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Figure C.5.3-96. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, May C.5.3-244
Figure C.5.3-97. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, September C.5.3-246
Figure C.5.3-98. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, October C.5.3-246
Figure C.5.3-99. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, November C.5.3-247
Figure C.5.3-100. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, December C.5.3-258
Figure C.5.3-101. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, January C.5.3-258
Figure C.5.3-102. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, February C.5.3-259
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Figure C.5.3-104. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, April C.5.3-260
Figure C.5.3-105. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, May C.5.3-260
Figure C.5.3-106. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, September C.5.3-262
Figure C.5.3-107. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, October C.5.3-262
Figure C.5.3-108. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, November C.5.3-263

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C.5.3 Passage, Movement, and Migration Results

C.5.3.1 Fish Movement (Migration, Transport, and Passage)

C.5.3.1.1 Flow Summary

Flows relevant to fish movement upstream of the Delta (Plan Area) are presented in Section C.5.4. Summary tables (Table C.5.3-1 through Table C.5.3-18) of CALSIM flows within the Plan Area are provided below.

Table C.5.3-1. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Sacramento River at Freeport Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	50,800	50,438	51,801	52,716	51,538	52,200
	AN	39,719	38,205	38,821	40,339	39,055	39,622
	BN	23,705	22,806	23,033	22,575	22,056	22,332
	D	17,397	17,175	17,373	17,404	17,192	17,780
	C	14,265	14,509	14,499	15,056	14,732	13,659
	AVG	31,874	31,371	31,974	32,496	31,752	32,064
Feb	W	57,222	56,685	58,786	59,754	57,852	58,768
	AN	45,570	44,638	46,803	47,678	47,245	47,480
	BN	31,864	30,759	31,635	31,522	30,668	30,958
	D	21,179	21,195	20,994	21,083	20,399	20,593
	C	14,732	14,849	14,442	14,311	14,081	14,543
	AVG	37,057	36,583	37,612	38,028	37,032	37,516
Mar	W	49,436	49,397	50,217	51,011	48,338	49,080
	AN	44,531	43,842	45,138	45,122	43,863	43,857
	BN	24,520	23,330	23,039	22,944	22,340	22,201
	D	20,684	20,436	20,311	20,677	20,037	19,711
	C	13,300	13,166	13,098	13,190	13,032	13,047
	AVG	32,865	32,474	32,837	33,164	31,865	32,007
Apr	W	37,854	37,985	37,928	37,588	35,806	35,506
	AN	26,041	26,068	25,455	24,993	24,139	24,559
	BN	17,823	17,516	17,319	17,199	17,682	18,500
	D	13,066	13,114	12,910	12,978	13,852	14,866
	C	10,325	10,293	10,128	10,460	10,640	11,061
	AVG	23,236	23,234	23,024	22,892	22,502	22,893
May	W	32,064	31,813	29,176	24,615	29,403	26,025
	AN	21,138	20,823	19,822	18,772	21,917	21,394
	BN	14,366	13,987	13,139	12,531	15,936	15,868
	D	11,093	10,846	10,737	11,558	12,125	13,421
	C	7,897	7,776	8,281	8,156	8,173	8,275

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
	AVG	19,303	19,041	17,964	16,422	19,109	18,249
Jun	W	24,106	23,875	19,961	18,807	22,599	22,045
	AN	16,526	16,666	15,378	16,266	19,768	20,886
	BN	13,793	13,634	13,345	14,112	17,313	17,320
	D	12,451	12,593	12,764	12,882	13,639	13,458
	C	10,133	10,126	10,075	10,369	9,962	10,195
	AVG	16,633	16,583	15,134	15,098	17,466	17,450
Jul	W	20,096	20,107	20,548	21,644	18,067	18,771
	AN	21,793	22,099	22,403	22,945	19,494	19,431
	BN	21,176	21,480	21,174	20,734	17,669	16,073
	D	19,498	19,300	18,894	19,182	16,008	13,530
	C	15,656	14,435	14,406	14,003	10,622	11,383
	AVG	19,748	19,626	19,665	20,020	16,667	16,175
Aug	W	15,965	16,060	16,030	16,212	13,887	13,872
	AN	16,021	16,533	16,729	17,635	14,567	14,508
	BN	15,792	15,913	15,393	16,382	13,060	11,947
	D	17,113	16,009	14,651	14,498	11,720	10,721
	C	10,242	10,048	9,445	9,143	8,253	8,299
	AVG	15,358	15,213	14,757	15,039	12,545	12,129
Sep	W	18,351	27,667	26,940	27,309	14,029	12,559
	AN	13,297	20,646	21,323	21,102	12,125	11,879
	BN	12,522	12,433	12,876	12,399	10,702	10,170
	D	12,250	11,242	9,840	8,713	10,146	9,427
	C	8,580	8,153	7,781	7,386	7,934	8,507
	AVG	13,847	17,577	17,159	16,857	11,438	10,771
Oct	W	13,583	12,980	12,860	13,355	12,635	14,818
	AN	11,200	10,517	10,507	11,937	10,881	13,949
	BN	11,642	11,136	10,666	12,208	11,141	14,747
	D	10,366	9,984	10,315	10,572	9,797	13,210
	C	10,161	9,624	9,475	10,051	10,493	14,008
	AVG	11,696	11,156	11,087	11,857	11,187	14,207
Nov	W	19,472	20,795	20,502	19,308	18,854	18,020
	AN	15,357	16,902	16,909	15,972	14,477	12,465
	BN	12,633	13,779	13,603	13,094	11,976	11,042
	D	12,920	12,735	12,549	11,964	11,940	10,821
	C	9,703	9,893	9,518	9,364	9,196	8,877
	AVG	14,834	15,663	15,445	14,692	14,108	13,097
Dec	W	39,674	37,430	39,300	36,987	39,415	37,003
	AN	21,658	22,234	22,691	22,622	21,639	23,374
	BN	16,695	16,951	17,187	16,708	17,895	17,559
	D	15,471	15,537	15,411	15,185	16,002	15,551
	C	11,879	11,350	10,901	10,694	12,210	11,872
	AVG	23,734	23,087	23,694	22,789	24,019	23,302

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Table C.5.3-2. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Sacramento River at Freeport[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	738 (1.5%)	1400 (2.8%)	1101 (2.2%)	1763 (3.5%)	-263 (-0.5%)	-516 (-1%)
	AN	-664 (-1.7%)	-97 (-0.2%)	850 (2.2%)	1417 (3.7%)	234 (0.6%)	-717 (-1.8%)
	BN	-1649 (-7%)	-1373 (-5.8%)	-749 (-3.3%)	-474 (-2.1%)	-977 (-4.2%)	-243 (-1.1%)
	D	-206 (-1.2%)	382 (2.2%)	16 (0.1%)	604 (3.5%)	-181 (-1%)	376 (2.2%)
	C	467 (3.3%)	-605 (-4.2%)	223 (1.5%)	-850 (-5.9%)	233 (1.6%)	-1396 (-9.3%)
	AVG	-122 (-0.4%)	190 (0.6%)	382 (1.2%)	694 (2.2%)	-222 (-0.7%)	-432 (-1.3%)
Feb	W	630 (1.1%)	1547 (2.7%)	1167 (2.1%)	2084 (3.7%)	-934 (-1.6%)	-985 (-1.6%)
	AN	1676 (3.7%)	1910 (4.2%)	2607 (5.8%)	2842 (6.4%)	442 (0.9%)	-199 (-0.4%)
	BN	-1196 (-3.8%)	-907 (-2.8%)	-91 (-0.3%)	199 (0.6%)	-966 (-3.1%)	-564 (-1.8%)
	D	-780 (-3.7%)	-586 (-2.8%)	-795 (-3.8%)	-601 (-2.8%)	-595 (-2.8%)	-490 (-2.3%)
	C	-650 (-4.4%)	-189 (-1.3%)	-768 (-5.2%)	-306 (-2.1%)	-361 (-2.5%)	232 (1.6%)
	AVG	-25 (-0.1%)	459 (1.2%)	449 (1.2%)	934 (2.6%)	-580 (-1.5%)	-511 (-1.3%)
Mar	W	-1098 (-2.2%)	-356 (-0.7%)	-1059 (-2.1%)	-317 (-0.6%)	-1879 (-3.7%)	-1931 (-3.8%)
	AN	-669 (-1.5%)	-674 (-1.5%)	20 (0%)	15 (0%)	-1276 (-2.8%)	-1265 (-2.8%)
	BN	-2181 (-8.9%)	-2319 (-9.5%)	-990 (-4.2%)	-1129 (-4.8%)	-700 (-3%)	-743 (-3.2%)
	D	-647 (-3.1%)	-973 (-4.7%)	-399 (-2%)	-725 (-3.5%)	-274 (-1.3%)	-966 (-4.7%)
	C	-268 (-2%)	-253 (-1.9%)	-135 (-1%)	-119 (-0.9%)	-67 (-0.5%)	-143 (-1.1%)
	AVG	-1000 (-3%)	-858 (-2.6%)	-609 (-1.9%)	-468 (-1.4%)	-972 (-3%)	-1157 (-3.5%)
Apr	W	-2049 (-5.4%)	-2348 (-6.2%)	-2179 (-5.7%)	-2479 (-6.5%)	-2122 (-5.6%)	-2082 (-5.5%)
	AN	-1903 (-7.3%)	-1483 (-5.7%)	-1929 (-7.4%)	-1509 (-5.8%)	-1316 (-5.2%)	-434 (-1.7%)
	BN	-142 (-0.8%)	676 (3.8%)	166 (0.9%)	984 (5.6%)	363 (2.1%)	1300 (7.6%)
	D	786 (6%)	1800 (13.8%)	738 (5.6%)	1752 (13.4%)	942 (7.3%)	1888 (14.5%)
	C	315 (3.1%)	737 (7.1%)	347 (3.4%)	769 (7.5%)	512 (5.1%)	602 (5.8%)
	AVG	-733 (-3.2%)	-343 (-1.5%)	-732 (-3.2%)	-342 (-1.5%)	-522 (-2.3%)	1 (0%)
May	W	-2661 (-8.3%)	-6039 (-18.8%)	-2410 (-7.6%)	-5788 (-18.2%)	228 (0.8%)	1411 (5.7%)
	AN	779 (3.7%)	257 (1.2%)	1094 (5.3%)	571 (2.7%)	2095 (10.6%)	2623 (14%)
	BN	1571 (10.9%)	1502 (10.5%)	1949 (13.9%)	1881 (13.4%)	2797 (21.3%)	3337 (26.6%)
	D	1032 (9.3%)	2329 (21%)	1279 (11.8%)	2576 (23.7%)	1388 (12.9%)	1863 (16.1%)
	C	276 (3.5%)	377 (4.8%)	398 (5.1%)	499 (6.4%)	-108 (-1.3%)	119 (1.5%)
	AVG	-195 (-1%)	-1054 (-5.5%)	68 (0.4%)	-792 (-4.2%)	1145 (6.4%)	1827 (11.1%)
Jun	W	-1506 (-6.2%)	-2060 (-8.5%)	-1276 (-5.3%)	-1830 (-7.7%)	2638 (13.2%)	3238 (17.2%)
	AN	3242 (19.6%)	4360 (26.4%)	3102 (18.6%)	4220 (25.3%)	4390 (28.5%)	4620 (28.4%)
	BN	3520 (25.5%)	3528 (25.6%)	3679 (27%)	3686 (27%)	3967 (29.7%)	3208 (22.7%)
	D	1188 (9.5%)	1007 (8.1%)	1046 (8.3%)	865 (6.9%)	875 (6.9%)	577 (4.5%)
	C	-171 (-1.7%)	62 (0.6%)	-164 (-1.6%)	69 (0.7%)	-113 (-1.1%)	-173 (-1.7%)
	AVG	833 (5%)	817 (4.9%)	883 (5.3%)	867 (5.2%)	2332 (15.4%)	2352 (15.6%)
Jul	W	-2028 (-10.1%)	-1325 (-6.6%)	-2040 (-10.1%)	-1336 (-6.6%)	-2481 (-12.1%)	-2873 (-13.3%)
	AN	-2299 (-10.5%)	-2362 (-10.8%)	-2605 (-11.8%)	-2668 (-12.1%)	-2909 (-13%)	-3514 (-15.3%)
	BN	-3508 (-16.6%)	-5103 (-24.1%)	-3812 (-17.7%)	-5407 (-25.2%)	-3506 (-16.6%)	-4661 (-22.5%)
	D	-3490 (-17.9%)	-5968 (-30.6%)	-3292 (-17.1%)	-5770 (-29.9%)	-2886 (-15.3%)	-5651 (-29.5%)
	C	-5034 (-32.2%)	-4273 (-27.3%)	-3813 (-26.4%)	-3052 (-21.1%)	-3784 (-26.3%)	-2620 (-18.7%)
	AVG	-3081 (-15.6%)	-3572 (-18.1%)	-2959 (-15.1%)	-3450 (-17.6%)	-2998 (-15.2%)	-3845 (-19.2%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-2078 (-13%)	-2092 (-13.1%)	-2173 (-13.5%)	-2187 (-13.6%)	-2143 (-13.4%)	-2340 (-14.4%)
	AN	-1454 (-9.1%)	-1514 (-9.4%)	-1966 (-11.9%)	-2026 (-12.3%)	-2162 (-12.9%)	-3128 (-17.7%)
	BN	-2733 (-17.3%)	-3846 (-24.4%)	-2853 (-17.9%)	-3966 (-24.9%)	-2333 (-15.2%)	-4435 (-27.1%)
	D	-5393 (-31.5%)	-6392 (-37.4%)	-4289 (-26.8%)	-5288 (-33%)	-2931 (-20%)	-3777 (-26.1%)
	C	-1989 (-19.4%)	-1943 (-19%)	-1795 (-17.9%)	-1750 (-17.4%)	-1192 (-12.6%)	-845 (-9.2%)
	AVG	-2813 (-18.3%)	-3229 (-21%)	-2668 (-17.5%)	-3084 (-20.3%)	-2212 (-15%)	-2910 (-19.3%)
Sep	W	-4323 (-23.6%)	-5792 (-31.6%)	-13638 (-49.3%)	-15108 (-54.6%)	-12911 (-47.9%)	-14749 (-54%)
	AN	-1172 (-8.8%)	-1418 (-10.7%)	-8521 (-41.3%)	-8767 (-42.5%)	-9198 (-43.1%)	-9224 (-43.7%)
	BN	-1819 (-14.5%)	-2351 (-18.8%)	-1730 (-13.9%)	-2262 (-18.2%)	-2174 (-16.9%)	-2229 (-18%)
	D	-2104 (-17.2%)	-2823 (-23%)	-1096 (-9.7%)	-1815 (-16.1%)	305 (3.1%)	713 (8.2%)
	C	-646 (-7.5%)	-74 (-0.9%)	-219 (-2.7%)	353 (4.3%)	153 (2%)	1120 (15.2%)
	AVG	-2409 (-17.4%)	-3076 (-22.2%)	-6139 (-34.9%)	-6806 (-38.7%)	-5722 (-33.3%)	-6086 (-36.1%)
Oct	W	-948 (-7%)	1234 (9.1%)	-345 (-2.7%)	1837 (14.2%)	-225 (-1.8%)	1462 (11%)
	AN	-319 (-2.8%)	2749 (24.5%)	364 (3.5%)	3433 (32.6%)	374 (3.6%)	2012 (16.9%)
	BN	-502 (-4.3%)	3105 (26.7%)	5 (0%)	3611 (32.4%)	474 (4.4%)	2539 (20.8%)
	D	-568 (-5.5%)	2845 (27.4%)	-186 (-1.9%)	3227 (32.3%)	-518 (-5%)	2638 (25%)
	C	333 (3.3%)	3847 (37.9%)	870 (9%)	4384 (45.6%)	1018 (10.7%)	3957 (39.4%)
	AVG	-509 (-4.4%)	2511 (21.5%)	31 (0.3%)	3051 (27.4%)	100 (0.9%)	2350 (19.8%)
Nov	W	-618 (-3.2%)	-1453 (-7.5%)	-1940 (-9.3%)	-2775 (-13.3%)	-1648 (-8%)	-1288 (-6.7%)
	AN	-880 (-5.7%)	-2892 (-18.8%)	-2425 (-14.3%)	-4438 (-26.3%)	-2432 (-14.4%)	-3507 (-22%)
	BN	-657 (-5.2%)	-1591 (-12.6%)	-1803 (-13.1%)	-2737 (-19.9%)	-1627 (-12%)	-2052 (-15.7%)
	D	-980 (-7.6%)	-2099 (-16.2%)	-796 (-6.2%)	-1914 (-15%)	-609 (-4.9%)	-1143 (-9.6%)
	C	-507 (-5.2%)	-826 (-8.5%)	-697 (-7%)	-1016 (-10.3%)	-322 (-3.4%)	-487 (-5.2%)
	AVG	-726 (-4.9%)	-1737 (-11.7%)	-1555 (-9.9%)	-2565 (-16.4%)	-1337 (-8.7%)	-1594 (-10.9%)
Dec	W	-259 (-0.7%)	-2671 (-6.7%)	1986 (5.3%)	-427 (-1.1%)	115 (0.3%)	16 (0%)
	AN	-19 (-0.1%)	1715 (7.9%)	-595 (-2.7%)	1139 (5.1%)	-1052 (-4.6%)	752 (3.3%)
	BN	1201 (7.2%)	864 (5.2%)	945 (5.6%)	608 (3.6%)	709 (4.1%)	851 (5.1%)
	D	531 (3.4%)	80 (0.5%)	464 (3%)	14 (0.1%)	591 (3.8%)	366 (2.4%)
	C	331 (2.8%)	-7 (-0.1%)	859 (7.6%)	522 (4.6%)	1309 (12%)	1178 (11%)
	AVG	285 (1.2%)	-432 (-1.8%)	931 (4%)	215 (0.9%)	325 (1.4%)	513 (2.3%)

[1]A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

Table C.5.3-3. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Sacramento River downstream of North Delta Diversion Estimated from CALSIM II

Year	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	50,961	50,599	51,963	52,878	41,688	42,014
	AN	39,863	38,350	38,966	40,484	31,531	32,151
	BN	23,781	22,883	23,111	22,653	18,739	18,962
	D	17,444	17,222	17,420	17,451	15,318	16,372
	C	14,281	14,527	14,516	15,073	13,542	12,576
	AVG	31,971	31,469	32,073	32,595	26,376	26,698
Feb	W	57,314	56,778	58,879	59,847	48,290	48,632
	AN	45,676	44,745	46,911	47,786	38,297	37,562
	BN	31,934	30,829	31,705	31,592	24,027	24,113

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Year	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
	D	21,202	21,218	21,018	21,107	17,171	17,556
	C	14,708	14,829	14,422	14,291	13,098	13,618
	AVG	37,116	36,642	37,671	38,087	30,704	30,880
Mar	W	49,416	49,379	50,198	50,993	39,677	40,210
	AN	44,495	43,809	45,105	45,088	33,942	33,116
	BN	24,489	23,300	23,010	22,915	16,725	16,602
	D	20,656	20,409	20,284	20,650	16,143	16,014
	C	13,245	13,113	13,045	13,137	11,813	11,863
	AVG	32,834	32,445	32,807	33,134	25,675	25,682
Apr	W	37,809	37,941	37,883	37,543	28,084	27,818
	AN	25,979	26,006	25,393	24,931	17,687	17,618
	BN	17,752	17,445	17,248	17,128	14,688	14,856
	D	12,990	13,040	12,836	12,904	12,107	12,911
	C	10,229	10,198	10,033	10,365	9,894	10,315
	AVG	23,169	23,169	22,959	22,826	18,106	18,279
May	W	31,948	31,699	29,061	24,500	20,832	17,764
	AN	21,021	20,708	19,707	18,657	15,274	14,932
	BN	14,227	13,851	13,003	12,394	12,249	12,411
	D	10,959	10,714	10,606	11,427	10,694	11,868
	C	7,749	7,631	8,136	8,011	7,556	7,660
	AVG	19,175	18,915	17,837	16,295	14,385	13,663
Jun	W	23,900	23,671	19,758	18,603	14,709	14,397
	AN	16,309	16,451	15,163	16,051	13,003	14,276
	BN	13,576	13,420	13,131	13,898	12,589	13,069
	D	12,222	12,367	12,538	12,656	11,823	11,844
	C	9,884	9,880	9,829	10,123	9,172	9,306
	AVG	16,412	16,365	14,916	14,880	12,654	12,847
Jul	W	19,876	19,889	20,330	21,425	14,012	15,809
	AN	21,574	21,881	22,186	22,727	15,679	15,970
	BN	20,953	21,258	20,953	20,513	14,935	14,056
	D	19,272	19,076	18,670	18,957	14,191	12,278
	C	15,397	14,178	14,149	13,767	9,863	10,579
	AVG	19,520	19,400	19,439	19,797	13,846	13,993
Aug	W	15,816	15,911	15,882	16,064	8,853	9,210
	AN	15,877	16,389	16,585	17,491	10,618	11,175
	BN	15,643	15,763	15,243	16,232	9,826	9,744
	D	16,965	15,862	14,504	14,351	10,108	10,152
	C	10,095	9,901	9,298	8,996	7,985	8,047
	AVG	15,210	15,066	14,610	14,891	9,426	9,625
Sep	W	18,254	27,571	26,844	27,212	8,187	7,963
	AN	13,198	20,549	21,227	21,006	7,893	8,249
	BN	12,427	12,340	12,783	12,306	7,763	7,900
	D	12,155	11,149	9,748	8,620	7,761	8,330
	C	8,485	8,059	7,687	7,292	7,596	8,298
	AVG	13,751	17,483	17,065	16,763	7,891	8,123

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Year	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Oct	W	13,505	12,903	12,783	13,277	9,547	13,281
	AN	11,118	10,436	10,426	11,864	8,806	13,607
	BN	11,557	11,052	10,582	12,124	9,276	14,504
	D	10,279	9,898	10,230	10,487	8,737	12,687
	C	10,073	9,537	9,389	9,964	9,056	13,918
	AVG	11,613	11,074	11,005	11,776	9,142	13,500
Nov	W	19,447	20,772	20,479	19,285	13,796	13,258
	AN	15,309	16,856	16,862	15,925	11,261	9,667
	BN	12,574	13,721	13,546	13,037	9,286	8,487
	D	12,868	12,685	12,499	11,914	10,086	8,551
	C	9,633	9,824	9,449	9,295	7,998	8,074
	AVG	14,788	15,618	15,400	14,647	10,992	10,126
Dec	W	39,708	37,465	39,335	37,022	32,828	31,205
	AN	21,663	22,241	22,698	22,629	19,668	21,404
	BN	16,678	16,935	17,171	16,692	15,860	15,751
	D	15,442	15,511	15,384	15,159	14,754	14,448
	C	11,816	11,289	10,840	10,632	11,484	11,195
	AVG	23,727	23,082	23,689	22,784	20,914	20,525

Table C.5.3-4. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Sacramento River downstream of North Delta Diversion[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	-9273 (-18.2%)	-8947 (-17.6%)	-8911 (-17.6%)	-8585 (-17%)	-10275 (-19.8%)	-10864 (-20.5%)
	AN	-8332 (-20.9%)	-7712 (-19.3%)	-6819 (-17.8%)	-6199 (-16.2%)	-7435 (-19.1%)	-8333 (-20.6%)
	BN	-5041 (-21.2%)	-4819 (-20.3%)	-4144 (-18.1%)	-3922 (-17.1%)	-4372 (-18.9%)	-3691 (-16.3%)
	D	-2125 (-12.2%)	-1072 (-6.1%)	-1904 (-11.1%)	-851 (-4.9%)	-2102 (-12.1%)	-1079 (-6.2%)
	C	-739 (-5.2%)	-1705 (-11.9%)	-984 (-6.8%)	-1951 (-13.4%)	-974 (-6.7%)	-2497 (-16.6%)
	AVG	-5595 (-17.5%)	-5273 (-16.5%)	-5093 (-16.2%)	-4771 (-15.2%)	-5696 (-17.8%)	-5897 (-18.1%)
Feb	W	-9024 (-15.7%)	-8682 (-15.1%)	-8488 (-14.9%)	-8145 (-14.3%)	-10589 (-18%)	-11214 (-18.7%)
	AN	-7379 (-16.2%)	-8114 (-17.8%)	-6448 (-14.4%)	-7183 (-16.1%)	-8614 (-18.4%)	-10224 (-21.4%)
	BN	-7907 (-24.8%)	-7820 (-24.5%)	-6803 (-22.1%)	-6716 (-21.8%)	-7678 (-24.2%)	-7479 (-23.7%)
	D	-4030 (-19%)	-3646 (-17.2%)	-4047 (-19.1%)	-3662 (-17.3%)	-3847 (-18.3%)	-3551 (-16.8%)
	C	-1610 (-10.9%)	-1090 (-7.4%)	-1731 (-11.7%)	-1211 (-8.2%)	-1324 (-9.2%)	-673 (-4.7%)
	AVG	-6412 (-17.3%)	-6235 (-16.8%)	-5938 (-16.2%)	-5762 (-15.7%)	-6967 (-18.5%)	-7207 (-18.9%)
Mar	W	-9739 (-19.7%)	-9206 (-18.6%)	-9702 (-19.6%)	-9169 (-18.6%)	-10522 (-21%)	-10783 (-21.1%)
	AN	-10554 (-23.7%)	-11379 (-25.6%)	-9867 (-22.5%)	-10692 (-24.4%)	-11163 (-24.7%)	-11972 (-26.6%)
	BN	-7764 (-31.7%)	-7886 (-32.2%)	-6575 (-28.2%)	-6698 (-28.7%)	-6285 (-27.3%)	-6312 (-27.5%)
	D	-4514 (-21.9%)	-4642 (-22.5%)	-4266 (-20.9%)	-4395 (-21.5%)	-4141 (-20.4%)	-4636 (-22.4%)
	C	-1433 (-10.8%)	-1382 (-10.4%)	-1301 (-9.9%)	-1250 (-9.5%)	-1233 (-9.4%)	-1274 (-9.7%)
	AVG	-7158 (-21.8%)	-7152 (-21.8%)	-6770 (-20.9%)	-6763 (-20.8%)	-7132 (-21.7%)	-7453 (-22.5%)
Apr	W	-9725 (-25.7%)	-9990 (-26.4%)	-9857 (-26%)	-10122 (-26.7%)	-9800 (-25.9%)	-9725 (-25.9%)
	AN	-8292 (-31.9%)	-8360 (-32.2%)	-8319 (-32%)	-8388 (-32.3%)	-7706 (-30.3%)	-7313 (-29.3%)
	BN	-3064 (-17.3%)	-2895 (-16.3%)	-2757 (-15.8%)	-2589 (-14.8%)	-2560 (-14.8%)	-2272 (-13.3%)
	D	-883 (-6.8%)	-79 (-0.6%)	-933 (-7.2%)	-129 (-1%)	-729 (-5.7%)	7 (0.1%)
	C	-334 (-3.3%)	86 (0.8%)	-304 (-3%)	117 (1.1%)	-138 (-1.4%)	-50 (-0.5%)
	AVG	-5063 (-21.9%)	-4890 (-21.1%)	-5063 (-21.9%)	-4890 (-21.1%)	-4852 (-21.1%)	-4548 (-19.9%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
May	W	-11116 (-34.8%)	-14184 (-44.4%)	-10867 (-34.3%)	-13935 (-44%)	-8229 (-28.3%)	-6736 (-27.5%)
	AN	-5747 (-27.3%)	-6089 (-29%)	-5434 (-26.2%)	-5776 (-27.9%)	-4433 (-22.5%)	-3724 (-20%)
	BN	-1978 (-13.9%)	-1816 (-12.8%)	-1602 (-11.6%)	-1440 (-10.4%)	-754 (-5.8%)	16 (0.1%)
	D	-266 (-2.4%)	909 (8.3%)	-21 (-0.2%)	1154 (10.8%)	88 (0.8%)	442 (3.9%)
	C	-193 (-2.5%)	-89 (-1.1%)	-74 (-1%)	30 (0.4%)	-580 (-7.1%)	-351 (-4.4%)
	AVG	-4790 (-25%)	-5512 (-28.7%)	-4530 (-23.9%)	-5252 (-27.8%)	-3452 (-19.4%)	-2632 (-16.2%)
Jun	W	-9190 (-38.5%)	-9502 (-39.8%)	-8962 (-37.9%)	-9274 (-39.2%)	-5048 (-25.6%)	-4206 (-22.6%)
	AN	-3305 (-20.3%)	-2032 (-12.5%)	-3448 (-21%)	-2175 (-13.2%)	-2160 (-14.2%)	-1775 (-11.1%)
	BN	-986 (-7.3%)	-506 (-3.7%)	-830 (-6.2%)	-350 (-2.6%)	-541 (-4.1%)	-828 (-6%)
	D	-399 (-3.3%)	-379 (-3.1%)	-543 (-4.4%)	-523 (-4.2%)	-715 (-5.7%)	-812 (-6.4%)
	C	-711 (-7.2%)	-578 (-5.8%)	-708 (-7.2%)	-574 (-5.8%)	-656 (-6.7%)	-816 (-8.1%)
	AVG	-3758 (-22.9%)	-3564 (-21.7%)	-3711 (-22.7%)	-3517 (-21.5%)	-2262 (-15.2%)	-2032 (-13.7%)
Jul	W	-5865 (-29.5%)	-4067 (-20.5%)	-5877 (-29.6%)	-4080 (-20.5%)	-6319 (-31.1%)	-5616 (-26.2%)
	AN	-5895 (-27.3%)	-5603 (-26%)	-6203 (-28.3%)	-5911 (-27%)	-6507 (-29.3%)	-6757 (-29.7%)
	BN	-6018 (-28.7%)	-6897 (-32.9%)	-6323 (-29.7%)	-7203 (-33.9%)	-6017 (-28.7%)	-6457 (-31.5%)
	D	-5081 (-26.4%)	-6994 (-36.3%)	-4885 (-25.6%)	-6797 (-35.6%)	-4478 (-24%)	-6679 (-35.2%)
	C	-5534 (-35.9%)	-4818 (-31.3%)	-4315 (-30.4%)	-3599 (-25.4%)	-4286 (-30.3%)	-3188 (-23.2%)
	AVG	-5675 (-29.1%)	-5527 (-28.3%)	-5555 (-28.6%)	-5407 (-27.9%)	-5593 (-28.8%)	-5804 (-29.3%)
Aug	W	-6963 (-44%)	-6605 (-41.8%)	-7059 (-44.4%)	-6701 (-42.1%)	-7029 (-44.3%)	-6853 (-42.7%)
	AN	-5258 (-33.1%)	-4702 (-29.6%)	-5771 (-35.2%)	-5214 (-31.8%)	-5967 (-36%)	-6316 (-36.1%)
	BN	-5816 (-37.2%)	-5899 (-37.7%)	-5937 (-37.7%)	-6019 (-38.2%)	-5417 (-35.5%)	-6488 (-40%)
	D	-6857 (-40.4%)	-6813 (-40.2%)	-5754 (-36.3%)	-5709 (-36%)	-4396 (-30.3%)	-4199 (-29.3%)
	C	-2110 (-20.9%)	-2048 (-20.3%)	-1916 (-19.4%)	-1855 (-18.7%)	-1312 (-14.1%)	-950 (-10.6%)
	AVG	-5784 (-38%)	-5585 (-36.7%)	-5640 (-37.4%)	-5440 (-36.1%)	-5184 (-35.5%)	-5266 (-35.4%)
Sep	W	-10067 (-55.1%)	-10291 (-56.4%)	-19384 (-70.3%)	-19608 (-71.1%)	-18657 (-69.5%)	-19250 (-70.7%)
	AN	-5306 (-40.2%)	-4950 (-37.5%)	-12657 (-61.6%)	-12301 (-59.9%)	-13334 (-62.8%)	-12757 (-60.7%)
	BN	-4664 (-37.5%)	-4527 (-36.4%)	-4577 (-37.1%)	-4440 (-36%)	-5020 (-39.3%)	-4406 (-35.8%)
	D	-4395 (-36.2%)	-3825 (-31.5%)	-3389 (-30.4%)	-2819 (-25.3%)	-1987 (-20.4%)	-291 (-3.4%)
	C	-889 (-10.5%)	-187 (-2.2%)	-463 (-5.7%)	238 (3%)	-91 (-1.2%)	1005 (13.8%)
	AVG	-5859 (-42.6%)	-5627 (-40.9%)	-9591 (-54.9%)	-9359 (-53.5%)	-9174 (-53.8%)	-8639 (-51.5%)
Oct	W	-3958 (-29.3%)	-223 (-1.7%)	-3356 (-26%)	379 (2.9%)	-3236 (-25.3%)	4 (0%)
	AN	-2312 (-20.8%)	2489 (22.4%)	-1630 (-15.6%)	3171 (30.4%)	-1620 (-15.5%)	1743 (14.7%)
	BN	-2281 (-19.7%)	2947 (25.5%)	-1776 (-16.1%)	3452 (31.2%)	-1306 (-12.3%)	2381 (19.6%)
	D	-1543 (-15%)	2407 (23.4%)	-1162 (-11.7%)	2789 (28.2%)	-1493 (-14.6%)	2200 (21%)
	C	-1017 (-10.1%)	3845 (38.2%)	-481 (-5%)	4381 (45.9%)	-333 (-3.5%)	3954 (39.7%)
	AVG	-2470 (-21.3%)	1888 (16.3%)	-1931 (-17.4%)	2427 (21.9%)	-1863 (-16.9%)	1724 (14.6%)
Nov	W	-5652 (-29.1%)	-6189 (-31.8%)	-6977 (-33.6%)	-7514 (-36.2%)	-6684 (-32.6%)	-6027 (-31.3%)
	AN	-4047 (-26.4%)	-5641 (-36.8%)	-5594 (-33.2%)	-7188 (-42.6%)	-5601 (-33.2%)	-6258 (-39.3%)
	BN	-3288 (-26.1%)	-4087 (-32.5%)	-4435 (-32.3%)	-5234 (-38.1%)	-4259 (-31.4%)	-4549 (-34.9%)
	D	-2782 (-21.6%)	-4318 (-33.6%)	-2599 (-20.5%)	-4135 (-32.6%)	-2412 (-19.3%)	-3363 (-28.2%)
	C	-1635 (-17%)	-1559 (-16.2%)	-1826 (-18.6%)	-1750 (-17.8%)	-1451 (-15.4%)	-1222 (-13.1%)
	AVG	-3795 (-25.7%)	-4662 (-31.5%)	-4626 (-29.6%)	-5492 (-35.2%)	-4408 (-28.6%)	-4521 (-30.9%)
Dec	W	-6880 (-17.3%)	-8503 (-21.4%)	-4636 (-12.4%)	-6260 (-16.7%)	-6507 (-16.5%)	-5817 (-15.7%)
	AN	-1996 (-9.2%)	-259 (-1.2%)	-2574 (-11.6%)	-837 (-3.8%)	-3030 (-13.4%)	-1225 (-5.4%)
	BN	-818 (-4.9%)	-927 (-5.6%)	-1075 (-6.3%)	-1184 (-7%)	-1311 (-7.6%)	-941 (-5.6%)
	D	-689 (-4.5%)	-994 (-6.4%)	-757 (-4.9%)	-1063 (-6.9%)	-631 (-4.1%)	-711 (-4.7%)
	C	-332 (-2.8%)	-621 (-5.3%)	195 (1.7%)	-94 (-0.8%)	644 (5.9%)	562 (5.3%)
	AVG	-2813 (-11.9%)	-3201 (-13.5%)	-2168 (-9.4%)	-2557 (-11.1%)	-2775 (-11.7%)	-2258 (-9.9%)

