Appendix H: Future Level of Demand for Water

1.0 FUTURE LEVEL OF DEMAND FOR WATER

This future condition captures the changes in flood operations and the structural modifications to Folsom Dam would not create any additional storage space for water supply. However, any increases in future level of demand from water users in the region may have an effect on the volume of water that would be stored throughout the CVP/SWP reservoirs, including Folsom Lake. This change in storage would have an effect on how the other project purposes of each CVP/SWP reservoir are met, including the other project purposes at Folsom Dam (e.g. flood control, water storage and supply, recreation, etc.).

Alternative 2 model results were compared to the No Action/No Project condition, with an estimated future level of water demand within the regional affects assessment area through year 2033 applied to both CalSim model constructs. This comparison allowed for a better understanding of additional effects which forecast-informed operations at Folsom might contribute to future resource conditions. A detailed explanation of how future levels of demand are represented in the CalSim II model is provided in Appendix A.

1.1 Comparison of Alternative 2 - Forecast-informed Operations Future Condition to No Action/No Project Future Condition – Year 2033 Level of Water Demand

1.1.1 Hydrology and Hydraulics

This section discusses period of record hydrology comparisons between Alternative 2 – Forecast-informed Operations and No Action/No Project while using a future level of water demand condition forecasted to 2033 in the CalSim II model. A detailed explanation of how future levels of demand are represented in the CalSim II model is provided in Appendix A. In addition, significance criteria for hydrology effects would be the same as discussed in section 4.2.2.

When comparing the Alternative 2 future condition modeled daily discharge frequencies to the No Action/No Project future condition, there was a substantial decrease in the discharge frequency of the 30,000 cfs to 40,000 cfs range but a substantial increase in the 40,000 cfs to 50,000 cfs range and the 70,000 cfs to 80,000 cfs range, as shown in Table 5-24. The modeling indicates almost no difference in discharge frequency in the 80,000 cfs to 115,000 cfs range. Overall, Alternative 2 – Forecast-informed operation discharges and effects on channel stability would be considered similar to those under No Action/No Project when considering future levels of water demand.

Table 1-1. Modeled Average Daily Discharge Frequencies for No Action/No Project and Alternative 2 - Forecast-informed Operations assuming future levels of water demand.

Discharge (cfs)	No Action/No Project Future Condition Discharge Frequencies (# of days)	Alternative 2 – Forecast-informed Operation Future Condition Discharge Frequencies (# of days)
< 10,000	28339	28363

10,000 to < 20,000	891	931
20,000 to < 30,000	146	148
30,000 to < 40,000	158	36
40,000 to < 50,000	18	34
50,000 to < 60,000	8	15
60,000 to < 70,000	9	3
70,000 to < 80,000	3	12
80,000 to < 90,000	2	3
90,000 to < 100,000	1	1
100,000 to 115,000	4	4

The probability that flows would be exceeded for the No Action/No Project future condition is rare. In this case, the percentage of the period or record that flows would exceed 20,000 cfs for the No Action/No Project future condition is 1.2 percent. Alternative 2 Future Condition flows would only deviate 2 percent from the No Action/No Project future condition (Figure 5-15), and the greatest benefits are gained for the rarest of events.

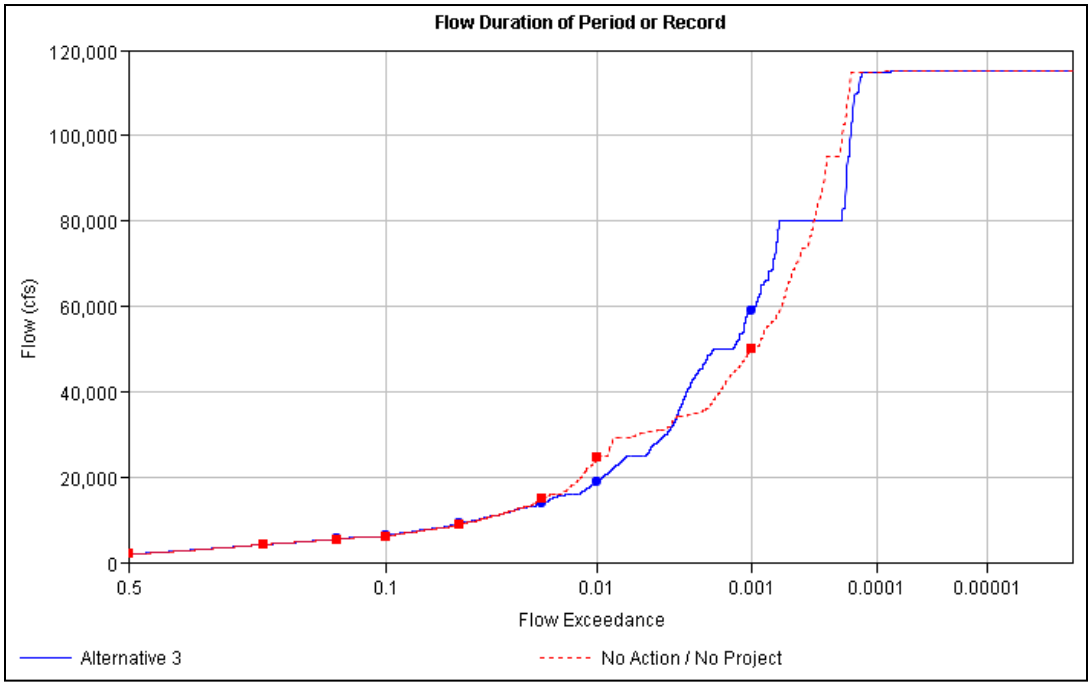

Figure 1-1: Probability of Flow Exceedance for Alternative 2 Future Condition and No Action/No Project Future Condition

Channel Stability

Since modeled Folsom Dam releases are consistent between Alternative 2 and No Action/No Project under the future level of water demand forecasted conditions, the channel widening and degradation/aggradation trends discussed in Section 4.2 would similarly apply to these future conditions as well.

Folsom Lake Bank Erosion

The Alternative 2 Forecast-informed Operations future condition was compared to the No Action/No Project future condition. The percentage of days with water surface elevations above 466 feet would be slightly higher with Alternative 2 (0.22 percent) relative to the No Action/No Project Alternative (0.03 percent). Also, the percentage of days with water surface elevations below 395 feet would be lower with Alternative 2 (11.22 percent) than with the No Action/No Project Alternative (12.40 percent). These data are illustrated in Figure 5-16 below.

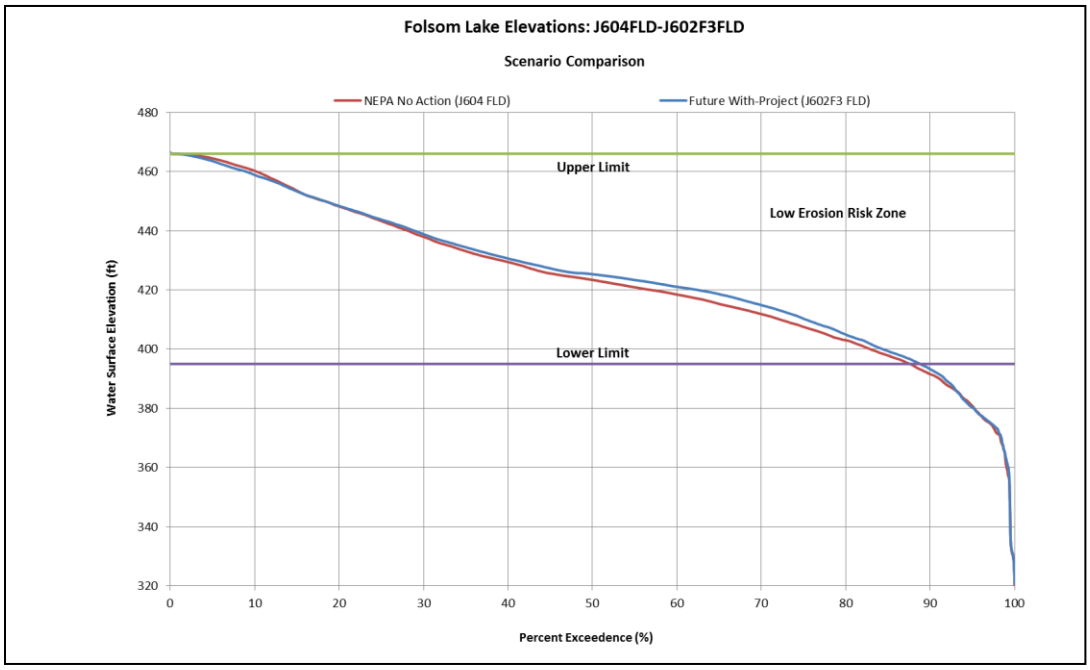

Figure 1-2. Folsom Lake Pool Level Comparison of No Action/No Project Future Condition to Alternative 2 Forecast-informed Operations Future Condition

1.1.2 Water Quality

This section discusses water quality comparisons between Alternative 2 – Forecast-informed Operations and No Action/No Project while using a future level of water demand condition in the CalSim II models. Significance criteria for water quality effects would be the same as discussed in section 4.4.2.

Water quality modeling indicates that, in general, there is little difference between Alternative 2 operations and the No Action/No Project under future conditions.

As shown in Table 5-25, the magnitude of differences in Delta outflow is within a range of ±1.0 percent for the full simulation period average monthly outflow. Although Alternative 2 - Forecast-informed Operations future condition results show a maximum of a 1.6-percent decrease in average monthly values for March of dry water years, long-term average March through May outflow show an increase of 0.7 percent over the full simulation period with a maximum of 0.6-percent reduction observed in dry water years.

Table 1-2. Delta Outflow, E/I Ratio for Alternative 2 - Forecast-informed Operations future condition vs. No Action/No Project future condition.

Delta Outflow	**Evaluation Parameters**	**Long-term**	**Wet**	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Long-term and water year type average Delta Outflow – Generally similar long-term average Delta outflows and generally similar average Delta outflow most of the time during all water year types (±1.6 percent).	Monthly Maximum Reduction	√	–1.2 percent	–1.2 percent	–1.3 percent	–1.6 percent	–1.2 percent
	Delta Outflow March–May	√	√	√	√	√	√
	Delta Outflow Objectives	NA	√	√	√	√	√
E/I Ratio	**Evaluation Parameters**	**Long-term**	**Wet**	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Long-term and water year type average E/I Ratio – Generally similar long-term average and generally similar most of the time during all water year types. The maximum change is seen is (±3.1 percent) in Critical year types.	E/I Ratio	–1.2 percent to +0.6 percent	–1.9 percent to +1.8 percent	–1.5 percent to +0.8 percent	–1.2 percent to +1.6 percent	–0.2 percent to +0.6 percent	–1.2 percent to +3.1 percent

Long-term average monthly E/I ratios show a maximum absolute difference in the range of –0.2 to +0.1 percent. The relative difference ranges from –1.2 percent in average monthly values for April to 0.6 percent in average monthly values for February.

The X2 location in general also shows minimal difference for the two scenarios (Table 5-26). Long-term average changes –0.1 km for May through July, and 0.1 km for March. All other months show no changes in long-term average X2 location. X2 location is similar for most months for all water years, with more negative shifts up to 0.3 km and a few positive shifts of 0.1 km. The maximum year-to-year change for each month in the 82-year POR ranged from 0.3 km in August to 1.2 km in December. Minimum monthly change observed was –2.8 km in June to –0.1 km in September. The average X2 moves east of the control point relative to the No

Action/No Project future condition two times: at the 64 km control point in one year in April of dry water years, and in one year at the 74 km control point in April of critical water years (Table 5-26).

Table 1-3. X2 Location for Alternative 2 - Forecast-informed Operations future condition vs. No Action/No Project future condition.

X2 Location	Evaluation Parameters	Long-term	Wet	Above Normal	Below Normal	Dry	Critical
Long-term and water year type average X2 Location – Generally similar long-term average and generally similar most of the time during all water year types.	X2 Location (km)	±0.1	±0.2	±0.3	±0.3	±0.1	±0.1
	X2 Location Count 81 km	NC	√	√	√	√	√
	X2 Location Count 74 km	NA	√	√	√	√	1
	X2 Location Count 64 km	NA	√	√	√	1	√

Both scenarios have average X2 locations greater than those required by September standards while meeting October X2 standards. Both scenarios meet the Delta outflow objectives for July through January. Results indicate that the scenarios are "consistent" with respect to the fall X2 standards (Table 5-27). The X2 for Alternative 2 - Forecast-informed Operations Future Condition scenario has three instances with a greater than or equal to 1 km shift: once in March and twice in December. Although these shifts would indicate Alternative 2 - Forecast-informed Operations Future Condition would be "not consistent" with No Action/No Project future condition, these differences would be considered less than significant because of the small increase in occurrences of these shifts relative to the number of years considered in the period of record. In addition, typical CVP/SWP operations would be managed to prevent those minor shifts in X2 location.

Table 1-4. Long-term and water year type average X2 Location Analysis for Alternative 2 - Forecast-informed Operations Future Condition vs. No Action/No Project Future Condition.

X2 Location	Evaluation Parameters	
Long-term and water year type average X2 Location – Generally similar long-term average and generally similar most of the time during all water year types. The maximum change is seen in December (1.2 km) and June (-2.8 km).	Change in X2 Location Monthly Maximum Value km	1.1 east
	Change in X2 Location Monthly Minimum Value km	0.4 east
	X2 Location Relative Change km (Maximum)	1.2
	X2 Location Relative Change km (Minimum)	–2.8
	X2 Exceeding Fall Standards (Count)	√
	X2 Location Shift	**Count**
	> or = 1 km	3
	0.5–1.0 km	16
	0.25–0.5 km	22

The CCWD Rock Slough intake occurrences of salinity levels at greater than 150 mg/L levels show an increase in average salinity in one year in September of critical water years and a decrease in average salinity in one year in October of below-normal water years (Table 5-28). The maximum difference in salinity was an increase of 16.69 mg/L (from 211.69 mg/L to 228.37 mg/L) occurring in water year 1991, a critical water year. Although Alternative 2 - Forecast-informed Operations future condition would be considered "not consistent" with the No Action/No Project future condition because of the single occurrence of increased salinity, the

effect would be considered less than significant because of the similar results for all other water year types. In addition, it is expected that CVP/SWP operations would be managed to avoid those increases in salinity.

Table 1-5. Water year type Salinity at Rock Slough Intake for Alternative 2 - Forecast-informed Operations future condition vs. No Action/No Project future condition.

Salinity Rock Slough	Evaluation Parameters	Long-term	Wet	Above Normal	Below Normal	Dry	Critical
Water year type Salinity at Rock Slough Intake – Generally similar long-term average and generally similar most of the time during all water year types.	Salinity Rock Slough (Change in Count >150 mg/L)	NA	√	√	o	√	1
	Salinity Rock Slough Max Change (>150 mg/L: 16.69 mg/L)						

Note: "✓"refers to same or similar values, generally representing a less than 1-percent difference in parameters.
Note: "o" refers to a decrease in the count of occurrences of greater than 150 mg/L salinity at Rock Slough.

1.1.3 Vegetation and Wildlife

This section discusses comparisons between vegetation and wildlife conditions, including special status plants and animals, for Alternative 2 – Forecast-informed Operations and No Action/No Project while using a future level of water demand condition in the CalSim II models. Significance criteria for vegetation and wildlife effects, including special status plants and animals, would be the same as discussed in section 4.5.2. A detailed analysis of potential differences in cottonwood growth and backwater recharge along the lower American River is provided in Appendix C.

Lower American River

The lower American River terrestrial assessment focuses on cottonwood growth and backwater recharge. This section includes a summary of the results.

Cottonwood Growth

Relative to the No Action/No Project future condition, Alternative 2 - Forecast-informed Operations future condition results indicate that the lower American River flows under the 1,765-cfs threshold could decrease between 1.7 to 3.3 average days per month over a 3-consecutive-month period during the cottonwood growing season, relative to No Action/No Project future condition. Relative to No Action/No Project future condition, this change could provide additional flows for cottonwood radial growth and provide a potential benefit during the cottonwood growing season. However, when looking at change under the 3,000-cfs threshold comparison, cottonwood maintenance and optimal growth would stay relatively consistent during the cottonwood growing season between Alternative 2 - Forecast-informed Operations future condition and No Action/No Project future condition. Therefore, effects on vegetation growth in the riparian corridor of the lower American River with Alternative 2 - Forecast-informed Operations future condition would be less than significant. In addition, there would be no substantial difference in the pattern of peak flows needed to inundate terraces for cottonwood dispersal and regeneration between Alternative 2 - Forecast-informed Operations future condition and No Action/No Project future condition.

Backwater Recharge

Relative to No Action/No Project future condition, Alternative 2 - Forecast-informed Operations future condition would result in a minimal monthly change in the average number of days when average daily flows are below the thresholds during winter and spring. Given the minimal difference between No Action/No Project future condition and Alternative 2 - Forecast-informed Operations future condition, average daily flows are projected to remain essentially the same. As a result, there would be essentially no change to the magnitude and frequency of flows to substantially alter the existing backwater habitats dependent on the lower American River.

Folsom Reservoir

With Alternative 2 - Forecast-informed Operations future condition, the water surface elevation fluctuations at Folsom Reservoir would remain within normal operating parameters (i.e., it is not anticipated that water elevations would exceed the 466 foot-msl threshold or barren band for durations that could affect existing vegetation). Folsom Reservoir has water levels that routinely fluctuate. Alternative 2 - Forecast-informed Operations future condition would result in water surface elevation patterns that are the same as or slightly lower than those with No Action/No Project future condition.

Special Status Plant and Animal Species

Because effects on backwater habitats with Alternative 2 - Forecast-informed Operations future condition would be less than significant, effects on elderberry shrubs and special-status species that depend on these habitats would also be less than significant.

Alternative 2 - Forecast-informed Operations future condition would not change the distribution of vegetation or alter riparian vegetation scattered around Folsom Reservoir. The fluctuation zone at Folsom Reservoir is essentially devoid of vegetation with typical elevations levels ranging from 384 to 465 feet msl. This duration is not expected to alter vegetation around the reservoir. Under these conditions, any elderberry shrubs that would be established at Folsom Reservoir would exist above the fluctuation zone and would not be adversely affected by the flood-control project operations.

1.1.4 Fisheries

This section discusses comparisons between conditions for fisheries under Alternative 2 – Forecast-informed Operations and No Action/No Project while using a future level of water demand condition in the CalSim II models. Significance criteria for fisheries effects would be the same as discussed in section 4.6.2.

Lower American River

For salmonid and other fish species, daily flow and water temperature model results on a monthly basis were examined for the lower American River below Nimbus Dam, at Watt

Avenue, and near the mouth of the lower American River (i.e., RM 1). In addition to flow and water temperature modeling, model results for spawning habitat availability (WUA) and an index for redd dewatering were examined for steelhead and fall-run Chinook salmon. For fall-run Chinook salmon, an updated lower American River early lifestage mortality model also was used to compare thermally-influenced early lifestage mortality.

A discussion of general changes in simulated water temperatures in the lower American River under Alternative 2 - Forecast-informed Operations future condition relative to No Action/No Project future condition is provided in the Water Quality section, and is summarized below. Monthly water temperature exceedance distributions below Nimbus Dam demonstrate that water temperatures are generally similar during October through March, and are cooler during May through September, including substantially more often during May, June, and August. Changes in water temperature at Watt Avenue and at the mouth of the lower American River exhibit similar trends under the Alternative 2 future condition relative to No Action future condition as described for below Nimbus Dam, including similar water temperatures during October through February, and cooler temperatures more often during March through September.

A summary of general changes in flows in the lower American River below Nimbus Dam under Alternative 2 - Forecast-informed Operations future condition relative to No Action/No Project future condition is provided below, and is based on changes in long-term average monthly flow and average monthly flow by water year type, and monthly cumulative probability of exceedance distributions over the entire simulation period.

Generally, flows are higher more often during November, December, March through July, and September, lower more often during October and February, and generally similar or higher and lower with similar frequencies during January and August, as described in more detail for below Nimbus Dam.

Long-term average monthly flows below Nimbus Dam under the Alternative 2 future condition relative to the No Action future condition are generally lower during October through February and during August, and higher during March through July and September (Table 5-29). As shown in Figures 5-17 to 5-28, average monthly flows exhibit similar trends by water year type during wet and above-normal water years. Average monthly flows during below-normal water years are lower during February and August through October, and are higher during December, March, April, June, and July. Average monthly flows during dry water year types are lower during October, November, February, and March, and are higher during January, April through June, and August. During critical water years, average monthly flows are higher during most months, including November through February, April, May, August, and September, and are similar during the remaining months. Long-term average monthly flows and average monthly flow by water year type at Watt Avenue and at the mouth of the lower American River exhibit trends similar to those described for below Nimbus Dam.

