitigation measures to offset the loss of SRA vegetation.

Operation-Related Effects

Lower American River. Folsom and Nimbus Dams prevent the supply of coarse bed material-sized sediment into the Lower American River from upstream. Increased flow releases have the potential to result in mobilization and potential loss of suitable spawning gravel, which could have an adverse effect on the spawning and incubation success of chinook salmon and steelhead. Ayres Associates (1997) conducted a hydraulic analysis to provide information on sediment transport and channel stability in the Lower American River. This study looked at five scenarios with respective objective releases of 115,000, 145,000, and 180,000 cfs and with Folsom Reservoir storage levels ranging from 400,000 to 650,000 acre-feet. Ayres Associates concluded that the channel bed of the Lower American River would remain relatively stable regardless of the operation. The model predicts less than two feet of mobilization in all locations and less than one foot for the majority of locations, with very little difference among the five

scenarios. In addition, bed material is generally immobile at discharges of less than 50,000 cfs. As discharges increase, the bed material is mobilized, although in some locations, the bed stays immobile even at a discharge of 180,000 cfs. Therefore, the stepped release to 160,000 cfs is not expected to substantially affect bed material transport or reduce the availability of spawning habitat for chinook salmon and steelhead.

Changes in Lower American River flows under this alternative would be relatively minor, temporary, and infrequent and would occur only during major storm and flood events. Alternative 5 would not result in changes in Folsom Reservoir storage levels during non-flood control operations and would therefore not result in any flow or temperature effects on sensitive fish species. There would be no adverse effects to special-status fish species or EFH because infrequent flood-related changes in flows would not affect fish habitat or water quality conditions.

- The operation-related effects on fish habitat in the Lower American River is considered less than significant because flood releases are not expected to substantially affect fish habitat in the Lower American River. Releases from Folsom Reservoir to the Lower American River during normal reservoir operations would be the same as under Alternative 1. There would be no adverse effects to special-status fish species or EFH.

Yolo and Sacramento Bypasses. Under Alternative 5, increased flows would be conveyed through the Sacramento and Yolo Bypasses. The infrequent increase in flows would not change the quality of spawning and rearing habitat for fish species in the bypasses. Therefore, no adverse effects are expected to occur.

- The operation-related effects of increased conveyance of floodflows through the Yolo and Sacramento Bypasses would not harm fish species. There would be no adverse effects to special-status fish species or EFH.

7.7.9 Alternative 6: Stepped-Release to 160,000 cfs and New Outlet at Folsom Dam

Construction-Related Effects

Construction-related effects on fish habitat would be the same as described under Alternative 5.

Alternative 6 would include constructing a new outlet and enlarging the emergency spillway stilling basin at Folsom Dam. Although this would not include in-water work, spills of fuels and lubricants could occur as a result of operation of heavy equipment. Spills could adversely affect fish and fish habitat downstream of the construction site.

- Construction-related effects on fish habitat downstream of Folsom Dam are considered significant because of the potential for spills of fuels and lubricants. Implementation of Mitigation Measure WQ-1 and WQ-2 would reduce this effect to a less-than-significant level.

Operation-Related Effects

Operation-related effects on fish habitat would be the same as described under Alternative 5.

7.7.10 Alternative 7: Stepped-Release to 180,000 cfs

Construction- and operation-related effects on fish habitats and special-status species in the Lower American River under Alternative 7 would be similar to those described for Alternative 5.

Construction-Related Effects

Construction-related effects on fish habitat would be the same as discussed under Alternative 5.

Construction-related effects on fish habitat along the Lower American River would be similar to Alternative 6. Modifying and constructing levees and floodwalls and raising the bridges could result in a greater potential for localized increased levels of turbidity and chemical and fuel spills associated with construction equipment.

- Construction-related effects on fish habitat in the Lower American River are considered significant because of the potential for discharge of sediments and spills of fuels and lubricants. Implementation of Mitigation Measure WQ-1 and WQ-2 would reduce this effect to a less-than-significant level.
- There would not be any adverse effects to special-status fish species or EFH because no riparian vegetation or in-water habitat would be disturbed.

Operation-Related Effects

Operation-related effects on fish habitat would be the same as described under Alternative 6. The stepped release to 180,000 cfs would not significantly affect bed material transport or availability of spawning habitat availability for chinook salmon and steelhead. Changes in Lower American River flows under Alternative 7 would be relatively minor, temporary, and infrequent, occurring only during major storm and flood events. Alternative 7 would not result in changes in Folsom Reservoir storage levels during non-flood control operations and would therefore not result in any flow or temperature effects to sensitive fish species.

- The operation-related effect on fish habitat in the Lower American River is considered less than significant because flood releases are not expected to substantially affect fish habitat in the Lower American River. Releases to the Lower American River during normal reservoir operations would be the same as under Alternative 1. There would be no adverse effects to special-status species or EFH.

7.7.11 Alternative 8: Stepped-Release to 160,000 and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

The construction- and operation-related effects along the Lower American River and the Yolo and Sacramento Bypasses under Alternative 8 would be the same as described for Alternative 5. The construction- and operation-related effects of increasing the flood storage capacity at Folsom Reservoir would be the same as described under Alternative 3.

7.7.12 Alternative 9.0: Ecosystem Restoration Alternatives

Alternative 9.1: Urrutia Restoration Site

Construction-Related Effects. Construction activities, including grading and vegetation removal, could result in indirect effects on fish in the Lower American River, including habitat for threatened and endangered chinook salmon, steelhead, and Sacramento splittail, if sedimentation or release of fuels or lubricants occur. The magnitude of the effects depends on the timing and duration and extent of sediment discharges or disturbances.

- Construction activities could result in a significant adverse effect on fish habitat in the Lower American River if sediments, fuels, or lubricants enter the river during construction. Construction within the active channel or streambank areas should be limited to the summer low-flow period to reduce the potential for soil erosion and sediment transport. Implementation of Mitigation Measure WQ-1 and WQ-2 and implementation of measures stipulated by DFG for the Section 1601 streambed alteration agreement would reduce this effect to a less-than-significant level.
- The planned restoration activities within the Lower American River flood plain would require removal of some riparian vegetation and SRA habitat. The effects would be temporary, and the net improvement of riparian vegetation and SRA habitat would be specific goals of the restoration activities. Following construction, flood plain habitat improvements would increase the quality of valuable fish habitat available under a range of flow conditions. The restoration is expected to increase cover for fish species—including spawning and rearing habitat, increase stream shading, and increase food supplies.
- Construction activities would result in temporary reductions in riparian vegetation and SRA habitat. However, the impacts are considered less than significant because the restoration activities are specifically designed to increase the acreage and quality of these habitat types.

Operation-Related Effects. The restoration of riparian habitats and the creation of side channels would enhance fish habitat by providing additional shaded riverine aquatic SRA habitat, particularly for Sacramento splittail. The restoration would also reduce the potential for fish stranding after high river flows recede by providing an outlet channel to the river.

- The restoration would result in a beneficial effect on fish by creating additional SRA cover and by reducing stranding.

Alternative 9.2: Woodlake Restoration Site

Construction- and operation-related effects on fish would be the same as described under Alternative 9.1.

Alternative 9.3: Bushy Lake Restoration Site

Construction- and operation-related effects on fish would be the same as described under Alternative 9.1.

Alternative 9.4: Arden Bar Restoration Site

The Arden Bar restoration site would include construction of a high-flow bypass channel designed specifically to provide backwater or lentic habitat for Sacramento splittail, chinook salmon, and steelhead. In-water construction would be required to reduce the size of an existing pond to enable construction of the bypass channel. However, the pond is not hydraulically connected to the main river channel, and no in-water work would be required in the American River. Construction- and operation-related effects on fish would be the same as described under Alternative 9.1.

Alternative 9.5: Fisheries Restoration

Construction-Related Effects. In-water construction would be necessary to modify the temperature control shutters at Folsom Dam. Modifying the shutters would not directly affect fish habitat because construction would be limited to the top of the dam and the intakes to the penstocks. Fish habitat could be adversely affected if fuels or lubricants are spilled to the reservoir during construction.

- The fisheries restoration alternative could result in a significant adverse effect on fish habitat in Folsom Reservoir in the event fuels or lubricants are spilled during construction. Implementation of Mitigation Measure WQ-1 would reduce this effect to a less-than-significant level.

Operation-Related Effects. Improvements to the temperature control shutters in Folsom Reservoir would improve fisheries habitat in the Lower American River by allowing greater flexibility to manage the temperature of releases from Folsom Reservoir.

- The temperature control shutter improvements would result in a beneficial effect on fish habitat in the Lower American River by enhancing management of the Folsom Reservoir cold-water pool.

7.8 Vegetation

7.8.1 Introduction

This section describes the effects on vegetation as a result of construction and operation of each project alternative. The evaluation includes a discussion of construction-related and operation-related effects on vegetation at L. L. Anderson Dam, around Folsom Reservoir, at Mississippi Bar, along the Lower American River, along the Sacramento and Yolo Bypasses, and along the Sacramento River and Delta sloughs.

Vegetation surveys were conducted at L. L. Anderson Dam, around Folsom Reservoir, and at the levees that would be strengthened in the Yolo Bypass and along the Sacramento River and Delta sloughs. Vegetation surveys were conducted along the Lower American River for the 1996 SIR, and recent additional surveys were conducted at proposed staging areas along the Lower American River. A Habitat Evaluation Procedure (HEP) analysis was prepared by the USFWS to evaluate effects on vegetation around Folsom Reservoir, along the Lower American River, and in the Yolo and Sacramento Bypasses. Acreage reported in this section reflects the conclusions of the USFWS Coordination Act Report (CAR) for this project.

7.8.2 Methods and Assumptions

Identification of potential project-related effects on natural vegetation in the study area, including sensitive plant communities, special-status plant species, and species that are listed as threatened or endangered under ESA and CESA, was based in large part on a BDR prepared for the project by the Corps. At French Meadows Reservoir, Folsom Reservoir, Lower American River, and areas downstream in the Sacramento River and Yolo Bypass, potential special-status species include Layne's ragwort, El Dorado bedstraw, Palmate-bracted bird's beak, Antioch Dunes evening primrose, Crampton's tuctoria, Stebbins' morning-glory, Bogg's Lake hedge-hyssop, Pine Hill ceanothus, Pine Hill flannelbush, Colusa grass, slender Orcutt grass, Sacramento Orcutt grass, and Hartweg's golden sunburst. Surveys for listed species were not specifically conducted. However, based on the available information and proposed project activities, the BDR indicates that there is a very low probability that any of these species would be adversely affected by the project.

The project alternatives could affect vegetation during construction and operation. Potential construction-related effects include ground disturbance caused by grading, filling, and excavating, as well as by the construction of equipment staging areas and vehicle travel routes. Potential operation-related effects include inundation at Folsom Reservoir during periodic flood events and increased objective releases, flood stage elevations, and scouring and sedimentation in the Lower American River and the Sacramento and Yolo Bypasses. Effects are considered to be either temporary (i.e., the vegetation would recover) or permanent (i.e., the vegetation is not expected to recover or become reestablished).

Potential effects on sensitive plant communities and special-status plant species were assessed based on the likelihood that suitable habitat or known occurrences of the communities and species would be affected. If suitable habitat for a species is not likely to be affected, effects as a result of project implementation are considered unlikely.

For purposes of this analysis, riparian- and wetland-related habitats, such as seasonal wetland, freshwater marsh, and open water, as well as the Folsom Dam spillway, are treated as jurisdictional waters of the United States. A Section 404(b)(1) evaluation for each candidate plan has been prepared and is presented in Attachment 1D of Appendix A.

Construction-Related Effects

Construction activities would result in the direct removal of vegetation in the footprints of new structures and vehicle and equipment travel routes. The following assumptions were made regarding construction-related effects on vegetation:

- Grading, filling, and excavation activities would remove existing vegetation.
- Vegetation mortality or injury would occur adjacent to construction areas or in off-road travel routes because of soil compaction by heavy equipment, pruning and root cutting, or sidecasting of graded material.
- Jurisdictional waters of the United States, including wetlands, and associated plant communities could be affected directly by grading, excavation, or fill activities or indirectly by changes in surface hydrology, soil erosion, and sedimentation.
- Removing portions of riparian, woodland, or chaparral vegetation could indirectly affect vegetation in adjacent areas because of increased exposure to sun and wind and the introduction of weed species.
- Vegetation would not be disturbed at staging areas or borrow sites.

Operation-Related Effects

Operation-related effects on vegetation are those effects that would result from water management and maintenance activities. The following are general categories of operation-related effects that may result from implementation of flood control program components.

- There would be no change in the operation of L. L. Anderson Dam or French Meadows Reservoir as a result of the spillway modifications. Therefore, no changes in the degree or extent of vegetation inundation would occur.
- Operation of increased gross flood control pool elevation at Folsom Reservoir and increased releases into the Lower American River would result in periodic inundation of natural vegetation communities, which may cause mortality or decreased vigor and health.
- Project operation would result in increased intensity or frequency of maintenance activities.

Folsom Reservoir. The potential effects of periodic inundation on vegetation are based on a review of existing literature and other environmental documents prepared for similar projects in the region (McClelland and Leiser 1991, Teskey and Hinckley 1977, Montgomery Watson and Jones & Stokes 1994, National Research Council 1995, U.S. Army Corps of Engineers, et al. 1996, and CH2M Hill 2001). Variables that influence vegetation response to inundation include time of year; duration, depth, and frequency of flood events; plant species and ecotype; plant age and size; soil type; other environmental stressors on plants, such as disease and competition; sedimentation; and flow velocity of floodwaters (McClelland and Leiser 1991, Teskey and Hinckley 1977). The following assumptions were made to analyze potential effects of inundation on vegetation:

- The frequency of flood events is expected to be very low; the proposed project alternatives would provide flood storage for approximately 1-in-100 to 1-in-500-year flood events, which have a 1 percent to 0.2 percent probability, respectively, of occurrence in any year.
- The duration of any inundation in excess of future without-project conditions is expected to be relatively short, between 3 and 5 days.
- As indicated in Section 7.2, “Geology, Seismicity, and Soils,” water stored in Folsom Reservoir during flood events would have little or no flow and is not expected to result in substantial soil erosion or sedimentation.
- Inundation is expected to occur only during the winter months, when most plant species are either dormant or have a low rate of growth.
- Most plant species located in riparian or wetland communities are expected to have a high level of natural tolerance to periodic inundation.
- Operation of any of the project alternatives would not affect the operation of Folsom Reservoir as related to storage of water for water supply purposes.

Lower American River. Operation-related effects on vegetation that would result from inundation along the Lower American River were evaluated using considerations similar to those described above for Folsom Reservoir.

Yolo and Sacramento Bypasses. Operation-related effects on vegetation that would result from inundation in the Yolo and Sacramento Bypasses are evaluated using considerations similar to those described above for Folsom Reservoir.

7.8.3 Criteria for Determining Significance

Effects on vegetation were considered potentially significant if the project would result in any of the following:

- Substantial loss of native vegetation

- Removal, filling, or substantial disturbance of a sensitive natural community (e.g., wetlands, riparian woodlands, oak woodlands, northern mafic chaparral)
- Direct loss or indirect disturbance of oak trees or other native trees protected by local ordinances
- Direct mortality, permanent habitat loss, or lowered reproductive success for State-listed or Federally-listed threatened or endangered plants
- Direct mortality, permanent habitat loss, or lowered reproductive success of:
 - Individuals of State-listed or Federally-listed threatened or endangered plant species or candidates for Federal listing
 - Substantial portions of local populations of plant species that are candidates for State or Federal listing or species identified by the California Native Plant Society as rare, threatened, or endangered in California or elsewhere (California Native Plant Society List 1b species)

Mitigation measures are provided for each potentially-significant effect and are designed to reduce potential effects to a less-than-significant level. Effects are considered less than significant if they do not meet any of the criteria identified above. No mitigation measures are required for less-than-significant effects.

7.8.4 Alternative 1: No Action

Construction- and Operation-Related Effects

Under Alternative 1, there would be no construction of flood control facilities or operation-related changes at Folsom Reservoir, the Lower American River, or the Yolo and Sacramento Bypasses.

- Alternative 1 would have no effect on vegetation.

7.8.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Construction activities required to enlarge the spillway at L. L. Anderson Dam include deepening and widening the existing spillway. Widening the upper portion of the spillway would directly affect approximately 0.25 acre of Sierra mixed conifer habitat. Reconstructing the temporary haul road at the lower end of the spillway is not expected to affect vegetation.

- Widening the L. L. Anderson Dam spillway would result in a less-than-significant effect on vegetation because only a small amount of vegetation would be removed.

Folsom Reservoir. Alternative 2 includes replacing spillway gates and spillway, raising the concrete dam, constructing a Folsom Dam operation and maintenance (O&M) bridge, and modifying the elevator tower.

- Replacing the spillway gates and bridge, raising the concrete dam, and modifying the elevator tower would have no effect on vegetation because these modifications would be limited to the concrete dam.

Constructing the 3.5-foot parapet wall would not affect vegetation because the work would be limited to the crown of the wing dams and dikes, which are not vegetated. Constructing the temporary construction bridge would affect common vegetation, riparian woodland, and sensitive communities, including jurisdictional waters of the United States. Vegetation adjacent to the construction area would be fenced, and construction crews would be educated on the importance of avoiding fenced areas.

Construction activities associated with Alternative 2 could result in the loss or temporary disturbance of about 0.5 acre of common natural vegetation communities, such as nonnative annual grassland and ruderal vegetation, and disturbance of 4.6 acres of bare ground. This cover type is common locally and regionally, and loss as a result of construction of Alternative 2 would not be considered substantial on a local or regional basis.

- Construction-related effects on common natural vegetation communities at Folsom Reservoir that would result under Alternative 2 would be less than significant. The USFWS has recommended that the Corps ensure annual grasslands are reseeded on completion of the wing dams and dikes and the temporary construction bridge (U.S. Fish and Wildlife Service 2001b). The Corps has incorporated this recommendation as part of the project description.

Construction activities associated with the temporary construction bridge would result in the loss or disturbance of 1.8 acres of oak woodland and 2.9 acres of pine-oak woodlands. (Table 7-11). Native oak trees in the study area and vicinity include valley oak, blue oak, interior live oak, and black oak. Oak trees may be removed if they are in the footprints of construction activities or may be indirectly affected by soil compaction, soil disturbance, off-road vehicle travel, equipment staging and storage, or grading and excavation. They also may be adversely affected as a result of root-cutting and pruning. Most of the construction area located within oak and pine-oak woodlands is situated in previously-disturbed or open areas and less than 10 percent of the area is covered by oak canopy. A site-specific survey of the construction footprints and individual oak trees would be required to determine the number of oak trees that would be affected during construction.

- Construction-related effects on oak trees and oak woodlands that would result under Alternative 2 would be significant because oak trees and woodlands provide important habitat for special-status species that have declined substantially in extent. Implementation of Mitigation Measure V-1 would reduce these effects to a less-than-significant level.

Mitigation Measure V-1: Compensate for loss of 4.8 acres of oak and pine-oak woodland. The Corps would compensate for the loss of oak and pine-oak woodland by developing 4.72 acres of oak woodland and 8.01 acres of pine-oak woodland (U.S. Fish and Wildlife Service 2001a and 2001b). This would fully compensate for the loss of 1.7 acres of oak woodland and 2.9 acres of pine-oak woodland as a result of constructing the temporary construction bridge. Mitigation areas would be developed on Federal land around Folsom Reservoir.

Construction activities would directly affect 1.3 acres of riparian woodland located within the footprint of the temporary construction bridge. The loss of riparian woodland is considered a significant effect because it provides important habitat for wetland-dependent plant and wildlife species.

- Construction-related effects on jurisdictional waters of the United States and associated riparian and wetland vegetation communities that would result under Alternative 2 would be significant. Implementation of Mitigation Measure V-2 would reduce effects on streams, wetlands, and associated vegetation communities to a less-than-significant level.

Mitigation Measure V-2: Compensate for loss of 1.3 acres of riparian woodland. The Corps would compensate for the loss of seasonal wetland and riparian woodland by developing 1.3 acres of riparian woodland (U.S. Fish and Wildlife Service 2001a and 2001b). The Corps has identified Mormon Island Wetlands Preserve as a potential mitigation site.

The Corps would also avoid disturbing seasonal wetlands and riparian vegetation to the extent feasible during construction by installing fencing to identify nondisturbance buffers. Indirect effects would be avoided or minimized by following the best management practices (BMP) indicated in Mitigation Measures WQ-1 and WQ-2 for soil erosion, grading, and other earth-moving practices and by retaining natural hydrologic connections during construction. Additional avoidance and minimization measures, including the location of fencing and width of buffer areas, would be determined in consultation with the Corps, Central Valley Regional Water Quality Control Board (CVRWQCB), and DFG.

Construction-related activities are not expected to adversely affect State-listed or Federally-listed plant species because no species are known to occur on or near the wing dams, dikes, or in the alignment of the temporary construction bridge. The nearest suitable habitats for these species are located in the vicinity of the South Fork of the American River. Construction is unlikely to result in the loss of special-status plant species because of the relatively small amount of areas that would be disturbed and the location of construction areas away from known observations of plants.

- The construction-related effects on special-status plant species are considered less than significant.

TABLE 7-11. Vegetation Types Affected by Construction- and Operation-Related Activities (Acres)

Cover Types	Construction	Operation
Alternative 2^a		
Oak and pine-oak woodland	4.6	488.9
Riparian woodland	1.3	20.9
Seasonal wetland	0.0	2.6
Annual grassland	0.5	80.5
Chaparral	0.0	20.1
Total	6.4	613.0
Alternative 3^a		
Oak and pine-oak woodland	29.8	631.5
Riparian woodland	10.3	24.5
Seasonal wetland	0.3	2.6
Annual grassland	80.5	106.5
Chaparral	0.0	28.7
Total	120.9	793.8
Alternative 4^a		
Oak and pine-oak woodland	29.8	819.7
Riparian woodland	10.3	30.8
Seasonal wetland	0.3	2.9
Annual grassland	80.5	172.7
Chaparral	0.0	38.7
Total	120.9	1,064.8
Alternative 5^b		
Oak woodland	6.7	N/A ^c
Riparian woodland	22.7	N/A ^c
Seasonal wetland	23.2	N/A ^c
Open water	11.3	N/A ^c
Individual trees/shrubs	^d	N/A ^c
Upland herbaceous	290.5	N/A ^c
Agricultural land (rice)	12.5	N/A ^c
Total	366.9	N/A
Alternative 6^c		
Oak woodland	6.7	N/A ^c
Riparian woodland	22.7	N/A ^c
Seasonal wetland	23.2	N/A ^c
Open water	11.3	N/A ^c
Individual trees/shrubs	^d	N/A ^c
Upland herbaceous	290.5	N/A ^c
Agricultural land (rice)	12.5	N/A ^c
Total	366.9	N/A
Alternative 7^b		
Oak woodland	25.3	N/A ^c
Riparian woodland	48.2	N/A ^c
Seasonal wetland	23.2	N/A ^c
Open water	11.3	N/A ^c
Individual trees/shrubs	^d	N/A ^c
Upland herbaceous	516.8	N/A ^c
Agricultural land (rice)	12.5	N/A ^c
Total	637.3	N/A
Alternative 8^f		
Oak woodland	36.5	631.5
Riparian woodland	33.0	24.5
Seasonal wetland	23.5	2.6
Open water	11.3	N/A ^c
Annual grassland	80.0	106.5
Chaparral	0.0	28.7
Individual trees/shrubs	^d	N/A
Upland herbaceous	290.5	N/A
Agricultural land (rice)	12.5	N/A ^c
Total	487.3	793.8

^a Affected areas include French Meadows and Folsom Reservoirs, the temporary construction bridge site, and borrow sites.

^b Affected areas include Lower American River, Sacramento Weir, and Yolo Bypass hydraulic mitigation areas, borrow sites, and staging areas.

^c There are no operation-related effects identified under this stepped release alternative.

^d Five individual trees would be affected under Alternatives 5, 6, 7, and 8.

^e No vegetation effects are associated with construction of new outlets at Folsom Dam.

^f Affected areas are the same as shown for Alternative 3 and Alternative 5.

Operation-Related Effects

L. L. Anderson Dam. Operation of the enlarged L. L. Anderson Dam would not affect vegetation downstream of the spillway because the frequency that releases are made through the spillway would not change.

- Operation of the enlarged L. L. Anderson Dam spillway would not affect downstream vegetation.

Folsom Reservoir. Inundation is not expected to result in substantial mortality of vegetation because of the predicted short duration of inundation and the low probability of inundation. Inundation would also most likely occur during the winter months, when many species are either dormant or have low biological activity (National Research Council 1995, McClelland and Leiser 1991, Teskey and Hinckley 1977, Montgomery Watson and Jones & Stokes 1994). Preliminary data indicate that reservoir elevation would exceed existing conditions only during extreme flood events (100-year or greater flood events) and that inundation above current levels would last 1 to 3 days (U.S. Army Corps of Engineers 2001).

A maximum of 613 acres could be subject to inundation under Alternative 2, including 284 acres of blue oak-pine woodland, 205 acres of oak woodland, 20 acres of chaparral, and 81 acres of annual grassland (Table 7-11 and Plate 7.8-1). Individual plants may suffer mortality or a reduction in growth or vigor due to inundation. However, the vast majority of perennial woody plants in these communities are not expected to be adversely affected because inundation would occur during winter months, would be infrequent and of short duration, and is not expected to result in soil erosion.

As described in Section 7.2, “Geology, Seismicity, and Soils,” floodwater stored in Folsom Reservoir is not expected to result in substantial amounts of sedimentation, soil erosion, or slope failure in areas higher than 474 feet. If plant mortality were to occur after an inundation event, natural vegetation is expected to fully recover or become reestablished because of the low probability of soil erosion or slope failure associated with inundation.

- Operation-related effects on natural vegetation communities at Folsom Reservoir under Alternative 2 are considered less than significant because inundation would occur when plants are dormant, would be of short duration, and is not expected to result in loss of soils.
- USFWS has recommended that the Corps implement a monitoring and adaptive management program that would monitor vegetation within the expanded inundation zone over the life of the project. This would include establishing baseline conditions around the reservoir that would be updated at a predetermined interval. After major flood events that encroach on the inundation area above 474 feet, vegetation would be surveyed and damages attributable to inundation would be determined. Appropriate mitigation would be implemented to compensate for losses (U.S. Fish and Wildlife Service 2001b). The Corps has incorporated this recommendation as part of project description.

7.8.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction-Related Effects

Construction activities associated with Alternative 3, including raising the wing dams and dikes and building a temporary construction bridge, would affect common vegetation and sensitive communities, including seasonal wetlands and jurisdictional waters of the United States. Construction would result in the loss or temporary disturbance of up to 80 acres of nonnative annual grassland and ruderal vegetation as a result of increasing the footprint of the wing dams and dikes. The Corps has incorporated USFWS recommendations to reseed annual grasslands as part of the project.

- Construction-related effects on common natural vegetation communities at Folsom Reservoir that would result under Alternative 3 would be less than significant.

Construction activities would result in the loss or disturbance of 29.8 acres of oak and pine-oak woodlands (Table 7-11 and Plate 7.8-2). In addition to the loss of 4.6 acres associated with the temporary bridge, 25.2 acres of oak and pine-oak woodlands would be removed as a result of construction of the wing dams and dikes.

- Construction-related effects on oak trees and oak woodlands that would result under Alternative 3 would be significant. Implementation of Mitigation Measure V-3 would reduce these effects to a less-than-significant level.
- **Mitigation Measure V-3: Compensate for loss of 23.1 acres of oak and 6.7 acres of pine-oak woodlands.** The Corps would compensate for the loss of oak and pine-oak woodlands by developing 51 acres of oak and 18 acres of pine-oak woodlands (U.S. Fish and Wildlife Service 2001a and 2001b). This would fully compensate for the loss of 23.1 acres of oak woodland and 6.7 acres of pine-oak woodland.

Construction activities would directly affect 10.3 acres of riparian woodland and 0.3 acre of seasonal wetlands. Riparian woodland and seasonal wetlands provides important habitat for wetland-dependent plants and wildlife.

- Construction-related effects on riparian woodland and seasonal wetlands under Alternative 2 are considered significant. Implementation of Mitigation Measure V-4 would reduce effects to a less-than-significant level.
- **Mitigation Measure V-4: Compensate for loss of 10.3 acres of riparian woodland.** The Corps would compensate for the loss of riparian woodland and seasonal wetlands by developing 10.3 acres of riparian woodland and 0.3 acre of seasonal wetlands (U.S. Fish and Wildlife Service 2001a and 2001b). The Corps has identified Mormon Island Wetlands Preserve as a potential mitigation site.

Construction-related effects on special-status plant species would be the same as described under Alternative 2.

Operation-Related Effects

Operation-related effects under Alternative 3 would be the same as described under Alternative 2; however, operation would result in the inundation of a larger area because the inundation zone would increase to 482 feet. A maximum of 794 acres could be subject to inundation under Alternative 3, including 367 acres of blue oak-pine woodland, 264 acres of oak woodland, 29 acres of chaparral, and 107 acres of annual grassland (Table 7-11).

7.8.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Construction-related effects on vegetation under Alternative 4 would be the same as those described under Alternative 3 (Table 7-11 and Plate 7.8-3). Operation-related effects under Alternative 4 would be the same as described under Alternative 2; however, operation would result in the inundation of a larger area because the inundation zone would increase to 487 feet. A maximum of 1,065 acres could be subject to inundation under Alternative 4, including 470 acres of blue oak-pine woodland, 350 acres of oak woodland, 39 acres of chaparral, and 173 acres of annual grassland.

7.8.8 Alternative 5: Stepped Release to 160,000 cfs

Construction-Related Effects

Construction-related activities that would occur along the Lower American River, Yolo Bypass, Sacramento Bypass, Sacramento River, and Delta sloughs include strengthening levees and modifying utilities and local drainages that cross through the levees. These activities could affect common vegetation, sensitive plant communities, jurisdictional wetlands, and special-status plant species.

Construction activities associated with Alternative 5 could result in the loss or temporary disturbance of up to 291 acres of common natural vegetation communities, such as nonnative annual grassland and ruderal vegetation (Table 7-11). This cover type is common locally and regionally and loss as a result of construction of Alternative 5 would not be considered substantial on a local or regional basis.

- Construction-related effects on common natural vegetation communities within the Lower American River under Alternative 5 are expected to be less than significant. No mitigation is required.

Construction activities would result in the loss or disturbance of 6.7 acres of oak woodlands. This includes loss of 1.5 acres as a result of strengthening levees along the Lower American River and 5.2 acres as a result of work in the Yolo Bypass. These effects are considered to be significant because oak trees and woodlands provide important habitat for special-status species that have declined substantially in extent.

- Construction-related effects on oak woodlands that would result under Alternative 5 would be significant. Implementation of Mitigation Measure V-5 would reduce these effects to a less-than-significant level.

Mitigation Measure V-5: Compensate for loss of 6.7 acres of oak woodlands. The Corps would compensate for the loss of oak woodlands by developing 23.1 acres of oak woodlands. This would fully compensate for the loss of oak woodland along the Lower American River and in the Yolo Bypass. The Corps has identified Egbert Tract in the lower portion of the Yolo Bypass as a mitigation site for the 17.7 acres of compensation associated with work in the Yolo Bypass. The Corps has also identified Rossmore Bar as a mitigation site for the 5.4 acres of compensation associated with work along the Lower American River.

Construction activities would directly affect 23.2 acres of seasonal freshwater emergent marsh, 11.3 acres of open water, 23 acres of riparian woodland, and 12.5 acres of rice. This includes loss of 6.3 acres as a result of strengthening levees along the Lower American River and 16.4 acres as a result of work in the Yolo Bypass.

The loss of seasonal freshwater marsh, open water, and rice would occur as a result of relocating irrigation ditches from the toe of the landside of the levees. The effect of the loss of this habitat is being addressed as part of the Section 7 consultation. A total of 141 acres of wetland-related habitat would be created at Egbert Tract to compensate for the loss of giant garter snake, delta smelt, and splittail habitat.

- The construction-related effect on riparian woodland under Alternative 5 is considered significant. Implementation of Mitigation Measure V-6 would reduce effects on streams, wetlands, and associated vegetation communities to a less-than-significant level.

Mitigation Measure V-6: Compensate for loss of 23.2 acres of riparian woodland. The Corps would compensate for the loss of riparian woodland by developing 24 acres of replacement riparian woodland. The Corps has identified Egbert Tract in the lower portion of the Yolo Bypass as a mitigation site for the 18 acres of compensation associated with work in the Yolo Bypass. The Corps has also identified Mississippi Bar as a mitigation site for the 6 acres of compensation associated with work along the Lower American River. The Corps would also avoid disturbing seasonal wetlands and riparian vegetation to the extent feasible during construction. Fencing and nondisturbance buffers would be installed. Indirect effects would be avoided or minimized by following the BMP indicated in Mitigation Measures WQ-1 and WQ-2 for soil erosion, grading, and other earth-moving practices and by retaining natural hydrologic connections during construction. Additional avoidance and minimization measures, including the location of fencing and width of buffer areas, would be determined in consultation with the Corps, CVRWQCB, and DFG.

Effects on special-status plant species would be the same as discussed in Alternative 3.

Operation-Related Effects

Potential operation-related effects on vegetation under Alternative 5 would include an increased objective release of 160,000 cfs, which could affect vegetation as a result of higher velocity flows.

Potential inundation-related effects on vegetation along the Lower American River are expected to be similar to the operation-related effects described for Folsom Reservoir under Alternative 2. There would be a greater likelihood for vegetation on the banks of the levees to be subjected to inundation due to the higher objective release rate during flood events. As described for Alternative 2, inundation is not expected to result in substantial mortality of vegetation because of the inherent tolerance level of many species, the predicted short duration of inundation, the low probability of frequent inundation, and the fact that inundation would most likely occur during the winter months, when many species are either dormant or have low biological activity. The 160,000 cfs objective release rate would change the pattern of streamflow velocities and duration that vegetation is exposed to high flows. In general, there would be more frequent high flows; however, the overall frequency of these occurrences would be low because they would only occur under the extreme flood events. Previous modeling of increased flows indicated that at the highest flow rates within the channel (i.e., greater than 115,000 cfs), flow velocity and the potential for erosion and scour to occur is lower than at moderate flow rates (50,000–80,000 cfs). The frequency of these moderate flow ranges is not expected to change appreciably.

- Operation-related effects on vegetation on the Lower American River that would result under Alternative 5 are expected to be less than significant.

7.8.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

The construction- and operation-related effects on vegetation under Alternative 6 would be the same as described under Alternative 5. Construction of the new outlet at Folsom Dam would not result in the loss of vegetation.

7.8.10 Alternative 7: Stepped Release to 180,000 cfs

Alternative 7 would include the same construction elements as Alternative 5, with the addition of raising and strengthening 13.5 miles of levees, 2 miles of new levees, 1.7 miles of floodwalls, and the modification of the Guy West and Howe Avenue bridges. These additional elements would occur along the Lower American River. A number of staging areas would also be developed on both sides of the Lower American River where existing vegetation would be disturbed.

Construction-Related Effects

Construction activities associated with Alternative 7 could result in the loss or temporary disturbance of up to 516 acres of common natural vegetation communities, such as nonnative annual grassland and ruderal vegetation (Table 7-11 and Plates 7.8-4a to 7.8-4d). This cover type is common locally and regionally, and loss as a result of construction of Alternative 7 would not be considered substantial on a local or regional basis. USFWS has recommended that the Corps ensure annual grasslands are reseeded on completion of the wing dams and dikes and the temporary construction bridge (U.S. Fish and Wildlife Service 2001b). The Corps has incorporated this recommendation as part of project description.

- Construction-related effects on common natural vegetation communities within the Lower American River under Alternative 7 are expected to be less than significant. No mitigation is required.

Construction activities would result in the loss or disturbance of 25.3 acres of oak woodlands, including 20.1 acres along the Lower American River and 5.2 acres in the Yolo Bypass. These effects are considered to be significant because oak trees and woodlands provide important habitat for special-status species that have declined substantially in extent.

- Construction-related effects on oak woodlands that would result under Alternative 7 would be significant. Implementation of Mitigation Measure V-7 would reduce these effects to a less-than-significant level.

Mitigation Measure V-7: Compensate for loss of 25.3 acres of oak woodlands. The Corps would compensate for the loss of oak woodlands by developing 88.6 acres of oak woodlands. The Corps has identified Egbert Tract in the lower portion of the Yolo Bypass as a mitigation site for the 17.7 acres of compensation associated with work in the Yolo Bypass. The Corps has also identified Rossmore Bar as a mitigation site for the 70.9 acres of compensation associated with work along the Lower American River.

Construction activities would directly affect 23.2 acres of seasonal freshwater emergent marsh, 11.3 acres of open water, 48.2 acres of riparian woodland, and 12.5 acres of rice. This includes loss of 6.3 acres as a result of strengthening levees along the Lower American River and 16.4 acres as a result of work in the Yolo Bypass.

The loss of seasonal freshwater marsh, open water, and rice would occur as a result of relocating irrigation ditches from the toe of the landside of the levees. The effect of the loss of this habitat is being addressed as part of the Section 7 consultation. A total of 141 acres of wetland-related habitat would be created at Egbert Tract to compensate for the loss of giant garter snake, delta smelt, and splittail habitat.

- The construction-related effect on riparian woodland under Alternative 7 is considered significant. Implementation of Mitigation Measure V-8 would reduce effects on streams, wetlands, and associated vegetation communities to a less-than-significant level.

Mitigation Measure V-8: Compensate for loss of 48.2 acres of riparian woodland. The Corps would compensate for the loss of riparian woodland by developing 49.8 acres of replacement riparian woodland. The Corps has identified Egbert Tract in the lower portion of the Yolo Bypass as a mitigation site for the 18 acres of compensation associated with work in the Yolo Bypass. The Corps has also identified Mississippi Bar as a mitigation site for the 31.8 acres of compensation associated with work along the Lower American River.

The Corps would also avoid disturbing seasonal wetlands and riparian vegetation to the extent feasible during construction. Fencing and nondisturbance buffers would be

installed. Indirect effects would be avoided or minimized by following the BMP indicated in Mitigation Measures WQ-1 and WQ-2 for soil erosion, grading, and other earth-moving practices and by retaining natural hydrologic connections during construction. Additional avoidance and minimization measures, including the location of fencing and width of buffer areas, would be determined in consultation with the Corps, CVRWQCB, and DFG.

Effects on special-status plant species would be the same as discussed in Alternative 3.

Operation-Related Effects

Potential operation-related effects on vegetation under Alternative 7 would include an increased objective release of 180,000 cfs, which could affect vegetation as a result of higher velocity flows.

Potential inundation-related effects are expected to be similar to the operation-related effects described for Alternative 5.

- Operation-related effects on vegetation on the Lower American River and Yolo and Sacramento Bypasses that would result under Alternative 7 are anticipated to be less than significant.

7.8.11 Alternative 8: Stepped Release Plan to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

The construction- and operation-related effects on vegetation under Alternative 8 would be the same as discussed under Alternatives 3 and 5.

7.8.12 Alternative 9.0: Ecosystem Restoration Alternatives

Alternative 9.1: Urrutia Restoration Site

Construction-Related Effects. The proposed restoration activities at the 251-acre Urrutia site could potentially result in direct and cumulative effects on vegetation. Ten acres of non-native invasive plant species will be removed by herbicide or mechanical means. Restoration would create or enhance 55 acres of riparian forest, construct 4.5 acres of low level bank benches that will be planted with emergent wetland species; and terrace 21 acres of steep banks. Approximately 120.5 acres will be restored. Irrigated container stock, cuttings, plugs, and native seed mixes would be used to establish vegetation at the site.

Alternative 9.1 would establish or enhance native vegetation in areas that are poorly vegetated or dominated by ruderal and nonnative invasive species, such as annual grasses, star thistle, cocklebur, fennel, and pepperweed. Ruderal and nonnative plant communities in general have little ecological value, and their replacement with native plant species is considered a beneficial effect on habitat functions and values. Existing vegetation would be directly removed where site grading, soil preparation, and planting would occur.

Construction may remove up to 4.4 acres of cottonwood and mixed riparian forest and scrub. Many of these stands are currently in a degraded state because of senescence, unsuitable hydrologic conditions, lack of regeneration, or invasion of nonnative species. Most existing stands of riparian vegetation would be retained, including 5.84 acres of cottonwood riparian forest south and west of the Urrutia Pond. Approximately 2.15 acres of riparian vegetation that may be removed are located along the steep, eroding right bank of the Lower American River. This stand currently provides a small amount of cover. The remainder of the restoration activities involve site-specific, targeted, nonnative plant removal and in-planting of native species.

- The effects on vegetation during construction are considered less-than-significant and no mitigation is required. Alternative 9.1 would remove primarily ruderal and nonnative vegetation that are common to disturbed and degraded habitats along the Lower American River and other disturbed environments in the vicinity. The removal of a small amount of native vegetation is considered a short-term, less-than-significant effect that would be far outweighed by the long-term beneficial effects of restoring and enhancing native vegetation communities and ecological functions on the site.

Operation-Related Effects. Project operations that may affect vegetation include ongoing monitoring- and maintenance-related activities, such as watering, seasonally establishing irrigation lines, weeding with tools or herbicide applications, pruning tree limbs, and replacing individual plants that have died. Regular maintenance is scheduled for the first 5 years of the project and then generally would be conducted as needed for the remaining 45 years of the project life. Once plants mature and become established, irrigation, weeding, and individual plant replacement would no longer be required on a regular basis, but may be conducted as part of general vegetation management actions within the Lower American River Parkway.

- Operation-related effects on vegetation are expected to be less than significant, and no mitigation is required.

Alternative 9.2: Woodlake Restoration Site

Habitat restoration would directly affect 108 acres of the 283-acre Woodlake site, or about 38 percent of the area. Restoration would create or enhance 16 acres of riparian forest, 25 acres of oak woodlands and savanna, 16 acres of valley oak riparian forest, and 50 acres of grassland. In addition, lowering one 1-acre section of berm adjacent to the Lower American River would reestablish hydrologic connections for 5.5 acres of seasonal wetland habitat, but no planting would occur at this location. Irrigated container stock and native seed mixes would be used to establish vegetation at the site by hand planting. Most of the grassland would be drill-seeded following nonnative plant removal. Nonnative removal methods may include excavation and/or herbicides.

Alternative 9.2 would establish or enhance native vegetation in areas dominated by ruderal and nonnative invasive species, such as annual grasses, star thistle, cocklebur, fennel, and pepperweed. Ruderal and nonnative plant communities in general have little ecological value, and their replacement with native plant species is considered a beneficial effect on habitat

functions and values. Existing vegetation would be directly removed where site grading, soil preparation, planting, herbicide spraying, and controlled burning would occur. Approximately 17 acres would be graded, which includes all areas that would be restored as riparian forest and the berm removal to reestablish hydrologic connections in existing seasonal wetlands.