[1]A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

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Table C.5.3-5. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Yolo Bypass at Delta Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	26,963	26,126	30,433	32,670	34,052	35,972
	AN	7,560	7,386	7,727	7,913	10,709	9,653
	BN	1,007	1,046	966	961	2,976	2,871
	D	536	543	633	500	1,281	1,211
	C	299	318	302	306	721	694
	AVG	9,989	9,709	11,128	11,835	13,259	13,676
Feb	W	31,634	31,023	36,518	38,424	39,153	41,241
	AN	13,234	11,939	13,208	14,188	17,945	18,362
	BN	3,018	2,781	3,232	2,539	5,553	5,337
	D	1,703	1,721	1,797	1,821	2,762	2,733
	C	352	363	363	363	803	797
	AVG	12,908	12,490	14,511	15,146	16,712	17,391
Mar	W	21,628	21,365	23,472	25,168	25,695	27,454
	AN	9,041	8,378	9,721	10,281	12,612	13,209
	BN	715	693	628	631	2,280	2,175
	D	749	703	722	729	1,832	1,793
	C	279	292	292	292	701	693
	AVG	8,508	8,315	9,174	9,795	10,887	11,505
Apr	W	6,490	6,535	6,932	6,953	9,249	8,994
	AN	1,400	1,424	1,429	1,450	2,910	2,926
	BN	488	568	569	563	1,111	1,114
	D	306	308	308	308	530	545
	C	104	107	107	107	212	213
	AVG	2,428	2,461	2,587	2,596	3,695	3,621
May	W	640	631	457	229	557	329
	AN	183	183	183	183	283	283
	BN	64	67	67	67	167	167
	D	76	77	77	77	177	177
	C	65	68	68	68	168	168
	AVG	267	265	210	138	310	238
Jun	W	240	230	120	118	220	214
	AN	65	66	66	66	166	166
	BN	64	66	66	66	166	166
	D	65	67	67	67	167	167
	C	63	64	64	64	164	164
	AVG	120	118	83	82	183	181
Jul	W	47	48	48	48	48	48
	AN	47	48	48	48	48	48
	BN	47	48	48	48	48	48
	D	47	48	48	48	48	48
	C	47	48	48	55	48	48
	AVG	47	48	48	49	48	48

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	149	143	147	143	143	147
	AN	96	95	95	95	95	95
	BN	116	114	114	114	114	114
	D	61	61	62	62	62	62
	C	54	54	54	54	86	54
	AVG	102	100	101	100	105	101
Sep	W	76	102	103	110	173	173
	AN	68	65	65	65	165	165
	BN	88	86	86	86	185	185
	D	74	73	72	76	165	165
	C	109	78	109	182	175	213
	AVG	81	84	89	102	172	178
Oct	W	305	166	174	126	225	225
	AN	37	32	39	38	134	139
	BN	52	47	52	50	141	141
	D	125	122	130	121	221	229
	C	39	41	41	44	141	146
	AVG	144	98	104	87	184	187
Nov	W	1,196	1,094	1,262	876	1,573	1,113
	AN	132	190	220	159	257	202
	BN	29	37	34	35	139	138
	D	120	133	68	69	236	168
	C	15	27	27	27	119	127
	AVG	432	414	457	326	629	461
Dec	W	9,767	8,680	11,064	9,209	15,027	12,422
	AN	1,663	1,718	2,150	1,772	2,604	2,341
	BN	1,408	1,443	2,145	1,505	2,383	1,830
	D	353	331	340	343	770	719
	C	78	89	107	98	249	228
	AVG	3,669	3,336	4,279	3,526	5,758	4,785

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Table C.5.3-6. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Yolo Bypass at Delta[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	7090 (26.3%)	9009 (33.4%)	7926 (30.3%)	9846 (37.7%)	3619 (11.9%)	3302 (10.1%)
	AN	3148 (41.6%)	2092 (27.7%)	3323 (45%)	2267 (30.7%)	2982 (38.6%)	1739 (22%)
	BN	1969 (195.6%)	1864 (185.1%)	1930 (184.5%)	1825 (174.4%)	2010 (208%)	1909 (198.6%)
	D	746 (139.1%)	675 (126%)	739 (136.1%)	668 (123%)	649 (102.5%)	711 (142.1%)
	C	422 (141.1%)	396 (132.4%)	402 (126.4%)	376 (118.2%)	419 (139%)	389 (127.2%)
	AVG	3270 (32.7%)	3687 (36.9%)	3550 (36.6%)	3967 (40.9%)	2131 (19.1%)	1840 (15.5%)
Feb	W	7519 (23.8%)	9607 (30.4%)	8130 (26.2%)	10218 (32.9%)	2635 (7.2%)	2818 (7.3%)
	AN	4710 (35.6%)	5128 (38.7%)	6006 (50.3%)	6423 (53.8%)	4737 (35.9%)	4174 (29.4%)
	BN	2535 (84%)	2318 (76.8%)	2772 (99.7%)	2555 (91.9%)	2322 (71.8%)	2798 (110.2%)
	D	1059 (62.2%)	1031 (60.5%)	1040 (60.4%)	1012 (58.8%)	965 (53.7%)	912 (50.1%)
	C	452 (128.3%)	445 (126.6%)	440 (121.1%)	434 (119.4%)	440 (121.1%)	434 (119.4%)
	AVG	3805 (29.5%)	4484 (34.7%)	4223 (33.8%)	4902 (39.2%)	2201 (15.2%)	2246 (14.8%)
Mar	W	4067 (18.8%)	5827 (26.9%)	4330 (20.3%)	6090 (28.5%)	2223 (9.5%)	2286 (9.1%)
	AN	3572 (39.5%)	4169 (46.1%)	4235 (50.5%)	4832 (57.7%)	2891 (29.7%)	2929 (28.5%)
	BN	1565 (219%)	1461 (204.4%)	1587 (229.2%)	1483 (214.1%)	1652 (263.1%)	1544 (244.7%)
	D	1083 (144.5%)	1044 (139.4%)	1129 (160.7%)	1091 (155.2%)	1110 (153.9%)	1064 (145.9%)
	C	421 (150.8%)	414 (148%)	409 (139.7%)	401 (137.1%)	409 (139.7%)	401 (137.1%)
	AVG	2379 (28%)	2997 (35.2%)	2571 (30.9%)	3189 (38.4%)	1713 (18.7%)	1709 (17.5%)
Apr	W	2759 (42.5%)	2504 (38.6%)	2714 (41.5%)	2459 (37.6%)	2317 (33.4%)	2041 (29.4%)
	AN	1510 (107.9%)	1526 (109%)	1486 (104.3%)	1502 (105.4%)	1481 (103.6%)	1476 (101.8%)
	BN	623 (127.8%)	626 (128.4%)	542 (95.4%)	545 (95.9%)	542 (95.3%)	550 (97.7%)
	D	224 (73.3%)	240 (78.4%)	222 (72%)	237 (77.1%)	222 (72%)	237 (77.1%)
	C	108 (103.8%)	109 (104.2%)	106 (99.4%)	106 (99.8%)	106 (99.4%)	106 (99.8%)
	AVG	1267 (52.2%)	1193 (49.1%)	1235 (50.2%)	1160 (47.2%)	1108 (42.8%)	1025 (39.5%)
May	W	-83 (-13%)	-311 (-48.6%)	-74 (-11.8%)	-302 (-47.9%)	100 (21.8%)	100 (43.5%)
	AN	100 (54.4%)	100 (54.4%)	100 (54.7%)	100 (54.7%)	100 (54.7%)	100 (54.7%)
	BN	103 (159.7%)	103 (159.7%)	100 (148.7%)	100 (148.7%)	100 (148.7%)	100 (148.7%)
	D	101 (134%)	101 (134%)	100 (129.8%)	100 (129.8%)	100 (129.8%)	100 (129.8%)
	C	103 (158%)	103 (158%)	100 (147.2%)	100 (147.2%)	100 (147.2%)	100 (147.2%)
	AVG	43 (16.1%)	-29 (-10.9%)	45 (16.9%)	-27 (-10.4%)	100 (47.6%)	100 (72.5%)
Jun	W	-20 (-8.3%)	-26 (-10.8%)	-10 (-4.2%)	-16 (-6.8%)	100 (83%)	96 (81.6%)
	AN	102 (156.5%)	102 (156.5%)	100 (150.6%)	100 (150.6%)	100 (150.6%)	100 (150.6%)
	BN	102 (157.5%)	102 (157.5%)	100 (151.4%)	100 (151.4%)	100 (151.4%)	100 (151.4%)
	D	102 (156.2%)	102 (156.2%)	100 (150.2%)	100 (150.2%)	100 (150.2%)	100 (150.2%)
	C	102 (161.3%)	102 (161.3%)	100 (155.2%)	100 (155.2%)	100 (155.2%)	100 (155.2%)
	AVG	63 (52.5%)	61 (50.9%)	65 (55.3%)	63 (53.7%)	100 (120.2%)	99 (119.9%)
Jul	W	1 (1.9%)	1 (1.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AN	1 (1.9%)	1 (1.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	1 (1.9%)	1 (1.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	1 (1.9%)	1 (1.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	1 (1.9%)	1 (1.9%)	0 (0%)	0 (0%)	0 (0%)	-7 (-13.1%)
	AVG	1 (1.9%)	1 (1.9%)	0 (0%)	0 (0%)	0 (0%)	-1 (-2.2%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-6 (-4.1%)	-2 (-1.6%)	0 (0%)	4 (2.7%)	-4 (-2.6%)	4 (2.7%)
	AN	-1 (-1.3%)	-1 (-1.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	-2 (-2.1%)	-2 (-2.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	1 (1.6%)	1 (1.8%)	0 (0.7%)	1 (0.9%)	0 (-0.2%)	0 (0%)
	C	33 (61.1%)	1 (1.3%)	32 (58.9%)	0 (0%)	32 (58.9%)	0 (0%)
	AVG	2 (2.4%)	-1 (-1%)	5 (4.8%)	1 (1.3%)	3 (3.4%)	1 (1.2%)
Sep	W	97 (127.4%)	97 (127.4%)	71 (69.3%)	71 (69.3%)	69 (67.3%)	63 (57.1%)
	AN	97 (143.8%)	97 (143.8%)	100 (153.4%)	100 (153.4%)	100 (153.4%)	100 (153.4%)
	BN	97 (111.2%)	97 (111.2%)	99 (115.4%)	99 (115.4%)	99 (115.3%)	99 (115.8%)
	D	91 (122.7%)	91 (122.7%)	92 (126.3%)	92 (126.3%)	93 (129.2%)	89 (118.1%)
	C	65 (59.5%)	103 (94.6%)	96 (122.8%)	135 (171.7%)	66 (60.5%)	31 (16.8%)
	AVG	91 (112.1%)	97 (119%)	88 (105.1%)	94 (111.7%)	84 (94.3%)	76 (73.9%)
Oct	W	-80 (-26.3%)	-81 (-26.4%)	59 (35.2%)	58 (35.1%)	51 (29.2%)	99 (78.2%)
	AN	97 (263.9%)	102 (275.6%)	103 (325.8%)	107 (339.5%)	96 (246.9%)	101 (263.6%)
	BN	89 (171.5%)	89 (171.5%)	95 (203.4%)	95 (203.4%)	89 (170.5%)	91 (182.9%)
	D	96 (77.1%)	105 (83.7%)	99 (81.7%)	108 (88.5%)	91 (70.1%)	108 (89.5%)
	C	103 (266.8%)	107 (278.1%)	100 (241.6%)	104 (252.1%)	100 (241.6%)	102 (232.5%)
	AVG	40 (27.9%)	43 (30%)	86 (87.9%)	89 (91%)	80 (76.6%)	100 (115.2%)
Nov	W	377 (31.5%)	-82 (-6.9%)	478 (43.7%)	19 (1.7%)	311 (24.6%)	238 (27.1%)
	AN	126 (95.2%)	70 (52.8%)	67 (35.4%)	11 (6%)	38 (17.2%)	43 (26.9%)
	BN	110 (381%)	109 (378.4%)	102 (276.1%)	101 (274%)	105 (313.1%)	103 (296%)
	D	116 (97%)	48 (39.6%)	103 (77.4%)	34 (25.6%)	169 (250.2%)	98 (142.3%)
	C	105 (711.6%)	112 (763.8%)	92 (345.6%)	100 (374.3%)	92 (345.6%)	100 (367.6%)
	AVG	198 (45.8%)	30 (6.9%)	215 (51.9%)	47 (11.4%)	173 (37.8%)	135 (41.5%)
Dec	W	5260 (53.9%)	2655 (27.2%)	6347 (73.1%)	3742 (43.1%)	3963 (35.8%)	3213 (34.9%)
	AN	941 (56.6%)	678 (40.8%)	886 (51.5%)	622 (36.2%)	454 (21.1%)	568 (32.1%)
	BN	975 (69.3%)	422 (30%)	939 (65.1%)	386 (26.8%)	238 (11.1%)	325 (21.6%)
	D	418 (118.4%)	367 (104%)	439 (132.7%)	388 (117.4%)	431 (126.7%)	377 (110%)
	C	172 (220.8%)	151 (194.1%)	161 (181.3%)	140 (157.8%)	142 (133.5%)	131 (133.4%)
	AVG	2089 (56.9%)	1116 (30.4%)	2423 (72.6%)	1449 (43.4%)	1479 (34.6%)	1259 (35.7%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

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Table C.5.3-7. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Mokelumne River at Delta Estimated from CALSIM II

Month	WY Type[1]	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	3,071	3,098	3,389	3,634	3,389	3,634
	AN	1,707	1,691	1,759	1,876	1,759	1,876
	BN	597	598	622	617	622	617
	D	495	497	484	493	484	493
	C	280	301	282	281	282	281
	AVG	1,460	1,469	1,565	1,660	1,565	1,660
Feb	W	3,290	3,280	3,720	3,781	3,720	3,781
	AN	2,525	2,648	2,894	2,913	2,894	2,913
	BN	1,011	994	1,045	1,035	1,045	1,035
	D	695	697	684	678	684	678
	C	426	447	441	442	441	442
	AVG	1,809	1,832	2,014	2,033	2,014	2,033
Mar	W	3,179	3,204	3,243	3,336	3,243	3,336
	AN	1,582	1,651	1,633	1,639	1,633	1,639
	BN	1,181	1,175	1,144	1,140	1,144	1,140
	D	754	754	712	691	712	691
	C	595	613	581	580	581	580
	AVG	1,662	1,685	1,675	1,700	1,675	1,700
Apr	W	2,819	2,803	2,748	2,694	2,748	2,694
	AN	1,619	1,628	1,529	1,424	1,529	1,424
	BN	1,243	1,251	1,164	1,068	1,164	1,068
	D	623	627	577	550	577	550
	C	340	350	322	311	322	311
	AVG	1,503	1,504	1,442	1,384	1,442	1,384
May	W	3,170	3,137	3,094	2,885	3,094	2,885
	AN	1,439	1,401	1,303	1,179	1,303	1,179
	BN	976	959	886	812	886	812
	D	406	406	360	333	360	333
	C	181	196	179	170	179	170
	AVG	1,463	1,446	1,392	1,289	1,392	1,289
Jun	W	1,755	1,731	1,605	1,415	1,605	1,415
	AN	851	827	727	631	727	631
	BN	471	458	400	366	400	366
	D	93	93	83	76	83	76
	C	52	52	48	44	48	44
	AVG	779	766	697	616	697	616
Jul	W	772	748	613	469	613	469
	AN	347	313	228	167	228	167
	BN	123	114	88	70	88	70
	D	7	7	6	6	6	6
	C	3	3	3	3	3	3
	AVG	315	300	239	183	239	183

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Month	WY Type[1]	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	703	680	476	346	476	346
	AN	328	295	241	216	241	216
	BN	112	103	79	71	79	71
	D	4	4	4	4	4	4
	C	2	2	2	2	2	2
	AVG	289	274	200	156	200	156
Sep	W	702	679	549	497	549	497
	AN	333	299	271	259	271	259
	BN	114	105	95	91	95	91
	D	9	9	9	9	9	9
	C	5	5	5	5	5	5
	AVG	291	276	231	213	231	213
Oct	W	161	158	152	147	152	147
	AN	178	183	178	180	178	180
	BN	154	157	148	144	148	144
	D	180	184	169	160	169	160
	C	117	136	125	123	125	123
	AVG	158	163	154	150	154	150
Nov	W	487	482	502	431	502	431
	AN	912	918	1,009	855	1,009	855
	BN	347	347	347	301	347	301
	D	380	379	371	327	371	327
	C	195	214	202	186	202	186
	AVG	474	477	497	429	497	429
Dec	W	1,504	1,539	1,766	1,732	1,766	1,732
	AN	1,411	1,412	1,806	1,628	1,806	1,628
	BN	447	449	505	472	505	472
	D	384	385	392	374	392	374
	C	204	224	217	209	217	209
	AVG	887	902	1,054	999	1,054	999

[1] Water-year type was determined using the San Joaquin River Water-Year Type Classification

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Table C.5.3-8. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Mokelumne River at Delta[1]

Month	WY Type[2]	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	318 (10.3%)	563 (18.3%)	291 (9.4%)	536 (17.3%)	0 (0%)	0 (0%)
	AN	52 (3%)	169 (9.9%)	68 (4%)	185 (10.9%)	0 (0%)	0 (0%)
	BN	25 (4.2%)	21 (3.4%)	24 (4%)	19 (3.3%)	0 (0%)	0 (0%)
	D	-11 (-2.3%)	-2 (-0.5%)	-14 (-2.8%)	-5 (-0.9%)	0 (0%)	0 (0%)
	C	2 (0.6%)	1 (0.3%)	-19 (-6.3%)	-20 (-6.6%)	0 (0%)	0 (0%)
	AVG	106 (7.2%)	201 (13.8%)	96 (6.6%)	192 (13%)	0 (0%)	0 (0%)
Feb	W	430 (13.1%)	491 (14.9%)	440 (13.4%)	501 (15.3%)	0 (0%)	0 (0%)
	AN	369 (14.6%)	388 (15.4%)	246 (9.3%)	265 (10%)	0 (0%)	0 (0%)
	BN	35 (3.4%)	24 (2.4%)	51 (5.1%)	40 (4%)	0 (0%)	0 (0%)
	D	-11 (-1.5%)	-17 (-2.4%)	-13 (-1.9%)	-19 (-2.7%)	0 (0%)	0 (0%)
	C	15 (3.5%)	15 (3.5%)	-6 (-1.3%)	-6 (-1.2%)	0 (0%)	0 (0%)
	AVG	205 (11.3%)	223 (12.3%)	182 (9.9%)	201 (10.9%)	0 (0%)	0 (0%)
Mar	W	65 (2%)	158 (5%)	40 (1.2%)	133 (4.1%)	0 (0%)	0 (0%)
	AN	50 (3.2%)	57 (3.6%)	-18 (-1.1%)	-12 (-0.7%)	0 (0%)	0 (0%)
	BN	-37 (-3.2%)	-41 (-3.4%)	-31 (-2.6%)	-34 (-2.9%)	0 (0%)	0 (0%)
	D	-43 (-5.6%)	-63 (-8.3%)	-43 (-5.6%)	-63 (-8.3%)	0 (0%)	0 (0%)
	C	-14 (-2.3%)	-15 (-2.5%)	-32 (-5.2%)	-33 (-5.4%)	0 (0%)	0 (0%)
	AVG	13 (0.8%)	38 (2.3%)	-10 (-0.6%)	15 (0.9%)	0 (0%)	0 (0%)
Apr	W	-71 (-2.5%)	-125 (-4.4%)	-55 (-1.9%)	-109 (-3.9%)	0 (0%)	0 (0%)
	AN	-90 (-5.6%)	-194 (-12%)	-99 (-6.1%)	-203 (-12.5%)	0 (0%)	0 (0%)
	BN	-79 (-6.4%)	-175 (-14.1%)	-87 (-7%)	-183 (-14.6%)	0 (0%)	0 (0%)
	D	-46 (-7.4%)	-73 (-11.7%)	-50 (-7.9%)	-77 (-12.3%)	0 (0%)	0 (0%)
	C	-18 (-5.3%)	-29 (-8.7%)	-27 (-7.9%)	-39 (-11.1%)	0 (0%)	0 (0%)
	AVG	-62 (-4.1%)	-120 (-8%)	-62 (-4.1%)	-120 (-8%)	0 (0%)	0 (0%)
May	W	-76 (-2.4%)	-284 (-9%)	-43 (-1.4%)	-252 (-8%)	0 (0%)	0 (0%)
	AN	-136 (-9.4%)	-260 (-18.1%)	-98 (-7%)	-223 (-15.9%)	0 (0%)	0 (0%)
	BN	-90 (-9.2%)	-164 (-16.8%)	-73 (-7.6%)	-147 (-15.3%)	0 (0%)	0 (0%)
	D	-46 (-11.2%)	-72 (-17.8%)	-46 (-11.2%)	-72 (-17.8%)	0 (0%)	0 (0%)
	C	-2 (-0.9%)	-11 (-6.1%)	-18 (-8.9%)	-27 (-13.7%)	0 (0%)	0 (0%)
	AVG	-71 (-4.8%)	-174 (-11.9%)	-54 (-3.7%)	-157 (-10.9%)	0 (0%)	0 (0%)
Jun	W	-149 (-8.5%)	-339 (-19.3%)	-126 (-7.3%)	-316 (-18.3%)	0 (0%)	0 (0%)
	AN	-124 (-14.6%)	-220 (-25.8%)	-100 (-12.1%)	-196 (-23.7%)	0 (0%)	0 (0%)
	BN	-72 (-15.2%)	-105 (-22.3%)	-59 (-12.8%)	-92 (-20.1%)	0 (0%)	0 (0%)
	D	-10 (-11.2%)	-17 (-18.8%)	-10 (-11.2%)	-17 (-18.8%)	0 (0%)	0 (0%)
	C	-4 (-8.1%)	-8 (-14.7%)	-4 (-8.1%)	-8 (-14.7%)	0 (0%)	0 (0%)
	AVG	-82 (-10.5%)	-163 (-20.9%)	-68 (-8.9%)	-150 (-19.5%)	0 (0%)	0 (0%)
Jul	W	-159 (-20.6%)	-303 (-39.3%)	-136 (-18.1%)	-280 (-37.4%)	0 (0%)	0 (0%)
	AN	-120 (-34.5%)	-180 (-51.8%)	-86 (-27.4%)	-146 (-46.6%)	0 (0%)	0 (0%)
	BN	-36 (-28.9%)	-54 (-43.4%)	-26 (-23.2%)	-44 (-38.9%)	0 (0%)	0 (0%)
	D	0 (-2%)	0 (-3.1%)	0 (-2%)	0 (-3.1%)	0 (0%)	0 (0%)
	C	0 (-2.6%)	0 (-4.4%)	0 (-2.6%)	0 (-4.4%)	0 (0%)	0 (0%)
	AVG	-76 (-24%)	-132 (-42%)	-61 (-20.2%)	-117 (-39.1%)	0 (0%)	0 (0%)

Draft

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Month	WY Type[2]	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-227 (-32.3%)	-357 (-50.8%)	-204 (-30%)	-334 (-49.1%)	0 (0%)	0 (0%)
	AN	-88 (-26.7%)	-113 (-34.3%)	-54 (-18.4%)	-79 (-26.8%)	0 (0%)	0 (0%)
	BN	-34 (-30%)	-41 (-36.5%)	-25 (-23.8%)	-32 (-30.8%)	0 (0%)	0 (0%)
	D	0 (-0.2%)	0 (-0.5%)	0 (-0.2%)	0 (-0.5%)	0 (0%)	0 (0%)
	C	0 (-1.7%)	0 (-3.1%)	0 (-1.7%)	0 (-3.1%)	0 (0%)	0 (0%)
	AVG	-89 (-30.8%)	-133 (-46.1%)	-74 (-27%)	-118 (-43.2%)	0 (0%)	0 (0%)
Sep	W	-154 (-21.9%)	-205 (-29.3%)	-130 (-19.2%)	-182 (-26.8%)	0 (0%)	0 (0%)
	AN	-61 (-18.4%)	-74 (-22.2%)	-28 (-9.3%)	-40 (-13.5%)	0 (0%)	0 (0%)
	BN	-19 (-16.7%)	-23 (-20.5%)	-10 (-9.4%)	-14 (-13.6%)	0 (0%)	0 (0%)
	D	-1 (-6.6%)	-1 (-5.9%)	-1 (-6.6%)	-1 (-5.9%)	0 (0%)	0 (0%)
	C	0 (5.3%)	0 (4.6%)	0 (-7.5%)	0 (-8.1%)	0 (0%)	0 (0%)
	AVG	-60 (-20.6%)	-78 (-26.9%)	-45 (-16.4%)	-64 (-23%)	0 (0%)	0 (0%)
Oct	W	-9 (-5.4%)	-14 (-8.7%)	-6 (-3.9%)	-12 (-7.3%)	0 (0%)	0 (0%)
	AN	1 (0.3%)	2 (1.1%)	-5 (-2.7%)	-4 (-2%)	0 (0%)	0 (0%)
	BN	-6 (-4.1%)	-10 (-6.6%)	-9 (-6%)	-13 (-8.5%)	0 (0%)	0 (0%)
	D	-12 (-6.4%)	-20 (-11.1%)	-16 (-8.6%)	-24 (-13.2%)	0 (0%)	0 (0%)
	C	8 (7.1%)	6 (4.7%)	-11 (-7.8%)	-13 (-9.8%)	0 (0%)	0 (0%)
	AVG	-4 (-2.3%)	-7 (-4.7%)	-9 (-5.4%)	-13 (-7.8%)	0 (0%)	0 (0%)
Nov	W	15 (3%)	-56 (-11.5%)	20 (4.1%)	-51 (-10.6%)	0 (0%)	0 (0%)
	AN	97 (10.6%)	-57 (-6.3%)	91 (9.9%)	-63 (-6.9%)	0 (0%)	0 (0%)
	BN	0 (-0.1%)	-46 (-13.2%)	0 (-0.1%)	-46 (-13.3%)	0 (0%)	0 (0%)
	D	-9 (-2.5%)	-53 (-13.9%)	-8 (-2.1%)	-52 (-13.7%)	0 (0%)	0 (0%)
	C	7 (3.3%)	-9 (-4.6%)	-12 (-5.7%)	-28 (-12.9%)	0 (0%)	0 (0%)
	AVG	23 (4.9%)	-45 (-9.5%)	20 (4.2%)	-48 (-10.1%)	0 (0%)	0 (0%)
Dec	W	262 (17.4%)	228 (15.2%)	227 (14.7%)	193 (12.5%)	0 (0%)	0 (0%)
	AN	395 (28%)	217 (15.4%)	394 (27.9%)	215 (15.3%)	0 (0%)	0 (0%)
	BN	58 (12.9%)	25 (5.5%)	56 (12.5%)	23 (5.1%)	0 (0%)	0 (0%)
	D	9 (2.2%)	-10 (-2.6%)	7 (1.8%)	-11 (-2.9%)	0 (0%)	0 (0%)
	C	14 (6.8%)	6 (2.9%)	-7 (-3.1%)	-15 (-6.6%)	0 (0%)	0 (0%)
	AVG	167 (18.8%)	113 (12.7%)	152 (16.8%)	97 (10.8%)	0 (0%)	0 (0%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions
[2] Water-year type was determined using the San Joaquin River Water-Year Type Classification.