Table 1-6. Average Monthly Flows below Nimbus Dam under Alternative 2 - Forecast-informed Operations Future Condition and No Action/No Project Future Condition.

Analysis Period	Flow (cfs)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep

Long-term												
Full Simulation Period[2]												
No Action/No Project future condition	2,029	3,017	3,423	4,735	5,200	3,901	3,036	3,379	3,273	3,133	2,215	2,336
Alternative 2 - Forecast-informed Operations future condition	1,928	2,883	3,339	4,482	4,818	4,147	3,422	3,526	3,555	3,296	2,170	2,435
Difference	-101	-134	-84	-253	-382	246	386	147	282	163	-45	99
Percent Difference[3]	-5.0	-4.4	-2.5	-5.3	-7.3	6.3	12.7	4.4	8.6	5.2	-2.0	4.2
Water Year Types[1]												
Wet												
No Action/No Project future condition	2,265	3,821	5,892	8,855	9,094	6,124	4,894	5,826	5,620	3,267	2,918	3,565
Alternative 2 - Forecast-informed Operations future condition	2,108	3,566	5,641	8,310	8,221	7,069	5,578	5,964	6,019	3,352	2,926	3,800
Difference	-157	-255	-251	-545	-873	945	684	138	399	85	8	235
Percent Difference[3]	-6.9	-6.7	-4.3	-6.2	-9.6	15.4	14.0	2.4	7.1	2.6	0.3	6.6
Above Normal												
No Action/No Project future condition	1,927	3,847	3,347	6,150	6,836	5,680	3,154	2,982	2,520	3,702	2,355	3,136
Alternative 2 - Forecast-informed Operations future condition	1,865	3,578	3,190	5,428	6,849	5,914	3,463	3,214	2,970	3,989	2,175	3,280
Difference	-62	-269	-157	-722	13	234	309	232	450	287	-180	144
Percent Difference[3]	-3.2	-7.0	-4.7	-11.7	0.2	4.1	9.8	7.8	17.9	7.8	-7.6	4.6
Below Normal												
No Action/No Project future condition	2,031	2,401	2,290	2,337	3,873	2,574	2,807	3,009	2,447	3,890	2,144	1,609
Alternative 2 - Forecast-informed Operations future condition	1,878	2,392	2,358	2,331	3,589	2,625	3,018	2,996	2,550	4,447	1,914	1,572
Difference	-153	-9	68	-6	-284	51	211	-13	103	557	-230	-37
Percent Difference[3]	-7.5	-0.4	3.0	-0.3	-7.3	2.0	7.5	-0.4	4.2	14.3	-10.7	-2.3
Dry												
No Action/No Project future condition	1,948	2,464	1,807	1,680	1,832	2,280	1,530	1,430	1,853	3,020	1,773	1,440
Alternative 2 - Forecast-informed Operations future condition	1,892	2,397	1,823	1,748	1,663	1,752	1,776	1,722	2,178	3,009	1,811	1,436
Difference	-56	-67	16	68	-169	-528	246	292	325	-11	38	-4
Percent Difference[3]	-2.9	-2.7	0.9	4.0	-9.2	-23.2	16.1	20.4	17.5	-0.4	2.1	-0.3
Critical												
No Action/No Project future condition	1,661	1,941	1,374	1,168	1,109	1,060	996	1,216	1,426	1,484	1,133	921
Alternative 2 - Forecast-informed Operations future condition	1,661	1,969	1,418	1,229	1,127	1,064	1,156	1,285	1,432	1,493	1,184	986
Difference	0	28	44	61	18	4	160	69	6	9	51	65
Percent Difference[3]	0	1.4	3.2	5.2	1.6	0.4	16.1	5.7	0.4	0.6	4.5	7.1

[1] As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995)

[2] Based on the entire simulation period

[3] Relative difference of the monthly average

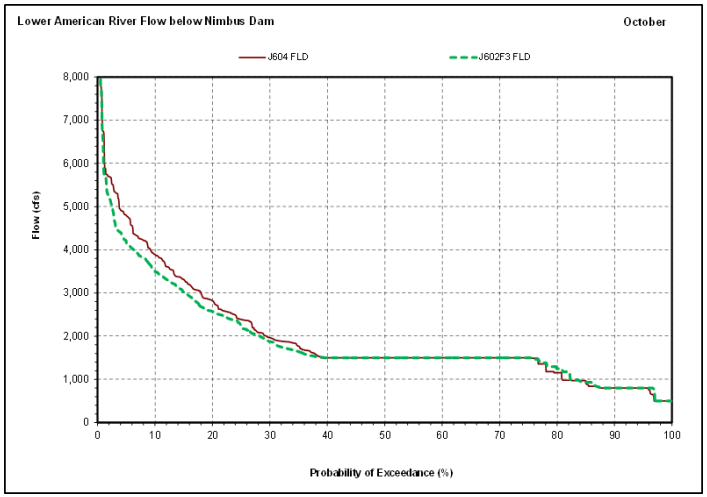

Figure 1-3. Lower American River Flow Probability of Exceedance Distributions below Nimbus Dam for October.

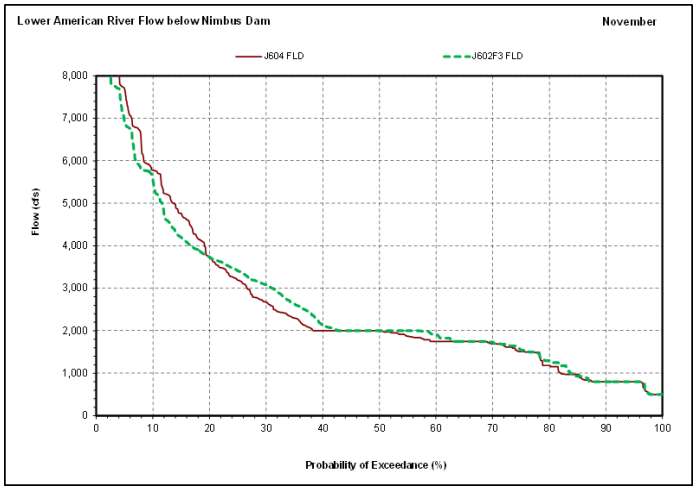

Figure 1-4. Lower American River Flow Probability of Exceedance Distributions below Nimbus Dam for November under Alternative 2 - Forecast-informed Operations Future Condition and No Action/ No Project Future Condition.

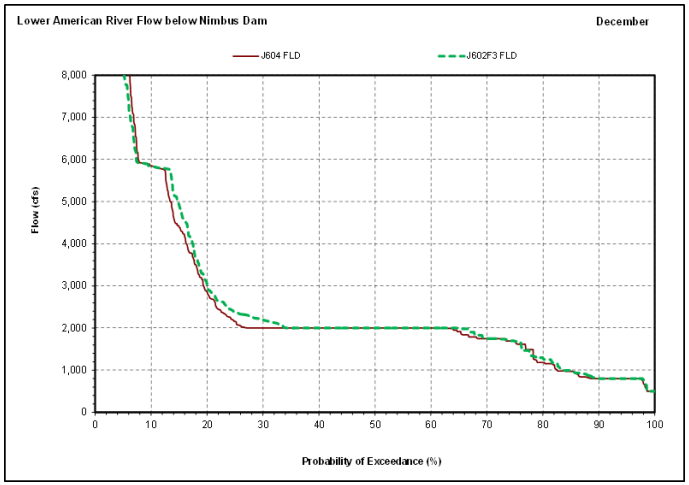

Figure 1-5. Lower American River Flow Probability of Exceedance Distributions below Nimbus Dam for December under Alternative 2 - Forecast-informed Operations future condition and No Action/ No Project future condition.

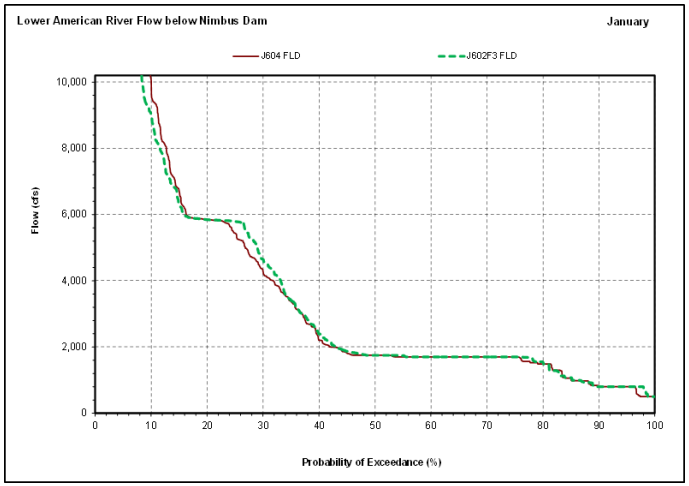

Figure 1-6. Lower American River Flow Probability of Exceedance Distributions below Nimbus Dam for January under Alternative 2 - Forecast informed Operations Future Condition and No Action/ No Project Future Condition.

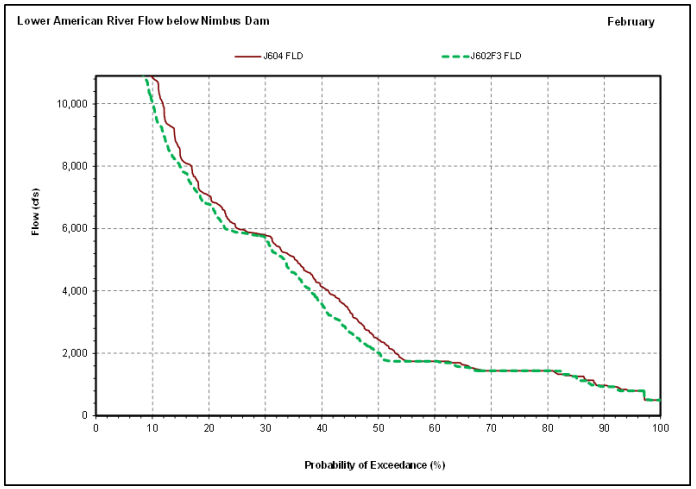

Figure 1-7. Lower American River Flow Probability of Exceedance Distributions below Nimbus Dam for February under Alternative 2 - Forecast-informed Operations Future Condition and No Action/ No Project Future Condition.

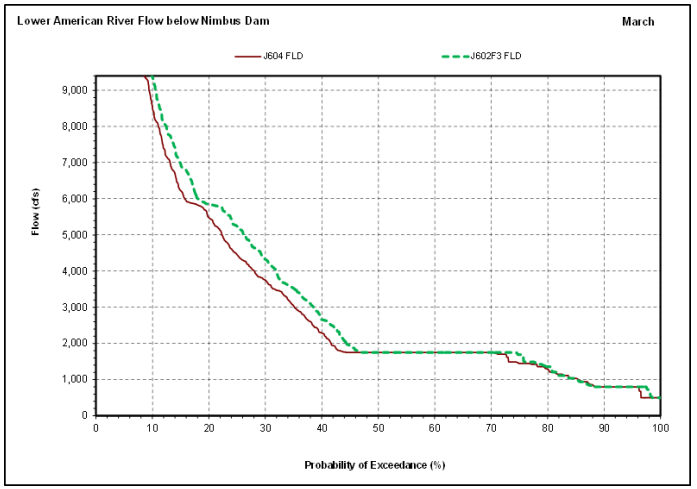

Figure 1-8. Lower American River Flow Probability of Exceedance Distributions below Nimbus Dam for March under Alternative 2 - Forecast informed Operations Future Condition and No Action/No Project Future Condition.

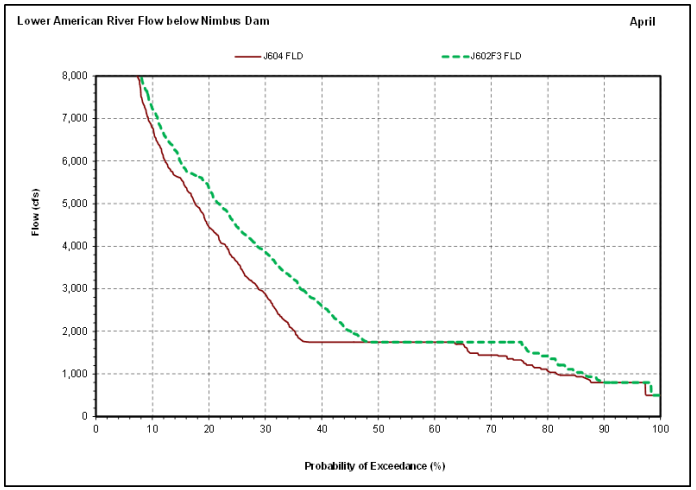

Figure 1-9. Lower American River Flow Probability of Exceedance Distributions below Nimbus Dam for June under Alternative 2 - Forecast-informed Operations Future Condition and No Action/No Project Future Condition.

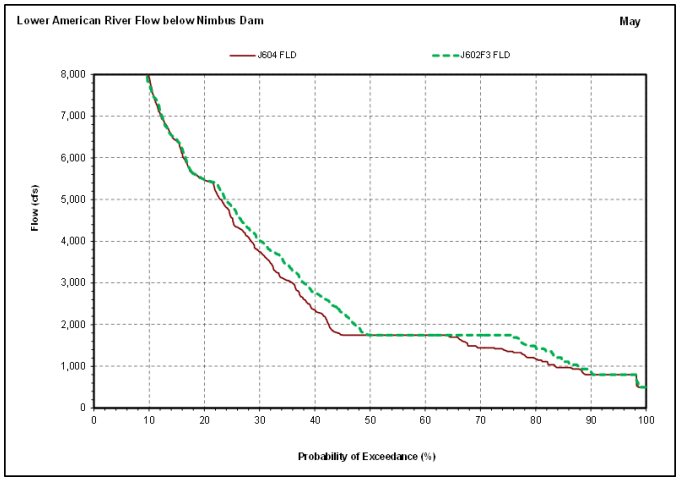

Figure 1-10. Lower American River Flow Probability of Exceedance Distributions below Nimbus Dam for May under Alternative 2 - Forecast-informed Operations Future Condition and No Action/No Project Future Condition.

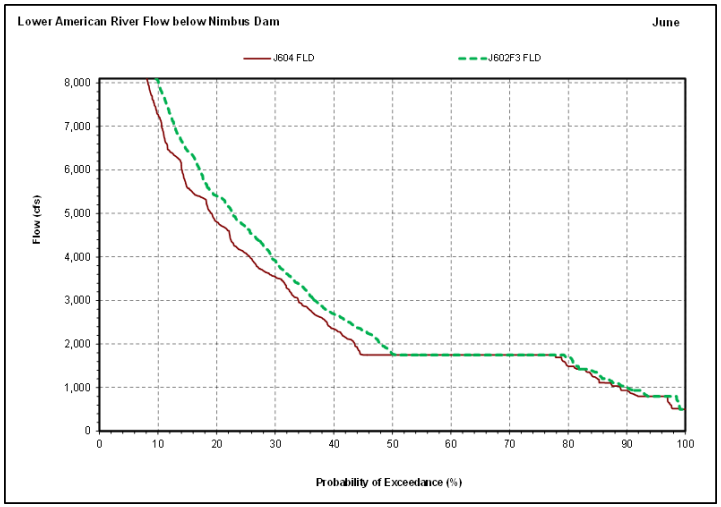

Figure 1-11. Lower American River Flow Probability of Exceedance Distributions below Nimbus Dam for June under Alternative 2 - Forecast-informed Operations Future Condition and No Action/No Project Future Condition.

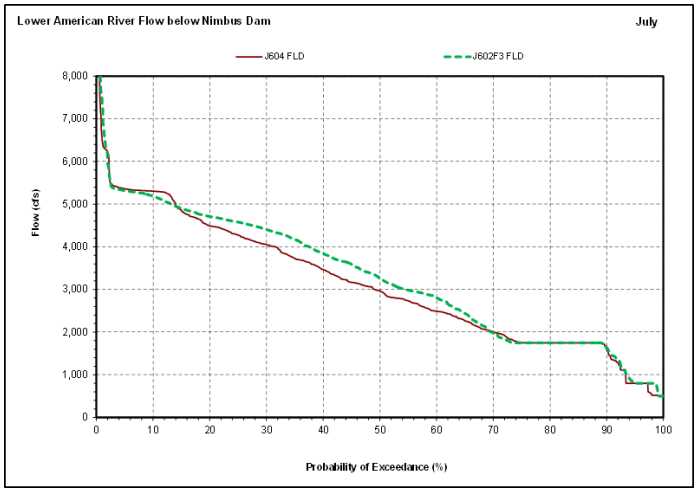

Figure 1-12. Lower American River Flow Probability of Exceedance Distributions below Nimbus Dam for July under Alternative 2 - Forecast-informed Operations Future Condition and No Action/No Project Future Condition.

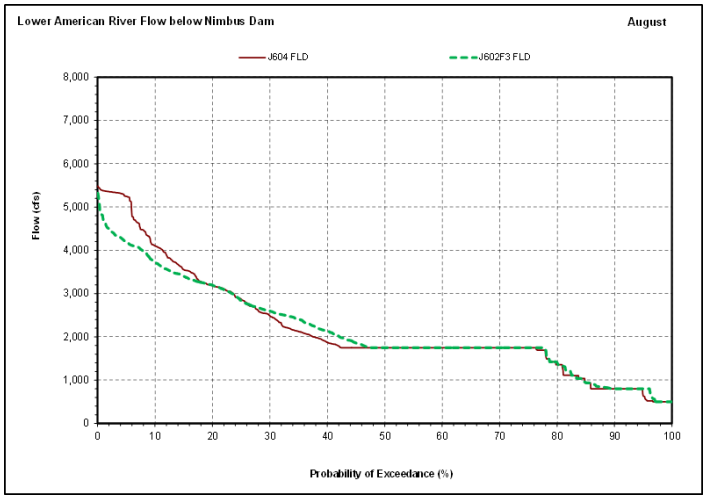

Figure 1-13. Lower American River Flow Probability of Exceedance Distributions below Nimbus Dam for August under Alternative 2 - Forecast-informed Operations Future Condition and No Action/No Project Future Condition.

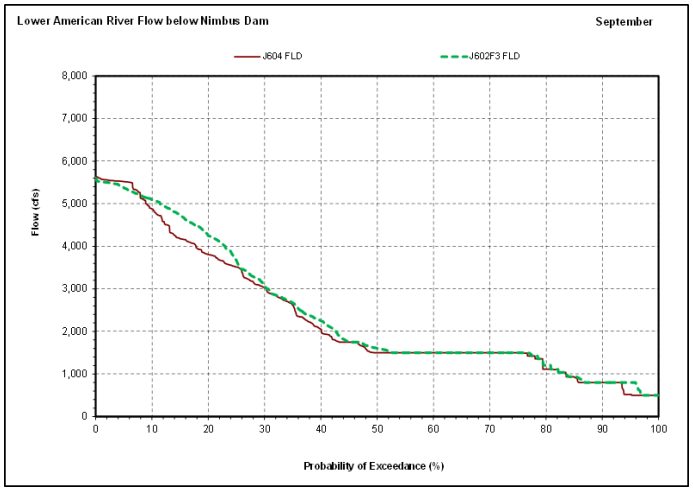

Figure 1-14. Lower American River Flow Probability of Exceedance Distributions below Nimbus Dam for September under Alternative 2 - Forecast-informed Operations Future Condition and No Action/No Project Future Condition.

Monthly flow exceedance distributions at Watt Avenue and at the mouth of the lower American River exhibit similar trends as described for below Nimbus Dam.

In addition to evaluating general changes in the monthly flow exceedance distributions, net changes in flow of 10 percent or more are calculated based on the monthly exceedance distributions to determine whether flow increases by 10 percent or more with higher frequency, or whether flow decreases by 10 percent or more with higher frequency (i.e., the percentage of the time that flow increases by 10 percent or more minus the percentage of time that flow decreases by 10 percent or more. The net change in flow of 10 percent or more is evaluated on a monthly basis for below Nimbus Dam, at Watt Avenue and at the mouth of the lower American River for the entire distribution of flows, and/or for the lowest 40 percent of the distribution of flows, depending on the species and lifestage being evaluated.

Net changes in flow at all three locations of 10 percent or more over the entire monthly distributions are generally similar (i.e., less than 5 percent) during January (Table 5-30). Flows decrease by 10 percent or more with higher frequency during November, and with substantially higher frequency (i.e., 10 percent or more) during October, February and March under Alternative 2 - Forecast-informed Operations future condition relative to No Action/No Project future condition. By contrast, flows increase by 10 percent or more with higher frequency during August and September, and with substantially higher frequency during December, April, May, June and July.