Construction may remove up to 3 acres of poor quality, degraded cottonwood and mixed riparian forest and scrub along the drainage channel at the east end of the site. A portion of this area includes habitat situated on steep banks along the Lower American River. These stands are currently in a degraded state because of senescence, unsuitable hydrologic conditions, lack of regeneration, or invasion of nonnative species. Existing stands of native woody vegetation within the grassland restoration area would be retained, including 3.62 acres of riparian scrub, mixed riparian forest, and other mature trees. Implementation would also convert about 60 acres of star thistle and other nonnative-dominated grasslands to native and nonnative grass and forb species that are less invasive and provide greater habitat values. The remainder of the restoration activities involve site-specific, targeted nonnative plant removal and in-planting of native species.

- The effects on vegetation during construction are considered less than significant and no mitigation is required. Alternative 9.2 would remove primarily ruderal and nonnative vegetation that are common to disturbed and degraded habitats along the Lower American River and other disturbed environments in the vicinity. The removal of a small amount of native vegetation is considered a short-term, less-than-significant effect that would be far outweighed by the long-term beneficial effects of restoring and enhancing native vegetation communities and ecological functions on the site.

Operation-Related Effects. Project operations that may affect vegetation include ongoing monitoring- and maintenance-related activities, such as watering, seasonally establishing irrigation lines, weeding with tools or herbicide applications, pruning tree limbs, and replacing individual plants that have died. Regular maintenance is scheduled for the first 5 years of the project and then generally would be conducted as needed for the remaining 45 years of the project life. Once plants mature and become established, irrigation, weeding and individual plant replacement would no longer be required on a regular basis but may be conducted as part of general vegetation management actions within the Lower American River Parkway. Grassland restoration may require periodic treatments of controlled burns, herbicide applications, or other measures to control the reestablishment of nonnative species.

- Operation-related effects on vegetation are expected to be less than significant, and no mitigation is required.

Alternative 9.3: Bushy Lake Restoration Site

Construction-Related Effects. Restoration would directly affect 125 acres of the 337-acre Bushy Lake site, or about 37 percent of the area. Restoration would create or enhance 1.75 acres of natural channel planted with native emergent wetland species, 18 acres of a wetland, 17 acres of riparian forest, 10 acres of open water; 70 acres of oak woodland or savanna, 8 acres of riparian forest/seasonal wetland/shallow aquatic habitat, 3.75 acres of shallow aquatic habitat,

and a 60 acre storage wetland. Irrigated container stock, cuttings, plugs, and native seed mixes would be used to establish vegetation at the site.

Alternative 9.3 would establish or enhance native vegetation in areas primarily dominated by ruderal vegetation, nonnative invasive exotic species, such as star thistle, cocklebur, fennel, and pepperweed, and degraded riparian forest and woodland communities. Ruderal and nonnative plant communities in general have little ecological value, and their replacement with native plant species is considered a beneficial effect on habitat functions and values. Existing vegetation would be directly removed where site grading, soil preparation, and planting would occur. Approximately 54.5 acres would be graded, which includes all areas that would be restored as shallow aquatic habitat, seasonal wetlands, riparian forest, and natural channel. On the margins of Bushy Lake and along the right bank of the Lower American River, up to 33.1 acres of existing riparian forest, scrub, and woodland would be removed. Dominated by cottonwood, willow, valley oak, and ash, these stands are currently in a degraded state, lack of regeneration, fire, or invasion of nonnative species. Current hydrologic conditions are such that the stands are unlikely to be sustained or regenerate if no action is taken. The remainder of the restoration activities involve site-specific, targeted nonnative plant removal and in-planting of native species.

- The effects on vegetation during construction are considered less than significant and no mitigation is required. Alternative 9.3 would remove primarily ruderal and nonnative vegetation that are common to disturbed and degraded habitats along the Lower American River and other disturbed environments in the vicinity. The removal of a small amount of native vegetation is considered a short-term, less-than-significant effect that would be far outweighed by the long-term beneficial effects of restoring and enhancing native vegetation communities and ecological functions on the site.

Operation-Related Effects. Project-operations that may affect vegetation include ongoing monitoring- and maintenance-related activities, such as watering, seasonally establishing irrigation lines, weeding with tools or herbicide applications, pruning tree limbs, and replacing individual plants that have died. Regular maintenance is scheduled for the first 5 years of the project and then generally would be conducted as needed for the remaining 45 years of the project life. Once plants mature and become established, irrigation, weeding, and individual plant replacement would no longer be required on a regular basis but may be conducted as part of general vegetation management actions within the Lower American River Parkway.

- Operation-related effects on vegetation are expected to be less than significant, and no mitigation is required.

Alternative 9.4: Arden Bar Restoration Site

Construction-Related Effects. The proposed restoration activities at the 280-acre Arden site could potentially result in direct and cumulative effects on vegetation. Restoration would create or enhance 31 acres of riparian forest, 25 acres of oak savanna, remove 110 acres of non-native invasive species, and construct 1.5 acres of low level bank benches with native emergent wetland species. Approximately 167.5 acres will be restored. Irrigated container stock and

native seed mixes would be used to establish vegetation at the site. Existing vegetation would be directly removed where site grading, soil preparation, and planting would occur. Approximately 39.75 acres would be graded, which includes all areas that would be restored as emergent wetland, shallow aquatic habitat, riparian forest, high-flow bypass channel, and willow scrub. The remainder of the restoration activities involves site-specific, targeted nonnative plant removal and in-planting of native species.

Alternative 9.4 would establish native vegetation on poorly vegetated cobbles and unvegetated deep-water habitat in Arden Pond. The remaining affected areas are primarily dominated by ruderal vegetation on cobbles, patches of star thistle and red sesbania, and degraded stands of cottonwood and mixed riparian forests, willow scrub, and oak woodland that have large components of nonnative species. Ruderal and nonnative plant communities in general have little ecological value, and their replacement with native plant species is considered a beneficial effect on habitat functions and values.

Operation-Related Effects. Project operations that may affect vegetation include ongoing monitoring- and maintenance-related activities, such as watering, seasonally establishing irrigation lines, weeding with tools or herbicide applications, pruning tree limbs, and replacing individual plants that have died. Regular maintenance is scheduled for the first 5 years of the project and then generally would be conducted as needed for the remaining 45 years of the project life. Once plants mature and become established, irrigation, weeding, and individual plant replacement would no longer be required on a regular basis but may be conducted as part of general vegetation management actions within the Lower American River Parkway.

- Operation-related effects on vegetation are expected to be less than significant, and no mitigation is required.

Alternative 9.5: Fisheries Restoration

- Construction and operation of Alternative 9.5 would not affect vegetation.

7.9 Wildlife

7.9.1 Introduction

This section discusses the methods and results of the analysis of potential construction- and operation-related effects on wildlife resources under the project alternatives.

7.9.2 Methods and Assumptions

This assessment is based in part on previous environmental documents that were prepared for Sacramento area flood protection measures. In addition, current information on the status and distribution of special-status wildlife species was used. Potential effects on special-status wildlife were assessed based on known occurrences or the likelihood that suitable habitat would be affected. Information used in developing this analysis includes:

- The American and Sacramento River, California Project: Geomorphic, Sediment Engineering, and Channel Stability Analyses (Ayres Associates 1997).
- The Program Environmental Impact Report on Flood Control Improvements along the Main Stem of the American River (Jones & Stokes 2000a) (PEIR).
- The American River Watershed Project, California Final Supplemental Environmental Impact Statement/Environmental Impact Report, Part II (U.S. Army Corps of Engineers, et al. 1996).

This section identifies those potential impacts that could affect species that are listed as threatened or endangered under the Federal ESA and State CESA. A BDR was also prepared for the project that addresses potential effects of the alternatives under evaluation on wildlife species listed and proposed for listing under the Federal ESA and State CESA. For French Meadows Reservoir, Folsom Reservoir, Lower American River, and areas downstream in the Sacramento River and Yolo Bypass, the listed species of concern include valley elderberry longhorn beetle (VELB), vernal pool tadpole shrimp, vernal pool fairy shrimp, giant garter snake, California red-legged frog, Swainson's hawk, and bank swallow.

The BDR identifies the occurrence of these species and their habitats in areas to be affected by project activities. The BDR also identifies mitigation measures or other actions that could avoid or minimize effects if incidental take, as defined under the ESA regulations were to occur. The BDR is designed to provide the project sponsors with sufficient information to prepare a BA for consultation with the Service and NMFS under Section 7 of the Federal ESA and with the DFG under the CESA.

It is assumed that following the selection of a preferred action, a detailed BA would be prepared and formal consultation with the Service, NMFS, and DFG would be conducted. These agencies would then issue BOs that identify the allowable incidental take (if any) that may occur from the project, and stipulate reasonable and prudent measures required to be implemented to reduce significant effects.

7.9.3 Criteria for Determining Significance

Adverse effects on wildlife are considered significant if they would result in any of the following:

- Direct or indirect reduction in the growth, survival, or reproductive success of species listed or proposed for listing as threatened or endangered under the Federal ESA.
- Direct or indirect reduction in the growth, survival, or reproductive success of substantial populations of Federal species of concern, State-listed endangered or threatened species, or species of special concern, or regionally important species.
- Substantial reduction in the quality and quantity of important habitat or access to such habitat for these species.

- Substantial net loss of important wildlife habitat over the project life compared to the existing conditions.

7.9.4 Alternative 1: No-Action Alternative

Alternative 1 does not include construction or operation of new flood control improvements. No changes in wildlife habitat or species abundance would occur.

7.9.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Construction required to enlarge the spillway at L. L. Anderson Dam would include blasting and excavation activities that could disturb resident wildlife populations. The effects would be limited to resident bird species that may have active nests during the construction period. No direct effects to other terrestrial wildlife would occur because the disturbance area is a bedrock channel. Previous surveys indicate that the area has suitable habitat for California spotted owl and northern goshawk. Construction activities would be conducted in a manner to reduce potential disturbances during the breeding season for California spotted owl and northern goshawks (March 1 to August 31).

- Construction could temporarily disturb nesting raptors in the area. This effect is considered significant because it could cause raptors to abandon nests. Loss of nests or eggs of raptors as a result of tree removal associated with construction would be a violation of Sections 3503 and 3503.5 of the California Fish and Game Code and would be considered a significant effect. To reduce this effect to a less-than-significant level, Mitigation Measure W-1 would need to be implemented.
- **Mitigation Measure W-1: Conduct preconstruction raptor survey near L. L. Anderson Dam.** To reduce these effects to a less than significant level, the Corps would conduct surveys for nesting raptors prior to construction of spillway improvements. Surveys would be conducted between March 1 and August 15. If an active nest were located near the construction area, the Corps would consult with the Tahoe National Forest to determine the appropriate no-disturbance buffer around the nest site until the young have fledged.

To avoid effects to cliff swallows on the underside of the spillway bridge, nesting activity would be monitored prior to and during construction and nests would be removed to prevent nesting and egg laying, or netting would be installed to prevent nest building.

- Construction of the L. L. Anderson spillway would result in a less-than-significant effect on cliff swallows because habitat removal would be minimal.

Folsom Reservoir and Lower American River. Construction-related effects would include the removal of nonnative annual grassland and ruderal area and potential removal of oak woodland. Habitat loss would result from the movement of construction equipment to raise the

dams and dikes and from the resulting greater width of the base of these structures. Habitat would also be lost at staging areas and at the Mississippi Bar borrow site.

The wing dams and dikes are faced with large diameter roots and boulders and are generally steep. These characteristics are not conducive to wildlife migration. The dikes are not continuous around the perimeter of Folsom Reservoir and are separated by oak woodland and grasslands. These natural areas provide access routes for large and small animals to the reservoirs edge. The construction of the 3.5-foot floodwalls on the wing dams and dikes are not expected to adversely affect wildlife movement or migration because animals do not currently use the wing dams and dikes as migration paths and access to the reservoir would be maintained through open space areas.

The Folsom Reservoir area provides suitable foraging and/or nesting habitat for special-status raptors including osprey, white-tailed kite, bald eagle, sharp-shinned hawk, Cooper's hawk, and ferruginous hawk. In most cases, the construction areas at the dam, dikes, staging areas, and borrow sites have been disturbed previously and do not provide high-quality habitat for these species. Nonnative grassland and ruderal areas that would be lost are considered common communities both locally and regionally, while oak and riparian woodlands are considered important habitat areas.

- Construction associated with raising embankment dams and dikes could temporarily disturb nesting raptors in the area. This effect is considered significant because it could cause raptors to abandon nests. Implementation of Mitigation Measure W-2 would reduce this impact to a less-than-significant level.

Mitigation Measure W-2: Conduct preconstruction raptor surveys. To reduce these effects to a less than significant level, the Corps would conduct preconstruction surveys for nesting raptors near construction sites. Surveys would be conducted within a 0.5-mile radius of construction areas, staging areas, and borrow sites, where there is suitable nesting habitat. If an active nest is located near the construction area, California Department of Water Resources (DWR) would consult with DFG to determine the appropriate no-disturbance buffer around the nest site until the young have fledged. If raptor nests are identified in trees that are to be removed, these trees would be removed between August 15 and March 1.

The VELB, a species Federally-listed as threatened, is known to occur in areas affected by this alternative. Construction of the temporary construction bridge could directly affect approximately 21 elderberry shrubs within the alignment.

- Because elderberry shrubs provide potential habitat for the Federally-listed VELB, this would be considered a significant effect. Implementation of Mitigation Measure W-3 would reduce this effect to a less-than-significant level.

Mitigation Measure W-3: Compensate for loss of elderberry shrubs. To reduce this effect to a less-than-significant level, the Corps would compensate for the loss of elderberry shrubs that cannot be avoided. This may include transplanting shrubs to a conservation area according to the Service's Conservation Guidelines (U.S. Fish and

Wildlife Service 1999). Additional elderberry seedlings and associated native plants may also be planted in the conservation area according to the guidelines. Potential mitigation may occur at the oak woodland mitigation sites.

Operation-Related Effects

Under Alternative 2, the maximum design flood control pool elevation would be increased from 474 to 478 feet. Inundation is not expected to result in substantial mortality of vegetation because of the inherent tolerance level of many species, the predicted short duration of inundation, and the low probability of frequent inundation and because inundation would most likely occur during the winter months when many species are either dormant or have low biological activity. Available data indicate that reservoir elevation would exceed existing conditions only during extreme flood events (100-year or greater flood events) and that inundation above current levels would last 1 to 3 days.

- Operation-related effects on previously disturbed areas, wetlands, grasslands, and riparian areas that provide habitat for common and special-status wildlife species associated with infrequent flood storage at a higher water surface elevation are considered less than significant.
- Operation-related effects associated with infrequent flood storage at a higher water surface elevation on blue oak-foothill pine woodlands, oak woodlands, and chaparral that provide habitat for common and special-status wildlife species are considered less than significant.
- Operation-related effects on elderberry shrubs and VELB associated with infrequent flood storage at a higher water surface elevation are considered less than significant.
- Inundation of tributaries to Folsom Reservoir and tributary streams of the Upper American River as a result of increased flood capacity could result in the brief and infrequent inundation of potential, but unoccupied habitat for California red-legged frog. Because this effect is temporary, infrequent, and not likely to substantially affect vegetation and because the species is not expected to occur in the area, this effect is less than significant.
- Inundation of tributaries to Folsom Reservoir and tributary streams of the Upper American River as a result of increased flood capacity could result in the brief and infrequent inundation of potential, but unoccupied habitat for foothill yellow-legged frogs. Because this effect is temporary, infrequent, and not likely to substantially affect vegetation and because the species is not expected to occur in the area, this effect is less than significant.
- Brief and infrequent inundation of potential, but unoccupied habitat for California horned lizards is unlikely to have a substantial effect on the local population and is considered less than significant.

7.9.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction- and Operation-Related Effects

Construction activities required to raise Folsom Dam and associated wing walls and dikes would disturb additional areas. In addition to the effects associated with construction of the temporary bridge, an additional 19 elderberry shrubs could be directly affected as a result of constructing wing dams and dikes. Surveys indicate there are 22 elderberry bushes within the borrow site. However, excavation activities would be conducted to avoid all vegetation, including elderberry shrubs. Other construction-related and operation-related effects would be the same as those discussed under Alternative 2.

7.9.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Construction- and Operation-Related Effects

Although construction areas and areas briefly inundated during infrequent flood events would be slightly greater, the effects on wildlife associated with construction and operation of Alternative 4 would be essentially identical to those discussed under Alternative 3.

7.9.8 Alternative 5: Stepped Release to 160,000 cfs

Construction-Related Effects

Under Alternative 5, construction-related activities along the Lower American River would occur on the landside of the levee between the NEMDC and the confluence with the Sacramento River. These areas support minor amounts of habitat for VELB and various bird species, including the State-threatened Swainson's hawk, which could be affected by construction activities.

- Construction associated with improving facilities along the Lower American River and Sacramento and Yolo Bypasses could temporarily disturb nesting raptors. This is considered significant because it could cause raptors to abandon nests. Loss of nests or eggs of raptors as a result of tree removal associated with construction would be a violation of Sections 3503 and 3503.5 of the California Fish and Game Code and would be considered a significant effect. Implementation of Mitigation Measure W-2 would reduce the effect to a less-than-significant level.

Construction associated with improving facilities and levees along the Lower American River could directly affect three elderberry shrubs. Recent surveys indicate that no elderberry shrubs are located within the affected areas of the Sacramento Weir or Yolo Bypass.

- Because elderberry shrubs provide potential habitat for the Federally-listed VELB, this would be considered a significant effect. Implementation of Mitigation Measure W-3 would reduce the effect to a less-than-significant level.

Burrowing owls may be present at construction sites, particularly in the Sacramento and Yolo Bypass areas. Burrowing owls are susceptible to mortality during construction because they nest underground during daylight hours.

- Loss of western burrowing owls would be considered a significant effect because they are rare in the region. Implementation of Mitigation Measure W-4 would reduce this effect to a less-than-significant level.

Mitigation Measure W-4: Conduct preconstruction burrowing owl surveys. To minimize direct mortality to burrowing owls, wildlife biologists would conduct breeding season surveys and wintering season surveys. Preconstruction surveys during the wintering season consist of visually checking all potential habitat in areas where ground-disturbing activities would occur. Because adult burrowing owls can occupy burrows year-round, DFG mitigation guidelines for burrowing owls would be implemented before initiating construction activities in potential burrowing owl habitat.

Qualified wildlife biologists would conduct preconstruction surveys for burrowing owls within 1 to 2 weeks of construction activities. The guidelines require that one-way doors be installed at least 48 hours before construction at all active burrows that exist within the construction area so that the burrows are not occupied during construction activities. The one-way doors would be installed at that time to ensure the owls can get out of the burrows and cannot get back in. The guidelines also require the installation of two artificial burrows for each occupied burrow that is removed. Artificial burrows would be constructed prior to the installation of one-way doors.

During the breeding season, preconstruction surveys would consist of visually checking all potential habitat within 250 feet of construction activities. If they found any active burrowing owl nests, biologists would establish a 250-foot buffer zone around the active burrow. No construction activities would be permitted within the specified buffer zone until after the breeding season, between February 1 and August 31, or until it is determined that young have fledged.

Construction activity in the Yolo and Sacramento Bypasses could result in loss or disturbance of giant garter snakes or their habitat.

- This would be considered a significant effect because this species is a Federally-listed threatened species. Implementation of Mitigation Measure W-5 would reduce this effect to a less-than-significant level.

Mitigation Measure W-5: Avoid and minimize loss of giant garter snake habitat. Using information acquired from the field survey, consult with the Service concerning potential effects and appropriate mitigation for the giant garter snake. Mitigation could include restoration and/or replacement of giant garter snake habitat. Avoidance measures include using silt fencing and protective mats, preventing runoff, providing worker awareness training, avoiding construction within 200 feet from the banks of aquatic habitat, and confining construction activity within habitat to the time period between May 1 and October 1. Replacement measures would include creating, maintaining, and

monitoring habitat for giant garter snakes. To compensate for the loss of habitat, the Corps would create 141 acres of wetlands at Egbert Tract, located at the south end of the Yolo Bypass.

Operation-Related Effects

As described in Section 7.8, “Vegetation,” operation of Alternative 5 would not result in substantial changes in the effect to vegetation along the Lower American River or the Sacramento and Yolo Bypasses. Therefore, operation of Alternative 5 would have a less-than-significant effect on wildlife or wildlife habitat in these areas.

7.9.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Construction- and Operation-Related Effects

This alternative is essentially identical to Alternative 5 except that it would also entail the construction of a new outlet and other relatively minor modifications at Folsom Dam. Construction of a new outlet at Folsom Dam would not adversely affect wildlife because no substantial habitat areas would be affected. Construction- and operation-related effects would be the same as described for Alternative 5.

7.9.10 Alternative 7: Stepped Release to 180,000 cfs

Construction-Related Effects

This alternative is essentially identical to Alternative 5 except that it would also entail raising additional levees and raising bridges that cross the Lower American River. Construction activities along the Lower American River could directly affect about 137 elderberry shrubs and associated VELB habitat. No elderberry shrubs would be affected on the Sacramento Weir or Yolo Bypass. Therefore, construction- and operation-related effects would be greater than described for Alternative 5.

The roadway and pedestrian bridges and the UPRR Bridge located along the Lower American River provide habitat for cliff swallows that may be affected by construction activities.

- Construction activities associated with bridge and railroad trestle modifications could affect cliff swallows by removing nests or harming eggs. This impact is considered significant, and implementation of Mitigation Measure W-6 would reduce the impact to a less-than-significant level.

Mitigation Measure W-6: Examine bridges for use by cliff swallows. Bridges and the railroad trestle should be examined for evidence of swallow use. If evidence of use is found, the following measures would be implemented:

- Nests should be removed before March 1. After nest removals, the underside of the bridge should be covered with 0.5- to 0.75-inch mesh net or poultry wire or similar

material. All net installation should occur before March 1. The netting would be anchored so that swallows could not attach their nests to the bridge through gaps in the net.

- If steps are taken to prevent swallows from constructing new nests, then work may proceed at any time of the year. To avoid damaging active nests, they would be washed down before the laying of eggs occurs. A permit from DFG and the Service is required if active nests are to be removed.
- If netting of the bridge does not occur by March 1 and cliff swallows substantially colonize the bridge, modifications to the bridge should not begin before September 1 or until it is determined that all the young have fledged.

Construction associated with raising and strengthening levees and construction of new levees and floodwalls along the Lower American River could disturb active nesting colonies of bank swallows. Three nesting colonies have been documented between 1989 and 1995 along the Lower American River (California Natural Diversity Database 2000).

- Disturbance to nesting colonies of bank swallows is considered a significant effect. To reduce this effect to a less-than-significant level, implement Mitigation Measure W-7.

Mitigation Measure W-7: Conduct preconstruction bank swallow survey. Conduct preconstruction surveys for active nesting colonies of bank swallows along the Lower American River where construction activities would occur. If colonies are located and could be affected by construction activities, defer all or a portion of construction within 0.25 mile of the colonies until after August 1. If a colony is discovered after construction is initiated, an 800-foot buffer should be implemented, and the colony should be monitored by a qualified biologist to determine if construction is affecting nesting success. DFG should be notified if historically active nest sites would be removed during construction.

Operation-Related Effects

Operation of Alternative 7 would not result in substantial changes in the effect to vegetation along the Lower American River and the Sacramento and Yolo Bypasses. Therefore, operation of Alternative 5 would have a less-than-significant effect on wildlife or wildlife habitat in these areas.

7.9.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction- and Operation-Related Effects

Effects on wildlife by constructing and operating Alternative 8 would be the same as described for Alternatives 3 and 5.

7.9.12 Alternative 9.0: Ecosystem Restoration Alternatives

Alternative 9.1: Urrutia Restoration Site

Construction-Related Effects. The proposed restoration activities have the potential to result in construction-related effects on wildlife within the Urrutia site. Construction activities associated with habitat restoration would affect approximately 60 percent of the 251-acre area. Removal or conversion of existing wildlife habitats has the potential to temporarily displace wildlife species and restoration construction may disturb any animals within the site.

Construction of Alternative 9.1 would result in the loss of 1.55 acres of young cottonwoods located in a small seasonal overflow from Bannon Slough. This area would be graded to repair active gully erosion within the drainage, and the cottonwoods would be replaced with riparian forest habitat. It is possible that migratory or resident birds use these trees and may be impacted during construction activities. To avoid impacts to these species and comply with the Migratory Bird Treaty Act, construction should be conducted out of nesting season (February 15–August 15) or following surveys to determine presence of nesting birds. Also, these trees may currently be used by raptors for perching. However, the stand is relatively small in size and the trees are young and have not formed a mature stand that is preferred by raptors and other wildlife.

The steep edges of the pond would be graded to create a more sloping bank. The result of this structural change would be a reduction in open water habitat from 62.36 acres to 28.97 acres. Currently, the open water habitat in deeper areas within the pond is used for resting by gulls and diving ducks, and the shallower edges are used by dabbling ducks for feeding and resting. However, the use of this habitat is restricted due to the sparse vegetation around the edges of the pond caused by compacted and disturbed soils. The proposed regrading and reestablishment of vegetation would produce a complex of emergent wetland, riparian forest, and seasonal wetland habitats to transition from upland areas to open water habitat. The loss of open water habitat would be offset by the benefits from establishing these habitats because they provide a buffer and vegetative cover that is currently absent around the pond. The resulting usable habitat would approximate the amount of low-quality habitat that exists under current conditions.

Noise and human disturbance associated with construction activities would render the shallow water and open water habitats within the pond unusable during the construction period. However, alternative, higher-quality habitat exists in adjacent sites. In addition, the construction would occur for a relatively short period, and the resulting improvements to the open water and adjacent habitats would benefit the species far more than maintenance of current conditions.

Construction associated with restoration activities proposed near mature cottonwood stands may disturb wildlife in those areas. In addition, any losses of mature trees may result in loss of habitat or disturbance to roosting raptors. Implementation of Mitigation Measure W-2, as previously described, including raptor surveys and protection zones should adequately protect these species during construction. In addition, raptors are able to use a larger, more valuable ruderal or nonnative grassland area nearby during the relatively short construction period. Also, this site is already impacted by human disturbance in and around the remaining mining operation

and the riparian forest near the bike path and Garden Highway. Any wildlife on site would have likely become accustomed to human presence near these areas and may not be disturbed by construction noise as much as those located in fairly isolated sites. The benefits gained from the creation of larger, more contiguous forest habitat areas would benefit these species when implemented and established.

The steep banks along the American River would also be graded to a more sloping topography. A mosaic of riparian forest (60 percent), seasonal wetland (20 percent), and shallow aquatic (20 percent) habitats would be established along the river to allow water movement in and out of the pond. Grading of the banks may impact active nesting colonies of bank swallows. A preconstruction survey, including proper mitigation measures as previously described in Mitigation Measure W-6, should be followed to provide adequate protection of this species during restoration activities.

Construction activities may impact elderberry plants, which provide potential habitat for the Federally-listed VELB. These plants are common throughout the Lower American River, and impacts to these plants should be avoided or mitigated as previously described in Mitigation Measure W-3.

- Due to the relatively-short construction period, the degraded conditions that currently exist on the Urrutia site, and with the implementation of mitigation measures previously-mentioned, the effects of restoration on wildlife are expected to be reduced to a less-than-significant level. Improvements to the site from restoration activities are expected to dramatically increase the habitat functions and values for wildlife.

Operation-Related Effects. Areas where trees and seeds are planted may be irrigated to assist in the growth or naturalization of native species. These irrigation systems would be maintained for up to 5 years and would require ongoing maintenance, including, but not limited to weeding, excavation associated with minor repairs, monitoring equipment, and replacing pipes or driplines.

- Operation-related effects are expected to be less than significant on wildlife, and no mitigation is required.

Alternative 9.2: Woodlake Restoration Site

Construction-Related Effects. Construction activities associated with habitat restoration would affect approximately 25 percent of the 283-acre area. Removal or conversion of existing wildlife habitats has the potential to temporarily displace wildlife species, and restoration construction may disturb any animals within the site.

Approximately 50 acres would be converted to native grasslands (95 acres). This area currently provides nonnative grassland/ruderal habitat that supports populations of small and medium mammals and provides a substantial prey base for raptors. Restoration activities include removal of invasive exotic plant species and drill seeding. Although construction may

temporarily disturb these species, an increase in the habitat values from a change to more native species would be much more beneficial than the maintenance of current conditions.

The drainage channel at the east end of the site would be graded and converted to 4.5 acres of riparian forest. Grading of this area is not expected to affect any wildlife species if conducted during the dry season.

An area of abandoned hayfield directly south of the bike trail and urban drainage channel and its adjacent high-quality riparian forest and wetland habitats would be converted to oak woodland savanna and riparian forest. This area currently offers habitat for small mammals and foraging habitat for raptors. The establishment of a wider riparian forest corridor, as well as a transition to oak Savannah, would provide more diversity of vegetation structure and plant species composition that would provide high-quality habitat for small and medium mammals and birds and travel corridors for the larger mammals such as deer and coyote.

One seasonal wetland near the river channel would be reconnected with water flows by lowering the berm adjacent to the river. Construction along the bank of the river that would be needed to adjust the height of the berm may impact bank swallow nesting colonies if any are present on site. A preconstruction survey, including proper mitigation measures as previously described in Mitigation Measure W-6, should be followed to provide adequate protection of this species during restoration activities.

Loss of grassland habitat and the construction activities associated with it may disturb or impact small and medium mammal species and raptors or passerine bird species that use this grassland. However, the presence of similar alternative habitats nearby would facilitate avoidance of construction activities. In addition, to avoid impacts to migratory bird species and comply with the Migratory Bird Treaty Act, construction should be conducted out of nesting season (February 15–August 15) or following surveys to determine presence of nesting birds. The relatively small amount of habitat lost, increased habitat diversity, and increased habitat values gained from the restoration of existing ruderal habitat should provide long-term benefits for these species.

Construction of the proposed project would result in the loss of a portion of acres of mixed low quality riparian forest and low quality riparian scrub. These trees may currently be used by raptors and other avian species for perching, nesting, and foraging. However, the relative area lost is very small compared to similar available habitat in other areas on site, and the resulting habitat diversity and complexity would benefit the species that use this area. Construction disturbance would be short in duration, and similar alternative sites are available nearby. In addition, the implementation of Mitigation Measure W-2, including raptor surveys and protection zones, should adequately protect these species during construction. Further, to avoid impacts to migratory bird species and comply with the Migratory Bird Treaty Act, construction should be conducted out of nesting season (February 15–August 15) or following surveys to determine presence of nesting birds. Construction activities may also impact elderberry plants, which provide potential habitat for the Federally-listed VELB. The elderberry plants are common throughout the Lower American River, and impacts to these plants should be avoided or mitigated as previously described in Mitigation Measure W-3.

- Due to the relatively short construction period and the suboptimal conditions of the abandoned hayfields that currently exist on the Woodlake restoration site and with the implementation of mitigation measures previously mentioned, the effects of restoration construction on wildlife are expected to be reduced to a less-than-significant level. Improvements to the site from restoration activities are expected to dramatically increase the habitat functions and values for wildlife.

Operation-Related Effects. Areas where trees and seeds are planted may be irrigated to assist in the growth or naturalization of native species. These irrigation systems would be maintained for up to five years and would require ongoing maintenance, including, but not limited to weeding, excavation associated with minor repairs, monitoring equipment, and replacing pipes or driplines.

Excavations related to connecting wetlands with the flows of the American River would be designed to be self-maintaining. However, it may be necessary to periodically maintain these connections to the river.

- Operation-related effects are expected to be less than significant on wildlife, and no mitigation is required.

Alternative 9.3: Bushy Lake Restoration Site

Construction-Related Effects. Construction activities associated with habitat restoration would affect approximately 37 percent of the 337-acre area. Removal or conversion of existing wildlife habitats has the potential to temporarily displace wildlife species, and restoration construction may disturb any animals within the site.

The use of heavy equipment to excavate material to restore the Bushy Lake basin to a more naturally functioning ecosystem may remove up to 16 acres of willow/cocklebur scrub. This scrub offers valuable habitat for wildlife, including foraging habitat and cover for avian and small to midsized mammal species. However, the value of this habitat is decreased because of the presence of invasive nonnative plants such as cocklebur. This area would be regraded and connected to Bushy Lake, providing open water seasonal and perennial wetland, mudflat and near shore habitat for waterfowl. Construction should be conducted outside of the migratory bird nesting season to avoid impacts to nesting birds in this habitat.

The small pine and cypress grove (0.68 acres) would be removed and replaced with the storage wetland. Although this area may currently be used by raptors for perching, it is small in size and the trees are not native to the Lower American River ecosystem. Raptors should be able to use adjacent, more suitable habitat during restoration construction and would benefit from the enhancement and addition of native riparian forest more than the maintenance of current conditions. Implementation of Mitigation Measure W-2, including raptor surveys and protection zones, should adequately protect these species during construction.

Nonnative tree and shrub species (2.3 acres) would be removed from the Picnic Island area of Bushy Lake. This area currently offers habitat for small and medium mammals and bird

species, including raptors. Potential impacts and mitigation measures are similar to those described for the pine and cypress grove and willow/cocklebur habitats.

Seedlings and native grass seed would be planted in the oak/walnut/elderberry savanna (moderate quality) to the south of Bushy Lake. A natural channel created from 1.75 acres of ruderal grassland, would lead from Bushy Lake southwest to the Lower American River. Construction could temporarily displace wildlife but is not expected to adversely affect wildlife because suitable habitat adjacent to the site is available.

This may disturb or remove elderberry shrubs, which provide habitat for the VELB. The presence of humans and equipment associated with this restoration activity may disturb wildlife species. However, the short duration of the construction and the resulting benefits from restoration of this habitat would benefit the wildlife species on site far more than maintenance of current conditions. Other wildlife species, including small and medium mammals and birds, should be able to use adjacent habitat during the short construction period. In addition, to avoid impacts to migratory bird species and comply with the Migratory Bird Treaty Act, construction should be conducted out of nesting season (February 15–August 15) or following surveys to determine presence of nesting birds. In addition, implementation of Mitigation Measure W-3 would sufficiently protect the VELB.

Steeper banks along the American River would be graded to establish a sloping bank with a mosaic of riparian forest (60 percent), seasonal wetland (20 percent), and shallow aquatic (20 percent) habitat. This would replace the existing 2.15 acres of oak/ash woodland that currently occupy the terrace directly adjacent to the river channel. Grading of the banks may impact active nesting colonies of bank swallows. A preconstruction survey, including proper mitigation measures as described in Mitigation Measure W-6, should be followed to provide adequate protection of this species during restoration activities.

Two small areas that contain exotic invasive plant species such as sweet fennel and yellow star thistle (1.28 acres) and black locust (0.5 acre) would be removed and replaced with oak woodland savanna. These habitats have little or no value for wildlife and removal of these plants is not expected to affect wildlife species.

- Due to the relatively short construction period and with the implementation of mitigation measures previously mentioned, the effects of restoration construction on wildlife are expected to be reduced to a less-than-significant level. Improvements to the site from restoration activities are expected to dramatically increase the habitat functions and values for wildlife.

Operation-Related Effects. Areas where trees and seeds are planted may be irrigated to assist in the growth or naturalization of native species. These irrigation systems would be maintained for up to 5 years and would require ongoing maintenance, including, but not limited to weeding, excavation associated with minor repairs, monitoring equipment, and replacing pipes or driplines.

The use of urban runoff would be monitored to ensure there is no effect on wildlife. Consistent with the Service's recommendations in the CAR, a monitoring and evaluation plan

would be implemented to ensure that contaminant-related problems are not created for water quality or fish and wildlife.

- Operation-related effects are expected to be less than significant on wildlife, and no mitigation is required.

Alternative 9.4: Arden Bar Restoration Site

Construction-Related Effects. The proposed restoration activities have the potential to result in construction-related effects on wildlife within the Arden Bar site. Construction activities associated with habitat restoration would affect approximately 29 percent of the 280-acre area. Removal or conversion of existing wildlife habitats has the potential to temporarily displace wildlife species, and restoration construction may disturb any animals within the site.

Construction of the proposed project would result in the loss of 30.46 acres of ruderal/upland habitat. This area would be converted into 21.27 acres of oak woodland savanna. The establishment of oak savanna would increase the diversity of vegetation structure and plant species composition and would provide high-quality habitat for small and medium mammals, migratory birds, and raptors and travel corridors for the larger mammals such as deer and coyote.

Two seasonal wetlands (totaling 0.65 acres) located northeast of the main pond would be reconnected to open water habitat located in the core of the pond. These activities may disturb wildlife, especially waterfowl, in the immediate area, but the availability of similar quality alternative habitat during this time is expected to facilitate avoidance of construction areas.

This restoration project proposes conversion of some open water habitat within the Arden Bar site to emergent wetland habitat (1.5 acres total), riparian forest (approximately 6.5 acres), and willow scrub (4.21 acres total) that are associated with a high flow bypass channel. This conversion would reduce the open water habitat from 33.8 acres to 16.50 acres. Disturbance to waterfowl and other birds that use this area would be limited to the short duration of construction. In addition, the resulting habitat complexes and waterways that would be established would provide more valuable habitat for these species than what is currently offered at this site. This construction may also disturb or remove elderberry shrubs, which provide habitat for the VELB. In addition, wildlife that use the grasslands or shrubs in the savanna may be disturbed by construction within this habitat type. Implementation of Mitigation Measure W-3 would sufficiently protect VELB. Other wildlife species, including small and medium mammals and birds, should be able to use adjacent habitat during the short construction period. In addition, to avoid impacts to migratory bird species and comply with the Migratory Bird Treaty Act, construction should be conducted out of nesting season (February 15–August 15) or following surveys to determine presence of nesting birds.

The two islands in the middle of the pond consisting of 0.65 acres of nonnative grasses and weedy species would be converted into one island of riparian forest (1.01 acres). Geese and ducks, especially mallards, use these islands for nesting. To avoid impacts to these species, construction activities should be conducted outside of the nesting season.

The steep banks along the American River would also be graded to a more sloping topography. Grading of the banks may impact active nesting colonies of bank swallows. A preconstruction survey, including proper mitigation measures as described in Mitigation Measure W-6, should be implemented to provide adequate protection of this species during restoration activities.

- Due to the relatively short construction period and the degraded conditions that currently exist on the Arden Bar site and with the implementation of mitigation measures previously mentioned, the effects of restoration on wildlife are expected to be reduced to a less-than-significant level. Improvements to the site from restoration activities are expected to dramatically increase the habitat functions and values for wildlife.

Operation-Related Effects. Areas where trees and seeds are planted may be irrigated to assist in the growth or naturalization of native species. These irrigation systems would be maintained for up to 5 years and would require ongoing maintenance, including, but not limited to weeding, excavation associated with minor repairs, monitoring equipment, and replacing pipes or driplines.

The natural channels that are excavated to help maintain a positive connection between the seasonal wetlands and core open water habitat of the pond would also need to be maintained. Ongoing maintenance activities may include excavation of the channels to remove sediment.

- Operation-related effects are expected to be less than significant on wildlife, and no mitigation is required.

Alternative 9.5: Fisheries Restoration

Construction-Related Effects. Construction-related changes associated with the proposed fisheries restoration activities would be limited to structural changes to Folsom Dam. In general, Folsom Dam is not used by wildlife. However, some bird species have used the dam. Implementation of Mitigation Measures W-1 and W-6, as previously described, including preconstruction surveys, should be followed to provide adequate protection.

- Due to the nature of the project and the lack of suitable habitat and with the implementation of mitigation measures previously mentioned, the effects of fisheries restoration on wildlife are expected to be reduced to a less-than-significant level.

Operation-Related Effects. Operation-related changes associated with the proposed fisheries restoration activities would be limited to slight changes in water temperatures in the Lower American River. These slight changes are not expected to have an effect on wildlife.

- Operation-related effects are expected to be less than significant on wildlife, and no mitigation is required.

7.10 Water Quality

7.10.1 Introduction

This section presents the methods and results for an analysis of potential effects on water quality from construction and operation of the project alternatives. Additional effects associated with potential changes in water temperatures are evaluated in Section 7.7, "Fisheries." Effects associated with the inundation and drawdown of water between 474 and 487 feet at Folsom Reservoir are also discussed in Section 7.2, "Geology, Seismicity, and Soils."

7.10.2 Methods and Assumptions

Effects on water quality that could result from construction activities were qualitatively evaluated based on the construction practices and materials to be used, the location and duration of the activities, and the potential for water-quality or beneficial-use degradation of project waterways. It is assumed that standard pollution prevention measures, including erosion and sediment control measures, good housekeeping, proper control of nonstormwater discharges, and hazardous spill prevention and response measures, would be implemented as part of the project design. These measures are also described in Chapter 5, "Flood Control Alternatives."

Effects on water quality were evaluated to determine if changes in reservoir operations would impair water quality by raising temperatures or increasing suspended sediment.

The following sources were used in evaluating the effects on water quality:

- Ayres Associates. 1997. Final Report American and Sacramento River, California Project: Geomorphic, Sediment Engineering, and Channel Stability Analyses. Report prepared for the U.S. Army Corps of Engineers, Sacramento District. Ayres Associates. Fort Collins, CO.
- Jones & Stokes. 2000a. Draft Program Environmental Impact Report on Flood Control Improvements Along the Mainstem of the American River. Volume I. April. Prepared for Sacramento Area Flood Control Agency. Sacramento, CA.
- U.S. Army Corps of Engineers, et al. 1996. Supplemental Information Report on the American River Watershed Project, California. Part I, Main report; Part II, Final supplemental environmental impact statement/environmental impact report. March. Sacramento, CA

7.10.3 Criteria for Determining Significance

Criteria for determining the significance of effects related to water quality were based in part on criteria contained in the 1996 Supplemental Environmental Impact Statement/ Supplemental Environmental Impact Report (SEIS/SEIR) for the American River Watershed Project. Construction activities would result in a significant effect on water quality if they would:

- substantially degrade surface-water quality such that it would violate criteria or objectives identified in the Central Valley Regional Water Quality Control Board (RWQCB) basin plan or otherwise substantially degrade water quality to the detriment of beneficial uses; or
- disturb existing channel banks, channel beds, or levees to the extent that accelerated erosion and sedimentation could occur.

Operation of the project alternatives would have a significant effect on water quality if they would:

- substantially degrade surface-water quality such that it would violate criteria or objectives identified in the RWQCB basin plan or otherwise substantially degrade water quality to the detriment of beneficial uses;
- disturb existing channel banks, channel beds, or levees to the extent that accelerated erosion and sedimentation could occur;
- result in increased probability that average water temperatures exceeding 70°F would be experienced at municipal supply intakes in Folsom Reservoir and the Lower American River; or
- result in the inability of a public water supplier to provide adequate treatment.

The following sections describe the activities, associated effects, and mitigation measures proposed for the project alternatives.