Agency Draft

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Table C.5.3-9. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for San Joaquin River at Vernalis Estimated from CALSIM II

Month	WY Type[1]	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	9,089	9,004	9,838	9,681	9,890	9,811
	AN	5,447	5,370	5,781	6,011	5,825	6,011
	BN	2,326	2,252	2,291	2,220	2,321	2,255
	D	2,270	2,214	2,247	2,202	2,229	2,236
	C	1,667	1,607	1,603	1,592	1,603	1,592
	AVG	4,777	4,705	5,040	5,018	5,065	5,067
Feb	W	12,750	12,605	14,001	13,191	13,995	13,196
	AN	6,965	6,837	7,100	6,721	7,100	6,680
	BN	2,983	2,885	2,965	2,841	2,921	2,849
	D	2,590	2,447	2,312	2,269	2,312	2,246
	C	2,120	1,953	1,942	1,941	1,943	1,943
	AVG	6,388	6,250	6,699	6,361	6,690	6,352
Mar	W	14,374	14,262	15,127	15,235	15,137	15,234
	AN	6,284	6,180	6,252	6,364	6,252	6,365
	BN	2,949	2,751	2,614	2,476	2,615	2,476
	D	2,479	2,361	2,191	2,146	2,192	2,146
	C	1,813	1,689	1,689	1,688	1,689	1,688
	AVG	6,648	6,520	6,739	6,763	6,742	6,763
Apr	W	11,955	11,895	12,185	12,457	12,181	12,458
	AN	6,014	5,980	5,970	6,042	5,970	6,044
	BN	4,490	4,445	4,161	3,922	4,163	3,924
	D	3,656	3,624	3,380	3,112	3,381	3,113
	C	1,983	1,932	1,844	1,796	1,846	1,797
	AVG	6,351	6,305	6,286	6,291	6,286	6,292
May	W	12,109	12,064	13,210	12,632	13,214	12,636
	AN	5,381	5,380	5,278	5,092	5,280	5,094
	BN	4,074	4,024	3,871	3,657	3,877	3,662
	D	3,308	3,265	3,040	2,823	3,046	2,825
	C	1,964	1,896	1,819	1,798	1,821	1,799
	AVG	6,148	6,106	6,347	6,069	6,351	6,072
Jun	W	11,058	11,046	9,255	6,820	9,254	6,822
	AN	2,965	2,928	2,782	2,678	2,784	2,682
	BN	2,051	2,007	1,960	1,870	1,968	1,876
	D	1,537	1,470	1,361	1,291	1,368	1,295
	C	1,020	980	975	956	977	956
	AVG	4,583	4,547	3,969	3,206	3,971	3,209
Jul	W	7,654	7,730	5,903	4,345	5,906	4,350
	AN	1,958	1,927	1,806	1,801	1,814	1,808
	BN	1,491	1,436	1,432	1,381	1,447	1,392
	D	1,295	1,205	1,146	1,100	1,156	1,107
	C	898	883	869	858	870	860
	AVG	3,239	3,229	2,658	2,184	2,665	2,190

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Month	WY Type[1]	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	3,539	3,522	3,051	2,645	3,053	2,648
	AN	2,000	1,989	1,764	1,699	1,770	1,704
	BN	1,460	1,426	1,423	1,375	1,435	1,383
	D	1,375	1,339	1,272	1,225	1,279	1,230
	C	1,007	1,018	993	987	994	988
	AVG	2,072	2,056	1,858	1,710	1,863	1,715
Sep	W	3,519	3,475	3,306	3,127	3,308	3,129
	AN	2,355	2,338	2,221	2,164	2,224	2,167
	BN	1,829	1,804	1,800	1,748	1,805	1,752
	D	1,796	1,770	1,691	1,643	1,695	1,645
	C	1,402	1,407	1,392	1,378	1,392	1,379
	AVG	2,338	2,314	2,226	2,144	2,228	2,146
Oct	W	2,760	2,748	2,714	2,726	2,721	2,744
	AN	2,745	2,720	2,638	2,595	2,638	2,596
	BN	2,502	2,481	2,412	2,348	2,413	2,349
	D	2,945	2,942	2,849	2,790	2,850	2,792
	C	2,213	2,190	2,162	2,031	2,163	2,032
	AVG	2,639	2,622	2,565	2,515	2,568	2,521
Nov	W	2,534	2,495	2,516	2,411	2,516	2,418
	AN	3,182	3,151	3,232	3,193	3,238	3,208
	BN	2,150	2,120	2,180	1,997	2,224	1,997
	D	2,272	2,244	2,244	2,217	2,290	2,253
	C	1,968	1,944	1,911	1,898	1,912	1,898
	AVG	2,448	2,416	2,441	2,367	2,457	2,378
Dec	W	4,370	4,351	4,835	4,504	4,874	4,556
	AN	4,711	4,604	4,917	4,567	5,026	4,593
	BN	2,182	2,151	2,099	2,065	2,149	2,060
	D	2,129	2,100	2,072	2,166	2,078	2,163
	C	1,729	1,704	1,689	1,694	1,689	1,694
	AVG	3,219	3,178	3,366	3,211	3,407	3,230

[1] Water-year type was determined using the San Joaquin River Water-Year Type Classification

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Table C.5.3-10. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for San Joaquin River at Vernalis[1]

Month	WY Type[2]	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	801 (8.8%)	722 (7.9%)	886 (9.8%)	807 (9%)	51 (0.5%)	130 (1.3%)
	AN	378 (6.9%)	564 (10.4%)	455 (8.5%)	641 (11.9%)	44 (0.8%)	0 (0%)
	BN	-5 (-0.2%)	-71 (-3.1%)	69 (3.1%)	3 (0.1%)	30 (1.3%)	35 (1.6%)
	D	-41 (-1.8%)	-34 (-1.5%)	15 (0.7%)	22 (1%)	-17 (-0.8%)	35 (1.6%)
	C	-64 (-3.9%)	-75 (-4.5%)	-4 (-0.2%)	-15 (-0.9%)	0 (0%)	0 (0%)
	AVG	288 (6%)	290 (6.1%)	361 (7.7%)	362 (7.7%)	26 (0.5%)	49 (1%)
Feb	W	1245 (9.8%)	445 (3.5%)	1391 (11%)	591 (4.7%)	-6 (0%)	5 (0%)
	AN	135 (1.9%)	-284 (-4.1%)	263 (3.8%)	-157 (-2.3%)	-1 (0%)	-41 (-0.6%)
	BN	-61 (-2.1%)	-134 (-4.5%)	36 (1.3%)	-36 (-1.3%)	-44 (-1.5%)	8 (0.3%)
	D	-278 (-10.7%)	-345 (-13.3%)	-135 (-5.5%)	-201 (-8.2%)	0 (0%)	-24 (-1%)
	C	-177 (-8.3%)	-177 (-8.4%)	-10 (-0.5%)	-11 (-0.6%)	1 (0%)	1 (0.1%)
	AVG	302 (4.7%)	-36 (-0.6%)	441 (7.1%)	103 (1.6%)	-9 (-0.1%)	-9 (-0.1%)
Mar	W	763 (5.3%)	860 (6%)	875 (6.1%)	972 (6.8%)	10 (0.1%)	-1 (0%)
	AN	-32 (-0.5%)	81 (1.3%)	72 (1.2%)	185 (3%)	0 (0%)	0 (0%)
	BN	-334 (-11.3%)	-473 (-16%)	-137 (-5%)	-275 (-10%)	1 (0%)	0 (0%)
	D	-287 (-11.6%)	-333 (-13.4%)	-169 (-7.2%)	-215 (-9.1%)	1 (0%)	0 (0%)
	C	-124 (-6.8%)	-125 (-6.9%)	0 (0%)	-2 (-0.1%)	0 (0%)	0 (0%)
	AVG	94 (1.4%)	115 (1.7%)	221 (3.4%)	243 (3.7%)	3 (0%)	0 (0%)
Apr	W	227 (1.9%)	503 (4.2%)	287 (2.4%)	563 (4.7%)	-3 (0%)	1 (0%)
	AN	-44 (-0.7%)	29 (0.5%)	-9 (-0.2%)	64 (1.1%)	1 (0%)	1 (0%)
	BN	-327 (-7.3%)	-566 (-12.6%)	-283 (-6.4%)	-522 (-11.7%)	2 (0%)	2 (0%)
	D	-275 (-7.5%)	-544 (-14.9%)	-243 (-6.7%)	-511 (-14.1%)	2 (0.1%)	1 (0%)
	C	-138 (-6.9%)	-187 (-9.4%)	-87 (-4.5%)	-136 (-7%)	2 (0.1%)	1 (0%)
	AVG	-65 (-1%)	-59 (-0.9%)	-18 (-0.3%)	-13 (-0.2%)	0 (0%)	1 (0%)
May	W	1105 (9.1%)	526 (4.3%)	1150 (9.5%)	571 (4.7%)	4 (0%)	3 (0%)
	AN	-101 (-1.9%)	-288 (-5.3%)	-100 (-1.9%)	-287 (-5.3%)	3 (0.1%)	2 (0%)
	BN	-197 (-4.8%)	-412 (-10.1%)	-148 (-3.7%)	-363 (-9%)	6 (0.1%)	5 (0.1%)
	D	-263 (-7.9%)	-483 (-14.6%)	-219 (-6.7%)	-440 (-13.5%)	5 (0.2%)	2 (0.1%)
	C	-144 (-7.3%)	-165 (-8.4%)	-76 (-4%)	-97 (-5.1%)	2 (0.1%)	1 (0.1%)
	AVG	203 (3.3%)	-76 (-1.2%)	244 (4%)	-35 (-0.6%)	4 (0.1%)	3 (0%)
Jun	W	-1803 (-16.3%)	-4236 (-38.3%)	-1792 (-16.2%)	-4224 (-38.2%)	-1 (0%)	2 (0%)
	AN	-180 (-6.1%)	-283 (-9.5%)	-143 (-4.9%)	-246 (-8.4%)	2 (0.1%)	4 (0.1%)
	BN	-83 (-4%)	-175 (-8.5%)	-39 (-1.9%)	-131 (-6.5%)	8 (0.4%)	6 (0.3%)
	D	-169 (-11%)	-242 (-15.7%)	-102 (-7%)	-175 (-11.9%)	7 (0.5%)	4 (0.3%)
	C	-43 (-4.2%)	-64 (-6.3%)	-3 (-0.3%)	-23 (-2.4%)	2 (0.2%)	1 (0.1%)
	AVG	-611 (-13.3%)	-1374 (-30%)	-575 (-12.7%)	-1337 (-29.4%)	3 (0.1%)	3 (0.1%)
Jul	W	-1748 (-22.8%)	-3304 (-43.2%)	-1824 (-23.6%)	-3380 (-43.7%)	3 (0.1%)	5 (0.1%)
	AN	-144 (-7.4%)	-150 (-7.7%)	-114 (-5.9%)	-119 (-6.2%)	8 (0.4%)	7 (0.4%)
	BN	-44 (-2.9%)	-99 (-6.6%)	11 (0.8%)	-44 (-3.1%)	16 (1.1%)	11 (0.8%)
	D	-139 (-10.8%)	-188 (-14.5%)	-49 (-4.1%)	-98 (-8.2%)	11 (0.9%)	7 (0.6%)
	C	-29 (-3.2%)	-38 (-4.2%)	-13 (-1.5%)	-23 (-2.6%)	1 (0.1%)	2 (0.2%)
	AVG	-574 (-17.7%)	-1049 (-32.4%)	-565 (-17.5%)	-1039 (-32.2%)	7 (0.3%)	6 (0.3%)

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Month	WY Type[2]	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-485 (-13.7%)	-891 (-25.2%)	-469 (-13.3%)	-874 (-24.8%)	3 (0.1%)	3 (0.1%)
	AN	-231 (-11.5%)	-296 (-14.8%)	-220 (-11%)	-285 (-14.3%)	6 (0.3%)	5 (0.3%)
	BN	-25 (-1.7%)	-77 (-5.3%)	9 (0.6%)	-43 (-3%)	11 (0.8%)	8 (0.6%)
	D	-96 (-7%)	-145 (-10.6%)	-60 (-4.5%)	-109 (-8.1%)	7 (0.6%)	4 (0.4%)
	C	-13 (-1.3%)	-19 (-1.9%)	-24 (-2.4%)	-30 (-3%)	1 (0.1%)	1 (0.1%)
	AVG	-209 (-10.1%)	-358 (-17.3%)	-193 (-9.4%)	-342 (-16.6%)	5 (0.3%)	4 (0.2%)
Sep	W	-211 (-6%)	-390 (-11.1%)	-167 (-4.8%)	-346 (-10%)	1 (0%)	2 (0.1%)
	AN	-130 (-5.5%)	-188 (-8%)	-114 (-4.9%)	-171 (-7.3%)	3 (0.1%)	2 (0.1%)
	BN	-24 (-1.3%)	-77 (-4.2%)	1 (0%)	-52 (-2.9%)	5 (0.3%)	4 (0.2%)
	D	-102 (-5.7%)	-151 (-8.4%)	-75 (-4.3%)	-125 (-7.1%)	3 (0.2%)	2 (0.1%)
	C	-10 (-0.7%)	-24 (-1.7%)	-15 (-1%)	-28 (-2%)	1 (0%)	1 (0.1%)
	AVG	-109 (-4.7%)	-192 (-8.2%)	-86 (-3.7%)	-168 (-7.3%)	2 (0.1%)	2 (0.1%)
Oct	W	-38 (-1.4%)	-16 (-0.6%)	-27 (-1%)	-5 (-0.2%)	7 (0.3%)	18 (0.7%)
	AN	-106 (-3.9%)	-149 (-5.4%)	-81 (-3%)	-124 (-4.6%)	1 (0%)	1 (0%)
	BN	-89 (-3.6%)	-153 (-6.1%)	-68 (-2.7%)	-132 (-5.3%)	1 (0%)	1 (0%)
	D	-95 (-3.2%)	-153 (-5.2%)	-92 (-3.1%)	-150 (-5.1%)	1 (0%)	1 (0%)
	C	-50 (-2.2%)	-181 (-8.2%)	-27 (-1.2%)	-158 (-7.2%)	1 (0%)	1 (0%)
	AVG	-71 (-2.7%)	-118 (-4.5%)	-54 (-2.1%)	-101 (-3.9%)	3 (0.1%)	6 (0.2%)
Nov	W	-18 (-0.7%)	-116 (-4.6%)	21 (0.8%)	-77 (-3.1%)	0 (0%)	6 (0.3%)
	AN	56 (1.8%)	26 (0.8%)	87 (2.8%)	57 (1.8%)	6 (0.2%)	14 (0.5%)
	BN	73 (3.4%)	-154 (-7.1%)	104 (4.9%)	-123 (-5.8%)	44 (2%)	0 (0%)
	D	18 (0.8%)	-20 (-0.9%)	45 (2%)	8 (0.4%)	46 (2%)	35 (1.6%)
	C	-57 (-2.9%)	-70 (-3.6%)	-33 (-1.7%)	-46 (-2.4%)	0 (0%)	0 (0%)
	AVG	9 (0.4%)	-70 (-2.9%)	40 (1.7%)	-39 (-1.6%)	15 (0.6%)	10 (0.4%)
Dec	W	504 (11.5%)	186 (4.3%)	523 (12%)	205 (4.7%)	39 (0.8%)	52 (1.2%)
	AN	315 (6.7%)	-118 (-2.5%)	422 (9.2%)	-11 (-0.2%)	109 (2.2%)	26 (0.6%)
	BN	-32 (-1.5%)	-121 (-5.6%)	-1 (-0.1%)	-90 (-4.2%)	50 (2.4%)	-4 (-0.2%)
	D	-51 (-2.4%)	34 (1.6%)	-22 (-1.1%)	63 (3%)	6 (0.3%)	-3 (-0.1%)
	C	-41 (-2.3%)	-35 (-2%)	-15 (-0.9%)	-10 (-0.6%)	-1 (-0.1%)	0 (0%)
	AVG	188 (5.8%)	11 (0.3%)	229 (7.2%)	52 (1.6%)	41 (1.2%)	19 (0.6%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.
[2] Water-year type was determined using the San Joaquin River Water-Year Type Classification

Draft

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Table C.5.3-11. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Old and Middle Rivers Estimated from CALSIM II

Month	WY Type[1]	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	-1,869	-2,129	-1,808	-1,476	4,150	4,159
	AN	-3,579	-3,746	-3,465	-3,405	-118	205
	BN	-3,985	-4,207	-4,349	-4,124	-2,557	-2,079
	D	-4,524	-4,560	-4,312	-4,661	-4,221	-3,376
	C	-4,379	-3,893	-4,076	-3,788	-3,990	-2,076
	AVG	-3,449	-3,504	-3,373	-3,228	-662	-13
Feb	W	-1,710	-1,722	-1,256	-1,683	7,252	6,508
	AN	-4,298	-4,305	-4,146	-4,026	2,247	2,119
	BN	-3,658	-3,662	-3,560	-3,564	-1,096	-1,738
	D	-4,116	-4,147	-4,089	-3,490	-3,034	-2,706
	C	-3,004	-3,108	-3,162	-2,909	-2,968	-2,895
	AVG	-3,158	-3,188	-3,006	-2,964	1,327	1,049
Mar	W	-898	-1,237	-954	-759	7,724	7,779
	AN	-4,467	-4,328	-4,339	-4,411	1,631	1,517
	BN	-4,298	-4,298	-4,183	-3,576	-1,589	-921
	D	-3,043	-3,002	-3,000	-2,769	-2,045	-1,773
	C	-2,355	-2,518	-2,184	-2,040	-1,951	-1,544
	AVG	-2,758	-2,855	-2,691	-2,487	1,622	1,844
Apr	W	2,686	2,592	2,677	2,740	4,173	4,518
	AN	1,165	1,143	1,104	957	-681	-745
	BN	393	381	163	-380	-1,662	-1,565
	D	-290	-278	-786	-702	-2,004	-1,667
	C	-955	-1,021	-949	-812	-1,483	-1,462
	AVG	843	799	715	659	218	379
May	W	1,912	1,684	2,066	1,942	3,969	3,781
	AN	542	491	421	317	-2,007	-1,356
	BN	33	-44	-214	-607	-1,299	-1,426
	D	-522	-535	-980	-1,121	-1,450	-1,149
	C	-1,202	-1,175	-1,207	-1,030	-1,181	-965
	AVG	353	267	262	155	104	246
Jun	W	-4,218	-4,313	-4,289	-4,401	-329	-168
	AN	-4,364	-4,220	-4,049	-3,998	-2,910	-2,223
	BN	-4,286	-4,192	-4,045	-3,547	-2,882	-2,648
	D	-3,102	-3,077	-2,743	-2,572	-2,123	-1,966
	C	-2,679	-2,678	-2,615	-2,384	-1,932	-2,003
	AVG	-3,780	-3,761	-3,632	-3,504	-1,834	-1,605
Jul	W	-8,526	-8,610	-8,930	-8,906	-4,145	-5,522
	AN	-10,300	-10,362	-9,346	-8,038	-4,967	-4,019
	BN	-10,861	-10,943	-9,824	-9,699	-6,006	-5,663
	D	-10,796	-10,735	-10,122	-8,980	-7,017	-4,928
	C	-9,104	-8,327	-7,738	-6,853	-3,649	-3,174
	AVG	-9,715	-9,603	-9,110	-8,473	-4,959	-4,699

Admin Draft

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Month	WY Type[1]	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	-9,704	-10,044	-10,217	-10,246	-4,561	-4,616
	AN	-9,960	-10,134	-9,984	-9,896	-3,939	-4,220
	BN	-10,725	-10,701	-10,072	-9,957	-5,074	-4,636
	D	-9,996	-9,091	-8,476	-7,773	-4,949	-4,572
	C	-6,225	-5,788	-5,033	-4,423	-3,594	-3,210
	AVG	-9,283	-9,184	-8,861	-8,604	-4,394	-4,261
Sep	W	-9,226	-8,342	-8,138	-7,345	-3,960	-4,578
	AN	-9,083	-8,780	-9,035	-8,519	-4,906	-4,668
	BN	-8,911	-8,336	-8,291	-8,000	-4,498	-4,583
	D	-7,793	-7,241	-6,296	-5,820	-4,367	-4,097
	C	-5,718	-5,468	-4,952	-4,433	-4,248	-3,009
	AVG	-8,236	-7,691	-7,423	-6,868	-4,351	-4,214
Oct	W	-7,785	-6,105	-5,229	-4,553	-5,360	-5,083
	AN	-7,786	-6,842	-6,040	-4,872	-5,129	-4,324
	BN	-7,854	-5,806	-4,982	-4,183	-5,355	-5,185
	D	-8,153	-6,024	-4,818	-4,660	-5,537	-5,390
	C	-6,316	-5,234	-5,050	-3,804	-5,013	-4,337
	AVG	-7,568	-6,019	-5,248	-4,427	-5,274	-4,854
Nov	W	-8,184	-6,824	-6,553	-6,138	-5,453	-4,761
	AN	-8,042	-7,335	-7,107	-6,742	-4,496	-4,160
	BN	-7,723	-5,255	-5,734	-4,855	-5,683	-4,958
	D	-8,128	-5,622	-5,739	-5,582	-5,868	-4,976
	C	-5,712	-4,290	-4,339	-4,453	-4,930	-3,969
	AVG	-7,592	-5,990	-5,970	-5,636	-5,266	-4,555
Dec	W	-6,295	-6,399	-6,270	-6,110	-3,304	-3,746
	AN	-5,499	-5,991	-5,621	-5,758	-2,825	-3,692
	BN	-7,131	-7,661	-7,173	-6,901	-6,471	-6,291
	D	-7,800	-8,207	-8,371	-7,820	-7,123	-7,422
	C	-6,305	-6,204	-5,472	-4,661	-5,600	-5,410
	AVG	-6,513	-6,768	-6,464	-6,155	-4,766	-5,046

[1]Water-year type was determined using the San Joaquin River Water-Year Type Classification

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Table C.5.3-12. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Old and Middle Rivers[1]

Month	WY Type [2]	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	6019 (-322.1%)	6028 (-322.5%)	6279 (-295%)	6288 (-295.4%)	5958 (-329.6%)	5636 (-381.8%)
	AN	3461 (-96.7%)	3784 (-105.7%)	3628 (-96.8%)	3951 (-105.5%)	3347 (-96.6%)	3610 (-106%)
	BN	1428 (-35.8%)	1906 (-47.8%)	1650 (-39.2%)	2128 (-50.6%)	1792 (-41.2%)	2045 (-49.6%)
	D	303 (-6.7%)	1148 (-25.4%)	339 (-7.4%)	1184 (-26%)	91 (-2.1%)	1285 (-27.6%)
	C	388 (-8.9%)	2302 (-52.6%)	-97 (2.5%)	1817 (-46.7%)	86 (-2.1%)	1711 (-45.2%)
	AVG	2787 (-80.8%)	3436 (-99.6%)	2842 (-81.1%)	3491 (-99.6%)	2712 (-80.4%)	3216 (-99.6%)
Feb	W	8962 (-524.2%)	8217 (-480.6%)	8974 (-521.2%)	8229 (-478%)	8509 (-677.3%)	8190 (-486.7%)
	AN	6545 (-152.3%)	6417 (-149.3%)	6552 (-152.2%)	6425 (-149.2%)	6393 (-154.2%)	6145 (-152.6%)
	BN	2562 (-70%)	1920 (-52.5%)	2566 (-70.1%)	1924 (-52.5%)	2464 (-69.2%)	1826 (-51.2%)
	D	1083 (-26.3%)	1411 (-34.3%)	1113 (-26.8%)	1441 (-34.8%)	1056 (-25.8%)	784 (-22.5%)
	C	35 (-1.2%)	109 (-3.6%)	139 (-4.5%)	213 (-6.8%)	194 (-6.1%)	14 (-0.5%)
	AVG	4485 (-142%)	4207 (-133.2%)	4515 (-141.6%)	4237 (-132.9%)	4334 (-144.1%)	4013 (-135.4%)
Mar	W	8622 (-960.2%)	8677 (-966.4%)	8961 (-724.5%)	9016 (-729%)	8678 (-909.7%)	8539 (-1124.6%)
	AN	6098 (-136.5%)	5984 (-134%)	5959 (-137.7%)	5845 (-135%)	5970 (-137.6%)	5928 (-134.4%)
	BN	2709 (-63%)	3378 (-78.6%)	2709 (-63%)	3378 (-78.6%)	2594 (-62%)	2655 (-74.2%)
	D	998 (-32.8%)	1270 (-41.7%)	957 (-31.9%)	1229 (-40.9%)	956 (-31.9%)	997 (-36%)
	C	405 (-17.2%)	811 (-34.4%)	568 (-22.5%)	974 (-38.7%)	233 (-10.7%)	496 (-24.3%)
	AVG	4380 (-158.8%)	4602 (-166.9%)	4478 (-156.8%)	4700 (-164.6%)	4313 (-160.3%)	4331 (-174.2%)
Apr	W	1486 (55.3%)	1831 (68.2%)	1581 (61%)	1926 (74.3%)	1496 (55.9%)	1778 (64.9%)
	AN	-1846 (-158.4%)	-1910 (-164%)	-1824 (-159.5%)	-1888 (-165.2%)	-1784 (-161.7%)	-1702 (-177.9%)
	BN	-2055 (-522.6%)	-1959 (-498.1%)	-2042 (-536.7%)	-1946 (-511.4%)	-1825 (-1119.1%)	-1185 (311.7%)
	D	-1714 (591%)	-1377 (474.9%)	-1726 (620.8%)	-1389 (499.7%)	-1219 (155.1%)	-966 (137.6%)
	C	-528 (55.3%)	-507 (53.1%)	-462 (45.2%)	-441 (43.2%)	-535 (56.4%)	-650 (80.1%)
	AVG	-626 (-74.2%)	-464 (-55.1%)	-581 (-72.7%)	-420 (-52.5%)	-497 (-69.5%)	-280 (-42.5%)
May	W	2057 (107.6%)	1869 (97.7%)	2285 (135.7%)	2097 (124.6%)	1903 (92.1%)	1838 (94.6%)
	AN	-2549 (-470.3%)	-1898 (-350.1%)	-2499 (-508.7%)	-1847 (-376%)	-2428 (-577%)	-1673 (-527.3%)
	BN	-1332 (-4027.4%)	-1459 (-4410.4%)	-1255 (2826.9%)	-1381 (3112.4%)	-1085 (506.9%)	-819 (135.1%)
	D	-928 (177.7%)	-626 (120%)	-915 (170.9%)	-613 (114.6%)	-470 (47.9%)	-27 (2.4%)
	C	22 (-1.8%)	237 (-19.7%)	-6 (0.5%)	210 (-17.9%)	26 (-2.2%)	65 (-6.3%)
	AVG	-250 (-70.7%)	-108 (-30.5%)	-164 (-61.2%)	-22 (-8.2%)	-158 (-60.4%)	90 (58%)
Jun	W	3890 (-92.2%)	4050 (-96%)	3984 (-92.4%)	4145 (-96.1%)	3960 (-92.3%)	4233 (-96.2%)
	AN	1453 (-33.3%)	2141 (-49.1%)	1310 (-31%)	1997 (-47.3%)	1139 (-28.1%)	1775 (-44.4%)
	BN	1404 (-32.8%)	1637 (-38.2%)	1311 (-31.3%)	1544 (-36.8%)	1163 (-28.8%)	899 (-25.3%)
	D	979 (-31.6%)	1136 (-36.6%)	954 (-31%)	1111 (-36.1%)	620 (-22.6%)	606 (-23.6%)
	C	748 (-27.9%)	677 (-25.3%)	746 (-27.9%)	675 (-25.2%)	684 (-26.1%)	382 (-16%)
	AVG	1946 (-51.5%)	2175 (-57.5%)	1926 (-51.2%)	2156 (-57.3%)	1797 (-49.5%)	1898 (-54.2%)
Jul	W	4381 (-51.4%)	3004 (-35.2%)	4465 (-51.9%)	3088 (-35.9%)	4786 (-53.6%)	3384 (-38%)
	AN	5333 (-51.8%)	6281 (-61%)	5395 (-52.1%)	6343 (-61.2%)	4379 (-46.9%)	4019 (-50%)
	BN	4855 (-44.7%)	5198 (-47.9%)	4937 (-45.1%)	5281 (-48.3%)	3818 (-38.9%)	4036 (-41.6%)
	D	3779 (-35%)	5867 (-54.3%)	3718 (-34.6%)	5806 (-54.1%)	3106 (-30.7%)	4052 (-45.1%)
	C	5455 (-59.9%)	5930 (-65.1%)	4677 (-56.2%)	5153 (-61.9%)	4088 (-52.8%)	3678 (-53.7%)
	AVG	4756 (-49%)	5016 (-51.6%)	4644 (-48.4%)	4905 (-51.1%)	4151 (-45.6%)	3775 (-44.5%)

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Month	WY Type [2]	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	5143 (-53%)	5088 (-52.4%)	5483 (-54.6%)	5428 (-54%)	5655 (-55.4%)	5629 (-54.9%)
	AN	6021 (-60.5%)	5740 (-57.6%)	6196 (-61.1%)	5914 (-58.4%)	6045 (-60.5%)	5676 (-57.4%)
	BN	5651 (-52.7%)	6089 (-56.8%)	5627 (-52.6%)	6065 (-56.7%)	4998 (-49.6%)	5321 (-53.4%)
	D	5048 (-50.5%)	5425 (-54.3%)	4142 (-45.6%)	4519 (-49.7%)	3527 (-41.6%)	3201 (-41.2%)
	C	2630 (-42.3%)	3015 (-48.4%)	2194 (-37.9%)	2579 (-44.5%)	1438 (-28.6%)	1214 (-27.4%)
	AVG	4889 (-52.7%)	5023 (-54.1%)	4790 (-52.2%)	4924 (-53.6%)	4467 (-50.4%)	4343 (-50.5%)
Sep	W	5265 (-57.1%)	4648 (-50.4%)	4382 (-52.5%)	3764 (-45.1%)	4178 (-51.3%)	2767 (-37.7%)
	AN	4177 (-46%)	4415 (-48.6%)	3873 (-44.1%)	4112 (-46.8%)	4128 (-45.7%)	3851 (-45.2%)
	BN	4413 (-49.5%)	4329 (-48.6%)	3837 (-46%)	3753 (-45%)	3793 (-45.7%)	3417 (-42.7%)
	D	3426 (-44%)	3696 (-47.4%)	2873 (-39.7%)	3143 (-43.4%)	1928 (-30.6%)	1723 (-29.6%)
	C	1469 (-25.7%)	2709 (-47.4%)	1220 (-22.3%)	2459 (-45%)	703 (-14.2%)	1424 (-32.1%)
	AVG	3885 (-47.2%)	4022 (-48.8%)	3340 (-43.4%)	3477 (-45.2%)	3072 (-41.4%)	2654 (-38.6%)
Oct	W	2424 (-31.1%)	2701 (-34.7%)	745 (-12.2%)	1022 (-16.7%)	-132 (2.5%)	-530 (11.6%)
	AN	2657 (-34.1%)	3462 (-44.5%)	1713 (-25%)	2518 (-36.8%)	911 (-15.1%)	549 (-11.3%)
	BN	2499 (-31.8%)	2668 (-34%)	451 (-7.8%)	620 (-10.7%)	-373 (7.5%)	-1002 (24%)
	D	2617 (-32.1%)	2764 (-33.9%)	487 (-8.1%)	634 (-10.5%)	-719 (14.9%)	-730 (15.7%)
	C	1303 (-20.6%)	1980 (-31.3%)	221 (-4.2%)	897 (-17.1%)	37 (-0.7%)	-532 (14%)
	AVG	2293 (-30.3%)	2714 (-35.9%)	744 (-12.4%)	1164 (-19.3%)	-27 (0.5%)	-427 (9.6%)
Nov	W	2732 (-33.4%)	3423 (-41.8%)	1372 (-20.1%)	2063 (-30.2%)	1100 (-16.8%)	1377 (-22.4%)
	AN	3546 (-44.1%)	3883 (-48.3%)	2839 (-38.7%)	3176 (-43.3%)	2611 (-36.7%)	2583 (-38.3%)
	BN	2040 (-26.4%)	2765 (-35.8%)	-428 (8.1%)	296 (-5.6%)	51 (-0.9%)	-104 (2.1%)
	D	2260 (-27.8%)	3152 (-38.8%)	-245 (4.4%)	646 (-11.5%)	-129 (2.2%)	606 (-10.9%)
	C	781 (-13.7%)	1743 (-30.5%)	-640 (14.9%)	321 (-7.5%)	-592 (13.6%)	485 (-10.9%)
	AVG	2326 (-30.6%)	3038 (-40%)	724 (-12.1%)	1436 (-24%)	704 (-11.8%)	1081 (-19.2%)
Dec	W	2990 (-47.5%)	2549 (-40.5%)	3095 (-48.4%)	2654 (-41.5%)	2966 (-47.3%)	2365 (-38.7%)
	AN	2674 (-48.6%)	1808 (-32.9%)	3166 (-52.8%)	2300 (-38.4%)	2796 (-49.7%)	2067 (-35.9%)
	BN	660 (-9.3%)	840 (-11.8%)	1191 (-15.5%)	1370 (-17.9%)	703 (-9.8%)	610 (-8.8%)
	D	676 (-8.7%)	377 (-4.8%)	1083 (-13.2%)	784 (-9.6%)	1247 (-14.9%)	397 (-5.1%)
	C	704 (-11.2%)	895 (-14.2%)	604 (-9.7%)	795 (-12.8%)	-129 (2.4%)	-748 (16.1%)
	AVG	1746 (-26.8%)	1466 (-22.5%)	2002 (-29.6%)	1722 (-25.4%)	1698 (-26.3%)	1109 (-18%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions
[2] Water-year type was determined using the San Joaquin River Water-Year Type Classification.