Net changes in flow of 10 percent or more during low flow conditions are generally similar (i.e., less than 5 percent) during May, June, August and September (Table 5-31). Net reductions in flow of 10 percent or more occur with higher frequency during December, and with generally substantially higher frequency during October, November, January, February and March under Alternative 2 - Forecast-informed Operations future condition relative to No Action/No Project future condition. Net increases in flow of 10 percent or more occur with substantially higher frequency during April and July under Alternative 2 - Forecast-informed Operations future condition relative to No Action/No Project future condition.

Table 1-7. Monthly Net Changes in Flow of 10 percent or More below Nimbus Dam, at Watt Avenue and at the Mouth of the Lower American River.

Indicator of Potential Impact	Location	Metric	Range	Net Change in Probability of Exceedance under With-Project (Alternative 2 - Forecast-informed Operations) relative to the No Action/No Project future Condition											
	Description	percent		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean Daily Flow (cfs)	American River below Nimbus Dam	10	All Years	-2	6	7	-3	-25	33	54	37	42	29	6	17
	American River at Watt Ave	10	All Years	-2	8	6	-3	-26	33	53	37	41	33	6	17
	Mouth of the American River (RM 1)	10	All Years	0	7	1	-5	-24	28	53	38	41	33	7	18

Table 1-8. Monthly Net Changes in Flow of 10 percent or More during Low Flow Conditions below Nimbus Dam, at Watt Avenue and at the Mouth of the Lower American River.

Indicator of Potential Impact	Location	Metric	Range	Net Change in Probability of Exceedance under With-Project (Alternative 2 - Forecast-informed Operations) relative to the No Action/No Project Future Condition											
	Description	percent		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean Daily Flow (cfs)	American River below Nimbus Dam	10	Lower 40 percent	10	7	4	4	-4	13	56	54	18	11	9	10
	American River at Watt Ave	10	Lower 40 percent	10	7	4	5	-4	13	56	54	20	15	9	10
	Mouth of the American River (RM 1)	10	Lower 40 percent	13	7	1	6	0	12	53	56	19	17	8	10

Based on the general changes in flows (described above) and water temperatures (see Water Temperature section), as well as fish species and lifestage-specific flow and water temperature-related indicators of potential impact presented below, potential changes in species and lifestage-specific suitabilities under Alternative 2 - Forecast-informed Operations future condition relative to No Action/No Project future condition are described in the following sections.

Riverine Temperatures

Simulated monthly water temperatures at representative nodes in the rivers in the Project Area indicate that water temperatures under Alternative 2 - Forecast-informed Operations future condition relative to No Action/No Project future condition would generally be: (1) equivalent or similar most of the time in the Sacramento River, but would be measurably cooler more often during August, and measurably warmer more often during September below Keswick Dam and at Bend Bridge; (2) equivalent or similar most of the time in the Feather River below the Thermalito Afterbay Outlet and at the mouth; and (3) cooler more often during the spring and summer and warmer during April in the American River.

Changes in simulated water temperatures within each evaluated water body under Alternative 2 - Forecast-informed Operations future condition relative to No Action/No Project future condition are summarized in Tables 5-32 to 5-34, below.

Table 1-9. Riverine Water Temperatures Long-term Average and Average by Water Year Type for Alternative 2 - Forecast-informed Operations Future Condition vs. No Action/No Project Future Condition.

Evaluation Parameters	Evaluation Metrics and Summary of Effects	Results					
River and Location	Generally similar long-term average water temperatures and average water temperatures by water year type during most months at all locations.	Long-term and Water Year Type Average Water Temperature					
		Long-term	Wet	Above Normal	Below Normal	Dry	Critical
Sacramento River below Keswick Dam		✓	✓	✓	✓	✓	✓
Sacramento River at Bend Bridge		✓	✓	✓	✓	✓	✓
Sacramento River at Feather River confluence		✓	✓	✓	✓	✓	✓
Sacramento River at Freeport		✓	✓	✓	✓	✓	✓
Feather River below Thermalito Afterbay Outlet		✓	✓	✓	✓	✓	✓
Feather River at the mouth		✓	✓	✓	✓	✓	✓
American River below Nimbus Dam		Cooler in May	✓	Cooler in May, Jun, & Aug	✓	Cooler in May & Jun	✓
American River at Watt Avenue		Cooler in May, Jun, & Aug	Cooler in May & Aug	Cooler in May–Aug	Cooler in May–Jul	Cooler in May, Jun, & Aug	Cooler in Mar–Aug
American River at the mouth		Cooler in Apr–Sep	Cooler in Mar & May–Aug	Cooler in May–Aug	Cooler in Apr–Jul	Cooler in Apr–Aug	Cooler in Mar–Sep

Table 1-10. Water Temperature – Net Measurable Differences over Entire Monthly Exceedance Distributions for Alternative 2 - Forecast-informed Operations Future Condition vs. No Action/No Project Future Condition.

Evaluation Parameters	Evaluation Metrics and Summary of Effects	Results
River and Location	Generally similar water temperatures over most of the monthly exceedance distributions at all locations.	**Entire Monthly Exceedance Distributions**
Sacramento River below Keswick Dam		✓
Sacramento River at Bend Bridge		✓
Sacramento River at Feather River confluence		✓
Sacramento River at Freeport		✓
Feather River below Thermalito Afterbay Outlet		✓
Feather River at the mouth		✓
American River below Nimbus Dam		Net measurable decreases in May, Jun, & Aug; net increase in Apr
American River at Watt Avenue		Net measurable decreases in May–Sep
American River at the mouth		Net measurable decrease in Mar–Sep

Table 1-11. Water Temperature – Net Measurable Differences over Warmest 25 percent of Monthly Exceedance Distributions

Evaluation Parameters	Evaluation Metrics and Summary of Effects	Results
River and Location	Generally similar water temperatures over most of the monthly exceedance distributions at all locations.	**Warmest 25 percent of the Monthly Exceedance Distributions**
Sacramento River below Keswick Dam		Net measurable reduction in Aug, net increase in Sep
Sacramento River at Bend Bridge		Net measurable reduction in Aug, net increase in Sep
Sacramento River at Feather River confluence		✓
Sacramento River at Freeport		✓
Feather River below Thermalito Afterbay Outlet		✓
Feather River at the mouth		✓
American River below Nimbus Dam		Net measurable decreases in May–Sep
American River at Watt Avenue		Net measurable decreases in Mar–Sep
American River at the mouth		Net measurable decreases in Mar–Sep

Note: "✓" refers to similar values of the evaluation metric for both scenarios

Additional discussion of water temperature changes in the lower American River is provided below.

American River below Nimbus Dam

Long-term average monthly water temperatures in the American River below Nimbus Dam would be essentially equivalent during all months of the year, except for May when there is a measurably decrease in water temperature. Mean monthly water temperatures by water year type would be generally similar most of the time, except for measurably cooler water temperatures during May, June, and August of above-normal water years and during May and June of dry water years. Monthly water temperature exceedance probability distributions would be generally similar with slight differences most of the time during all months, but are slightly cooler during May, June, and August, and are warmer during April.

Over the entire monthly distributions, net measurable decreases in water temperature would occur over 10 percent or more of the time during May, June, and August, and a net measurable increase would occur over 10 percent or more of the time during April. Over the warmest 25 percent of the monthly distributions, net measurable decreases in water temperature would occur over 10 percent or more in the distributions during May through September.

American River at Watt Avenue

Long-term average monthly water temperatures in the American River at Watt Avenue would be essentially equivalent during all months of the year, but would be measurably cooler during May, June, and August. Monthly water temperatures by water year type would be generally similar most of the time, but would be measurably cooler during May and August of wet water years; May through August of above-normal water years; May through July of below-normal water years; May, June, and August of dry water years; and during March through August of critical years. Monthly water temperature exceedance probability distributions would be generally similar most of the time during all months with some slight differences, but would be cooler during March through September.

Over the entire monthly distributions, net measurable decreases in water temperature would occur over 10 percent or more of the time during May through September. Over the warmest 25 percent of the monthly distributions, net measurable decreases in water temperature would occur in over 10 percent or more in the distributions during March through September.

American River at the Mouth

Long-term average monthly water temperatures in the American River at the mouth (i.e., RM 1) would be essentially equivalent during most months of the year, and would be measurably cooler during April through September. Monthly water temperatures by water year type would be generally similar most of the time, but would be measurably cooler during March of above-normal and critical water years, April of below-normal and dry water years, May through August of most water year types, and September of critical years. Monthly water temperature exceedance probability distributions would be generally similar during most months of the year, but would be cooler during March through September.

Over the entire monthly distributions, net measurable decreases in water temperature would occur over 10 percent or more of the time during March through September. Over the warmest 25 percent of the monthly distributions, net measurable decreases in water temperature would occur over 10 percent or more in the distributions during March through September.

Steelhead

Flow and water temperature model results were examined for the lower American River below Nimbus Dam, at Watt Avenue, and near the mouth of the lower American River (i.e., RM 1). Additional flow and water temperature nodes were used to simulate potential redd dewatering (i.e., daily water temperatures by river mile).

Table 5-35 summarizes the net difference in water temperature index value exceedance probabilities for steelhead observed from model outputs for the lower American River. Table 5-36 presents the long-term average and average by water wear type steelhead spawning WUA comparison results for Alternative 2 and No Action/No Project under future water demand conditions, while Figure 5-29 compares the exceedance distribution for steelhead spawning WUA. Table 5-37 and Figure 5-30 summarize the results of the steelhead redd dewatering analysis for the two scenarios being compared.

Relative to the No Action/No Project future condition, the Alternative 2 - Forecast-informed Operations future condition would be expected to provide:

a) Similar adult immigration (November through March [peaking during January]) conditions due to: (1) over the monthly flow exceedance distributions, similar or higher flows more often during most months of the evaluation period, except for February when lower flows occur more often; (2) over the entire flow exceedance distributions, flows are lower by 10 percent or more with substantially higher frequency at both locations during February, are similar or lower more often during January, are higher by 10 percent or more with higher or substantially higher frequency during November and March, and are similar or higher more often during December; (3) during low-flow conditions, flows are similar or lower by 10 percent or more with higher frequency during February, are higher by 10 percent or more with higher or substantially higher frequency during November, January, and March, and are similar or higher by 10 percent or more with higher frequency during December; (4) over the monthly water temperature exceedance distributions, similar water temperatures most of the time during most months of the evaluation period, but with lower temperatures more often during March; and (5) equivalent monthly probabilities of exceeding both UO and UT WTI values at both locations evaluated.

b) Similar adult holding (November through March [peaking during January]) conditions due to: (1) over the monthly flow exceedance distributions, similar or higher flows more often during most months of the evaluation period, except for February when lower flows occur more often; (2) over the entire flow exceedance distributions, flows are lower by 10 percent or more with substantially higher frequency at both locations during February, and are higher by 10 percent or more with higher or substantially higher frequency during November, December, and March, with minor net changes in flow of 10 percent or more during January; (3) during low-flow conditions, flows are lower by 10 percent or more with higher frequency during February, and are higher by 10 percent or more with higher or substantially higher frequency during November, December, January, and March; (4) over the monthly water temperature exceedance distributions, similar water temperatures most of the time during most months of the evaluation period, but with lower temperatures more often during March at Watt Avenue; and (5) equivalent monthly probabilities of exceeding both UO and UT WTI values at both locations evaluated.

Table 1-12. Net Difference in Water Temperature Index Value Exceedance Probabilities for Steelhead.

Steelhead in the Lower American River																		
Lifestage	Evaluation Period	Indicator of Potential Impact	Location	Metric	Range	Net Change in Probability of Exceedance under With-Project (Alternative 2 - Forecast-informed Operations) relative to the No Action/No Project Future Condition												
			Description	Value		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Adult Immigration	November through March	Mean Daily Water Temperature (°F)	American River at Watt Ave	64	All Years		0	0	0	0	0						
				68	All Years		0	0	0	0	0						
			Mouth of the American River (RM 1)	64	All Years		0	0	0	0	0						
				68	All Years		0	0	0	0	0						
Adult Holding	November through March	Mean Daily Water Temperature (°F)	American River below Nimbus Dam	61	All Years		0	0	0	0	0						
				65	All Years		0	0	0	0	0						
			American River at Watt Ave	61	All Years		-1	0	0	0	0						
				65	All Years		0	0	0	0	0						
Adult Spawning	January through mid-April	Mean Daily Water Temperature (°F)	American River below Nimbus Dam	54	All Years				0	0	0	6					
				57	All Years				0	0	0	0					
			American River at Watt Ave	54	All Years				0	0	-1	6					
				57	All Years				0	0	-2	0					
Embryo Incubation	January through May	Mean Daily Water Temperature (°F)	American River below Nimbus Dam	54	All Years				0	0	0	2	-1				
				57	All Years				0	0	0	-2	-4				
			American River at Watt Ave	54	All Years				0	0	-1	-1	0				
				57	All Years				0	0	-2	-2	-4				
Juvenile Rearing and Downstream Movement	Year-round	Mean Daily Water Temperature (°F)	American River below Nimbus Dam	65	All Years	-1	0	0	0	0	0	0	-2	-5	-5	-4	-3
				68	All Years	0	0	0	0	0	0	0	0	-1	-2	-1	-2
			American River at Watt Ave	65	All Years	0	0	0	0	0	0	-1	-6	-4	-1	-5	-3
				68	All Years	0	0	0	0	0	0	-1	-3	-5	-7	-7	-5
			Mouth of the American River (RM 1)	65	All Years	0	0	0	0	0	0	-2	-7	-5	-1	-1	1
				68	All Years	-1	0	0	0	0	0	-1	-7	-5	-5	-5	-5
Smolt Emigration	December through April	Mean Daily Water Temperature (°F)	American River at Watt Ave	52	All Years			0	0	0	-3	2					
				55	All Years			0	0	0	-1	-2					
			Mouth of the American River (RM 1)	52	All Years			1	0	0	-1	1					
				55	All Years			-1	0	0	-2	-2					

Table 1-13. Long-term Average and Average by Water Year Type Steelhead Spawning WUA.

Lower American River Steelhead Annual Spawning WUA Averages (percent of Maximum WUA)			
Water Year Type Category	Alternative 2 - Forecast-informed Operations future condition	No Action/No Project future condition	Difference
All Water Years	72.9 percent	71.9 percent	1.0 percent
Wet	54.2 percent	53.9 percent	0.3 percent
Above Normal	66.7 percent	65.9 percent	0.9 percent
Below Normal	83.7 percent	82.8 percent	0.8 percent
Dry	89.0 percent	88.4 percent	0.5 percent
Critical	82.6 percent	79.0 percent	3.6 percent

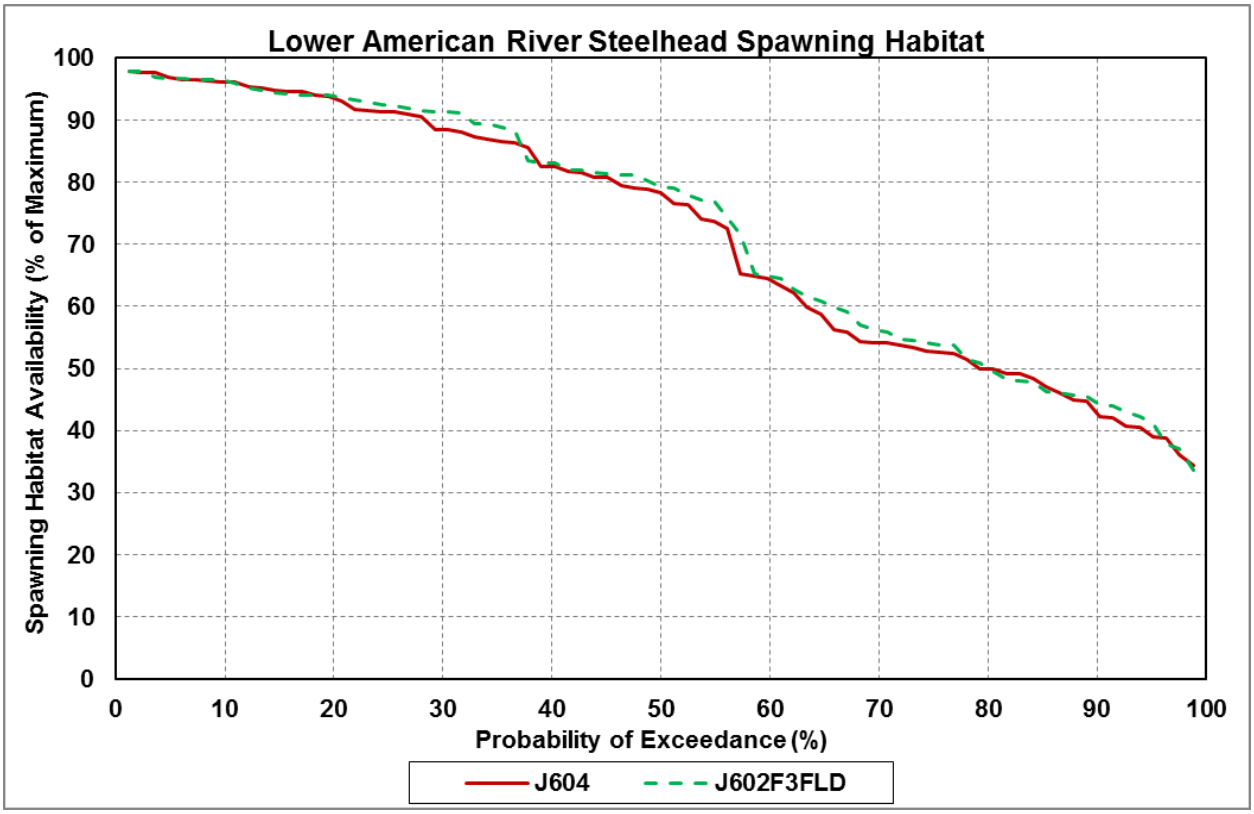

Figure 1-15. Steelhead Spawning WUA Exceedance Distribution.

Table 1-14. Long-term Average and Average by Water Year Type Steelhead Redd Dewatering Index.