7.10.4 Alternative 1: No Action

Construction- Related Effects

Under Alternative 1, no new construction activities are expected to occur at Folsom Reservoir, the Lower American River, or the Yolo or Sacramento Bypasses that have not been previously evaluated. These construction activities include modifying the outlet works at Folsom Dam, increasing the surcharge storage at Folsom Reservoir to 474 feet , and constructing features of the “Common Elements” project, which includes strengthening levees along the Lower American River.

- No construction-related effects on water quality would occur under Alternative 1 because no new construction would occur.

Operation-Related Effects

On completion of the modifications to the Folsom Dam outlet works, it is expected that flood control operations at Folsom Dam would shift from the 400,000- to 670,000-acre-foot

flood rule curve to a 400,000- to 600,000-acre-foot flood rule curve. Changing flood control operations to a 400,000- to 600,000-acre-foot flood rule curve would increase the potential to fill Folsom Reservoir at the end of the flood season. When full, the reservoir's cold-water pool is maximized. Maximizing the reservoir's cold-water pool would reduce the extent and frequency of algae blooms and associated adverse effects on drinking water quality and allow enhanced management of water temperatures in the Lower American River, which can benefit anadromous fish.

- Operation of Alternative 1 could benefit drinking water and downstream water quality by more frequently maximizing Folsom Reservoir's cold-water pool.

7.10.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Increasing the capacity of the L. L. Anderson Dam spillway would require blasting, roadbuilding, and other ground-disturbing activities. All excavated material would be disposed of onsite and be stabilized. A temporary culvert crossing would be installed in the Middle Fork of the American River between the end of the spillway and the dam to allow transport of material from the lower portion of the spillway to the disposal site. Excavation of material from the spillway and reconstructing a temporary haul road from across the Middle Fork of the American River would result in the temporary disturbance of soil and may result in the discharge of sediment to the river. No discharge of sediment is expected to occur to French Meadows Reservoir because construction activities would occur when lake levels are low and most construction would occur in the spillway.

- Construction-related effects on water quality of the Middle Fork of the American River are considered significant because of the potential for discharge of sediments. Implementation of Mitigation Measure WQ-1 would reduce this effect to a less-than-significant level.

Mitigation Measure WQ-1: Implement pollution prevention measures. Pollution prevention measures should be incorporated into all final design and construction plans. The pollution prevention measures would include erosion and sediment control measures, measures for nonstormwater discharges (i.e., construction dewatering and appropriate spill prevention and containment measures). Measures would be implemented to avoid accidental spills and sediment dispersal during barging of borrow materials. Construction contractor(s) would be required to obtain coverage under the National Pollutant Discharge Elimination System (NPDES) General Storm Water Permit for Construction Activities from the State Water Resources Control Board (SWRCB) and obtain any applicable waste discharge requirements. Work under NPDES jurisdiction requires the preparation of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP would describe the proposed construction activities and pollution prevention measures that should be implemented to prevent discharge of pollutants. The SWPPP would also include a description of inspection and monitoring activities that should be conducted. Construction and postconstruction monitoring should be conducted to ensure that all pollution prevention efforts are performing as described in the SWPPP. The SWPPP

should be amended in the event modifications to the pollution prevention measures become necessary.

Folsom Reservoir. Alternative 2 would include substantial construction activity to replace the spillway gates and spillway bridge, raise the concrete dam, construct a parapet wall on the wing dams and dikes, and construct a temporary bridge below Folsom Dam.

Excavation of fill material from borrow sites and construction activities would result in the temporary disturbance of soil and may result in the discharge of sediment to Folsom Reservoir and the Lower American River. Construction would include soil removal, grading, and revegetation. Earthwork within the reservoir would require heavy construction and could result in accelerated erosion or an incidental release of sediment and/or hazardous substance(s). Construction would extend up to five years for some of the facilities and would potentially expose disturbed areas to winter storm events. Rain of sufficient intensity could dislodge soil particles from the soil surface. Once particles are dislodged and the storm is large enough to generate runoff, pollutants may be transported to stream channels and may cause increases in turbidity, suspended solids, oil and grease, and nutrients in receiving waters.

- Construction-related effects on water quality of Folsom Reservoir and the Lower American River are considered significant because of the potential for discharge of sediments. Implementation of Mitigation Measure WQ-1 would reduce this effect to a less-than-significant level.

Operation-Related Effects

Folsom Reservoir. Operation of Alternative 2 would result in the occasional inundation of the area around the reservoir between 474 and 478 feet. As discussed in Section 7.2, “Geology, Seismicity, and Soils,” flood control operations are not expected to result in accelerated erosion of areas not previously inundated. If erosion does occur, it is expected to be localized. The Corps would also implement an adaptive management plan to address erosion in the event vegetation is adversely affected as a result of flood control operations.

- Operation of Alternative 2 is expected to result in a less-than-significant effect on water quality at Folsom Reservoir and the Lower American River because postconstruction erosion is not expected to be substantial and because operation-related effects would be monitored.

7.10.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction-Related Effects

Construction-related effects on water quality at L. L. Anderson Dam would be the same as the effects described for Alternative 3. In addition, Alternative 2 includes raising Folsom Dam, wing dams, and dikes to allow storage of floodwaters to an elevation of 482 feet. Alternative 3 also include excavation of fill material from Mississippi Bar.

Material excavated from the Mississippi Bar borrow site would be transported by barge across Lake Natoma. Sediment would be dredged along the south and north shoreline of Lake Natoma to provide access points for the barging operation. Accidental spills and sediment dispersal could occur in Lake Natoma during dredging, and loading, barging, and unloading operations for borrow material.

- Construction-related effects on water quality of Folsom Reservoir and Lake Natoma are considered significant because of the potential for discharge of sediments. Implementation of Mitigation Measure WQ-1 would reduce this effect to a less-than-significant level.

Operation-Related Effects

- Operation-related effects on water quality in Folsom Reservoir and the Lower American River would be the same as described under Alternative 2.

7.10.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Construction-Related Effects

- Construction-related effects on water quality under Alternative 4 would be the same as described under Alternative 3.

Operation-Related Effects

Operation-related effects on water quality under Alternative 4 would be the same as described under Alternative 3.

7.10.8 Alternative 5: Folsom Stepped Release to 160,000 cfs

Construction-Related Effects

Folsom Reservoir. Under Alternative 5, no construction activities would occur at Folsom Reservoir.

- The water quality of Folsom Reservoir would not be affected because no construction would occur.

Lower American River. Alternative 5 would include a substantial amount of ground-disturbing activity as a result of strengthening the segment of the levee between the NEMDC and the confluence with the Sacramento River. Construction activities would result in the temporary disturbance of soil and may result in the discharge of sediments to the American River.

- Construction-related effects on water quality in the Lower American as a result of construction of Alternative 5 are considered significant. Implementation of Mitigation Measures WQ-1 and WQ-2 would reduce this effect to a less-than-significant level. Mitigation Measure WQ-1 is described under Alternative 2 above.

Mitigation Measure WQ-2: Implement erosion control measures for banks and flood plain areas. For all levee construction and flood plain habitat improvement activities, exposed areas would be revegetated soon after construction is completed. Sediment barriers would be installed along the perimeter of work areas to prevent the accidental discharge of sediment. An inspection and monitoring program would be implemented to ensure the effectiveness of all erosion control efforts. In addition, BMPs would be implemented to avoid and minimize potential disturbances to habitat and fisheries resources.

Yolo and Sacramento Bypasses. Alternative 5 would include a substantial amount of construction activity to widen the Sacramento Weir and Bypass and strengthen levees in the Yolo Bypass, along the Sacramento River, and Delta sloughs. Levee strengthening would be limited to the landside levees. Construction activities would result in the temporary disturbance of soil and may result in the discharge of sediment to the canals within and adjacent to the Yolo Bypass, Sacramento River, and sloughs.

- Effects on water quality in the Yolo and Sacramento Bypasses, Sacramento River, and Delta sloughs that would result from construction of Alternative 5 are considered significant. Implementation of Mitigation Measures WQ-1 and WQ-2 would reduce this effect to a less-than-significant level.

Operation-Related Effects

Folsom Reservoir. Operation of Alternative 5 would not change the maximum design flood pool elevation of Folsom Reservoir.

- The water quality of Folsom Reservoir would not be affected because no change in flood control operations would occur.

Lower American River. Alternative 5 allows for an objective release of 160,000 cfs. Channel-stability modeling has not been conducted for the project alternatives; however, channel-stability analysis was performed by the Corps in 1997. The results of the channel stability modeling indicated the Lower American River to be vertically stable (resistant to channel deepening) at various flows and flood release operations. Flows above 50,000 cfs were necessary to begin mobilization of the channel bottom, with some sections of the river bottom immobile even at flows of 180,000 cfs. Under various flows and flood release operations, lateral stability of the channel banks was found to be sensitive primarily to increased duration of moderate and high floodflows. The Corps identified four priority sites where accelerated lateral erosion is currently occurring. It is assumed that these sites would be stabilized under this alternative.

- Operation-related effects on water quality in the Lower American River that would result from implementation of the Alternative 5 are considered less-than-significant. No mitigation is required.

7.10.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Construction-Related Effects

Effects on water quality as a result of strengthening levees along the Lower American River, Yolo and Sacramento Bypasses, Sacramento River and Delta sloughs would be the same as described for Alternative 5. Alternative 6 would also include construction of a new outlet and modifying the stilling basin at Folsom Dam.

Folsom Dam. Construction activities associated with increasing the size of the outlets and modifying the stilling basin could result in the temporary disturbance of soil and discharge of sediments to the Lower American River. Operation of heavy equipment near the river could result in the accidental spilling of fuels and lubricants.

- Construction-related effects on water quality that could occur during construction of a new outlet at Folsom Dam are considered significant. Implementation of Mitigation Measure WQ-1 as described above would reduce this effect to a less-than-significant level.

Operation-Related Effects

Operation-related effects under Alternative 6 would be the same as described for Alternative 5.

7.10.10 Alternative 7: Stepped Release to 180,000 cfs

Construction-Related Effects

- Construction-related effects on water quality in Folsom Reservoir are the same as described for Alternative 5.

Construction-related effects on water quality as a result of strengthening levees along the Lower American River, Yolo and Sacramento Bypasses, Sacramento River, and Delta sloughs would be the same as described for Alternative 5. Alternative 7 would also include strengthening existing levees and constructing new levees and floodwalls along the Lower American River to safely convey flows up to 180,000 cfs.

Alternative 7 would require extensive ground-disturbing activity to modify levees and floodwalls along the Lower American River. Construction activities would result in the temporary disturbance of soil and may result in the discharge of sediment during wet and dry periods to the American River.

- Construction-related effects on water quality in the Lower American as a result of construction of Alternative 7 are considered significant. Implementation of Mitigation Measures WQ-1 and WQ-2 would reduce this effect to a less-than-significant level.

Operation-Related Effects

Operation-related effects under Alternative 7 would be the same as described under Alternative 6.

7.10.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Alternative 8 would incorporate all the components of Alternatives 3 and 5. Consequently, all the construction- and operation-related effects and applicable mitigation measures that would occur under Alternatives 3 and 5 would also occur for Alternative 8.

7.10.12 Alternative 9.0: Ecosystem Restoration Alternatives

Alternative 9.1: Urrutia Restoration Site

Construction-Related Effects. Construction would require excavating and transporting earth and other ground-disturbing activities. These activities could result in soil erosion and construction-related pollutant discharges (fuels or lubricants) to the Lower American River. Herbicides and prescribed burning may also be used to remove undesirable vegetation and could cause discharges of pollutants. Herbicide applications would be conducted by licensed pesticide applicators and work around water would be limited to those uses allowed according to the particular chemical label instructions.

- Construction activities could result in a significant adverse effect on water quality in Lower American River if the sediments or fuels or lubricants enter the river during construction. Implementation of Mitigation Measure WQ-1 would reduce this effect to a less-than-significant level.

Operation-Related Effects. Grading and excavation disturbances would be temporary and there would be no long-term discharges of pollutants under the restoration alternative; therefore, no operation-related water quality impacts would occur.

Alternative 9.2: Woodlake Restoration Site

Construction-related and operation-related effects on water quality would be the same as described under Alternative 9.1.

Alternative 9.3: Bushy Lake Restoration Site

Construction-Related Effects. Temporary construction-related effects on water quality could occur from discharges of sediment or fuels/lubricants during construction of necessary pump stations or the constructed wetland.

- Construction activities could result in a significant adverse effect on water quality in Lower American River if the sediments or fuels or lubricants enter the river during

construction. Implementation of Mitigation Measure WQ-1 would reduce this effect to a less-than-significant level.

Operation-Related Effects. Restoration activities at Bushy Lake would include supplementing natural flows into Bushy Lake with water from the Chicken Ranch Slough, and Strong Ranch Slough (CRSR) drainage basin. Water quality in CRSR flows is known to periodically contain elevated concentrations of contaminants, such as trace metals (copper, mercury, lead, and zinc), organophosphorus and carbamate pesticides, and petroleum-based hydrocarbon compounds. The restoration project would pump a small fraction of natural CRSR flows into a constructed wetland and subsequently release water into Bushy Lake. The restoration project constructed wetland, and water quality analyses that have been conducted for the project are described in Appendix A. The constructed wetland would serve to remove contaminants from the water through physical and chemical treatment. Concentrations of contaminants could increase in Bushy Lake. However, water flow rates through the constructed wetland and Bushy Lake would be carefully managed to prevent water quality impacts. In addition, water circulation would generally increase within the lake and reduce stagnant conditions.

Consistent with the Service's recommendations in the CAR, a monitoring and evaluation plan would be implemented to ensure that contaminant-related problems are not created that would adversely affect water quality or fish and wildlife.

- The restoration would benefit water quality by removing pollutants that would otherwise be discharged to the Lower American River.

Alternative 9.4: Arden Bar Restoration Site

Construction-related and operation-related effects on water quality would be the same as described under Alternative 9.1.

Alternative 9.5: Fisheries Restoration

Construction-Related Effects. In-water construction would be necessary to modify the temperature control shutters at Folsom Dam. Construction would be limited to the top of Folsom Dam and the intakes and temperature shutters to powerplant penstocks. Although construction equipment would be limited to the top of the dam, spills of fuels and lubricants could occur.

- Construction-related effects on water quality in Folsom Reservoir during construction of the temperature control shutters are considered significant because of the potential for spills of fuels and/or lubricants. Implementation of Mitigation Measure WQ-1 would reduce this effect to a less-than-significant level.

Operation-Related Effects. Improvements to the temperature control shutters in Folsom Reservoir would improve water quality for fisheries habitat in the Lower American River by allowing greater flexibility to manage the temperature of releases from Folsom Reservoir.

- Operation of the shutters would result in beneficial effect on water quality in the Lower American River as a result of enhancing flexibility of management of the Folsom Reservoir cold-water pool.

7.11 Cultural Resources

7.11.1 Introduction

The purpose of this section is to evaluate the effects of the proposed alternatives on cultural resources identified in the area of potential effects (APE). Information contained here is neither inclusive nor exhaustive due to a variety of constraints. Additional investigations would be necessary to identify and evaluate all cultural resources in the APE. If a cultural resource is determined to be ineligible for listing in the National Register of Historic Places (NRHP), a determination of no effect would be made. Conversely, if an alternative would adversely affect an historic property, further consultation to resolve adverse effects would be required before construction commences.

7.11.2 Regulatory Agreements

Some steps toward the compliance with Section 106 of the National Historic Preservation Act (NHPA) have already been undertaken. As part of the Interim Agreement on Reoperation of Folsom Reservoir, Sacramento Area Flood Control Agency (SAFCA) and the Bureau entered into an agreement with the State Office of Historic Preservation to ensure compliance with the NHPA. Section 106 compliance would take the form of a research design that would guide future inventory, evaluation, data recovery, and/or protection of archeological resources that may be affected by reoperation (Sacramento Area Flood Control Agency and U.S. Bureau of Reclamation 1994). The research design, completed by Far Western Anthropological Research Group and JRP Historical Consulting Services (Waechter and Mikesell 1994) and amended in 1999, would be implemented as part of the Proposed Action.

The research design calls for (1) enhanced inventory of unsurveyed areas, or areas not surveyed to current standards, with emphasis on those locations with high archeological sensitivity, those areas where project effects would be greatest, and/or those elevation zones that are rarely accessible; (2) site evaluation, using limited subsurface excavation, surface collection, and/or minimally-destructive shovel tests or augering (unless sites are deeply buried) to determine which sites (or classes of sites) still have data potential and which do not; and (3) protection or data recovery would be mitigation measures at sites with high scientific, social, or interpretive value.

As part of the Corps' American River Watershed Project (U.S. Army Corps of Engineers, et al. 1996), a Programmatic Agreement (PA) pursuant to 36 Code of Federal Regulations (CFR) 800(a)(1)(i)(C) and 800.14(b) for the American River Watershed Project was executed on December 13, 1991 (Appendix 1B in the Technical Environmental Evaluation [Appendix A, Attachment 1]). The Programmatic Agreement (PA) was between the Corps, the Bureau, the Reclamation Board, SAFCA, the State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation (ACHP). Provisions of this PA cover implementation of those specific elements of the Proposed Action or alternatives that would involve the Corps as the

Federal lead agency. As various project elements are implemented, site-specific compliance would be conducted on an individual basis.

This PA is relevant to the present study because it directs that measures be implemented to complete the Section 106 process for the wide range of related Federal actions expected to be carried out in connection with the American River Watershed Project. Further, it acknowledges that “the Project may be modified based on public input, Congressional authorization, and ongoing negotiations among the primary sponsors.” The PA includes procedures for the treatment of indirect and direct effects of the levee improvements associated with the actions.

These agreements (the PA and the research design) outline all the additional inventory, evaluation and mitigation measures that would be required to implement the proposed project. Therefore, to the extent feasible, the following is a tiered analysis based largely on the premise that the implementation of these legally binding agreements would mitigate effects on cultural resources for the purposes of Section 106 and CEQA compliance.

Methods and Assumptions

L. L. Anderson Dam. Methods employed for the L. L. Anderson Dam project area consisted of conducting a records search at the Foresthill Ranger District office of the Tahoe National Forest and consultation with Forest Service personnel. The records search indicated that a previous cultural resources study had been conducted which incorporated only the northern spillway improvement project area (Maniery 1997). The southern portion of the project area has not been subjected to a cultural resources survey. No previously-recorded cultural resources were noted in the project area. However, one historical resource, the Red Star Mining Ditch, was noted, but not recorded, in the unsurveyed southern spillway improvement project area. This historic ditch may be located within the APE.

Folsom Reservoir. Methods employed for the Folsom Reservoir project area consisted of reviewing previous studies and consulting the library and records of the Bureau. For the purposes of a cultural resources study, the APE around the lake is defined as the area between the present and proposed lake elevations and a buffer of 15 feet. In all, the APE is the area around Folsom Reservoir between the 460 and 500-foot elevation levels, wing dam construction sites, and areas affected by bridge and road construction.

The Bureau provided a Geographic Information System (GIS) layer of cultural resource sites within the Folsom Reservoir area, including Mississippi Bar, and an attached database. The database and GIS layers were generated from information provided by the SHPO. Information, in database form, provided by the SHPO was checked by Bureau staff against site records, and site locations, as indicated by Universal Transverse Mercaeter (UTM) coordinates, were digitized into the current GIS cultural resources layer. For the current analysis, the GIS layer was superimposed on aerial photographs and overlain with elevation lines and the sites which fall between the elevations of 460 and 500 feet were noted. The Bureau data addressed only prehistoric sites. No site locations were field-checked.

Literature Review Results. Numerous cultural resources studies have been conducted in the Folsom Reservoir area, but the entire area has not been systematically investigated. Non-

systematic surveys have resulted in the recording of many archeological sites. Many of the surveys date from the 1950s or earlier, and the data are not considered reliable in accordance with current standards. Exceptions include two cultural resources overviews prepared as part of the Corps' 1992 Folsom Dam and Reservoir Reoperation Study and two archeological studies conducted in the early 1990s. An historic overview was prepared by Peak & Associates (1990). Another overview addresses available information on known archeological resources, documents ongoing effects on these sites, and summarizes the extent of past surveys (Barrett 1989). The vast majority of the information presented here has been summarized from the two archeological studies conducted by Far Western Anthropological Research Group (Waechter 1992, 1993) and the research design completed as indicated in the PA (Waechter and Mikesell 1994).

The first documented archeological work at Folsom Reservoir was Drucker's (1948) preconstruction inventory; only one site, CA-ELD-1, was recorded at that time. The results of this survey are more of a reflection of the level of effort and methodology considered appropriate for that time period than of the actual prehistoric and historic settlement patterns now known to have occurred in the region. Several other surveys and studies have taken place since then; the levels of detail and accuracy of these reports vary widely, and some surveys have never been formally documented. The various studies have resulted in the recording of some 175 archeological and historical resources within the reservoir pool. The prehistoric/ethnographic sites are primarily scatters of flaked-stone tools and debitage, grindstone, and bedrock milling features. Historic sites are related to mining, water development, transportation, and nonnative American settlement.

Systematic, documented excavation has taken place at only one site, CA-ELD-201 (Foster et al. 1977). Field observations made since the 1970s, however, indicate that inundation has had a serious detrimental effect on many, if not most, sites within the reservoir basin. Studies conducted at other reservoirs in California (e.g., Foster and Bingham 1978, Henn and Sundahl 1986, Lenihan et al. 1981, Stoddard and Fredrickson 1978, Ware 1989) suggest, however, that important scientific and/or cultural data may still survive within some of these sites.

No attempt was made to conduct a comprehensive investigation of cultural sites below gross pool elevation until severe drought conditions in 1975–1977 exposed a number of areas. DPR recorded sites within a small portion of the fluctuation zone and completed preliminary test excavations at the Pedersen site, CA-ELD-201. An additional survey (Olsen 1977) resulted in the recording of 48 prehistoric and 23 historic sites. In 1993, Reclamation contracted with Far Western Anthropological Research Group to survey 655 acres in the Beals Point and Beeks Bight area; this supplemented a 1,035-acre survey conducted the previous year by Far Western Anthropological Research Group in the Granite Bay and Rattlesnake Bar areas (Plates 7.11-1 through 7.11-4). During archeological surveys of portions of the reservoir basin (Waechter 1992, 1993), 29 sites were identified at 400 feet or above that had some potential for intact subsurface deposits, features, or other potentially important data (while more than 60 others appeared to have little remaining data potential beyond the enhanced survey level).

More than 160 archeological sites have been recorded within the elevation range of 390 to 465 feet in Folsom Reservoir (Table 2-7). Nineteen sites have been recorded between the elevations of 460 and 500 feet (entries in bold face in Table 2-7). Eight of these sites are

prehistoric (CA-ELD-32, -35, -76, -100, -232, CA-PLA-158/255, -204, and -759). These sites include midden, ground and flaked stone scatters, milling stations, and one village site. Eight historic sites include the historic town of Goose Flat (CA-ELD-139H), historic foundations and refuse deposits (CA-ELD-256H, CA-PLA-269H, -270H, CA-SAC-361H), the flume caretaker's home (CA-ELD-276H), mining debris (CA-ELD-796H), and an earthen ditch (CA-PLA-520H). Three sites have both prehistoric and historic components (CA-ELD-237/H, -791/H, CA-PLA-769/H).

None of these archeological sites within the Folsom Reservoir area have been evaluated for eligibility for listing in the California Register of Historical Resources (CRHR) or the NRHP. Until a more reliable inventory is completed, it is unknown how many sites would be considered significant. Excavations (Foster and Bingham 1978, Foster et al. 1977) at the Pedersen site, CA-ELD-201, and the recent discovery of an adjacent previously-unknown prehistoric site suggest that there is the potential for sites to contribute to our knowledge of the history and prehistory of the area under NRHP Criterion D and CRHR criteria for properties "that have yielded, or may be likely to yield, information important in prehistory or history" (Public Resources Code 5024.1).

U.S. Bureau of Reclamation Data Review Results. The review of the Bureau GIS maps and associated database yielded a list of 14 sites present in the project area (Table 2-8). Of these sites, six are also mentioned in the Far Western studies (CA-ELD-35, -76, -232, CA-PLA-158/255, -204, and CA-SAC-361H). Three more were noted in the Far Western studies, but with lower elevations, putting them outside of the APE (CA-ELD-257, -262, and CA-PLA-268). Four site numbers, CA-ELD-932, -937, CA-PLA-929, and CA-SAC-943, do not appear to correspond to those assigned by the North Central Information Center of the California Historical Resources Information System (NCIC). The first three are located in different areas of their respective counties and the site records describe different types of resources. The site number, CA-SAC-943, has not been assigned yet. The locations of these sites indicated on the Bureau GIS map data should be field checked.

Discrepancies between the Bureau and Far Western data are due primarily to two factors. 1) the Bureau data only addressed prehistoric sites and 2) neither study confirmed all site locations. These reports relied upon fieldwork and the NCIC for this information.

In summary, it is evident from past and current studies that major portions of Folsom Reservoir have not been adequately inventoried or evaluated in accordance with the NHPA or CEQA standards. This requirement has not been fulfilled because of funding constraints and the restriction of access by reservoir storage levels. Evidence from known prehistoric and historic sites, current archival research, and site visits suggest that substantial numbers of unidentified resources are likely to be present. Additionally, previous studies have paid little attention to historic structures, and historic archeological sites.

Folsom Dam. Construction of Folsom Dam began in and was completed in 1956. It consists of a straight concrete gravity dam approximately 340 feet high. Folsom Dam was evaluated by the Corps and was recommended to be ineligible for NRHP listing (Peak & Associates, Inc. 2000). In a letter dated June 25, 2001, the SHPO agreed with the Corps' conclusion that Folsom Dam is individually ineligible for inclusion on the NRHP.

- (1) One historic structure, the Folsom Powerhouse, was listed in the NRHP in 1973. The Folsom Powerhouse is located immediately downstream from Folsom Dam. This property is automatically eligible for listing in the CRHR because of its NRHP status and would be considered a significant resource for the purposes of both Section 106 and CEQA compliance. The Folsom Powerhouse was operational from 1895 to 1952. Folsom Dam only became operational in 1956. The powerhouse, of course, was developed to provide electricity to the area. There is no relationship between the powerhouse and the dam, which was built much later. The two were evaluated separately. The main historic context to theme for evaluating the dam was flood control and the ensuing downstream development. Development of the dam did not foster any level of economic or social change to occur in the Sacramento Valley. According to the supplemental report prepared by Peak and Associates, *Addendum To An Evaluation Of Folsom Dam For Inclusion In The National Register Of Historic Places, City Of Folsom Sacramento, County, California*, “that Folsom Dam provides water, supplemental flood control, and recreational opportunities for the greater Sacramento area is unquestioned. But it was not and is not the driving force behind the phenomenal human expansion; instead it is part of the infrastructure that helps satisfy the needs of a growing population.”

Borrow Sites

Methods employed to identify cultural resources sites within the proposed Mississippi Bar and Peninsula borrow sites included reviewing Bureau data, reviewing previous studies, and conducting records searches. Additionally, conversations with archeologists at the Corps and the NCIC yielded pertinent information. The records searches were conducted in June 2001, and consulted the maps, records, and backlogs at the NCIC.

Mississippi Bar. Records search information indicates that one previous study was conducted on Mississippi Bar (Mutz 1980), and that no known archeological sites are located there. However, Bureau GIS maps indicate that CA-SAC-172 and CA-SAC-173 are located on Mississippi Bar, and personal communications with a Corps archeologist and Information Center staff of the California Historical Resources Information System reveal that CA-SAC-308H, a number assigned to numerous tailings deposits throughout the Folsom area, is also located on Mississippi Bar. CA-SAC-172 and CA-SAC-173 are plotted immediately adjacent to Nimbus Dam on the NCIC maps. The site records indicate that both sites were destroyed by the construction of Nimbus Dam.

CA-SAC-308H, or the mine tailings site at Mississippi Bar, was briefly addressed in an evaluation of the Natoma Ground Sluice Diggings (Lindstrom et al. 1988). This study concluded that the Mississippi Bar Diggings represented early mining activity in the area; however, mining features were largely obscured by later activity. Ten mining/tailings sites in the Folsom area were ranked for relative significance; the Mississippi Bar Diggings were ranked fifth. This study recommended the Natoma Ground Sluice Diggings, which were ranked first in the comparative study, eligible for listing in the NRHP.

The core area of the Mississippi Bar Diggings, as illustrated in the comparative evaluation report (Lindstrom et al. 1988) is located immediately adjacent to the borrow site. This site may be within the APE and has not been evaluated for eligibility for listing in the NRHP or CRHR.

Peninsula. The records search indicates that no cultural resources studies have been conducted within the project area. No sites are located within the project area, but two sites are located within a 1/4-mile radius of the project area. Bureau GIS maps indicate that no previously-recorded cultural resources sites are located within the proposed Peninsula Borrow area.

CA-ELD-201 and CA-ELD 216 are located within a 1/4-mile radius of the project area. CA-ELD-216 is a granite foundation and a small area of associated refuse that was recorded in 1977. CA-ELD-201, also known as the Pedersen site, is a prehistoric village midden site that was recorded in 1976. Though it has not been formally evaluated, excavations in 1976 indicate that the Pedersen site is likely to be eligible for listing in the NRHP and the CRHR (Foster et al. 1977).

Lower American River. The study area for the Lower American River segment is defined as direct-effect areas relating to levee improvements or levee and floodwall construction along a 23-mile-long corridor of the American River extending from Nimbus Dam to the confluence with the Sacramento River. This area was the focus of the 1996 study undertaken by Dames & Moore for the Corps' American River Watershed Project, final SEIS/EIR (U.S. Army Corps of Engineers, et al. 1996).

Efforts to locate sites in the area and determine the current status of the project area regarding survey coverage included reviewing previous studies and conducting a records search at the NCIC to address any studies that had been conducted since 1995. Though many studies have been conducted along the Lower American River, most were conducted more than 10 years ago. Previous studies reviewed in depth were limited to the most recent and inclusive, the Archeological Inventory Report (Nilsson et al. 1995) and the Historic Properties Report (Dames and Moore 1995) for the American River Locality.

A records search was conducted at the NCIC in June, 2001. This records search concentrated on reviewing the backlog at that facility to determine if any studies had been conducted in the project area since 1995. Previously-recorded sites were plotted on U.S. Geological Survey (USGS) topographic maps, and trinomials, assigned to those sites recorded during the 1995 Dames & Moore archeological study, were obtained. This records search did not address historic buildings and structures that were not located immediately along the river because there is no potential for the project to affect them.

Literature Review Results. The research for the 1995 archeological inventory report began with a records search at the NCIC. Literature searches encompassed all project-related features, as well as a 1/4-mile-wide area adjacent to the project area. Records for the Lower American River study area identified 25 previously-recorded prehistoric archeological sites.

Subsequent to the records search, a cultural resources inventory and site re-recording program was initiated for the Lower American River segment (Nilsson et al. 1995). This program included a pedestrian survey of 50 miles of existing and proposed levees and floodwalls, staging areas, and borrow sites. The pedestrian survey resulted in the identification of 18 new archeological sites, and the re-recording or reconnaissance of 23 previously-recorded archeological sites. Access was denied at two sites.

These efforts resulted in the identification and re-recording of 41 sites, including 25 prehistoric, 13 historic, and 3 prehistoric/historic properties. The prehistoric sites include one extensive bedrock milling station and 24 habitation sites, 6 of which have been partially or completely destroyed by residential development. The historic archeological sites consist of four properties characterized by single concrete foundations, one historic homestead remnant, one trash scatter, three segments of the UPRR or Southern Pacific Railroad (SPRR), portions of the Folsom (American River) Mining District, portions of the NEMDC levee, and both the southern and northern levee systems paralleling the American River. The three multi-component archeological sites consist of prehistoric habitation sites overlain by historic-era deposits. At least four prehistoric resources have been destroyed. Three sites examined in this study were listed in the NRHP (CA-SAC-26, CA-SAC-39, and CA-SAC-99/333). Another four were recommended eligible [CA-SAC 155/156, CA-SAC-157 (Neuenschwander and Peak 1988), CA-SAC-319 (Peak & Associates 1983), LAR-16 (NEMDC) (Bradley and Corbett 1996)]. Fifteen sites are recommended not eligible for listing in the NRHP (Nilsson et al. 1995). The remaining 21 sites have not been evaluated (Table 2-7).

Plates 7.11-5a through 7.11-5g illustrate areas surveyed as a result of the 1995 study. Because the areas surveyed for this 1995 project were those that would be directly affected, there may be portions of the current project area that were not inventoried as part of the 1995 study. As project specific components are defined, specific APEs must be compared with the project area and survey techniques of the 1995 study to determine if further inventory is necessary.

A historic property survey within the Lower American River area (Dames & Moore 1995) resulted in the identification of several historic or potentially historic cultural properties. This study consisted of archival- and property-specific research, a literature search, and a field survey. The field survey was conducted in February, March, and April 1995, and consisted of a windshield survey to determine the presence of pre-1946 properties within the APE. This study focused only on direct-effect areas.

Fifteen properties and fourteen bridges were identified within the APE. The properties include the American River Parkway, levees, Reclamation District (RD) 1000 (RD 1000) Rural Historic Landscape District, power lines, a water tank, and other structures (Table 2-10). RD 1000 was determined eligible for listing in the NRHP in September 1994. A portion of the East Levee and the NEMDC are within the program area. Also, a portion of the historic road alignment for the Garden Highway is located on top of the East Levee west of Northgate Boulevard. The East Levee, NEMDC, Garden Highway, and Levee Road are contributing elements of the RD 1000 Rural Historic Landscape District. In addition, certain pre-1944 elements of the Sacramento River Flood Control Project, including certain levees within the program area, may be eligible for listing in the NRHP.

Fourteen bridges within the program area were evaluated and two (Jibboom Street and Old Fair Oaks) were found eligible for listing in the NRHP. The H Street Bridge was evaluated and determined not eligible. However, Caltrans plans to reevaluate this bridge. Three potentially historic railroad bridges were identified: the Northern Electric, Western Pacific, and Southern Pacific.

The mining tailings district just south of Nimbus Dam in the American River Parkway is part of the Folsom (American River) Mining District (CA-SAC-308/H), and more research is required to determine its significance. Finally, the Urrutia property is a farm complex at 599 Garden Highway in Discovery Park dating to ca. 1928 that includes a house, barn, and shed; also, several power lines, one of which is more than 50 years old, cross the parkway. These features would require significance assessments.

Records Search

The records search indicated that since 1995 nine cultural resources studies have been conducted within a 1/4 mile radius of the American River from Nimbus Dam to the confluence with the Sacramento River (Cultural Resources Unlimited 1996, Derr 1998; Foster 2000; Holman 1996; Johnson 1999; Keefer 2000; Peak & Associates, Inc. 1999; Warner 1997; Windmiller 2000). Combined, these studies cover less than 160 acres along the river. Plates 7.11-5a through 7.11-5g indicate areas within the Lower American River that have been APE surveyed since 1995. No cultural resource sites were recorded as a result of these surveys.

Records search of the four ecosystem restoration sites was conducted at the NCIC for these project areas and a 1/4 mile radius around them. The records searches consulted the State's database of previous studies and previously-recorded sites, historical inventories, and pertinent historic maps.

Yolo and Sacramento Bypasses. The project area is described as the Sacramento Weir and Bypass, and portions of levees along the Yolo Bypass, Sacramento River, and Delta sloughs. Previous studies were reviewed and records searches were conducted to determine the status of cultural resources inventory in this project area. Records searches were conducted at the NCIC, at California State University, Sacramento, and Sonoma State University, Rohnert Park, respectively. These records searches consulted the State's database of previous studies and previously-recorded cultural resources sites, as well as historical inventoried and historic maps. Eight historic resources are located within the APE (Table 2-11).

Eleven previous studies have been conducted within the project area during the past decade (Bouey 1994; Dames & Moore 1995; Deitz 1998, 1999; Hale and Nilsson 1993; Peak & Associates, Inc. 1997; Shapiro and Syda 1997a, 1997b, 1997c, 1997d; U.S. Army Corps of Engineers 1995). Seven of these studies were conducted between 1997 and 1999 in association with Corps' Levee Rehabilitation Program. Three other studies conducted within the project area were conducted in 1990 (Bouey and Herbert 1990, Derr 1990, Glover and Bouey 1990). These studies address portions of the project area along the Sacramento Bypass and in the Lake Washington area. Including the 2 miles that were examined in 1990, these projects cover approximately 50 percent of the project area (Plates 7.11-6a through 7.11-6e).

These and earlier investigations resulted in the documentation of eight historic resources (a historic homestead, the Sacramento and Yolo Bypasses, the Sacramento Weir, the Sacramento Northern Railroad; a SPRR trestle, a Sacramento Northern Railroad trestle, and Meyers' River Mansion). The 20th-century homestead was located in the vicinity of the Sacramento Weir and Sacramento Bypass. This historic homestead site may be subject to significant effects as a result of this project and may require NRHP and CRHR significance evaluation (Hale et al. 1995).

A historic property survey within the project area resulted in the identification of numerous properties, including pre-1944 portions of the Sacramento River Flood Control Project comprising the Sacramento Weir and the Yolo Bypass. The Sacramento Weir was determined eligible for listing in the NRHP in 1976, and a study in 1986 (Les 1986) indicated that the Yolo Bypass appeared to be eligible for listing. The Sacramento Northern Railroad tracks were not part of the earlier evaluations of the Sacramento Weir, and more research on this structure is necessary. The Sacramento Bypass is also a component of the pre-1944 Sacramento River Flood Control Project. More research is still necessary on certain aspects of this property to determine its significance and integrity as an element of the portion of the pre-1944 Sacramento River Flood Control Project within the Yolo Basin. Other properties that may be eligible for listing in the NRHP or CRHR, but that require more research include the Sacramento Northern Railroad Trestle and the SPRR trestle.

Though no mention is made of levees in the records search, the levees themselves may be historic. Reclamation of the Sacramento-San Joaquin Delta began as early as the 1850s. Though none of the levees in the project area have been recorded as historic cultural resources, most of them are probably more than 50 years of age.

The previous studies noted above were completed in compliance with Federal regulations and resources were evaluated for significance under NRHP criteria. Resources that are eligible for listing in the NRHP are considered eligible for listing in the CRHR. However, properties that are determined not eligible for listing in the NRHP may be eligible for listing in the CRHR. Thus, resources that have been determined not eligible for listing in the NRHP must be evaluated for significance under CRHR criteria.

Urrutia Restoration Site. The records search indicated that 4 studies have been conducted within the project area within the last 10 years (Cultural Resources Unlimited 1993, Lindström 1990, Nilsson et al. 1994, 1995). The records search indicated that eight previously-recorded sites are located within the project area (Table 2-12). These sites consist of three prehistoric mound sites (CA-SAC-31, -SAC-32, -SAC-316), two historic levees (CA-SAC-436H, -SAC-481H), two historic roads (CRU-93-SAC-24H, CRU-93-SAC-25H), a bridge (C-Sacramento-B-4), and a prehistoric mound coincident with a pre-1900 brick structure (CA-SAC-306/H). Another resource, the Urrutia Property, is noted as present in this area in the Historic Property Report (Dames & Moore 1995). The exact location of this property is difficult to ascertain from the information presented in the report, but it is likely to be located within the APE. The Urrutia Property has not been evaluated and further research is recommended to determine its significance.

One of the prehistoric mound sites, CA-SAC-32 has been destroyed by the construction of a pond. CA-SAC-316 was originally recorded in 1973, but subsequent examinations of the

area have failed to reveal any cultural remains. It is possible that this site has been destroyed. The third prehistoric mound site, CA-SAC-31, was excavated in 1971, and human burials and lithic artifacts were recorded. A large portion of this site has been destroyed or disturbed. CA-SAC-31 has not been evaluated for listing in the NRHP; however, it is likely to be eligible for the information it has yielded and its potential to yield further information.

The northern American River levee (CA-SAC-481H), and the two historic roads (CRU-93-SAC-24H and CRU-93-SAC-25H), have not been evaluated for eligibility for listing in the NRHP or CRHR. The other levee, CA-SAC-463H, was evaluated in 1994 (Bradley and Corbett 1996), and is a contributing element of Reclamation District 1000.

The historic bridge (C-Sacramento East-B-4) was examined during the California Department of Transportation (Caltrans) Local Bridge Survey (California Department of Parks and Recreation 1989), and was found not to be historically significant. Therefore, it is recommended not eligible for listing in the NRHP. The multi-component site, CA-SAC-306/H, was recorded in 1973. The site was evaluated in 1995 and recommended not eligible for NRHP listing (Nilsson et al. 1995).

Woodlake Restoration Site. The records search indicated that 8 cultural resources studies have been conducted in the proposed Woodlake restoration site, 4 of which were conducted within the last 10 years (Cultural Resources Unlimited 1993; Nelson et al. 2000; Nilsson et al. 1994, 1995). Four previously-recorded resources are located within the boundaries of the Woodlake restoration site: CA-SAC-39, CA-SAC-464H, CA-SAC-478H, and CA-SAC-481H (Table 2-12).

CA-SAC-39 is a prehistoric mound site that is listed in the NRHP (Nilsson et al. 1994). CA-SAC-478H includes a segment of the First Transcontinental Railroad as well as a railroad bridge. This resource was recommended eligible for listing in the NRHP and CRHR (Jones & Stokes Associates 1999b). CA-SAC-464H is a 1.1-mile-long section of the historic Western Pacific Railroad (WPRR) that includes a trestle spanning the American River. CA-SAC-481H, also present at the Bushy Lake and Arden Bar locations, consists of two segments of historic levee. One segment was constructed by the Corps as part of the pre-1944 Sacramento River Flood Control Plan. The other was constructed as part of the American River Flood Control Plan, a component of the Central Valley Flood Control Project. Neither of these resources has been evaluated.

Bushy Lake Restoration Site. The records search indicated that four cultural resources studies have been conducted in the proposed Bushy Lake restoration site (Peak 1973, 1974; Peak & Associates 1980; Nilsson et al. 1995). Only one study was conducted within the project areas over the last 10 years, encompassing only the northern levee. (Nilsson et al. 1995). One previously-recorded cultural resource site, CA-SAC-481H, is located within the proposed Bushy Lake restoration site (Table 2-12). CA-SAC-481H, which consists of two sections of historic levee, is also located within the proposed Woodlake, and Arden Bar restoration sites. This resource has not been evaluated for eligibility for NRHP listing.

Arden Bar Restoration Site. The records search indicated that two cultural resources studies have been conducted in the proposed Arden Bar restoration site during the past 10 years. Intensive survey coverage was accomplished by a linear survey comprising three-quarters of a mile (Nilsson et al. 1995). A very small portion of the project area was examined by Peak & Associates (Peak & Associates, Inc. 1999). CA-SAC-481H is located within the Arden Bar Restoration project area, as well as within the Woodlake and Bushy Lake restoration locations (Table 2-12). This site consists of two section of historic levee that have not been evaluate for eligibility for listing in the NRHP.