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Table C.5.3-13. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Sutter and Steamboat Sloughs Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	24,208	24,180	25,077	25,163	20,233	20,791
	AN	18,674	18,041	18,525	18,984	15,155	15,804
	BN	10,656	10,289	10,532	10,093	8,759	9,135
	D	7,496	7,452	7,664	7,500	7,049	7,826
	C	5,919	6,100	6,200	6,314	6,161	5,907
	AVG	14,739	14,592	15,050	15,050	12,578	13,047
Feb	W	27,375	27,277	28,563	28,638	23,534	24,137
	AN	21,573	21,246	22,530	22,625	18,538	18,540
	BN	14,721	14,271	14,865	14,550	11,403	11,740
	D	9,370	9,454	9,477	9,322	7,975	8,425
	C	6,132	6,252	6,152	5,924	5,938	6,433
	AVG	17,304	17,185	17,872	17,789	14,741	15,162
Mar	W	23,437	23,568	24,187	24,224	19,228	19,878
	AN	20,984	20,777	21,619	21,280	16,360	16,292
	BN	11,009	10,498	10,481	10,224	7,752	7,943
	D	9,098	9,049	9,107	9,095	7,461	7,645
	C	5,403	5,392	5,458	5,349	5,296	5,547
	AVG	15,169	15,081	15,420	15,319	12,227	12,533
Apr	W	17,650	17,836	17,979	17,518	13,431	13,613
	AN	11,752	11,854	11,683	11,229	8,233	8,456
	BN	7,649	7,563	7,577	7,339	6,733	7,060
	D	5,275	5,355	5,353	5,232	5,443	6,076
	C	3,899	3,931	3,940	3,967	4,337	4,764
	AVG	10,351	10,432	10,456	10,180	8,442	8,790
May	W	14,728	14,707	13,532	11,014	9,805	8,530
	AN	9,280	9,199	8,816	8,101	7,026	7,098
	BN	5,892	5,762	5,437	4,978	5,514	5,823
	D	4,263	4,190	4,228	4,496	4,736	5,549
	C	2,662	2,644	2,984	2,793	3,167	3,422
	AVG	8,359	8,300	7,874	6,923	6,582	6,456
Jun	W	9,814	9,791	8,017	7,041	6,115	6,248
	AN	6,153	6,275	5,632	5,846	5,202	6,109
	BN	4,626	4,614	4,554	4,763	5,029	5,592
	D	4,051	4,164	4,299	4,235	4,707	5,068
	C	3,058	3,101	3,131	3,159	3,595	3,981
	AVG	6,139	6,178	5,545	5,293	5,118	5,525
Jul	W	7,167	7,163	7,430	7,806	5,507	6,646
	AN	7,788	7,993	8,208	8,265	6,186	6,713
	BN	7,531	7,733	7,691	7,349	5,883	5,916
	D	6,836	6,825	6,733	6,706	5,686	5,274
	C	5,234	4,787	4,835	4,560	3,818	4,469
	AVG	6,964	6,960	7,056	7,079	5,463	5,911

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	5,407	5,508	5,563	5,510	3,406	3,899
	AN	5,433	5,707	5,858	6,100	4,125	4,717
	BN	5,336	5,446	5,295	5,580	3,803	4,121
	D	5,883	5,487	4,984	4,802	3,917	4,291
	C	3,042	3,007	2,799	2,588	3,053	3,415
	AVG	5,157	5,156	5,029	5,025	3,640	4,072
Sep	W	6,582	12,279	11,909	11,925	3,135	3,380
	AN	4,325	7,438	8,003	7,763	3,015	3,499
	BN	4,006	4,022	4,262	3,956	2,963	3,354
	D	3,894	3,526	2,988	2,433	2,962	3,533
	C	2,377	2,240	2,124	1,884	2,895	3,519
	AVG	4,607	6,770	6,642	6,402	3,015	3,447
Oct	W	4,924	4,682	4,662	4,771	3,862	5,942
	AN	3,684	3,318	3,437	4,169	3,415	6,101
	BN	3,813	3,645	3,448	4,145	3,621	6,461
	D	3,240	3,074	3,281	3,398	3,374	5,555
	C	3,190	2,978	2,957	3,079	3,581	6,290
	AVG	3,929	3,703	3,723	4,027	3,607	6,020
Nov	W	8,146	8,981	8,954	8,212	6,143	6,178
	AN	6,160	7,072	7,188	6,529	4,877	4,346
	BN	4,596	5,294	5,338	4,971	3,798	3,707
	D	4,821	4,785	4,811	4,402	4,235	3,771
	C	3,137	3,335	3,211	3,067	3,188	3,495
	AVG	5,786	6,325	6,328	5,823	4,706	4,567
Dec	W	18,568	17,556	18,669	17,217	15,784	15,290
	AN	9,442	9,801	10,143	9,907	9,114	10,223
	BN	6,840	7,013	7,242	6,840	7,134	7,357
	D	6,275	6,350	6,385	6,119	6,596	6,696
	C	4,386	4,189	4,053	3,839	4,942	5,067
	AVG	10,456	10,205	10,635	9,982	9,727	9,811

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Table C.5.3-14. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Sutter and Steamboat Sloughs[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	-3974 (-16.4%)	-3417 (-14.1%)	-3947 (-16.3%)	-3389 (-14%)	-4843 (-19.3%)	-4373 (-17.4%)
	AN	-3519 (-18.8%)	-2870 (-15.4%)	-2886 (-16%)	-2237 (-12.4%)	-3370 (-18.2%)	-3180 (-16.8%)
	BN	-1897 (-17.8%)	-1520 (-14.3%)	-1530 (-14.9%)	-1153 (-11.2%)	-1773 (-16.8%)	-958 (-9.5%)
	D	-447 (-6%)	330 (4.4%)	-403 (-5.4%)	374 (5%)	-615 (-8%)	326 (4.4%)
	C	241 (4.1%)	-12 (-0.2%)	60 (1%)	-194 (-3.2%)	-39 (-0.6%)	-407 (-6.4%)
	AVG	-2162 (-14.7%)	-1692 (-11.5%)	-2014 (-13.8%)	-1545 (-10.6%)	-2472 (-16.4%)	-2003 (-13.3%)
Feb	W	-3841 (-14%)	-3238 (-11.8%)	-3742 (-13.7%)	-3140 (-11.5%)	-5029 (-17.6%)	-4501 (-15.7%)
	AN	-3035 (-14.1%)	-3033 (-14.1%)	-2708 (-12.7%)	-2706 (-12.7%)	-3992 (-17.7%)	-4085 (-18.1%)
	BN	-3318 (-22.5%)	-2981 (-20.2%)	-2869 (-20.1%)	-2531 (-17.7%)	-3462 (-23.3%)	-2810 (-19.3%)
	D	-1395 (-14.9%)	-945 (-10.1%)	-1479 (-15.6%)	-1030 (-10.9%)	-1502 (-15.9%)	-898 (-9.6%)
	C	-194 (-3.2%)	302 (4.9%)	-314 (-5%)	182 (2.9%)	-214 (-3.5%)	510 (8.6%)
	AVG	-2563 (-14.8%)	-2143 (-12.4%)	-2443 (-14.2%)	-2023 (-11.8%)	-3131 (-17.5%)	-2627 (-14.8%)
Mar	W	-4210 (-18%)	-3559 (-15.2%)	-4341 (-18.4%)	-3690 (-15.7%)	-4959 (-20.5%)	-4345 (-17.9%)
	AN	-4624 (-22%)	-4692 (-22.4%)	-4416 (-21.3%)	-4484 (-21.6%)	-5259 (-24.3%)	-4988 (-23.4%)
	BN	-3257 (-29.6%)	-3066 (-27.9%)	-2746 (-26.2%)	-2555 (-24.3%)	-2729 (-26%)	-2281 (-22.3%)
	D	-1637 (-18%)	-1453 (-16%)	-1588 (-17.5%)	-1403 (-15.5%)	-1646 (-18.1%)	-1449 (-15.9%)
	C	-107 (-2%)	144 (2.7%)	-96 (-1.8%)	154 (2.9%)	-163 (-3%)	198 (3.7%)
	AVG	-2942 (-19.4%)	-2636 (-17.4%)	-2854 (-18.9%)	-2548 (-16.9%)	-3193 (-20.7%)	-2786 (-18.2%)
Apr	W	-4219 (-23.9%)	-4037 (-22.9%)	-4404 (-24.7%)	-4222 (-23.7%)	-4548 (-25.3%)	-3904 (-22.3%)
	AN	-3519 (-29.9%)	-3295 (-28%)	-3621 (-30.5%)	-3398 (-28.7%)	-3450 (-29.5%)	-2773 (-24.7%)
	BN	-916 (-12%)	-590 (-7.7%)	-830 (-11%)	-503 (-6.7%)	-844 (-11.1%)	-279 (-3.8%)
	D	167 (3.2%)	801 (15.2%)	88 (1.6%)	721 (13.5%)	90 (1.7%)	844 (16.1%)
	C	438 (11.2%)	865 (22.2%)	406 (10.3%)	833 (21.2%)	397 (10.1%)	797 (20.1%)
	AVG	-1908 (-18.4%)	-1560 (-15.1%)	-1989 (-19.1%)	-1642 (-15.7%)	-2013 (-19.3%)	-1390 (-13.7%)
May	W	-4922 (-33.4%)	-6198 (-42.1%)	-4902 (-33.3%)	-6177 (-42%)	-3727 (-27.5%)	-2484 (-22.6%)
	AN	-2253 (-24.3%)	-2181 (-23.5%)	-2172 (-23.6%)	-2100 (-22.8%)	-1790 (-20.3%)	-1003 (-12.4%)
	BN	-378 (-6.4%)	-69 (-1.2%)	-248 (-4.3%)	62 (1.1%)	77 (1.4%)	845 (17%)
	D	473 (11.1%)	1286 (30.2%)	547 (13%)	1359 (32.4%)	508 (12%)	1053 (23.4%)
	C	505 (19%)	759 (28.5%)	523 (19.8%)	777 (29.4%)	184 (6.2%)	629 (22.5%)
	AVG	-1777 (-21.3%)	-1903 (-22.8%)	-1718 (-20.7%)	-1843 (-22.2%)	-1292 (-16.4%)	-467 (-6.7%)
Jun	W	-3699 (-37.7%)	-3566 (-36.3%)	-3676 (-37.5%)	-3543 (-36.2%)	-1902 (-23.7%)	-793 (-11.3%)
	AN	-951 (-15.5%)	-44 (-0.7%)	-1072 (-17.1%)	-166 (-2.6%)	-430 (-7.6%)	263 (4.5%)
	BN	403 (8.7%)	966 (20.9%)	414 (9%)	978 (21.2%)	475 (10.4%)	829 (17.4%)
	D	656 (16.2%)	1016 (25.1%)	543 (13%)	903 (21.7%)	409 (9.5%)	832 (19.6%)
	C	537 (17.6%)	923 (30.2%)	494 (15.9%)	880 (28.4%)	464 (14.8%)	822 (26%)
	AVG	-1021 (-16.6%)	-614 (-10%)	-1060 (-17.2%)	-653 (-10.6%)	-427 (-7.7%)	232 (4.4%)
Jul	W	-1660 (-23.2%)	-521 (-7.3%)	-1656 (-23.1%)	-518 (-7.2%)	-1923 (-25.9%)	-1161 (-14.9%)
	AN	-1602 (-20.6%)	-1075 (-13.8%)	-1807 (-22.6%)	-1280 (-16%)	-2023 (-24.6%)	-1552 (-18.8%)
	BN	-1648 (-21.9%)	-1615 (-21.4%)	-1850 (-23.9%)	-1818 (-23.5%)	-1808 (-23.5%)	-1433 (-19.5%)
	D	-1150 (-16.8%)	-1562 (-22.9%)	-1139 (-16.7%)	-1551 (-22.7%)	-1046 (-15.5%)	-1432 (-21.4%)
	C	-1417 (-27.1%)	-765 (-14.6%)	-969 (-20.2%)	-318 (-6.6%)	-1018 (-21%)	-91 (-2%)
	AVG	-1502 (-21.6%)	-1053 (-15.1%)	-1497 (-21.5%)	-1049 (-15.1%)	-1593 (-22.6%)	-1168 (-16.5%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-2001 (-37%)	-1508 (-27.9%)	-2102 (-38.2%)	-1609 (-29.2%)	-2156 (-38.8%)	-1611 (-29.2%)
	AN	-1307 (-24.1%)	-716 (-13.2%)	-1582 (-27.7%)	-990 (-17.3%)	-1733 (-29.6%)	-1383 (-22.7%)
	BN	-1533 (-28.7%)	-1214 (-22.8%)	-1644 (-30.2%)	-1325 (-24.3%)	-1492 (-28.2%)	-1458 (-26.1%)
	D	-1965 (-33.4%)	-1591 (-27.1%)	-1570 (-28.6%)	-1196 (-21.8%)	-1067 (-21.4%)	-511 (-10.6%)
	C	11 (0.4%)	373 (12.3%)	46 (1.5%)	408 (13.6%)	254 (9.1%)	827 (31.9%)
	AVG	-1517 (-29.4%)	-1085 (-21%)	-1516 (-29.4%)	-1084 (-21%)	-1389 (-27.6%)	-953 (-19%)
Sep	W	-3447 (-52.4%)	-3202 (-48.6%)	-9144 (-74.5%)	-8899 (-72.5%)	-8774 (-73.7%)	-8545 (-71.7%)
	AN	-1310 (-30.3%)	-826 (-19.1%)	-4423 (-59.5%)	-3939 (-53%)	-4988 (-62.3%)	-4264 (-54.9%)
	BN	-1044 (-26.1%)	-653 (-16.3%)	-1059 (-26.3%)	-668 (-16.6%)	-1300 (-30.5%)	-603 (-15.2%)
	D	-932 (-23.9%)	-361 (-9.3%)	-564 (-16%)	7 (0.2%)	-27 (-0.9%)	1100 (45.2%)
	C	518 (21.8%)	1143 (48.1%)	655 (29.2%)	1279 (57.1%)	771 (36.3%)	1636 (86.8%)
	AVG	-1592 (-34.6%)	-1160 (-25.2%)	-3755 (-55.5%)	-3323 (-49.1%)	-3627 (-54.6%)	-2955 (-46.2%)
Oct	W	-1062 (-21.6%)	1018 (20.7%)	-820 (-17.5%)	1260 (26.9%)	-800 (-17.2%)	1171 (24.5%)
	AN	-268 (-7.3%)	2418 (65.6%)	98 (2.9%)	2784 (83.9%)	-21 (-0.6%)	1933 (46.4%)
	BN	-192 (-5%)	2648 (69.5%)	-24 (-0.7%)	2816 (77.3%)	173 (5%)	2316 (55.9%)
	D	134 (4.1%)	2315 (71.5%)	300 (9.8%)	2481 (80.7%)	93 (2.8%)	2157 (63.5%)
	C	391 (12.3%)	3100 (97.2%)	603 (20.3%)	3312 (111.2%)	625 (21.1%)	3211 (104.3%)
	AVG	-322 (-8.2%)	2091 (53.2%)	-95 (-2.6%)	2317 (62.6%)	-115 (-3.1%)	1993 (49.5%)
Nov	W	-2003 (-24.6%)	-1969 (-24.2%)	-2838 (-31.6%)	-2804 (-31.2%)	-2811 (-31.4%)	-2035 (-24.8%)
	AN	-1283 (-20.8%)	-1814 (-29.4%)	-2195 (-31%)	-2726 (-38.5%)	-2311 (-32.2%)	-2183 (-33.4%)
	BN	-798 (-17.4%)	-889 (-19.3%)	-1496 (-28.3%)	-1588 (-30%)	-1540 (-28.8%)	-1264 (-25.4%)
	D	-585 (-12.1%)	-1050 (-21.8%)	-550 (-11.5%)	-1015 (-21.2%)	-575 (-12%)	-632 (-14.3%)
	C	51 (1.6%)	358 (11.4%)	-147 (-4.4%)	161 (4.8%)	-23 (-0.7%)	429 (14%)
	AVG	-1080 (-18.7%)	-1220 (-21.1%)	-1619 (-25.6%)	-1758 (-27.8%)	-1622 (-25.6%)	-1256 (-21.6%)
Dec	W	-2784 (-15%)	-3278 (-17.7%)	-1773 (-10.1%)	-2266 (-12.9%)	-2886 (-15.5%)	-1927 (-11.2%)
	AN	-328 (-3.5%)	781 (8.3%)	-687 (-7%)	422 (4.3%)	-1030 (-10.2%)	316 (3.2%)
	BN	294 (4.3%)	517 (7.6%)	121 (1.7%)	344 (4.9%)	-108 (-1.5%)	517 (7.6%)
	D	322 (5.1%)	421 (6.7%)	246 (3.9%)	346 (5.4%)	211 (3.3%)	577 (9.4%)
	C	556 (12.7%)	681 (15.5%)	753 (18%)	878 (21%)	889 (21.9%)	1228 (32%)
	AVG	-729 (-7%)	-645 (-6.2%)	-478 (-4.7%)	-394 (-3.9%)	-908 (-8.5%)	-170 (-1.7%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

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Table C.5.3-15. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Delta Cross Channel and Georgiana Slough Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	7,607	7,559	7,740	7,862	6,374	6,417
	AN	6,131	5,930	6,012	6,213	5,023	5,105
	BN	3,992	3,872	3,903	3,842	3,321	3,351
	D	3,149	3,120	3,146	3,150	2,866	3,006
	C	2,728	2,761	2,760	2,834	2,630	2,502
	AVG	5,081	5,014	5,095	5,164	4,337	4,380
Feb	W	8,452	8,380	8,660	8,789	7,252	7,297
	AN	6,904	6,780	7,068	7,185	5,923	5,825
	BN	5,076	4,929	5,046	5,031	4,025	4,036
	D	3,649	3,651	3,624	3,636	3,113	3,164
	C	2,785	2,801	2,747	2,730	2,571	2,640
	AVG	5,765	5,702	5,839	5,895	4,913	4,936
Mar	W	7,401	7,396	7,505	7,611	6,106	6,177
	AN	6,747	6,656	6,828	6,826	5,343	5,233
	BN	4,086	3,928	3,889	3,877	3,053	3,037
	D	3,576	3,543	3,527	3,575	2,976	2,959
	C	2,591	2,573	2,564	2,576	2,400	2,407
	AVG	5,196	5,144	5,192	5,236	4,244	4,245
Apr	W	5,858	5,875	5,868	5,822	4,564	4,529
	AN	4,284	4,288	4,206	4,145	3,181	3,172
	BN	3,190	3,149	3,123	3,107	2,782	2,805
	D	2,557	2,563	2,536	2,545	2,439	2,546
	C	2,189	2,185	2,163	2,208	2,145	2,201
	AVG	3,910	3,910	3,882	3,865	3,237	3,260
May	W	5,078	5,045	4,694	4,088	3,600	3,192
	AN	3,625	3,583	3,450	3,310	2,860	2,815
	BN	2,721	2,671	2,558	2,477	2,458	2,480
	D	2,287	2,254	2,240	2,349	2,251	2,407
	C	1,860	1,844	1,911	1,894	1,834	1,848
	AVG	3,379	3,345	3,201	2,996	2,742	2,646
Jun	W	6,583	6,536	5,880	6,312	5,448	5,604
	AN	5,463	5,505	5,564	5,866	5,454	5,800
	BN	5,610	5,568	5,489	5,697	5,342	5,472
	D	5,242	5,282	5,328	5,360	5,134	5,139
	C	4,607	4,606	4,592	4,672	4,414	4,450
	AVG	5,670	5,662	5,457	5,693	5,210	5,339
Jul	W	7,708	7,917	8,047	8,164	6,195	6,722
	AN	8,411	8,501	8,590	8,749	6,684	6,769
	BN	8,229	8,319	8,229	8,100	6,466	6,208
	D	7,737	7,679	7,560	7,644	5,955	5,391
	C	6,601	6,244	6,236	6,124	4,980	5,190
	AVG	7,744	7,774	7,786	7,826	6,083	6,125

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	6,724	6,752	6,743	6,797	4,684	4,789
	AN	6,742	6,892	6,949	7,215	5,201	5,364
	BN	6,673	6,709	6,556	6,846	4,969	4,945
	D	7,061	6,737	6,340	6,295	5,052	5,065
	C	5,048	4,991	4,814	4,726	4,430	4,448
	AVG	6,547	6,504	6,371	6,453	4,852	4,910
Sep	W	7,018	5,439	5,704	5,599	4,489	4,423
	AN	5,957	8,111	7,828	7,734	4,403	4,507
	BN	5,731	5,706	5,835	5,696	4,365	4,405
	D	5,651	5,357	4,946	4,616	4,364	4,531
	C	4,576	4,451	4,342	4,227	4,316	4,521
	AVG	5,986	5,713	5,672	5,511	4,402	4,470
Oct	W	4,727	4,663	4,718	4,750	4,007	4,503
	AN	4,616	4,836	4,630	4,371	4,458	4,558
	BN	4,966	4,824	4,843	4,819	4,526	5,013
	D	4,699	4,755	4,782	4,504	4,521	5,049
	C	4,545	4,483	4,445	4,696	4,304	4,684
	AVG	4,719	4,709	4,701	4,644	4,318	4,745
Nov	W	4,550	4,380	4,323	4,055	3,643	3,471
	AN	3,863	3,797	3,766	3,720	3,384	3,339
	BN	4,101	3,972	3,834	3,712	3,557	3,445
	D	3,959	3,898	3,753	3,647	3,504	3,236
	C	3,853	3,713	3,669	3,558	3,427	3,590
	AVG	4,141	4,022	3,937	3,785	3,528	3,413
Dec	W	6,196	5,932	6,180	5,873	5,271	5,122
	AN	4,242	4,327	4,409	4,399	3,962	4,333
	BN	3,963	4,045	4,054	3,989	3,780	3,802
	D	3,624	3,690	3,670	3,631	3,544	3,596
	C	3,466	3,376	3,295	3,231	3,351	3,359
	AVG	4,565	4,509	4,585	4,457	4,165	4,188

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Table C.5.3-16. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Delta Cross Channel and Georgiana Slough[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	-1233 (-16.2%)	-1190 (-15.6%)	-1185 (-15.7%)	-1142 (-15.1%)	-1367 (-17.7%)	-1445 (-18.4%)
	AN	-1108 (-18.1%)	-1026 (-16.7%)	-907 (-15.3%)	-824 (-13.9%)	-989 (-16.4%)	-1108 (-17.8%)
	BN	-671 (-16.8%)	-641 (-16.1%)	-551 (-14.2%)	-522 (-13.5%)	-581 (-14.9%)	-491 (-12.8%)
	D	-283 (-9%)	-143 (-4.5%)	-253 (-8.1%)	-113 (-3.6%)	-280 (-8.9%)	-144 (-4.6%)
	C	-98 (-3.6%)	-227 (-8.3%)	-131 (-4.7%)	-259 (-9.4%)	-130 (-4.7%)	-332 (-11.7%)
	AVG	-744 (-14.6%)	-701 (-13.8%)	-677 (-13.5%)	-635 (-12.7%)	-758 (-14.9%)	-784 (-15.2%)
Feb	W	-1200 (-14.2%)	-1155 (-13.7%)	-1129 (-13.5%)	-1083 (-12.9%)	-1408 (-16.3%)	-1492 (-17%)
	AN	-981 (-14.2%)	-1079 (-15.6%)	-858 (-12.6%)	-955 (-14.1%)	-1146 (-16.2%)	-1360 (-18.9%)
	BN	-1052 (-20.7%)	-1040 (-20.5%)	-905 (-18.4%)	-893 (-18.1%)	-1021 (-20.2%)	-995 (-19.8%)
	D	-536 (-14.7%)	-485 (-13.3%)	-538 (-14.7%)	-487 (-13.3%)	-512 (-14.1%)	-472 (-13%)
	C	-214 (-7.7%)	-145 (-5.2%)	-230 (-8.2%)	-161 (-5.8%)	-176 (-6.4%)	-90 (-3.3%)
	AVG	-853 (-14.8%)	-829 (-14.4%)	-790 (-13.8%)	-766 (-13.4%)	-927 (-15.9%)	-959 (-16.3%)
Mar	W	-1295 (-17.5%)	-1224 (-16.5%)	-1290 (-17.4%)	-1220 (-16.5%)	-1399 (-18.6%)	-1434 (-18.8%)
	AN	-1404 (-20.8%)	-1513 (-22.4%)	-1312 (-19.7%)	-1422 (-21.4%)	-1485 (-21.7%)	-1592 (-23.3%)
	BN	-1033 (-25.3%)	-1049 (-25.7%)	-875 (-22.3%)	-891 (-22.7%)	-836 (-21.5%)	-840 (-21.7%)
	D	-600 (-16.8%)	-617 (-17.3%)	-567 (-16%)	-585 (-16.5%)	-551 (-15.6%)	-617 (-17.2%)
	C	-191 (-7.4%)	-184 (-7.1%)	-173 (-6.7%)	-166 (-6.5%)	-164 (-6.4%)	-169 (-6.6%)
	AVG	-952 (-18.3%)	-951 (-18.3%)	-900 (-17.5%)	-900 (-17.5%)	-949 (-18.3%)	-991 (-18.9%)
Apr	W	-1293 (-22.1%)	-1329 (-22.7%)	-1311 (-22.3%)	-1346 (-22.9%)	-1303 (-22.2%)	-1293 (-22.2%)
	AN	-1103 (-25.7%)	-1112 (-26%)	-1106 (-25.8%)	-1116 (-26%)	-1025 (-24.4%)	-973 (-23.5%)
	BN	-407 (-12.8%)	-385 (-12.1%)	-367 (-11.6%)	-344 (-10.9%)	-341 (-10.9%)	-302 (-9.7%)
	D	-117 (-4.6%)	-11 (-0.4%)	-124 (-4.8%)	-17 (-0.7%)	-97 (-3.8%)	1 (0%)
	C	-44 (-2%)	11 (0.5%)	-40 (-1.8%)	16 (0.7%)	-18 (-0.9%)	-7 (-0.3%)
	AVG	-673 (-17.2%)	-650 (-16.6%)	-673 (-17.2%)	-650 (-16.6%)	-645 (-16.6%)	-605 (-15.6%)
May	W	-1478 (-29.1%)	-1886 (-37.1%)	-1445 (-28.6%)	-1853 (-36.7%)	-1095 (-23.3%)	-896 (-21.9%)
	AN	-764 (-21.1%)	-810 (-22.3%)	-723 (-20.2%)	-768 (-21.4%)	-590 (-17.1%)	-495 (-15%)
	BN	-263 (-9.7%)	-242 (-8.9%)	-213 (-8%)	-192 (-7.2%)	-100 (-3.9%)	2 (0.1%)
	D	-35 (-1.5%)	121 (5.3%)	-3 (-0.1%)	153 (6.8%)	12 (0.5%)	59 (2.5%)
	C	-26 (-1.4%)	-12 (-0.6%)	-10 (-0.5%)	4 (0.2%)	-77 (-4%)	-47 (-2.5%)
	AVG	-637 (-18.9%)	-733 (-21.7%)	-602 (-18%)	-698 (-20.9%)	-459 (-14.3%)	-350 (-11.7%)
Jun	W	-1135 (-17.2%)	-979 (-14.9%)	-1088 (-16.6%)	-932 (-14.3%)	-432 (-7.4%)	-708 (-11.2%)
	AN	-9 (-0.2%)	337 (6.2%)	-51 (-0.9%)	295 (5.4%)	-110 (-2%)	-66 (-1.1%)
	BN	-268 (-4.8%)	-138 (-2.5%)	-226 (-4.1%)	-95 (-1.7%)	-147 (-2.7%)	-225 (-3.9%)
	D	-108 (-2.1%)	-103 (-2%)	-148 (-2.8%)	-142 (-2.7%)	-194 (-3.6%)	-221 (-4.1%)
	C	-193 (-4.2%)	-157 (-3.4%)	-192 (-4.2%)	-156 (-3.4%)	-178 (-3.9%)	-222 (-4.7%)
	AVG	-459 (-8.1%)	-330 (-5.8%)	-451 (-8%)	-322 (-5.7%)	-247 (-4.5%)	-353 (-6.2%)
Jul	W	-1513 (-19.6%)	-986 (-12.8%)	-1722 (-21.7%)	-1195 (-15.1%)	-1851 (-23%)	-1442 (-17.7%)
	AN	-1727 (-20.5%)	-1642 (-19.5%)	-1817 (-21.4%)	-1732 (-20.4%)	-1907 (-22.2%)	-1980 (-22.6%)
	BN	-1763 (-21.4%)	-2021 (-24.6%)	-1853 (-22.3%)	-2110 (-25.4%)	-1763 (-21.4%)	-1892 (-23.4%)
	D	-1781 (-23%)	-2345 (-30.3%)	-1724 (-22.4%)	-2288 (-29.8%)	-1605 (-21.2%)	-2253 (-29.5%)
	C	-1622 (-24.6%)	-1412 (-21.4%)	-1264 (-20.2%)	-1055 (-16.9%)	-1256 (-20.1%)	-934 (-15.3%)
	AVG	-1662 (-21.5%)	-1619 (-20.9%)	-1692 (-21.8%)	-1649 (-21.2%)	-1703 (-21.9%)	-1701 (-21.7%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-2040 (-30.3%)	-1935 (-28.8%)	-2068 (-30.6%)	-1963 (-29.1%)	-2059 (-30.5%)	-2008 (-29.5%)
	AN	-1541 (-22.9%)	-1378 (-20.4%)	-1691 (-24.5%)	-1528 (-22.2%)	-1748 (-25.2%)	-1851 (-25.7%)
	BN	-1704 (-25.5%)	-1728 (-25.9%)	-1739 (-25.9%)	-1764 (-26.3%)	-1587 (-24.2%)	-1901 (-27.8%)
	D	-2009 (-28.5%)	-1996 (-28.3%)	-1686 (-25%)	-1673 (-24.8%)	-1288 (-20.3%)	-1230 (-19.5%)
	C	-618 (-12.2%)	-600 (-11.9%)	-561 (-11.2%)	-543 (-10.9%)	-385 (-8%)	-278 (-5.9%)
	AVG	-1695 (-25.9%)	-1636 (-25%)	-1652 (-25.4%)	-1594 (-24.5%)	-1519 (-23.8%)	-1543 (-23.9%)
Sep	W	-2529 (-36%)	-2595 (-37%)	-950 (-17.5%)	-1016 (-18.7%)	-1215 (-21.3%)	-1176 (-21%)
	AN	-1555 (-26.1%)	-1450 (-24.3%)	-3708 (-45.7%)	-3604 (-44.4%)	-3425 (-43.8%)	-3227 (-41.7%)
	BN	-1367 (-23.8%)	-1326 (-23.1%)	-1341 (-23.5%)	-1301 (-22.8%)	-1471 (-25.2%)	-1291 (-22.7%)
	D	-1288 (-22.8%)	-1121 (-19.8%)	-993 (-18.5%)	-826 (-15.4%)	-582 (-11.8%)	-85 (-1.8%)
	C	-260 (-5.7%)	-55 (-1.2%)	-136 (-3%)	70 (1.6%)	-27 (-0.6%)	295 (7%)
	AVG	-1584 (-26.5%)	-1516 (-25.3%)	-1311 (-22.9%)	-1243 (-21.8%)	-1269 (-22.4%)	-1041 (-18.9%)
Oct	W	-720 (-15.2%)	-224 (-4.7%)	-657 (-14.1%)	-160 (-3.4%)	-712 (-15.1%)	-247 (-5.2%)
	AN	-158 (-3.4%)	-57 (-1.2%)	-378 (-7.8%)	-278 (-5.7%)	-172 (-3.7%)	187 (4.3%)
	BN	-440 (-8.9%)	47 (0.9%)	-297 (-6.2%)	189 (3.9%)	-317 (-6.5%)	194 (4%)
	D	-178 (-3.8%)	350 (7.5%)	-233 (-4.9%)	295 (6.2%)	-261 (-5.5%)	545 (12.1%)
	C	-242 (-5.3%)	139 (3.1%)	-179 (-4%)	202 (4.5%)	-142 (-3.2%)	-12 (-0.3%)
	AVG	-401 (-8.5%)	26 (0.5%)	-392 (-8.3%)	35 (0.7%)	-383 (-8.1%)	100 (2.2%)
Nov	W	-908 (-19.9%)	-1080 (-23.7%)	-738 (-16.8%)	-910 (-20.8%)	-681 (-15.7%)	-584 (-14.4%)
	AN	-479 (-12.4%)	-523 (-13.5%)	-413 (-10.9%)	-458 (-12%)	-383 (-10.2%)	-381 (-10.2%)
	BN	-544 (-13.3%)	-656 (-16%)	-415 (-10.5%)	-527 (-13.3%)	-277 (-7.2%)	-267 (-7.2%)
	D	-455 (-11.5%)	-723 (-18.3%)	-394 (-10.1%)	-662 (-17%)	-249 (-6.6%)	-411 (-11.3%)
	C	-426 (-11.1%)	-263 (-6.8%)	-286 (-7.7%)	-123 (-3.3%)	-242 (-6.6%)	32 (0.9%)
	AVG	-613 (-14.8%)	-728 (-17.6%)	-494 (-12.3%)	-609 (-15.1%)	-409 (-10.4%)	-372 (-9.8%)
Dec	W	-925 (-14.9%)	-1074 (-17.3%)	-660 (-11.1%)	-809 (-13.6%)	-909 (-14.7%)	-751 (-12.8%)
	AN	-280 (-6.6%)	91 (2.1%)	-364 (-8.4%)	6 (0.1%)	-447 (-10.1%)	-66 (-1.5%)
	BN	-183 (-4.6%)	-161 (-4.1%)	-265 (-6.5%)	-243 (-6%)	-274 (-6.8%)	-187 (-4.7%)
	D	-81 (-2.2%)	-28 (-0.8%)	-147 (-4%)	-94 (-2.5%)	-126 (-3.4%)	-35 (-1%)
	C	-115 (-3.3%)	-107 (-3.1%)	-26 (-0.8%)	-17 (-0.5%)	55 (1.7%)	128 (4%)
	AVG	-400 (-8.8%)	-377 (-8.3%)	-344 (-7.6%)	-320 (-7.1%)	-420 (-9.2%)	-269 (-6%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