Lower American River Steelhead Annual Redd Dewatering Index Averages (percent)			
Water Year Type Category	Alternative 2 – Forecast-informed Future Condition	No Action/No Project Future Condition	Difference
All Water Years	25.7 percent	26.8 percent	–1.1 percent
Wet	44.7 percent	46.4 percent	–1.7 percent
Above Normal	42.7 percent	43.4 percent	–0.7 percent
Below Normal	14.6 percent	16.0 percent	–1.5 percent
Dry	7.3 percent	6.7 percent	0.6 percent
Critical	1.4 percent	1.5 percent	–0.1 percent

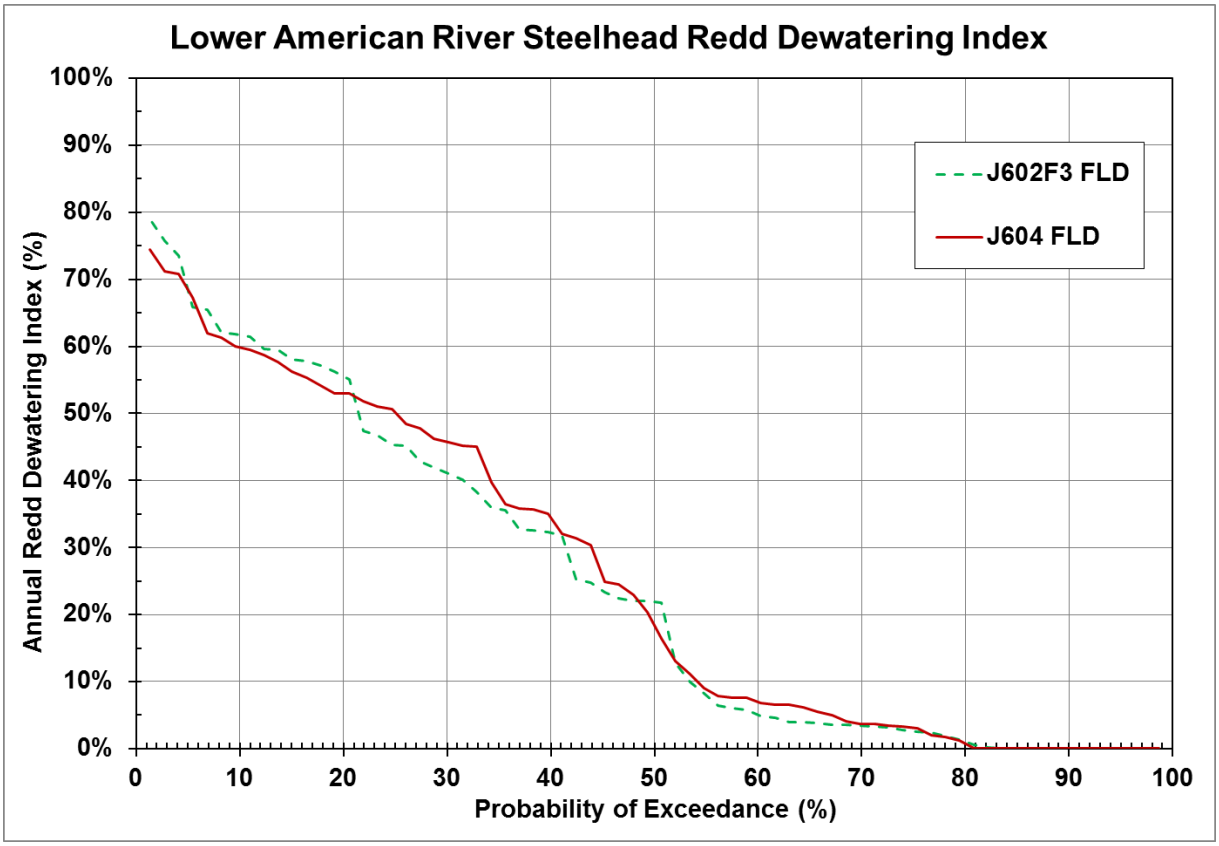

Figure 1-16. Steelhead Redd Dewatering Index Exceedance Distribution.

c) Similar spawning (January through mid-April [peaking during February]) conditions due to: (1) generally equivalent long-term average spawning WUA and average spawning WUA during all water year types, except for slightly higher spawning WUA during critical water years; (2) over the annual spawning WUA exceedance distribution, slightly higher probability of spawning WUA equal to or greater than 80 percent of maximum spawning WUA, and generally similar or slightly higher spawning WUA over the

distribution when spawning WUA is less than 80 percent of maximum under both scenarios; (3) over the monthly water temperature exceedance distributions, similar water temperatures most of the time, but with lower water temperatures during March at Watt Avenue, and higher temperatures during April below Nimbus Dam (primarily when water temperatures under both scenarios are below 52°F); and (4) similar probabilities of exceeding WTI values at both locations during all months, except for a slight decrease in the probability of exceedance of the UT WTI value during March at Watt Avenue, and an increase in the probability of exceedance of the UO WTI value during the first half of April. Although there is an increase in the probability of exceedance during the first half of April, less than 1 percent of steelhead spawning is expected to occur during April. Therefore, water temperature conditions are expected to be generally similar overall for steelhead spawning.

d) More suitable embryo incubation (January through May [peaking during March]) conditions due to: (1) slightly lower long-term average annual redd dewatering index and similar or slightly lower average redd dewatering index during all water year types; (2) slightly lower or similar annual redd dewatering index over most of the exceedance distribution; (3) over the monthly water temperature exceedance distributions, similar or lower water temperatures most of the time during most months of the evaluation period, but with slightly higher temperatures during April (below Nimbus Dam); and (4) similar most of the time during all months, with primarily some slight decreases in probabilities of exceeding UT WTI values at both locations.

e) More suitable juvenile rearing and downstream movement (year-round) conditions due to: (1) over the monthly flow exceedance distributions, higher flows more often during most months of the year; (2) over the entire flow exceedance distributions, flows at all locations are higher by 10 percent or more with higher or substantially higher frequency during most months of the year, except during February when they are lower by 10 percent or more with substantially higher frequency, and during January when flows are similar or lower by 10 percent or more with higher frequency; (3) during low-flow conditions, flows at all locations are higher by 10 percent or more with higher or substantially higher frequency during most months of the year, except during February when they are lower by 10 percent or more with generally higher or substantially higher frequency, and during December when minor net changes in flow of 10 percent or more occur; (4) over the monthly water temperature exceedance distributions, similar or lower water temperatures most of the time during most months of the year, but with higher temperatures during April below Nimbus Dam (primarily when water temperatures are below 52°F); and (5) generally similar probabilities of exceeding UO and UT WTI values at all locations during October through April, and reduced probabilities of exceedance during May through September at all locations.

f) Slightly less suitable smolt emigration (December through April [peaking during January]) conditions due to: (1) over the monthly flow exceedance distributions, similar or higher flows more often during most months of the evaluation period, except during February when flows are lower; (2) over the entire flow exceedance distributions, flows are similar or higher by 10 percent or more with higher or substantially higher frequency

at both locations most of the time, but are lower by 10 percent or more with higher frequency during January at the mouth and during February at both locations; (3) during low-flow conditions, flows are similar or higher by 10 percent or more with higher or substantially higher frequency at both locations most of the time, but are lower by 10 percent or more with higher frequency during February; (4) over the monthly water temperature exceedance distributions, similar water temperatures most of the time during most months of the evaluation period, but with higher water temperatures during April below Nimbus Dam, and lower water temperatures during March at Watt Avenue and the mouth, and during April at the mouth; and (5) similar or generally slightly lower probabilities of exceeding WTI values over the evaluation period.

Overall, in consideration of all flow and water temperature–related impact indicators, as well as peak lifestage-specific temporal considerations, and limiting factors and key stressors for steelhead in the lower American River, habitat conditions are expected to be more suitable for steelhead under J602F3 FLD relative to J604. Although flows decrease more often during February, flows increase more often during other months of the year, the probability of redd dewatering is slightly reduced, spawning habitat availability increases slightly, and water temperatures are reduced more often during the warmest months of the juvenile rearing period. Therefore, key stressors to steelhead in the lower American River identified by NMFS (2014), including flow fluctuations and elevated water temperatures, may be less impactful to steelhead under the Alternative 2 future condition relative to the No Action/No Project future condition.

Fall-run Chinook Salmon

Flow and water temperature model results were examined for the lower American River below Nimbus Dam, at Watt Avenue, and near the mouth of the lower American River (i.e., RM 1) (Table 5-38). Additional flow and water temperature nodes were used to simulate potential redd dewatering (i.e., daily water temperatures by river mile).

Table 5-39 summarizes the net difference in water temperature index value exceedance probabilities for Fall-run Chinook salmon observed from model outputs for the lower American River. Table 5-40 presents the long-term average and average by water wear type Fall-run Chinook salmon spawning WUA comparison results for Alternative 2 and No Action/No Project under future water demand conditions, while Figure 5-31 compares the exceedance distribution for Fall-run Chinook salmon spawning WUA. Table 5-41 and Figure 5-32 summarize the results of the Fall-run Chinook salmon redd dewatering analysis for the two scenarios being compared.

Table 1-15. Net Difference in Water Temperature Index Value Exceedance Probabilities for Fall-run Chinook Salmon.

Fall-run Chinook Salmon in the Lower American River																		
Lifestage	Evaluation Period	Indicator of Potential Impact	Location	Metric	Range	Net Change in Probability of Exceedance under Alternative 2 - Forecast-informed Operations Future Condition relative to the No Action/No Project Future Condition												
			Description	Value (°F)		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Adult Immigration and Staging	August through December	Mean Daily Water Temp (°F)	American River below Nimbus Dam	64	All Years	-1	0	0								-6	-1
				68	All Years	0	0	0								-1	-2
			American River at Watt Avenue	64	All Years	0	0	0								-4	-2
				68	All Years	0	0	0								-7	-5
			Mouth of the American River (RM 1)	64	All Years	2	0	0								2	1
				68	All Years	-1	0	0								-5	-5
Adult Spawning	Mid-October through December	Mean Daily Water Temp (°F)	American River below Nimbus Dam	56	All Years	2	0	0									
				58	All Years	1	0	0									
			American River at Watt Avenue	56	All Years	2	-1	0									
				58	All Years	1	-1	0									
Embryo Incubation	Mid-October through March	Mean Daily Water Temp (°F)	American River below Nimbus Dam	56	All Years	2	0	0	0	0	0						
				58	All Years	1	0	0	0	0	0						
			American River at Watt Avenue	56	All Years	2	-1	0	0	0	-1						
				58	All Years	1	-1	0	0	0	-1						
Juvenile Rearing and Emigration	January through May	Mean Daily Water Temp (°F)	American River below Nimbus Dam	61	All Years				0	0	0	0	-4				
				65	All Years				0	0	0	0	-2				
			American River at Watt Avenue	61	All Years				0	0	0	-2	-7				
				65	All Years				0	0	0	-1	-6				
			Mouth of the American River (RM 1)	61	All Years				0	0	-1	-4	-4				
				65	All Years				0	0	0	-2	-7				

Table 1-16. Long-term Average and Average by Water Year Type Fall-run Chinook Salmon Spawning WUA.

Lower American River Fall-run Chinook Salmon Annual Weighted WUA Averages (percent)			
Water Year Type Category	**Alternative 2 Forecast-informed Operations Future Condition**	**No Action/No Project Future Condition**	**Difference**
All Water Years	84.2 percent	84.1 percent	0.1 percent
Wet	80.7 percent	82.3 percent	–1.6 percent
Above Normal	80.8 percent	81.5 percent	–0.7 percent
Below Normal	88.5 percent	86.8 percent	1.7 percent
Dry	85.1 percent	85.0 percent	0.1 percent
Critical	88.4 percent	85.7 percent	2.7 percent

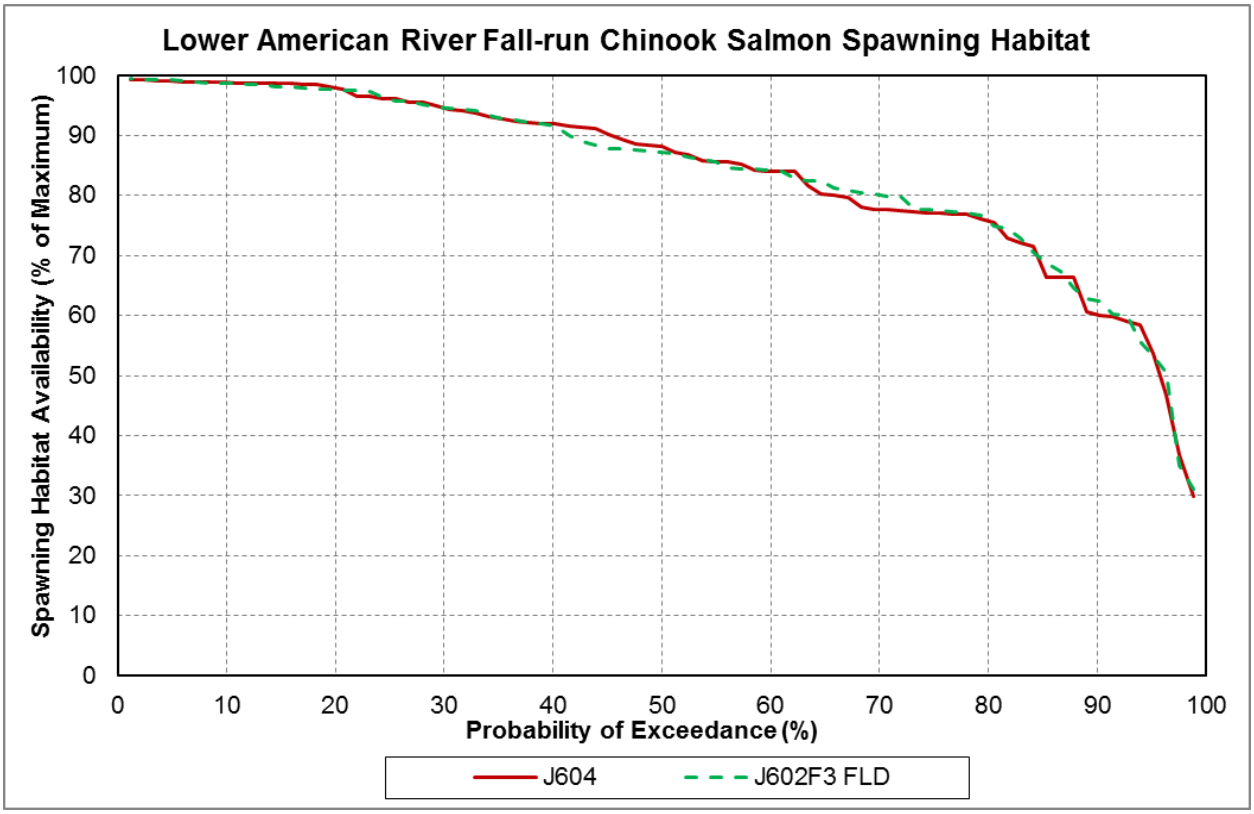

Figure 1-17. Fall-run Chinook Salmon Spawning WUA Exceedance Distribution.

Table 1-17. Long-term Average and Average by Water Year Type Fall-run Chinook Salmon Redd Dewatering Index.

Lower American River Chinook Salmon Annual Redd Dewatering Index Averages (percent)			
Water Year Type Category	**Alternative 2 Forecast-informed Operation Future Condition**	**No Action/No Project Future Condition**	**Difference**
All Water Years	8.41 percent	8.19 percent	0.23 percent
Wet	11.21 percent	11.32 percent	–0.11 percent
Above Normal	5.23 percent	6.10 percent	–0.87 percent
Below Normal	4.72 percent	4.77 percent	–0.05 percent
Dry	5.68 percent	7.40 percent	–1.73 percent
Critical	13.20 percent	7.86 percent	5.34 percent

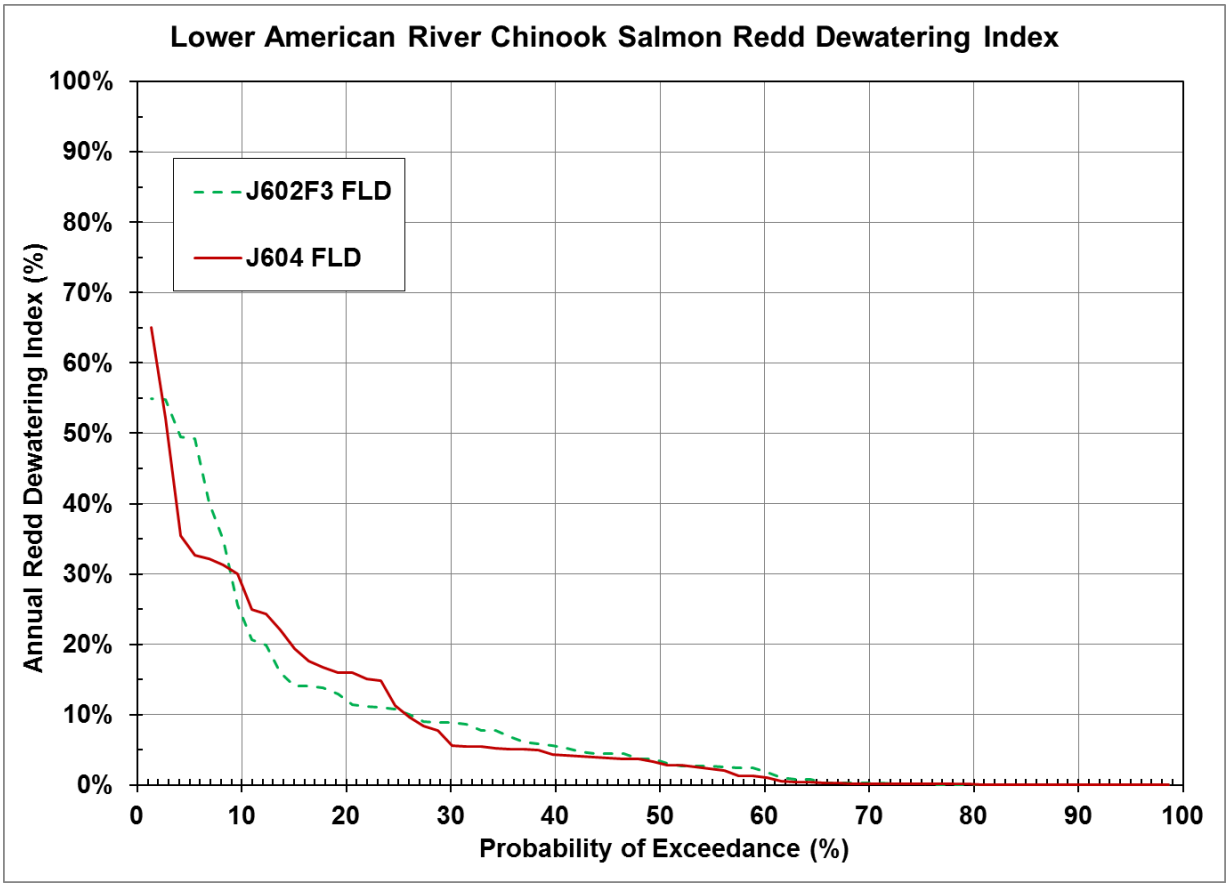

Figure 1-18. Fall-run Chinook Salmon Redd Dewatering Index Exceedance Distribution.

Table 1-18. Long-term Average and Average by Water Year Type Fall-run Chinook Salmon Early Lifestage Mortality.

Lower American River Fall-run Chinook Salmon Annual Early Lifestage Mortality Averages (percent)

Water Year Type Category	Alternative 2 Forecast-informed Operations Future Condition	No Action/No Project Future Condition	Difference
All Water Years	7.7 percent	8.2 percent	–0.4 percent
Wet	4.7 percent	5.2 percent	–0.5 percent
Above Normal	4.1 percent	4.2 percent	0.0 percent
Below Normal	5.4 percent	5.6 percent	–0.3 percent
Dry	10.9 percent	11.7 percent	–0.7 percent
Critical	15.5 percent	15.9 percent	–0.3 percent

Relative to the No Action/No Project future condition, the Alternative 2 - Forecast-informed Operation future condition would be expected to provide:

a) Similar adult immigration and staging (August through December [peaking during November]) conditions due to: (1) over the monthly flow exceedance distributions, higher flows more often during most months of the evaluation period, but with lower flows more often during October; (2) over the entire flow exceedance distributions, flows at all locations are similar or higher by 10 percent or more with higher or substantially higher frequency during all months of the evaluation period; (3) during low-flow conditions, flows at all locations are similar or higher by 10 percent or more with higher or substantially higher frequency during all months of the evaluation period; (4) over the monthly water temperature exceedance distributions, similar or lower water temperatures most of the time during all months of the evaluation period; and (5) generally similar probabilities of exceeding UO and UT WTI values with some slight differences in exceedance, primarily including reductions in exceedance during August and September.

b) Similar spawning (mid-October through December [peaking during November]) conditions due to: (1) similar long-term average spawning WUA and average spawning WUA during most water year types, except for slightly lower spawning WUA during wet water years, and slightly higher spawning WUA during below-normal and critical water years; (2) over the annual spawning WUA exceedance distribution, slightly higher probability of spawning WUA equal to or greater than 80 percent of maximum spawning WUA, and generally similar spawning WUA when spawning WUA is less than 80 percent of maximum; (3) over the monthly water temperature exceedance distributions, similar water temperatures most of the time during all months of the evaluation period; and (4) similar probabilities of exceeding WTI values during all months evaluated at both locations, except for slightly increased probabilities of exceedance of the UO WTI value during October.

c) Similar embryo incubation conditions (mid-October through March) due to: (1) similar long-term average annual redd dewatering index and similar average redd dewatering index during most water year types, but with slightly reduced dewatering during dry water years and increased dewatering during critical water years; (2) similar or higher and lower annual redd dewatering index with similar frequencies over the exceedance distribution; (3) over the monthly water temperature exceedance distributions, similar water temperatures most of the time during all months of the evaluation period; and (4)

similar probabilities of exceeding WTI values during all months evaluated at both locations, but with slightly increased probabilities of exceedance of the UO WTI value during October.

d) Similar early lifestage mortality due to: (1) lower annual long-term average early lifestage mortality and average annual early lifestage mortality by water year type; and (2) similar or slightly lower early lifestage annual mortality over the entire exceedance distribution (Figure 5-33).

e) Slightly more suitable juvenile rearing and downstream movement (January through May [peaking during February]) conditions due to: (1) over the monthly flow exceedance distributions, similar or higher flows more often during most months of the evaluation period, except for February when flows are lower; (2) over the entire flow exceedance distributions, flows at all locations are higher by 10 percent or more with higher or substantially higher frequency during most months, except during February when they are lower by 10 percent or more with substantially higher frequency, and during January when flows are similar or lower by 10 percent or more with higher frequency; (3) during low-flow conditions, flows at all locations are higher by 10 percent or more with higher or substantially higher frequency during most months, except during February when they are lower by 10 percent or more with substantially higher frequency, and during January when flows are similar or lower by 10 percent or more with higher frequency; (3) during low-flow conditions, flows at all locations are higher by 10 percent or more with higher or substantially higher frequency during most months, except during February when they are lower by 10 percent or more with generally higher or substantially higher frequency; (4) over the monthly water temperature exceedance distributions, similar or lower water temperatures most of the time during most months, but with higher temperatures during April below Nimbus Dam (primarily when water temperatures are below 52°F); and (5) generally similar probabilities of exceeding WTI values at all locations, but with generally slightly reduced probabilities of exceedance during April and May at most locations.