7.11.3 Significance Criteria

Section 106 Guidelines

Under Federal regulations, a project has an effect on a historic property when the undertaking could alter the characteristics of the property that may qualify it for inclusion in the NRHP including alteration of location, setting, or use. An undertaking may be considered to have an adverse effect on a historic property when the effect may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects on historic properties include, but are not limited to,

- physical destruction or alteration of all or part of the property;
- isolation of the property from or alteration of the property's setting when that character contributes to the property's qualifications for listing in the NRHP;
- introduction of visual, audible, or atmospheric elements that are out of character with the property or that alter its setting;
- neglect of a property resulting in its deterioration or destruction; or
- transfer, lease, or sale of the property. (36 CFR 800.9).

To be listed in the NRHP, a property must be 50 years old or older and be evaluated as significant (or if less than 50 years old, be of exceptional historic significance). To qualify for listing in the NRHP, a property must represent a significant theme or pattern in history, architecture, archeology, engineering, or culture at the local, State, or national level. It must meet one or more of the following four criteria and have sufficient integrity to convey its historic significance (National Park Service 1991). Integrity refers to "the authenticity of the property's historic identity, evidenced by the survival of physical characteristics that existed during the property's historic or prehistoric period" (National Park Service 1991).

NRHP significance criteria applied to evaluate the cultural resources in this study are defined in 36 CFR 60.4 as follows:

- The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects

- that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and
- that are associated with events that have made a significant contribution to the broad patterns of our history; or
 - that are associated with the lives of persons significant in our past; or
 - that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
 - that have yielded, or may be likely to yield, information important in prehistory or history.

CEQA Guidelines

Under CEQA, an impact would be considered significant if a project would have an effect that may change the significance of a resource (Public Resources Code 5020.1). Demolition, replacement, substantial alteration, and relocation of historic properties are actions that would change the significance of a historical resource.

According to the State CEQA Guidelines, impacts on important or unique archeological resources must be addressed. To be considered important or unique, an archeological resource must meet one of the following criteria:

- is associated with an event or person of recognized significance in California or American history or recognized scientific importance in prehistory;
- can provide information that is of demonstrable public interest and is useful in addressing scientifically consequential and reasonable research questions;
- has a special or a particular quality, such as oldest, best example, largest, or last surviving example of its kind;
- is at least 100 years old and possesses substantial stratigraphic integrity; or
- involves important research questions that historical research has shown can be answered only with archeological methods.

In addition, CEQA also must address the effects on historical resources (Pub. Res. Code 5020.1), defined as properties that are on or are eligible for inclusion in the CRHR, including those properties that are:

- associated with events that have made a significant contribution to the broad of California's history and cultural heritage;
- associated with the lives of persons important to our past;
- that embody the distinctive characteristics of a type, period, region, or method construction, or represent the work of an important creative individual, or high artistic value; or
- that have yielded or may be likely to yield information important in prehistory or history.

Significance Context

An examination of the cultural context of the project area can elucidate what resource types may be eligible for listing in the NRHP or CRHR. Cultural resources in the project area can be divided into three major categories, historic, prehistoric, and traditional cultural properties.

The majority of the historic cultural resources in the French Meadows area, the Folsom Dam area, the Lower American River and the Yolo and Sacramento Bypasses are associated with the general theme of settlement. Other themes represented include mining, water development, and transportation. Effects to these resources include flooding, clearing, dam and levee construction, and development.

Sites associated with the transportation theme include roads, railroads, and bridges. A number of historically important transportation routes pass through the project area. The Coloma Road, an early route to the gold country, generally parallels the American River. This route was used by miners and the merchants who supported them, by stage companies, and by the Pony Express. A number of important railroads are located within the APE, including the SPRR, the Northern Electric Railroad, the WPRR, and, California's first railroad, the Sacramento Valley Railroad. Historic bridges in the area include bridges for railroads, vehicles, and pedestrians. Potentially-eligible railroads, roads and bridges would likely be important for their engineering, construction, and/or their association with historic events. Of primary interest would be the association of a property with the opening of the west, the Gold Rush, or the development of local and transcontinental rail transport. Integrity, particularly of materials and setting, must be considered.

The theme of water development has been well researched. Water development has been historically important in mining, agriculture, and flood control. Natomas Consolidated of California, and its forbears, were very active in the Sacramento Valley and foothills, establishing water transport and control systems that were instrumental in the development of the mining and agricultural industries of Northern California. Properties that are related to the theme of water development would include components of RD 900, RD 1000, the CVP, and the Sacramento Valley Flood Control Project. Smaller ditches and canals would fall into this category as well.

Water development features would be considered significant based upon their construction methods or association with important historical events or people.

Many mining sites have been destroyed by further mining activities. Mining sites might include mines, prospect pits, processing areas, mining camps, ditches, and tailings. Mining played a very important part in the history of the project area. The American River has been mined extensively; The Gold Rush essentially began in the northern portion of the project area. Mining camps were located on numerous bars along the American River, though many are submerged beneath Folsom Reservoir. The Red Star Ditch in the French Meadows area was originally associated with the Red Star Mine. Mining activity sites that might be eligible for listing in the NRHP or CRHR would retain integrity and illustrate particular methods of mining. Particularly important would be sites that illustrate aspects of mining technology that are not fully understood. Settlements associated with mining would be significant if they retained sufficient integrity to illustrate their association with early mining, or if they might yield important data pertaining to mining practices or the lives of the miners.

The theme of settlement is very broad and sites associated with this theme vary widely. Settlement sites include townsites, trash dumps, and combinations thereof. A number of historic settlements are located within the project and they range from small mining camps to cities. The town of Goose Flat is submerged beneath Folsom Reservoir, and settlements were located on numerous bars along the river. Any of these sites might be eligible if they retain integrity and can be associated with a particular social, ethnic, or other group over a discrete period of time. Refuse deposits and structural debris or isolated home sites may address many social and economic research issues. Townsites may address an even greater variety of research issues.

Prehistoric resources within the APE include village sites, campsites, lithic scatters, and milling sites. Prehistoric sites are generally eligible for listing in the NRHP or the CRHR because of their potential to yield important information about the prehistory of an area. Sites within the project area may address issues of chronology, settlement patterning, subsistence and technology, trade, and group boundaries. The presence and integrity of subsurface deposits are usually paramount in determining the integrity and data potential of prehistoric sites.

A traditional cultural property is defined generally as, “one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community’s history, and (b) are important in maintaining the continuing cultural identity of the community” (Parker and King n.d.). Traditional cultural properties can include landscapes, mountains, lakes, streams, rivers, towns, neighborhoods, or groves of trees. These locations can have importance for their religious associations or their historical uses. No traditional cultural properties have been identified within the APE in this study. Further research is necessary.

7.11.4 Alternative 1: No Action

Construction-Related Effects

No construction-related activities would take place; therefore, no construction effects are anticipated in the project area.

Operation-Related Effects

Under Alternative 1, no changes would be made in operations, and therefore no new effects would result. Effects that are currently underway would continue. These include disturbance to cultural resources by looters, vehicular traffic, wave action, and changing water levels.

7.11.5 Alternative 2: 3-5 Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Under Alternative 2, modifications would be made to enlarge the spillway at L. L. Anderson Dam. Approximately half of the project area has not been subjected to a cultural resources survey. Cultural resources that may be located in this area have not been inventoried or evaluated. Effects to these potentially NRHP eligible cultural resources would be considered significant effects.

- Construction-related effects on undiscovered cultural resources that would result under Alternative 2 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

Mitigation Measure C-1: Implement the PA among the Corps, Bureau, SHPO, and the ACHP regarding implementation of the American River Watershed Project (Appendix 1B in the Technical Environmental Evaluation [Appendix A, Attachment 1]). This PA provides for a review of the previous studies to determine the scope and extent of further actions; necessary inventory, site recording, and evaluation; the participation of interested persons or parties; and the development of treatment plans for eligible resources. This work would be guided by research designs that comply with the guidelines provided by the Office of Historic Preservation (Office of Historic Preservation 1991). The purpose of the PA is to comply with the Section 106 process.

There is always the possibility that previously unrecorded archeological resources may be unearthed during ground-disturbing activities. Effects to these potentially-significant resources would be considered a significant effect.

- Construction-related effects on buried cultural resources that would result under Alternative 2 would be significant. To reduce this effect to a less-than-significant level, implement Mitigation Measure C-2.

Mitigation Measure C-2: Stop work in case of discovery of cultural resources. If buried cultural resources such as chipped or ground stone, historic debris, building foundations or human bone, are inadvertently discovered during ground-disturbing activities, all work would stop in that area and within 100 feet of the find. Work can resume once a qualified archeologist has been able to assess the significance of the find and, if necessary, develop an appropriate treatment measure in consultation with the appropriate agencies.

If human remains of Native American origin are discovered during project construction, it is necessary to comply with State laws relating to the disposition of Native American burials, which fall within the jurisdiction of the Native American Heritage Commission (Public Resource Code Sec. 5097). If any human remains are discovered or recognized in any location other than a dedicated cemetery, there would be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:

- (a) The coroner of the county has been informed and has determined that no investigation of the cause of death is required; and
- (b) if determined that the remains are of Native American origin,
 1. The descendants of the deceased Native Americans have made a recommendation to the landowner or the person responsible for the excavation work, for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98, or
 2. The Native American Heritage Commission was unable to identify a descendant or the descendant failed to make a recommendation within 24 hours after being notified by the commission.

According to California Health and Safety Code, six or more human burials at one location constitute a cemetery (Section 8100) and disturbance of Native American cemeteries is a felony (Section 7052). Section 7050.5 requires that construction or excavation be stopped in the vicinity of discovered human remains until the coroner can determine whether the remains are those of a Native American. If the remains are determined to be Native American, the coroner must contact the California Native American Heritage Commission.

Folsom Reservoir. Under Alternative 2, modifications would be made to Folsom Dam, wing dams and dikes. In addition, a temporary construction bridge would be constructed, and borrow sites would be used. Construction necessary to accomplish these modifications would result in alterations to potentially historic structures and ground-disturbing activities.

Cultural resources surveys have not been conducted in all proposed construction areas or the alignment of the temporary construction bridge. Cultural resources that may be located within these areas have not been inventoried or evaluated. It is possible that resources in these areas are eligible for listing in the NRHP or CRHR. The disturbance or destruction of these potentially eligible resources would be a significant effect.

- Construction-related effects on undiscovered cultural resources that would result under Alternative 2 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

Activities at the Peninsula borrow site would entail the removal of earth. Construction of the temporary construction bridge, and modifications to the wing dams and dikes and other

structures would involve ground-disturbing activities such as grading, and excavation. These activities may result in the destruction or disturbance of buried cultural resource sites.

- Construction-related effects on buried cultural resources that would result under Alternative 2 would be significant. To reduce this effect to a less-than-significant level, implement Mitigation Measure C-2.

There are a number of structures within the project area that have not been evaluated for significance under CEQA. The Folsom Dam has been recommended not eligible for listing in the NRHP by the Corps of Engineers, but SHPO has not yet concurred. The dam would need to be evaluated for CRHR eligibility. If Folsom Dam is eligible for listing in the CRHR, changes to it would be considered significant. Eligibility of the Folsom Dam for inclusion in the California Register of Historic Places is not a Federal concern. Any procedures to either have the dam listed on the CRHP or for mitigation purposes are the responsibility of the non-Federal sponsor to develop.

The wing dams and dikes and other features associated with Folsom Dam have not been evaluated for eligibility for listing in the NRHP or CRHR. These properties may be eligible individually, or as part of the Folsom Dam system. If they were eligible, these effects would be considered significant.

- Construction-related effects on potentially-significant structures that would result under Alternative 2 would be significant. Implementation of Mitigation Measures C-1 and C-3 would reduce these effects to a less-than-significant level.

Mitigation Measure C-3: Evaluate properties for eligibility for listing in the CRHR.

Cultural resources would be evaluated for the CRHR. Properties that have been determined eligible for listing in the NRHP are automatically eligible for listing in the CRHR. However, those cultural resources that have been determined ineligible for NRHP listing may still be eligible for listing in the CRHR.

Lower American River. Under Alternative 2, no construction-related activities are expected to result in effects in the Lower American River area.

Yolo and Sacramento Basin. Under Alternative 2, no construction-related activities are expected to result in effects in the Yolo and Sacramento Basin project area.

Operation-Related Effects

L. L. Anderson Dam. Under Alternative 2, no operation-related effects are expected to occur at L. L. Anderson Dam.

Folsom Reservoir area. To date, approximately 2,940 acres of land within the reservoir and inundation zone have been surveyed using methods considered adequate under current standards. This accounts for approximately 25 percent of the 11,450 acres in the inundation zone. Because the lower elevations are rarely exposed, virtually all the surveyed areas are above 350 feet in elevation, and most of them are above 400 feet. These surveys and several other (less

complete) ones have identified and recorded approximately 175 sites. Within the reservoir inundation zone there are 8,510 acres that have not been adequately surveyed. Many of the unsurveyed areas may never be accessible, except during extreme drought conditions.

Previous research indicates that cultural resources located in areas that are seasonally inundated are subject to damaging natural processes and human activities. These processes and activities occur during the fluctuation of reservoir levels and include erosion, siltation, redeposition, mixing of artifacts, chemical alteration of site deposits, vandalism, theft, and vehicular effects.

Regarding the potential significance of these resources, the consensus among researchers is that the nature and extent of previous damage that would have affected the significance of the resources depend on several factors, most notably the location of a cultural property within the reservoir basin. Sites within the zone of seasonal fluctuation (or drawdown) have suffered the greatest effects, primarily in the form of erosion/scouring, deflation, hydrologic sorting, and artifact displacement, caused by waves and currents. Sites lower in the reservoir, within the deep pool (including those adjacent to old river flood plains) have been more likely to be covered with silt, which sometimes forms a protective cap. Sites at or near the high-water line and sites exposed during drawdown have suffered both erosion and vandalism. The various reservoir studies have also indicated, however, that sites that have been inundated for a few decades may still contain viable research data (Waechter and Mikesell 1994).

Six known cultural resources sites are located between the gross pool elevation of 466 feet and the maximum surface elevation of 478 feet (CA-ELD-32, -76, -232, -237/H, -256, and CA-SAC-361). Another site, CA-PLA-759 may extend into this elevation range. None of these sites have been evaluated for significance. It is very likely that other, unrecorded sites are present within this area. Because sites between 474 and 478 feet would be subject to occasional inundation, they may be subject to erosion, deflation, hydrologic sorting, and artifact displacement. Because these sites may be eligible for listing in the NRHP or CRHR, this effect is considered significant.

- Operation-related effects to undiscovered cultural resources that would result under Alternative 2 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

Lower American River. There would be no operational effects to this area under the implementation of Alternative 2. Current effects, including disturbance to cultural resources by looters, wave action, and changing water levels would continue.

Yolo and Sacramento Bypasses. Under Alternative 2, there would be no operational impacts to this area. Current effects, including disturbance to cultural resources by looters, wave action, and changing water levels would continue.

7.11.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

The effects and mitigation measures for this alternative include those discussed for Alternative 2. In addition, Mississippi Bar would be used as a borrow site.

Cultural resources surveys have not been conducted in all proposed construction areas, including Mississippi Bar. It is possible that resources at Mississippi Bar are eligible for listing in the NRHP or CRHR. The disturbance or destruction of these potentially eligible resources would be a significant effect.

- Construction-related effects on undiscovered cultural resources that would result under Alternative 3 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

Activities at the Mississippi Bar borrow site would entail the removal of earth. Construction of the temporary construction bridge, and modifications to the wing dams and dikes and other structures would involve ground-disturbing activities such as grading, and excavation. These activities may result in the destruction or disturbance of buried cultural resource sites.

- Construction-related effects on buried cultural resources that would result under Alternative 3 would be significant. To reduce this effect to a less-than-significant level, implement Mitigation Measures C-1 and C-2.

Because the maximum surface elevation during flood control operations would be higher, the number of cultural resource sites affected would be greater. There are 10 known cultural resources sites located between 466 and 482 feet (CA-ELD-32, -76, -100, -232, -237/H, -256H, CA-PLA-204, -267H, -769/H, and CA-SAC-361). CA-PLA-759 may extend into this elevation range. There are very likely other, undiscovered cultural resource sites in the area. Because sites between 474 and 482 feet would be subject to occasional inundation, they may be subject to erosion, deflation, hydrologic sorting, and artifact displacement. Because these sites may be eligible for listing in the NRHP or CRHR, this effect is considered significant.

- Operation-related effects to undiscovered cultural resources that would result under Alternative 3 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

7.11.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

The effects and mitigation measures for this alternative would be the same as those discussed for Alternative 3. However, because the proposed pool elevation is higher, there are likely to be more sites affected. Though the number of known cultural resources within the inundation area is the same as in Alternative 3, the larger inundation area indicates the potential for more undiscovered sites. Because sites between 474 and 487 feet would be subject to occasional inundation, they may be subject to erosion, deflation, hydrologic sorting, and artifact displacement. Because these sites may be eligible for listing in the NRHP or CRHR, this effect is considered significant.

- Operation-related effects to undiscovered cultural resources that would result under Alternative 4 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

7.11.8 Alternative 5: Stepped Release to 160,000 cfs

Lower American River. Modifications to levees along the American River, utilities and local drainage, Howe Avenue Bridge, Guy West Bridge, and a UPRR trestle are necessary to implement this alternative.

Surveys of the Lower American River study area have resulted in the discovery of 41 cultural resources sites (Nilsson et al. 1995). Three prehistoric sites within the study area are listed in the National Register of Historic Places (NRHP) (CA-SAC-26, CA-SAC-39, and CA-SAC-99/333). One historic site, the NEMDC levee, has been determined eligible for NRHP listing as a contributing element to the Rural Historic Landscape RD 1000 (Dames & Moore 1995). Three other sites have been recommended eligible for listing [CA-SAC-155/156 (Peak & Associates, Inc. 1983), CA-SAC-157, and CA-SAC-319 (Neuenschwander and Peak 1988)], and one has been recommended not eligible [CA-SAC-199 (Dougherty 1984)]. The remaining sites have not been evaluated. Modifications of pumping stations and drainage facilities, and construction of new levees and floodwalls may lead to the disturbance of cultural resource sites. These effects would be considered significant if the sites were eligible for listing in the NRHP or CRHR.

- Construction-related effects to known cultural resources that would result under Alternative 5 would be significant. Implementation of Mitigation Measure C-1 and C-3 would reduce these effects to a less-than-significant level.

Portions of the Lower American River project area may not have been subjected to a cultural resources survey within the past 10 years. Cultural resources that may be located in these areas have not been inventoried or evaluated. Effects to these potentially NRHP-eligible cultural resources would be considered significant effects.

- Construction-related effects to undiscovered cultural resources that would result under Alternative 5 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

Unrecorded archeological resources may be unearthed during ground-disturbing activities. Impacts to these potentially-significant resources would be considered significant.

- Construction-related effects to buried cultural resources that would result under Alternative 5 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

Yolo and Sacramento Bypasses. Under Alternative 5, modifications would be made to the Sacramento Weir, the Sacramento Bypass, and the Yolo Bypass, and to levees in the Delta.

While much of the project area has been surveyed for cultural resources, approximately half of the levee areas in the Delta have not been examined within the past 10 years. The Yolo Bypass appears to have low sensitivity for prehistoric resources, but the entire project area is highly sensitive for historic resources. No mention is made of the levees themselves as historic resources, though they are almost certainly all more than 50 years of age. Meyers' River

Mansion, an historic residence located within the project area, has been noted, but never formally recorded. Other cultural resources that may be located in the area, have not been inventoried or evaluated. Effects to these potentially NRHP-eligible cultural resources would be considered significant effects.

- Construction-related effects to undiscovered cultural resources that would result under Alternative 5 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

Eight historic resources are located within the APE. The Sacramento Weir is listed in the NRHP, and studies indicate that the Yolo Bypass appears to be eligible for listing (Les 1986). Both of these resources are pre-1944 portions of the Sacramento River Flood Control Project. Another pre-1944 element of the Sacramento River Flood Control Project that may be affected by the implementation of this alternative is the Sacramento Bypass. The Sacramento Bypass has not been evaluated, but is likely to be eligible for listing. Other potentially-eligible resources within the project area include the Sacramento Northern Railroad tracks, the SPRR trestle, and the Sacramento Northern Railroad trestle.

This alternative calls for the modification of the Sacramento Weir, the Sacramento Bypass, and the Yolo Bypass. Widening the Sacramento Weir by 1,000 feet would impact not only the weir, but also the Sacramento Northern Railroad tracks. The resultant widening and levee removal would impact the Sacramento Bypass. The changes to the historic design, materials, and location of the Sacramento Weir and Bypass are considered significant effects.

The Yolo Bypass is an NRHP-listed property. Proposed modification to the Yolo Bypass include strengthening levees. Changes to the historic design, materials, and location are considered significant effects.

- Construction-related effects on potentially-significant cultural resources that would result under Alternative 5 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.
- Construction-related effects to NRHP-listed cultural resources that would result under Alternative 5 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

There is always the possibility that previously-unrecorded archeological resources may be unearthed during ground-disturbing activities. Impacts to these potentially-significant resources would be considered significant.

- Construction-related effects to buried cultural resources that would result under Alternative 5 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

Operation-Related Effects

No operational effects are expected to occur as a result of the implementation of Alternative 5.

7.11.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Operation- and Construction-Related Effects

Effects to cultural resources and mitigation measures to reduce them to a less-than-significant level are the same as those discussed under Alternative 5. In addition, Alternative 6 includes modifications to Folsom Dam.

Implementation of this alternative calls for constructing a new outlet at Folsom Dam. Construction of dam modifications would alter the structure of the dam to some degree. The Folsom Dam has been recommended as not eligible for listing in the NRHP by the Corps of Engineers, but SHPO has not yet concurred. The dam would need to be evaluated for CRHR eligibility. If Folsom Dam is eligible for listing in the CRHR, changes to it would be considered significant.

- Construction-related effects to potentially-significant historic structures that would result under Alternative 5 would be significant. Implementation of Mitigation Measure C-3 would reduce these effects to a less-than-significant level.

7.11.10 Alternative 7: Stepped Release Plan to 180,000 cfs

Construction- and operation-related effects under Alternative 7 would be the same as discussed under Alternative 6. In addition, Alternative 7 includes making substantial changes to the levee system to accommodate flows up to 180,000 cfs.

Lower American River. Modifications to levees along the American River, utilities and local drainage, Howe Avenue Bridge, Guy West Bridge, and a UPRR trestle are necessary to implement this alternative.

The two bridges that would be modified under this alternative are not historic. However, the UPRR trestle that would be modified is the former SPRR trestle and has not been evaluated for eligibility. If the railroad trestle were eligible for NRHP or CRHR listing, changes to the historic design and materials of this resource would be considered a significant effect.

- Construction-related effects to historic structures that would result under Alternative 7 would be significant. Implementation of Mitigation Measures C-1 and C-3 would reduce these effects to a less-than-significant level.

Surveys of the Lower American River study area have resulted in the discovery of 41 cultural resource sites (Nilsson et al. 1995). Three prehistoric sites within the study area are listed in the NRHP (CA-SAC-26, CA-SAC-39, and CA-SAC-99/333). One historic site, the NEMDC levee, has been determined eligible for NRHP listing as a contributing element to the

Rural Historic Landscape RD 1000 (Dames & Moore 1995). Three other sites have been recommended eligible for listing [CA-SAC-155/156 (Peak & Associates 1983), CA-SAC-157, and CA-SAC-319 (Neuenschwander and Peak 1988)], and one has been recommended not eligible [CA-SAC-199 (Dougherty 1984)]. The remaining sites have not been evaluated. Modifications of pumping stations and drainage facilities, and construction of new levees and floodwalls may lead to the disturbance of cultural resource sites. These effects would be considered significant if the sites were eligible for listing in the NRHP or CRHR.

- Construction-related effects to known cultural resources that would result under Alternative 7 would be significant. Implementation of Mitigation Measure C-1 and C-3 would reduce these effects to a less-than-significant level.

Portions of the Lower American River project area may not have been subjected to a cultural resources survey within the past 10 years. Cultural resources that may be located in these areas have not been inventoried or evaluated. Effects to these potentially NRHP-eligible cultural resources would be considered significant effects.

- Construction-related effects to undiscovered cultural resources that would result under Alternative 7 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

Unrecorded archeological resources may be unearthed during ground-disturbing activities. Impacts to these potentially-significant resources would be considered significant.

- Construction-related effects to buried cultural resources that would result under Alternative 7 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

7.11.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Alternative 8 includes the plan components of Alternatives 3 and 5. All construction- and operation-related effects under Alternatives 3 and 5 would also occur under Alternative 8.

7.11.12 Alternative 9.0: Ecosystem Restoration Alternatives

Alternative 9.1: Urrutia Restoration Site

Construction-Related Effects. Under Alternative 2, ground-disturbing activities would take place including grading and excavating of soils on the flood plain terraces in close proximity to the main river channel. The restoration site has not been completely surveyed within the past decade. Cultural resources that may be located within these areas have not been inventoried or evaluated. It is possible that resources in the restoration area are eligible for listing in the NRHP or CRHR. Disturbance or destruction of potentially-eligible cultural resources would be considered a significant effect.

These sites consist of a historic levee (CA-SAC-436H) that is listed in the NRHP. In addition, three prehistoric mound sites (CA-SAC-31, -SAC-32, -SAC-316), a historic levee (CA-SAC-481H), and two historic roads (CRU-93-SAC-24H, CRU-93-SAC-25H) have not been evaluated for eligibility for listing in the NRHP or CRHR. CA-SAC-32 and CA-SAC-316, both prehistoric mound sites, appear to have been destroyed. A bridge (C-Sacramento East-B-4) and a prehistoric mound coincident with a pre-1900 brick structure (CA-SAC-306/H) have been recommended not eligible for NRHP listing. The historic Urrutia Property is also present in the area. However, the exact location of this property is difficult to ascertain from the available information.

- Construction-related effects on undiscovered cultural resources that would result under Alternative 2 would be significant. Implementation of Mitigation Measure C-1 would reduce these effects to a less-than-significant level.

There is always the possibility that previously unrecorded archeological resources may be unearthed during ground-disturbing activities. Effects to these potentially-significant resources would be considered significant.

- Construction-related effects on buried cultural resources that would result under Alternative 2 would be significant. To reduce this effect to a less-than-significant level, implement Mitigation Measure C-2.

Operation-Related Effects. There would be no long-term ground-disturbing activities at the site, therefore, no cultural resource impacts would occur.

Alternative 9.2: Woodlake Restoration Site

The restoration site has not been completely surveyed within the past decade. Four previously-recorded sites within the restoration area include CA-SAC-39 (prehistoric mound site) that is listed in the NRHP. The area also includes CA-SAC-464H (section of the historic WPRR and trestle spanning the river), CA-SAC-478H (segment of the First Transcontinental Railroad and a railroad bridge), and CA-SAC-481H (historic levee) that have not been evaluated for eligibility for listing in the NRHP or CRHR. The potential construction and operation-related effects on cultural resources would be the same as described under Alternative 9.1. Implementation of Mitigation Measures C-1 and C-2 would reduce these effects to a less-than-significant level.

Alternative 9.3: Bushy Lake Restoration Site

The restoration site has not been completely surveyed within the past decade. The CA-SAC-481H site (historic levee) has not been evaluated for eligibility for listing in the NRHP or CRHR. The potential construction- and operation-related effects on cultural resources would be the same as described under Alternative 9.1. Implementation of Mitigation Measures C-1 and C-2 would reduce these effects to a less-than-significant level.

Alternative 9.4: Arden Bar Restoration Site

The restoration site has not been completely surveyed within the past decade. The CA-SAC-481H site (historic levee) has not been evaluated for eligibility for listing in the NRHP or CRHR. The potential construction- and operation-related effects on cultural resources would be the same as described under Alternative 9.1. Implementation of Mitigation Measures C-1 and C-2 would reduce these effects to a less-than-significant level.

Alternative 9.5: Fisheries Restoration

Construction for the fisheries restoration alternative would be confined to the top of Folsom Dam. In a letter dated June 25, 2001, the SHPO agreed with the Corps' conclusion that Folsom Dam is individually ineligible for inclusion on the NRHP. Therefore, there would be no impacts to cultural resources.

7.12 Traffic and Circulation

7.12.1 Introduction

This section describes the construction- and operation-related effects on traffic that are expected to occur under each alternative. The following discussion also includes a description of the methods and assumptions used to conduct the analysis and the criteria for determining the significance of effects.

7.12.2 Methods and Assumptions

Construction-Related Effects

Construction activities could generate motor vehicle trips and result in road closures that have the potential to affect traffic and circulation in the Sacramento metropolitan area. Construction could temporarily affect traffic and roadway circulation by adding vehicle traffic from construction employee commute trips and from construction vehicles, such as haul trucks, traveling on public roads. Construction-related trip generation by alternative is shown in Table 7-12 and is based on an estimate of the numbers of heavy trucks and crew members that would be present during construction-related activities. As shown in the table, between 34 (Alternative 2) and 151 (Alternative 8) total vehicle trips would occur during the a.m. and p.m. peak hours. However, construction workers may carpool to the individual project sites, which would result in a lower daily trip generation. Construction-related traffic would be limited to a 7-month period (April 15th to November 15th) each year over the duration of the project. Temporary road closures would also affect traffic flow and congestion levels.

Operation-Related Effects

This analysis assumes that operation of any of the project alternatives would not generate any new long-term vehicle trips because operation and maintenance of the alternatives would be similar to existing conditions. Operation of the alternatives could occasionally affect traffic and circulation as a result of road closures. Increases in the surface elevation of Folsom Reservoir

TABLE 7-12. Total Estimated Number of Construction-Related Vehicles Generated by each Alternative

Proposed Alternative	Total Daily Trips (1)	Total Peak Hour Trips (2)
Alternative 2		
Worker Commute Trips	67	34
Heavy Truck Trips	20	2
Total Trips	87	36
Alternative 3		
Worker Commute Trips	96	48
Heavy Truck Trips	88	9
Total Trips	184	57
Alternative 4		
Worker Commute Trips	122	61
Heavy Truck Trips	155	16
Total Trips	277	77
Alternative 5		
Worker Commute Trips	132	66
Heavy Truck Trips	88	9
Total Trips	220	75
Alternative 6		
Worker Commute Trips	132	66
Heavy Truck Trips	88	9
Total Trips	220	75
Alternative 7		
Worker Commute Trips	149	75
Heavy Truck Trips	115	12
Total Trips	264	87
Alternative 8		
Worker Commute Trips	288	144
Heavy Truck Trips	88	9
Total Trips	376	153

Notes:

(1) Vehicles and trucks accessing the construction areas generate two daily trips (one inbound and one outbound).

(2) Peak hour trip generation is based on 50 percent of the resultant daily worker commute vehicle generation and 10 percent of the daily heavy truck generation.

Source: U.S. Army Corps of Engineers, et al. 1996

could flood adjacent roads and increasing the capacity of the Lower American River to convey floodwaters could also occasionally flood river crossings.

7.12.3 Criteria for Determining Significance

Criteria for determining the significance of traffic and circulation effects were developed based on the environmental checklist form in Appendix G of the CEQA Guidelines. Effects on traffic and circulation were considered significant if the action would:

- Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the roadway system.
- Exceed, either individually or cumulatively, a level-of-service standard established by the county congestion management agency for designated roads or highways.
- Result in inadequate emergency access.

For the initial screening of effects of increased traffic, the Institute of Transportation Engineers (ITE) (1989) recommends that an effect be examined more closely if it involves an increase of 50 or more trucks, 100 passenger vehicles, or an equivalent combination of vehicles per hour in the peak direction during the peak hour at any roadway intersection. For construction projects that create temporary traffic increases, this criterion is considered conservative. Because construction of the project would require a number of heavy trucks, one trip by a heavy truck was assumed to equal two vehicle trips in this analysis. For example, construction-related activities resulting from implementation of Alternative 3 would generate up to 9 heavy truck trips (see Table 7-12) or 18 additional passenger vehicle trips during the peak hour. Consequently, for purposes of this analysis, effects of increased traffic may be considered substantial if the number of project-generated vehicle trips would exceed ITE's threshold of 100 passenger vehicles per hour during any given peak direction. As in the case of Alternative 8, because more than one project component would be constructed at a given time, construction-related vehicles would typically gain access to the construction sites via different sets of roadways and intersections.

7.12.4 Alternative 1: No Action

Under Alternative 1, no modification to Folsom Dam, wing dams, dikes, levees along the Lower American River or other flood control facilities would occur. No changes in traffic or circulation attributable to the operation of Alternative 1 is expected.

- Alternative 1 would have no effect on traffic and circulation because no construction or change in operations would occur.

7.12.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Under Alternative 2, construction workers, equipment, and material deliveries to the construction site at L. L. Anderson Dam would increase traffic on local roadways. The total trips associated with construction activities would be minimal and construction could be completed within one summer construction season. The majority of trips would be associated with daily arrival and departures of workers; all excavated material would be disposed of onsite. Material excavated from the lower segment of the spillway would be hauled from the bottom of the spillway to the south side of L. L. Anderson Dam and then across the dam to the spoils site on the north side of the dam. Material excavated from the upper segment of the spillway would be hauled across Mosquito Ridge Road to the spoils site.

- As shown in Table 7-12, trips generated by employees, transporting construction materials to the construction site and removing spoils would result in a less-than-significant effect on traffic and roadway circulation because the total number of trips generated would not exceed the significance criteria of 100 vehicles per hour.

Increasing the capacity of the spillway would require blasting. Blasting is estimated to occur twice a day six days a week. To ensure public safety, Mosquito Ridge Road would be closed during blasting of the upper segment of the spillway. Road closures during blasting operations would be short-term and traffic would be allowed to proceed after each blasting operation is completed. Delays are estimated to last up to one-half hour. Access to French Meadows Reservoir from the south would not be affected.

- Blasting would result in a less-than-significant effect on traffic and circulation because road closures would be short-term and access routes to L. L. Anderson Dam from the south would not be affected.

Folsom Reservoir. Under Alternative 2, vehicle trips to Folsom Dam, wing dams, and dikes would increase as a result of employee commute trips and transporting materials. The total number of additional peak hour trips made by workers and trucks transporting materials over the 4-year construction period is estimated to total 36 (Table 7-12). This includes 34 worker commute trips and 2 trips made by heavy trucks during any given daily peak hour. All trips were assumed to occur over the same roadway segment because raising the wing dams and dikes would be sequential.

- As shown in Table 7-12, trips generated by commuting workers and heavy trucks hauling construction materials to the construction sites would result in a less-than-significant effect on traffic and the existing capacity of the roadway system because the total number of trips generated by the project would not exceed ITE's significance criteria.
- However, construction site access points involving heavy trucks along major roadways would create roadway operation safety hazards. Slow-moving trucks hauling construction equipment and excavated materials in and out of the

construction sites would create safety hazards by creating sight distance problems. Therefore, this traffic safety effect is considered significant. Implementation of Mitigation Measure T-1 would reduce this effect to a less-than-significant level.

Mitigation Measure T-1: Prepare and implement a traffic safety plan. Contractors should prepare a traffic safety plan. This plan would address appropriate vehicle size and speed, travel routes, detour or lane closure plans, flagperson requirements, location of turnouts to be constructed, coordination with law enforcement and fire control agencies, coordination with Caltrans personnel (for work affecting State road rights-of-way), emergency access to ensure public safety, and need for traffic and speed limit signs.

Increasing the height of Folsom Dam would require closing the segment of Folsom Dam Road that crosses the concrete structure and the Left Wing Dam. As indicated in Chapter 5.0, "Flood Control Alternatives," to avoid a significant effect on regional transportation and circulation, the Corps would construct a temporary construction bridge downstream of the Folsom Dam to maintain the capacity of Folsom Dam Road during construction.

The intersection of the north approach road of the temporary construction bridge and Folsom-Auburn Road would be signalized. This new intersection would be within $\frac{1}{4}$ mile of the existing intersection of Folsom-Auburn Road and Folsom Dam Road (Plate 7.14-1). The traffic signal at Folsom-Auburn Road and Folsom Dam Road would remain in operation to allow vehicles from the development to the north of Folsom-Auburn Road and from the Bureau and DPR offices to safely enter Folsom-Auburn Road. The minimum acceptable distance between two signalized intersections within the City of Folsom is $\frac{1}{4}$ mile (Rackovan pers. com.). The effect on traffic congestion on Folsom-Auburn Road would cease once construction is completed and the temporary construction bridge and signalized intersection are removed.

- The effect on traffic and circulation as a result of constructing a new signalized intersection within $\frac{1}{4}$ mile of the intersection of Folsom-Auburn Road and Folsom Dam Road is considered significant because substantial traffic congestion could occur of Folsom-Auburn Road. Implementation of Mitigation T-2 would reduce this effect to a less-than-significant level.

Mitigation Measure T-2: Conduct operational analysis and ensure signals are timed correctly. The Corps would conduct an operational analysis of the two intersections to ensure that the signals at the new intersection and the existing intersection are timed in such a manner to avoid congestion on Folsom-Auburn Road. The operational analysis of the intersection would demonstrate that the signals could be coordinated such that the traffic in between the two signals does not back up beyond the back signal. The operational analysis would be required to show that signal timing was adequate to prevent congestion and demonstrate that acceptable levels of service would be maintained.

Operation-Related Effects

Operation of Alternative 2 would not require additional worker trips associated with operation and maintenance. During flood control operations, no roadways or other transportation routes would be inundated.

- Operation of Alternative 2 would not affect traffic and circulation because no additional operation and maintenance trips would be required and no roadways would be closed during flood control operations.

7.12.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction-Related Effects

Construction-related effects on traffic and circulation as a result of increasing the spillway capacity of L. L. Anderson Dam and closing Folsom Dam Road would be the same as described under Alternative 2. In addition, construction of Alternative 3 includes transporting fill material to the wing dams and dikes and raising a segment of Folsom Dam Road.

Folsom Dam. The total number of additional peak hour trips made by workers and trucks transporting materials over the 4-year construction period is estimated to total 57 (Table 7-12). This includes 48 worker commute trips and 9 trips by trucks hauling fill material during the peak hour.

Material from the Mississippi Bar borrow site would be barged across Lake Natoma and loaded onto trucks at Willow Creek Recreation Area and then transported on Folsom Blvd. Haul routes to Dikes 1–6 and the Right Wing Dam would be via Folsom Blvd and Folsom Auburn Road. Haul routes to Mormon Island Dam, Dike 7, and the Left Wing Dam would be via Blue Ravine Road and Green Valley Road. All trips were assumed to occur over the same roadway segment because raising the wing dams and dikes would be sequential.

- As shown in Table 7-12, trips generated by commuting workers and heavy trucks hauling construction materials to the construction sites would result in a less-than-significant effect on traffic and the existing capacity of the roadway system because the total number of trips generated by the project would not exceed ITE's significance criteria.
- However, similar to Alternative 2, construction site access points involving heavy trucks along major roadways would create roadway operation safety hazards. Therefore, this traffic safety effect is considered significant. Mitigation Measure T-1 would reduce this effect to a less-than-significant level.

Alternative 3 includes raising a 1/3-mile segment of Folsom Dam Road south of the Left Wing Dam to avoid inundation during flood control operations. Raising this segment of roadway would be accomplished within the existing Folsom Dam Road right-of-way and would not require complete or partial closure of Folsom Dam Road. Some delays for motorists using

Folsom Dam Road may occur. However, these delays are not expected to substantially increase transit times.

- Raising the 1/3 mile segment of Folsom Dam Road would result in a less-than-significant effect on traffic and circulation because construction would not result in closure of Folsom Dam Road and would not substantially increase transit times.

Operation-Related Effects

Operation of Alternative 3 would not require additional worker trips associated with operation and maintenance. During flood control operations, no roadways or other transportation routes would be inundated.

- Operation of Alternative 3 would not affect traffic and circulation because no additional operation and maintenance trips would be required and no roadways would be closed during flood control operations.

7.12.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Construction-Related Effects

Construction-related effects on traffic and circulation as a result of increasing the spillway capacity of L. L. Anderson Dam, closing Folsom Dam Road, and increasing the height of a segment of Folsom Dam Road would be the same as described under Alternative 3.

Construction of Alternative 4 includes transporting a substantial amount of fill material to raising the wing dams and dikes 12 feet. Haul routes for transporting this material to the wing dams and dikes would be the same as described under Alternative 3.

Folsom Dam. The total number of additional peak hour trips made by construction workers and trucks transporting materials over the 4-year construction period is estimated to total 77 (Table 7-12). This includes 61 worker commute trips and 16 trips by heavy trucks hauling fill material during any given peak hour.

- As shown in Table 7-12, trips generated by commuting workers and haul trucks would result in a less-than-significant effect on traffic and the existing capacity of the roadway system because the total number of trips generated by the project would not exceed ITE's significance criteria. However, similar to Alternative 2, construction site access points involving heavy trucks along major roadways would create roadway operation safety hazards. Therefore, this traffic safety effect is considered significant. Mitigation Measure T-1 would reduce this effect to a less-than-significant level.

Operation-Related Effects

Flood control operations under Alternative 4 could result in the occasional closure of portions of Salmon Falls Road, the access road to Beeks Bight, and the PG&E access road to Newcastle Powerhouse.

During flood operations, segments of Salmon Falls Road including the Sweetwater Creek, New York Creek, and Salmon Falls crossings could be inundated. These crossings are below the maximum design flood control pool elevation of 487 feet. The potential for these roadway segments to be inundated is very low. Inundation is expected to occur only during flood events with a 1-in-500 or less chance of occurring in any year. (Section 7.1, "Hydrology and Hydraulics," includes a detailed discussion of inundation frequency and duration.)

The access road to Beeks Bight would be inundated during a major flood event. The roadway is only used to access FLSRA recreation sites located between Granite Bay and Beeks Bight. Inundation of this roadway would occur infrequently, would be of short duration, and would occur during the off-peak recreation season.

The access road to the Newcastle Powerhouse would also be inundated during a major flood event. The roadway is gated and is only used by PG&E employees to access the powerhouse for maintenance purposes.

- Inundation of segments of Salmon Falls Road, Beeks Bight Road, and the access road to Newcastle Powerhouse would result in a less-than-significant effect on traffic and circulation because inundation would occur only during extremely large flood events and would be of short duration.

7.12.8 Alternative 5: Stepped Release to 160,000 cfs

Construction-Related Effects

Under Alternative 5, the total number of additional peak hour trips made by workers and heavy trucks transporting materials during construction is estimated to total 75 trips (Table 7-12). This total number includes 66 worker commute trips and 9 trips made by heavy trucks during any given daily peak hour.

- Construction-related vehicle trips generated by employees and the transportation of construction materials to the construction sites would result in a less-than-significant effect on traffic and the existing capacity of the roadway system because the total number of trips generated by the project would not exceed ITE's significance criteria.
- However, similar to Alternative 2, construction site access points involving heavy trucks along major roadways would create roadway operation safety hazards. Therefore, this traffic safety effect is considered significant. Mitigation Measure T-1 would reduce this effect to a less-than-significant level.