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Table C.5.3-17. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Fremont Weir Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	20,528	19,687	23,036	24,758	26,605	28,086
	AN	4,359	4,207	4,495	4,602	7,373	6,353
	BN	–	–	–	–	1,929	1,830
	D	103	96	184	45	833	768
	C	–	–	–	–	413	389
	AVG	7,170	6,879	8,003	8,533	10,087	10,373
Feb	W	23,869	23,256	28,177	29,796	30,769	32,583
	AN	9,430	8,130	9,202	10,011	13,811	14,110
	BN	1,179	1,015	1,279	691	3,636	3,414
	D	542	544	623	641	1,587	1,556
	C	–	–	–	–	428	426
	AVG	9,269	8,856	10,636	11,171	12,809	13,383
Mar	W	15,897	15,576	17,336	18,802	19,556	21,084
	AN	6,058	5,386	6,631	7,175	9,515	10,114
	BN	1	2	2	5	1,590	1,485
	D	86	78	93	111	1,201	1,178
	C	–	–	–	–	409	401
	AVG	5,946	5,744	6,488	7,037	8,188	8,736
Apr	W	3,122	3,144	3,515	3,513	5,837	5,627
	AN	124	149	145	158	1,634	1,651
	BN	36	39	37	28	588	586
	D	–	–	–	–	227	243
	C	–	–	–	–	106	106
	AVG	1,014	1,025	1,142	1,142	2,256	2,195
May	W	345	343	184	43	284	142
	AN	–	–	–	–	100	100
	BN	–	–	–	–	100	100
	D	–	–	–	–	100	100
	C	–	–	–	–	100	100
	AVG	110	109	58	14	158	113
Jun	W	82	77	6	–	105	100
	AN	–	–	–	–	100	100
	BN	–	–	–	–	100	100
	D	–	–	–	–	100	100
	C	–	–	–	–	100	100
	AVG	26	24	2	–	102	100
Jul	W	–	–	–	–	–	–
	AN	–	–	–	–	–	–
	BN	–	–	–	–	–	–
	D	–	–	–	–	–	–
	C	–	–	–	–	–	–
	AVG	–	–	–	–	–	–

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	–	–	–	–	–	–
	AN	–	–	–	–	–	–
	BN	–	–	–	–	–	–
	D	–	–	–	–	–	–
	C	–	–	–	–	–	–
	AVG	–	–	–	–	–	–
Sep	W	–	–	–	–	100	100
	AN	–	–	–	–	100	100
	BN	–	–	–	–	100	100
	D	–	–	–	–	100	100
	C	–	–	–	–	100	100
	AVG	–	–	–	–	100	100
Oct	W	53	77	85	39	141	140
	AN	–	–	–	–	100	100
	BN	–	–	–	–	100	100
	D	–	–	–	–	100	100
	C	–	–	–	–	100	100
	AVG	17	25	27	12	113	113
Nov	W	828	709	844	502	1,150	736
	AN	–	–	–	–	100	100
	BN	–	–	–	–	100	100
	D	–	–	–	–	100	100
	C	–	–	–	–	100	100
	AVG	263	225	268	159	433	302
Dec	W	6,724	5,628	7,511	5,906	11,349	9,094
	AN	823	834	1,220	926	1,736	1,513
	BN	793	800	1,403	839	1,644	1,169
	D	–	–	–	–	427	386
	C	–	–	–	–	138	140
	AVG	2,388	2,043	2,800	2,151	4,247	3,409

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Table C.5.3-18. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Fremont Weir[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	6077 (29.6%)	7558 (36.8%)	6918 (35.1%)	8399 (42.7%)	3569 (15.5%)	3328 (13.4%)
	AN	3014 (69.1%)	1994 (45.7%)	3166 (75.3%)	2146 (51%)	2878 (64%)	1752 (38.1%)
	BN	–	–	–	–	–	–
	D	730 (708.6%)	665 (645.7%)	736 (763.3%)	672 (696.1%)	649 (352.3%)	723 (1607.8%)
	C	–	–	–	–	–	–
	AVG	2918 (40.7%)	3203 (44.7%)	3208 (46.6%)	3494 (50.8%)	2085 (26.1%)	1840 (21.6%)
Feb	W	6900 (28.9%)	8714 (36.5%)	7513 (32.3%)	9327 (40.1%)	2593 (9.2%)	2787 (9.4%)
	AN	4381 (46.5%)	4680 (49.6%)	5681 (69.9%)	5980 (73.6%)	4609 (50.1%)	4099 (40.9%)
	BN	2457 (208.4%)	2235 (189.6%)	2622 (258.4%)	2399 (236.5%)	2357 (184.3%)	2723 (394.2%)
	D	1045 (192.8%)	1014 (187.1%)	1043 (191.7%)	1012 (186.1%)	964 (154.7%)	915 (142.6%)
	C	–	–	–	–	–	–
	AVG	3541 (38.2%)	4114 (44.4%)	3953 (44.6%)	4527 (51.1%)	2173 (20.4%)	2212 (19.8%)
Mar	W	3659 (23%)	5187 (32.6%)	3980 (25.6%)	5508 (35.4%)	2220 (12.8%)	2282 (12.1%)
	AN	3457 (57.1%)	4056 (66.9%)	4129 (76.7%)	4728 (87.8%)	2884 (43.5%)	2939 (41%)
	BN	1589 (235905.4%)	1484 (220381.9%)	1587 (72179.2%)	1483 (67425%)	1588 (99401.7%)	1480 (31265.1%)
	D	1116 (1303.8%)	1092 (1276.5%)	1124 (1445.1%)	1100 (1415.2%)	1109 (1198.6%)	1067 (958.1%)
	C	–	–	–	–	–	–
	AVG	2242 (37.7%)	2790 (46.9%)	2444 (42.5%)	2992 (52.1%)	1700 (26.2%)	1699 (24.1%)
Apr	W	2716 (87%)	2505 (80.3%)	2693 (85.6%)	2483 (79%)	2323 (66.1%)	2114 (60.2%)
	AN	1510 (1221.1%)	1527 (1235.2%)	1485 (998.8%)	1502 (1010.5%)	1489 (1027.3%)	1493 (945.8%)
	BN	551 (1511.9%)	550 (1507.1%)	549 (1418.1%)	547 (1413.6%)	551 (1476.3%)	558 (1977.7%)
	D	–	–	–	–	–	–
	C	–	–	–	–	–	–
	AVG	1242 (122.4%)	1181 (116.4%)	1230 (120%)	1169 (114%)	1114 (97.5%)	1053 (92.2%)
May	W	-62 (-17.9%)	-203 (-58.8%)	-59 (-17.3%)	-201 (-58.5%)	100 (54.1%)	100 (234.2%)
	AN	–	–	–	–	–	–
	BN	–	–	–	–	–	–
	D	–	–	–	–	–	–
	C	–	–	–	–	–	–
	AVG	49 (44.4%)	4 (3.6%)	49 (45.5%)	5 (4.3%)	100 (171.2%)	100 (739.8%)
Jun	W	23 (28.3%)	18 (21.7%)	29 (37.1%)	23 (30%)	100 (1769.3%)	-
	AN	–	–	–	–	–	–
	BN	–	–	–	–	–	–
	D	–	–	–	–	–	–
	C	–	–	–	–	–	–
	AVG	76 (290.3%)	74 (283.8%)	77 (317.2%)	76 (310.1%)	100 (5589.2%)	–
Jul	W	–	–	–	–	–	–
	AN	–	–	–	–	–	–
	BN	–	–	–	–	–	–
	D	–	–	–	–	–	–
	C	–	–	–	–	–	–
	AVG	–	–	–	–	–	–

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	–	–	–	–	–	–
	AN	–	–	–	–	–	–
	BN	–	–	–	–	–	–
	D	–	–	–	–	–	–
	C	–	–	–	–	–	–
	AVG	–	–	–	–	–	–
Sep	W	–	–	–	–	–	–
	AN	–	–	–	–	–	–
	BN	–	–	–	–	–	–
	D	–	–	–	–	–	–
	C	–	–	–	–	–	–
	AVG	–	–	–	–	–	–
Oct	W	88 (167.2%)	87 (165.8%)	63 (82%)	63 (81.1%)	55 (65.1%)	101 (259.6%)
	AN	–	–	–	–	–	–
	BN	–	–	–	–	–	–
	D	–	–	–	–	–	–
	C	–	–	–	–	–	–
	AVG	96 (576.1%)	96 (574.6%)	88 (360.6%)	88 (359.6%)	86 (317.7%)	100 (812.9%)
Nov	W	322 (38.9%)	-93 (-11.2%)	441 (62.3%)	27 (3.8%)	306 (36.2%)	234 (46.6%)
	AN	–	–	–	–	–	–
	BN	–	–	–	–	–	–
	D	–	–	–	–	–	–
	C	–	–	–	–	–	–
	AVG	170 (64.9%)	39 (14.8%)	208 (92.7%)	77 (34.1%)	165 (61.7%)	142 (89.6%)
Dec	W	4626 (68.8%)	2370 (35.2%)	5721 (101.6%)	3465 (61.6%)	3839 (51.1%)	3188 (54%)
	AN	912 (110.8%)	689 (83.7%)	902 (108.2%)	679 (81.5%)	516 (42.3%)	586 (63.3%)
	BN	851 (107.4%)	376 (47.4%)	844 (105.5%)	369 (46.1%)	241 (17.2%)	330 (39.4%)
	D	–	–	–	–	–	–
	C	–	–	–	–	–	–
	AVG	1860 (77.9%)	1022 (42.8%)	2204 (107.9%)	1366 (66.9%)	1448 (51.7%)	1258 (58.5%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

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C.5.3.1.2 Smelt Larval Transport Flows

Delta Smelt

Delta smelt may rely on flow patterns to facilitate their movement between habitat areas for each life stage. The literature describes this as movement from spawning areas to the vicinity of the low salinity zone (LSZ) where most feeding and maturation occur (Bennett 2005). Also, entrainment of delta smelt at the south Delta facilities may increase when transport flows are lower because fish can be influenced by negative Old and Middle River (OMR) flow associated with pumping from the State Water Project (SWP) and Central Valley Project (CVP) facilities. The evaluation of entrainment relative to particle movement as a result of transport flows is described in Appendix B, *Entrainment*.

CALSIM Flows

Delta Outflow

The various model scenarios are estimated to result in very similar May through June outflows in the driest 45% of years (Figure C.5.3-1). It is during these drier conditions that water temperatures are likely to become too warm. The model scenarios begin to diverge at this point, with the EBC1 and EBC2 having higher flows than the preliminary proposal 65% of the time and the EBC1, EBC2_ELT, and EBC2_LLT providing higher flows than the corresponding preliminary proposal model scenarios beginning about 45% of the time. The preliminary proposal model scenarios do not begin to diverge substantially from one another except in the wettest 20% of years. Above the 50th percentile, flows under the existing biological conditions always exceed those for the corresponding preliminary proposal climate change scenario. Box plots displaying the distribution of average May through June Delta outflow by scenario are presented in Figure C.5.3-2.

Averaged across all water years and without accounting for climate change effects (i.e., comparisons with EBC1 and EBC2), Delta outflows under PP scenarios were around 4,500–6,000 cubic feet per second (cfs) (20–26%) lower than EBC scenarios in May, and 2000 cfs (15–16%) lower than EBC scenarios in June (Table C.5.3-19 and Table C.5.3-20). When climate change effects were accounted for, PP scenarios were on average 2,500–3,500 cfs (13–17%) lower than EBC scenarios in May and were relatively unchanged in June. There was little difference between PP and EBC scenarios in average flow during May and June of critical years regardless of whether climate change was accounted for. Average outflow was appreciably lower (20–30%) under PP scenarios compared with EBC1 and EBC2 scenarios during May of below-normal, above-normal, and wet years. Accounting for climate change, PP scenarios were 10–24% lower than EBC2_ELT and EBC2_LLT during May in these water-year types. In June, average flows in below-normal and dry years were somewhat greater (8–21%) under PP scenarios than EBC1 and EBC2 scenarios, whereas in above-normal and wet years, flows under PP scenarios were 10–30+% lower than EBC1 and EBC2 scenarios. When accounting for climate change, there generally was little difference (-7% to +8%) between PP and EBC scenarios in June (Table C.5.3-20).

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Table C.5.3-19. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Delta Outflow Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	85,900	84,432	91,158	94,620	91,537	93,735
	AN	49,448	47,574	48,959	51,100	47,621	48,196
	BN	22,968	22,129	22,263	22,301	21,336	21,763
	D	14,736	14,587	14,754	14,732	13,634	15,816
	C	11,343	12,118	12,173	12,651	11,354	12,882
	AVG	43,289	42,487	44,889	46,372	44,290	45,847
Feb	W	96,835	95,560	104,533	107,085	106,071	107,800
	AN	62,321	60,457	64,163	65,873	66,184	65,435
	BN	36,766	35,439	37,266	36,084	35,985	35,010
	D	20,915	20,907	20,936	21,461	18,637	19,127
	C	12,991	13,053	12,553	12,798	11,919	12,373
	AVG	52,594	51,697	55,330	56,338	55,297	55,743
Mar	W	78,956	78,235	81,693	84,471	82,703	84,947
	AN	54,171	52,769	55,754	56,737	54,328	54,848
	BN	24,029	22,941	22,522	22,467	21,382	21,443
	D	19,880	19,489	19,388	19,985	16,912	17,264
	C	11,911	11,640	11,948	12,215	11,308	11,551
	AVG	43,172	42,427	43,911	45,097	43,191	44,102
Apr	W	54,394	54,471	54,860	54,562	48,665	48,246
	AN	31,975	31,907	31,183	30,576	24,174	24,457
	BN	21,928	21,726	21,218	20,641	16,506	16,714
	D	14,142	14,196	13,450	13,413	11,417	12,324
	C	9,053	9,012	8,881	9,294	8,537	9,012
	AVG	30,099	30,085	29,833	29,603	25,542	25,754
May	W	41,040	40,498	38,276	32,880	31,850	27,984
	AN	24,200	23,780	23,131	21,709	17,683	16,919
	BN	16,299	15,887	14,740	13,596	11,506	12,204
	D	10,487	10,211	9,737	10,375	9,103	10,508
	C	6,000	5,905	6,341	6,286	6,037	6,196
	AVG	22,517	22,139	21,103	19,121	17,532	16,646
Jun	W	23,451	23,008	18,080	15,640	16,890	15,739
	AN	11,801	11,836	10,177	10,676	10,048	10,625
	BN	8,004	8,046	8,067	8,943	8,702	9,688
	D	6,636	6,750	7,123	7,689	7,512	7,844
	C	5,322	5,322	5,345	5,632	5,345	5,365
	AVG	12,765	12,661	10,945	10,560	10,743	10,706
Jul	W	11,441	11,342	10,817	11,407	9,266	9,186
	AN	9,430	9,580	10,657	12,225	8,575	8,891
	BN	7,151	7,435	7,613	7,668	6,482	6,388
	D	5,024	5,103	5,548	6,448	5,406	5,397
	C	4,238	4,279	4,953	5,832	4,219	5,344
	AVG	7,951	8,014	8,232	8,984	7,104	7,271

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	5,341	5,032	4,412	4,308	4,202	4,000
	AN	4,000	4,000	4,009	4,713	4,000	4,175
	BN	4,000	4,000	4,120	5,129	3,857	4,088
	D	4,829	4,759	4,617	5,348	3,687	4,470
	C	4,077	4,484	4,141	4,433	3,396	3,919
	AVG	4,618	4,565	4,308	4,754	3,882	4,132
Sep	W	9,569	19,685	18,873	20,078	5,096	4,185
	AN	3,672	11,771	11,810	11,581	3,154	3,077
	BN	3,445	3,279	3,795	3,428	3,000	3,190
	D	3,350	3,165	3,067	3,021	3,000	3,979
	C	3,000	3,000	3,000	3,036	3,035	5,689
	AVG	5,334	9,658	9,473	9,754	3,692	4,028
Oct	W	6,487	7,509	8,133	9,520	5,830	9,685
	AN	4,021	5,273	6,500	8,982	4,161	9,717
	BN	4,477	5,420	6,206	8,054	4,448	10,487
	D	4,157	5,242	6,017	7,294	4,565	8,757
	C	4,158	4,682	4,969	6,607	4,724	10,195
	AVG	4,931	5,914	6,638	8,276	4,910	9,698
Nov	W	14,232	17,295	17,346	15,987	13,185	12,336
	AN	9,683	12,587	12,410	11,529	8,029	6,760
	BN	5,864	8,762	8,694	8,681	4,932	4,493
	D	6,943	8,651	8,375	8,052	5,815	5,494
	C	5,045	6,494	5,988	5,725	4,216	5,163
	AVG	9,193	11,671	11,515	10,844	8,091	7,629
Dec	W	48,185	44,649	49,759	45,191	51,097	45,940
	AN	18,014	18,190	19,384	19,119	19,120	20,042
	BN	11,950	11,724	13,284	12,231	13,722	12,524
	D	8,884	8,278	8,467	8,828	8,680	8,634
	C	5,531	5,283	5,505	6,560	6,160	5,562
	AVG	22,714	21,411	23,546	22,113	24,149	22,347

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Table C.5.3-20. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Delta Outflow[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	5637 (6.6%)	7835 (9.1%)	7105 (8.4%)	9302 (11%)	379 (0.4%)	-885 (-0.9%)
	AN	-1826 (-3.7%)	-1251 (-2.5%)	47 (0.1%)	622 (1.3%)	-1338 (-2.7%)	-2904 (-5.7%)
	BN	-1632 (-7.1%)	-1205 (-5.2%)	-793 (-3.6%)	-366 (-1.7%)	-927 (-4.2%)	-538 (-2.4%)
	D	-1101 (-7.5%)	1081 (7.3%)	-953 (-6.5%)	1229 (8.4%)	-1119 (-7.6%)	1084 (7.4%)
	C	11 (0.1%)	1540 (13.6%)	-764 (-6.3%)	764 (6.3%)	-819 (-6.7%)	232 (1.8%)
	AVG	1001 (2.3%)	2558 (5.9%)	1803 (4.2%)	3360 (7.9%)	-599 (-1.3%)	-525 (-1.1%)
Feb	W	9236 (9.5%)	10964 (11.3%)	10511 (11%)	12239 (12.8%)	1538 (1.5%)	714 (0.7%)
	AN	3863 (6.2%)	3113 (5%)	5727 (9.5%)	4977 (8.2%)	2021 (3.1%)	-438 (-0.7%)
	BN	-781 (-2.1%)	-1756 (-4.8%)	546 (1.5%)	-429 (-1.2%)	-1281 (-3.4%)	-1074 (-3%)
	D	-2278 (-10.9%)	-1788 (-8.5%)	-2269 (-10.9%)	-1779 (-8.5%)	-2298 (-11%)	-2334 (-10.9%)
	C	-1072 (-8.2%)	-618 (-4.8%)	-1133 (-8.7%)	-680 (-5.2%)	-633 (-5%)	-425 (-3.3%)
	AVG	2703 (5.1%)	3149 (6%)	3600 (7%)	4046 (7.8%)	-33 (-0.1%)	-596 (-1.1%)
Mar	W	3747 (4.7%)	5992 (7.6%)	4467 (5.7%)	6712 (8.6%)	1010 (1.2%)	476 (0.6%)
	AN	157 (0.3%)	677 (1.2%)	1559 (3%)	2079 (3.9%)	-1426 (-2.6%)	-1890 (-3.3%)
	BN	-2647 (-11%)	-2586 (-10.8%)	-1560 (-6.8%)	-1498 (-6.5%)	-1140 (-5.1%)	-1024 (-4.6%)
	D	-2968 (-14.9%)	-2617 (-13.2%)	-2577 (-13.2%)	-2225 (-11.4%)	-2476 (-12.8%)	-2722 (-13.6%)
	C	-604 (-5.1%)	-360 (-3%)	-333 (-2.9%)	-90 (-0.8%)	-641 (-5.4%)	-664 (-5.4%)
	AVG	19 (0%)	930 (2.2%)	764 (1.8%)	1675 (3.9%)	-720 (-1.6%)	-995 (-2.2%)
Apr	W	-5729 (-10.5%)	-6148 (-11.3%)	-5806 (-10.7%)	-6224 (-11.4%)	-6195 (-11.3%)	-6316 (-11.6%)
	AN	-7801 (-24.4%)	-7519 (-23.5%)	-7733 (-24.2%)	-7451 (-23.4%)	-7009 (-22.5%)	-6119 (-20%)
	BN	-5422 (-24.7%)	-5214 (-23.8%)	-5220 (-24%)	-5012 (-23.1%)	-4713 (-22.2%)	-3927 (-19%)
	D	-2725 (-19.3%)	-1818 (-12.9%)	-2779 (-19.6%)	-1872 (-13.2%)	-2033 (-15.1%)	-1090 (-8.1%)
	C	-517 (-5.7%)	-41 (-0.5%)	-475 (-5.3%)	0 (0%)	-344 (-3.9%)	-282 (-3%)
	AVG	-4558 (-15.1%)	-4345 (-14.4%)	-4543 (-15.1%)	-4330 (-14.4%)	-4291 (-14.4%)	-3849 (-13%)
May	W	-9190 (-22.4%)	-13056 (-31.8%)	-8649 (-21.4%)	-12515 (-30.9%)	-6426 (-16.8%)	-4897 (-14.9%)
	AN	-6517 (-26.9%)	-7280 (-30.1%)	-6098 (-25.6%)	-6861 (-28.9%)	-5449 (-23.6%)	-4790 (-22.1%)
	BN	-4793 (-29.4%)	-4095 (-25.1%)	-4381 (-27.6%)	-3683 (-23.2%)	-3235 (-21.9%)	-1392 (-10.2%)
	D	-1385 (-13.2%)	21 (0.2%)	-1108 (-10.9%)	297 (2.9%)	-634 (-6.5%)	133 (1.3%)
	C	37 (0.6%)	196 (3.3%)	133 (2.2%)	291 (4.9%)	-304 (-4.8%)	-90 (-1.4%)
	AVG	-4984 (-22.1%)	-5871 (-26.1%)	-4607 (-20.8%)	-5493 (-24.8%)	-3571 (-16.9%)	-2475 (-12.9%)
Jun	W	-6561 (-28%)	-7711 (-32.9%)	-6118 (-26.6%)	-7268 (-31.6%)	-1190 (-6.6%)	100 (0.6%)
	AN	-1753 (-14.9%)	-1176 (-10%)	-1788 (-15.1%)	-1211 (-10.2%)	-129 (-1.3%)	-51 (-0.5%)
	BN	698 (8.7%)	1684 (21%)	656 (8.2%)	1642 (20.4%)	635 (7.9%)	745 (8.3%)
	D	876 (13.2%)	1209 (18.2%)	762 (11.3%)	1095 (16.2%)	389 (5.5%)	155 (2%)
	C	23 (0.4%)	43 (0.8%)	23 (0.4%)	43 (0.8%)	-1 (0%)	-267 (-4.7%)
	AVG	-2022 (-15.8%)	-2058 (-16.1%)	-1919 (-15.2%)	-1955 (-15.4%)	-202 (-1.8%)	146 (1.4%)
Jul	W	-2175 (-19%)	-2255 (-19.7%)	-2076 (-18.3%)	-2156 (-19%)	-1551 (-14.3%)	-2221 (-19.5%)
	AN	-856 (-9.1%)	-540 (-5.7%)	-1005 (-10.5%)	-690 (-7.2%)	-2083 (-19.5%)	-3334 (-27.3%)
	BN	-669 (-9.4%)	-763 (-10.7%)	-953 (-12.8%)	-1047 (-14.1%)	-1130 (-14.8%)	-1280 (-16.7%)
	D	383 (7.6%)	374 (7.4%)	304 (6%)	295 (5.8%)	-141 (-2.5%)	-1051 (-16.3%)
	C	-19 (-0.4%)	1107 (26.1%)	-60 (-1.4%)	1065 (24.9%)	-734 (-14.8%)	-488 (-8.4%)
	AVG	-848 (-10.7%)	-680 (-8.6%)	-910 (-11.4%)	-743 (-9.3%)	-1128 (-13.7%)	-1713 (-19.1%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-1139 (-21.3%)	-1341 (-25.1%)	-830 (-16.5%)	-1032 (-20.5%)	-210 (-4.8%)	-308 (-7.2%)
	AN	0 (0%)	175 (4.4%)	0 (0%)	175 (4.4%)	-9 (-0.2%)	-538 (-11.4%)
	BN	-143 (-3.6%)	88 (2.2%)	-143 (-3.6%)	88 (2.2%)	-263 (-6.4%)	-1041 (-20.3%)
	D	-1142 (-23.6%)	-358 (-7.4%)	-1073 (-22.5%)	-289 (-6.1%)	-930 (-20.2%)	-877 (-16.4%)
	C	-681 (-16.7%)	-158 (-3.9%)	-1088 (-24.3%)	-564 (-12.6%)	-745 (-18%)	-514 (-11.6%)
	AVG	-736 (-15.9%)	-486 (-10.5%)	-682 (-14.9%)	-433 (-9.5%)	-426 (-9.9%)	-622 (-13.1%)
Sep	W	-4473 (-46.7%)	-5384 (-56.3%)	-14589 (-74.1%)	-15500 (-78.7%)	-13777 (-73%)	-15893 (-79.2%)
	AN	-518 (-14.1%)	-595 (-16.2%)	-8617 (-73.2%)	-8694 (-73.9%)	-8656 (-73.3%)	-8504 (-73.4%)
	BN	-445 (-12.9%)	-256 (-7.4%)	-279 (-8.5%)	-89 (-2.7%)	-795 (-21%)	-238 (-6.9%)
	D	-350 (-10.5%)	628 (18.8%)	-165 (-5.2%)	813 (25.7%)	-67 (-2.2%)	957 (31.7%)
	C	35 (1.2%)	2689 (89.6%)	35 (1.2%)	2689 (89.6%)	35 (1.2%)	2653 (87.4%)
	AVG	-1642 (-30.8%)	-1306 (-24.5%)	-5966 (-61.8%)	-5630 (-58.3%)	-5780 (-61%)	-5726 (-58.7%)
Oct	W	-657 (-10.1%)	3199 (49.3%)	-1679 (-22.4%)	2176 (29%)	-2303 (-28.3%)	165 (1.7%)
	AN	140 (3.5%)	5696 (141.7%)	-1112 (-21.1%)	4444 (84.3%)	-2338 (-36%)	735 (8.2%)
	BN	-28 (-0.6%)	6010 (134.3%)	-972 (-17.9%)	5066 (93.5%)	-1758 (-28.3%)	2433 (30.2%)
	D	407 (9.8%)	4600 (110.6%)	-677 (-12.9%)	3516 (67.1%)	-1453 (-24.1%)	1463 (20.1%)
	C	566 (13.6%)	6037 (145.2%)	42 (0.9%)	5513 (117.8%)	-245 (-4.9%)	3588 (54.3%)
	AVG	-20 (-0.4%)	4767 (96.7%)	-1004 (-17%)	3784 (64%)	-1727 (-26%)	1422 (17.2%)
Nov	W	-1047 (-7.4%)	-1897 (-13.3%)	-4110 (-23.8%)	-4959 (-28.7%)	-4161 (-24%)	-3652 (-22.8%)
	AN	-1655 (-17.1%)	-2923 (-30.2%)	-4558 (-36.2%)	-5826 (-46.3%)	-4382 (-35.3%)	-4768 (-41.4%)
	BN	-933 (-15.9%)	-1371 (-23.4%)	-3831 (-43.7%)	-4269 (-48.7%)	-3763 (-43.3%)	-4188 (-48.2%)
	D	-1128 (-16.2%)	-1449 (-20.9%)	-2836 (-32.8%)	-3157 (-36.5%)	-2560 (-30.6%)	-2558 (-31.8%)
	C	-829 (-16.4%)	118 (2.3%)	-2277 (-35.1%)	-1330 (-20.5%)	-1772 (-29.6%)	-562 (-9.8%)
	AVG	-1102 (-12%)	-1564 (-17%)	-3580 (-30.7%)	-4042 (-34.6%)	-3424 (-29.7%)	-3215 (-29.6%)
Dec	W	2912 (6%)	-2245 (-4.7%)	6448 (14.4%)	1291 (2.9%)	1338 (2.7%)	749 (1.7%)
	AN	1106 (6.1%)	2027 (11.3%)	930 (5.1%)	1851 (10.2%)	-264 (-1.4%)	923 (4.8%)
	BN	1771 (14.8%)	574 (4.8%)	1998 (17%)	801 (6.8%)	437 (3.3%)	293 (2.4%)
	D	-204 (-2.3%)	-250 (-2.8%)	402 (4.9%)	356 (4.3%)	213 (2.5%)	-194 (-2.2%)
	C	629 (11.4%)	31 (0.6%)	878 (16.6%)	280 (5.3%)	655 (11.9%)	-998 (-15.2%)
	AVG	1435 (6.3%)	-367 (-1.6%)	2738 (12.8%)	936 (4.4%)	603 (2.6%)	234 (1.1%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