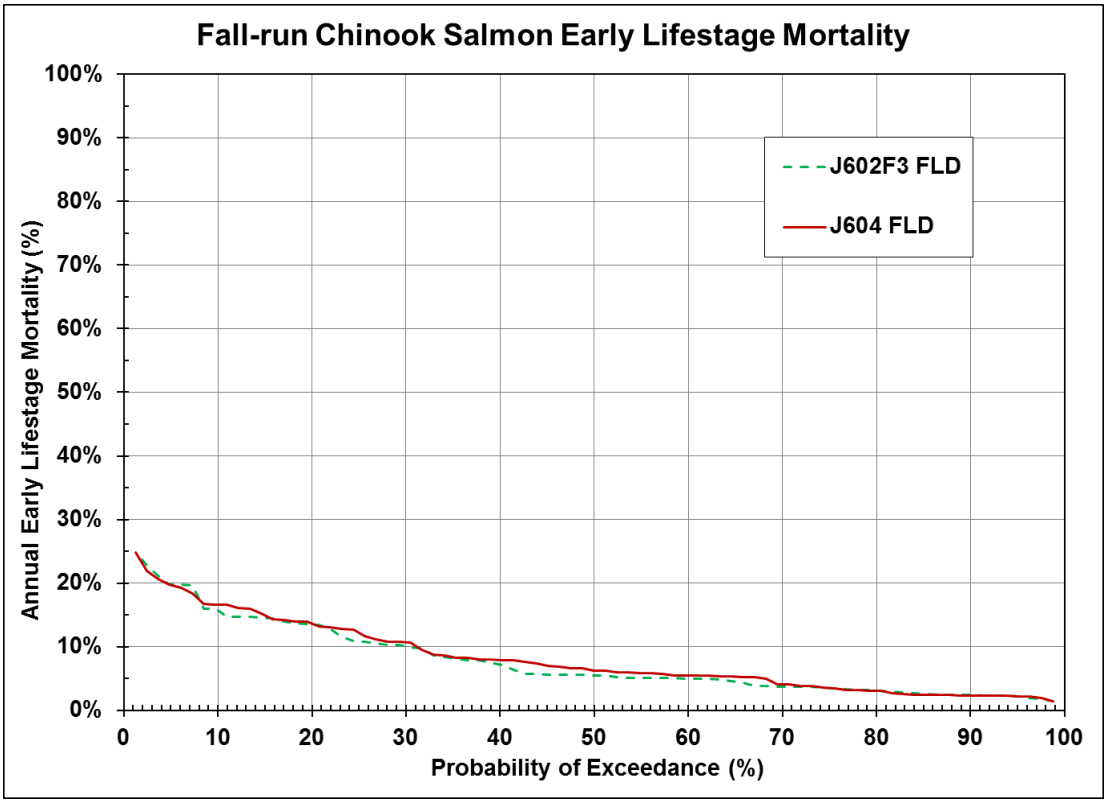

Figure 1-19. Fall-run Chinook Salmon Annual Early Lifestage Mortality Exceedance Distribution.

Overall, in consideration of all flow and water temperature–related impact indicators, as well as peak lifestage-specific temporal considerations, and limiting factors and key stressors for salmonids in the lower American River, habitat conditions are expected to be generally similar for fall-run Chinook salmon under Alternative 2 future condition relative to the No Action/No Project future condition. Although flows decrease during February, flows increase during most months of the year, and water temperatures are cooler during the warmest periods of the year, including during April and May of the juvenile rearing and emigration lifestage, and during August and September of the adult immigration and staging lifestage.

Spring-run Chinook Salmon (non-natal juvenile rearing)

Flow and water temperature model results were examined for the lower American River near the mouth of the lower American River (i.e., RM 1) for non-natal juvenile rearing. The net difference in water temperature index value exceedance probabilities for spring-run Chinook salmon is summarized in Table 5-42.

Table 1-19. Net Difference in Water Temperature Index Value Exceedance Probabilities for Spring-run Chinook Salmon.

Spring-run Chinook Salmon in the Lower American River																	
Lifestage	Evaluation Period	Indicator of Potential Impact	Location	Metric	Range	Net Change in Probability of Exceedance under With-Project (Alternative 2 - Forecast-informed Operations) relative to the No Action/No Project Future Condition											
			Description	Value (°F)		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Non-Natal Juvenile Rearing	November through April	Mean Daily Water Temper-ature (°F)	Mouth of the American River (RM 1)	61	All Years		0	0	0	0	-1	-4					
				65	All Years		0	0	0	0	0	-2					

Relative to the No Action/No Project future condition scenario, the Alternative 2 future condition scenario would be expected to provide:

g) Similar non-natal juvenile rearing (November through April) conditions due to: (1) over the monthly flow exceedance distributions, similar or higher flows more often during most months of the evaluation period, except during February when flows are lower; (2) over the entire flow exceedance distributions, flows are similar or higher by 10 percent or more with higher or substantially higher frequency at both locations most of the time, but are lower by 10 percent or more with higher frequency during January at the mouth and during February at both locations; (3) during low-flow conditions, flows are similar or higher by 10 percent or more with higher or substantially higher frequency at both locations most of the time, but are lower by 10 percent or more with higher frequency during February; (4) over the monthly water temperature exceedance distributions, similar water temperatures most of the time during most months of the evaluation period, but with lower water temperatures during March and April; and (5) similar or slightly lower probabilities of exceeding WTI values over the evaluation period.

Overall, in consideration of all flow and water temperature-related indicators of potential impact, habitat conditions are expected to be similar for spring-run Chinook salmon under the Alternative 2 future condition scenario relative to No Action/ No Project future condition scenario. Although flows decrease more often, water temperature index values are exceeded with similar frequency. In addition, flow reductions are not expected to substantially affect the incidental rearing of non-natal juvenile spring-run Chinook salmon in the lower American River when seeking refuge from high winter flows in the Sacramento River.

River Lamprey

Flow and water temperature model results were examined for the lower American at Watt Avenue and near the mouth of the lower American River (i.e., RM 1) (Table 5-43).

Table 1-20. Net Difference in Water Temperature Index Value Exceedance Probabilities for River Lamprey.

River Lamprey in the Lower American River

Lifestage	Evaluation Period	Indicator of Potential Impact	Location	Metric	Range	Net Change in Probability of Exceedance under With-Project (Alternative 2 - Forecast-informed Operations) relative to the No Action/No Project Future Condition											
			Description	Value		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Adult Immigration	September through June	Mean Daily Water Temperature (°F)	American River at Watt Ave	42-60[1]	All Years	0	0	0	0	0	1	2	5	1			0
			Mouth of the American River (RM 1)	42-60	All Years	0	1	0	0	0	2	3	3	1			0
Spawning and Embryo Incubation	February through July	Mean Daily Water Temperature (°F)	American River at Watt Ave	50-64	All Years					0	-2	1	6	5	1		
Ammocoete Rearing and Downstream Movement	Year-round	Mean Daily Water Temperature (°F)	American River at Watt Ave	72	All Years	0	0	0	0	0	0	0	-1	-3	-1	-2	-1
			Mouth of the American River (RM 1)	72	All Years	0	0	0	0	0	0	-1	-2	-6	-5	-7	-2

[1]Water temperature ranges are evaluated by calculating the net change in the probability of water temperatures occurring within the specified range.

Relative to the No Action/No Project future condition scenario, the Alternative 2 Forecast-Informed Operations future condition scenario would be expected to provide:

h) Similar adult immigration (September through June) conditions due to: (1) over the monthly flow exceedance distributions, similar or higher flows more often during most months of the evaluation period; (2) over the entire flow exceedance distributions, flows at both locations are higher by 10 percent or more with higher or substantially higher frequency during most months, except during February when they are lower by 10 percent or more with substantially higher frequency, and during January when flows are similar or lower by 10 percent or more with higher frequency; (3) during low-flow conditions, flows at all locations are higher by 10 percent or more with higher or substantially higher frequency during most months, except during February when they are lower by 10 percent or more with substantially higher frequency, and during January when flows are similar or lower by 10 percent or more with higher frequency; (3) during low-flow conditions, flows at all locations are higher by 10 percent or more with higher or substantially higher frequency during most months, except during February when they are lower by 10 percent or more with generally higher or substantially higher frequency, and during December when minor net changes in flow of 10 percent or more occur; (4) over the monthly water temperature exceedance distributions, similar or lower water temperatures most of the time during most months; and (5) generally similar probabilities of exceeding UO and UT WTI values at both locations, but with reduced probabilities of exceedance during March through May.

i) Slightly more suitable spawning and embryo incubation (February through July) conditions due to: (1) over the monthly flow exceedance distributions, higher flows more

often during all months of the evaluation period, except for February when flows are lower; (2) over the entire flow exceedance distributions, flows are lower by 10 percent or more with substantially higher frequency during February, and are higher by 10 percent or more with substantially higher frequency during March through July; (3) during low-flow conditions, flows are lower by 10 percent or more with higher frequency during February, and are higher by 10 percent or more with substantially higher frequency during March through July; (4) over the monthly water temperature exceedance distributions, cooler water temperatures most of the time during most months of the evaluation period, with similar temperatures during February and April; and (5) similar monthly probabilities of water temperatures occurring within the specified range during most months evaluated, but with increased probabilities of occurring within the range during May and June.

j) Slightly more suitable ammocoete rearing and downstream movement (year-round) conditions due to: (1) over the monthly flow exceedance distributions, higher flows more often during most months of the year; (2) over the entire flow exceedance distributions, flows at both locations are higher by 10 percent or more with higher or substantially higher frequency during most months of the year, except during February when they are lower by 10 percent or more with substantially higher frequency, and during January when flows are similar or lower by 10 percent or more with higher frequency; (3) during low-flow conditions, flows at both locations are higher by 10 percent or more with higher or substantially higher frequency during most months of the year, except during February when they are lower by 10 percent or more with similar or higher frequency, and during December at the mouth when minor net changes in flow of 10 percent or more occur; (4) over the monthly water temperature exceedance distributions, similar or lower water temperatures most of the time during most months of the year, but with higher temperatures during April below Nimbus Dam (primarily when water temperatures are below 52°F); and (5) generally similar probabilities of exceeding UO and UT WTI values at all locations during October through April, and reduced probabilities of exceedance during May through September at both locations.

Overall, in consideration of all flow and water temperature-related indicators of potential impact, as well as peak lifestage-specific temporal considerations, habitat conditions are expected to be more suitable for river lamprey under the Alternative 2 future condition scenario relative to the No Action/No Project future condition scenario, particularly in consideration of more suitable water temperatures during the warmest months of the rearing and downstream movement lifestage.

Pacific Lamprey

Flow and water temperature model results were examined for the lower American at Watt Avenue and near the mouth of the lower American River (i.e., RM 1) (Table 5-44).

Table 1-21. Net Difference in Water Temperature Index Value Exceedance Probabilities for Pacific Lamprey.

Pacific Lamprey in the Lower American River						
Lifestage	Evaluation Period	Indicator of	Location	Metric	Range	Net Change in Probability of Exceedance under With-Project (Alternative 2 - Forecast-informed Operations) relative to the No Action/No Project Future Condition

		Potential Impact	Description	Value		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Adult Immigration	January through June	Mean Daily Water Temperature (°F)	American River at Watt Ave	42-60[1]	All Years				0	0	1	2	5	1			
			Mouth of the American River (RM 1)	42-60	All Years				0	0	2	3	3	1			
Spawning and Embryo Incubation	January through August	Mean Daily Water Temperature (°F)	American River at Watt Ave	50-64	All Years				0	0	-2	1	6	5	1	4	
Ammocoete Rearing and Downstream Movement	Year-round	Mean Daily Water Temperature (°F)	American River at Watt Ave	72	All Years	0	0	0	0	0	0	0	-1	-3	-1	-2	-1
			Mouth of the American River (RM 1)	72	All Years	0	0	0	0	0	0	-1	-2	-6	-5	-7	-2

[1]Water temperature ranges are evaluated by calculating the net change in the probability of water temperatures occurring within the specified range.

Relative to the No Action/No Project future condition scenario, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide:

k) Similar adult immigration (January through June) conditions due to: (1) over the monthly flow exceedance distributions, higher flows more often during most months, but with generally similar flows during January and lower flows during February; (2) over the entire flow exceedance distributions, flows at both locations are higher by 10 percent or more with substantially higher frequency during most months of the evaluation period, except during February when they are lower by 10 percent or more with substantially higher frequency, and during January when flows are similar or lower by 10 percent or more with higher frequency; (3) during low-flow conditions, flows at both locations are higher by 10 percent or more with higher or substantially higher frequency during most months of the evaluation period, except during February when they are similar or lower by 10 percent or more with higher frequency; (4) over the monthly water temperature exceedance distributions, lower water temperatures most of the time during most months of the evaluation period, except for February when temperatures are similar; and (5) generally similar probabilities of exceeding UO and UT WTI values at both locations during most months, and reduced probabilities of exceedance during April and May at both locations.

l) Slightly more suitable spawning and embryo incubation (March through August) conditions due to: (1) over the monthly flow exceedance distributions, higher flows more often during most months of the evaluation period; (2) over the entire flow exceedance distributions, flows are higher by 10 percent or more with generally substantially higher frequency during the evaluation period; (3) during low-flow conditions, flows are higher by 10 percent or more with substantially higher frequency during all months of the evaluation period; (4) over the monthly water temperature exceedance distributions,

lower water temperatures most of the time during most months of the evaluation period; and (5) similar monthly probabilities of water temperatures occurring within the specified range during all months evaluated, but with increased probabilities of occurring within the range during May, June, and August.

m) Slightly more suitable ammocoete rearing and downstream movement (year-round) conditions due to: (1) over the monthly flow exceedance distributions, higher flows more often during most months of the year; (2) over the entire flow exceedance distributions, flows at both locations are higher by 10 percent or more with higher or substantially higher frequency during most months of the year, except during February when they are lower by 10 percent or more with substantially higher frequency, and during January when flows are similar or lower by 10 percent or more with higher frequency; (3) during low-flow conditions, flows at both locations are higher by 10 percent or more with higher or substantially higher frequency during most months of the year, except during February when they are lower by 10 percent or more with similar or higher frequency, and during December at the mouth when minor net changes in flow of 10 percent or more occur; (4) over the monthly water temperature exceedance distributions, similar or lower water temperatures most of the time during most months of the year; and (5) generally similar probabilities of exceeding UO and UT WTI values at all locations during October through April, and reduced probabilities of exceedance during May through September at both locations.

Overall, in consideration of all flow and water temperature–related impact indicators, habitat conditions are expected to be more suitable for Pacific lamprey under the Alternative 2 future condition relative to the No Action/No Project future condition, particularly in consideration of more suitable water temperatures during the warmest months of the rearing and downstream movement lifestage.

Hardhead

Flow and water temperature model results were examined for the lower American at Watt Avenue (Table 5-45).

Table 1-22. Net Difference in Water Temperature Index Value Exceedance Probabilities for Hardhead.

Hardhead in the Lower American River																		
Life-stage	Evaluation Period	Indicator of Potential Impact	Location	Metric	Range	Net Change in Probability of Exceedance under With-Project (Alternative 2 - Forecast-informed Operations) relative to the No Action/No Project Future Condition												
			Description	Value		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Adult and Other Life-stages	Year-round	Mean Daily Water Temper-ature (°F)	American River at Watt Ave	61-77[1]	All Years	2	-1	0	0	0	0	-2	-7	-2	1	2	1

Spawn-ing	April through June	Mean Daily Water Temper-ature (°F)	American River at Watt Ave	59-64	All Years							-1	3	4			
[1]Water temperature ranges are evaluated by calculating the net change in the probability of water temperatures occurring within the specified range.																	

Relative to the No Action/No Project future scenario, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide:

n) Similar adult and other lifestage (year-round) conditions due to: (1) over the monthly flow exceedance distributions, higher flows more often during most months of the year; (2) over the entire flow exceedance distributions, flows are higher by 10 percent or more with higher or substantially higher frequency during most months of the year, except during February when they are lower by 10 percent or more with substantially higher frequency, and during January when minor net changes in flows of 10 percent or more occur; (3) during low-flow conditions, flows are higher by 10 percent or more with higher or substantially higher frequency during most months of the year, except during February when they are lower by 10 percent or more with higher frequency, and during December when minor net changes in flow of 10 percent or more occur; (4) over the monthly water temperature exceedance distributions, similar or lower water temperatures most of the time during most months of the year; and (5) similar probabilities of water temperatures occurring within the specified range during most months of the year, but with slightly increased probabilities during October and August, and decreased probabilities during April through June (due to reductions in water temperatures).

o) More suitable spawning (April through June) conditions due to: (1) over the monthly flow exceedance distributions, higher flows more often during April through June; (2) over the entire flow exceedance distributions, flows are higher by 10 percent or more with substantially higher frequency during April through June; (3) during low-flow conditions, flows are higher by 10 percent or more with substantially higher frequency during April through June; (4) over the monthly water temperature exceedance distributions, similar or lower temperatures during April through June; and (5) similar or slightly increased monthly probabilities of water temperatures occurring within the specified range during April through June.

Overall, in consideration of all flow and water temperature-related indicators of potential impact, habitat conditions are expected to be similar or more suitable for hardhead under the Alternative 2 future condition scenario relative to the No Action/No Project scenario, primarily due to increased flows and decreased water temperatures.

Recreational Fisheries (American Shad and Striped Bass)

Flow and water temperature model results were examined for the lower American at Watt Avenue. In addition, flows near the mouth of the lower American River (i.e., RM 1) were evaluated for adult attraction into the lower American River.

Relative to the No Action/No Project Future Condition, the Alternative 2 Forecast-informed future condition scenario would be expected to provide the following:

American shad - similar adult attraction, more suitable adult immigration and spawning, and similar juvenile rearing and downstream movement conditions;

Striped bass – more suitable adult attraction, more suitable immigration and spawning, and similar juvenile rearing conditions.

Overall, in consideration of all flow and water temperature-related indicators of potential impact, habitat conditions are expected to be similar for American shad and striped bass under the Alternative 2 future condition scenario relative to the No Action/No Project future condition scenario.

Sacramento River

The species and lifestage-specific interpretive comparisons below are based on numerous output provided in the appendices, including: (1) long-term average and average by water year type riverine flows on a monthly basis; (2) monthly riverine flow exceedance distributions; (3) monthly water temperature exceedance distributions in relation to specific water temperature index values; (4) long-term average and average by water year type annual spawning habitat availability for anadromous salmonids; (5) annual spawning habitat availability exceedance distributions for anadromous salmonids; (6) long-term average and average by water year type monthly Delta outflow, Old and Middle River flow, and Delta exports; (7) monthly exceedance distributions for Delta outflow, Old and Middle River flow, and Delta exports; (8) long-term average and average by water year type monthly X2 location; and (9) monthly X2 location exceedance distributions.

For salmonid species, flow and water temperature model results were generated for the Sacramento River below Keswick Dam, at Ball's Ferry, at Jelly's Ferry, at Bend Bridge, at Red Bluff, at Verona, below the Feather River confluence, and at Freeport. In addition to flow and water temperature modeling, spawning habitat availability (weighted usable area, or WUA) for salmonid species was also analyzed. Modeling results for other fish species are described separately.