Operation-Related Effects

Flood control operations under Alternative 5 would be limited to increasing flows within the Lower American River, Sacramento Bypass, and Yolo Bypass. Increasing flows would not affect existing roadways or railroads, which cross or run along the river or bypasses.

- Operation of Alternative 5 would not affect traffic and roadway circulation because flows would be contained within the existing floodways and no transportation routes would be inundated.

7.12.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Construction-Related Effects

Effects on traffic as a result of construction for Alternative 6 would be the same as discussed under Alternative 5. In addition, Alternative 6 includes constructing a new outlet at Folsom Dam.

Construction of the new dam outlet would contribute additionally to trip generation for construction activities. However, there are no road closures anticipated with the construction work.

- Similar to Alternative 5, construction-related vehicle trips (see Table 7-12) generated by employees and the transportation of construction materials to the construction sites would result in a less-than-significant effect on traffic and the existing capacity of the roadway system because the total number of trips generated by the project would not exceed ITE's significance criteria.
- However, construction site access points involving heavy trucks along major roadways would create roadway operation safety hazards. Therefore, this traffic safety effect is considered significant. Mitigation Measure T-1 would reduce this effect to a less-than-significant level.

Operation-Related Effects

Operation-related effects under Alternative 6 would be the same as described under Alternative 5.

7.12.10 Alternative 7: Stepped Release to 180,000 cfs

Construction-Related Effects

Construction-related effects on traffic and circulation would be the same as discussed under Alternative 5. In addition, Alternative 7 includes extensive levee modifications along the Lower American River. In addition, Alternative 7 would require the construction of 20 miles of new levees and floodwalls along the American River and raising the Guy West and Howe Avenue bridges and the UPRR trestle.

Lower American River. Under Alternative 5, construction workers, equipment, and material deliveries to the various construction sites for levee stabilization, flood plain habitat improvements, and relocation of utilities would increase traffic on local roadways, in particular, during the peak commute periods. The primary truck travel routes between the Lower American River sites and the West Sacramento borrow site would include West Capitol Avenue, Business 80, Highway 50, SR 160, Howe Avenue, Watt Avenue, Fair Oaks Boulevard, Folsom Boulevard, and a number of smaller residential roadways located near the various access points to the construction sites.

The total number of additional peak hour trips made by workers and heavy trucks transporting materials during construction is estimated to total 87 trips (Table 7-12). This includes 75 worker commute trips and 12 trips made by heavy trucks during any given daily peak hour.

- Construction-related vehicle trips generated by employees and the transportation of construction materials to the construction sites would result in a less-than-significant effect on traffic and the existing capacity of the roadway system because the total number of trips generated by the project would not exceed ITE's significance criteria.
- Haul trucks and heavy construction equipment leaving and entering roadways would create a safety hazard for motorists. This effect is considered significant because of the large number of trucks needed during construction. Mitigation Measure T-1 would reduce this effect to a less-than-significant level.

To allow safe passage of 180,00 cfs, the Howe Avenue Bridge and Guy West Bridge would be raised. The north approaches to the UPRR Bridge located just downstream of the Business 80 crossing would be modified.

Raising the Howe Avenue Bridge would be phased so that four lanes of Howe Avenue would remain open during bridge construction. Two lanes of the new bridge would be constructed and opened to traffic before two lanes of the original bridge are closed and removed. Once the first two lanes of the old bridge were removed, the remaining two lanes of the new bridge would be constructed and opened to traffic. Construction is expected to result in occasional delays and slowing of traffic. However, construction is not expected to substantially increase transit time across the bridge.

- Construction of a new Howe Avenue Bridge is expected to result in a less-than-significant effect on traffic because the number of lanes crossing the river would be maintained and construction is not expected to substantially increase transit time.

Alternative 4 would result in the temporary closure of the Guy West Bridge. During construction, direct access by pedestrians and bicyclists to the Sacramento State University campus or the Campus Commons residential area would be eliminated. The bridge is expected to be closed for up to one year. An alternate access route for pedestrians and bicyclists would be available by using the right bank and left bank levee and H Street. This access route is approximately 0.5 mile long. Using this access route is not expected to substantially increase travel time between the university campus and Campus Commons.

- Raising the Guy West Bridge would result in a less-than-significant effect on access to the Sacramento State University campus and the Campus Commons area because an alternative access route is available.
- Alternative 7 would require constructing a floodgate over UPRR tracks at the point they cross through the right bank levee. Construction would be coordinated closely with UPRR and would not interfere with rail traffic. The floodgate would not affect rail traffic once completed and would only be operated during a major flood event.
- Construction of the floodgate would result in a less-than-significant effect on transportation because construction would be closely coordinated with UPRR to ensure limited disruption of rail traffic.

Operation-Related Effects

Operation-related effects under Alternative 7 would be the same as described under Alternative 5. In addition, operation would require closing the UPRR Bridge just downstream of the Business 80 crossing.

Operation of Alternative 7 would result in the short-term closure of the UPRR Bridge over the American River. Closure would be very infrequent and would occur only during flood events with a 1-in-100 or less chance of occurring in any year.

- Closure of the Union Pacific Railroad (UPRR) Bridge would result in a less-than-significant effect on transportation because bridge closure would be infrequent and of short duration.

7.12.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction and operation of Alternative 8 would result in the same traffic effects described under Alternatives 3 and 5. Although the total number of construction-related vehicles generated during construction of Alternative 8 would exceed ITE's significance criteria, traffic generated by this alternative would typically gain access to the various construction sites via several different sets of roadways and roadway intersections, thereby reducing the overall traffic effect generated by the activities that comprise this alternative (Table 7-12).

- Because construction-related traffic volumes generated by this alternative would be dispersed over several different roadways, implementation of this alternative would result in a less-than-significant effect on traffic and the existing capacity of the roadway system.
- Haul trucks and heavy construction equipment leaving and entering roadways would create a safety hazard for motorists. This effect is considered significant because of the large number of trucks needed during construction. Mitigation Measure T-1 would reduce this effect to a less-than-significant level.

7.12.12 Alternative 9.0: Ecosystem Restoration Alternatives

This section describes the construction-related effects on traffic and circulation occurring at the ecosystem restoration sites. Because very few additional trips would be generated after construction is completed, operation-related effects were not evaluated.

Alternative 9.1: Urrutia Restoration Site

Expected travel routes to the Alternative 9.1 restoration site and existing annual average daily traffic (AADT) volumes for these roadway segments are shown in Table 7-13. As shown in Table 7-14, average daily trips and daily peak hour trips would range from 260 to 280 and 22 to 32, respectively. Increased trips associated with construction of Alternative 9.1 would be below ITE's criteria for determining a significant effect on traffic and circulation for each roadway segment.

- Trips generated by commuting workers and heavy trucks hauling excavation materials during construction of Alternative 9.1 would result in a less-than-significant effect on traffic and the existing capacity of the roadway system because the total number of trips generated by the project would not exceed ITE's significance criteria.

Access to and from the restoration site may result in traffic safety hazards. Traffic safety hazards would occur as a result of slow moving trucks impeding traffic as they enter or leave public roadways.

- The effect on traffic safety during construction is considered significant. Implementation of Mitigation Measure T-1 would reduce this effect to a less-than-significant level.

Alternative 9.2: Woodlake Restoration Site

Expected travel routes to the Alternative 9.2 restoration site and existing AADT volumes for these roadway segments are shown in Table 7-13. As shown in Table 7-14, average daily trips and daily peak hour trips would range from 90 to 110 and 13 to 23, respectively. Increased trips associated with construction of Alternative 9.2 would be below ITE's criteria for determining a significant effect on traffic and circulation for each roadway segment.

- Trips generated by commuting workers and heavy trucks hauling excavation materials during construction of Alternative 9.2 would result in a less-than-significant effect on traffic and the existing capacity of the roadway system because the total number of trips generated by the project would not exceed ITE's significance criteria.
- Effects of construction of traffic safety would be the same as described under Alternative 9.1.

TABLE 7-13. Regional and Local Access to Restoration Sites

Alternative	Access Routes	Existing AADT¹	Jurisdiction
9.1 and 9.2	Northgate Blvd	17,023	City of Sacramento
	State Route 160	39,000	Caltrans
	Interstate 80	119,000	Caltrans
9.3	Exposition Blvd	15,319	City of Sacramento
	Interstate 80	119,000	Caltrans
9.4	Arden Way	Not available	County of Sacramento
	Fair Oaks Blvd	Not available	County of Sacramento
	Watt Avenue	90,212	City of Sacramento
	U.S. Hwy 50	178,000	Caltrans

Notes:

¹ AADT for local roadways (e.g., Northgate Boulevard, Exposition Boulevard, and Watt Avenue) is from 1993/1995. AADT for regional roadways is from 2000.

Source: Caltrans 2001 and City of Sacramento 2001

TABLE 7-14. Construction Vehicle Trip Generation

Restoration Alternative	Average Daily Vehicle Trips¹	Daily Peak Hour Vehicle Trips²
Alternative 9.1		
Construction worker vehicles	20–40	10–20
Offsite heavy truck trips	240	12
Total:	260–280	22–32
Alternative 9.2		
Construction worker vehicles	20–40	10–20
Offsite heavy truck trips	70	3
Total:	90–110	13–23
Alternative 9.3		
Construction worker vehicles	20–40	10–20
Offsite heavy truck trips	106	5
Total:	126–146	15–25
Alternative 9.4		
Construction worker vehicles	20–40	10–20
Offsite heavy truck trips	102	5
Total:	122–142	15–25

Notes:

Assumptions: Earthmoving activities would be completed within a 4-month period. Earth would be hauled up to 10 miles from each restoration site. Twenty construction workers at each site.

¹ Vehicle and trucks accessing the site generate two daily trips (one inbound and one outbound);

² Peak hour trip generation is based on 50 percent of the resultant daily passenger vehicle generation and 10 percent of the daily heavy truck generation.

Alternative 9.3: Bushy Lake Restoration Site

Expected travel routes to the Alternative 9.3 restoration site and existing AADT volumes for these roadway segments are shown in Table 7-13. As shown in Table 7-14, average daily trips and daily peak hour trips would range from 126 to 146 and 15 to 25, respectively. Increased trips associated with construction of Alternative 9.3 would be below ITE's criteria for determining a significant effect on traffic and circulation for each roadway segment.

- Trips generated by commuting workers and heavy trucks hauling excavation materials during construction of Alternative 9.3 would result in a less-than-significant effect on traffic and the existing capacity of the roadway system because the total number of trips generated by the project would not exceed ITE's significance criteria.
- Effects of construction of traffic safety would be the same as described under Alternative 9.1.

Alternative 9.4: Arden Bar Restoration Site

Expected travel routes to the Alternative 9.4 restoration site and existing AADT volumes for these roadway segments are shown in Table 7-13. As shown in Table 7-14, average daily trips and daily peak hour trips would range from 122 to 142 and 15 to 25, respectively. Increased trips associated with construction of Alternative 9.4 would be below ITE's criteria for determining a significant effect on traffic and circulation for each roadway segment.

- Trips generated by commuting workers and heavy trucks hauling excavation materials during construction of Alternative 9.4 would result in a less-than-significant effect on traffic and the existing capacity of the roadway system because the total number of trips generated by the project would not exceed ITE's significance criteria.
- Effects of construction on traffic safety would be the same as described under Alternative 9.1.

Alternative 9.5: Fisheries Restoration

Modification to the temperature control shutters would include work from the top of Folsom Dam Road and a barge anchored next to the dam. Most of the construction would be carried out from the barge. In the event work is required from Folsom Dam Road, closures would occur during non-peak traffic hours.

- Construction of Alternative 9.5 would result in a less-than-significant effect on traffic and circulation because interruptions of use of Folsom Dam Road would be infrequent and of short duration.

7.13 Air Quality

7.13.1 Introduction

This section describes the construction-related effects on air quality that are expected to occur under each project alternative. Construction of the flood control elements associated with each project alternative would generate air emissions from the operation of heavy construction equipment, transporting materials to construction sites, and from construction worker commute trips. Operational emissions were not addressed because changes in flood control operations would result in a measurable increase in air emissions.

7.13.2 Methods and Assumptions

Effects on air quality were calculated using general estimates of known emission rates and predictions regarding the extent of use or distances of travel for heavy equipment and haul trucks, the quantity of the various types of equipment to be used, acreage of construction areas, and time required for construction. Air quality analysis also accounted for the creation of fugitive dust at construction areas and the average number of employee trips per person. A complete discussion of the methods and assumptions used in this evaluation is provided in Appendix 1B in the Technical Environmental Evaluation (Appendix A, Attachment 1).

The analysis evaluated effects on air quality based on “mitigated” and “unmitigated” scenarios. The “mitigated” scenario assumed that construction of the wing dams and dikes would be sequential, 50 percent of construction equipment would be 1996 models or newer, and that low emission fuels would be used on all diesel equipment.

Since completion of the Draft Supplemental Plan Formulation Report/Environmental Impact Statement/Environmental Impact Report (SPFR/EIS/EIR) the Corps has further refined the construction sequence and schedule for Alternative 3. This includes operating barges on Lake Natoma and Folsom Reservoir for no longer than 4 hours per day and construction of wing dams and dikes would occur no more than 190 days per year.

The daily worst-case construction emissions were estimated for each alternative and are reported in pounds per day (ppd). The worst-case annual emissions were also estimated and are reported as tons per year (tons/yr).

Raising Folsom Dam, Wing Dams, and Dikes

Construction activities at Folsom Reservoir would include raising the height of the concrete dam, wing dams, dikes, and the construction of new floodwalls. Air emissions would be generated by operation of earth moving and other heavy construction equipment, haul trucks, and employee commute trips. It was assumed that construction would occur in phases around the dam for a four-year duration, with construction starting at one end, and working around the dam to the final modification area. It was assumed that under Alternative 2, all fill material would come from the Peninsula borrow site. Under Alternatives 3, 4, and 8, 90 percent of the fill material would come from the Mississippi Bar borrow site and 10 percent would come from the Peninsula borrow site. The assumptions used to estimate emissions from raising wing dams and

dikes are discussed in Appendix 1B in the Technical Environmental Evaluation (Appendix A, Attachment 1).

A new outlet proposed for Folsom Dam would be constructed first by use of carefully controlled blasting and then by smoothing out by jackhammers. A crane or similar type equipment would be needed to remove concrete debris and a front-end loader would load concrete debris onto a truck for transport to a landfill.

With the exception of haul trucks, construction equipment would not be operated on the public road system. Haul trucks would be used to transport fill material required to raise wing dams and dikes and to remove debris created during the construction process. Debris removed from construction areas would be transported to Kiefer Landfill in south Sacramento County for disposal.

Levee Construction

Levee construction would occur along the Lower American River, Sacramento Weir/Bypass, Yolo Bypass, Sacramento River, and Delta sloughs. A new floodwall would be constructed to protect Nimbus Fish Hatchery and Goethe Park. During levee and floodwall construction, emissions would be generated by operation of earth moving and other heavy construction equipment, haul trucks, and employee commute trips. The assumptions used to estimate emissions from levee construction activities are discussed in Appendix 1B in the Technical Environmental Evaluation (Appendix A, Attachment 1).

Bridge Modifications

Bridge modifications would occur at the UPRR Bridge, Guy West Bridge, Howe Avenue Bridge, and proposed Folsom Dam Bridge. During bridge modifications, emissions would be generated by employee commute trips, by earth-moving equipment, haul trucks, cranes, and paving equipment. The assumptions used to estimate emissions from bridge modification activities are discussed in Appendix 1B in the Technical Environmental Evaluation (Appendix A, Attachment 1).

7.13.3 Criteria for Determining Significance

Air quality significance thresholds were based on standards developed by the Sacramento Metropolitan Air Quality Management District (SMAQMD) and EPA used in assessing project-related air quality effects in Sacramento County (SMAQMD 1994). SMAQMD defines an effect on air quality as being significant if a project would produce more than:

- 85 ppd of reactive organic gases (ROG),
- 85 ppd of oxides of nitrogen (NO_x), or
- 275 ppd of particulate matter less than 10 microns in diameter (PM₁₀), (SMAQMD 1994).

Project-related annual emissions were considered significant if emissions exceeded EPA's general conformity thresholds. Those conformity thresholds are based on the de minimis thresholds included in EPA's general conformity guidance regulation for the Sacramento area (40 CFR Part 51 Subpart W and 40 CFR Part 93 Subpart B). The threshold levels are:

- 25 tons/yr for ROG,
- 25 tons/yr for NO_x,
- 100 tons/yr for carbon monoxide (CO), or
- 100 tons/yr for PM₁₀.

The general conformity regulation requires that the Federal sponsor show that the emissions associated with project activities conform to the State Implementation Plan (SIP) and take specific actions to prove conformity. A detailed general conformity determination would be prepared once design plans and specifications have been developed for the preferred alternative if projected emissions exceed the SIP standards. The conformity determination is required to show that the generation of these pollutants would not cause or contribute to additional violations of the national ambient air quality standards. If appropriate mitigation measures cannot be developed to reduce emissions below the de minimis levels, emission offsets must be purchased to offset the total amount of emissions for each year. Currently, the available supply of emission credits from the SMAQMD is limited due to the California energy crisis and the rate is about \$20,000 per ton of emissions (Thalen pers comm.). It is difficult to predict the future availability of emission credits, however, the supply is expected to improve once energy supply and demand issues are resolved.

SMAQMD's and the EPA's quantitative thresholds are used in this analysis to determine whether the project would result in a significant effect on air quality. In addition, while SMAQMD has removed a threshold of significance for CO, the discontinued standard of 550 ppb was used in this analysis as a threshold to determine whether CO levels attributable to the project alternatives would likely result in significant effect on air quality.

7.13.4 Alternative 1: No Action

Under Alternative 1, no modification to Folsom Dam, wing dams, dikes, or levees would occur. Because no construction activities would occur, no change in air quality conditions is expected.

- No effect on air quality would occur under Alternative 1 because no construction would occur.

7.13.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

L. L. Anderson Dam. Increasing the capacity of the L. L. Anderson Dam would require blasting, excavating, and hauling of excavated material from the spillway to a nearby spoils

disposal site. No substantial change in air quality is expected because blasting would be infrequent and only a few pieces of construction equipment would be in operation at any one time. The project would generate some worker commute trips, but the relatively short construction period and because only a few employees would be required the impacts are not considered to be substantial. Emissions associated with blasting, operation of construction equipment, and employee commute trips are not considered substantial.

- Construction of the L. L. Anderson Dam spillway would result in a less-than-significant effect on air quality because emissions generated by construction activities would not be substantial and would not violate Placer County Air Pollution Control District air quality standards.

Folsom Dam. Construction-related activities associated with Alternative 2 are expected to exceed thresholds established for daily emissions of ROG and NO_x. (Table 7-15) Long-term emission thresholds are expected to be exceeded for NO_x (Table 7-15).

- Temporary effects on air quality as a result of construction-related activities are considered significant because emissions would exceed the air quality standards and thresholds identified by SMAQMD and EPA for ROG and NO_x. Implementation of Mitigation Measure AQ-1 would reduce emissions of NO_x, but not to a less-than-significant level (Table 7-15). Following implementation of Mitigation Measure AQ-1, implementation of Mitigation Measure AQ-2 could reduce the effect of NO_x to a less-than-significant level if air quality credits are available during project construction. Implementation of Mitigation Measure AQ-1 would reduce emissions of ROG, but not to a less-than-significant level (Table 7-15).

Mitigation Measure AQ-1: Incorporate and implement air quality measures for NO_x in the construction management plan. Construction bid specifications should include measures to address NO_x emissions as part of the construction management plan for the project. The plan should be submitted to SMAQMD and should include the following measures:

- require that all off-road construction vehicles be manufactured in 1996 or later or that pre-1996 vehicles be capable of meeting the 6.9 grams NO_x per horsepower-hour standard established by the California Air Resources Board;
- properly maintain all equipment per manufacturers' specifications; and
- use equipment powered by electricity where feasible.

TABLE 7-15. Estimated Emissions Generated during Construction of Each Project Alternative

Alternative	ROG (lbs/day)	NO _x (lbs/day)	CO (lbs/day)	PM10 (lbs/day)	ROG (tons/yr)	NO _x (tons/yr)	CO (tons/yr)	PM10 (tons/yr)
Unmitigated								
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	72.2	427.1	95.6	37.0	10.8	64.1	14.3	5.6
3	14.0	401.4	66.6	34.1	1.3	38.1	6.3	3.2
4	99.4	896.3	309.5	113.9	14.9	134.4	46.4	17.1
5	113.0	1,400.0	628.4	912.5	17.0	210.0	94.3	136.9
6	117.1	1,457.6	647.1	918.6	17.6	218.6	97.1	137.8
7	126.1	1,599.7	716.2	929.8	18.9	240.0	107.4	139.5
Mitigated								
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	72.2	331.2	95.6	12.8	10.8	49.7	14.3	1.9
3	14.0	311.2	66.6	15.2	1.3	29.6	6.3	1.4
4	99.5	694.8	309.5	43.8	14.9	104.2	46.4	6.6
5	113.0	1,086.0	628.4	424.2	17.0	162.9	94.3	63.6
6	117.1	1,130.6	647.1	426.4	17.6	169.6	97.1	64.0
7	126.1	1,240.9	716.2	430.8	18.9	186.1	107.4	64.6

Note: Analysis for Alternative 3 assumed that barges transporting material across Lake Natoma and Folsom Reservoir would be operated no longer than 4 hours per day and construction 190 days per year.

Significance thresholds are as follows:

- ROG: 85 lbs/day and 25 tons/yr
- NO_x: 85 lbs/day and 25 tons/yr
- CO: 550 lbs/day and 100 tons/yr
- PM10: 275 lbs/day and 100 tons/yr

Mitigation Measure AQ-1: Incorporate and implement air quality measures for NO_x in the construction management plan. Construction bid specifications should include measures to address NO_x emissions as part of the construction management plan for the project. The plan should be submitted to SMAQMD and should include the following measures:

- require that all off-road construction vehicles be manufactured in 1996 or later or that pre-1996 vehicles be capable of meeting the 6.9 grams NO_x per horsepower-hour standard established by the California Air Resources Board;
- properly maintain all equipment per manufacturers' specifications; and
- use equipment powered by electricity where feasible.

Mitigation Measure AQ-2: Purchase NO_x emissions credits. Emission credits would be purchase to offset the remaining NO_x emissions attributable to construction of the project after implementation of Mitigation Measure AQ-1. The purchase of an adequate number of credits would reduce this effect to a less-than-significant level if a sufficient number of credits are available from the SMAQMD when construction starts.

7.13.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

- Construction activities under Alternative 3 are similar to Alternative 2 with the addition of raising a 1/3-mile segment of Folsom Dam Road, excavating and transporting borrow material from Mississippi Bar to the Lake Natoma wing dams and dikes, and increasing the height of the wing dams and dikes to accommodate a 482-foot flood pool elevation in Folsom Reservoir. Effects on air quality during construction of the L. L. Anderson Dam spillway would be the same as described under Alternative 2.

Construction-related activities associated with Alternative 3 are expected to exceed thresholds established for daily emissions of NO_x (Table 7-15). Long-term emission thresholds would be exceeded for NO_x (Table 7-15).

- Temporary effects on air quality as a result of construction-related activities are considered significant because emissions would exceed the air quality standards and thresholds identified by SMAQMD and EPA for NO_x. Implementation of Mitigation Measure AQ-1 would reduce emissions of NO_x, but not to a less-than-significant level (Table 7-15). Implementation of Mitigation Measure AQ-2 could reduce the effect of NO_x to a less-than-significant level if air quality credits are available during project construction.
- A description of Mitigation Measures AQ-1 and AQ-2 is provided in Alternative 2 above.

7.13.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

- Construction activities for Alternative 4 are the same as those described for Alternative 3 with the exception that structural changes to Folsom Dam, wing dams, and dikes would be performed to the extent necessary to accommodate a 487-foot flood pool elevation at Folsom Reservoir. Effects on air quality during construction of the L. L. Anderson Dam spillway and the ecosystem restoration alternatives would be the same as described under Alternative 2.

Construction-related activities associated with Alternative 4 are expected to exceed all thresholds established for daily emissions of ROG, NO_x, CO, and PM₁₀ (Table 7-15). Long-term emission thresholds would be exceeded for NO_x (Table 7-15).

- Temporary effects on air quality as a result of construction-related activities are considered significant because emissions would exceed the air quality standards and thresholds identified by SMAQMD and EPA for ROG, NO_x, CO, and PM₁₀. Implementation of Mitigation Measure AQ-1 would reduce emissions of ROG, NO_x and CO, but not to a less-than-significant level (Table 7-15). Implementation of Mitigation Measure AQ-2 could reduce the effect of NO_x to a less-than-significant level if air quality credits are available during project construction. Implementation of Mitigation Measure AQ-3 would reduce the effects of PM₁₀, but not to a less-than-significant level.

Descriptions of Mitigation Measures AQ-1, and AQ-2 are provided in Alternative 3 above.

Mitigation Measure AQ-3: Incorporate and implement air quality measures for PM10 in the construction management plan. The following PM10 control measures should be included in the construction management plan to limit construction-related dust emissions.

- Cover, enclose, or water active storage piles at least twice daily. Frequency of watering should be based on the type of operation.
- Cover inactive storage piles.
- Water all unpaved haul roads two times per day or as necessary to prevent visible dust emissions.
- Cover securely or maintain at least two feet of freeboard on all haul trucks when transporting materials.
- Prohibit all grading activities during periods of high wind (windspeeds greater than 25 miles per hour).
- Plant vegetative ground cover in disturbed areas as soon as possible.
- Install wheel washers for all exiting trucks.
- Sweep streets if visible soil is carried onto adjacent public roads.
- Post a publicly visible sign at the project site to specify the telephone number and person to contact regarding complaints. This person would be responsible for responding to complaints and taking corrective action within 48 hours.

7.13.8 Alternative 5: Stepped Release to 160,000 cfs

Alternative 5 would include improvements to accommodate increased objective releases from Folsom Dam up to a maximum of 160,000 cfs. Components of Alternative 5 include modifying pumping stations and drainage facilities, widening the Sacramento Weir and Bypass, and raising and strengthening the levees in the Yolo Bypass. In addition, levee strengthening would occur on the Lower American River from the NEMDC to I-5. Effects on air quality during construction of the ecosystem restoration alternatives would be the same as described under Alternative 2.

Construction of Alternative 5 is expected to exceed all thresholds established for daily emissions for ROG, NO_x, CO, and PM10 (Table 7-15). Long-term emission thresholds would be exceeded for NO_x (Table 7-15).

- Temporary effects on air quality as a result of construction-related activities are considered significant because emissions would exceed the air quality standards and thresholds identified by SMAQMD and EPA for ROG, NO_x, CO, and PM₁₀. Implementation of Mitigation Measure AQ-1 would reduce emissions of ROG, NO_x and CO, but not to a less-than-significant level (Table 7-15). Implementation of Mitigation Measure AQ-2 could reduce the effect of NO_x to a less-than-significant level if air quality credits are available during project construction. Implementation of Mitigation Measure AQ-3 would reduce the effects of PM₁₀, but not to a less-than-significant level.

A description of Mitigation Measures AQ-1, AQ-2, and AQ-3 is provided in Alternative 3 above.

7.13.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Alternative 6 would incorporate all components of Alternative 5 with the addition of a new outlet to be constructed within the auxiliary spillway of Folsom Dam. This plan would also require modifications to the flip bucket and stilling basin under the auxiliary spillway. The effect of these changes would be to increase the efficiency at which a stepped release of 160,000 cfs could be reached in order to maximize potential flood protection. Effects on air quality during construction of the ecosystem restoration alternatives would be the same as described under Alternative 2.

Construction of Alternative 6 is expected to exceed all thresholds established for daily emissions for ROG, NO_x, CO, and PM₁₀ (Table 7-15). Long-term emission thresholds would be exceeded for NO_x (Table 7-15).

- Temporary effects on air quality as a result of construction-related activities are considered significant because emissions would exceed the air quality standards and thresholds identified by SMAQMD and EPA for ROG, NO_x, CO, and PM₁₀. Implementation of Mitigation Measure AQ-1 would reduce emissions of ROG, NO_x and CO, but not to a less-than-significant level (Table 7-15). Implementation of Mitigation Measure AQ-2 could reduce the effect of NO_x to a less-than-significant level if air quality credits are available during project construction. Implementation of Mitigation Measure AQ-3 would reduce the effects of PM₁₀, but not to a less-than-significant level.

A description of Mitigation Measures AQ-1, AQ-2, and AQ-3 is provided in Alternative 3 above.

7.13.10 Alternative 7: Stepped Release to 180,000 cfs

Alternative 7 would include improvements to accommodate increased objective releases from Folsom Dam up to a maximum of 180,000 cfs. Components of Alternative 7 include all those described for Alternative 5 with the addition of the following elements:

- raising and strengthening 13.5 miles of existing levees along the Lower American River and placement of erosion protection along selected segments of 5.8 miles of these levees;
- construction of 2 miles of new levees along the American River and 1.7 miles of floodwalls at Goethe Park and Nimbus Hatchery; and
- raising the height of the Howe Avenue and Guy West bridges between 3 and 5 feet. In addition, modifying the right trestle of the UPRR where the track crosses the north levee below the levee crown.

Effects on air quality during construction of the ecosystem restoration alternatives would be the same as described under Alternative 2.

Construction of Alternative 7 is expected to exceed all thresholds established for daily emissions for ROG, NO_x, CO, and PM₁₀ (Table 7-15). Long-term emission thresholds would be exceeded for NO_x (Table 7-15).

- Temporary effects on air quality as a result of construction-related activities are considered significant because emissions would exceed the air quality standards and thresholds identified by SMAQMD and EPA for ROG, NO_x, CO, and PM₁₀. Implementation of Mitigation Measure AQ-1 would reduce emissions of ROG, NO_x and CO, but not to a less-than-significant level (Table 7-15). Implementation of Mitigation Measure AQ-2 could reduce the effect of NO_x to a less-than-significant level if air quality credits are available during project construction. Implementation of Mitigation Measure AQ-3 would reduce the effects of PM₁₀, but not to a less-than-significant level.

A description of Mitigation Measures AQ-1, AQ-2, and AQ-3 is provided in Alternative 3 above.

7.13.11 Alternative 8: Stepped Release to 160,000 cfs and 8-5-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction-related effects on air quality resulting from raising Folsom Dam, dikes, and wings; increasing the capacity of the L. L. Anderson Dam spillway, and construction of the ecosystem restoration alternatives would be the same as described under Alternative 3. Construction-related effects on strengthening levees along the Lower American River, within the Yolo and Sacramento Bypasses, and along the Sacramento River and Delta sloughs would be the same as described under Alternative 5. Effects on air quality resulting from constructing the flood plain ecosystem or aquatic ecosystem restoration alternative would be the same as described under Alternative 2.

Construction of Alternative 8 is expected to exceed all thresholds established for daily emissions for ROG, NO_x, CO, and PM₁₀ (Table 7-15). Long-term emission thresholds would be exceeded for NO_x (Table 7-15).

- Temporary effects on air quality as a result of construction-related activities are considered significant because emissions would exceed the air quality standards and thresholds identified by SMAQMD and EPA for ROG, NO_x, CO, and PM₁₀. Implementation of Mitigation Measure AQ-1 would reduce emissions of ROG, NO_x and CO, but not to a less-than-significant level (Table 7-15). Implementation of Mitigation Measure AQ-2 could reduce the effect of NO_x to a less-than-significant level if air quality credits are available during project construction. Implementation of Mitigation Measure AQ-3 would reduce the effects of PM₁₀, but not to a less-than-significant level.

A description of Mitigation Measures AQ-1, AQ-2, and AQ-3 is provided in Alternative 3 above.

7.13.12 Alternative 9.0: Ecosystem Restoration Alternatives

This section describes the construction-related effects on air quality occurring at the ecosystem restoration sites. Operation of Alternatives 9.1 through 9.5 would not affect air quality and is not analyzed further.

Alternative 9.1: Urrutia Restoration Site

Construction activities that would occur under Alternative 9.1 are expected to exceed thresholds established for daily emissions of NO_x and PM₁₀ by 437 lbs/day and 1,400 lbs/day, respectively (Table 7-16). Long-term emission thresholds would not be exceeded.

TABLE 7-16. Estimated Emissions Generated during Construction of Alternatives 9.1 through 9.4

Alternative	Total Area (acres)	ROG (lbs/day)	NO _x (lbs/day)	CO (lbs/day)	PM ₁₀ (lbs/day)	ROG (tons/year)	NO _x (tons/year)	CO (tons/year)	PM ₁₀ (tons/year)
Unmitigated									
9.1	160	40.8	522.2	235.5	1674.9	1.8	23.0	10.4	73.7
9.2	184	16.4	165.4	91.5	1627.0	0.7	7.3	4.0	71.6
9.3	137	21.9	242.1	121.9	1637.6	1.0	10.7	5.4	72.1
9.4	112	21.9	242.1	121.9	1637.6	1.0	10.7	5.4	72.1
Mitigated									
9.1	160	35.0	445.0	199.2	242.3	1.5	19.6	8.8	10.7
9.2	184	14.0	142.5	77.2	245.0	0.6	6.3	3.4	10.8
9.3	137	18.7	207.3	102.9	192.6	0.8	9.1	4.5	8.5
9.4	112	18.7	207.3	102.9	161.3	0.8	9.1	4.5	7.1

Please note: Mitigated emissions assume 50 percent control with water application and assume that only 25 percent of all disturbed areas will be worked on the worst-case day.

- Effects on air quality during construction of Alternative 9.1 are considered significant because emissions would exceed the daily air quality standards and thresholds identified by SMAQMD and EPA for NO_x and PM₁₀. Implementation of Mitigation Measure AQ-1 would reduce NO_x emissions, but not to a less-than-significant level. Mitigation Measure AQ-2, if available, could reduce NO_x emissions to a less-than-significant level if emission credits are available. Mitigation Measure AQ-3 should

be included in the construction management plan to limit construction-related dust emissions of PM10 to a less-than-significant level.

Alternative 9.2: Woodlake Restoration Site

Construction activities that would occur under Alternative 9.2 are expected to exceed thresholds established for daily emissions of NO_x and PM10 by 80 lbs/day and 1,352 lbs/day, respectively (Table 7-16). Long-term emission thresholds would not be exceeded.

- Effects on air quality during construction of Alternative 9.2 are considered significant because emissions would exceed the daily air quality standards and thresholds identified by SMAQMD and EPA for NO_x and PM10. Implementation of Mitigation Measure AQ-1 would reduce NO_x emissions, but not to a less-than-significant level. Mitigation Measure AQ-2, if available, could reduce NO_x emissions to a less-than-significant level if emission credits are available. Mitigation Measure AQ-3 should be included in the construction management plan to limit construction-related dust emissions of PM10 to a less-than-significant level

Alternative 9.3: Bushy Lake Restoration Site

Construction activities that would occur under Alternative 9.3 are expected to exceed thresholds established for daily emissions of NO_x and PM10 by 157 lbs/day and 1,363 lbs/day, respectively (Table 7-16). Long-term emission thresholds would not be exceeded.

- Effects on air quality during construction of Alternative 9.3 are considered significant because emissions would exceed the daily air quality standards and thresholds identified by SMAQMD and EPA for NO_x and PM10. Implementation of Mitigation Measure AQ-1 would reduce NO_x emissions, but not to a less-than-significant level. Mitigation Measure AQ-2, if available, could reduce NO_x emissions to a less-than-significant level if emission credits are available. Mitigation Measure AQ-3 should be included in the construction management plan to limit construction-related dust emissions of PM10 to a less-than-significant level.

Alternative 9.4: Arden Bar Restoration Site

Construction activities that would occur under Alternative 9.4 are expected to exceed thresholds established for daily emissions of NO_x and PM10 by 157 lbs/day and 1,363 lbs/day, respectively (Table 7-16). Long-term emission thresholds would not be exceeded.

- Effects on air quality during construction of Alternative 9.4 are considered significant because emissions would exceed the daily air quality standards and thresholds identified by SMAQMD and EPA for NO_x and PM10. Implementation of Mitigation Measure AQ-1 would reduce NO_x emissions, but not to a less-than-significant level. Mitigation Measure AQ-2, if available, could reduce NO_x emissions to a less-than-significant level if emission credits are available. Mitigation Measure AQ-3 should be included in the construction management plan to limit construction-related dust emissions of PM10 to a less-than-significant level.

Alternative 9.5: Fisheries Restoration

- Constructing the fisheries ecosystem restoration alternative is not expected to result in a substantial effect on air quality because no ground-disturbing activities would occur and heavy equipment would be limited to a crane or other lifting device.
- Constructing the fisheries restoration alternative would result in a less-than-significant effect on air quality because few types of heavy equipment would be used.

7.14 Noise

7.14.1 Introduction

The project alternatives have the potential to generate noise as a result of construction-related activities associated with increasing the height of Folsom Dam, wing dams, and dikes; strengthening or raising levees along the Lower American River; Yolo Bypass, Sacramento River, and Delta sloughs; and increasing the size of the Sacramento Bypass.

Operation of any of the project alternatives are not expected to result in a substantial change in noise conditions and are not evaluated further in this section.

7.14.2 Methods and Assumptions

Noise effects were evaluated for each construction site by comparing the expected project-generated construction noise levels with existing noise levels while taking into account the locations of sensitive receptors and the noise criteria and standards set forth in applicable planning documents.

Modifications to L. L. Anderson Dam, Folsom Dam, Wing Dams, and Dikes

Increasing the capacity of the L. L. Anderson Dam spillway would include blasting, drilling, and use of excavators and haul trucks. Blasting would be limited to the existing spillway and the area immediate adjacent to the spillway. Construction would be completed within one season.

Raising the height of wing dams and dikes and constructing new floodwalls would require the use of heavy earthmoving equipment and haul trucks. Operation of earthmoving equipment would be limited to the wing dams, dikes, and borrow sites. Haul trucks would be used to transport material from the Willow Creek Recreation Area to wing dams and dikes. Construction activities associated with raising the dikes and wing dams at Folsom Dam would occur over a 3-year period.

Noise would be generated during construction of the temporary bridge downstream of Folsom Dam as a result of operation of earthmoving equipment, haul trucks, pile drivers, and other heavy equipment typically used in bridge construction projects.

Constructing a new outlet at Folsom Dam would include blasting and use of jackhammers and pneumatic drills. A crane or similar equipment would be used to remove concrete. Haul trucks would be used to remove concrete debris.

Levee Construction

Noise would be generated during strengthening of levees along the Lower American Yolo Bypass, Sacramento River, and Delta sloughs, and Sacramento Bypass as a result of use of earthmovers and haul trucks.

Bridge Modifications along the Lower American River

To accommodate higher flows in the Lower American River, modifications to the UPRR, Guy West, and Howe Avenue bridges would be required. During bridge construction, noise would be generated by numerous types of equipment including pile drivers, cranes, jackhammers, pneumatic drills, trucks, and earthmoving equipment used to cut pier walls, equipment used to construct and implement jacks and false work for temporary bridge support, reconstruction of pier walls, and regrading of the surface deck.

Assessment Methodology

The magnitude of construction noise effects would depend on the type of construction activity, the noise level generated by various pieces of construction equipment, the duration of the activity, the distance between the activity and noise sensitive receivers, and shielding effects from local barriers and topography.

Potential construction noise levels were compared to noise levels for sensitive residential uses that would provide a suitable environment for indoor communication and sleep. Table 7-17 shows noise levels at a distance of 50 feet for various types of construction equipment that may potentially be used during construction. Background sound levels for residential areas are typically in the range of 40–60 dBA. This analysis assumed an average background noise level of 50 dBA. The analysis also assumed that an increase in 10 dBA would represent a substantial increase in ambient noise levels. Therefore, a construction-related increase in noise to levels above 60 dBA would represent a significant effect. This value corresponds to the existing noise standards reported in the general plans and ordinances for Sacramento County, Placer County, Yolo County, El Dorado County, and the City of Folsom.

A reasonable worst-case assumption is that the three loudest pieces of equipment would operate simultaneously and continuously over at least a 1-hour period. The combined sound level of three of the loudest pieces of equipment listed in Table 7-17 (jackhammer, scraper, and truck) is 94 dBA measured at 50 feet from the source. Table 7-18, which assumes this combined source level, summarizes predicted noise levels at various distances from an active construction site. The data shown in the table indicates that the 60 dBA threshold would be exceeded up to 2,000 feet from the point the noise is generated. These estimations of noise levels take into account distance attenuation, attenuation from molecular absorption, and anomalous excess attenuation (Hoover 1996).

The results in Table 7-18 indicate the potential for residences within about 2,000 feet of active construction sites to be exposed to substantial increases in noise assuming a background sound level of 50 dBA.

Table 7-17. Noise Emission Levels Typical for Construction Equipment

Equipment	Typical Noise Level (dBA) 50 feet from Source
Backhoe	80
Bulldozer	85
Compressor	81
Generator	75
Grader	85
Jackhammer	90
Loader	85
Roller	75
Scraper	89
Truck	88

Note: dBA = A-weighted decibel scale.

Source: Federal Highway Administration 1995 and Reagan and Grant 1977.

Table 7-18. Estimated Construction Noise in the Project Area

Distance Attenuation	
Distance to Receptor (feet)	Sound Level at Receptor (dBA)
50	94
100	88
200	82
400	73
600	72
800	69
1,000	66
1,500	62
2,000	59
2,500	56
3,000	53
4,000	49
5,280	45
7,500	38

The following assumptions were used:

Basic sound level drop-off rate: 6.0 dB per doubling of distance

Molecular absorption coefficient: 0.7 dB per 1,000 feet

Analogous excess attenuation: 1.0 dB per 1,000 feet

Reference sound level: 94 dBA

Distance for reference sound level: 50 feet

This calculation assumes simultaneous operation of one jackhammer, one truck, and one scraper.

The results in Table 7-18 indicate the potential for residences within about 2,000 feet of active construction sites to be exposed to substantial increases in noise assuming a background sound level of 50 dBA.

7.14.3 Significance Criteria

Criteria for determining the significance of noise effects were developed based on professional judgment and guidance in the CEQA Guidelines. Noise effects were considered significant if they would result in any of the following:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinances, or applicable standards of other agencies.
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Effects were considered significant if they met any of the criteria identified above.

7.14.4 Alternative 1: No Action

Alternative 1 does not include construction of new flood control improvements or changes in flood control operations. Therefore, no change in noise levels would occur.

7.14.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Increasing the capacity of the L. L. Anderson Dam spillway would require blasting, drilling, and use of excavators and haul trucks. Enlarging the spillway would require blasting because the spillway passes through solid rock. Blasting is expected to occur twice a day, six days a week, over a period of six weeks. Noise from blasting is typically 94 dBA at a distance of 50 feet, although this may vary based on the size and location of the blasting charge.