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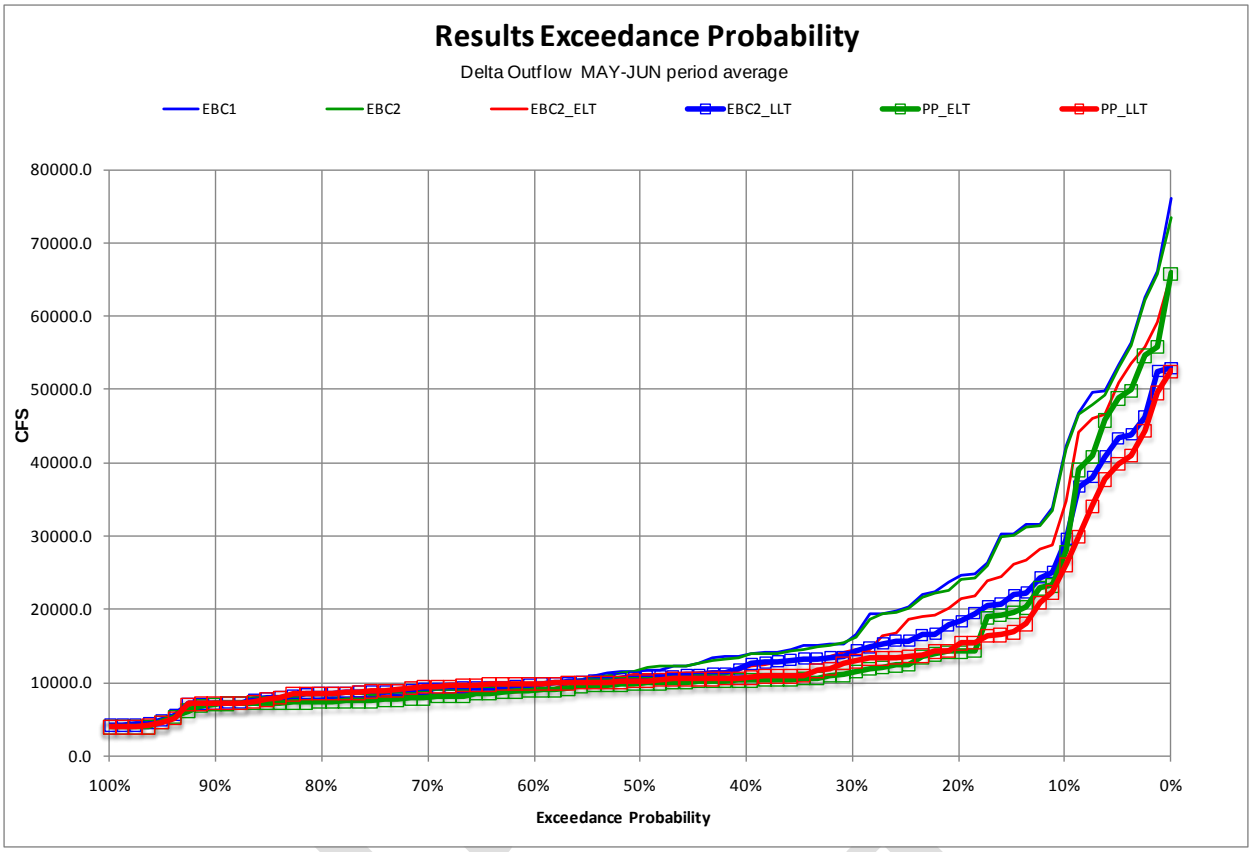

Figure C.5.3-1. Exceedance Plot of Delta Outflow in May and June

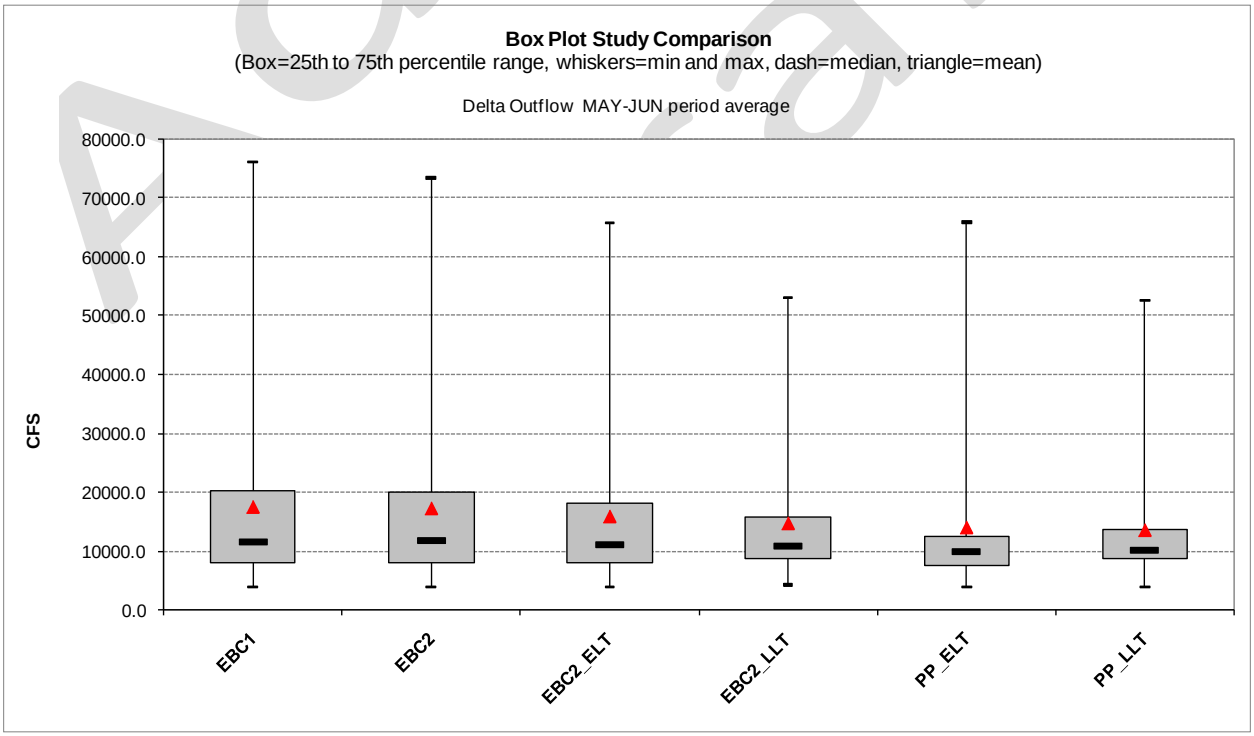

Figure C.5.3-2. Average Monthly Delta Outflow in May and June

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Sacramento River Flow at Rio Vista

The potential effect of preliminary proposal operations on larval delta smelt transport also was evaluated by examining average monthly Sacramento River flow at Rio Vista for May and June. Figure C.5.3-3 presents the various model scenarios and indicates patterns similar to those described for Delta outflow, but the magnitude of differences among model scenarios is somewhat greater. Box plots displaying the distribution of average May through June Rio Vista flow by scenario are presented in Figure C.5.3-4.

Averaged across all water years and without accounting for climate change effects (i.e., comparisons with EBC1 and EBC2), Rio Vista flows under PP scenarios were around 4,000–5,000 cfs (25–31%) lower than EBC scenarios in May, and around 3,200 cfs (32–33%) lower than EBC scenarios in June (Table C.5.3-21 and Table C.5.3-22). When climate change effects were accounted for, PP scenarios on average were 2,200–2,900 cfs (17–20%) lower than EBC scenarios in May and 1,600–1,900 cfs less than EBC scenarios in June. Differences in average Rio Vista flows between PP and EBC scenarios in critical, dry, and below-normal years ranged from around 1,600 cfs (15%) lower flows under PP (i.e., EBC1 vs. PP_ELT in May of below-normal years) to 1,100 cfs (14%) higher flows under PP (i.e., EBC2 vs. PP_LLT of dry years). Average differences between PP and EBC scenarios for above-normal and wet years were greater than for other water-year types, with averages for PP scenarios being consistently lower than EBC scenarios. Without accounting for climate change, differences in average flows for wet and above-normal years ranged from 2,300 cfs (23%) less under PP_LLT compared with EBC1 in June of above-normal years to almost 13,000 cfs (47%) less under PP_LLT compared with EBC1 in May of wet years. Accounting for climate change, differences in average Rio Vista flows for wet and above-normal years ranged from 1,600 cfs (18%) less under PP_LLT compared with EBC2_LLT in June of above-normal years to almost around 7,000 cfs (29%) less under PP_ELT compared with EBC2_ELT in May of wet years (Table C.5.3-22).

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Table C.5.3-21. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Sacramento River at Rio Vista Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	71,111	70,016	75,510	78,551	70,205	72,415
	AN	41,963	40,537	41,416	42,919	37,937	37,439
	BN	20,943	20,264	20,388	19,991	18,597	18,693
	D	14,895	14,766	15,032	14,927	13,853	14,703
	C	11,853	12,139	12,114	12,601	11,688	10,822
	AVG	37,268	36,610	38,556	39,721	35,738	36,443
Feb	W	80,958	79,915	87,232	89,989	80,666	83,061
	AN	52,542	50,466	53,615	55,363	50,869	50,658
	BN	30,159	29,018	30,231	29,442	25,883	25,747
	D	19,320	19,411	19,318	19,422	16,937	17,247
	C	12,247	12,437	12,074	11,956	11,366	11,812
	AVG	44,541	43,759	46,674	47,675	42,821	43,660
Mar	W	63,763	63,456	66,275	68,663	59,359	61,586
	AN	46,750	45,497	47,974	48,513	41,165	41,050
	BN	20,980	19,944	19,629	19,562	15,823	15,626
	D	17,656	17,428	17,341	17,679	14,858	14,726
	C	10,710	10,649	10,603	10,684	9,930	9,981
	AVG	36,084	35,567	36,744	37,655	32,261	32,895
Apr	W	38,214	38,344	38,692	38,422	32,507	32,024
	AN	22,726	22,759	22,234	21,855	17,016	16,986
	BN	14,652	14,471	14,295	14,207	12,609	12,777
	D	10,331	10,391	10,216	10,299	9,806	10,550
	C	7,665	7,654	7,520	7,816	7,505	7,883
	AVG	21,333	21,360	21,306	21,211	18,201	18,291
May	W	26,933	26,681	24,220	20,046	17,188	14,306
	AN	17,008	16,714	15,857	14,948	12,096	11,801
	BN	10,924	10,595	9,862	9,355	9,298	9,443
	D	8,135	7,919	7,840	8,564	8,000	9,032
	C	5,305	5,216	5,656	5,554	5,252	5,350
	AVG	15,456	15,217	14,232	12,833	11,332	10,641
Jun	W	16,557	16,350	12,993	11,418	8,474	8,002
	AN	9,887	9,964	8,634	9,220	6,661	7,583
	BN	7,001	6,873	6,677	7,241	6,347	6,703
	D	6,020	6,124	6,250	6,335	5,788	5,820
	C	4,333	4,340	4,304	4,513	3,927	4,020
	AVG	9,847	9,795	8,525	8,257	6,590	6,657
Jul	W	11,125	10,893	11,207	12,181	6,737	7,996
	AN	12,128	12,323	12,544	12,927	7,935	8,132
	BN	11,686	11,884	11,667	11,357	7,425	6,831
	D	10,523	10,390	10,105	10,307	7,253	5,916
	C	7,736	6,891	6,866	6,596	3,964	4,453
	AVG	10,739	10,575	10,604	10,921	6,737	6,842

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	8,507	8,541	8,527	8,650	3,565	3,826
	AN	8,538	8,877	9,013	9,648	4,774	5,174
	BN	8,371	8,428	8,062	8,753	4,274	4,224
	D	9,264	8,484	7,525	7,417	4,432	4,505
	C	4,390	4,250	3,823	3,615	3,119	3,157
	AVG	8,052	7,930	7,610	7,806	3,988	4,142
Sep	W	10,767	21,707	20,717	21,199	3,324	3,165
	AN	6,788	12,001	12,961	12,832	3,107	3,359
	BN	6,283	6,221	6,538	6,197	3,056	3,158
	D	6,116	5,415	4,432	3,644	3,031	3,477
	C	3,588	3,392	3,215	2,996	3,084	3,630
	AVG	7,348	11,386	11,025	10,896	3,147	3,329
Oct	W	8,718	8,036	7,867	8,287	5,367	8,615
	AN	6,183	5,292	5,518	7,207	4,132	8,846
	BN	6,258	5,898	5,416	6,976	4,486	9,224
	D	5,312	4,889	5,221	5,727	4,018	7,496
	C	5,215	4,745	4,684	4,969	4,541	9,015
	AVG	6,667	6,097	6,058	6,858	4,619	8,566
Nov	W	15,829	17,253	17,184	15,879	11,461	10,636
	AN	11,333	13,013	13,102	12,156	7,866	6,298
	BN	8,184	9,490	9,448	9,071	5,534	4,870
	D	8,733	8,630	8,539	8,061	6,528	5,178
	C	5,473	5,865	5,586	5,565	4,409	4,346
	AVG	10,793	11,748	11,671	10,946	7,808	6,898
Dec	W	43,367	40,285	44,292	40,431	42,647	38,576
	AN	19,040	19,570	20,375	19,936	18,233	19,338
	BN	13,987	14,169	15,099	14,049	14,295	13,609
	D	11,999	11,960	11,868	11,687	11,786	11,385
	C	8,131	7,681	7,341	7,186	8,051	7,752
	AVG	22,749	21,806	23,283	21,753	22,397	21,019

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Table C.5.3-22. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Sacramento River at Rio Vista[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	-907 (-1.3%)	1304 (1.8%)	188 (0.3%)	2399 (3.4%)	-5306 (-7%)	-6136 (-7.8%)
	AN	-4025 (-9.6%)	-4524 (-10.8%)	-2600 (-6.4%)	-3099 (-7.6%)	-3478 (-8.4%)	-5480 (-12.8%)
	BN	-2346 (-11.2%)	-2250 (-10.7%)	-1667 (-8.2%)	-1571 (-7.8%)	-1791 (-8.8%)	-1298 (-6.5%)
	D	-1042 (-7%)	-191 (-1.3%)	-913 (-6.2%)	-63 (-0.4%)	-1179 (-7.8%)	-224 (-1.5%)
	C	-165 (-1.4%)	-1031 (-8.7%)	-451 (-3.7%)	-1318 (-10.9%)	-426 (-3.5%)	-1780 (-14.1%)
	AVG	-1530 (-4.1%)	-826 (-2.2%)	-872 (-2.4%)	-168 (-0.5%)	-2818 (-7.3%)	-3279 (-8.3%)
Feb	W	-292 (-0.4%)	2103 (2.6%)	751 (0.9%)	3147 (3.9%)	-6567 (-7.5%)	-6928 (-7.7%)
	AN	-1673 (-3.2%)	-1885 (-3.6%)	403 (0.8%)	192 (0.4%)	-2745 (-5.1%)	-4705 (-8.5%)
	BN	-4276 (-14.2%)	-4412 (-14.6%)	-3135 (-10.8%)	-3271 (-11.3%)	-4348 (-14.4%)	-3696 (-12.6%)
	D	-2382 (-12.3%)	-2072 (-10.7%)	-2474 (-12.7%)	-2164 (-11.1%)	-2381 (-12.3%)	-2175 (-11.2%)
	C	-880 (-7.2%)	-435 (-3.5%)	-1071 (-8.6%)	-625 (-5%)	-708 (-5.9%)	-143 (-1.2%)
	AVG	-1720 (-3.9%)	-881 (-2%)	-938 (-2.1%)	-99 (-0.2%)	-3853 (-8.3%)	-4015 (-8.4%)
Mar	W	-4404 (-6.9%)	-2178 (-3.4%)	-4097 (-6.5%)	-1870 (-2.9%)	-6916 (-10.4%)	-7077 (-10.3%)
	AN	-5585 (-11.9%)	-5700 (-12.2%)	-4332 (-9.5%)	-4447 (-9.8%)	-6809 (-14.2%)	-7463 (-15.4%)
	BN	-5157 (-24.6%)	-5354 (-25.5%)	-4122 (-20.7%)	-4319 (-21.7%)	-3806 (-19.4%)	-3936 (-20.1%)
	D	-2798 (-15.8%)	-2930 (-16.6%)	-2570 (-14.7%)	-2702 (-15.5%)	-2483 (-14.3%)	-2953 (-16.7%)
	C	-780 (-7.3%)	-729 (-6.8%)	-719 (-6.8%)	-668 (-6.3%)	-673 (-6.3%)	-703 (-6.6%)
	AVG	-3823 (-10.6%)	-3189 (-8.8%)	-3306 (-9.3%)	-2672 (-7.5%)	-4482 (-12.2%)	-4759 (-12.6%)
Apr	W	-5707 (-14.9%)	-6189 (-16.2%)	-5838 (-15.2%)	-6320 (-16.5%)	-6186 (-16%)	-6398 (-16.7%)
	AN	-5711 (-25.1%)	-5740 (-25.3%)	-5743 (-25.2%)	-5772 (-25.4%)	-5218 (-23.5%)	-4868 (-22.3%)
	BN	-2044 (-13.9%)	-1876 (-12.8%)	-1862 (-12.9%)	-1694 (-11.7%)	-1686 (-11.8%)	-1430 (-10.1%)
	D	-526 (-5.1%)	219 (2.1%)	-585 (-5.6%)	159 (1.5%)	-410 (-4%)	252 (2.4%)
	C	-160 (-2.1%)	218 (2.8%)	-148 (-1.9%)	230 (3%)	-15 (-0.2%)	67 (0.9%)
	AVG	-3133 (-14.7%)	-3043 (-14.3%)	-3159 (-14.8%)	-3069 (-14.4%)	-3105 (-14.6%)	-2920 (-13.8%)
May	W	-9745 (-36.2%)	-12626 (-46.9%)	-9493 (-35.6%)	-12375 (-46.4%)	-7032 (-29%)	-5739 (-28.6%)
	AN	-4912 (-28.9%)	-5207 (-30.6%)	-4618 (-27.6%)	-4913 (-29.4%)	-3761 (-23.7%)	-3147 (-21.1%)
	BN	-1626 (-14.9%)	-1482 (-13.6%)	-1297 (-12.2%)	-1153 (-10.9%)	-563 (-5.7%)	88 (0.9%)
	D	-135 (-1.7%)	897 (11%)	81 (1%)	1113 (14%)	160 (2%)	468 (5.5%)
	C	-53 (-1%)	45 (0.9%)	35 (0.7%)	134 (2.6%)	-404 (-7.1%)	-204 (-3.7%)
	AVG	-4124 (-26.7%)	-4815 (-31.2%)	-3884 (-25.5%)	-4576 (-30.1%)	-2900 (-20.4%)	-2192 (-17.1%)
Jun	W	-8083 (-48.8%)	-8555 (-51.7%)	-7875 (-48.2%)	-8347 (-51.1%)	-4519 (-34.8%)	-3416 (-29.9%)
	AN	-3226 (-32.6%)	-2304 (-23.3%)	-3303 (-33.1%)	-2381 (-23.9%)	-1973 (-22.9%)	-1637 (-17.8%)
	BN	-654 (-9.3%)	-298 (-4.3%)	-527 (-7.7%)	-171 (-2.5%)	-331 (-5%)	-538 (-7.4%)
	D	-232 (-3.9%)	-200 (-3.3%)	-336 (-5.5%)	-304 (-5%)	-462 (-7.4%)	-516 (-8.1%)
	C	-406 (-9.4%)	-312 (-7.2%)	-414 (-9.5%)	-320 (-7.4%)	-378 (-8.8%)	-493 (-10.9%)
	AVG	-3257 (-33.1%)	-3190 (-32.4%)	-3205 (-32.7%)	-3138 (-32%)	-1935 (-22.7%)	-1600 (-19.4%)
Jul	W	-4388 (-39.4%)	-3129 (-28.1%)	-4156 (-38.2%)	-2897 (-26.6%)	-4470 (-39.9%)	-4185 (-34.4%)
	AN	-4193 (-34.6%)	-3996 (-32.9%)	-4389 (-35.6%)	-4191 (-34%)	-4609 (-36.7%)	-4795 (-37.1%)
	BN	-4261 (-36.5%)	-4855 (-41.5%)	-4458 (-37.5%)	-5052 (-42.5%)	-4241 (-36.4%)	-4526 (-39.8%)
	D	-3270 (-31.1%)	-4608 (-43.8%)	-3137 (-30.2%)	-4474 (-43.1%)	-2853 (-28.2%)	-4391 (-42.6%)
	C	-3772 (-48.8%)	-3283 (-42.4%)	-2927 (-42.5%)	-2438 (-35.4%)	-2903 (-42.3%)	-2143 (-32.5%)
	AVG	-4002 (-37.3%)	-3897 (-36.3%)	-3838 (-36.3%)	-3733 (-35.3%)	-3867 (-36.5%)	-4079 (-37.4%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-4942 (-58.1%)	-4681 (-55%)	-4975 (-58.3%)	-4714 (-55.2%)	-4962 (-58.2%)	-4824 (-55.8%)
	AN	-3764 (-44.1%)	-3364 (-39.4%)	-4103 (-46.2%)	-3703 (-41.7%)	-4239 (-47%)	-4474 (-46.4%)
	BN	-4097 (-48.9%)	-4147 (-49.5%)	-4154 (-49.3%)	-4205 (-49.9%)	-3788 (-47%)	-4529 (-51.7%)
	D	-4832 (-52.2%)	-4759 (-51.4%)	-4052 (-47.8%)	-3979 (-46.9%)	-3093 (-41.1%)	-2912 (-39.3%)
	C	-1272 (-29%)	-1233 (-28.1%)	-1131 (-26.6%)	-1093 (-25.7%)	-705 (-18.4%)	-458 (-12.7%)
	AVG	-4064 (-50.5%)	-3910 (-48.6%)	-3942 (-49.7%)	-3788 (-47.8%)	-3622 (-47.6%)	-3664 (-46.9%)
Sep	W	-7443 (-69.1%)	-7602 (-70.6%)	-18383 (-84.7%)	-18542 (-85.4%)	-17394 (-84%)	-18034 (-85.1%)
	AN	-3681 (-54.2%)	-3429 (-50.5%)	-8894 (-74.1%)	-8642 (-72%)	-9855 (-76%)	-9473 (-73.8%)
	BN	-3227 (-51.4%)	-3125 (-49.7%)	-3165 (-50.9%)	-3063 (-49.2%)	-3482 (-53.3%)	-3039 (-49%)
	D	-3085 (-50.4%)	-2639 (-43.2%)	-2384 (-44%)	-1938 (-35.8%)	-1400 (-31.6%)	-167 (-4.6%)
	C	-504 (-14.1%)	41 (1.2%)	-308 (-9.1%)	237 (7%)	-131 (-4.1%)	634 (21.1%)
	AVG	-4201 (-57.2%)	-4019 (-54.7%)	-8239 (-72.4%)	-8057 (-70.8%)	-7878 (-71.5%)	-7567 (-69.5%)
Oct	W	-3351 (-38.4%)	-102 (-1.2%)	-2669 (-33.2%)	580 (7.2%)	-2500 (-31.8%)	328 (4%)
	AN	-2051 (-33.2%)	2663 (43.1%)	-1160 (-21.9%)	3554 (67.2%)	-1386 (-25.1%)	1639 (22.7%)
	BN	-1773 (-28.3%)	2965 (47.4%)	-1412 (-23.9%)	3326 (56.4%)	-931 (-17.2%)	2248 (32.2%)
	D	-1294 (-24.4%)	2184 (41.1%)	-871 (-17.8%)	2608 (53.3%)	-1203 (-23%)	1769 (30.9%)
	C	-674 (-12.9%)	3800 (72.9%)	-204 (-4.3%)	4270 (90%)	-143 (-3.1%)	4046 (81.4%)
	AVG	-2048 (-30.7%)	1899 (28.5%)	-1478 (-24.2%)	2469 (40.5%)	-1439 (-23.8%)	1708 (24.9%)
Nov	W	-4368 (-27.6%)	-5193 (-32.8%)	-5792 (-33.6%)	-6617 (-38.4%)	-5723 (-33.3%)	-5243 (-33%)
	AN	-3467 (-30.6%)	-5035 (-44.4%)	-5147 (-39.6%)	-6715 (-51.6%)	-5237 (-40%)	-5858 (-48.2%)
	BN	-2650 (-32.4%)	-3314 (-40.5%)	-3957 (-41.7%)	-4620 (-48.7%)	-3914 (-41.4%)	-4200 (-46.3%)
	D	-2205 (-25.3%)	-3555 (-40.7%)	-2102 (-24.4%)	-3453 (-40%)	-2011 (-23.6%)	-2883 (-35.8%)
	C	-1065 (-19.4%)	-1128 (-20.6%)	-1456 (-24.8%)	-1519 (-25.9%)	-1177 (-21.1%)	-1219 (-21.9%)
	AVG	-2985 (-27.7%)	-3894 (-36.1%)	-3940 (-33.5%)	-4850 (-41.3%)	-3863 (-33.1%)	-4048 (-37%)
Dec	W	-719 (-1.7%)	-4791 (-11%)	2363 (5.9%)	-1708 (-4.2%)	-1645 (-3.7%)	-1855 (-4.6%)
	AN	-808 (-4.2%)	297 (1.6%)	-1338 (-6.8%)	-232 (-1.2%)	-2143 (-10.5%)	-598 (-3%)
	BN	308 (2.2%)	-378 (-2.7%)	126 (0.9%)	-560 (-4%)	-804 (-5.3%)	-440 (-3.1%)
	D	-213 (-1.8%)	-614 (-5.1%)	-174 (-1.5%)	-575 (-4.8%)	-82 (-0.7%)	-302 (-2.6%)
	C	-80 (-1%)	-380 (-4.7%)	370 (4.8%)	70 (0.9%)	710 (9.7%)	566 (7.9%)
	AVG	-352 (-1.5%)	-1730 (-7.6%)	591 (2.7%)	-787 (-3.6%)	-886 (-3.8%)	-734 (-3.4%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

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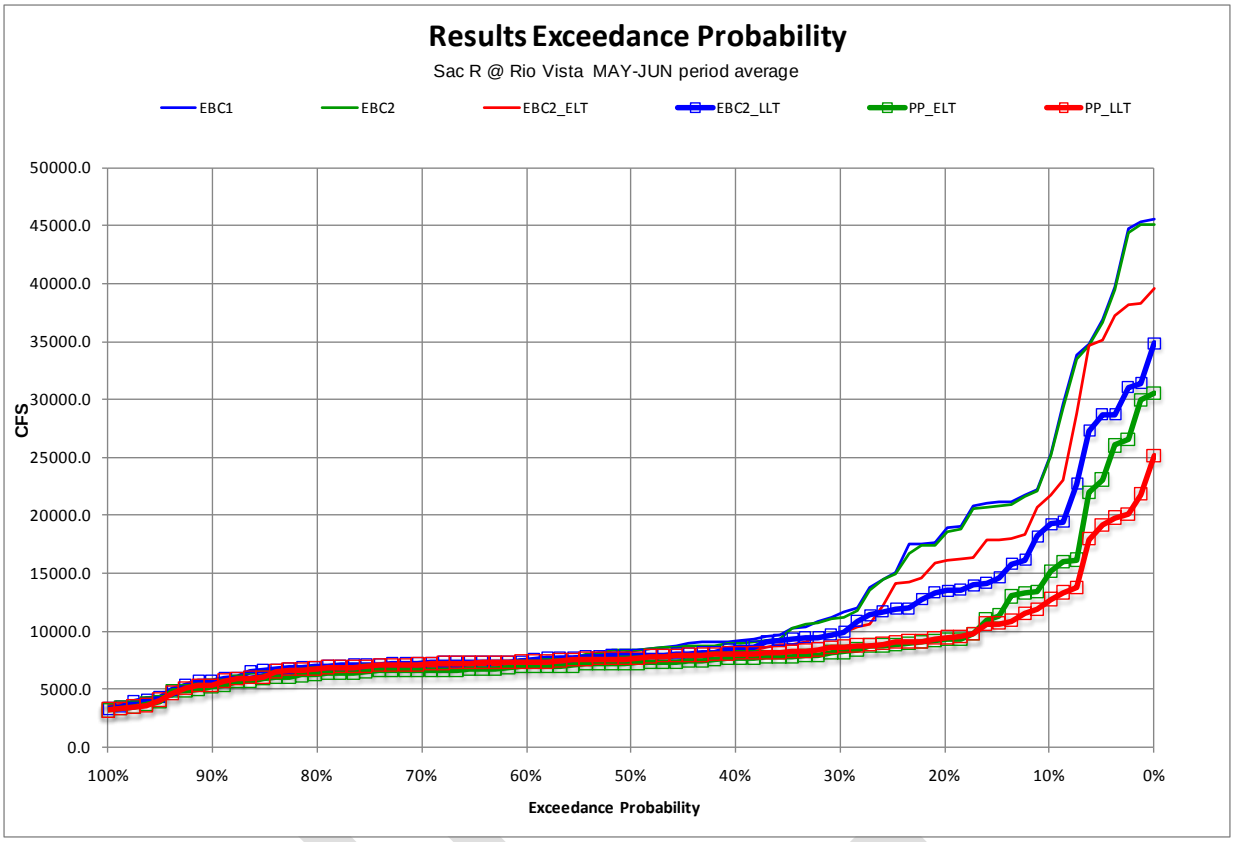

Figure C.5.3-3. Exceedance Plot of Flows in the Sacramento River at Rio Vista in May and June

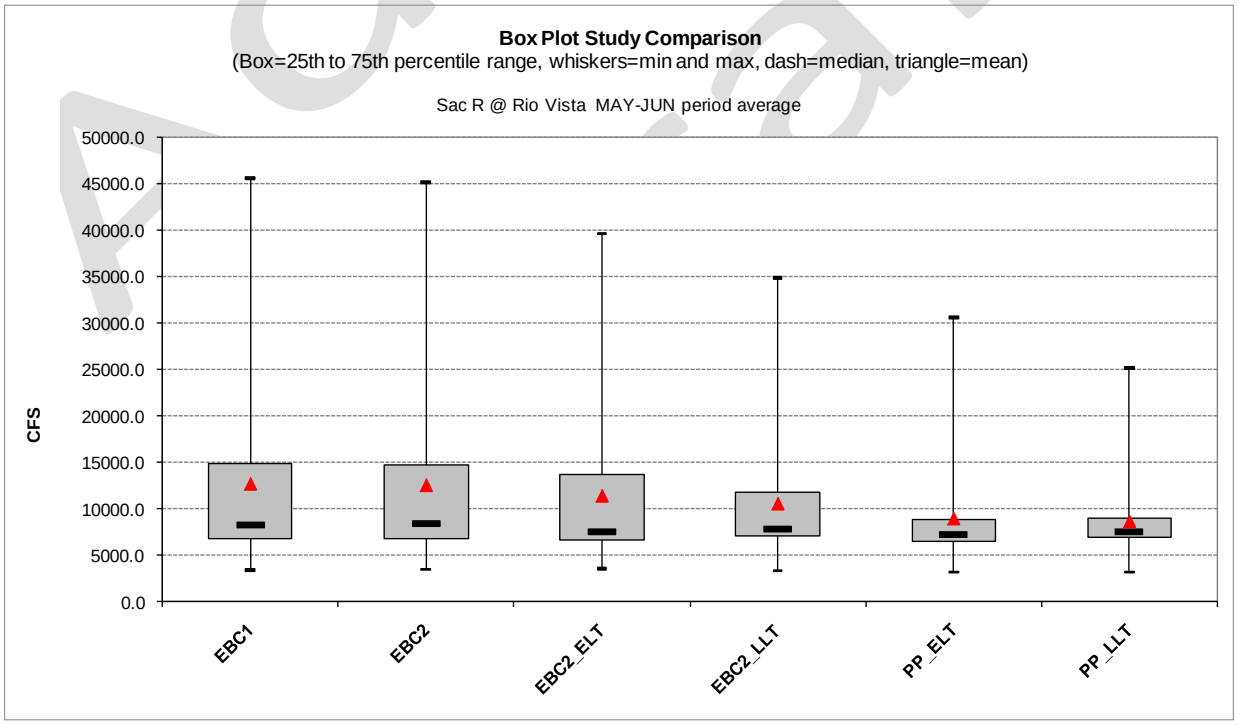

Figure C.5.3-4. Average Annual Flows in the Sacramento River at Rio Vista in May and June

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San Joaquin River Flows at Jersey Point

Average San Joaquin River flows at Jersey Point during May and June are estimated to have similar outflows in the driest 75–80% of years, but to diverge above approximately 5,000 cfs (Figure C.5.3-5). The distribution of flows overlaps substantially for all the various scenarios (Figure C.5.3-6). These are averages of both months, however, and closer examination of May and June individually shows differing patterns between the months (Table C.5.3-23 and Table C.5.3-24). In May, average flows across all years combined were lower under PP scenarios than under EBC1 and EBC2 by around 700–1,000 cfs (10–15%) and were lower than under EBC2_ELT and EBC2_LLT by 300–670 cfs (4–10%). In critical years, May average flows were around 90–160 cfs (10–19%) higher under PP scenarios compared to EBC scenarios, and in wet years there were relatively small differences (less than 7%) between PP and EBC scenarios for May flows. In dry, below-normal, and above-normal years, average flows in May were lower under PP scenarios than EBC scenarios. The differences ranged from 335 cfs (17%) lower under PP_LLT compared with EBC2_LLT in dry years to more than 1,200 cfs lower under PP_ELT compared with EBC1 in below-normal years. In June, average flows under PP scenarios were greater than EBC scenarios in all water-year types (Table C.5.3-24). Across all years combined, the average difference in June was around 1,100–1,300 cfs (35–40%) greater under PP scenarios compared with EBC1 and EBC2, and the average difference was more than 1,700 cfs (64–68%) greater under PP scenarios when compared with EBC2_ELT and EBC2_LLT (i.e., accounting for climate change). By water-year type, the difference in June average flows ranged from around 230 cfs (17%) greater under PP_LLT compared with EBC2_LLT in dry years to just over 3,500 cfs (nearly 80%) more under PP_LLT compared with EBC2_ELT in wet years. The greatest June average percentage difference was the 155% (1400 cfs) greater flows under PP_LLT compared with EBC1 in dry years (Table C.5.3-24).