<u>Winter-run Chinook Salmon</u>

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide:

a) Similar adult immigration (November through July) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, generally

equivalent or similar net changes in flow of 10 percent or more during all months at all locations evaluated, except during January when flows are lower by 10 percent or more with slightly higher frequency (3 percent) at Verona and Freeport; and (4) generally equivalent monthly probabilities of exceeding both UO and UT WTI values at all locations evaluated, but with a slightly lower exceedance probability during May at Freeport (1.3 percent).

b) Similar adult holding (November through July) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 1.5 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, generally equivalent net changes in flow of 10 percent or more during all months at both locations evaluated; and (4) generally equivalent monthly probabilities of exceeding both UT and UO WTI values at both locations.

c) Similar spawning (April through August) and embryo incubation (April through September) conditions due to: (1) generally equivalent long-term average monthly flows during the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with some slight increases (up to 1.5 percent) and decreases (up to 1.4 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) equivalent or similar net changes in flow of 10 percent or more during all months at both locations; (4) generally equivalent long-term average spawning WUA and by water year type; (5) over the annual spawning WUA exceedance distribution, generally equivalent or similar spawning WUA over most of the distribution; and (6) equivalent or similar probabilities of exceeding both UO and UT WTI values most of the time at all locations, with slightly increased exceedance probabilities (up to 2.4 percent) and some slightly reduced exceedance probabilities (up to 2.4 percent).

d) Similar spawning (April through August) and embryo incubation (Aril through September) conditions due to: (1) generally equivalent long-term average monthly flows during the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with some slight increases (up to 1.5 percent) and decreases (up to 1.4 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) equivalent or similar net changes in flow of 10 percent or more during all months at both locations; (4) generally equivalent long-term average spawning WUA and by water year type; (5) over the annual spawning WUA exceedance distribution, generally equivalent or similar spawning WUA over most of the distribution; and (6) equivalent or similar probabilities of exceeding both UO and UT WTI values most of the time at all locations, with slightly increased exceedance probabilities (up to 2.4 percent) and some slightly reduced exceedance probabilities (up to 2.4 percent).

In consideration of the general similarity of impact indicators to all lifestages of winter-run Chinook salmon in the Sacramento River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Spring-run Chinook Salmon

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide:

a) Similar adult immigration (March through September) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, generally equivalent net changes in flow of 10 percent or more during all months at all locations evaluated; and (4) generally equivalent or similar monthly probabilities of exceeding both UO and UT WTI values at all locations evaluated.

b) Similar adult holding (March through September) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 1.5 percent) and decreases (up to 1.4 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, generally equivalent net changes in flow of 10 percent or more during all months at both locations evaluated; and (4) generally equivalent or similar monthly probabilities of exceeding both UT and UO WTI values at both locations evaluated, but with a slightly lower probability of exceedance during August below Keswick Dam (1.3 percent).

c) Similar adult holding (March through September) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 1.5 percent) and decreases (up to 1.4 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, generally equivalent net changes in flow of 10 percent or more during all months at both locations evaluated; and (4) generally equivalent or similar monthly probabilities of exceeding both UT and UO WTI values at both locations evaluated, but with a slightly lower probability of exceedance during August below Keswick Dam (1.3 percent).

d) Similar juvenile rearing and downstream movement (year-round) conditions due to: (1) generally equivalent long-term average monthly flows during the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with some slight increases (up to 1.6 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions during the evaluation period; (3) equivalent net changes in

flow of 10 percent or more during all months at all locations evaluated, except during January when flows are lower by 10 percent or more with slightly higher frequency (3 percent) at Verona; and (4) equivalent or similar probabilities of exceeding both UO and UT WTI values most of the time at all locations, but with slightly reduced exceedance probabilities during August and September below Keswick Dam and at Verona, respectively (1.3 percent).

e) Generally equivalent smolt emigration (October through May) conditions due to: (1) generally equivalent long-term average monthly flows over the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent flows most of the time over the monthly flow exceedance distributions during the evaluation period; (3) during low-flow conditions, equivalent or similar net changes in flow of 10 percent or more during all months at all locations evaluated, except during January when flows are lower by 10 percent or more with slightly higher frequency (3 percent) at Verona and Freeport; and (4) generally equivalent or similar probabilities of exceeding UO and UT WTI values at all locations evaluated during all months of the evaluation period, but with slightly reduced exceedance probabilities during May and October at Freeport (1.6 percent and 1.3 percent, respectively).

In consideration of the general similarity of impact indicators to all lifestages of spring-run Chinook salmon in the Sacramento River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Fall-run Chinook Salmon

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide:

a) Similar adult immigration and staging (July through December) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 1.5 percent) and decreases (up to 1.4 percent) in average monthly flow; (2) generally equivalent or similar flows over the monthly flow exceedance distributions; (3) during low-flow conditions, generally equivalent or similar net changes in flow of 10 percent or more during all months at all locations evaluated; and (4) generally equivalent or similar monthly probabilities of exceeding both UO and UT WTI values at all locations evaluated, except for a slight decrease (1.3 percent) in exceedance probability during August at Red Bluff.

b) Similar spawning (October through December) and embryo incubation (October through March) conditions due to: (1) generally equivalent long-term average monthly flows during the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with some slight increases (up to 1.5 percent) and some slight decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent flows over the monthly flow exceedance distributions; (3) equivalent net changes in flow of 10 percent or more during all months at both locations; (4) generally equivalent long-

term average spawning WUA and spawning WUA by water year type; (5) over the annual spawning WUA exceedance distribution, generally equivalent or similar spawning WUA over the entire distribution; and (6) equivalent or similar probabilities of exceeding both UO and UT WTI values most of the time at all locations, but with slightly reduced exceedance probabilities at Ball's Ferry and Bend Bridge during October (1.6 percent and 1.3 percent, respectively).

c) Similar juvenile rearing and downstream movement (December through July) conditions due to: (1) generally equivalent long-term average monthly flows over the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent or similar net changes in flow of 10 percent or more most of the time at all locations, except during January when flows are lower by 10 percent or more with slightly higher frequency (3 percent) at Verona and Freeport; and (4) generally equivalent or similar probabilities of exceeding UO and UT WTI values during all months at all locations, but with slightly reduced exceedance probabilities at Freeport during April (3.7 percent).

In consideration of the general similarity of impact indicators to all lifestages of fall-run Chinook salmon in the Sacramento River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Late-fall Run Chinook Salmon

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide:

a) Similar adult immigration and staging (October through April) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, generally equivalent net changes in flow of 10 percent or more during all months at all locations evaluated, except during January when flows are lower by 10 percent or more with slightly higher frequency (3 percent) at Verona and Freeport; and (4) generally equivalent or similar monthly probabilities of exceeding both UO and UT WTI values at all locations evaluated.

b) Similar spawning (January through April) and embryo incubation (January through June) conditions due to: (1) generally equivalent long-term average monthly flows during the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with a slight increase of 1.5 percent and decrease 1.6 percent in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) equivalent net changes in flow of 10 percent or more during all months at both locations; (4) generally equivalent long-term average spawning WUA and spawning WUA by water year type; (5) over the annual spawning

WUA exceedance distribution, generally equivalent spawning WUA over the entire distribution; and (6) equivalent or similar probabilities of exceeding both UO and UT WTI values at all locations.

c) Similar juvenile rearing and downstream movement (April through December) conditions due to: (1) generally equivalent long-term average monthly flows over the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with some slight increases (up to 2.0 percent) and decreases (up to 1.4 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent or similar net changes in flow of 10 percent or more most of the time at all locations evaluated; and (4) generally equivalent or similar probabilities of exceeding UO and UT WTI values during all months at all locations, but with slightly reduced exceedance probabilities below Keswick Dam during August (1.3 percent) and at Freeport during April (3.7 percent).

In consideration of the general similarity of impact indicators to all lifestages of late fall-run Chinook salmon in the Sacramento River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Steelhead

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide:

a) Similar adult immigration (August through March) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated, except during January when flows are lower by 10 percent or more with slightly higher frequency (3 percent) at Verona and Freeport; and (4) generally equivalent or similar monthly probabilities of exceeding both UO and UT WTI values at all locations evaluated, except for a slight (1.3 percent) decrease in exceedance probability during August at Red Bluff.

b) Similar adult holding (August through March) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 1.5 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, generally equivalent or similar net changes in flow of 10 percent or more during all months at both locations evaluated; and (4) generally equivalent or similar monthly probabilities of exceeding both UT and UO WTI values at both locations evaluated, but with slightly reduced exceedance probabilities below Keswick Dam during August (1.3 percent).

c) Similar spawning (December through April) and embryo incubation (December through May) conditions due to: (1) generally equivalent long-term average monthly flows during the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with some slight increases of (up to1.5 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) equivalent net changes in flow of 10 percent or more during both months at both locations; (4) generally equivalent long-term average spawning WUA and spawning WUA by water year type; (5) over the annual spawning WUA exceedance distribution, generally equivalent spawning WUA over the entire distribution; and (6) equivalent or similar probabilities of exceeding both UO and UT WTI values most of the time at all locations.

d) Similar juvenile rearing and downstream movement (year-round) conditions due to: (1) generally equivalent long-term average monthly flows over the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with some slight increases (up to 1.6 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent or similar net changes in flow of 10 percent or more most of the time at all locations, except during January when flows are lower by 10 percent or more with slightly higher frequency (3 percent) at Verona; and (4) generally equivalent or similar probabilities of exceeding UO and UT WTI values during all months at all locations, but with slightly reduced exceedance probabilities below Keswick Dam and at Bend Bridge during August (1.3 percent) and at Verona (1.3 percent) during September.

e) Similar juvenile rearing and downstream movement (year-round) conditions due to: (1) generally equivalent long-term average monthly flows over the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with some slight increases (up to 1.6 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent or similar net changes in flow of 10 percent or more most of the time at all locations, except during January when flows are lower by 10 percent or more with slightly higher frequency (3 percent) at Verona; and (4) generally equivalent or similar probabilities of exceeding UO and UT WTI values during all months at all locations, but with slightly reduced exceedance probabilities below Keswick Dam and at Bend Bridge during August (1.3 percent) and at Verona (1.3 percent) during September.

In consideration of the general similarity of impact indicators to all lifestages of steelhead in the Sacramento River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Green Sturgeon

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide:

a) Similar adult immigration and holding (February through July) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated; and (4) generally equivalent or similar monthly probabilities of exceeding the specified WTI value at all locations evaluated, but with a slightly decreased probability (3.7 percent) of exceedance during April at Freeport.

b) Similar spawning and embryo incubation (March through August) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated; and (4) generally equivalent or similar monthly probabilities of exceeding the specified WTI value at all locations evaluated.

c) Similar adult post-spawning holding and emigration (July through November) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 1.5 percent) and decreases (up to 1.4 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated, except for a slight (3.0 percent) increase in exceedance probability at Freeport during August; and (4) generally equivalent or similar monthly probabilities of exceeding the specified WTI value at all locations evaluated, but with slightly reduced exceedance probabilities at Red Bluff during August and September (1.4 percent and 2.8 percent, respectively).

d) Similar juvenile rearing and downstream movement (year-round) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated, except for a slight (3 percent) decrease in exceedance probability in January at Freeport; and (4) generally equivalent or similar monthly probabilities of exceeding the specified WTI value at all locations evaluated.

In consideration of the general similarity of impact indicators to all lifestages of green sturgeon in the Sacramento River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

River Lamprey

Flow model results were examined for the Sacramento River below Keswick Dam, at Red Bluff, at Wilkins Slough, and at Freeport and water temperature model results were examined for the Sacramento River below Keswick Dam, at Red Bluff, and at Freeport.

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide:

a) Similar adult immigration (September through June) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent or similar net changes in flow of 10 percent or more during all months at all locations evaluated, except during January when flows are lower by 10 percent or more with slightly higher frequency (3 percent) at Freeport; and (4) generally equivalent or similar monthly probabilities of water temperatures occurring within the specified range at all locations evaluated, but with some slightly increased probability of temperatures occurring within the specified range at Freeport during October and April (2.4 percent and 1.9 percent, respectively), as well as a slight decrease in probability of temperatures occurring within the specified range below Keswick Dam during October (1.3 percent).

b) Similar spawning and embryo incubation (February through July) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 1.5 percent) and decreases (up to 1.8 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated; and (4) generally equivalent or similar monthly probabilities of water temperatures occurring within the specified ranges at all locations evaluated.

c) Similar ammocoete rearing and downstream movement (year-round) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated, except during August when flows are higher by 10 percent or more with slightly higher frequency (3 percent) at Freeport; and (4) generally equivalent or similar monthly probabilities of exceeding both UO and UT WTI values at all locations evaluated.

In consideration of the general similarity of impact indicators to all lifestages of river lamprey in the Sacramento River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Pacific Lamprey

Flow model results were examined for the Sacramento River below Keswick Dam, at Red Bluff, at Wilkins Slough, and at Freeport and water temperature model results were examined for the Sacramento River below Keswick Dam, at Red Bluff, at Wilkins Slough and at Freeport.

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide:

a) Similar adult immigration (January through June) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.8 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated, except during January when flows are lower by 10 percent or more with slightly higher frequency (3 percent) at Freeport; and (4) generally equivalent monthly probabilities of water temperatures occurring within the specified range at all locations evaluated, except a slight increase (1.9 percent) in probability of temperatures occurring within the specified range during April at Freeport.
b) Similar spawning and embryo incubation (March through August) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 1.5 percent) and decreases (up to 1.8 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated; and (4) generally equivalent or similar monthly probabilities of water temperatures occurring within the specified range at all locations evaluated, but with slightly increased exceedance probabilities below Keswick Dam during August (2.1 percent).
c) Similar ammocoete rearing and downstream movement (year-round) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.8 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated, except during January when flows are lower by 10 percent or more with

slightly higher frequency (3 percent) at Freeport; and (4) generally equivalent or similar monthly probabilities of exceeding both UO and UT WTI values at all locations evaluated.

In consideration of the general similarity of impact indicators to all lifestages of Pacific lamprey in the Sacramento River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Hardhead

Flow model results were examined for the Sacramento River below Keswick Dam, at Wilkins Slough, and at Freeport and water temperature model results were examined for the Sacramento River below Keswick Dam, at Wilkins Slough, below the Feather River Confluence and at Freeport.

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide:

a) Similar adult and other lifestage (year-round) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.1 percent) and decreases (up to 1.6 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated, except during January when flows are lower by 10 percent or more with somewhat higher frequency (3 percent) at Verona and Freeport; and (4) generally equivalent monthly probabilities of water temperatures occurring within the specified range at all locations evaluated, except for a slightly (3.7 percent) decreased probability of temperatures occurring within the specified range during April at Freeport.

b) Similar spawning (April through June) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 2.0 percent) and decreases (up to 1.8 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated; and (4) generally equivalent or similar monthly probabilities of water temperatures occurring within the specified range at all locations evaluated.

In consideration of the general similarity of impact indicators to all lifestages of hardhead in the Sacramento River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Recreational Fisheries (Striped Bass, American Shad and White Sturgeon)

Flow model results were examined for the Sacramento River below Keswick Dam, at Bend Bridge, at Red Bluff, at Verona, and at Freeport and water temperature model results were

examined for the Sacramento River below Keswick Dam, at Ball's Ferry, at Jelly's Ferry, at Bend Bridge, below the Feather River confluence, and at Freeport.

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide the following:

> Striped bass and American shad – similar adult immigration and spawning, and similar juvenile rearing and downstream movement conditions; and
>
> White sturgeon – similar adult immigration and holding, similar spawning and embryo incubation, and similar juvenile rearing and down stream movement conditions.

In consideration of the general similarity of impact indicators to all lifestages of striped bass, American shad and white sturgeon in the Sacramento River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Feather River

Flow and water temperature model results for the Feather River below the Fish Barrier Dam, below the Thermalito Afterbay Outlet, and at the mouth of the Feather River were analyzed. In addition to flow and water temperature modeling, model results for spawning habitat availability (WUA) for salmonid species were also examined.

Flows in the Low Flow Channel below the Fish Barrier Dam were modeled consistent with the terms of the California Department of Water Resources' agreement with the California Department of Fish and Wildlife. Modeled results for long-term average flows, average flows by water year type, and flow exceedance probabilities during all years and during low-flow conditions were equivalent for the Folsom WCM alternatives relative to the Existing Condition and No Action future condition scenarios. Although these results are not repeated for the discussions below, model results for the Low Flow Channel below the Fish Barrier Dam along with the information presented below were also considered and incorporated into the impact determinations for spring-run Chinook salmon, fall-run Chinook salmon, steelhead, river lamprey, Pacific lamprey, and hardhead.

<u>Spring-run Chinook Salmon</u>

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition would be expected to provide:

a) Similar adult immigration (March through September) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows by water year type most of the time during all water year types, but with some slight increases (up to 3.7 percent) and some slight decreases (up to 2.4 percent) in average monthly flow as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito

Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, generally equivalent net changes in flow of 10 percent or more most of the time, except during July when flows are higher by 10 percent or more with slightly higher frequency at the mouth (3 percent) and during September when flows are lower by 10 percent or more with substantially higher frequency below the Thermalito Afterbay Outlet and at the mouth (12.1 percent and 9.1 percent, respectively); and (4) generally equivalent or similar monthly probabilities of exceeding both UO and UT WTI values.

b) Similar adult holding (March through September) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows by water year type most of the time during all water year types, but with a slight increase of 1.9 percent and a slight decrease of 2.4 percent in average monthly flow as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, generally equivalent net changes in flow of 10 percent or more most of the time, except during September when flows are lower by 10 percent or more with a substantially higher frequency (12.1 percent) below the Thermalito Afterbay Outlet; and (4) generally equivalent or similar monthly probabilities of exceeding both UO and UT WTI values.

c) Similar spawning (September through October) and embryo incubation (September through February) conditions due to: (1) generally equivalent long-term average monthly flows during the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with a slight increase of 1.4 percent and some slight decreases (up to 2.4 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) lower flows by 10 percent or more with slightly higher frequency (about 3.7 percent) during September below the Thermalito Afterbay Outlet, and higher flows by 10 percent or more with slightly higher frequency (about 1.2 percent) during October below the Thermalito Afterbay Outlet; (4) generally equivalent long-term average spawning WUA, and equivalent or similar average spawning WUA by water year type; (5) over the annual spawning WUA exceedance distribution, generally similar spawning WUA over the entire distribution, with spawning WUA always above 80 percent of maximum; and (6) equivalent or similar probabilities of exceeding both UO and UT WTI values.

d) Similar juvenile rearing and downstream movement (year-round) conditions due to: (1) generally equivalent long-term average monthly flows over the evaluation period and generally equivalent or similar average monthly flows by water year type most of the time, but with some slight increases (up to 3.7 percent) and decreases (up to 2.4 percent) in average monthly flow as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent or similar net changes in flow of 10 percent or more most of the time, except during July when flows are higher by 10 percent or more with slightly higher frequency at the mouth (3 percent) and during September when flows are lower by 10 percent or more with substantially higher

frequency below the Thermalito Afterbay Outlet and at the mouth (12.1 percent and 9.1 percent, respectively); and (4) generally equivalent or similar probabilities of exceeding UO and UT WTI values at all locations evaluated.

e) Similar smolt emigration (October through June) conditions due to: (1) generally equivalent long-term average monthly flows over the evaluation period and generally equivalent or similar average monthly flows by water year type most of the time, but with some slight increases (up to 3.7 percent) and slight decreases (up to 1.4 percent) in average monthly flow as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent or similar net changes in flow of 10 percent or more most of the time; and (4) generally equivalent or similar probabilities of exceeding UO and UT WTI values during all months of the evaluation period.

In consideration of the general similarity of impact indicators to all lifestages of spring-run Chinook salmon in the Feather River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Fall-run Chinook Salmon

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition would be expected to provide:

a) Generally similar adult immigration and staging (July through December) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows by water year type most of the time, but with some slight increases (up to 1.9 percent) and decreases (up to 2.4 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, generally equivalent net changes in flow of 10 percent or more most of the time, except during July at the mouth when flows are higher by 10 percent or more with slightly higher frequency (3.0 percent) and during September below the Thermalito Afterbay Outlet and at the mouth when flows are lower by 10 percent or more with substantially higher frequency (12.1 percent and 9.1 percent, respectively); and (4) equivalent monthly probabilities of exceeding both UO and UT WTI values at all locations evaluated.

b) Similar spawning (October through December) and embryo incubation (October through March) conditions due to: (1) generally equivalent long-term average monthly flows during the evaluation period and generally equivalent or similar average monthly flows during all water year types, but with some increases (up to 1.4 percent) and some decreases (up to 1.4 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) similar net changes in flow of 10 percent or more, except during October below the Thermalito Afterbay Outlet when flows are higher by 10 percent or more with slightly higher frequency (1.2 percent) and during December below the Thermalito Afterbay Outlet when flows are lower by 10 percent or more with slightly higher frequency (1.2 percent); (4) generally equivalent long-term average spawning WUA and average spawning WUA

by water year type; (5) over the annual spawning WUA exceedance distribution, generally equivalent or similar spawning WUA over the entire distribution, with spawning WUA always above 80 percent of maximum under both scenarios; and (6) equivalent or similar probabilities of exceeding both UO and UT WTI values.

c) Similar juvenile rearing and downstream movement (November through June) conditions due to: (1) generally equivalent long-term average monthly flows over the evaluation period and generally equivalent or similar average monthly flows by water year type most of the time, but with some increases (up to 3.7 percent) and some decreases (up to 1.4 percent) in average monthly flow as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent or similar net changes in flow of 10 percent or more; and (4) generally equivalent probabilities of exceeding UO and UT WTI values.