- The effects of blasting and operation of construction equipment on noise conditions at L. L. Anderson Dam and French Meadows Reservoir are considered less than significant because blasting would occur intermittently, would only last one season, and would not affect sensitive receptors.

Folsom Dam. The nearest noise receptors to Folsom Dam and the alignment for the temporary bridge below Folsom Dam are the Bureau and DPR offices on the north side of the dam, an apartment complex located just west of the Bureau offices, and a mobile home park located along Folsom-Auburn Road (Plate 7.14-1). Folsom State Prison is located approximately

3,200 feet from the proposed bridge alignment. Single-family residences are located on both the north and south rims of the American River Canyon, approximately 1.0 mile from the project site.

Raising the height of Folsom Dam is not expected to result in a substantial increase in ambient noise levels because of the distance between the dam and sensitive noise receptors (Plate 7.14-1). Construction of the northern approach to the temporary bridge is expected to result in a substantial increase in ambient noise levels at the Bureau's and DPR's offices and at the apartment complex because of the close proximity of the proposed roadway to these buildings. Construction is expected to result in a substantial temporary increase in the ambient noise level and expose people to noise levels that exceed standards established by local noise ordinances.

- Temporary noise effects associated with raising and modifying Folsom Dam are considered less than significant because the distance between noise sources and potential receptors is large enough to attenuate noise.
- Temporary noise effects associated with constructing the temporary bridge and roadway are considered significant because of the close proximity of residences and offices to the bridge alignment. Implementation of Mitigation Measure N-1 would reduce this effect, but not to a less-than-significant level.

Mitigation Measure N-1: Develop and implement a noise abatement program. The Corps should avoid and minimize short-term noise-related effects by implementing the following noise abatement measures:

- Limit construction activities to daylight hours between 8 a.m. and 6 p.m. Monday through Friday and from 9 a.m. to 5 p.m. Saturday and Sunday. Haul truck trips should be prohibited in residential areas during the same hours.
- Ensure that all equipment have sound-control devices no less effective than those provided by the manufacturer. All equipment would be operated and maintained to minimize noise generation. Mufflers should be kept operable and effective on all construction equipment, generators, and vehicles. All internal-combustion engines must be operated with exhaust and intake silencers. Wherever possible, noise-generating construction equipment should be shielded from nearby residences by noise-attenuating buffers such as structures or truck trailers.
- Equipment warm up areas, water tanks, and equipment storage areas should be located as far away from existing residences as is feasible.
- Stationary noise sources should be located at least 300 feet from occupied residences. Contractors should provide appropriate noise-reducing engine-housing enclosures on all such equipment.
- Provide written notice of construction activities within 2,000 feet of residences or other sensitive receptors. Written notice provided to potentially-affected residences

should identify the type, duration, and frequency of construction activities. Notification materials would also identify a mechanism to register complaints if construction noise levels are overly intrusive or if construction occurs outside specified hours.

- Implement appropriate additional noise mitigation measures, including, but not limited to, changing the location of stationary construction equipment, shutting off idling equipment, rescheduling construction activity, or installing acoustic barriers around stationary construction noise sources at the request of the city or county.

Once the temporary bridge is complete, traffic normally using Folsom Dam Road would be diverted to the new roadway. The north end of the temporary bridge roadway would be located immediately adjacent to the apartment complex grounds and would pass within 150 feet of the nearest apartment building (Plate 7.14-1). Noise associated with vehicles using this new roadway was evaluated using Sound32, the Caltrans implementation of the Federal Highway Administration (FHWA) Traffic Noise Prediction Model (FHWA-RD-77-108). The evaluation indicates that when in use, noise within the apartment complex attributable to the new roadway would increase from about 56 day or night shift (L_{dn}) to 66 L_{dn} .

- Noise generated by traffic routed to the temporary bridge would result in a significant effect on noise at the apartment complex because the predicted 10 dB increase is considered substantial and the City of Folsom's compatibility standard of 60 L_{dn} would be exceeded. Mitigation Measure N-2 would reduce this effect, but not to a less-than-significant level.

Mitigation Measure N-2: Construct a sound wall between the temporary roadway and the apartment complex. A sound wall should be constructed between the roadway and the apartment complex. The wall should be designed to reduce exterior noise at ground-floor outdoor activity areas to 60 L_{dn} or less. It is impractical to design the wall to reduce exterior noise to 60 L_{dn} or less at second story locations. However, some benefit on the order of 1 to 2 dB would likely occur. The City of Folsom allows exterior noise levels of up to 65 L_{dn} where best available noise-reducing technologies have been implemented and noise at second-story locations would generally be expected to be below this level.

Once construction of the dam raise is completed, the temporary bridge would be removed. Demolition of the bridge would require use of the same types of construction equipment as during construction. The location of the temporary bridge would be over 1,000 feet from the closest sensitive noise receptors, including the Bureau and DPR facilities and the apartment complex located immediately to the west of these facilities (Plate 7.14-1).

- Temporary noise effects associated with removing the temporary bridge are considered less than significant because most demolition activity would occur away from the sensitive receptors.

Folsom Reservoir. Construction activities associated with borrowing material and raising the wing dams and dikes would result in the generation of noise levels greater than existing

conditions because numerous pieces of heavy equipment would be operating simultaneously during construction.

There are several sites where sensitive noise receptors are located near the proposed construction areas. Residences on the southwestern perimeter of the reservoir near Granite Bay are located between 600 and 1,000 feet of Dikes 1, 2, 3, and 4 (Plates 7.14-2 and 7.14-3). On the southeastern perimeter of the reservoir, some residences along Natoma Street are within 800 feet of Dikes 7 and 8 (Plate 7.14-4). Operation of heavy equipment within 2,000 feet of sensitive receptors would result in a substantial increase in the ambient noise level exceeding the estimated background level of 50 dBA (Table 7-18). Construction in these areas would cause a substantial temporary increase in the ambient noise level and expose sensitive receptors to noise levels that exceed standards established by local noise ordinances.

Residences in other areas around the perimeter of Folsom Reservoir are located far enough away from construction areas to attenuate construction-related noise to an acceptable level. It is not anticipated that construction-related noise would create an adverse effect on recreation facilities located at Granite Bay and Beals Point.

The location of the Peninsula campground is far enough away from the Peninsula borrow sites to attenuate construction-related noise to a level below levels of concern. In addition, excavation of material would be limited to times when the reservoir level is low. These would coincide with the off-peak season visitation to the campground.

- The effects of temporary noise generated by construction activities associated with improvements to Dikes 1, 2, and 3 near Granite Bay and the Mooney Ridge Development, and Dikes 7 and 8 near Natoma Street are considered significant because activity would generate noise above acceptable levels and would occur near sensitive receptors. Implementation of Mitigation Measure N-1 would reduce these effects, but not to a less-than-significant level.

Operation-Related Effects

Operation of Alternative 2 would not result in changes in noise conditions within the project area.

7.14.6 Alternative 3: Seven-Foot Dan Raise/482-Foot Flood Pool Elevation

The plan components for Alternative 3 are essentially identical to those of Alternative 2 with the exception that structural improvements to Folsom Dam and other surrounding dikes would be performed to accommodate a 482-foot flood pool elevation in Folsom Reservoir. In addition, a segment of Folsom Dam Road would be raised and material for raising wing dams and dikes would be excavated and transported from Mississippi Bar. Other effects of construction on noise conditions would be the same as described under Alternative 2.

Folsom Reservoir. To avoid inundation during flood control operations, approximately 0.33-mile of Folsom Dam Road, located at the southern end of the Left Wing Dam, would be raised to an elevation higher than 482 feet. No sensitive noise receptors are located in the

vicinity of the roadway construction area. Receptors to the west of the roadway would be protected from noise disturbance by intervening topography.

- Effects of raising Folsom Dam Road on noise are considered less than significant because no sensitive receptors are located near the construction site.

Lake Natoma. Construction activities associated with excavating, sorting, loading, and offloading materials from the Mississippi Bar borrow site would result in the generation of noise levels greater than existing conditions. There would be an increased usage of haul trucks on local roadways near the borrow areas.

Sensitive noise receptors are located in the vicinity of the Mississippi Bar borrow site. These receptors include residences located to the north and west of the borrow site, and recreationists at Lake Natoma. This area would experience a substantial increase in the ambient noise level or exposure to severe noise levels that exceed standards established by local noise ordinances.

- Temporary noise effects generated by excavation and hauling activities associated with the Mississippi Bar borrow site are considered significant because they would generate noise above acceptable levels and occur near sensitive receptors. Implementation of Mitigation Measure N-1 would reduce this effect, but not to a less-than-significant level.

7.14.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Construction- and operation-related effects under Alternative 4 would be the same as described under Alternative 3.

7.14.8 Alternative 5: Stepped Release to 160,000 cfs

Construction-Related Effects

Lower American River. Modifications to pumping stations and drainage facilities to allow the safe conveyance of flows up to 160,000 cfs would be required at numerous locations along the Lower American River. A list of these facilities and their location is shown in Table 5-8. Modifications would include the relocation or elevation of electrical equipment, pumps, pipes and other infrastructure. Any of the facilities that require modifications are located adjacent to residential developments.

As indicated in Table 7-18, construction activities are expected to result in noise levels substantially above typical residential ambient noise levels.

- Temporary noise effects generated by the modification of pumping stations and utilities along the Lower American River are considered significant because they would generate noise above acceptable levels and have the potential to occur near sensitive receptors. Implementation of Mitigation Measure N-1 would reduce this effect, but not to a less-than-significant level.

Levee strengthening between the NEMDC and the Sacramento River would require operation of heavy construction equipment immediately adjacent to commercial and residential development just north of the levee. As indicated in Table 7-18, construction activities are expected to result in noise levels substantially above typical residential ambient noise levels.

- Noise generated by strengthening the levee would result in a significant effect on residential and commercial development because of the close proximity of the levee the developments. Implementation of Mitigation Measure N-1 would reduce this effect, but not to a less-than-significant level.

Yolo and Sacramento Bypasses. Construction activities associated with proposed modifications in the Sacramento and Yolo Bypasses and in the Delta would generate noise which is expected to exceed standards established by local noise ordinances. However, these sites are not located near residential areas or other sensitive receptors.

- Noise effects that would result from construction activities associated with modifications to the Sacramento Weir and Bypass levees along Yolo Bypass and in the Delta are considered less than significant because sensitive receptors are absent or are located a considerable distance away from construction areas.

Operation-Related Effects

Operation of Alternative 5 would not result in changes in noise conditions within the project area.

7.14.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam Construction-Related Effects

Alternative 6 includes all the elements of Alternative 5 with the addition of a new outlet to be constructed within the auxiliary spillway of Folsom Dam. Effects associated with modifications of levees along the Lower American River, in the Sacramento and Yolo Bypasses, and in the Delta would be the same as described under Alternative 5.

Folsom Dam. Construction of the new outlet would be accomplished by blasting and using jackhammers, pneumatic drills, and other types of construction equipment. Blasting activities would create noise levels in excess of existing conditions. A typical sound level for blasting is 94 dBA at a distance of 50 feet (Hoover 1996). Table 7-19 shows estimated blasting-noise levels near an active blasting site and lists the assumptions on which the noise-level calculations were based. Assuming a background level of 50 dBA, sensitive receptors within approximately 2,000 feet of the blasting site could be exposed to substantial increases in noise. However, because sensitive receptors do not occur within 2,000 feet of the proposed location of the new outlet, and blasts would be small and limited in use, a substantial increase in noise is not expected to occur.

- Temporary noise effects generated by construction activities associated with constructing an additional outlet at Folsom Dam are considered less than significant

due to noise attenuation as a result of the large distance between noise sources and potential receptors.

TABLE 7-19. Estimated Blasting Noise in the Project Area

Distance Attenuation	
Distance to Receptor (feet)	Sound Level at Receptor (dBA)
50	94
100	88
200	82
400	75
600	71
800	69
1,000	66
1,500	62
2,000	59
2,500	56
3,000	53
4,000	49
5,280	45
7,500	38

The following assumptions were used:

Basic sound level drop-off rate: 6.0 dB per doubling of distance

Molecular absorption coefficient: 0.7 dB per 1,000 feet

Analogous excess attenuation: 1.0 dB per 1,000 feet

Reference sound level: 94 dBA

Distance for reference sound level: 50 feet

This calculation assumes simultaneous operation of one jackhammer, one truck, and one scraper.

7.14.10 Alternative 7: Stepped Release to 180,000 cfs

Construction-Related Effects

Lower American River. Heavy equipment would be used to raise and strengthen levees, construct new floodwalls, haul materials to the site, and to fill and grade materials on site. In addition, there would be numerous amounts of auxiliary equipment used for construction staging and maintenance, placement and movement of materials within sites, and transportation of workers to and from construction areas. It is anticipated that this activity would require the use of earthmoving and hauling equipment similar to those listed in Table 7-17.

As indicated in Table 7-18, construction-related noise sources with an overall level of 94 dBA or greater, would result in noise levels that are substantially above typical residential ambient noise levels for these receptors located within 2,000 feet of the noise source. Most of the levees along the Lower American River are located 2,000 feet or less from sensitive receptors, especially levees near Mayhew Drain and Campus Commons. Because proposed construction activities would occur in close proximity to nearby residences, noise effects would be considered significant.

- Temporary noise effects generated by the modification of pumping stations and utilities along the Lower American River are considered significant because they would generate noise above acceptable levels and have the potential to occur near

sensitive receptors. Implementation of Mitigation Measure N-1 would reduce this effect, but not to a less-than-significant level.

Flows of up to 180,000 cfs in the American River would require raising the Howe Avenue and Guy West bridges between 3 and 5 feet. Construction activities at the Howe Avenue Bridge would occur over 3 years. A similar timeline is expected for the Guy West Bridge. Construction within the channel at each bridge would be limited to the period between April 15 and October 15. To accommodate flows up to 180,000 cfs, the right trestle of the UPRR would also be modified. Modifications would occur where the track crosses the north levee below the levee crown. The UPRR, Guy West, and Howe Avenue bridges are near residential areas, and bridge modification activities may cause an increase in noise.

- Temporary noise effects generated by modifying the UPRR, Guy West, and Howe Avenue bridges are considered significant because they would generate noise above acceptable levels and have the potential to occur near sensitive receptors. Implementation of Mitigation Measure N-1 would reduce this effect, but not to a less-than-significant level.

7.14.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction- and operation-related effects at Folsom Reservoir would be the same as described under Alternative 3. Construction- and operation-related effects along the Lower American River and in the Sacramento Bypass, Yolo Bypass, and Delta would be the same as described under Alternative 5.

7.14.12 Alternative 9.0: Ecosystem Restoration Alternatives

This section describes the construction-related effects on noise that would occur under each restoration alternative. Operation of Alternatives 9.1 through 9.5 would not generate noise therefore, operation-relation effects were not analyzed.

Alternative 9.1: Urrutia Restoration Site

Construction activities would include the use of heavy construction equipment. Noise generated by the types of equipment that may be used during construction is indicated in Table 7-17. Construction-related noise effects would be short-term because the alternative would require no more than six months to complete. However, commercial and residential developments are within close proximity (about 500 feet) of Alternative 9.1.

- Effects of construction of Alternative 9.1 on noise are considered significant because of the close proximity of the sites to residential developments and the type of construction equipment that would be employed. Implementation of Mitigation Measure N-1 would reduce these effects, but not to a less-than-significant level.

Alternative 9.2: Woodlake Restoration Site

Construction activities for Alternative 9.2 would include the use of heavy construction equipment. Residences are located about 1,300 feet from the Woodlake restoration site.

- Effects of construction of Alternative 9.2 site are considered less than significant because sensitive receptors are located far enough away to attenuate noise generated during construction.

Alternative 9.3: Bushy Lake Restoration Site

Construction activities for Alternative 9.3 would include the use of heavy construction equipment. Residences are located about 2,000 feet from the Bushy Lake site.

- Effects of construction of Alternative 9.3 site are considered less than significant because sensitive receptors are located far enough away to attenuate noise generated during construction.

Alternative 9.4: Arden Bar Restoration Site

Construction activities for Alternative 9.4 would include the use of heavy construction equipment. Residences are located about 400 feet from the restoration site.

- Effects of construction of Alternative 9.4 on noise are considered significant because of the close proximity of the sites to residential developments. Implementation of Mitigation Measure N-1 would reduce these effects, but not to a less-than-significant level.

Alternative 9.5: Fisheries Restoration

Construction of the fisheries alternative would be limited to the powerhouse penstocks intakes. Most of the assembly of the shutters would occur underwater. Surface activities would be limited to the Folsom Dam Road or barges and would include operation of cranes, hoists, or other equipment to assist in assembly of the shutters. None of this equipment would generate substantial amounts of noise and no sensitive receptors are located in the vicinity of the temperature control shutters.

- Effects of construction of the Alternative 9.5 on noise are considered less than significant because operation of equipment is not expected to generate substantial amounts of noise and no sensitive receptors are located in the vicinity of the temperature control shutters.

7.15 Visual Resources

7.15.1 Introduction

This section describes the operation-related and construction-related effects on visual resources that are expected to occur under each project alternative. The following discussion includes the methods and assumptions used to conduct the analysis and the criteria for determining the significance of effects.

This analysis is a qualitative evaluation of effects of the project alternatives on the character and quality of views within the study area (French Meadows Reservoir, Folsom Reservoir, along the Lower American River, and within the Yolo and Sacramento Bypasses) relative to existing conditions. In general, conditions have not changed substantially since the analysis presented in the 1996 SEIR.

7.15.2 Methods and Assumptions

As described in the setting section, the methods used for this visual assessment were adapted from established, commonly used Federal visual assessment guidelines, including those prepared by the FHWA (1983):

- Identify the visual features or resources that make up and define the visual character of the landscape.
- Assess the visual quality of the identified visual resources relative to overall regional visual character.
- Identify major viewer groups and describe viewer exposure.
- Identify the importance to people, or the viewer sensitivity, of views in the landscape.

This assessment assumes that Folsom Reservoir is a significant visual feature in the regional landscape. The lake and shoreline contrast sharply with the nearby rolling wooded foothills. Visual quality is highest in winter and spring when reservoir levels are high. As summer progresses, reservoir drawdown typically exposes a ring of bare soil along the shoreline, negatively affecting visual quality. Major viewer groups are the residents of nearby areas and recreationists using the reservoir and shoreline.

The Lower American River corridor has an abundance of high-quality views consisting of a variety of visual components, including steep bluffs, terraces, islands, backwater areas, and riparian vegetation. The character of the landscape between the levees, including the river, is predominantly natural. The river and diverse riparian woodlands and grasslands dominate the views. For viewers within the floodway, views of surrounding urban land uses and activities are largely screened by the levees and by taller vegetation. The natural character of the Lower American River corridor contrasts vividly with the surrounding urban setting. Major viewer groups include pleasure boaters and anglers on the river; pedestrians, joggers, equestrians, and cyclists on the bicycle/equestrian trails and levees; visitors to developed parks; nearby residents; and to a lesser extent, motorists on bridges over the river. Because of their isolation, long-term agricultural use, and rural surroundings, the Sacramento and Yolo Bypasses exhibit little visual

diversity or character, attract few viewers and have low viewer sensitivity, and overall are not considered to have high value as scenic resources.

Construction-Related Effects

Construction-related effects were analyzed for each alternative, based on the following assumptions:

- Modifications to dikes and dams around Folsom Reservoir would occur in phases, limiting the extent of construction affecting viewsheds at any one time.
- Construction on any single dike would be completed within one season, and construction on Mormon Island Dam and Folsom Dam would be completed within two to three seasons, limiting viewer exposure.
- Construction of new levees along the Lower American River and Yolo and Sacramento Bypasses would occur in phases, and construction of any single levee would take no more than one season, limiting viewer exposure.
- Measures would be incorporated into the project design to minimize effects on riparian vegetation and ensure use of appropriate erosion control methods, thereby lessening the visual effects of vegetation loss.
- Staging areas would be located throughout the project area on previously disturbed areas and their use would not constitute a substantial change from existing visual resource conditions.
- Borrow sites within the project area would be located on existing unvegetated areas and/or within the existing inundation zone.

Operation-Related Effects

L. L. Anderson Dam. Operation of French Meadows Reservoir would not be affected by increasing the capacity of the L. L. Anderson Dam spillway.

Folsom Reservoir. The evaluation of operation-related effects on visual resources assumes that the project would affect only the frequency that floodwater is stored at or above are reservoir surface elevation of 474 feet. The elevations of important visual resources were identified and then compared to the maximum flood storage elevation that could occur under each alternative.

Lower American River. Effects on visual resources were evaluated based on comparisons of timing, duration, and size of releases to the Lower American River that could occur under each project alternative with existing operations.

Yolo and Sacramento Bypasses. Effects on visual resources within the Yolo and Sacramento Bypasses were evaluated based on comparisons of timing, duration, and size of releases that could occur under each project alternative with existing operations.

7.15.3 Criteria for Determining Significance

Criteria for determining the significance of visual resource effects were developed based on the environmental checklist form in Appendix G of the State CEQA Guidelines. Effects on visual resources were considered significant if they would:

- have a substantial adverse effect on a scenic vista;
- substantially damage scenic resources, including, but not limited to trees, rock outcroppings, and historic buildings along a scenic highway;
- substantially degrade the existing visual character or quality of the site and its surrounds; or
- create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area.

7.15.4 Alternative 1: No Action

Folsom Reservoir, Lower American River, and Yolo and Sacramento Bypasses. Under Alternative 1, the visual resources around Folsom Reservoir, the Lower American River, and in the Yolo and Sacramento bypasses would remain undisturbed. Dikes, levees, and dams would not be modified, and construction work, outside of routine maintenance and projects that are already underway or planned, would not contribute to any change in visual quality within the study area.

Alternative 1 would not affect visual resources at Folsom Reservoir, the Lower American River, or in the Yolo and Sacramento bypasses because no new flood control facilities would be constructed and no changes in flood control operation would occur.

7.15.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Increasing the capacity of the spillway of L. L. Anderson Dam would require widening and deepening the existing spillway channel. The entrance channel to the spillway would be widened and the upper portion of the spillway would be deepened. Widening the entrance channel to the spillway would require removal of a small amount granite rock and a small amount of vegetation adjacent to the channel.

Increasing the capacity of the lower reach of the spillway would require removing rock and transporting to a spoils pile on the north side of the dam. The visual character of the area

through which this portion of the spillway passes would not be affected because construction would occur within a previously disturbed area and would not require removing vegetation or constructing new haul roads.

- Increasing the capacity of the L. L. Anderson Dam spillway would result in a less-than-significant effect on visual resources because modifications would occur immediately adjacent to, or within, an existing flood control facility and would not require removing a substantial amount of vegetation or material outside the existing spillway channel.

Folsom Reservoir. The temporary construction bridge would be located immediately downstream of the Right Wing Dam, Folsom Dam, and near the Bureau's offices located on the north side of the dam. The bridge would be low crossing the river and would not significantly alter the landscape below the dam or block views of the dam from downstream. In addition, the area below Folsom Dam is not accessible to the public and views are limited to openings through the vegetation along the American Bike Trail and to motorists crossing the dam on Folsom Dam Road. Once modifications to Folsom Dam are completed, the temporary construction bridge and approach roadways would be removed.

- Construction of the temporary construction bridge would result in a less-than-significant effect on the visual character of the landscape below Folsom Dam because the bridge would be a low crossing of the river and would not obstruct a scenic view.

Use of the temporary construction bridge and roadway during dam and dike construction would result in additional light and glare to the area immediately downstream of the Folsom Dam. Additional light and glare would be generated by vehicle headlights and light fixtures needed to illuminate the roadway and bridge deck. The temporary construction bridge is not expected to substantially change light and glare in the vicinity of Folsom Dam because the area immediately downstream of dam is currently illuminated at night.

- The effect of the light generated from the temporary construction bridge is considered less than significant because the bridge alignment passes through an area that is currently illuminated during the night and is not accessible by the public.

Raising Folsom Dam, and constructing a parapet wall on Mormon Island Dam, the Right Wing Dam, and Dikes 1 through 8 would not significantly affect the visual character of the FLSRA. The 3.5 parapet wall is low enough to not obstruct views of the reservoir or surrounding areas from the tops of the wing dams or dikes. Relatively small changes in the heights of these large linear features would not significantly alter the quality of views around the reservoir. The Corps will evaluate various architectural treatments for the parapet wall. A treatment considered appropriate to the setting and the location of the wall will be selected prior to construction.

- Construction-related effects on visual resources near existing wing dams and dikes are considered less than significant because construction would be short in duration, the area disturbed would be relatively small, modifications would be limited to existing linear features, and existing views would not be obstructed.

The borrow site near Peninsula campground would be located within the unvegetated reservoir inundation zone. Excavating material from the borrow site would not change the views from the Peninsula campground or the visual character of the FLSRA, because the borrow site would be frequently inundated, would not require removal of vegetation, and when exposed, would not distract from views of the surrounding area.

- Construction-related effects on visual resources near the Peninsula borrow site are considered less than significant because the area disturbed would be relatively small and would be located entirely within the inundation zone of the reservoir.

Lower American River. No construction would occur along the Lower American River.

- The visual character of the Lower American River would not be affected because no construction along the river would occur.

Yolo and Sacramento Bypasses. No construction would occur along the Yolo and Sacramento Bypasses.

- The visual character of the Yolo and Sacramento Bypasses would not be affected because no construction within the bypasses would occur.

Operation-Related Effects

Folsom Reservoir. The additional flood storage capacity provided by Alternative 2 would only be used during severe storms. Storage of floodwaters between 474 and 478 feet would occur very infrequently. Storing water in this portion of the inundation zone would not directly change the visual character of the reservoir. Indirect operation-related effects on the visual character of the FLSRA could occur as a result of erosion, landslides, and loss of vegetation. As indicated in Section 7.2, “Geology, Seismicity, and Soils,” and Section 7.8, “Vegetation,” occasional inundation between 474 and 478 feet is not expected to result in additional erosion or landslides or mortality of vegetation or within this zone.

- Use of the additional flood storage capacity at Folsom Reservoir would result in a less-than-significant effect on visual resources because inundation would be infrequent and is not expected to adversely affect soils or vegetation within the inundation zone.

The 3.5 parapet wall that would be constructed on Mormon Island Dam, the Right Wing Dam, and Dikes 1 through 8 would not significantly affect the visual character of the FLSRA. The wall is low enough to not obstruct views of the reservoir or surrounding areas from the tops of the wing dams or dikes. Relatively small changes in the heights of these large linear features would not significantly alter the quality of views around the reservoir. The Corps will evaluate various architectural treatments for the parapet wall. A treatment considered appropriate to the setting and the location of the wall will be selected prior to construction.

- The raised dikes and floodwall would have a less-than-significant effect on visual resources because the facilities would not interfere with views, and the incremental

effect to the visual character of the landscape from the additional height of existing long linear dike features is considered minimal.

Lower American River. Under Alternative 2, no operation-related change would occur within the Lower American River.

- Visual resources along the Lower American River would not be affected because no change in flood control operations would occur.

Yolo and Sacramento Bypasses. Under Alternative 2, no operation-related change would occur within the Yolo and Sacramento Bypasses.

- Visual resources within the Yolo and Sacramento Bypasses would not be affected because no change in flood control operations would occur.

7.15.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction-Related Effects

Under Alternative 3, construction-related effects on visual resources would include the effects described under Alternative 2 for constructing the temporary construction bridge below Folsom Dam, excavating material from the Peninsula borrow site, and constructing the ecosystem restoration alternatives. Alternative 3 also includes raising wing dams and dikes with combination of earthfill and a parapet wall, excavating fill material from Mississippi Bar, and raising a 1/3 mile segment of Folsom Dam Road.

Folsom Reservoir. Increasing the height of Folsom Dam and Mormon Island Dam, the Right Wing Dam, and Dikes 1 through 8 would not significantly affect the visual character of the FLSRA. The parapet walls would be low enough so as to not obstruct views of the reservoir or surrounding areas from the tops of the wing dams or dikes. Increasing the height of the wing dams and dikes would not significantly alter the quality of views around the reservoir because the increase in the size of the structures would be relatively small.

- Construction-related effects on visual resources near existing wing dams and dikes are considered less than significant because construction would be short in duration, the area disturbed would be relatively small, modifications would be limited to existing linear features, and existing views would not be obstructed.

A 1/3 mile portion of Folsom Dam Road near Observation Point would be raised in place to avoid flooding in the event the surface elevation of the reservoir exceeds 480.5 feet. Raising this segment of Folsom Dam Road would occur within the existing road right-of-way and would not affect surrounding lands.

Increasing the height of a segment of Folsom Dam Road would result in a less-than-significant effect on visual resources within the FLSRA because modifications would be limited to existing linear features and would not require additional clearing or right-of-way.

Lake Natoma. A borrow site for material necessary to raise the wing dams and dikes at Folsom Reservoir would be established at Mississippi Bar. In addition, material may be barged across Lake Natoma to the Willow Creek Recreation Area for storage and loading to trucks.

The Mississippi Bar borrow site would be located in an area which primarily consists of unvegetated dredge tailings not readily accessible by the public. Because the borrow site would be screened from Lake Natoma and from the recreation trails running along the north side of the lake by existing vegetation it would not distract from views from the lake or bike trail. In addition, as indicated in Section 7.8, “Vegetation,” excavating material from Mississippi Bar would not require removal of vegetation.

The Willow Creek Recreation Area is surrounded by dense vegetation and views of the area are limited to users of the bike trail running along the south side of Lake Natoma and to boaters on Lake Natoma. Use of the recreation area as a transfer and storage facility for borrow material would not substantially change the visual character of the south shore of Lake Natoma because of intervening vegetation and because the recreation area’s major facility is a large gravel parking area.

- Excavating material from Mississippi Bar borrow would result in a less-than-significant effect on the visual character of Lake Natoma because the borrow site would be screened by intervening vegetation from the lake and bike trail and no vegetation would be removed.
- Establishing a borrow material transfer and storage facility at the Willow Creek Recreation Area would result in a less-than-significant effect on visual resources at Lake Natoma because views of the recreation area are screened by dense vegetation and are limited to boaters on Lake Natoma.

Lower American River. Construction-related effects on visual resources along the Lower American River would be the same as described for Alternative 2.

Yolo and Sacramento Bypasses. Construction-related effects on visual resources within the Yolo and Sacramento Bypasses would be the same as described for Alternative 2.

Operation-Related Effects

Folsom Reservoir. The additional flood storage capacity provided by Alternative 3 would only be used during severe storms. Storage of floodwaters between 474 and 482 feet would occur very infrequently. Storing water in this portion of the inundation zone would not directly change the visual character of the reservoir. Indirect operation-related effects on the visual character of the FLSRA could occur as a result of erosion, landslides, and lost vegetation. As indicated in Section 7.2, “Geology, Seismicity, and Soils,” and Section 7.8, “Vegetation,” occasional inundation between 474 and 482 feet is not expected result in additional erosion or landslides or mortality of vegetation or within this zone.

- Use of the additional flood storage capacity at Folsom Reservoir would result in a less-than-significant effect on visual resources because inundation would be

infrequent and is not expected to adversely affect soils or vegetation within the inundation zone.

Lower American River. Operation-related effects on visual resources along the Lower American River would be the same as described for Alternative 2.

Yolo and Sacramento Bypasses. Operation-related effects on visual resources within the Yolo and Sacramento Bypasses would be the same as described for Alternative 2.

7.15.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Construction-Related Effects

Construction-related effects on visual resources would be the same as described for Alternative 3.

Operation-Related Effects

Folsom Reservoir. The additional flood storage capacity provided by Alternative 4 would only be used during severe storms. Storage of floodwaters between 474 and 487 feet would occur very infrequently. Storing water in this portion of the inundation zone would not directly change the visual character of the reservoir. Indirect operation-related effects on the visual character of the FLSRA could occur as a result of erosion, landslides, and loss vegetation. As indicated in Section 7.2, “Geology, Seismicity, and Soils,” and Section 7.8, “Vegetation,” occasional inundation between 474 and 487 feet is not expected result in additional erosion or landslides or mortality of vegetation or within this zone.

- Use of the additional flood storage capacity at Folsom Reservoir would result in a less-than-significant effect on visual resources because inundation would be infrequent and is not expected to adversely affect soils or vegetation within the inundation zone.

Lower American River. Operation-related effects on visual resources along the Lower American River would be the same as described for Alternative 2.

Yolo and Sacramento Bypasses. Operation-related effects on visual resources along the Lower American River would be the same as described for Alternative 2.

7.15.8 Alternative 5: Stepped Release to 160,000 cfs

Construction-Related Effects

Folsom Reservoir. Under Alternative 5, no construction activities would occur at Folsom Reservoir.

- Visual resources at Folsom Reservoir would not be affected because no construction would occur.

Lower American River. Construction activities along the Lower American River include constructing a stability berm on the landside of the north levee between the NEMDC and the Sacramento River and modifying drainage facilities and pump stations.

Modifying drainage facilities would include raising the elevation of the discharge invert and/or modifying drainage pumps. These modifications would take place within existing facilities or right-of-ways and would require minimal ground-disturbing activities.

Modifying pump stations would be accomplished within existing facilities and would not result in removal of vegetation or other ground-disturbing activities.

- The effect on visual resources as a result of modifying drainage facilities and pumps along the Lower American River is considered less than significant because ground-disturbing activities would be limited to the existing facilities.

Strengthening the segment of the north levee between the NEMDC and the Sacramento River would require either constructing a stability berm on the landside of the levee or a slurry wall. Constructing a stability berm along the landside of the levee would require clearing vegetation, including numerous mature native and nonnative trees. Removing this vegetation would result in a substantial change to the visual character of the Garden Highway corridor. Constructing the slurry wall would require work on the crown of the levee, but would not require removal of the vegetation at the toe of the levee. Constructing a slurry wall is not expected to substantially change the visual character of the Garden Highway corridor.

- Constructing a slurry wall on the levee would not affect visual resources along the levee because construction would not require removal of vegetation and would be limited to the crown of the levee.
- Constructing a landside stability berm would result in a significant effect on visual resources by removing mature vegetation and substantially changing the visual character of the Garden Highway corridor between I-5 and the NEMDC. Implementation of Mitigation Measure VR-1 would minimize this effect, but not to a less-than-significant level.

Mitigation Measure VR-1: To reduce the effect of levee construction, but not to a less-than-significant level, slopes of levees that have been modified or otherwise disturbed as a result of flood control activities should be revegetated to the greatest extent possible. This could include hydroseeding or another planting method. Hydroseeding or plantings should be compatible with requirements for levee inspection and maintenance.

Yolo and Sacramento Bypasses. Construction activities Yolo Bypass and along the Sacramento River and Delta sloughs would consist almost entirely of making improvements to existing levees. Improvements to the Sacramento Bypass would consist of increasing the width of the bypass.

Levee modifications would occur in isolated areas in the Yolo Bypass, along the Sacramento River, and the Delta sloughs. Most of these modifications would be made on the

landside of the levees and would consist of creating stability berms. In some instances, vegetation, including vineyards and orchards, would be removed along the toe of levee to allow construction to proceed. Modification of these levees would not substantially change the visual character of the Yolo Bypass or Delta islands because modifications would be made to existing isolated linear features.

- Improving levees within the Yolo Bypass and along the Sacramento River and Delta sloughs would result in a less-than-significant effect on visual resources because improvements would be limited to modifying existing linear features and would mostly be constructed on the landside of the levees.

A borrow site for materials needed to strengthen levees would be located at West Sacramento. The West Sacramento borrow site was used for the disposal of material dredged from the ship channel and primarily supports ruderal vegetation. (Section 7.8, “Vegetation”).

- Borrowing dredge material from the West Sacramento site would result in a less-than-significant effect on visual resources because the site is isolated, supports mostly ruderal vegetation, and would not affect a unique scenic resource.

The area to the north of the Sacramento Bypasses consists of agricultural lands with limited visual diversity. Moving the north levee of the bypass 1,000 feet to the north would not adversely affect the visual character of this area and would not block or distract from adjacent views. Expanding the Sacramento Weir to the north is not expected to adversely effect views of the riverbank because the weir would be adjacent to and at the same elevation as the existing weir. In addition, the banks of the Sacramento River upstream and downstream from the weir include substantial revetment work.

- Lengthening the Sacramento Weir and setting back the north levee of the Sacramento Bypass 1,000 feet would result in a less-than-significant effect on visual resources because the expanded weir and bypass would not substantially degrade the existing visual character or quality of the site and its surroundings.

Operation-Related Effects

Folsom Reservoir. Visual resources at Folsom Reservoir would not be affected because no changes in flood control operations at the reservoir would occur.

Lower American River. Under Alternative 5, flood control could result in a change in the timing and duration of flows in the American River. However, floodwaters would be contained within the existing floodway. Changes in flows would occur only in the winter months and would be very infrequent and of short duration. As indicated in Section 7.8, “Vegetation,” changes in flows are also not expected to result in an adverse effect on vegetation resources within the American River Parkway.

- Operation-related effects on visual resources within the Yolo and Sacramento Bypasses are considered less than significant because changes in flows are not expected to adversely affect vegetation or other visual resources within the bypasses.

Yolo and Sacramento Bypasses. Under Alternative 5, no operation-related changes would occur because floodwaters would be contained within existing floodways. The timing and duration of flows in the Yolo and Sacramento Bypasses could change. However, floodwaters would be contained within the existing floodway. Changes in flows within the bypasses would be infrequent and of short duration and are not expected to adversely affect resources within the bypass such as vegetation.

- Operation-related effects on visual resources along the Lower American River are considered less than significant because changes in flows are not expected to adversely affect vegetation or other resources within the flood control channel.

7.15.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Construction-Related Effects

Construction-related effects on visual resources along the Lower American River, within the Yolo and Sacramento Bypasses, along the Sacramento River and Delta sloughs, and at the ecosystem restoration sites would be the same as described under Alternative 5. In addition, Alternative 6 includes constructing a new outlet at Folsom Dam.

Construction of a new outlet at Folsom Dam would be restricted to modifying an existing structure. Most of this work would occur within the dam and would not substantially change the appearance of Folsom Dam from downstream.

- Construction of a new outlet at Folsom Dam would result in a less-than-significant effect on visual resources because construction would be limited to the dam and would not affect views of or from the structure.

Operation-Related Effects

Operation-related effects on visual resources would be the same as described under Alternative 5.

7.15.10 Alternative 7: Stepped Release to 180,000 cfs

Construction-Related Effects

Folsom Reservoir. No construction activities would occur at Folsom Reservoir under Alternative 7.

- Visual resources at Folsom Reservoir would not be affected because no construction would occur.

Lower American River. Levee modification along the Lower American River under Alternative 7 would include building new levees and floodwalls and raising or otherwise modifying over 20 miles of new levees. Where levees are modified, the levee crowns would be raised and the levee footprint would be increased, usually on the landside of the levee. From the

landside of the levees, the existing views are of high, bare or grass-covered landside levee slopes. Riparian vegetation on the waterside of the levee in many places rises above the levee tops and provides visual variety and scenic interest. The increases in levee height are not likely to be great enough to substantially degrade or otherwise change the character of these views. Views from the waterside of the levees are dominated by the river and by riparian woodlands and grasslands. For viewers within the leveed corridor, the character of the landscape is predominately natural. The landscape's focal points are the river, riverbanks, and often-tall vegetation, which in many places screens the levees from view.

In addition, rock revetment would have to be installed as erosion protection on some slopes, resulting in barren-appearing slopes. These improvements would affect riparian and scrub-shrub vegetation, oak woodland, and upland herbaceous habitat, which provide habitat for a variety of wildlife species. The affected levees are almost entirely in residential neighborhoods. Views would be substantially altered, particularly in the neighborhoods adjacent to the new levee and floodwall sections, where residences currently overlook natural-appearing stretches of the river.

As described in the 1996 SEIR, hydroseeding for erosion protection would be performed on the waterside of the levees, somewhat reducing the visual alteration. However, because levees must remain accessible for operation and maintenance, additional onsite mitigation is not possible. Implementation of Mitigation Measure VR-1 would minimize this effect, but not to a less-than-significant level.

- Construction-related effects on visual resources in the Lower American River are considered significant. Implementation of Mitigation Measure VR-1 would minimize this effect, but not to a less-than-significant level.

Mitigation Measure VR-1: To reduce the effect of levee construction, but not to a less-than-significant level, slopes of levees that have been modified or otherwise disturbed as a result of flood control activities should be revegetated to the greatest extent possible. This could include hydroseeding or other planting method. Hydroseeding or plantings should be compatible with requirements for levee inspection and maintenance.

As described in the 1996 SEIR, raising the Guy West and UPRR bridges to accommodate higher flows in the river under this alternative would not result in adverse visual effects because the current alignments of these bridges would be unaffected and the raises would be relatively minor. Although the appearance of the Howe Avenue Bridge would be substantially altered, design and architectural review of bridge modification would be approved by the City and County of Sacramento prior to construction.

- There would be no substantial change in the character of long-term views along the river corridor resulting from the bridge modifications. Effects associated with raising the Guy West, UPRR, and Howe Avenue bridges would be less than significant.

A floodwall would be constructed around a portion of the Nimbus Fish Hatchery. The wall would be located adjacent to existing buildings and would not substantially change views from or of the fish hatchery.

- The effect of constructing a floodwall is considered less than significant because the presence of the floodwall would not substantially change views of the river from the fish hatchery.

Yolo and Sacramento Bypasses. Construction-related effects on visual resources in the Yolo and Sacramento Bypasses would be the same as those described for Alternative 5.

Operation-Related Effects

Operation-related effects on visual resources at Folsom would be the same as those described for Alternative 5.

7.15.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Under Alternative 8, the construction- and operation-related effects on visual resources at Folsom Reservoir would be the same as those discussed for Alternative 3. The construction- and operation-related effects on visual resources along the Lower American River and within the Sacramento and Yolo Bypasses would be the same as those discussed for Alternative 5.

7.15.12 Alternative 9.0: Ecosystem Restoration Alternatives

This section describes the construction-related effects on visual resources that would occur under each of the restoration alternatives.

Alternative 9.1: Urrutia Restoration Site

Construction of the Alternative 9.1 would result in temporary change in the visual quality of the restoration site because of the presence of construction equipment and disturbance of existing vegetation. This effect would be short-term because earthmoving and planting would be completed during a 6 months.

Viewer groups are primarily recreationists using the Jedediah Smith Trail. The short-term change in the visual quality of the restoration site is not considered substantial because viewers pass through the site as part of using the trail and are frequently exposed to construction activities within the Parkway as a result of ongoing levee maintenance and improvement projects.

Long-term benefits to the visual quality of the American River Parkway would occur as a result of restoring the riparian ecosystem.

- Effects on the visual quality of the American River Parkway as a result of construction of Alternative 9.1 are considered less than significant because construction occur over a short period and vegetation would be reestablished and enhanced.

Alternative 9.2: Woodlake Restoration Site

Effects on the visual quality of the American River Parkway would be the same as described under Alternative 9.1.

Alternative 9.3: Bushy Lake Restoration Site

Effects on the visual quality of the American River Parkway would be the same as described under Alternative 9.1.