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Table C.5.3-23. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for San Joaquin River at Jersey Point Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	14,649	14,276	15,506	15,928	21,186	21,174
	AN	7,334	6,889	7,396	8,033	9,530	10,600
	BN	1,945	1,786	1,794	2,233	2,662	2,984
	D	-214	-231	-329	-249	-274	1,055
	C	-560	-67	9	3	-382	2,008
	AVG	5,921	5,779	6,234	6,553	8,450	9,300
Feb	W	15,781	15,547	17,203	16,998	25,299	24,635
	AN	9,652	9,863	10,420	10,382	15,178	14,643
	BN	6,530	6,342	6,956	6,563	10,020	9,177
	D	1,551	1,450	1,572	1,992	1,655	1,833
	C	727	597	458	822	534	540
	AVG	7,978	7,861	8,579	8,587	12,395	12,002
Mar	W	15,143	14,728	15,365	15,757	23,291	23,307
	AN	7,409	7,257	7,766	8,210	13,142	13,775
	BN	3,077	3,024	2,919	2,932	5,584	5,842
	D	2,256	2,092	2,078	2,337	2,085	2,567
	C	1,247	1,035	1,389	1,575	1,421	1,614
	AVG	7,089	6,859	7,166	7,442	10,927	11,203
Apr	W	16,249	16,192	16,233	16,205	16,222	16,287
	AN	9,376	9,272	9,072	8,845	7,276	7,592
	BN	7,396	7,373	7,041	6,551	4,014	4,055
	D	3,934	3,925	3,354	3,235	1,731	1,893
	C	1,528	1,495	1,498	1,614	1,168	1,265
	AVG	8,874	8,830	8,632	8,497	7,445	7,568
May	W	14,274	13,980	14,220	12,997	14,825	13,840
	AN	7,352	7,223	7,431	6,918	5,743	5,275
	BN	5,544	5,458	5,045	4,407	2,373	2,928
	D	2,519	2,455	2,060	1,974	1,266	1,640
	C	856	845	842	888	942	1,002
	AVG	7,227	7,084	7,033	6,449	6,362	6,167
Jun	W	7,175	6,935	5,364	4,499	8,693	8,015
	AN	2,208	2,162	1,833	1,746	3,677	3,332
	BN	1,292	1,458	1,675	1,988	2,640	3,271
	D	905	912	1,159	1,640	2,010	2,311
	C	1,237	1,226	1,286	1,363	1,663	1,589
	AVG	3,198	3,144	2,697	2,581	4,430	4,327
Jul	W	618	749	-90	-475	2,829	1,490
	AN	-2,395	-2,442	-1,586	-402	941	1,059
	BN	-4,226	-4,142	-3,748	-3,383	-637	-137
	D	-5,204	-4,995	-4,265	-3,566	-1,554	-226
	C	-3,230	-2,346	-1,650	-509	523	1,153
	AVG	-2,491	-2,267	-2,078	-1,644	662	723

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	-2,936	-3,279	-3,886	-4,112	866	404
	AN	-4,311	-4,652	-4,778	-4,709	-548	-774
	BN	-4,139	-4,197	-3,711	-3,394	-186	96
	D	-4,211	-3,500	-2,690	-1,852	-521	190
	C	-118	433	517	1,013	472	955
	AVG	-3,210	-3,142	-3,080	-2,830	118	213
Sep	W	-1,047	-1,874	-1,699	-978	1,920	1,168
	AN	-2,966	-83	-1,009	-1,111	192	-144
	BN	-2,700	-2,821	-2,623	-2,654	81	151
	D	-2,638	-2,133	-1,246	-509	83	612
	C	-463	-264	-88	152	59	2,169
	AVG	-1,874	-1,595	-1,421	-1,015	677	827
Oct	W	-2,160	-452	342	1,307	529	1,134
	AN	-2,102	42	1,045	1,835	82	923
	BN	-1,705	-400	869	1,155	35	1,329
	D	-1,087	426	871	1,640	612	1,323
	C	-990	7	355	1,705	247	1,244
	AVG	-1,667	-111	653	1,490	356	1,194
Nov	W	-1,634	9	129	77	1,682	1,660
	AN	-1,645	-417	-679	-618	163	475
	BN	-2,316	-721	-747	-377	-604	-365
	D	-1,781	34	-149	7	-706	331
	C	-395	667	441	200	-161	866
	AVG	-1,603	-76	-154	-100	275	733
Dec	W	4,735	4,283	5,384	4,677	8,362	7,277
	AN	-1,098	-1,449	-1,058	-887	810	626
	BN	-2,078	-2,481	-1,852	-1,851	-617	-1,124
	D	-3,146	-3,706	-3,427	-2,884	-3,140	-2,782
	C	-2,603	-2,396	-1,835	-625	-1,897	-2,191
	AVG	-86	-442	215	312	1,698	1,276

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Table C.5.3-24. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for San Joaquin River at Jersey Point[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	6537 (44.6%)	6525 (44.5%)	6910 (48.4%)	6898 (48.3%)	5679 (36.6%)	5246 (32.9%)
	AN	2196 (29.9%)	3265 (44.5%)	2641 (38.3%)	3710 (53.9%)	2134 (28.9%)	2566 (31.9%)
	BN	717 (36.9%)	1040 (53.5%)	876 (49%)	1198 (67.1%)	867 (48.3%)	751 (33.6%)
	D	-60 (28.3%)	1269 (-593.8%)	-43 (18.9%)	1285 (-557.6%)	55 (-16.8%)	1304 (-524%)
	C	178 (-31.7%)	2568 (-458.8%)	-315 (469.2%)	2076 (-3091.2%)	-391 (-4492.7%)	2005 (60988.9%)
	AVG	2529 (42.7%)	3379 (57.1%)	2671 (46.2%)	3521 (60.9%)	2216 (35.5%)	2747 (41.9%)
Feb	W	9519 (60.3%)	8854 (56.1%)	9752 (62.7%)	9088 (58.5%)	8097 (47.1%)	7637 (44.9%)
	AN	5527 (57.3%)	4991 (51.7%)	5315 (53.9%)	4780 (48.5%)	4758 (45.7%)	4260 (41%)
	BN	3490 (53.4%)	2648 (40.5%)	3677 (58%)	2835 (44.7%)	3064 (44%)	2615 (39.8%)
	D	103 (6.6%)	281 (18.1%)	205 (14.1%)	383 (26.4%)	83 (5.3%)	-159 (-8%)
	C	-193 (-26.5%)	-187 (-25.7%)	-63 (-10.5%)	-57 (-9.6%)	76 (16.7%)	-282 (-34.3%)
	AVG	4417 (55.4%)	4024 (50.4%)	4534 (57.7%)	4141 (52.7%)	3816 (44.5%)	3415 (39.8%)
Mar	W	8149 (53.8%)	8164 (53.9%)	8563 (58.1%)	8578 (58.2%)	7926 (51.6%)	7549 (47.9%)
	AN	5733 (77.4%)	6366 (85.9%)	5885 (81.1%)	6518 (89.8%)	5376 (69.2%)	5565 (67.8%)
	BN	2506 (81.4%)	2765 (89.8%)	2560 (84.7%)	2818 (93.2%)	2664 (91.3%)	2910 (99.3%)
	D	-172 (-7.6%)	310 (13.7%)	-7 (-0.3%)	475 (22.7%)	7 (0.3%)	229 (9.8%)
	C	174 (14%)	366 (29.4%)	386 (37.3%)	579 (55.9%)	32 (2.3%)	39 (2.5%)
	AVG	3838 (54.1%)	4114 (58%)	4068 (59.3%)	4344 (63.3%)	3761 (52.5%)	3761 (50.5%)
Apr	W	-27 (-0.2%)	37 (0.2%)	30 (0.2%)	95 (0.6%)	-11 (-0.1%)	82 (0.5%)
	AN	-2100 (-22.4%)	-1784 (-19%)	-1997 (-21.5%)	-1681 (-18.1%)	-1796 (-19.8%)	-1253 (-14.2%)
	BN	-3381 (-45.7%)	-3341 (-45.2%)	-3358 (-45.6%)	-3318 (-45%)	-3027 (-43%)	-2496 (-38.1%)
	D	-2203 (-56%)	-2040 (-51.9%)	-2194 (-55.9%)	-2031 (-51.8%)	-1623 (-48.4%)	-1341 (-41.5%)
	C	-360 (-23.6%)	-262 (-17.2%)	-327 (-21.9%)	-230 (-15.4%)	-330 (-22%)	-348 (-21.6%)
	AVG	-1429 (-16.1%)	-1306 (-14.7%)	-1385 (-15.7%)	-1262 (-14.3%)	-1188 (-13.8%)	-929 (-10.9%)
May	W	551 (3.9%)	-434 (-3%)	845 (6%)	-140 (-1%)	605 (4.3%)	843 (6.5%)
	AN	-1609 (-21.9%)	-2077 (-28.3%)	-1480 (-20.5%)	-1948 (-27%)	-1688 (-22.7%)	-1642 (-23.7%)
	BN	-3171 (-57.2%)	-2617 (-47.2%)	-3084 (-56.5%)	-2530 (-46.4%)	-2671 (-53%)	-1480 (-33.6%)
	D	-1253 (-49.7%)	-879 (-34.9%)	-1189 (-48.4%)	-815 (-33.2%)	-794 (-38.5%)	-335 (-17%)
	C	86 (10.1%)	147 (17.1%)	97 (11.5%)	158 (18.7%)	100 (11.9%)	114 (12.8%)
	AVG	-865 (-12%)	-1060 (-14.7%)	-722 (-10.2%)	-917 (-12.9%)	-671 (-9.5%)	-282 (-4.4%)
Jun	W	1518 (21.2%)	840 (11.7%)	1758 (25.3%)	1079 (15.6%)	3329 (62.1%)	3515 (78.1%)
	AN	1469 (66.5%)	1124 (50.9%)	1515 (70.1%)	1170 (54.1%)	1844 (100.6%)	1586 (90.8%)
	BN	1348 (104.3%)	1979 (153.1%)	1183 (81.1%)	1813 (124.4%)	965 (57.6%)	1283 (64.5%)
	D	1105 (122%)	1405 (155.2%)	1098 (120.4%)	1399 (153.4%)	852 (73.5%)	671 (40.9%)
	C	426 (34.4%)	352 (28.5%)	437 (35.7%)	363 (29.6%)	377 (29.3%)	226 (16.6%)
	AVG	1231 (38.5%)	1129 (35.3%)	1286 (40.9%)	1183 (37.6%)	1732 (64.2%)	1746 (67.7%)
Jul	W	2211 (357.6%)	871 (141%)	2080 (277.8%)	741 (98.9%)	2919 (-3242.7%)	1964 (-413.8%)
	AN	3335 (-139.3%)	3454 (-144.2%)	3383 (-138.5%)	3502 (-143.4%)	2527 (-159.3%)	1461 (-363.5%)
	BN	3590 (-84.9%)	4090 (-96.8%)	3505 (-84.6%)	4006 (-96.7%)	3111 (-83%)	3246 (-96%)
	D	3651 (-70.1%)	4979 (-95.7%)	3441 (-68.9%)	4769 (-95.5%)	2711 (-63.6%)	3340 (-93.7%)
	C	3754 (-116.2%)	4383 (-135.7%)	2870 (-122.3%)	3499 (-149.1%)	2173 (-131.7%)	1661 (-326.6%)
	AVG	3153 (-126.6%)	3214 (-129%)	2928 (-129.2%)	2990 (-131.9%)	2740 (-131.8%)	2367 (-144%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	3802 (-129.5%)	3339 (-113.7%)	4145 (-126.4%)	3682 (-112.3%)	4752 (-122.3%)	4515 (-109.8%)
	AN	3763 (-87.3%)	3537 (-82.1%)	4103 (-88.2%)	3878 (-83.4%)	4230 (-88.5%)	3935 (-83.6%)
	BN	3953 (-95.5%)	4235 (-102.3%)	4011 (-95.6%)	4293 (-102.3%)	3525 (-95%)	3490 (-102.8%)
	D	3690 (-87.6%)	4400 (-104.5%)	2979 (-85.1%)	3690 (-105.4%)	2170 (-80.6%)	2041 (-110.3%)
	C	590 (-501.5%)	1073 (-912.4%)	39 (9%)	522 (120.6%)	-45 (-8.7%)	-58 (-5.7%)
	AVG	3327 (-103.7%)	3422 (-106.6%)	3259 (-103.7%)	3354 (-106.8%)	3197 (-103.8%)	3043 (-107.5%)
Sep	W	2966 (-283.4%)	2214 (-211.6%)	3794 (-202.4%)	3042 (-162.3%)	3619 (-213%)	2146 (-219.4%)
	AN	3157 (-106.5%)	2822 (-95.2%)	275 (-329.5%)	-60 (72.1%)	1201 (-119%)	967 (-87.1%)
	BN	2782 (-103%)	2851 (-105.6%)	2902 (-102.9%)	2972 (-105.4%)	2704 (-103.1%)	2805 (-105.7%)
	D	2721 (-103.1%)	3250 (-123.2%)	2215 (-103.9%)	2744 (-128.7%)	1329 (-106.6%)	1120 (-220.2%)
	C	522 (-112.8%)	2631 (-568.8%)	323 (-122.4%)	2433 (-921.7%)	147 (-166.8%)	2017 (1330.1%)
	AVG	2551 (-136.2%)	2700 (-144.1%)	2272 (-142.5%)	2422 (-151.8%)	2098 (-147.7%)	1842 (-181.4%)
Oct	W	2689 (-124.5%)	3293 (-152.5%)	981 (-217.2%)	1585 (-351.1%)	187 (54.7%)	-173 (-13.2%)
	AN	2184 (-103.9%)	3025 (-143.9%)	40 (96.5%)	881 (2117.7%)	-963 (-92.2%)	-912 (-49.7%)
	BN	1739 (-102%)	3034 (-178%)	435 (-108.6%)	1730 (-432%)	-834 (-96%)	174 (15.1%)
	D	1699 (-156.3%)	2410 (-221.8%)	186 (43.6%)	897 (210.5%)	-259 (-29.8%)	-317 (-19.3%)
	C	1237 (-124.9%)	2233 (-225.7%)	240 (3599.5%)	1237 (18542.5%)	-108 (-30.4%)	-461 (-27.1%)
	AVG	2023 (-121.4%)	2861 (-171.6%)	467 (-421%)	1305 (-1176.4%)	-297 (-45.5%)	-296 (-19.8%)
Nov	W	3315 (-202.9%)	3294 (-201.6%)	1672 (17939.1%)	1651 (17706.8%)	1553 (1206.2%)	1583 (2066.8%)
	AN	1809 (-109.9%)	2121 (-128.9%)	580 (-139.2%)	892 (-214.1%)	843 (-124%)	1094 (-176.9%)
	BN	1712 (-73.9%)	1952 (-84.3%)	117 (-16.2%)	356 (-49.4%)	142 (-19.1%)	12 (-3.3%)
	D	1075 (-60.3%)	2112 (-118.6%)	-741 (-2151.6%)	296 (861.1%)	-557 (373.7%)	324 (4412.5%)
	C	233 (-59.1%)	1260 (-319.4%)	-828 (-124.2%)	199 (29.8%)	-603 (-136.6%)	666 (332.9%)
	AVG	1878 (-117.2%)	2336 (-145.7%)	351 (-461.8%)	809 (-1063.4%)	429 (-278.5%)	833 (-834.8%)
Dec	W	3627 (76.6%)	2543 (53.7%)	4079 (95.2%)	2994 (69.9%)	2978 (55.3%)	2601 (55.6%)
	AN	1908 (-173.8%)	1724 (-157%)	2259 (-155.9%)	2075 (-143.2%)	1868 (-176.6%)	1513 (-170.6%)
	BN	1461 (-70.3%)	954 (-45.9%)	1863 (-75.1%)	1357 (-54.7%)	1234 (-66.7%)	728 (-39.3%)
	D	6 (-0.2%)	364 (-11.6%)	566 (-15.3%)	924 (-24.9%)	287 (-8.4%)	103 (-3.6%)
	C	706 (-27.1%)	412 (-15.8%)	499 (-20.8%)	206 (-8.6%)	-62 (3.4%)	-1566 (250.5%)
	AVG	1783 (-2081.7%)	1362 (-1589.4%)	2140 (-484.3%)	1718 (-388.8%)	1482 (687.9%)	964 (308.5%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

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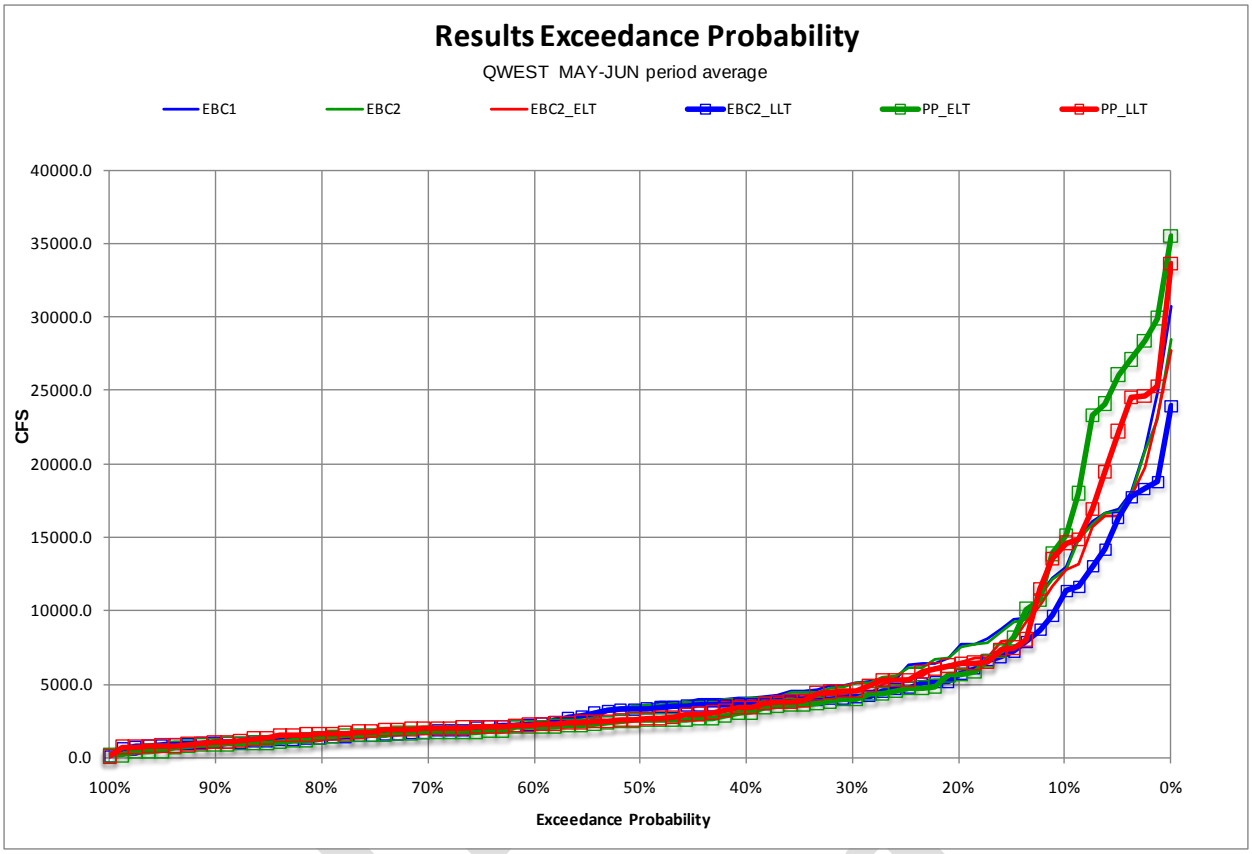

Figure C.5.3-5. Exceedance Plot of Flows in the San Joaquin River at Jersey Point in May and June

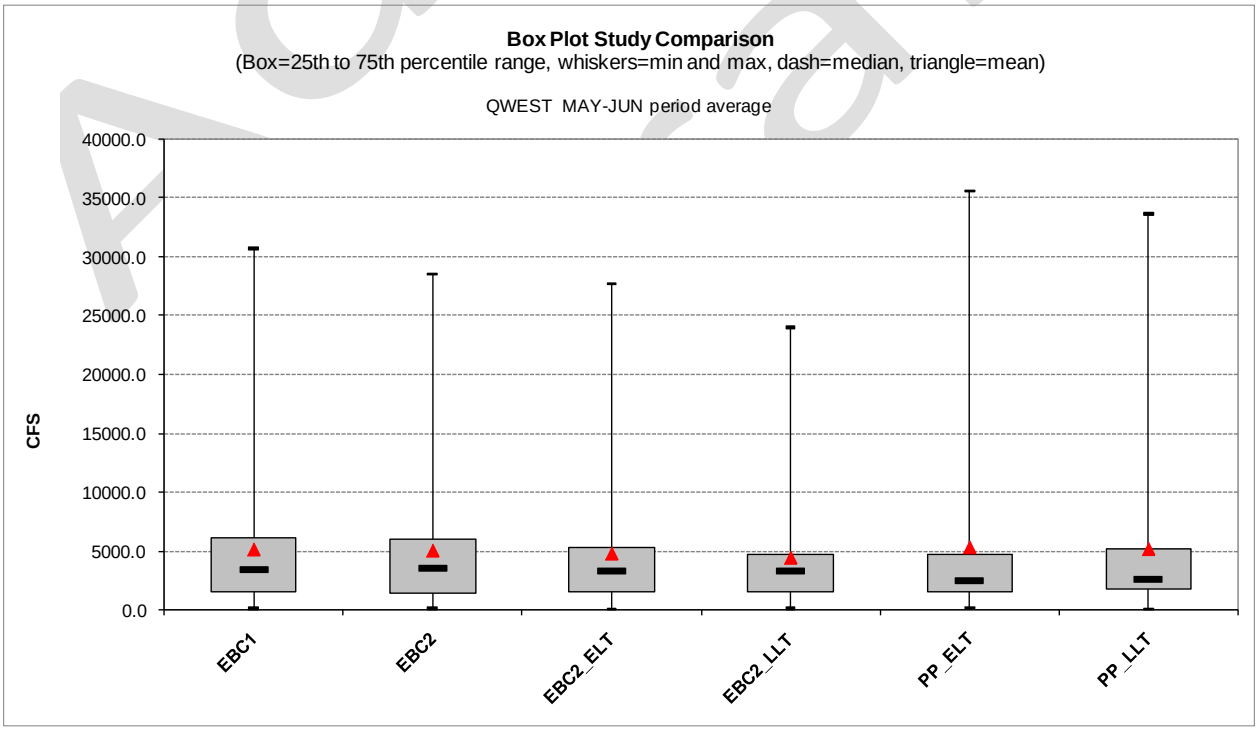

Figure C.5.3-6. Average Annual Flows in the San Joaquin River at Jersey Point in May and June

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Maximum Daily Flow at Martinez

The maximum daily flow from DSM2 outputs for May and June was examined to determine potential effects on larval delta smelt transport. Average and median flows were similar in each model scenario for maximum daily outflows (Table C.5.3-25, Figure C.5.3-7). The model estimated that average and median maximum daily flows in the PP_ELT and PP_LLT would be 4% and 11% higher, respectively, than the EBC2 (Table C.5.3-26). Isolating the effect of the preliminary proposal from that of climate change, average and median maximum daily flows in the PP_ELT and PP_LLT were 1% and 3% higher than flows in the EBC2_ELT and EBC2_LLT, respectively.

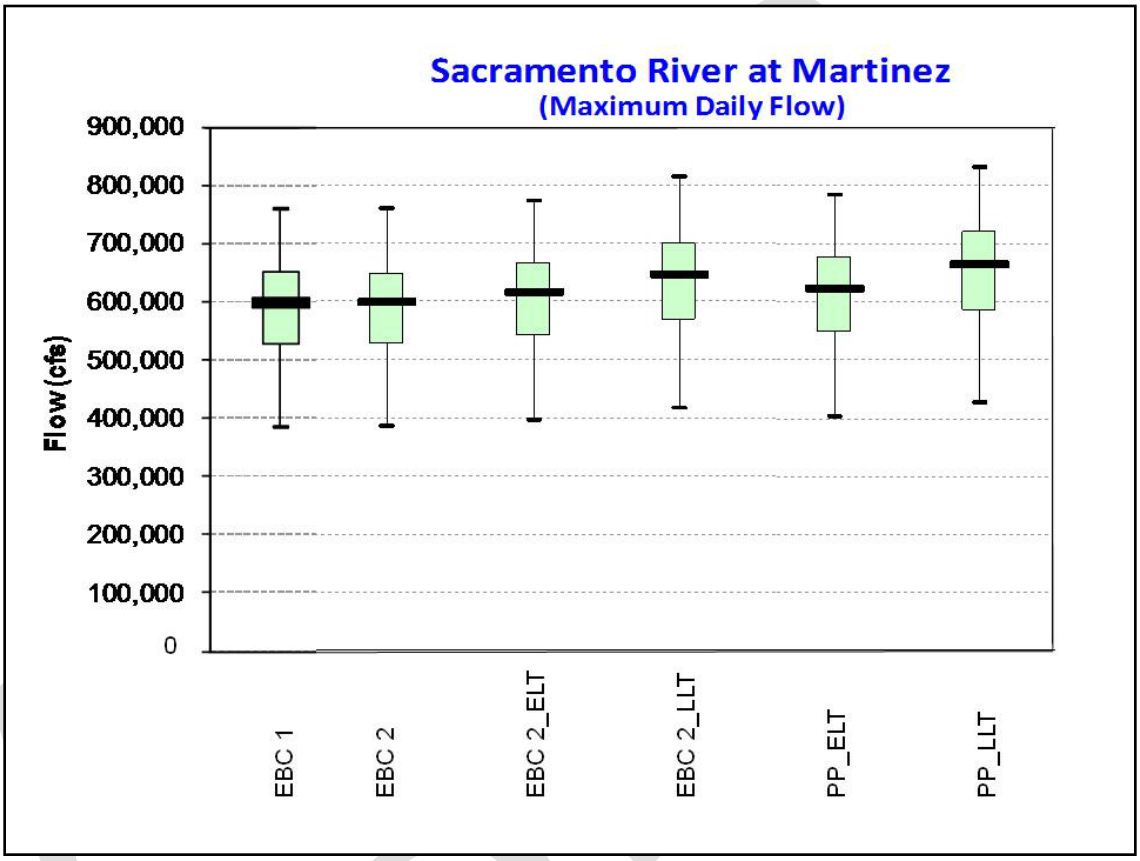

Figure C.5.3-7. Average of Maximum Daily Flows during May and June for the Sacramento River at Martinez (Corresponds to Delta Outflow)

Table C.5.3-25. Average and Median Maximum Daily Flows (Cubic Feet per Second) for Sacramento River at Martinez in May and June

	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Average	590,023	589,749	604,337	634,773	612,138	651,887
Median	598,687	598,261	613,976	645,325	622,590	664,580

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Table C.5.3-26. Percent Difference between Model Scenarios Maximum Daily Flows for Sacramento River at Martinez in May and June[1]

	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Average	4	10	4	11	1	3
Median	4	11	4	11	1	3

[1] A positive value signifies that maximum daily flow in the preliminary proposal is higher than in the existing biological conditions.

Particle Tracking Model Evaluation

This analysis also used DSM2 particle tracking with the same particle release locations, hydrologic conditions, and duration as that described in Appendix B and Attachment C.A for delta larval entrainment to determine the proportion of particles that would reach Martinez, which is used as a surrogate for the LSZ while recognizing that there is wide variation in X2.

The proportion of particles reaching Martinez (i.e., emigration potential for delta smelt larvae) ranges from about 12% to more than 90%, depending on the starting distribution and the number of days elapsed before evaluation of particle fate. Emigration potential to Martinez generally is higher for analyses conducted after 60 days relative to those conducted after 30 days (Figure C.5.3-8 to Figure C.5.3-14). After 30 days, the lower end ranges from 12% to about 38% of the population. With the exception of February 1940, which was an extremely wet period where all starting distributions had similar results, the upper end varies from 75% to 85% of the population. After 60 days, the lower end ranges from 35% to about 60% of the population, and the upper end ranges from approximately 85% to 95% of the population.

After 30 days, emigration potential to Martinez under the PP_ELT and PP_LLT scenarios was typically lower relative to the EBC1 and EBC2 in the large majority of model runs for all starting distributions, except the Dry February All Female Distribution (Figure C.5.3-9). Using the Dry February All Female starting distribution, emigration potential was lower in 10 of the 13 runs under the PP_ELT relative to both the EBC1 and EBC2 and eight runs under the PP_LLT relative to the EBC1 and EBC2 (Figure C.5.3-9). The average difference in emigration potential under the PP_ELT relative to the EBC1 and EBC2 ranged from 5.8% to 8.8% lower (relative changes of around 10–20% lower) depending on the preliminary proposal scenario and starting distribution (Table C.5.3-27). Under the PP_LLT, the average difference in emigration potential relative to the EBC1 and EBC2 ranged from 6.2% to 10.5% (relative changes of 11–24% lower) lower depending on the preliminary proposal scenario and starting distribution (Table C.5.3-27). Emigration potential was greater under the PP_ELT and PP_LLT than EBC scenarios in one or two runs of the 13 under each starting distribution, except the Dry February All Female distribution where increases occurred in three and five runs. The average size of these differences was 1.1% to 4.8% of the population (Table C.5.3-27). The same trends also applied to the comparison of the preliminary proposal scenarios when accounting for climate change (PP_ELT vs. EBC2_ELT and PP_LLT vs. EBC2_LLT) (Table C.5.3-27 and Table C.5.3-28). The magnitude of the difference between PP and EBC scenarios when accounting for climate change generally was somewhat less than in the comparison of the preliminary proposal future conditions to existing biological conditions under current conditions.