In consideration of the general similarity of impact indicators to all lifestages of fall-run Chinook salmon in the Feather River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Steelhead

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition would be expected to provide:

a) Generally similar adult immigration (August through March) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows by water year type most of the time, but with some slight increases (up to 1.9 percent) and decreases (up to 2.4 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, generally equivalent net changes in flow of 10 percent or more most of the time, except during September below the Thermalito Afterbay Outlet and at the mouth when flows are lower by 10 percent or more with substantially higher frequency (12.1 percent and 9.1 percent, respectively); and (4) generally equivalent or similar monthly probabilities of exceeding both UO and UT WTI values.

b) Similar adult holding (August through March) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows by water year type most of the time, but with some slight increases (up to 1.9 percent) and decreases (up to 2.4 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, generally equivalent net changes in flow of 10 percent or more most of the time, except during September below the Thermalito Afterbay Outlet and at the mouth when flows are lower by 10 percent or more with substantially higher frequency (12.1 percent and 9.1 percent, respectively); and (4) generally equivalent or similar monthly probabilities of exceeding both UO and UT WTI values.

c) Similar spawning (January through April) and embryo incubation (January through May) conditions due to: (1) generally equivalent long-term average monthly flows during the evaluation period and generally equivalent or similar average monthly flows during all water year types, except for a slight reduction (1.4 percent) during above-normal water years as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) similar long-term average spawning WUA and average spawning WUA by water year type; (4) over the annual spawning WUA exceedance distribution, similar amounts of spawning WUA over the entire distribution; and (5) equivalent or similar probabilities of exceeding both UO and UT WTI values.

d) Similar juvenile rearing and downstream movement (year-round) conditions due to: (1) generally equivalent long-term average monthly flows over the evaluation period and generally equivalent or similar average monthly flows by water year type most of the time, but with some slight increases (up to 1.9 percent) and decreases (up to 2.4 percent) in average monthly flow as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent or similar net changes in flow of 10 percent or more most of the time, except during September when flows are lower by 10 percent or more with substantially higher frequency (12.1 percent) below the Thermalito Afterbay Outlet; and (4) generally equivalent or similar probabilities of exceeding UO and UT WTI values.

e) Similar smolt emigration (October through April) conditions due to: (1) generally equivalent long-term average monthly flows over the evaluation period and generally equivalent or similar average monthly flows by water year type most of the time, but with some slight increases (up to 1.4 percent) and some slight decreases (up to 1.4 percent); (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent or similar net changes in flow of 10 percent or more; and (4) generally equivalent or similar probabilities of exceeding UO and UT WTI values, but with a slightly decreased exceedance probability below the Thermalito Afterbay Outlet during November (1.3 percent).

In consideration of the general similarity of impact indicators to all lifestages of steelhead in the Feather River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Green Sturgeon

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition would be expected to provide:

a) Similar adult immigration and holding (February through November) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water

year types, but with some slight increases (up to 3.7 percent) and decreases (up to 2.4 percent) in average monthly flow as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more most of the time, except during July at the mouth when flows are higher by 10 percent or more with slightly higher frequency (3.0 percent) and during September below the Thermalito Afterbay Outlet and at the mouth when flows are lower by 10 percent or more with substantially higher frequency (12.1 percent and 9.1 percent, respectively); and (4) generally equivalent or similar monthly probabilities of exceeding both the specified WTI values.

b) Similar spawning and embryo incubation (March through August) conditions due to: (1) generally equivalent long-term average monthly flows and generally equivalent or similar average monthly flows most of the time during all water year types, but with a slight increase of 1.9 percent in average monthly flow during August of dry water years as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months evaluated; and (4) generally equivalent or similar monthly probabilities of exceeding the specified WTI value.

c) Similar juvenile rearing and downstream movement year-round) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 3.7 percent) and some decreases (up to 2.4 percent) in average monthly flow as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more most of the time, except during July at the mouth when flows are higher by 10 percent or more with slightly higher frequency (3.0 percent) and during September below the Thermalito Afterbay Outlet and at the mouth when flows are lower by 10 percent or more with substantially higher frequency (12.1 percent and 9.1 percent, respectively); and (4) generally equivalent or similar monthly probabilities of exceeding the specified WTI value, but with a slight reduction in exceedance during August below the Thermalito Afterbay Outlet (1.3 percent).

In consideration of the general similarity of impact indicators to all lifestages of green sturgeon in the Feather River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

River Lamprey

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition would be expected to provide:

a) Similar adult immigration (September through June) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 3.7 percent) and some decreases (up to 2.4 percent) in average monthly flow as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more most of the time, except during September below the Thermalito Afterbay Outlet and at the mouth when flows are lower by 10 percent or more with substantially higher frequency (12.1 percent and 9.1 percent, respectively); and (4) generally equivalent or similar monthly probabilities of water temperatures occurring within the specified range.

b) Similar spawning and embryo incubation (February through July) conditions due to: (1) generally equivalent long-term average monthly flows and generally equivalent or similar average monthly flows most of the time during all water year types, except for a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated; and (4) generally equivalent or similar monthly probabilities of water temperatures occurring within the specified range.

c) Similar ammocoete rearing and downstream movement (year-round) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 3.7 percent) and some decreases (up to 2.4 percent) in average monthly flow as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during most months at both locations evaluated, except during July at the mouth when flows are higher by 10 percent or more with slightly higher frequency, and during September below the Thermalito Afterbay Outlet and at the mouth when flows are lower by 10 percent or more with substantially higher frequency (12.1 percent and 9.1 percent, respectively); and (4) generally equivalent monthly probabilities of exceeding the specified WTI value at both locations evaluated.

In consideration of the general similarity of impact indicators to all lifestages of river lamprey in the Feather River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Pacific Lamprey

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition would be expected to provide:

a) Similar adult immigration (January through June) conditions due to: (1) generally equivalent long-term average monthly flows at all locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with a slight decrease of 1.4 percent in average monthly flow during January of above-normal water years below the Thermalito Afterbay Outlet and a slight increase of 3.7 percent during May of below-normal water years at the mouth as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more most of the time; and (4) generally equivalent or similar monthly probabilities of water temperatures occurring within the specified range.

b) Similar spawning and embryo incubation (March through August) conditions due to: (1) generally equivalent long-term average monthly flows and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 3.7 percent) in average monthly flow; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during all months at all locations evaluated; and (4) generally equivalent monthly probabilities of water temperatures occurring within the specified range.

c) Similar ammocoete rearing and downstream movement (year-round) conditions due to: (1) generally equivalent long-term average monthly flows at both locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 3.7 percent) and decreases (up to 2.4 percent) in average monthly flow as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during most months at both locations evaluated, except during July at the mouth when flows are higher by 10 percent or more with slightly higher frequency (3.0 percent), and during September below the Thermalito Afterbay Outlet and at the mouth when flows are lower by 10 percent or more with higher frequency (12.1 percent and 9.1 percent, respectively); and (4) generally equivalent monthly probabilities of exceeding the specified WTI value at both locations evaluated.

In consideration of the general similarity of impact indicators to all lifestages of pacific lamprey in the Feather River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Hardhead

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition would be expected to provide:

a) Similar adult and other lifestage (year-round) conditions due to: (1) generally equivalent long-term average monthly flows at both locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, but with some slight increases (up to 3.7 percent) and decreases (up to 2.4 percent) in average monthly flow as well as a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more during most months at both locations evaluated, except during July at the mouth when flows are higher by 10 percent or more with slightly higher frequency (3.0 percent), and during September below the Thermalito Afterbay Outlet and at the mouth when flows are lower by 10 percent or more with substantially higher frequency (12.1 percent and 9.1 percent, respectively); and (4) generally equivalent monthly probabilities of exceeding the specified WTI value at both locations evaluated.

b) Similar spawning (April through June) conditions due to: (1) generally equivalent long-term average monthly flows at both locations evaluated and generally equivalent or similar average monthly flows most of the time during all water year types, except for a substantial increase in flow (16.0 percent) during May of below-normal water years below the Thermalito Afterbay Outlet; (2) generally equivalent or similar flows most of the time over the monthly flow exceedance distributions; (3) during low-flow conditions, equivalent net changes in flow of 10 percent or more; and (4) generally equivalent or similar monthly probabilities of water temperatures occurring within the specified range.

In consideration of the general similarity of impact indicators to all lifestages of hardhead in the Feather River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

<u>Recreational Fisheries (Striped Bass, American Shad and White Sturgeon)</u>
Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide the following:

Striped bass and American shad – generally similar adult immigration and spawning, and generally similar juvenile rearing and downstream movement conditions; and

White sturgeon – similar adult immigration and holding, similar spawning and embryo incubation, and similar juvenile rearing and downstream movement conditions.

In consideration of the general similarity of impact indicators to all lifestages of striped bass, American shad and white sturgeon in the Feather River under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Sacramento-San Joaquin Delta and Yolo Bypass

Model results for Old and Middle River (OMR) flows and X2 location for Delta smelt and longfin smelt were examined. Delta outflow and water temperatures in the Sacramento River at Freeport for Delta smelt were also analyzed.

Additionally, model results for Sacramento River flows at Rio Vista, Yolo Bypass outflow, Delta outflow, and OMR flows for all runs of Central Valley Chinook salmon and Central Valley steelhead were examined. OMR flows for adult San Joaquin River fall- and late fall-run Chinook salmon were also analyzed.

Finally, Yolo Bypass outflow for Delta smelt, splittail, green sturgeon, and white sturgeon and examined X2 location for American shad and striped bass were considered. Results were examined for exports at the State Water Project (SWP) and Central Valley Project (CVP) export facilities year-round. The model results showed that: (1) long-term average monthly total SWP and CVP Delta exports are generally equivalent year-round; (2) average total Delta exports by water year type are generally equivalent, except for some slight increases and decreases during some months of dry and critical water years; and (3) monthly exceedance distributions are generally similar year-round, but are slightly lower over potions of the distribution during August, and are slightly higher over portions of the distribution during September. For these reasons, no further evaluations were conducted to evaluate fish salvage at the SWP and CVP export facilities.

Delta Smelt in the Delta Region

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide the following:

a) Similar adult conditions due to: (1) equivalent or similar monthly probabilities of water temperatures at Freeport occurring within the specified water temperature range (December through May), but with an increased probability (1.3 percent) during May; (2) generally similar probabilities of X2 occurring between 74 and 81 RKm during wet and above-normal water years (September through November); and (3) generally equivalent monthly probabilities of OMR flows being more negative than –5,000 cfs (December through February).

b) Similar adult spawning conditions in the Yolo Bypass (December through May) due to generally equivalent or similar net changes in Yolo Bypass outflow of 10 percent or more during the evaluation period.

c) Similar egg and embryo conditions (February through May) due to equivalent or similar monthly probabilities of water temperatures at Freeport occurring within the specified water temperature range, but with an increased probability (1.3 percent) during May.

d) Similar larvae conditions (March through June) due to: (1) similar monthly probabilities of water temperatures at Freeport occurring within the specified water temperature range, but with an increased probability (1.3 percent) during May; (2) during March through June of dry and critical water years, generally equivalent probabilities of mean monthly OMR flows being more negative than –1,500 cfs; and (3) and generally equivalent net changes of 10 percent or more in mean monthly Delta outflow.

e) Similar juvenile conditions (May through July) due to: (1) generally equivalent monthly probabilities of water temperatures at Freeport occurring within the specified water

temperature range, but with an increased probability (1.3 percent) during May; and (2) between RKm 65 and 80, X2 location moves upstream by 0.5 RKm or more with generally similar or somewhat reduced frequency (up to 7.3 percent).

In consideration of the general similarity of impact indicators to all lifestages of Delta smelt in the Delta under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Longfin Smelt in the Delta Region

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide the following:

a) Similar adult conditions (December through March) due to generally equivalent monthly probabilities of OMR flows being more negative than –5,000 cfs.
b) Generally similar larvae and juvenile conditions due to: (1) during April and May of dry and critical water years, the probabilities of mean monthly OMR flows being more negative than –1,500 cfs are generally equivalent, and the probabilities of mean monthly OMR flows being less than 0 are generally equivalent, but with an increased probability (3.3 percent) during April; (2) for all water years during January through June, mean monthly X2 location occurs downstream of 75 RKm with generally similar frequency during all months evaluated, but with slightly increased probability in January (1.2 percent) and slightly decreased probability in June (1.2 percent); and (3) for dry and critical water years mean monthly X2 location occurs downstream of 75 RKm with generally equivalent frequencies during all months evaluated.
c)

In consideration of the general similarity of impact indicators to all lifestages of longfin smelt in the Delta under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Winter-run Chinook Salmon in the Delta Region

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide the following:

a) Similar juvenile and emigration conditions (November through May) due to: (1) generally equivalent net changes in mean monthly Rio Vista flows of 10 percent or more, except during January when flows are lower by 10 percent or more with slightly higher frequency (3.0 percent); (2) generally equivalent or similar net changes in mean monthly Yolo Bypass outflow of 10 percent or more, except during November when flows are lower by 10 percent or more with slightly higher frequency (2.4 percent); (3) generally equivalent or similar net changes in mean monthly Delta outflow of 10 percent or more, except during November when flows are lower by 10 percent or more with slightly higher

frequency (1.2 percent); and (4) generally equivalent probabilities of OMR flows being more negative than –2,500 cfs.

In consideration of the general similarity of impact indicators to all lifestages of winter-run Chinook salmon in the Delta under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Spring-run Chinook Salmon in the Delta Region

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide the following:

a) Similar juvenile and emigration conditions (November through June) due to: (1) generally equivalent net changes in mean monthly Rio Vista flows of 10 percent or more, except during January when flows are lower by 10 percent or more with slightly higher frequency (about 3 percent); (2) generally equivalent or similar net changes in mean monthly Yolo Bypass outflow of 10 percent or more, except during November when flows are lower by 10 percent or more with slightly higher frequency (2.4 percent); (3) generally equivalent or similar net changes in mean monthly Delta outflow of 10 percent or more, except during November when flows are lower by 10 percent or more with slightly higher frequency (1.2 percent); and (4) generally equivalent probabilities of OMR flows being more negative than –2,500 cfs.

In consideration of the general similarity of impact indicators to all lifestages of spring-run Chinook salmon in the Delta under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Fall-run and Late Fall-run Chinook Salmon in the Delta Region

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide the following:

a) Similar juvenile and emigration conditions (November through June) due to: (1) generally equivalent net changes in mean monthly Rio Vista flows of 10 percent or more, except during January when flows are lower by 10 percent or more with slightly higher frequency (about 3 percent); (2) generally equivalent or similar net changes in mean monthly Yolo Bypass outflow of 10 percent or more, except during November when flows are lower by 10 percent or more with slightly higher frequency (2.4 percent); (3) generally equivalent or similar net changes in mean monthly Delta outflow of 10 percent or more, except during November when flows are lower by 10 percent or more with slightly higher frequency (1.2 percent); and (4) generally equivalent probabilities of OMR flows being more negative than –2,500 cfs.
b) Generally similar San Joaquin River adult fall-run Chinook salmon conditions (December through February) due to generally similar probabilities of OMR flows being more negative than –5,000 cfs, but with a slightly increased probability during December (1.2 percent).

In consideration of the general similarity of impact indicators to all lifestages of fall-run and late fall-run Chinook salmon in the Delta under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Steelhead in the Delta Region

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide the following:

a) Similar juvenile and emigration conditions (October through July) due to: (1) generally equivalent net changes in mean monthly Rio Vista flows of 10 percent or more, except during January when flows are lower by 10 percent or more with slightly higher frequency (about 3 percent); (2) generally equivalent or similar net changes in mean monthly Yolo Bypass outflow of 10 percent or more, except during November when flows are lower by 10 percent or more with slightly higher frequency (2.4 percent); (3) generally equivalent or similar net changes in mean monthly Delta outflow of 10 percent or more, except during November when flows are lower by 10 percent or more with slightly higher frequency (1.2 percent); and (4) generally equivalent probabilities of OMR flows being more negative than –2,500 cfs.

In consideration of the general similarity of impact indicators to all lifestages of steelhead in the Delta under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Green Sturgeon in the Delta Region

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide the following:

a) Generally similar juvenile rearing and emigration conditions (year-round) due to generally equivalent or similar net changes in mean monthly Yolo Bypass outflow of 10 percent or more, except during November when flows are lower by 10 percent or more with slightly higher frequency (2.4 percent).

In consideration of the general similarity of impact indicators to all lifestages of green sturgeon in the Delta under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Splittail in the Delta Region

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide the following:

a) Similar adult spawning and embryo incubation conditions (February through May) due to generally equivalent or similar net changes in mean monthly Yolo Bypass outflow of 10 percent or more.

b) Similar juvenile rearing and emigration conditions (April through July) due to generally equivalent net changes in mean monthly Yolo Bypass outflow of 10 percent or more.

In consideration of the general similarity of impact indicators to all lifestages of splittail in the Delta under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

Recreational Fisheries (White Sturgeon, American Shad and Striped Bass) in the Delta Region

Relative to the No Action/No Project future condition, the Alternative 2 Forecast-informed Operations future condition scenario would be expected to provide generally similar egg and larval conditions for American shad and striped bass; and generally similar juvenile rearing and emigration conditions for white sturgeon.

In consideration of the general similarity of impact indicators to all lifestages of American shad, striped bass and white sturgeon in the Delta under the Alternative 2 future condition relative to the No Action/No Project future condition, no further evaluations are necessary.

1.1.5 Water Supply

This section discusses water supply comparisons between Alternative 2 – Forecast-informed Operations and No Action/No Project while using a future level of water demand condition in the CalSim II models. Significance criteria for water quality effects would be the same as discussed in section 4.7.2.

General Observations

CalSim II model outputs for the No Action future conditions and Alternative 2, Future Level of Demand indicate that, overall, Alternative 2 would be generally similar to or better than the No Action future condition. There could be some occurrences of slight increases and decreases in evaluation metrics, as expected with any changes in the CalSim II models.

As shown in Table 5-46, model outputs for storage in Folsom Reservoir for Alternative 2, Future Level of Demand are higher than for the No Action future condition. The top-of-conservation-pool storage volumes computed from inflow-forecast-based operations and selective basin wetness corrections to the spring refill curve for Alternative 2, Future Level of Demand, prescribe higher maximum allowable storages in November through April months than for the No Action Alternative. As a result, the model is storing more water in these months and releasing it in summer. Releases in November through February are reduced accordingly. Storage in Folsom Reservoir is higher in May and September, implying better availability of water to meet summer water delivery obligations and higher Folsom Reservoir releases through the summer.

October mean monthly flows below Nimbus Dam are higher, relative to the basis of comparison. Flows in November and December show a decrease of 3 to 4 percent for the long-term average value; however, most of these decreases occur in the high-flow ranges and in wet and above-normal water years, and there is a slight increase in flow for the low-flow ranges. Reduced flows are because of the higher storages in the Folsom Reservoir for the same months. Sacramento

River flows below Keswick Dam and at Rio Vista are similar for the two scenarios and meet the MFR.

Table 1-23. Storages, Flows, and MFR for Alternative 2, Future Level of Demand vs. No Action.

Evaluation Parameters	Evaluation Metrics and Summary of Effects	Generalized Results
End of Month Storages (May and September)		
Folsom	Monthly exceedance distributions – Folsom storages as noted; Similar storages for others.	May and September – higher storages.
Shasta		✓
Oroville		✓
Mean Monthly Flows and MFR Compliance (October through December)		
Lower American River below Nimbus Dam	Monthly exceedance distributions – Similar flows; MFR met.	October - very small increases in flows. November – slight increases in below 2,000-cfs flow range; decreases in flows for 3,000–6,000-cfs range. December – increase in flows below 3,000-cfs range.
Sacramento River below Keswick Dam		✓
Sacramento River at Rio Vista		✓

Note: "✓" refers to similar value of the evaluation metric for both scenarios.

As shown in Table 5-47, because of the higher Folsom Reservoir storages and changes in the allocations in the With-Project Alternative, Future Level of Demand CalSim II model, long-term average annual deliveries show a slight increase (10-TAF increase for long-term average of total CVP deliveries and 2 TAF decrease for long-term average of SWP deliveries). It is notable that the critical years average annual CVP deliveries show a slight increase of 4 TAF.