Alternative 9.4: Arden Bar Restoration Site

Effects on the visual quality of the American River Parkway would be the same as described under Alternative 9.1.

Alternative 9.5: Fisheries Restoration

Construction associated with making modifications to the temperature control shutters at Folsom Dam would be short-term and would only require cranes or similar construction equipment be placed on the top of the dam and a barge anchored near the control structure. Only the existing temperature control shutters would be modified which would not affect the visual quality of Folsom Dam or the FLSRA.

- No effect on the visual character of the FLSRA would occur as a result of modifying the temperature control shutters at Folsom Dam because modifications would be limited to the existing intakes.

7.16 Public Health and Safety

7.16.1 Introduction

This section describes the construction- and operation-related effects that are expected to occur under each project alternative. The following discussion also includes a description of the methods and assumptions used to conduct the analysis and the criteria for determining the significance of effects.

The analysis discloses effects on public safety at Folsom Reservoir and Lake Natoma, along the Lower American River, and within the Yolo and Sacramento Bypasses. No effect on public safety in other areas is expected because no project-related construction activities or changes in flood control operations would occur.

7.16.2 Methods and Assumptions

Effects on public safety at Folsom Reservoir, along the Lower American River, and within the Yolo and Sacramento Bypasses were evaluated based on the potential for persons to be exposed to hazardous conditions during construction or during flood control operations.

7.16.3 Significance Criteria

The criteria for determining the significance of effects related to public safety were based on the environmental checklist form in Appendix G of the State CEQA Guidelines. Effects on public safety were considered significant if the project alternative would:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials; or the release of hazardous material or emissions into the environment.
- Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment.
- Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including areas where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.
- Expose people to significant public safety hazards resulting from construction activities that encroach into areas beyond the public road system (i.e., on levee roads, or near or at construction sites).

7.16.4 Alternative 1: No Action

Under Alternative 1, no new construction would occur and flood control operations would not change. No change in public safety is expected because persons would not be exposed to hazards associated with construction or operation of flood control facilities.

7.16.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Public safety could be adversely affected during construction on the spillway at L. L. Anderson Dam. Construction activities could result in potential public safety hazards to recreationists using the area or traveling on Mosquito Ridge Road when explosive blasting operations are conducted to excavate bedrock.

Construction activities could result in accidental spills of hazardous materials at construction sites. These spills would present a safety risk to construction crews and the general public. Exposure of any such materials could pose a health risk to construction crews and the general public.

Operation of heavy equipment during summer periods could increase the potential for wildfire. Vegetation around French Meadows Reservoir typically becomes very dry during the summer months and can easily be ignited and increase the potential damage to life and property.

- Construction-related effects on public safety are considered significant because of the potential for recreation uses to conflict with construction activities. This effect would be reduced to a less-than-significant level by implementing Mitigation Measure PSF-1.

Mitigation Measure PSF-1: Prepare and implement a public safety management plan. A public safety management plan would be prepared and implemented that would maintain public safety during all phases of construction. Components of the plan would include:

- notifying the public of the location and duration of construction activities,
 - providing adequate signage regarding the location of construction sites and warning of the presence of construction equipment,
 - fencing of staging areas, and
 - fencing of construction areas if dangerous conditions existing when construction is not occurring.
- Construction activities could result in a significant adverse effect on public safety if hazardous materials are accidentally spilled or if hazardous materials sites are disturbed during construction. Implementation of Mitigation Measure PSF-2 would reduce this effect to a less-than-significant level.

Mitigation Measure PSF-2: Implement a hazardous materials management plan. A hazardous materials management plan would be developed and implemented before construction begins. The plan would include appropriate practices to reduce the likelihood of spill of toxic chemicals and other hazardous materials during construction and would describe a specific protocol for the proper handling and disposal of materials as well as contingency procedures to follow in the event of an accidental spill.

- Operation of heavy equipment associated with construction activities could result in a significant adverse affect on public safety by increasing the potential for wildfire. Implementation of Mitigation Measure PSF-3 would reduce this effect to a less-than-significant level.

Mitigation Measure PSF-3: Prepare and implement a fire management plan. A Fire Management Plan should be implemented prior to initiating construction activities. The Corps in coordination with State project sponsors should consult with the appropriate city, county, and State fire suppression agencies to verify that the necessary fire prevention and response methods are included in the plan. The plan would include fire precaution, presuppression, and suppression measures consistent with the policies and standards in the affected jurisdictions.

Folsom Reservoir. Public safety could be adversely affected increasing the size of wing dams and dikes around Folsom Reservoir. Because the Right Wing Dam, Dikes 1 through 8, and

Mormon Island Dam are accessible to the public, construction activities could result in potential public safety hazards to recreationists using these sites. Staging areas at Beals Point and Granite Bay, would also be in close proximity to popular recreation sites. Because the crests of dams and dikes are popular recreation sites and staging areas would be at and near heavily used recreation site, the effect on public safety could be substantially reduced during the construction period. The potential effects at Folsom Reservoir are similar to those described for French Meadows Reservoir. Construction activities could result in accidental spills of hazardous materials at construction sites. The area around the reservoir is also at risk for fires during the dry season, particularly at the interface between residential development and open space. Implementation of Mitigation Measures PSF-1, PSF-2, and PSF-3 would reduce these effects to a less-than-significant level.

- In addition, sites where dikes and dams are expanded could contain hazardous materials. Exposure of any such materials could pose a health risk to construction crews and the general public. Implementation of Mitigation Measure PSF-4 would reduce this effect to a less-than-significant level.

Mitigation Measure PSF-4: Conduct environmental site assessments at all construction sites before beginning construction. Site-specific environmental site assessments would be performed for all sites where construction would be conducted. Previous land uses would be identified where possible. Site evaluations would be conducted to identify potential problems with hazardous, toxic, or radioactive wastes. The evaluations would be coordinated with the City of Sacramento's Environmental, Public Works, and Solid Waste Departments, with the California Department of Toxic Substances Control, and with the Sacramento County Environmental Management Department.

North and South Forks of the American River. Alternative 2 does not include the construction of new flood control improvements along the north and south forks of the American River. Therefore, no construction-related effects would occur.

Lower American River. Alternative 2 does not include the construction of new flood control improvements along the Lower American River. Therefore, no construction-related effects would occur.

Yolo and Sacramento Bypasses. Alternative 2 does not include the construction of new flood control improvements along the Yolo and Sacramento Bypasses. Therefore, no construction-related effects would occur.

Operation-Related Effects

L. L. Anderson Dam. No changes to reservoir operations would occur as a result of modifications to the spillway at L. L. Anderson Dam, therefore, there would be no operational effects.

Folsom Reservoir. An increase in the storage capacity of the flood control pool between 474 and 478 feet would provide opportunity for loose debris not normally affected by high water

to be swept into the reservoir. This debris could create public safety hazards for boaters and swimmers and could affect intakes situated near the dam. However, during previous flood events, when the flood control pool was maintained at its maximum capacity of 474 feet, reservoir debris was already a significant problem. Therefore, an increase in flood pool elevation to 478 feet is not expected to substantially increase the amount of loose debris in the reservoir to levels above those currently experienced under existing conditions.

High water conditions associated with Alternative 2 could also affect the ability to safely access and use recreation areas around the reservoir. However, under current California State Department of Parks and Recreation policy, recreation facilities that are flooded during high water are closed to the public. Assuming that this policy would continue in the future, this hazard would not be considered greater or different than what is currently experienced at the reservoir during flood conditions. In addition, flood operations under this alternative are infrequent, of short duration, and would occur during the off-peak recreation season.

- Public safety hazards associated with increasing the storage capacity of the flood control pool at Folsom Reservoir between 474 and 478 feet would not be substantially greater than what is currently experienced; therefore, operation-related effects on public safety resulting from implementation of Alternative 2 are considered less than significant.

North and South Forks of the American River. The infrequent inundation of small segments of the north and south forks of the American River could result in adverse effects similar in nature to those discussed above for Folsom Reservoir. However, recreation uses are limited or restricted in these areas and inundation of the affected river segments would be infrequent, of short duration, and would occur during the off-peak recreation season.

- Public safety hazards associated with the temporary inundation of segments of the north and south forks of the American River would not be substantially greater than what is currently experienced; therefore, operation-related effects on public safety resulting from implementation of Alternative 2 are considered less than significant.

Lower American River. Under Alternative 2, the objective release from Folsom Dam would remain at 115,000 cfs. If the dam were filled to the new flood control pool elevation of 478 feet, more water would be available for release into the American River. However, because the objective release rate would remain the same, additional water available for release would not present a public safety hazard beyond that which is experienced under current conditions.

- Operation-related effects on public safety on the Lower American River resulting from implementation of Alternative 2 would not present a public safety hazard beyond that which is experienced under current conditions. Therefore, this effect is considered to be less than significant.

Yolo and Sacramento Bypasses. Because the Yolo and Sacramento Bypasses are downstream of the Lower American River and Folsom Reservoir, operation-related effects would be the same as those described above for the Lower American River.

- Operation-related effects on public safety in the Yolo and Sacramento Bypasses resulting from implementation of Alternative 2 would not present a public safety hazard beyond that which is experienced under current conditions. Therefore this effect is considered to be less than significant.

7.16.6 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Construction- and operation-related effects under Alternative 3 would be the same as described under Alternative 2.

7.16.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

The plan components for Alternative 4 are essentially identical to those of Alternative 2, with the exception that structural improvements to Folsom Dam and other surrounding dikes would be performed to the extent necessary to accommodate a flood pool elevation of 487 feet at Folsom Reservoir. Construction- and operations related effects at French Meadows Reservoir and Folsom Dam would be identical to those described under Alternative 2. Potential construction-related effects from implementation of the ecosystem restoration alternatives are the same as described for Alternative 2.

7.16.8 Alternative 5: Stepped Release to 160,000 cfs

Alternative 5 includes improvements to accommodate increased objective releases from Folsom Dam up to a maximum of 160,000 cfs. Components of Alternative 5 include modifying pumping stations and drainage facilities, widening the Sacramento Weir and Bypass, and raising and strengthening the levees in the Yolo Bypass. In addition, levee strengthening and would occur on the Lower American River from the NEMDC to I-5. Under Alternative 5, the maximum design flood control pool at Folsom Reservoir would remain at 474 feet, and no additional flood storage space would be created at Folsom Reservoir.

Construction-Related Effects

Folsom Reservoir. Alternative 5 does not include construction of new flood control improvements at Folsom Reservoir. Therefore, no construction-related effects would occur.

North and South Forks of the American River. Alternative 5 does not include construction of new flood control improvements along the north and south forks of the American River. Therefore, no construction-related effects would occur.

Lower American River. Slight modifications to pumping and drainage facilities along the Lower American River could pose potential public safety hazards to pedestrians and bicyclists along affected segments of recreation trails or to work crews in construction areas. Construction activities could expose workers to hazardous chemical spills and unknown hazardous waste sites.

In addition, the operation of equipment associated with construction activities could increase the potential for wild fires in the American River Parkway. Fire could threaten

resources in the parkway and create a safety risk for construction crews and the general public in adjacent urban areas.

- Construction-related effects on public safety are considered significant because of the potential for recreation uses to conflict with construction activities. This effect would be reduced to a less-than-significant level by implementing Mitigation Measure PSF-1, described above under Alternative 2.
- Construction activities could result in a significant adverse effect on public safety if hazardous materials are accidentally spilled or if hazardous materials sites are disturbed during construction. Implementation of Mitigation Measures PSF-2 and PSF-4, described above, would reduce this effect to a less-than-significant level.
- Operation of equipment associated with construction activities could result in a significant adverse affect on public safety by increasing the potential for wildfire along the Lower American River. Implementation of Mitigation Measure PSF-3, described above, would reduce this effect to a less-than-significant level.

Yolo and Sacramento Bypasses. Effects on public safety associated with associated with extending the north levee of the Sacramento Bypass as well as other construction activities are the similar to those discussed above for the Lower American River with the exception that there are no recreation sites or facilities located in these areas. Therefore it is not anticipated that there would be a substantial conflict between construction and recreation activities.

- Construction activities could result in a significant adverse effect on public safety if hazardous materials are accidentally spilled or if hazardous materials sites are disturbed during construction. Implementation of Mitigation Measures PSF-2 and PSF-4 would reduce this effect to a less-than-significant level.
- Operation of equipment associated with construction activities could result in a significant adverse affect on public safety by increasing the potential for wildfire along the Lower American River. Implementation of Mitigation Measure PSF-3 would reduce this effect to a less-than-significant level.

Operation-Related Effects

Lower American River. An increase in the objective release from Folsom Dam to 160,000 cfs would cause higher water velocities within the American River, which could be dangerous to recreationists utilizing river resources. However, recreation use during the winter months, when this objective release would be expected, is limited, and use on the river during severe storm events is already discouraged and dangerous. The high water warning system currently in place on the Lower American River would provide the precautions necessary to prevent people in the American River Parkway from being caught off guard by exceedingly large or unexpected river flows.

- Operation-related effects on public safety on the Lower American River resulting from implementation of Alternative 5 would be the same as those described under

Alternative 1, “No Action.” Therefore, this effect is considered to be less than significant.

Yolo and Sacramento Bypasses. The East Yolo County landfill lies adjacent to the existing north levee of the Sacramento Bypass. Relocation of the north levee of the Sacramento Bypass could result in the portions of this the current extent of landfill to be inundated during flood periods. However, in order to initiate construction, the Corps and State project sponsors would be required to remove or remediate the landfill prior project implementation. Therefore, it is not anticipated that temporary and infrequent inundation of this area resulting from project operations would lead to an increased potential for water contamination in the Sacramento and Yolo Bypasses.

- Operation-related effects on public safety in the Yolo and Sacramento bypasses created by temporary inundation of portions of the East Yolo County Landfill would be avoided through the removal or remediation of the landfill prior to project operation. Therefore, this effect is considered less than significant.

7.16.9 Alternative 6: Stepped-Release to 160,000 cfs and New Outlet at Folsom Dam

Facilities constructed for Alternative 6 are identical to those described for Alternative 5 with the additional construction activities for one new outlet located within the auxiliary spillway of Folsom Dam. Therefore, the construction- and operation-related effects to public health and safety under Alternative 6 would be the same as described for Alternative 5. The additional construction-related effects of a new outlet at Folsom Dam.

7.16.10 Alternative 7: Stepped-Release Plan to 180,000 cfs

Alternative 7 includes improvements to accommodate increased objective releases from Folsom Dam up to a maximum of 180,000 cfs. Components of Alternative 7 include all those described for Alternative 5, with the exception that an objective release of this magnitude would require increased levee strengthening and construction of new floodwalls along the Lower American River as well as the modification of bridges downstream of Folsom Dam. Therefore, the additional incremental construction- and operation-related effects would be the same as those effects described for Alternative 5.

7.16.11 Alternative 8: Stepped-Release to 160,000 cfs and Seven-Foot Raise/482-Foot Flood Pool Elevation

Alternative 8 would incorporate all the components of Alternatives 3 and 5. Consequently, all the construction- and operation-related effects that would result from implementation of these alternatives would also occur for Alternative 8.

7.16.12 Alternative 9.0: Ecosystem Restoration Alternatives

Alternative 9.1: Urrutia Restoration Site

Construction-Related Effects. Construction activities for this alternative could result in exposure of construction workers to the same type of potential safety hazards as described above. In addition, the Lower American River Parkway is visited by many recreational uses that may be exposed to the construction activities and thereby increase the risk of public safety problems. Exposure to hazardous wastes is probably minimal given that the restoration sites have not been used extensively for industrial or commercial activities. There would be an increased risk of wildfire from construction activities as a result of operation of heavy equipment near vegetation.

- Construction workers could be exposed to accidental spills of hazardous materials or hazardous wastes could be discovered during construction, and the risk of wildfire would be increased. These impacts are considered significant. Implementation of Mitigation Measures PSF-1, PSF-2, PSF-3, and PSF-4 would reduce these effects to a less-than-significant level.

Operation-Related Effects. Construction activities would be temporary and there would be no long-term exposure of workers or the general public to increased risks to public health or safety at the restoration site, therefore, no public health and safety impacts would occur.

Alternative 9.2: Woodlake Restoration Site

Construction-related and operation-related effects on public health and safety would be the same as described under Alternative 9.1.

Alternative 9.3: Bushy Lake Restoration Site

Construction-Related Effects. Construction-related effects on public health and safety would be the same as described under Alternative 9.1.

Operation-Related Effects. Hydrologic modifications at the Bushy Lake site have the potential to alter mosquito habitat and thereby change mosquito populations and the potential for mosquito-borne disease transmission. The local mosquito abatement district is responsible for monitoring mosquito conditions and implementing population reduction and eradication efforts.

- Increasing the hydraulic detention of water could increase nuisance mosquito conditions. The potential public health impacts are considered less than significant because Bushy Lake provides a small incremental area of potential mosquito habitat relative to the entire Lower American River corridor.

Alternative 9.4: Arden Bar Restoration Site

Construction-related and operation-related effects on public health and safety would be the same as described under Alternative 9.1.

Alternative 9.5: Fisheries Restoration

Construction-related and operation-related effects on public health and safety would be similar to those described under Alternative 9.1. However, because all work would be conducted from the top of the dam, there would be no potential for uncovering hazardous wastes, and limited potential for increased risk from wildfire.

7.17 Public Services

7.17.1 Introduction

Public services evaluated include emergency services and utilities. The evaluation focuses on short-term effects that could result from increasing the height of Folsom Dam, wing dams, and dikes; modifying levees along the Lower American River; and increasing the capacity of the Sacramento and Yolo Bypasses.

7.17.2 Methods and Assumptions

Effects on public services were evaluated based on the duration and extent to which such services would be affected as well as the ability of a service provider to continue to provide a level of service that could meet the needs of an affected community. The evaluation compared the duration of the effect with the service provided, taking into account the ability of the service provider to maintain necessary services through alternative means. The evaluation assumed modifications to the dikes and wing dams around Folsom Reservoir would occur in phases. For example, modifications to a dike would be completed prior to modifying an adjacent dike. Construction of levees along the Lower American River and the Sacramento and Yolo Bypasses would occur during the non-flood season.

7.17.3 Significance Criteria

The criteria for determining the significance of effects related to public services and utilities were developed based on the environmental checklist form in Appendix G of the State CEQA Guidelines. Effects on public services were considered significant if the project would:

- have the potential to affect a service provider's ability to continue to provide a level of service that meets established standards for the program area and the remainder of the designated service area; or
- impair implementation of, or physically interfere with, an adopted emergency-response plan or emergency evacuation plan.

7.17.4 Alternative 1: No Action

Under Alternative 1, access to and use of public services would remain unaffected. Public utilities around Folsom Reservoir and near the levees on the Lower American River and Yolo and Sacramento Bypasses would remain in place and fully operational.

7.17.5 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Construction-Related Effects

L. L. Anderson Dam. Construction to enlarge the spillway at L. L. Anderson Dam may require temporary and intermittent closures of Mosquito Ridge Road and the road across the dam, a main access route to the north side of French Meadows Reservoir. The closures would be expected to not exceed any single 24-hour period, several times per week during construction. No public utilities or rights-of-way would be disturbed.

- Potential interruptions to emergency access due to road closures would be temporary and intermittent, and there are also alternative access routes from the south side of French Meadows Reservoir. In addition, no public utilities or infrastructure would be affected. Therefore, construction activities at L. L. Anderson Dam would have less-than-significant effect on public services.

Folsom Reservoir. Construction on the dam would temporarily close Folsom Dam Road, which is a transportation route for emergency services. Traffic would be routed over the permanent maintenance bridge constructed just downstream of Folsom Dam until the modifications to Folsom Dam are completed. Emergency service providers that currently use Folsom Dam Road would not be disrupted because the permanent maintenance bridge would be in service before Folsom Dam and the Left Wing Dam are modified. Roadways are not located on the tops of the right wing dam or the dikes around Folsom Reservoir. Increasing the height of these facilities would not affect response times of emergency service providers.

Excavating and transporting materials from the Peninsula borrow site to the wing dams and dikes is not expected to adversely affect public services because the borrow site is located away from utilities and material would be barged to wing dams and dikes.

Modifications to the wing dams and dikes could disrupt buried and aerial utilities including sewage, water, and gas lines, and electric, telephone, and cable lines. Severing any of these lines could result in substantial disruption to services provided by the utilities.

The raw water outlet for San Juan Water District, City of Folsom, and Folsom State Prison is located on the right side of Folsom Dam near the intake for the powerplant. No construction activities would occur near the outlet, and raising the height of the dam, wing dams, and dikes would not necessitate lowering the surface elevation of the reservoir.

Construction-related effects on emergency services are considered less than significant because the link between the north and south sides of Folsom Lake provided by Folsom Dam Road would be maintained and no other major roadways used by emergency providers would be affected.

There would be no effect on the ability of San Juan Water District, City of Folsom, or Folsom State Prison to divert water from Folsom Reservoir because no construction activities

would occur in the vicinity of the outlet and construction would not require lowering the surface elevation of the reservoir.

- Effects on public services associated with utilities could be considered significant if utility service is disrupted during construction. Implementation of Mitigation Measure PSV-1 would reduce this effect to a less-than significant level.

Mitigation Measure PSV-1: Identify utility infrastructure components prior to construction. Before beginning construction, project engineers would consult with county, city, special district, and utility company engineering staff to ensure infrastructure components at each construction site are appropriately identified, avoided, and/or modified so that services would not be substantially interrupted. All existing, legally authorized infrastructure would be accommodated into the project designs as needed.

Operation-Related Effects

L. L. Anderson Dam. Modification of the spillway at L. L. Anderson Dam would not affect operations at French Meadows Reservoir or any other public utilities.

Folsom Reservoir. Increasing the maximum surface elevation of Folsom Reservoir to a control pool elevation of 478 feet could result in the inundation and damage of several public service facilities. The two El Dorado Irrigation District sewage lift stations located at Browns Ravine and the three DPR sewage lift stations at Granite Bay could be inundated and damaged under this Alternative.

Four vault toilets, two at Skunk Hollow, at an elevation of approximately 470 feet, and two at Salmon Falls, at an elevation of approximately 475 feet, could be inundated during flood control operations.

- Flood control operations would not affect emergency services because no roadways surrounding the reservoir would be inundated.
- Storage of floodwaters up to 478 feet would not adversely affect emergency services because no major roadways would be flooded.
- Flood control operations could result in damage to sewage lift stations at Browns Ravine and Granite Bay and to the vault toilets at Skunk Hollow and Salmon Falls. This effect on public services is considered less than significant because the lift stations and vault toilets provide service only to the recreation areas and do not serve surrounding residential or commercial developments. Damage to the sewage lift stations could affect the recreation-carrying capacity of both sites. Section 7.6, "Recreation," describes post-inundation measures that would be implemented to ensure recreation facilities are repaired or replaced after a flood event.

Lower American River. Flood control operations under Alternative 2 would be very similar to operations under Alternative 1, and the objective release would be the same. These operations would have no effect on emergency services or public utilities.

- Effects on public services along the Lower American River that would result from changes in flood control operations are considered less than significant and no mitigation is required.

Sacramento and Yolo Bypasses. Flood control operations in the Sacramento and Yolo Bypasses under Alternative 2 would be very similar to operations under Alternative 1. These operations would have no effect on emergency services or public utilities.

- No operation-related effects on emergency services or public utilities within the Sacramento and Yolo Bypasses are expected because no changes in operations would occur under Alternative 2.

7.17.6 Alternative 3: Seven-Foot Dan Raise/482-Foot Flood Pool Elevation

The plan components for Alternative 3 are essentially identical to those of Alternative 2, with the exception that structural improvements to Folsom Dam and other surrounding dikes would be performed to the extent necessary to accommodate a flood pool elevation of 482 feet at Folsom Reservoir. Excavating material from the Mississippi Bar borrow site is not expected to result in a significant effect on emergency services or public utilities because the site is isolated from major transportation routes and no public utilities are known to cross the site. Construction- and operation-related effects that would result from implementation of Alternative 3 are therefore essentially identical to those described for Alternative 2. Potential construction-related effects from implementation of the ecosystem restoration alternatives are also the same as described for Alternative 2.

7.17.7 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

The plan components for Alternative 4 are essentially identical to those of Alternative 2, with the exception that structural improvements to Folsom Dam and other surrounding dikes would be performed to the extent necessary to accommodate a flood pool elevation of 487 feet at Folsom Reservoir. Construction-related effects that would result from implementation of Alternative 4 are therefore essentially identical to those described for Alternative 3. Potential construction-related effects from implementation of the ecosystem restoration alternatives are also the same as described for Alternative 2.

Operation-Related Effects

Folsom Reservoir. Operation-related effects to public service facilities within the area of Folsom Reservoir between 474 and 482 feet and along the Lower American River would be similar to those described for Alternative 2. Increasing the maximum surface elevation of Folsom Reservoir to 487 feet could result in the inundation and damage to several additional public service facilities.

Flood control operations could affect the provision of emergency services by possibly inundating a small segment of Green Valley Road near Browns Ravine and Salmon Falls Road at New York Creek, Sweetwater Creek, and Salmon Falls. These roadways would be flooded if water stored in the reservoir reaches 485 feet. Hydrologic modeling of Alternative 4 indicates that water would reach the roadway surfaces only during events with a 1-in-225 or less chance of occurring in any year. The roadways would be flooded for a maximum of 29 hours during an event with a 1-in-250 chance of occurring in any year.

- Operation of Alternative 4 would not substantially affect emergency services because flooding over Green Valley Road and Salmon Falls Road would be very infrequent and of short duration.

7.17.8 Alternative 5: Stepped Release to 160,000 cfs

Construction-Related Effects

Folsom Reservoir. Alternative 5 does not include any modifications to Folsom Dam, wing dams, and dikes.

Lower American River. Under Alternative 5, modifications to levees would occur only along the north bank of the American River between the mouth of the American River and a point upstream of the NEMDC. The Garden Highway, a major connector between I-5 and North Sacramento, runs along a portion of the crest of this levee. Because modifications would consist of expanding the landside of the levee, the roadway on the crest would remain open, which would allow passage of emergency vehicles.

Modifications of the levee could result in disruption of services provided by major utilities. Numerous utilities, including pipelines, fiber optic cable, and power transmission lines, cross the Parkway. Excavation, transport, and placement of material could damage these utilities and result in service disruptions.

- Construction-effects on emergency services are considered less than significant because only a small segment of roadway, which is also expected to remain open during the construction period, would be affected.
- Effects on utility services are considered significant because construction-related activities could result in substantial service disruption as a result of damaging utilities in the Parkway. Implementation of Mitigation Measure PSV-1, described above under Alternative 2, would reduce these effects to a less-than-significant-level.

Yolo and Sacramento Bypasses. Modifying the levees within the Sacramento Bypass and increasing the size of the Yolo Bypass could result in disruption of services provided by major utilities. Numerous utilities cross the Yolo Bypass, including petroleum products pipelines, fiber optic cable, and power transmission lines. Excavations, transport, and placement of material could damage these utilities and result in service disruptions.

- Effects on utility services are considered significant because construction-related activities could result in substantial service disruption as a result of damaging utilities in the Yolo and Sacramento Bypasses. Implementation of Mitigation Measure PSV-1, described above under Alternative 2, would reduce these effects to a less-than-significant level.

The construction- and operation-related effects of ecosystem restoration alternatives would be the same as those described under Alternative 2.

Operation-Related Effects

Folsom Reservoir. Alternative 5 would not affect operations at Folsom Reservoir.

Lower American River. An increase in the objective release from Folsom Dam to 160,000 cfs could affect utilities and local drainages within the Lower American River floodway. A component of Alternative 5 is the modification of utilities and local drainages in a manner that would maintain the existing level of service provided by utilities while accommodating the increased objective release.

- Operation-related effects on public services that would result from increasing the objective release to 160,000 cfs are considered less than significant because the utilities would be modified to accommodate these flows.

Yolo and Sacramento Bypasses. Public services within the Yolo and Sacramento Bypasses would not be affected by an increase in the objective release under Alternative 5. Emergency service routes would not be inundated and utilities within the bypasses would be modified to accommodate the increased objective release.

- Operation-related effects on public services that would result from increasing the objective release to 160,000 cfs are considered less than significant because the utilities within the Yolo and Sacramento Bypasses would be modified to accommodate these flows.

7.17.9 Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Facilities constructed for Alternative 6 are identical to those described for Alternative 5 with the additional construction activities for one new outlet located within the auxiliary spillway of Folsom Dam. Construction of a new outlet at Folsom Dam is not expected to affect emergency services or utilities because construction would be limited to the inside and spillway of the dam. Therefore, the construction- and operation-related effects to public services under Alternative 6 would be the same as described for Alternative 5.

7.17.10 Alternative 7: Stepped Release to 180,000 cfs

Alternative 7 includes improvements to accommodate increased objective releases from Folsom Dam up to a maximum of 180,000 cfs. Components of Alternative 7 include all those described for Alternative 5, with the exception that an objective release of this magnitude would

require increased levee strengthening and construction of new floodwalls along the Lower American River as well as the modification of bridges downstream of Folsom Dam. The operation-related effects along the Lower American River, Yolo Bypass, and Sacramento Bypass would be essentially identical to those effects described for Alternative 5.

Construction-Related Effects

Lower American River. Allowing passage of 180,000 cfs would require increasing the low-chord elevation of the Howe Avenue Bridge and the Guy West Bridge. Increasing the height of the Guy West Bridge is not expected to affect emergency service providers because the bridge is used primarily by pedestrians and cyclists. Raising the Howe Avenue Bridge could affect emergency response times during construction. However, this is not expected to substantially change response times because construction would be phased to ensure that four lanes would remain open.

Modification and construction of new levees along the American River could result in disruption of services provided by major utilities. Numerous utilities cross the Parkway, including pipelines, fiber optic cable, and power transmission lines. Excavation, transport, and placement of material could damage these utilities and result in service disruptions.

- Construction-related effects on emergency services are considered less than significant because only a small segment of roadway would be affected. This segment would remain open during the construction period.
- The effects on utility services are considered significant because construction-related activities could result in substantial service disruption as a result of damaging utilities in the Parkway. Implementation of Mitigation Measure PSV-1, described above under Alternative 2, would reduce these effects to a less-than-significant level.

7.17.11 Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Alternative 8 would incorporate all the components of Alternatives 3 and 5. Consequently, all the construction- and operation-related effects that would result from implementation of these alternatives would also occur for Alternative 8. The construction-related effects of ecosystem restoration alternatives would be the same as those described under Alternative 2.

7.17.12 Alternative 9.0 Ecosystem Restoration Alternatives

This section describes the construction-related effects on public services that would occur under each restoration alternative. Operation of Alternatives 9.1 through 9.5 increase the demand for public services or affect exiting public services therefore, operation-related effects were not analyzed.

Alternative 9.1: Urrutia Restoration Site

The ecosystem restoration activities would not disrupt any public services. Restoration activities would be planned to avoid and maintain all public utilities (e.g., telephone lines, power transmission facilities, underground cables) that may be present and maintain easements for maintenance of utility corridors that may be held by various authorities.

- Construction-related effects on public services are considered less than significant because public utilities would be located prior to construction and avoided during construction.

Alternative 9.2: Woodlake Restoration Site

Construction-related and operation-related effects on public services would be the same as described under Alternative 9.1.

Alternative 9.3: Bushy Lake Restoration Site

Construction-related and operation-related effects on public services would be the same as described under Alternative 9.1.

Alternative 9.4: Arden Bar Restoration Site

Construction-related and operation-related effects on public services would be the same as described under Alternative 9.1.

Alternative 9.5: Fisheries Restoration

Construction activities for the fisheries restoration alternative would include modifications to the temperature control shutters at Folsom Dam. Hydropower generation at Folsom Dam would be temporarily interrupted during construction of the temperature control shutters; effects to hydropower are fully described in Section 7.4, "Hydropower." No other public utilities would be affected.

- No construction-related effects on public services would occur during modification of the temperature control structures because no public utilities are present.

7.18 Summary

Table 7-20 provides a summary of effects, mitigation, and post-mitigation effects for Alternatives 1 through 8. Table 7-21 provides a summary of effects, mitigation, and postmitigation effects for Alternatives 9.1 through 9.5.

TABLE 7-20. Summary of Effects and Mitigation Measures of Project Alternatives 1 through 8

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.1 Hydrology and Hydraulics				
Construction-related effects	NE	None Required	NE	All
Operation-related effects				
Change the conservation storage pool at Folsom Reservoir	B	None Required	B	1
Change the conservation storage pool at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Change flood protection downstream of Folsom Dam	B	None Required	B	All
Change flows in Yolo Bypass	LS	None Required	LS	5, 6, 7, 8
7.2 Geology, Seismicity, and Soils				
Construction-related effects				
Cause substantial soil erosion and/or the loss of topsoil	NE	None Required	NE	1
Cause substantial soil erosion and/or the loss of topsoil as a result of ground-disturbing activities associated with the modification of the L. L. Anderson Dam spillway	S	Mitigation Measure WQ-2: Implement erosion control measures.	LS	2, 3, 4, 8
Increase seismic or geologic hazards at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Cause substantial soil erosion and/or the loss of topsoil as a result of ground-disturbing activities associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure WQ-2: Implement erosion control measures.	LS	2, 3, 4, 8
Cause substantial soil erosion and/or the loss of topsoil as a result of ground-disturbing activities associated with the construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	Mitigation Measure WQ-1: Implement pollution prevention measures. Mitigation Measure WQ-2: Implement erosion control measures.	LS	5, 6, 7, 8
Increase seismic or geologic hazards along the Lower American River and the Yolo and Sacramento Bypasses	LS	None Required	LS	5, 6, 7, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.2 Geology, Seismicity, and Soils (Continued)				
Operation-related effects				
Cause substantial soil erosion and/or the loss of topsoil	NE	None Required	NE	1
Cause substantial soil erosion or mass movement in the inundation area at Folsom Reservoir as a result of flood control operations at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Decrease vertical and lateral channel stability in the Lower American River	LS	None Required	LS	5, 6, 7, 8
7.3 Water Supply				
Construction-related effects				
Affect water storage at French Meadow Reservoir as a result of construction activities associated with modification of the L. L. Anderson Dam spillway	NE	None Required	NE	2, 3, 4, 8
Affect water storage at Folsom Reservoir	NE	None Required	NE	5, 6, 7, 8
Affect water supply conditions at Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Affect water supply conditions at Folsom Reservoir as a result of activities associated with the construction of a new outlet at Folsom Dam	LS	None Required	LS	6
Affect water supply conditions along the Lower American River	NE	None Required	NE	2, 3, 4
Affect water supply conditions along the Lower American River as a result of activities associated with the construction of flood control improvements along the Lower American River	LS	None Required	LS	5, 6, 7, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a		Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.3 Water Supply (Continued)					
Operation-related effects					
Affect water storage at Folsom Reservoir	B	N/A		B	1
	LS	None Required		LS	2, 3, 4, 5, 7, 8
Affect water supply conditions along the Lower American River as a result of increasing objective releases from Folsom Dam	LS	None Required		LS	5, 6, 7, 8
7.4 Hydropower					
Construction-related effects					
Reduce hydropower production at Folsom Dam	NE	None Required		NE	1
Affect hydropower production as a result of construction activities associated with the modification of the L.L. Anderson Dam spillway.	NE	None Required		NE	2, 3, 4, 8
Affect hydropower production at Folsom Dam Powerhouse as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	NE	None Required		NE	2, 3, 4, 8
Affect hydropower production at Folsom Dam as a result of activities associated with the construction of a new outlet at the dam	LS	None Required		LS	6
Operation-related effects					
Hydropower production at Folsom Dam as a result of increasing the potential for Folsom Reservoir to fill	B	N/A		B	1
Affect hydropower production at Folsom Dam as a result of increasing objective releases	NE	None Required		NE	5, 6, 7, 8
Affect hydropower production as a result of modifications made to the L. L. Anderson Dam spillway	NE	None Required		NE	2, 3, 4, 8
Affect hydropower production at Newcastle Powerhouse	LS	None Required		LS	2, 3, 4, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.5 Land Use and Socioeconomics				
Construction-related effects				
Change or conflict with land use around Folsom Reservoir, along the Lower American River, or within the Yolo and Sacramento Bypasses	NE	None Required	NE	1
Change or conflict with land use at French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	NE	None Required	NE	2, 3, 4, 8
Change or conflict with land use at Folsom Reservoir as a result of activities associated with the modification of existing wing dams and dikes, the establishment of a borrow site near Peninsula campground, and the construction of temporary construction bridge below Folsom Dam	LS	None Required	LS	2, 3, 4, 8
Change or conflict with land use at Folsom Reservoir	NE	None Required	NE	5, 7
Change or conflict with land use at Folsom Reservoir as a result of activities associated with the construction of a new outlet at Folsom Dam	NE	None Required	NE	6
Change or conflict with land use at Folsom Reservoir as a result of construction activities associated with increasing the height of Folsom Dam Road	LS	None Required	LS	3, 4, 8
Create land use conflicts near Lake Natoma as a result of activities associated with the excavation and transport of borrow material from Mississippi Bar	LS	None Required	LS	3, 4, 8
Change or conflict with land use in and adjacent to the American River Parkway as a result of activities associated with the construction of stability berms along existing levees, the modification of existing drainage and pumping facilities, and the relocation of existing utilities along the Lower American River	LS	None Required	LS	5, 6, 7, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.5 Land Use and Socioeconomics (Continued)				
Change or conflict with land use within the American River Parkway as a result of activities associated with the improvement of existing levees, floodwalls, and bridges; the construction of new levees and floodwalls along the Lower American River; the modifications of bridges; and the use of staging areas from Nimbus Dam to Discovery Park	LS	None Required	LS	7
Conversion of prime farmland to non-agricultural uses in Yolo, Sacramento, and Solano Counties as a result of increasing the size of the Sacramento Bypass and strengthening levees in the Yolo Bypass and the Delta	LS	None Required	LS	5, 6, 7, 8
Reduce agricultural production as a result of increasing the size of the Sacramento Bypass and strengthening levees in the Yolo Bypass and the Delta	LS	None Required	LS	5, 6, 7, 8
Operation-related effects				
Change or conflict with land use at Folsom Reservoir	NE	None Required	NE	1, 2, 3, 5, 6, 7, 8
	LS	None Required	LS	4
Change or conflict with land use along the Lower American River	NE	None Required	NE	All
Change or conflict with land use within the Yolo and Sacramento Bypasses	NE	None Required	NE	All
7.6 Recreation				
Construction-related effects				
Disrupt recreation activities	NE	None Required	NE	1
Disrupt recreation activities at French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.6 Recreation (Continued)				
Disrupt recreation activities on a segment of the American River Bike Trail located between Negro Bar and Beals Point as a result of activities associated with the construction of temporary access roads and bridges	S	Mitigation Measure R-1: Provide notification of trail and road closures and establish alternative access routes Mitigation Measure R-2: Ensure the segment of the American River Bike Trail between Beals Point and Negro Bar is reestablished	LS	2, 3, 4, 8
Disrupt water-dependent recreation at Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Dam	NE	None Required	NE	2, 3, 4, 8
Disrupt recreation activities near Mormon Island Dam, Dike 7, and Dike 8 as a result of activities associated with the construction of flood control improvements at Folsom Dam	LS	None Required	LS	2, 3, 4, 8
Disrupt recreation activities near Peninsula Campground as a result of activities associated with the construction of flood control improvements at Folsom Dam	LS	None Required	LS	2, 3, 4, 8
Disrupt recreation activities between Beals Point and Beeks Bight as a result of construction activities associated with increasing the height of dikes near the west shore of Folsom Reservoir	S	Mitigation Measure R-3: Provide notification of trail and road closures and establish alternative access routes	S	2, 3, 4, 8
Disrupt recreation activities at Folsom Reservoir as a result of activities associated with the construction of a new outlet at Folsom Dam	NE	None Required	NE	6
Disrupt recreation activities on the American River Bike Trail or at Lake Natoma as a result of activities associated with excavating material from the Mississippi Bar borrow site	LS	None Required	LS	3, 4, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.6 Recreation (Continued)				
Disrupt recreation activities on the American River Bike Trail as a result of transporting borrow material from the Mississippi Bar borrow site to the barge loading site at Willow Creek, and from Willow Creek to Folsom Boulevard	S	Mitigation Measure R-4: Provide notification of trail closure, establish alternative trail routes, and signalize or flag intersection of the bike trail and haul road	LS	3, 4, 8
Disrupt recreation activities at Lake Natoma by temporarily converting the Willow Creek Recreation Area to a borrow material storage and transfer site	S	None Available	S	3, 4, 8
Disrupt recreation activities at Folsom Reservoir	NE	None Required	NE	5, 6, 7
Disrupt recreation activities on the American River Parkway trail system as a result of construction activities associated with the modification of existing drainage and pumping facilities along the Lower American River	S	Mitigation Measure R-5: Provide notification of trail and road closures and establish alternative access routes within the Parkway	LS	5, 6, 7, 8
Disrupt recreation activities in the Yolo and Sacramento Bypasses, Sacramento River and Delta Slough	LS	None Required	LS	5, 6, 7, 8
Disrupt recreation activities along the Lower American River as a result of activities associated with the construction of a floodwall near the Nimbus fish hatchery	S	Mitigation Measure R-5: Provide notification of trail and road closures and establish alternative access routes within the Parkway	LS	7
Reduce the number of available parking spaces at Goethe Park, Ancil Hoffman Park, Old Fair Oaks Bridge, and Nimbus Fish Hatchery during the construction of flood control improvements along the Lower American River	S	Mitigation Measure R-6: Provide notification of parking lot closures and identify alternative parking areas located nearest the affected area	S	7
Operation-related effects				
Disrupt recreation activities at Folsom Reservoir	NE	None Required	NE	1, 5, 6, 7
	LS	None Required	LS	2, 3, 4, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.6 Recreation (Continued)				
Disrupt recreation activities along the North and South Forks of the American River	NE	None Required	NE	1
	LS	None Required	LS	2, 3, 4, 8
Disrupt recreation activities along the Lower American River	NE	None Required	NE	1
	LS	None Required	LS	2, 3, 4, 5, 6, 7, 8
Disrupt recreation activities in the Yolo and Sacramento Bypasses	NE	None Required	NE	1
	LS	None Required	LS	2, 3, 4, 5, 6, 7, 8
7.7 Fisheries				
Construction-related effects				
Affect fish habitat	NE	None Required	NE	1
Affect fish and fish habitat in the Middle Fork of the American River as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Affect fish and fish habitat in Folsom Reservoir as a result of sediment, fuels, and lubricants being discharged during the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure WQ-1: Implement pollution prevention measures	LS	2, 3, 4, 8
		Mitigation Measure WQ-2: Implement erosion control measures		
Affect fish and fish habitat in Lake Natoma as a result of sediment, fuels, and lubricants being discharged during the operation of the Mississippi Bar borrow site	S	Mitigation Measure WQ-1: Implement pollution prevention measures	LS	3, 4, 8
Affect fish and fish habitat downstream of Folsom Dam as a result of activities associated with the construction of a new outlet and modification of the spillway stilling basin	S	Mitigation Measure WQ-1: Implement pollution prevention measures	LS	6

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.7 Fisheries (Continued)				
Affect fish and fish habitat in the Lower American River as a result of sediment, fuels, and lubricants being discharged into the river during the construction of flood control improvements along the Lower American River	S	Mitigation Measure WQ-1: Implement pollution prevention measures Mitigation Measure WQ-2: Implement erosion control measures	LS	5, 6, 7, 8
Affect fish habitat in the Yolo and Sacramento Bypasses, the Sacramento River, and the Delta Sloughs as a result of sediment, fuels, and lubricants being discharged to surface waters during the construction of flood control improvements	S	Mitigation Measure WQ-1: Implement pollution prevention measures Mitigation Measure WQ-2: Implement erosion control measures	LS	5, 6, 7, 8
Affect fish habitat within the Sacramento and Yolo Bypasses as a result of the loss of vegetation caused by activities associated with the construction of flood control improvements	LS	None Required	LS	5, 6, 7, 8
Operation-related effects				
Affect fish habitat in the Lower American River	B	N/A	B	1
Affect fish and fish habitat in French Meadows Reservoir as a result of operating the L. L. Anderson Dam spillway	NE	None Required	NE	2, 3, 4, 8
Affect warm water and cold water fish at Folsom Reservoir as a result of flood control operations	LS	None Required	LS	2, 3, 4, 8
Affect fish and fish habitat in the Lower American River as a result of flood control operations at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 5, 6, 7, 8
Affect fish and fish habitat in the Yolo and Sacramento Bypasses as a result of increasing flood flows through the Yolo and Sacramento Bypasses	NE	None Required	NE	5, 6, 7, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.8 Vegetation				
Construction-related effects				
Loss of vegetation at Folsom Reservoir, along the Lower American River, or in the Yolo and Sacramento Bypasses	NE	None Required	NE	1
Loss of vegetation in the vicinity of L.L Anderson Dam as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Loss of vegetation during construction of flood control at Folsom Dam as a result of activities	NE	None Required	NE	2, 3, 4, 8
Loss of common natural vegetation communities at Folsom Reservoir as a result of construction of flood control improvements at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Loss of oak woodland and oak pine woodland at Folsom Reservoir as a result of construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure V-1: Compensate for loss of 4.8 acres of oak and pine-oak woodland	LS	2
		Mitigation Measure V-3: Compensate for loss of 29.8 acres of oak and pine woodland	LS	3, 4, 8
		Mitigation Measure V-5: Compensate for loss of 6.7 acres of oak and pine woodland	LS	5, 6, 8
		Mitigation Measure V-7: Compensate for loss of 25.3 acres of oak and pine woodland	LS	7
Affect jurisdictional waters of the United States and associated riparian and wetland vegetation communities as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure V-2: Compensate for loss of 1.3 acres of riparian woodland	LS	2
		Mitigation Measure V-4: Compensate for Loss of 10.3 acres of riparian woodland and 0.3 acres of seasonal wetlands.	LS	3, 4, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.8 Vegetation (Continued)				
		Mitigation Measure V-6: Compensate for Loss of 23.2 acres of riparian woodland	LS	5, 6, 8
		Mitigation Measure V-8: Compensate for Loss of 48.2 acres of riparian woodland	LS	7
Loss of special-status plants during construction of flood control improvements at Folsom Reservoir	LS	None Required		2, 3, 4, 5, 6, 7, 8
Affect common natural vegetation communities along the Lower American River, the Yolo and Sacramento Bypasses, the Sacramento River, and the Delta Sloughs as a result of activities associated with the construction of flood control improvements	LS	None Required	LS	5, 6, 7, 8
Operation-related effects				
Affect vegetation at Folsom Reservoir, along the Lower American River, or in the Yolo and Sacramento Bypasses	NE	None Required	NE	1
Affect vegetation downstream of L. L. Anderson Dam	NE	None Required	NE	2, 3, 4, 8
Affect natural vegetation communities at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Affect vegetation along the Lower American River and the Yolo and Sacramento Bypasses	LS	None Required	LS	5, 6, 7, 8
7.9 Wildlife				
Construction-related effects				
Affect wildlife habitat or species abundance	NE	None Required	NE	1
Temporarily disturb nesting raptors in the vicinity of French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	S	Mitigation Measure W-1: Conduct preconstruction raptor survey at L. L. Anderson Dam	LS	2, 3, 4, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.9 Wildlife (Continued)				
Affect cliff swallows in the vicinity of L. L. Anderson Dam as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Temporarily disturb nesting raptors in the vicinity Folsom Reservoir as a result of construction activities associated with raising wing dams and dikes at Folsom Reservoir	S	Mitigation Measure W-2: Conduct preconstruction raptor survey	LS	2, 3, 4, 8
Cause the removal of elderberry shrubs from Folsom Reservoir as a result of activities associated with raising wing dams and dikes, the construction of a temporary bridge, and the operation of borrow sites at Folsom Reservoir	S	Mitigation measure W-3: Compensate for loss of elderberry shrubs	LS	2, 3, 4, 8
Temporarily disturb nesting raptors as a result of activities associated with the construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	Mitigation Measure W-2: Conduct preconstruction survey for Swainson's hawk	LS	5, 6, 7, 8
Affect potential VELB habitat as a result of activities associated with the construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	Mitigation measure W-3: Compensate for loss of elderberry shrubs	LS	5, 6, 7, 8
Increase the mortality of burrowing owls as a result of activities associated with the construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	Mitigation Measures W-4: Conduct burrowing owl surveys	LS	5, 6, 7, 8
Affect giant garter snakes and their habitat as a result of activities associated with the construction of flood control improvements along the Yolo and Sacramento Bypasses	S	Mitigation Measure W-5: Based on consultation with USFWS, avoid and minimize loss of giant garter snake habitat	LS	5, 6, 7, 8
Affect cliff swallows as a result of construction activities associated with bridge and railroad trestle modifications along the Lower American River	S	Mitigation Measure W-6: Examine bridges for use by cliff swallows	LS	7
Affect nesting colonies of bank swallows as a result of activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure W-7: Conduct preconstruction bank swallow surveys	LS	7

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.9 Wildlife (Continued)				
Operation-related effects				
Affect wildlife habitat or species abundance	NE	None Required	NE	1
Affect wetlands, grasslands, and riparian areas that provide habitat for common and special-status wildlife species at Folsom Reservoir as a result of infrequent flood storage at higher water surface elevations	LS	None Required	LS	2, 3, 4, 8
Affect blue oak-foothill pine woodlands, oak woodlands, and chaparral areas that provide habitat for common and special-status wildlife species at Folsom Reservoir as a result of infrequent flood storage at higher water surface elevations	LS	None Required	LS	2, 3, 4, 8
Affect elderberry shrubs and valley elderberry longhorn beetle as a result of infrequent flood storage at higher water surface elevations	LS	None Required	LS	2, 3, 4, 8
Affect potential but unoccupied California red-legged frog, foothill yellow-legged frog and California horned lizard habitat in tributaries of Folsom Reservoir and the upper American River as a result of infrequent flood storage at higher water surface elevations	LS	None Required	LS	2, 3, 4, 8
Affect wildlife or wildlife habitat along the Lower American River or the Yolo and Sacramento Bypasses	LS	None Required	LS	5, 6, 7, 8
7.10 Water Quality				
Construction-related effects				
Impair water quality in Folsom Reservoir, the Lower American River, or the Yolo or Sacramento Bypasses	NE	None Required	NE	1
Impair water quality in the Middle Fork of the American River with sediment derived from ground-disturbing activities associated with the modification of the L. L. Anderson Dam spillway	S	Mitigation Measure WQ-1: Implement pollution prevention measures	LS	2, 3, 4, 8
Affect water quality at Folsom Reservoir	NE	None Required	NE	5, 7

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.10 Water Quality (Continued)				
Impair water quality in Folsom Reservoir and the Lower American River with sediment derived from ground-disturbing activities associated with the construction of a new outlet at Folsom Dam	S	Mitigation Measure WQ-1: Implement pollution prevention measures	LS	6
Impair water quality in Folsom Reservoir and the Lower American River with sediment derived from ground-disturbing activities associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure WQ-1: Implement pollution prevention measures	LS	2, 3, 4, 8
Impair water quality at Folsom Reservoir and Lake Natoma with sediment derived from the excavation and transport of dredge materials from the Mississippi Bar borrow site	S	Mitigation Measure WQ-1: Implement pollution prevention measures	LS	3, 4, 8
Impair water quality in the Lower American River with sediment derived from ground-disturbing activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure WQ-1: Implement pollution prevention measures Mitigation Measure WQ-2: Implement erosion control measures	LS	5, 6, 7, 8
Impair water quality in the Yolo and Sacramento Bypasses, and along the Delta sloughs with sediment derived from ground disturbing activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure WQ-1: Implement pollution prevention measures Mitigation Measure WQ-2: Implement erosion control measures	LS	5, 6, 7, 8
Operation-related effects				
Impair water quality in Folsom Reservoir, the Lower American River, or the Yolo or Sacramento Bypasses	B	N/A	B	1
Impair water quality in Folsom Reservoir	NE	None Required	NE	5, 6, 7
Impair water quality in Folsom Reservoir and the Lower American River with sediment derived from flood control operations at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Impair water quality in the Lower American River with sediment derived bed and bank erosion along the Lower American River	LS	None Required	LS	5, 6, 7, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.11 Cultural Resources				
Construction-related effects				
Affect cultural resources	NE	None Required	NE	1
Affect undiscovered cultural resources in the vicinity of French Meadows Reservoir as a result of activities associated with the modification of the L. L. Anderson Dam spillway	S	Mitigation Measure C-1: Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project	LS	2, 3, 4, 8
Affect buried cultural resources in the vicinity of French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	S	Mitigation Measure C-2: Stop work in case of discovery of cultural resources	LS	2, 3, 4, 8
Affect undiscovered cultural resources at Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure C-1: Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project	LS	2, 3, 4, 8
Affect buried cultural resources at Folsom Reservoir as a result of ground-disturbing activities associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure C-2: Stop work in case of discovery of cultural resources	LS	2, 3, 4, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.11 Cultural Resources (Continued)				
Affect potentially significant historic structures at Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	S	<p>Mitigation Measure C-1: Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project</p> <p>Mitigation Measure C-3: Evaluate properties for eligibility for listing in the CRHR</p>	LS	2, 3, 4, 8
Affect potentially significant historic structures associated with Folsom Dam as a result of construction activities conducted during the construction of a new outlet at Folsom Dam	S	<p>Mitigation Measure C-3: Evaluate properties for eligibility for listing in the CRHR</p>	LS	6
Affect undiscovered cultural resources at Mississippi Bar as a result of using Mississippi Bar as a borrow site	S	<p>Mitigation Measure C-1: Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project</p>	LS	3, 4, 8

Notes:

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.11 Cultural Resources (Continued)				
Affect buried cultural resources at Mississippi Bar as a result of ground-disturbing activities associated with using Mississippi Bar as a borrow site	S	Mitigation Measure C-2: Stop work in case of discovery of cultural resources	LS	3, 4, 8
Affect known cultural resources along the Lower American River as a result of activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure C-1: Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project Mitigation Measure C-3: Evaluate properties for eligibility for listing in the CRHR	LS	5, 6, 7, 8
Affect undiscovered cultural resources along the Lower American River as a result of activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure C-1: Implement a Programmatic Agreement	LS	5, 6, 7, 8
Affect buried cultural resources along the Lower American River as a result of ground-disturbing activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure C-1: Implement a Programmatic Agreement	LS	5, 6, 7, 8
Affect historic structures along the Lower American as a result of construction activities associated with the modification of a UPRR trestle	S	Mitigation Measure C-1: Implement a Programmatic Agreement Mitigation Measure C-3: Evaluate properties for eligibility for listing in the CRHR	LS	7
Affect undiscovered cultural resources in the Yolo and Sacramento Bypasses as a result of construction activities associated with the modification of the Sacramento Weir, Yolo Bypass, Sacramento Bypass, and levees in the Delta	S	Mitigation Measure C-1: Implement a Programmatic Agreement	LS	5, 6, 7, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.11 Cultural Resources (Continued)				
Affect potentially significant cultural resources in the Yolo Bypass as a result of construction activities associated with the modification of levees in the Yolo Bypass	S	Mitigation Measure C-1: Implement a Programmatic Agreement	LS	5, 6, 7, 8
Affect NRHP-listed cultural resources in the Yolo Bypass as a result of construction activities associated with the modification of levees in the Yolo Bypass	S	Mitigation Measure C-1: Implement a Programmatic Agreement	LS	5, 6, 7, 8
Affect buried cultural resources in the Yolo Bypass as a result of construction activities associated with the modification of levees in the Yolo Bypass	S	Mitigation Measure C-1: Implement a Programmatic Agreement	LS	5, 6, 7, 8
Operation-related effects				
Affect cultural resources	NE	None Required	NE	1, 5, 6, 7
Affect undiscovered cultural resources in the inundation zone of Folsom Reservoir as a result of fluctuating reservoir levels and human activities	S	Mitigation Measure C-1: Implement a Programmatic Agreement	LS	2, 3, 4, 8
7.12 Traffic and Circulation				
Construction-related effects				
Affect traffic or roadway circulation	NE	None Required	NE	1
Affect traffic and circulation on roadways in the vicinity of L. L. Anderson Dam as a result of trips generated by employees and construction equipment involved with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Affect traffic and circulation on roadways in the vicinity of L. L. Anderson Dam as a result of blasting operations associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.12 Traffic and Circulation (Continued)				
Affect traffic and circulation on the roadway system around Folsom Reservoir as a result of trips generated by employees and equipment involved with the modification of Folsom Dam and associated wing dams and dikes	LS	None Required	LS	2, 3, 4, 6, 8
Affect traffic safety on roadways around Folsom Reservoir as a result of sight distance problems created by slow-moving trucks involved with the modification of Folsom Dam and associated wing dams and dikes	S	Mitigation Measure T-1: Prepare and implement a traffic safety plan	LS	2, 3, 4, 6, 8
Affect traffic and circulation on Folsom-Auburn Road as the result of constructing a new signalized intersection at the intersection of Folsom-Auburn Road and the northern approach road to the temporary construction bridge	S	Mitigation Measure T-2: Conduct operational analysis and ensure signals are timed correctly	LS	2, 3, 4, 8
Affect traffic and circulation on Folsom Dam Road as a result of delays caused by construction activities associated with increasing the height of Folsom Dam Road	LS	None Required	LS	3, 4, 8
Affect traffic and roadway circulation as a result of trips generated by employees and equipment involved with the construction of flood control improvements along the Lower American River, the Yolo and Sacramento Bypasses, the Sacramento River, and the Delta sloughs	LS	None Required	LS	5, 6, 7, 8
Affect roadway safety as a result of trips generated by employees and equipment involved with the construction of flood control improvements along the Lower American River, the Yolo and Sacramento Bypasses, the Sacramento River, and the Delta sloughs	S	Mitigation Measure T-1: Prepare and implement a traffic safety plan	LS	5, 6, 7, 8
Affect traffic and circulation on Howe Avenue as a result of construction activities associated with increasing the height of Howe Avenue Bridge	LS	None Required	LS	7
Restrict pedestrian and bicycle access to the Sacramento State campus or the Campus Commons area as a result of construction activities associated with increasing the height of Guy West Bridge	LS	None Required	LS	7

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.12 Traffic and Circulation (Continued)				
Affect railroad traffic as a result of activities associated with the construction of a floodgate over UPRR tracks on the right bank levee of the Lower American River	LS	None Required	LS	7
Operation-related effects				
Affect traffic and roadway circulation	NE	None Required	NE	1, 2, 3, 5, 6, 8
Affect traffic and circulation on some segments of Salmon Falls Road, Beeks Bight Road, and the access road to Newcastle Powerhouse as a result of temporary inundation during flood events	LS	None Required	LS	4
Affect railroad traffic on the UPRR bridge over the American River as a result of temporary closures during flood events	LS	None Required	LS	7
7.13 Air Quality				
Construction-related effects				
Reduce air quality by exceeding air quality standards and thresholds during construction	NE	None Required	NE	1
Reduce air quality by exceeding air quality standards during the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Reduce air quality by exceeding emission standards for ROG and NO _x during the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure AQ-1: Incorporate and Implement Air Quality Measures for NO _x in the Construction Management Plan Mitigation Measure AQ-2: Purchase NO _x Emission Credits	S/LS	2

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.13 Air Quality (Continued)				
Reduce air quality by exceeding emission standards for ROG, NO _x , CO, and PM10 during construction of flood control improvements at Folsom Reservoir	S	<p>Mitigation Measure AQ-1: Incorporate and Implement Air Quality Measures for NO_x in the Construction Management Plan</p> <p>Mitigation Measure AQ-2: Purchase NO_x Emission Credits</p> <p>Mitigation Measure AQ-3: Incorporate and Implement Air Quality Measures for PM10 in the Construction Management Plan</p>	S/LS	3, 4, 5, 8
Reduce air quality by exceeding emission standards for ROG, NO _x , CO, and PM10 during construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	<p>Mitigation Measure AQ-1: Incorporate and Implement Air Quality Measures for NO_x in the Construction Management Plan</p> <p>Mitigation Measure AQ-2: Purchase NO_x Emission Credits</p> <p>Mitigation Measure AQ-3: Incorporate and Implement Air Quality Measures for PM10 in the Construction Management Plan</p>	S/LS	5, 6, 7, 8
Operation-related effects on air quality	NE	None Required	NE	All
7.14 Noise				
Construction-related effects				
Increase noise levels	NE	None Required	NE	1
Temporarily increase noise levels near French Meadows Reservoir as a result of blasting operations associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Temporarily increase noise levels at Folsom Reservoir as a result of construction activities associated with the modification of Folsom Dam	LS	None Required	LS	2, 3, 4, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.14 Noise (Continued)				
Temporarily increase noise levels at Folsom Reservoir as a result of activities associated with the construction of a new outlet at Folsom Dam	LS	None Required	LS	6
Temporarily increase noise levels at Folsom reservoir as a result of activities associated with the construction of a temporary construction bridge and roadway near Folsom Dam	S	Mitigation Measure N-1: Develop and implement Noise Abatement Program	S	2, 3, 4, 8
Temporarily increase noise levels at an apartment complex near Folsom Reservoir as a result of diverting traffic onto the temporary construction bridge and roadway near Folsom Dam	S	Mitigation Measure N-2: Construct a sound wall between the temporary roadway and the apartment complex	S	2, 3, 4, 8
Temporarily increase noise levels at Folsom Reservoir as a result of construction activities associated with the removal of the temporary bridge near Folsom Dam	LS	None Required	LS	2, 3, 4, 8
Temporarily increase noise levels at Folsom Reservoir as a result of construction activities associated with increasing the height of Folsom Dam Road	LS	None Required	LS	3, 4, 8
Temporarily increase noise levels at Folsom Reservoir as a result of construction activities associated with the modification of Dikes 1, 2, 3, 7, and 8	S	Mitigation Measure N-1: Develop and implement Noise Abatement Program	S	2, 3, 4, 8
Temporarily increase noise levels in the vicinity of Lake Natoma as a result of excavation and hauling activities at the Mississippi Bar borrow site	S	Mitigation Measure N-1: Develop and implement Noise Abatement Program	S	3, 4, 8
Temporarily increase noise levels as a result of construction activities associated with the modification of levees, floodwalls, pumping stations, and utilities along the Lower American River	S	Mitigation Measure N-1: Develop and implement Noise Abatement Program	S	5, 6, 7, 8
Temporarily increase noise levels as a result of activities associated with the construction of flood control improvements in the Yolo and Sacramento Bypasses and in the Delta Sloughs	LS	None Required	LS	5, 6, 7, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.14 Noise (Continued)				
Temporarily increase noise levels as a result of construction activities associated with the modification of bridges along the Lower American River	S	Mitigation Measure N-1: Develop and implement Noise Abatement Program	S	7
Operation-related effects				
Affect noise levels	NE	None Required	NE	All
7.15 Visual Resources				
Construction-related effects				
Change the character or quality of visual resources at Folsom Reservoir, along the Lower American River, or in the Yolo and Sacramento Bypasses	LS	None Required	LS	1
Change the character or quality of visual resources at Folsom Reservoir	NE	None Required	NE	5, 7
Change the character and quality of visual resources near French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Change the character and quality of visual resources near Folsom Dam as a result of constructing a temporary construction bridge below Folsom dam	LS	None Required	LS	2, 3, 4, 8
Change light and glare near Folsom Dam as a result of constructing a temporary construction bridge below Folsom Dam.	LS	None Required	LS	2, 3, 4, 8
Change the character and quality of visual resources at Folsom Reservoir as a result of construction activities associated with the modification of existing wing dams and dikes	LS	None Required	LS	2, 3, 4, 8
Change the character and quality of visual resources at Folsom Reservoir as a result of establishing a borrow site near Peninsula campground	LS	None Required	LS	2, 3, 4, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.15 Visual Resources (Continued)				
Change the character and quality of visual resources at Folsom Reservoir as a result of activities associated with the construction of a new outlet at Folsom Dam	LS	None Required	LS	6
Change the character and quality of visual resources at Folsom Reservoir as a result of construction activities associated with increasing the height of Folsom Dam Road	LS	None Required	LS	3, 4, 8
Change the character and quality of visual resources at Lake Natoma as a result of establishing a borrow site at Mississippi Bar	LS	None Required	LS	3, 4, 8
Change the character and quality of visual resources at Lake Natoma as a result of establishing a borrow material transfer and storage facility at Willow Creek Recreation Area	LS	None Required	LS	3, 4, 8
Change the character and quality of views along the Lower American River	NE	None Required	NE	2, 3, 4
Change the character or quality of visual resources along the Lower American River as a result of construction activities associated with the modification of existing drainage facilities and pumps	LS	None Required	NE	5, 6, 7, 8
Change the character of views along the Lower American River as a result of construction activities associated with raising the Guy West, UPRR, and Howe Avenue bridges	LS	None Required	LS	7
Change the character or quality of visual resources along the Lower American River as a result of activities associated with the construction and modification of levees	S	Mitigation Measure VR-1: Levees modified or disturbed as a result of flood control activities shall be revegetated to the greatest extent possible	LS	7
Change the character and quality of visual resources in the Garden Highway corridor as a result of constructing a slurry wall on the north levee between the NEMDC and the Sacramento River	NE	None Required	NE	5, 6, 7, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.15 Visual Resources (Continued)				
Change the character and quality of visual resources in the Garden Highway corridor as a result of constructing a landside stability berm on the north levee between the NEMDC and the Sacramento River	S	Mitigation Measure VR-1: Levees modified or disturbed as a result of flood control activities shall be revegetated to the greatest extent possible	S	5, 6, 7, 8
Change the character and quality of views in the Yolo and Sacramento Bypasses	NE	None Required	NE	2, 3, 4
Change the character or quality of visual resources in the Yolo Bypass, along the Sacramento River, and along the Delta sloughs as a result of activities associated with the construction of flood control improvements	LS	None Required	LS	5, 6, 7, 8
Change the character or quality of visual resources in the vicinity of the Yolo Bypass, the Sacramento Bypass, or the Sacramento River as a result of excavating and transporting dredge material from borrow sites in West Sacramento	LS	None Required	LS	5, 6, 7, 8
Change the character or quality of visual resources in the vicinity of the Yolo Bypass, the Sacramento Bypass, or the Sacramento River as a result of construction activities associated with the modification of the Sacramento Weir and the north levee of the Sacramento Bypass	LS	None Required	LS	5, 6, 7, 8
Change the character or quality of views in the vicinity of Nimbus Dam as a result of constructing a floodwall around a portion of the Nimbus Fish Hatchery	LS	None Required	LS	7
Operation-related effects				
Change the character or quality of visual resources at Folsom Reservoir	NE	None Required	NE	5, 6, 7
Change the character or quality of visual resources at Folsom Reservoir as a result of using additional flood storage capacity at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Change the character and quality of visual resources along the Lower American River	NE	None Required	NE	2, 3, 4

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.15 Visual Resources (Continued)				
	LS	None Required	LS	5, 6, 7, 8
Change the character or quality of visual resources within the Yolo and Sacramento Bypasses	NE	None Required	NE	2, 3, 4
	LS	None Required	LS	5, 6, 7, 8
7.16 Public Health and Safety				
Construction-related effects				
Affect public health and safety	NE	None Required	NE	1
Affect public safety at French Meadows Reservoir as a result of potential use conflicts between recreation activities and construction activities associated with the modification of the L. L. Anderson Dam Spillway	S	Mitigation Measures PSF-1: Prepare and implement a public safety management plan	LS	2, 3, 4, 8
Affect public safety at French Meadows Reservoir as a result of accidental hazardous material spills from construction operations associated with the modification of the L. L. Anderson Dam spillway	S	Mitigation Measure PSF-2: Implement a hazardous materials management plan	LS	2, 3, 4, 8
Increase the potential for wildfire in the vicinity of French Meadows Reservoir as a result of operating heavy equipment during the modification of the L. L. Anderson Dam spillway	S	Mitigation Measure PSF-3: Prepare and implement a fire management plan	LS	2, 3, 4, 8
Affect public safety at Folsom Reservoir	NE	None Required	NE	5, 7
Affect public safety at Folsom Reservoir as a result of potential use conflicts between recreation activities and construction activities associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measures PSF-1: Prepare and implement a public safety management plan	LS	2, 3, 4, 6, 8
Affect public safety at Folsom Reservoir as a result of accidental hazardous material spills from construction operations associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure PSF-2: Implement a hazardous materials management plan	LS	2, 3, 4, 6, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.16 Public Health and Safety (Continued)				
Increase the potential for wildfire in the vicinity of Folsom Reservoir as a result of operating heavy equipment during the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure PSF-3: Prepare and implement a fire management plan	LS	2, 3, 4, 6, 8
Affect public health as a result of the potential for hazardous materials to become exposed during the construction of flood control improvements to wing dams and dikes at Folsom Reservoir	S	Mitigation Measure PSF-4: Conduct environmental site assessments at all construction sites before beginning construction	LS	2, 3, 4, 8
Affect public health and safety along the north and south forks of the American River	NE	None Required	NE	5, 6, 7, 8
Affect public safety as a result of the potential for recreation activities to conflict with activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measures PSF-1: Prepare and implement a public safety management plan	LS	5, 6, 7, 8
Affect public safety along the Lower American River as a result of potential use conflicts between recreation activities and activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measures PSF-1: Prepare and implement a public safety management plan	LS	5, 6, 7, 8
Affect public safety along the Lower American River as a result of accidental hazardous material spills from construction operations associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure PSF-2: Implement a hazardous materials management plan	LS	5, 6, 7, 8
Increase the potential for wildfire as a result of operating heavy equipment during the construction of flood control improvements along the Lower American River	S	Mitigation Measure PSF-3: Prepare and implement a fire management plan	LS	5, 6, 7, 8
Affect public safety as a result of accidental hazardous material spills from construction operations associated with the construction of flood control improvements in the Yolo and Sacramento Bypasses	S	Mitigation Measure PSF-2: Implement a hazardous materials management plan	LS	5, 6, 7, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.16 Public Health and Safety (Continued)				
Increase the potential for wildfire as a result of operating heavy equipment during the construction of flood control improvements in the Yolo and Sacramento Bypasses	S	Mitigation Measure PSF-3: Prepare and implement a fire management plan	LS	5, 6, 7, 8
Operation-related effects				
Affect public health and safety	NE	None Required	NE	1
Affect public health and safety at French Meadows Reservoir	NE	None Required	NE	2, 3, 4, 8
Affect public safety at Folsom Reservoir as a result of increasing the storage capacity of the reservoir	LS	None Required	LS	2, 3, 4, 8
Affect public safety at and upstream of Folsom Reservoir as a result of the temporary inundation of segments of the north and south forks of the American River	LS	None Required	LS	2, 3, 4, 8
Affect public safety on the Lower American River	NE	None Required	NE	5, 6, 7
	LS	None Required	LS	2, 3, 4, 8
Affect public safety in the Yolo and Sacramento Bypasses	LS	None Required	LS	2, 3, 4, 8
Affect public safety in the Yolo and Sacramento Bypasses as a result of temporary inundation of portions of the East Yolo County Landfill	LS	None Required	LS	5, 6, 7, 8
7.17 Public Services				
Construction-related effects				
Affect public services	NE	None Required	NE	1
Affect public services in the vicinity of French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.17 Public Services (Continued)				
Affect emergency services at Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Affect the ability of San Juan Water District, the City of Folsom, or Folsom Prison to divert water from Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Affect utility services and utility-dependent public services as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure PSV-1: Identify utility infrastructure components prior to construction	LS	2, 3, 4, 8
Affect public services at Lake Natoma as a result of construction activities at Mississippi Bar borrow site	NE	None Required	NE	3, 4, 8
Affect emergency services as a result of activities associated with the construction of flood control improvements along the Lower American River	LS	None Required	LS	5, 6, 7, 8
Affect utility services as a result of damage caused by activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure PSV-1: Identify utility infrastructure components prior to construction	LS	5, 6, 7, 8
Affect utility services as a result of damage caused by activities associated with the construction of flood control improvements in the Yolo and Sacramento Bypasses	S	Mitigation Measure PSV-1: Identify utility infrastructure components prior to construction	Ls	5, 6, 7, 8
Operation-related effects				
Affect public services	NE	None Required	NE	1
Affect public services at French Meadows Reservoir	NE	None Required	NE	2, 3, 4, 8
Affect emergency services at Folsom Reservoir as a result of flood control operations	NE	None Required	NE	2, 3, 4, 8

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TABLE 7-20. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.17 Public Services (Continued)				
Affect emergency services at Folsom Reservoir as a result of flood storage operations	NE	None Required	NE	2, 3, 4, 8
Affect sewage lift stations at Browns Ravine and Granite Bay, and vault toilets at Skunk Hollow and Salmon Falls as a result of flood control operations	LS	None Required	LS	2, 3, 4, 8
Affect emergency services as a result of infrequent, short-term flooding over Green Valley Road and Salmon Falls Road	LS	None Required	LS	4
Affect public services along the Lower American River as a result of flood control operations	LS	None Required	LS	2, 3, 4, 5, 6, 7, 8
Affect public services in the Yolo and Sacramento Bypasses as a result of flood control operations	NE	None Required	NE	2, 3, 4, 5, 6, 7, 8

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TABLE 7-21. Summary of Effects and Mitigation Measures of Project Alternatives 9.1 through 9.5

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.1 Hydrology and Hydraulics				
Construction-related effects				
Change river hydrology and hydraulics	LS	None Required	LS	9.1, 9.2, 9.3, 9.4, 9.5
Operation-related effects				
Adversely affect river hydrology and hydraulics	LS	None Required	LS	9.1, 9.2, 9.3, 9.4, 9.5
7.2 Geology, Seismicity, and Soils				
Construction-related effects				
Cause substantial soil erosion and/or the loss of topsoil as a result of activities associated with the construction of the fisheries ecosystem restoration alternative at Folsom Dam	NE	None Required	NE	9.5
Cause substantial soil erosion and/or the loss of topsoil as a result of ground-disturbing activities associated with the construction of the floodplain ecosystem restoration alternatives	S	Mitigation Measure WQ-2: Implement erosion control measures	LS	9.1, 9.2., 9.3, 9.4
Operation-related effects				
Substantial soil erosion and/or the loss of topsoil as a result of the terracing and riparian planting components of the floodplain ecosystem restoration alternatives	B	N/A	B	9.1, 9.3
Substantial soil erosion and/or the loss of topsoil as a result of alterations made to the north-south borrow channel at the Woodlake restoration site	B	N/A	B	9.2
Cause substantial soil erosion and/or the loss of topsoil as a result of operating low-gradient floodplain channels	LS	None Required	LS	9.3

Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect

TABLE 7-21. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.2 Geology, Seismicity, and Soils (Continued)				
Cause substantial soil erosion and/or the loss of topsoil as a result of operating a high-flow bypass channel	LS	None Required	LS	9.4
Cause substantial soil erosion during the operation of the fisheries ecosystem restoration alternative at Folsom Dam	NE	None Required	NE	9.5
7.3 Water Supply				
Construction-related effects				
Adversely affect water storage at Folsom Reservoir or diversion facilities along the Lower American River	NE	None Required	NE	9.1, 9.2, 9.3, 9.4, 9.5
Operation-related effects				
Adversely affect water storage at Folsom Reservoir	NE	None Required	NE	All
7.4 Hydropower				
Construction-related effects				
Adversely affect hydropower production at Folsom Dam or Nimbus Dam powerhouses as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives along the Lower American River	NE	None Required	NE	9.1, 9.2, 9.3, 9.4
Adversely affect hydropower production at Folsom Dam powerhouse as a result of activities associated with the construction of the fisheries ecosystem restoration alternative at Folsom Dam	LS	None Required	LS	9.5
Operation-related effects				
Adversely affect hydropower production	NE	None Required	NE	All

Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect

TABLE 7-21. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.5 Land Use and Socioeconomics				
Construction-related effects				
Change or conflict with land use within the American River Parkway as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives	NE	None Required	NE	9.1, 9.2, 9.3, 9.4
Change or conflict with land use at Folsom Reservoir as a result of activities associated with the construction of the fisheries ecosystem restoration alternative	NE	None Required	NE	9.5
Operation-related effects				
Change or conflict with land use at the Folsom Reservoir and/or along the Lower American River	NE	None Required	NE	All
7.6 Recreation				
Construction-related effects				
Disrupt recreation along the Lower American River as a result of the activities associated with the construction of the floodplain ecosystem restoration alternatives	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Disrupt recreation activities at Folsom Reservoir as a result of activities associated with the construction of the fisheries ecosystem restoration alternative	NE	None Required	NE	9.5
Operation-related effects				

Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect

TABLE 7-21. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.6 Recreation (Continued)				
Adversely affect recreation activities at Folsom Reservoir and/or along the Lower American River	NE	None Required	NE	All
7.7 Fisheries				
Construction-related effects				
Affect fish and fish habitat in the Lower American River as a result of sediment, fuels, and lubricants being discharged into the river during the construction of the floodplain ecosystem restoration alternatives	S	Mitigation Measure WQ-1: Implement pollution prevention measures	LS	9.1, 9.2, 9.3, 9.4
Affect fish and fish habitat in the Lower American River as a result of reducing riparian vegetation and shaded riverine aquatic cover habitat during the construction of the floodplain ecosystem restoration alternatives	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Affect fish and fish habitat in Folsom Reservoir as a result of fuels and lubricants being discharged into the reservoir during the construction of the fisheries ecosystem restoration alternative	S	Mitigation Measure WQ-1: Implement pollution prevention measures	LS	9.5
Operation-related effects				
Affect fish and fish habitat in the Lower American River as a result of operating the floodplain ecosystem restoration alternatives along the Lower American River	B	N/A	B	9.1, 9.2, 9.3, 9.4
Affect fish and fish habitat in the Lower American River as a result of operating the fisheries ecosystem restoration alternative	B	N/A	B	9.5

Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect

7.8 Vegetation

Construction-related effects

Affect vegetation along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Affect vegetation at Folsom Reservoir as a result of activities associated with the construction of the fisheries ecosystem restoration alternative	NE	None Required	NE	9.5

Operation-related effects

Short-term loss of vegetation along the Lower American River as a result of operating the floodplain ecosystem restoration alternatives	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Establish native vegetation along the Lower American River as a result of operating the floodplain ecosystem restoration alternatives	B	N/A	B	9.1, 9.2, 9.3, 9.4
Affect vegetation as a result of operating the fisheries ecosystem restoration alternative at Folsom Dam	NE	None Required	NE	9.5

Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect

7.9 Wildlife

Construction-related effects

Adversely affect nesting raptors along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives along the Lower American River

S

Mitigation Measure W-1: Conduct preconstruction raptor survey

LS

9.1, 9.2, 9.3, 9.4

Mitigation Measure W-3: Conduct preconstruction survey for Swainson’s hawk

Adversely affect nesting colonies of bank swallows along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives along the Lower American River

S

Mitigation Measure W-7: Conduct preconstruction bank swallow surveys

LS

9.1, 9.2, 9.3, 9.4

Adversely affect valley elderberry longhorn beetle along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives along the Lower American River

LS

None Required

LS

9.1, 9.2, 9.3, 9.4

Adversely affect wildlife habitat at Folsom Reservoir as a result of activities associated with the construction of the fisheries ecosystem restoration alternative at Folsom Dam

LS

None Required

LS

9.5

Operation-related effects

Adversely affect wildlife habitat

LS

None Required

LS

All

Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect

7.10 Water Quality

Construction-related effects

Impair water quality in the Lower American River with sediment derived from ground-disturbing activities associated with the construction of the floodplain ecosystem restoration alternatives	S	Mitigation Measure WQ-1: Implement pollution prevention measures	LS	9.1, 9.2, 9.3, 9.4
Impair water quality in Folsom Reservoir with fuels and lubricants used during the construction of the fisheries ecosystem restoration alternative at Folsom Dam	S	Mitigation Measure WQ-1: Implement pollution prevention measures	LS	9.5

Operation-related effects

Create short-term affects on water quality in the Lower American River	LS	None Required	LS	9.1, 9.2, 9.4
Create long-term affects on water quality in the Lower American River	B	N/A	B	All

Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect

7.11 Cultural Resources

Construction-related effects

Adversely affect undiscovered cultural resources along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives	S	Mitigation Measure C-1: Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project	LS	9.1, 9.2, 9.3, 9.4
Adversely affect buried cultural resources along the Lower American River as a result of ground-disturbing activities associated with the construction of the floodplain ecosystem restoration alternatives	S	Mitigation Measure C-2: Stop work in case of discovery of cultural resources	LS	9.1, 9.2, 9.3, 9.4
Adversely affect cultural resources at the Folsom Reservoir as a result of activities associated with the construction of the fisheries ecosystem restoration alternatives	NE	None Required	NE	9.5

Operation-related effects

Adversely affect cultural resource	NE	None Required	NE	All
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Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect

7.12 Traffic and Circulation

Construction-related effects

Adversely affect traffic and circulation of the local roadway system as a result of trips generated by employees and equipment involved with the construction of the floodplain ecosystem restoration alternatives along the Lower American River	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Adversely affect traffic safety on local roadways as a result of sight distance problems created by slow-moving trucks involve with the construction of the floodplain ecosystem restoration alternatives along the Lower American River	S	Mitigation Measure T-1: Prepare and implement a traffic safety plan	LS	9.1, 9.2, 9.3, 9.4
Adversely affect traffic and roadway circulation on Folsom Dam Road as a result of trips generated by employees and equipment involved with the construction of the fisheries ecosystem restoration alternative at Folsom Dam	LS	None Required	LS	9.5

Operation-related effects

Adversely affect traffic, circulation, and traffic safety on local roadways	NE	None Required	NE	All
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Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect

7.13 Air Quality

Construction-related effects				
Impair air quality by exceeding emission standards for NO _x and PM10 during the construction of the floodplain ecosystem restoration alternatives along the Lower American River	S	<p>Mitigation Measure AQ-1: Incorporate and Implement Air Quality Measures for NO_x in the Construction Management Plan</p> <p>Mitigation Measure AQ-2: Purchase NO_x Emission Credits</p> <p>Mitigation Measure AQ-3: Incorporate and Implement Air Quality Measures for PM10 in the Construction Management Plan</p>	LS	9.1, 9.2, 9.3, 9.4
Impair air quality during the construction of the fisheries ecosystem restoration alternative at Folsom Dam	LS	None Required	LS	9.5
Operation-related effects on air quality				
Impair air quality	NE	None Required	NE	All

7.14 Noise

Construction-related effects				
Temporarily increase noise levels as a result of activities associated with the construction of the Urrutia or Arden Bar floodplain ecosystem restoration alternatives along the Lower American River	S	Mitigation Measure N-1: Develop and implement Noise Abatement Program	S	9.1, 9.4
Temporarily increase noise levels as a result of activities associated with the construction of the Arden Bar or Bushy Lake floodplain ecosystem restoration alternatives along the Lower American River	LS	None Required	LS	9.2, 9.3

Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect

TABLE 7-21. Continued

7.14 Noise (Continued)					
Temporarily increase noise levels resulting from activities associated with the construction of the fisheries ecosystem restoration alternative	LS	None Required		LS	9.5
Increase noise levels	NE	None Required		NE	All
7.15 Visual Resources					
Construction-related effects					
Change the character and quality of visual resources along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives in the American River Parkway	LS	None Required		LS	9.1, 9.2, 9.3, 9.4
Change the character and quality of visual resources at Folsom Reservoir as a result of activities associated with the construction of the fisheries ecosystem restoration alternative at Folsom Dam	NE	None Required		NE	9.5
Operation-related effects					
Change the character and quality of visual resources	NE	None Required		NE	All

Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect

7.16 Public Health and Safety

Construction-related effects

Adversely affect construction worker and public safety as a result of accidental hazardous material spills, uncovering hazardous wastes, and increased wildfire risk from construction operations associated with the construction of the floodplain ecosystem restoration alternatives

S

Mitigation Measures PSF-1: Prepare and implement a public safety management plan

LS

9.1, 9.2, 9.3, 9.4

Mitigation Measure PSF-2: Implement a hazardous materials management plan

Mitigation Measure PSF-3: Prepare and implement a fire management plan

Mitigation Measure PSF-4: Conduct environmental site assessments at all construction sites before beginning construction

Adversely affect construction worker and public safety as a result of accidental hazardous material spills from construction operations associated with the construction of the fisheries ecosystem restoration alternatives

S

Mitigation Measures PSF-1: Prepare and implement a public safety management plan

LS

9.5

Mitigation Measure PSF-2: Implement a hazardous materials management plan

Mitigation Measure PSF-4: Conduct environmental site assessments at all construction sites before beginning construction

Adversely affect construction worker and public safety as a result of uncovering hazardous wastes and increased wildfire risk from construction operations associated with the construction of the fisheries ecosystem restoration alternatives

LS

None Required

LS

9.5

Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect

TABLE 7-21. Continued

7.16 Public Health and Safety (Continued)

Operation-related effects				
Adversely affect public health and safety	NE	None Required	NE	9.1, 9.2, 9.4, 9.5
Adversely affect public health as a result of increased nuisance mosquito conditions associated with the hydraulic detention of water at the Bushy Lake restoration site	LS	None Required	LS	9.4

7.17 Public Services

Construction-related effects				
Adversely affect public services along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Adversely affect public services at Folsom Dam as a result of activities associated with the construction of the fisheries ecosystem restoration alternatives	NE	None Required	NE	9.5
Operation-related effects				
Adversely affect public services	NE	None Required	NE	All

Notes:

- ^a B = beneficial effect
- LS = less-than-significant effect
- NE = no effect
- S = significant effect