Deliveries to lower American River purveyors are generally similar with some increases and decreases (–240 AF to +1060 AF, about 1 to 8 percent) for the long-term average (Table 5-48). Largest of these long-term average changes occur in FWTP deliveries with decreases in February and August and increases in March through June. This is likely because of the increased storages in spring months. It should be noted that the minimum deliveries for Placer County Water Agency Pumping Plant for August show a reduction of 2,572 AF. Upon further investigation of the CalSim models, these changes in minimum deliveries occur in year 1977, a drought year that usually causes anomalies in the model. In August 1977, modeled Folsom Reservoir storage reaches dead pool, and therefore a difference in top-of-conservation-pool storage volume of 3 TAF that started in October 1975 causes this difference in deliveries.

Based on the Folsom Pumping plant and FWTP deliveries data for water delivery evaluation, 8 out of the 10 metrics were the same for the two models; therefore, the deliveries produced by Alternative 2, Future Level of Demand were determined to be similar to deliveries from No Action/No Project under future conditions (Table 5-49).

Table 1-24. CVP/SWP Deliveries for Alternative 2 vs. No Action/No Project future condition.

Evaluation Parameters	Evaluation Metrics and Summary of Effects	Generalized Results					
CVP/SWP Deliveries							
Delivery Type	Long-term and water year type average annual deliveries – Generally similar long-term average annual deliveries and generally similar average annual deliveries most of the time during all water year types, but with some slight increases and/or decreases.	**Long-term and Water Year Type Average Annual Deliveries**					
		Long-term	**Wet**	**Above Normal**	**Below Normal**	**Dry**	**Critical**
CVP M&I NOD		✓	1 TAF increase	3 TAF increase	1 TAF decrease	2 TAF decrease	1 TAF increase
CVP agricultural NOD		3 TAF increase	5 TAF increase	9 TAF increase	3 TAF increase	✓	✓
CVP settlement NOD		✓	✓	1 TAF decrease	✓	✓	✓
CVP refuges NOD		✓	✓	✓	✓	✓	✓
CVP M&I SOD		✓	1 TAF increase	✓	✓	✓	✓
CVP agricultural SOD		6 TAF increase	5 TAF increase	14 TAF increase	7 TAF increase	2 TAF increase	4 TAF increase
CVP exchange Contractors		✓	✓	✓	✓	✓	✓
CVP refuges SOD		✓	✓	✓	✓	✓	✓
Total CVP deliveries		10 TAF increase	12 TAF increase	24 TAF increase	10 TAF increase	3 TAF increase	4 TAF increase
SWP contractors		2 TAF decrease	5 TAF decrease	2 TAF decrease	2 TAF increase	2 TAF decrease	1 TAF increase

Note: "✓" refers to the same value of the evaluation metric for both scenarios.
NOD = North of Delta
SOD = South of Delta

Table 1-25. American River Purveyors Deliveries for Alternative 2, Future Level of Demand vs. No Action.

Evaluation Parameters	Evaluation Metrics and Summary of Effects	Results		
American River Purveyors Deliveries				
Purveyor Delivery Type	Long-term monthly average, maximum and minimum deliveries – Generally similar deliveries with some increases and decreases as noted.	**Monthly Average, Maximum, and Minimum Deliveries**		
		Average	**Maximum**	**Minimum**
American River Pump Station deliveries to PCWA		31 AF decrease for August.	✓	2572 AF decrease for August.
City of Folsom deliveries		Same for November through February; Up to 2 AF increase for all other months.	22 AF increase for April.	1 AF decrease for July.
City of Roseville deliveries		Up to 6 AF increase for all months.	✓	✓
San Juan Water District deliveries		Up to 4 AF increase for all months.	80 AF increase for April.	2 AF decrease for July.
SSWD deliveries from Folsom		N/A	N/A	N/A
Folsom Pumping Plant deliveries		Up to 23 AF increase for all months.	✓	10 AF decrease for July.
FWTP deliveries		Up to 1056 AF increase for March through June, September, November, and December. Up to 241 AF decrease in February and August.	1,763 and 485 AF increase in March and April.	✓
Freeport Regional Water Project deliveries		Up to 20 AF of increase in June through September, and November. Up to 51 AF decreases in February through May.	Up to 24 AF increase in March and September. 5 AF decrease in May.	13 AF and 23 AF increase in June and July. 2 AF and 20 AF decrease in February and March.
August 1977 deliveries – City of Roseville, San Juan Water District, and City of Folsom		✓	N/A	N/A

Note: "✓" refers to the same value of the evaluation metric for both scenarios.
SSWD deliveries in CalSim II are included in PCWA's diversion from the American River Pump Station for the FLD scenarios because: (1) SSWD does not have a long-term Warren Act contract for diversion from Folsom Reservoir; and (2) SSWD's surface water supplies are from PCWA's water right.

Table 1-26. American River Diversions and Consistency Formulation for Alternative 2, Future Level of Demand vs. No Action.

Evaluation Parameters	Evaluation Metrics and Summary of Effects	Results
American River Diversions - Folsom Pumping Plant and E.A. Fairbairn Water Treatment Plant (Consistency Formulation)		
Folsom Pumping Plant - April	Total occurrences where delivery fell below 95 percent of POR average of all Aprils – Same for both scenarios.	✓
Folsom Pumping Plant - April	Maximum number of years for any water year type where delivery fell below 95 percent of POR average of all Aprils – Same for both scenarios.	✓
Folsom Pumping Plant - July	Total occurrences where delivery fell below 95 percent of POR average of all Julys – Not the same for both scenarios.	✓
Folsom Pumping Plant - July	Maximum number of years for any water year type where delivery fell below 95 percent of POR average of all Julys – Same for both scenarios.	✓
FWTP - April	Total occurrences where delivery fell below 95 percent of POR average of all Aprils – Not the same for both scenarios.	51 for No Action/No Project future condition. 46 for With-Project Alternative, Future Level of Demand.
FWTP - April	Maximum number of years for any water year type where delivery fell below 95 percent of POR average of all Aprils – Same for both scenarios.	16 for No Action/No Project future condition. 15 for With-Project Alternative, Future Level of Demand.
FWTP - July	Total occurrences where delivery fell below 95 percent of POR average of all Julys – Same for both scenarios.	✓
FWTP - July	Maximum number of years for any water year type where delivery fell below 95 percent of POR average of all Julys – Same for both scenarios.	✓
Folsom Pumping Plant	Minimum diversion for any month – Same for both scenarios.	✓
FWTP	Minimum diversion for any month – Same for both scenarios.	✓

Note: "✓" refers to the same value of the evaluation metric for both scenarios.

As summarized in Table 5-50, summer months MFRs in the lower American River are slightly higher than for No Action. October through December MFRs are higher than for No Action. As described earlier in the previous comparisons, MFR flows in the American River below Nimbus Dam are based on the regulated hydrology of the respective models. Changes in the Folsom Reservoir storages are causing changes in the MFR.

Table 1-27. American River MFR for Summer and Fall Months for Alternative 2, Future Level of Demand vs. No Action.

Evaluation Parameters	Evaluation Metrics and Summary of Effects	Generalized Results
American River Minimum Release Requirement in Summer and Fall Months		
June through September	Monthly exceedance distributions – Similar MFR.	Slight increase in MFR for July through September
October through December	Monthly exceedance distributions.	MFR increases.

Note: "✓" refers to similar value of the evaluation metric for both scenarios.

1.1.6 Hydropower

This section discusses hydropower comparisons between Alternative 2 – Forecast-informed Operations and No Action/No Project while using a future level of water demand condition in the CalSim II model. Significance criteria for hydropower effects would be the same as discussed in section 4.4.2.

Hydropower model outputs indicate that the CVP and SWP facilities' long-term, monthly and driest-periods' energy generation, capacity, pumping energy use, and net energy generation under With-Project Alternative, Future Level of Demand would slightly increase or not change relative to No Action/No Project. The magnitudes of changes would be small, typically a difference of 1 percent or less. Table 5-51 summarizes the results of the long-term and driest period hydropower effects evaluation. Table 5-52 summarizes the evaluation parameters and metrics for each monthly period. Comparisons of the hydropower metrics for the driest periods show a greater variation between the two scenarios, although the changes would typically be 1 percent or less.

Evaluation of Effects

The CVP and SWP facilities' capacity and generation differences would be due in part to changes to the spring-refill WCD operations under Alternative 2, Future Level of Demand whereby the CalSim II model predicts higher maximum allowable storages in November-through-April and therefore storing more water in these months and releasing it in summer through early fall. The November-through-February releases are reduced accordingly in the CalSim II model. The resulting storage in Folsom Reservoir would be higher in May and September.

Due to the changes in the Folsom Reservoir operations and its effects on storages and releases for other CVP/SWP reservoirs, CVP energy generation, capacity, energy use, and net generation at load center would slightly increase, while the SWP facilities would show no change or decrease slightly for these parameters. The net generation at load center for SWP facilities would

increase slightly. The magnitudes of these changes would be small, typically a difference of 1 percent or less.

Table 1-28. CVP-SWP Hydropower Summary for Alternative 2, Future Level of Demand vs. No Action/No Project Future Level of Demand.

Evaluation Parameters		Long Term			Driest Periods		
	Metric	Change		percent Difference	Change		percent Difference
CVP Long-Term and Driest Periods							
Increase or no change relative to the J604 FLD condition. Magnitude of changes are small, typically representing a difference of 1 percent or less. Driest Period shows slightly greater variability, but difference typically less than 1 percent.	Capacity	3	GWh	√	4	GWh	√
	Energy Generation	19	MW	√	-5	MW	√
	Energy Use	3	GWh	√	2	GWh	√
	Foregone Energy	-6	GWh	2 percent	0	GWh	√
	Net Generation	16	GWh	√	-7	GWh	√
SWP Long-Term and Driest Periods							
Slight increase relative to the J604 FLD condition. Magnitude of changes are small, typically representing a difference of 1 percent or less. Driest Period shows slightly greater variability, but difference typically less than 1 percent.	Capacity	0	GWh	√	0	GWh	√
	Energy Generation	-2	MW	√	5	MW	√
	Energy Use	-4	GWh	√	16	GWh	√
	Foregone Energy	0	GWh	√	1	GWh	√
	Net Generation	2	GWh	√	-11	GWh	√
Note: "√" refers to less than 1 percent difference in the evaluation metric for both scenarios or improvement relative to J604 FLD condition							

Table 1-29. CVP-SWP Hydropower Monthly Summary for Alternative 2, Future Level of Demand vs. No Action/No Project Future Level of Demand.

Evaluation Parameters	Long Term (Max Decrease)			Long Term (Max Increase)			Driest Periods (Max Decrease)			Driest Periods (Max Increase)		
	Change		percent Difference	Change		percent Difference	Change		percent Difference	Change		percent Difference
CVP Monthly Periods												
Energy Generation	-2	GWh	< 1 percent February	6	GWh	2 percent April	-10	GWh	5 percent September	4	GWh	2 percent April
Capacity	All Months Increase			6	MW	< 1 percent February	-2	MW	< 1 percent January	9	MW	< 1 percent September
Energy Use	-1	GWh	2.4 percent April	1	GWh	1 percent June	-3	GWh	4 percent July	2	GWh	3 percent August
Net Generation	-3	GWh	< 1 percent February	6	GWh	2 percent April	-9	GWh	7 percent September	4	GWh	1 percent May
SWP Monthly Periods												
Energy Generation	-1	GWh	1 percent November	1	GWh	< 1 percent May	-1	MW	1 percent February	2	GWh	2 percent October
Capacity	-3	MW	1 percent November	3	MW	< 1 percent January	-6	MW	2 percent November	4	GWh	1 percent January
Energy Use	-2	GWh	1 percent February	2	GWh	< 1 percent August	0	GWh	All Months Increase	5	GWh	2 percent October
Net Generation	-2	GWh	< 1 percent August	2	GWh	1 percent February	0	GWh	All Months Increase	3	GWh	1.5 percent October

1.1.7 Recreation

This section discusses comparisons between recreation conditions under Alternative 2 – Forecast-informed Operations and No Action/No Project while using a future level of water demand condition in the CalSim II model. Significance criteria for recreation effects would be the same as discussed in section 4.9.2.

Folsom Reservoir

The upper threshold of significance at an elevation of 466 feet would likely be met or exceeded more frequently with Alternative 2 future condition than with the No Action Alternative future condition in May through July (Table 5-53). The lower threshold of significance at elevation 435 feet would be met or exceeded more frequently with Alternative 2 future condition relative to the No Action future condition in every month except August and September (up to 4.8 percent less frequently).

Table 1-30. Key Reservoir Threshold Difference between the Alternative 2 Future Condition and the No Action Future Condition Probability of Exceedance.

Key Reservoir Elevations Elevation (ft.)	**Upper Threshold 466**	**Lower Threshold 435**
May	0.1 percent	0.8 percent
June	2.0 percent	0.3 percent
July	0.2 percent	1.1 percent
August	*	–1.7 percent
September	*	–4.8 percent

Note: * Threshold of significance is not crossed.

The thresholds of significance for the five boat ramps that provide access for on-lake recreation on Folsom Reservoir would generally be exceeded more frequently with the Alternative 2 future condition than with the No Action future condition (Table 5-54). Four of the five boat ramps would experience up to 3 months with a lower probability with the Alternative 2 future condition relative to the No Action future condition.

Table 1-31. Boat Ramp Access Threshold Difference between the Alternative 2 Future Condition and No Action future condition Probability of Exceedance.

Minimum Boat Ramp Elevation (ft.)	**Beal's Point 420**	**Dike 8 405**	**Brown's Ravine Main 395**	**Hobie Cove 375**	**Granite Bay 360**
May	–0.5 percent	–0.6 percent	0.0 percent	0.0 percent	*
June	–1.5 percent	0.7 percent	0.0 percent	0.0 percent	–0.1 percent
July	–0.7 percent	0.7 percent	0.2 percent	0.0 percent	0.0 percent
August	3.1 percent	0.0 percent	1.5 percent	0.4 percent	0.5 percent
September	4.1 percent	0.3 percent	2.7 percent	–0.2 percent	1.0 percent

Note: * Threshold of significance is not crossed.

The majority of the upper and lower thresholds of significance for the two primary swimming locations would be exceeded less frequently with the Alternative 2 future condition than with the No Action future condition (Table 5-55). Nine of the 20 thresholds of significance (Granite Bay Oak Point swim beach in September) would be exceeded more frequently with the Alternative 2 future condition than with the No Action future condition.

Table 1-32. Reservoir Swim Access Threshold Difference between the Alternative 2 Future Condition and No Action Future Condition Probability of Exceedance.

Swim Beaches **Minimum Elevation (ft.)**	**Granite Bay – Main Swim Beach** **450**	**Granite Bay – Oak Point Swim Beach** **440**	**Rattlesnake Bar – Jet Ski Cove** **425**	**Rattlesnake Bar– Vista Shoreline Access** **420**
May	7.9 percent	3.5 percent	–1.5 percent	–0.5 percent
June	3.0 percent	1.4 percent	–0.6 percent	–1.5 percent
July	–3.1 percent	0.7 percent	–1.1 percent	–0.7 percent
August	–3.4 percent	–2.1 percent	5.2 percent	3.1 percent
September	–9.3 percent	–7.0 percent	0.2 percent	4.1 percent

Lower American River

The upper threshold of significance (the maximum optimal flow) for the lower American River would be met or exceeded at the same or higher frequency with the Alternative 2 future condition relative to the No Action future condition, except for July when it would be exceeded at a lower frequency (0.3 percent less frequently). Notably, the threshold would not be crossed in August and September.

Both the minimum optimal and minimum adequate flow thresholds of significance (3,000 cfs and 1,750 cfs, respectively) for the lower American River would be met or exceeded at a higher frequency with the Alternative 2 future condition relative to the No Action future condition, except in August for the minimum optimal flow (3,000 cfs) when it would be met or exceeded at a lower frequency (0.2 percent less frequently) and in July for the minimum adequate flow (1,750 cfs) when it would be met or exceeded at a lower frequency (2.4 percent less frequently) (Table 5-56).

Table 1-33. Lower American River Recreation Threshold Difference between the Alternative 2 future condition and No Action Future Condition Probability of Exceedance.

Lower American River Thresholds of Significance Flows (cfs)	**Maximum Optimal** **6,000**	**Minimum Optimal** **3,000**	**Minimum Adequate** **1,750**
May	0.3 percent	2.0 percent	4.5 percent
June	3.1 percent	2.8 percent	5.3 percent
July	–0.3 percent	5.5 percent	–2.4 percent
August	*	–0.2 percent	5.1 percent
September	*	0.3 percent	2.1 percent

Note: * Threshold of significance is not crossed.

Shasta Reservoir

As indicated in Table 5-57, the upper threshold of significance, the optimum recreation WSE, at elevation 1,020 feet would be met or exceeded at the same or higher frequency in every month with the Alternative 2 future condition relative to the No Action future condition. The lower shoreline recreation WSE threshold of significance at elevation 1,007 feet would be met or exceeded at the same or lower frequency of time in every month with the Alternative 2 future condition relative to the No Action future condition except for August. The lowest threshold of significance, the minimum recreation WSE, at elevation 941 feet would be met or exceeded at the same or higher frequency in May through July with the Alternative 2 future condition relative to the No Action future condition.

Table 1-34. Key Shasta Reservoir Threshold Difference between the Alternative 2 Future Condition and No Action Future Condition Probability of Exceedance.

Key Reservoir Thresholds Elevation (ft.)	**Optimum Shoreline Recreation 1,020**	**Lower Shoreline Recreation 1,007**	**Minimum Recreation 941**
May	0.0 percent	–0.3 percent	0.1 percent
June	1.0 percent	0.0 percent	0.8 percent
July	1.0 percent	–0.1 percent	0.2 percent
August	0.0 percent	0.1 percent	–0.1 percent
September	0.0 percent	–1.6 percent	–0.03 percent

Sacramento River

The mean monthly flows on the Sacramento River below Keswick Dam would drop below the threshold of significance of 5,000 cfs during May and September. In May and September, the mean monthly flow probability of exceedance would not change with the With-Project alternative relative to the No Action future condition. The threshold of significance would not be crossed for the remainder of the recreation season.

The mean monthly flow on the Sacramento River at the Freeport gage would not drop below the threshold of significance of 5,000 cfs during the recreation season.

Evaluation of Effects

Folsom Reservoir

The Alternative 2 future condition would have minimal negative effects relative to the No Action future condition for the upper threshold of significance for Folsom Reservoir. The maximum water surface elevation (466 feet) would be met more frequently in May through July. Given that this threshold would not be exceeded, this effect is functionally equivalent. The Alternative 2 future condition would have a positive effect on the lower threshold of significance (435 feet). For May through July, the threshold would be met or exceeded at a greater frequency in all

months, which equates to an increase in the amount of time for recreation activities compared to the No Action future condition. For August and September, the lower threshold of significance would experience a negative effect with the Alternative 2 future condition relative to the No Action future condition (up to 4.8 percent less).

Overall, the Alternative 2 future condition would have a positive effect in relation to the minimum thresholds for all of the reservoir boat ramps with an increase in the probability of exceedance in most months (up to a 4.1percent increase), which equates to an increase in the amount of time that the boat ramps would be usable. For the swim beaches, the Alternative 2 future condition would have a slightly positive effect in relation to the minimum thresholds with 11 of the 20 thresholds showing an increase in the probability of exceedance or an increase in the amount of time that the swim beaches would be usable.

Lower American River

Overall, the lower American River would experience positive effects with the Alternative 2 future condition relative to the No Action future condition for the minimal optimum and adequate flows, with the minimum optimal and adequate flows being exceeded more frequently and the maximum optimal flow being exceeded less frequently. Both of these scenarios equate to an increase in the amount of time above the minimum thresholds (1,750 and 3,000 cfs) and below the maximum threshold (6,000 cfs).

Shasta Reservoir

The differences in the probability of exceedance for the Shasta Reservoir elevations between the Alternative 2 future condition and the No Action future condition for all three thresholds are functionally equivalent with differences no higher than 1.6 percent and most at or near no change.

Sacramento River

The thresholds of significance for the Sacramento River would be exceeded at similar percentages for the two conditions for May and September below Keswick Dam. The remainder of the thresholds of significance for the Sacramento River at Keswick Dam and the Freeport gage would not crossed, a result that gives no indication of the benefit or detriment for either condition in this comparison.

1.1.8 Cultural Resources

This section discusses differences in effects to cultural resources between Alternative 2 – Forecast-informed Operations and No Action/No Project while using a future level of water demand condition in the CalSim II models. Significance criteria for cultural resources effects would be the same as discussed in section 4.10.2.

Cultural resources site specific effects cannot be determined that this time. Due to the large geographic area of the project the identification, NRHP eligibility evaluation, alternative effects

evaluation, and potential mitigation of adverse effects will be determined through the process of execution of the PA.