After 60 days, the percentage of particles reaching Martinez was lower under the PP_ELT and PP_LLT scenarios than under the EBC1 and EBC2 in the majority of model runs; however, the

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frequency of model runs showing increases in emigration potential was higher than that observed after 30 days (Figure C.5.3-8 to Figure C.5.3-14; Figure C.5.3-15 to Figure C.5.3-21, Table C.5.3-27 and Table C.5.3-28). Increases in emigration potential most frequently were observed when using the Dry February All Female, Dry April All Female, Wet March All Female, and Wet April Ripe Female starting distributions, with the Dry February distribution showing the most consistent increases (i.e., increased emigration potential in four and seven out of 13 model runs under the PP_ELT and PP_LLT, respectively) (Table C.5.3-29). The average difference in emigration potential under the PP_ELT relative to the EBC1 and EBC2 ranged from 1.9% to 5.8% lower (relative change of 3–9% lower) depending on the preliminary proposal scenario and starting distribution (Table C.5.3-27). Under the PP_LLT, the average difference in emigration potential relative to the EBC1 and EBC2 ranged from 0.8% to 9% lower (relative change of 1–15% lower) depending on the preliminary proposal scenario and starting distribution (Table C.5.3-27). The average size of the estimated increases in emigration potential was 0.9% to 15.3% of the population (Table C.5.3-27). However, values as high as 15.3% were based on a single observation. For starting distributions with more than one model run showing an increase in emigration potential, these increases ranged from 1.1% to 8.4% of the population. Similar trends also apply to the comparison of the PP scenarios under future climate conditions (PP_ELT vs. EBC2_ELT and PP_LLT vs. EBC2_LLT) (Table C.5.3-27).

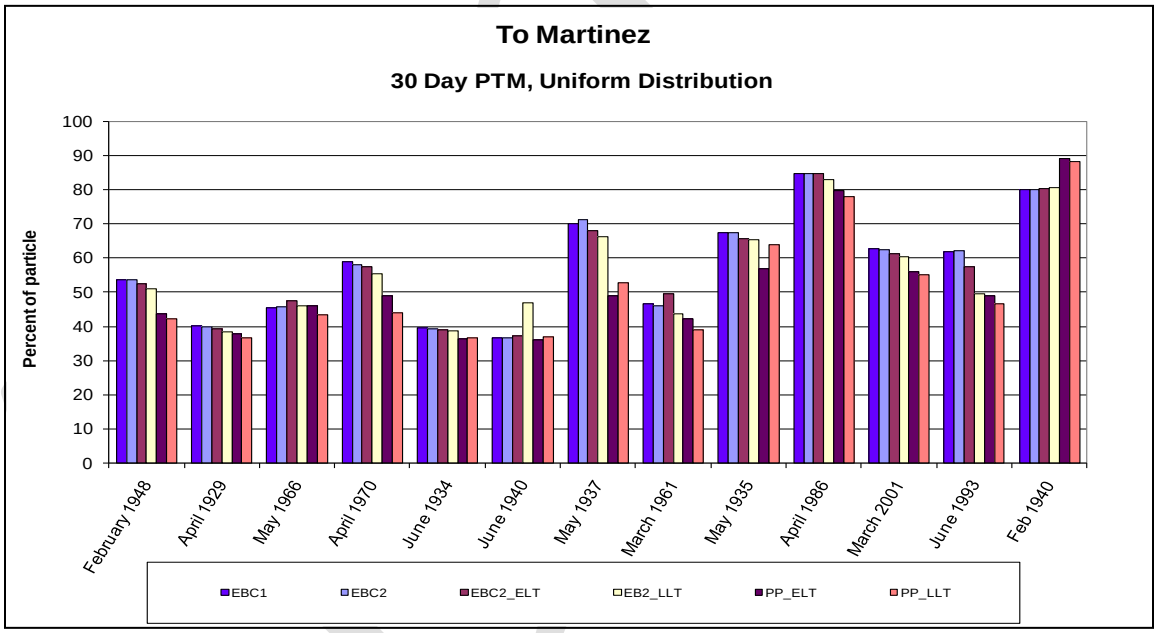

Figure C.5.3-8. Percentage of Particles Emigrating to Martinez after 30 Days; Uniform Distribution

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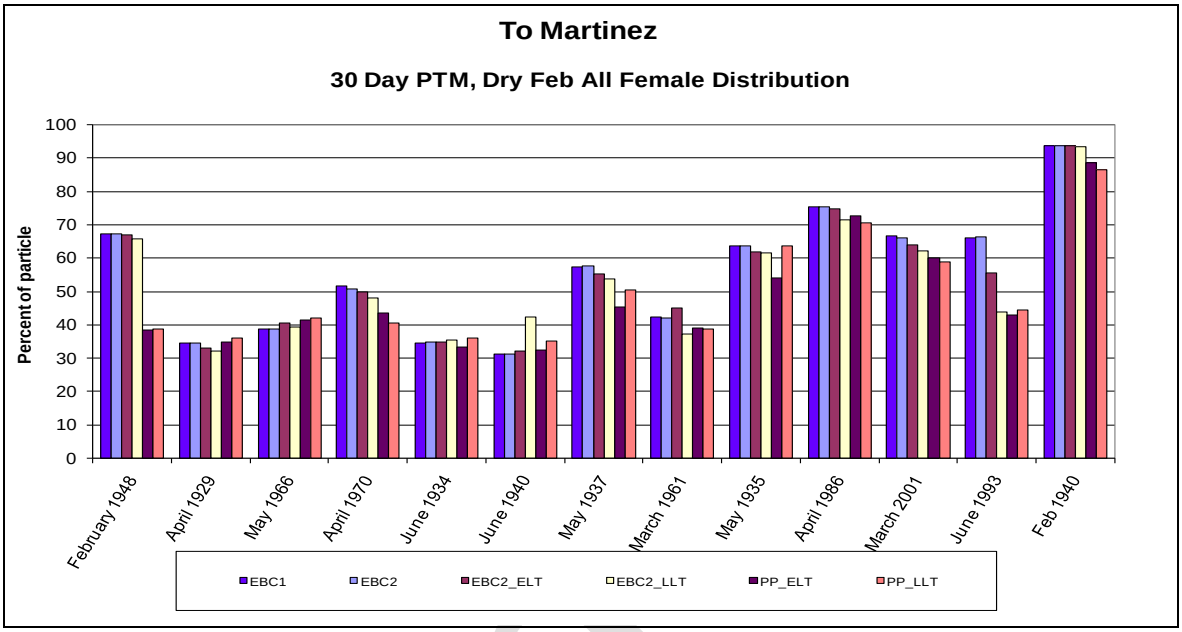

Figure C.5.3-9. Percentage of Particles Emigrating to Martinez after 30 Days; Dry February All-Female Distribution

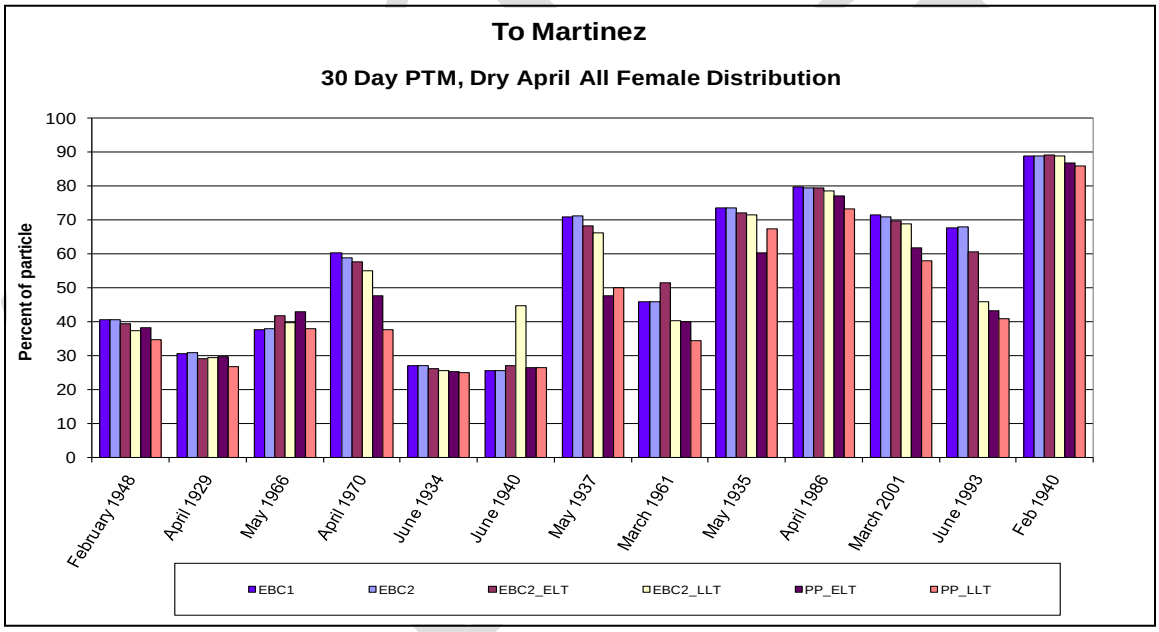

Figure C.5.3-10. Percentage of Particles Emigrating to Martinez after 30 Days; Dry April All-Female Distribution

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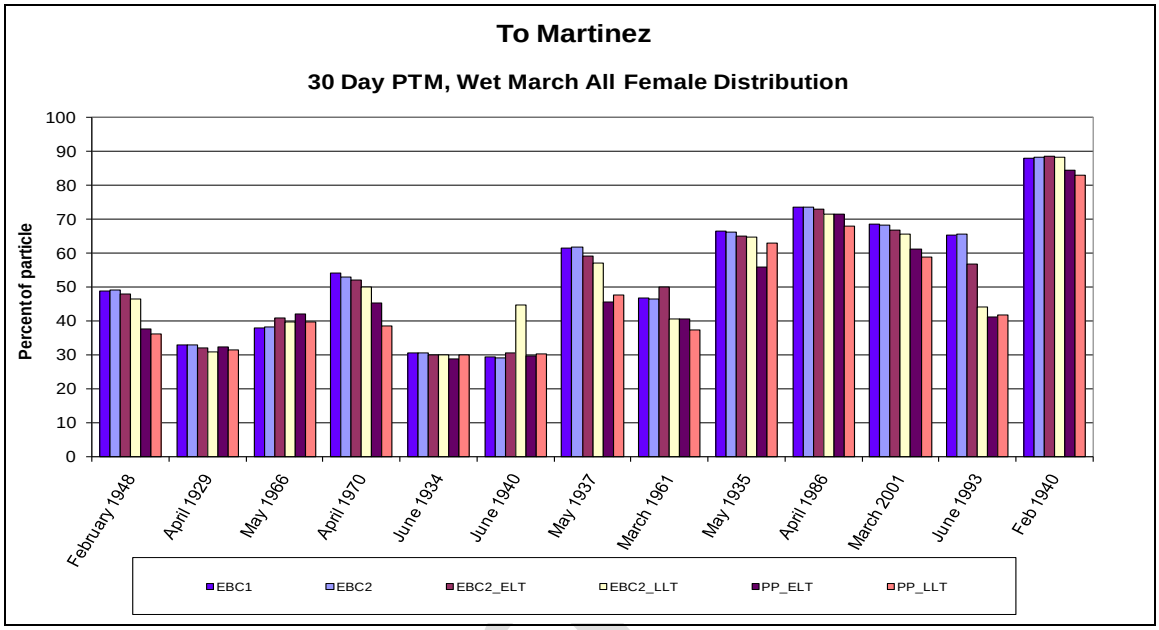

Figure C.5.3-11. Percentage of Particles Emigrating to Martinez after 30 Days; Wet March All-Female Distribution

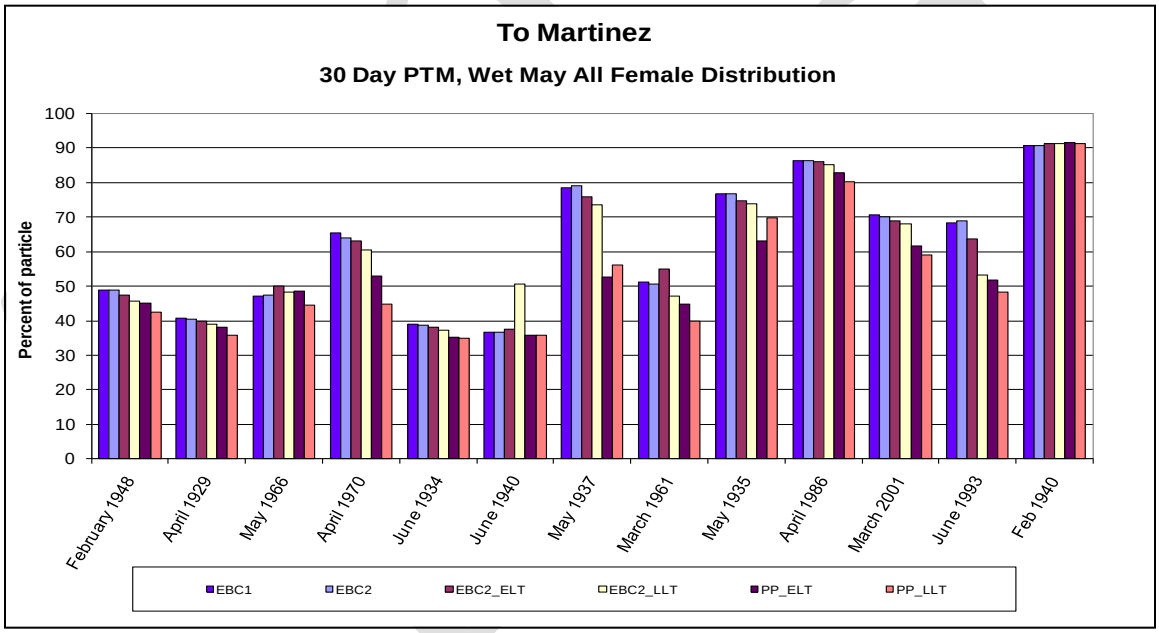

Figure C.5.3-12. Percentage of Particles Emigrating to Martinez after 30 Days; Wet May All-Female Distribution

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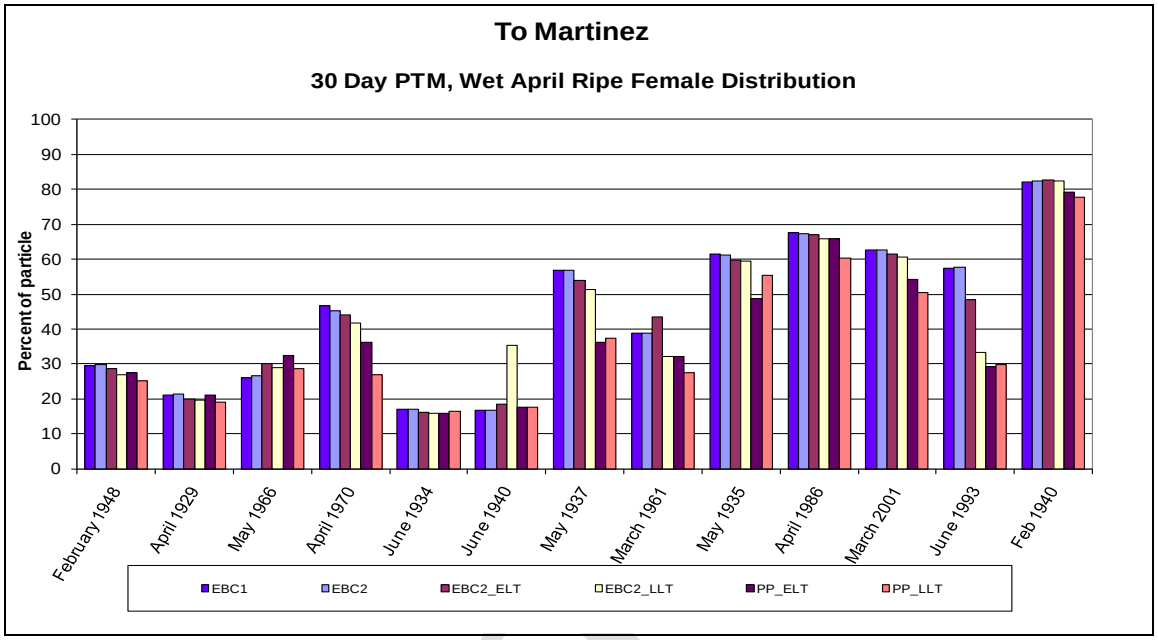

Figure C.5.3-13. Percentage of Particles Emigrating to Martinez after 30 Days; Wet April Ripe Female Distribution

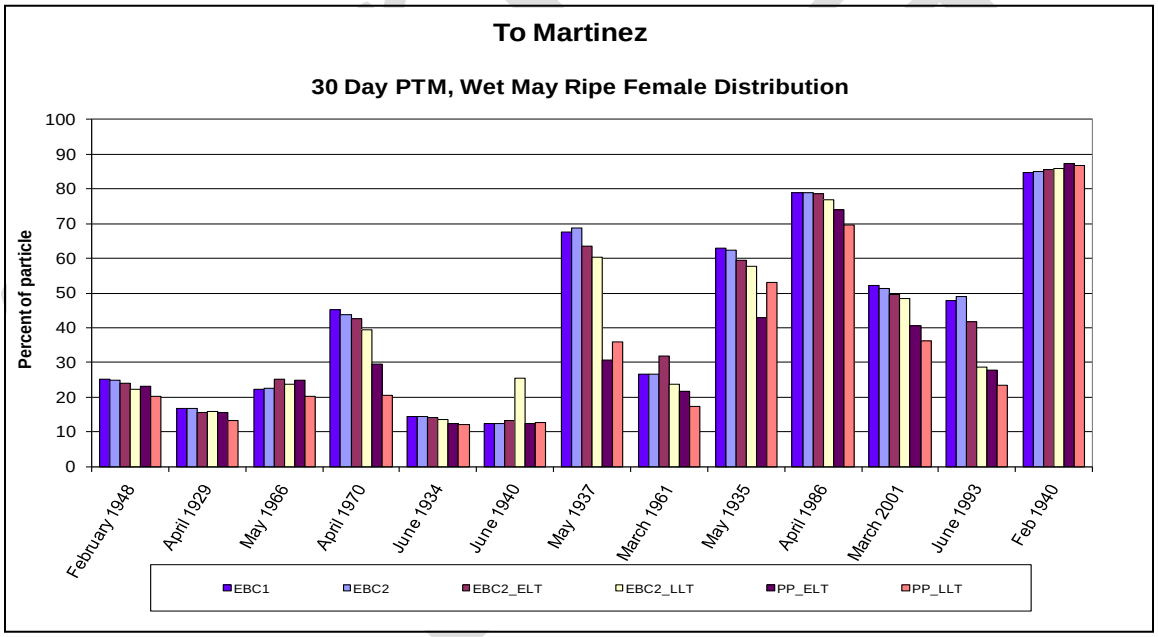

Figure C.5.3-14. Percentage of Particles Emigrating to Martinez after 30 Days; Wet May Ripe Female Distribution

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Table C.5.3-27. Average Difference[1] (Number of Runs) between Model Scenarios for Emigration Potential to Martinez for Particle Tracking Runs after 30 Days

Emigration to Martinez after 30 Days	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP _ELT	EBC2_LLT vs. PP _LLT
Uniform Distribution						
Higher Emigration	4.8 (2)	4.3 (2)	4.8 (2)	4.4 (2)	8.7 (1)	7.8 (1)
Lower Emigration	-7.8 (11)	-8.4 (11)	-7.7 (11)	-8.4 (11)	-6.4 (12)	-5.8 (12)
Dry February Distribution						
Higher Emigration	1.4 (3)	2.1 (5)	1.4 (3)	2.0 (5)	1.1 (3)	1.9 (6)
Lower Emigration	-10.1 (10)	-11.4 (8)	-10.0 (10)	-11.3 (8)	-8.4 (10)	-8.0 (7)
Dry April Distribution						
Higher Emigration	3.0 (2)	0.6 (2)	2.8 (2)	0.9 (1)	0.9 (2)	-
Lower Emigration	-8.9 (11)	-11.1 (11)	-8.8 (11)	-10.1 (12)	-7.9 (11)	-7.3 (13)
Wet March Distribution						
Higher Emigration	2.3 (2)	1.5 (2)	2.2 (2)	1.4 (2)	0.8 (2)	0.4 (2)
Lower Emigration	-8.4 (11)	-9.2 (11)	-8.3 (11)	-9.1 (11)	-7.1 (11)	-6.2 (11)
Wet May Distribution						
Higher Emigration	1.3 (2)	0.5 (1)	1.1 (2)	0.4 (1)	0.4 (1)	-
Lower Emigration	-8.9 (11)	-9.8 (12)	-8.8 (11)	-9.7 (12)	-7.3 (12)	-7.0 (13)
Wet April Ripe Female Distribution						
Higher Emigration	3.5 (2)	1.6 (2)	3.3 (2)	1.3 (2)	1.7 (2)	0.5 (1)
Lower Emigration	-8.7 (11)	-10.5 (11)	-8.6 (11)	-10.4 (11)	-7.4 (11)	-6.8 (12)
Wet May Ripe Female Distribution						
Higher Emigration	2.5 (2)	1.1 (2)	2.3 (2)	1.0 (2)	1.5 (1)	0.9 (1)
Lower Emigration	-10.9 (11)	-12.5 (11)	-10.8 (11)	-12.4 (11)	-8.7 (12)	-8.5 (12)

[1] Values represent the difference in the percentage of particles reaching this destination. Negative values indicate lower emigration under the preliminary proposal when compared to the existing biological conditions.

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Table C.5.3-28. Difference in Percentage of Particles Reaching Martinez between Model Scenarios (Relative Percentage Difference Is Indicated in Parentheses)

Tracking Duration, Starting Distribution	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
30-Day, Uniform	-5.88 (-10%)	-6.48 (-11%)	-5.82 (-10%)	-6.42 (-11%)	-5.28 (-9%)	-4.73 (-8%)
30-Day, Dry February	-7.4 (-13%)	-6.24 (-11%)	-7.34 (-13%)	-6.18 (-11%)	-6.18 (-11%)	-3.39 (-6%)
30-Day, Dry April	-7.1 (-13%)	-9.33 (-17%)	-7.05 (-13%)	-9.28 (-17%)	-6.51 (-12%)	-7.25 (-14%)
30-Day, Wet March	-6.75 (-12%)	-7.57 (-14%)	-6.68 (-12%)	-7.5 (-14%)	-5.9 (-11%)	-5.21 (-10%)
30-Day, Wet May	-7.37 (-12%)	-9.04 (-15%)	-7.26 (-12%)	-8.93 (-15%)	-6.74 (-11%)	-7. (-12%)
30-Day, Wet May Ripe Female	-8.83 (-21%)	-10.46 (-24%)	-8.76 (-20%)	-10.39 (-24%)	-7.89 (-19%)	-7.74 (-19%)
30-Day, Wet April Ripe Female	-6.79 (-15%)	-8.62 (-19%)	-6.74 (-15%)	-8.57 (-19%)	-6.01 (-14%)	-6.24 (-15%)
60-Day, Uniform	-4.34 (-6%)	-4.09 (-6%)	-4.24 (-6%)	-3.99 (-6%)	-3.91 (-6%)	-2.99 (-4%)
60-Day, Dry February	-5.17 (-7%)	-0.85 (-1%)	-5.09 (-7%)	-0.77 (-1%)	-4.09 (-6%)	1.89 (3%)
60-Day, Dry April	-2.86 (-4%)	-5.41 (-8%)	-2.88 (-4%)	-5.43 (-8%)	-2.89 (-4%)	-4.81 (-7%)
60-Day, Wet March	-2.91 (-4%)	-2.83 (-4%)	-2.88 (-4%)	-2.8 (-4%)	-2.44 (-4%)	-1.44 (-2%)
60-Day, Wet May	-4.24 (-6%)	-6.68 (-9%)	-4.15 (-5%)	-6.59 (-9%)	-4.06 (-5%)	-5.96 (-8%)
60-Day, Wet May Ripe Female	-5.82 (-9%)	-9.04 (-15%)	-5.75 (-9%)	-8.97 (-14%)	-5.66 (-9%)	-8.16 (-13%)
60-Day, Wet April Ripe Female	-1.88 (-3%)	-3.99 (-7%)	-1.91 (-3%)	-4.02 (-7%)	-1.73 (-3%)	-3.21 (-5%)
Note: Negative values indicate lower values under preliminary proposal relative to existing biological conditions.						

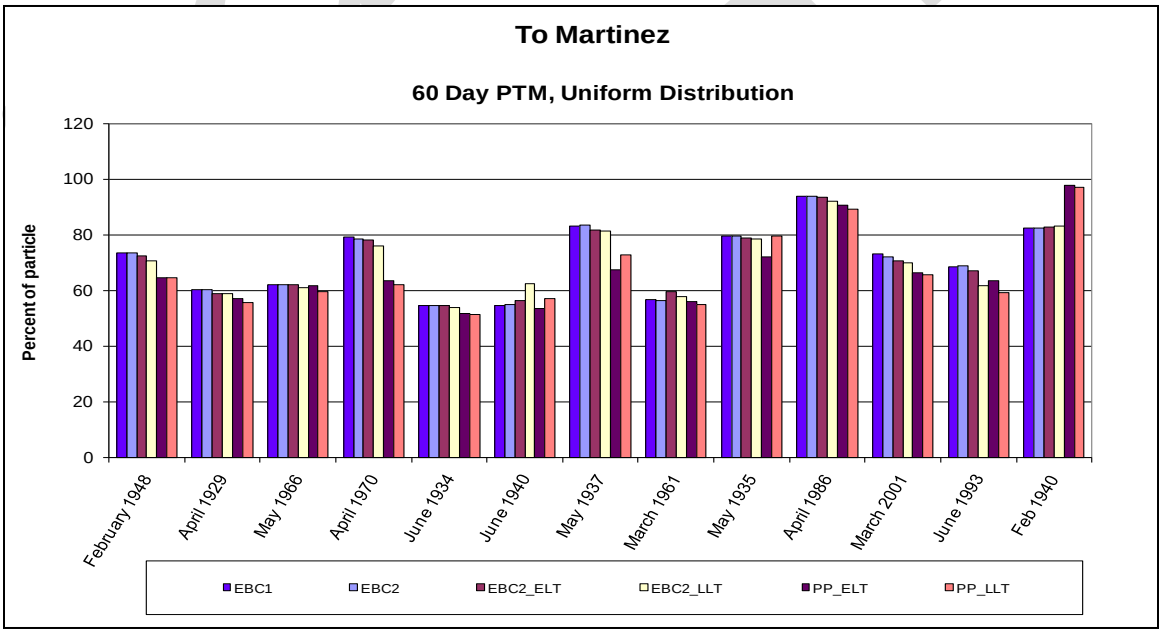

Figure C.5.3-15. Percentage of Particles Emigrating to Martinez after 60 Days; Uniform Distribution

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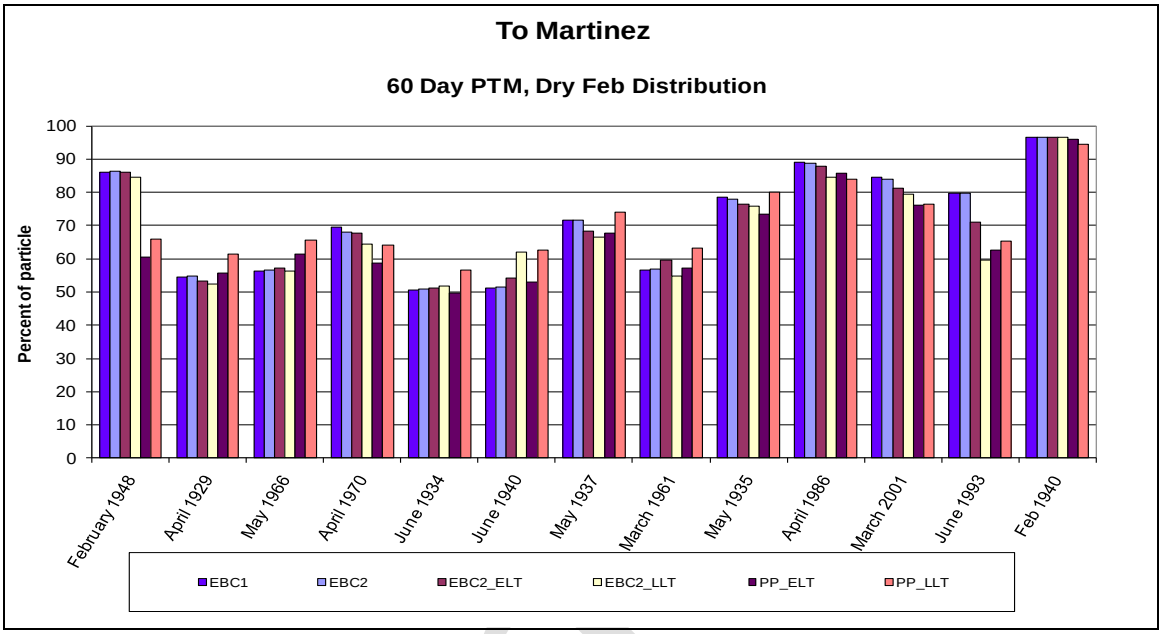

Figure C.5.3-16. Percentage of Particles Emigrating to Martinez after 60 Days; Dry February All-Female Distribution

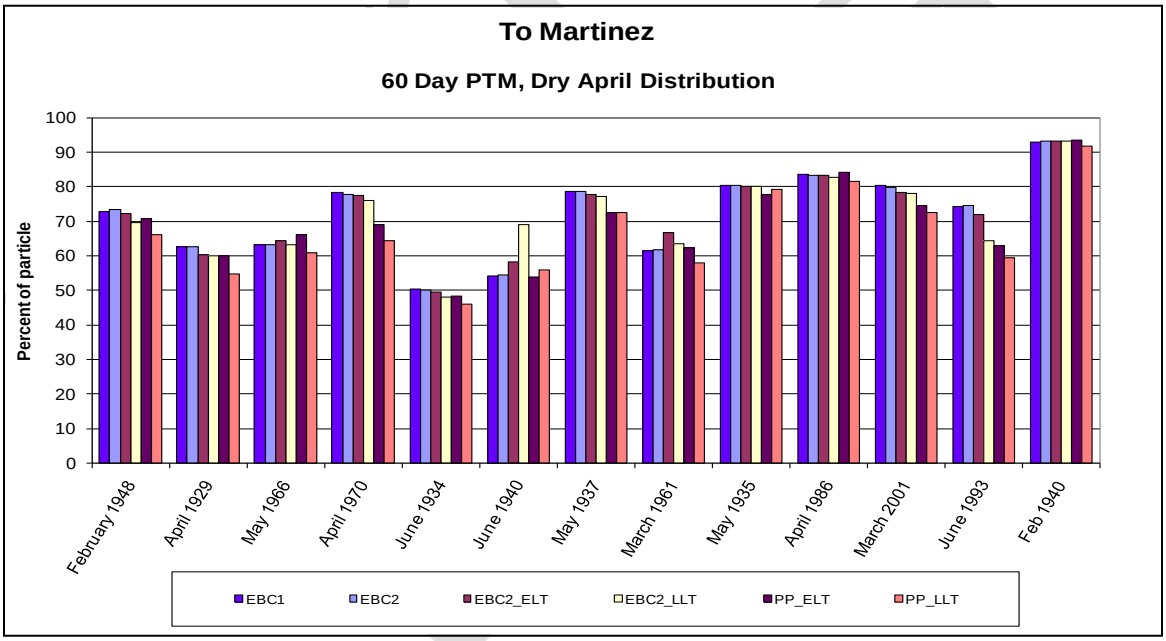

Figure C.5.3-17. Percentage of Particles Emigrating to Martinez after 60 Days; Dry April All-Female Distribution

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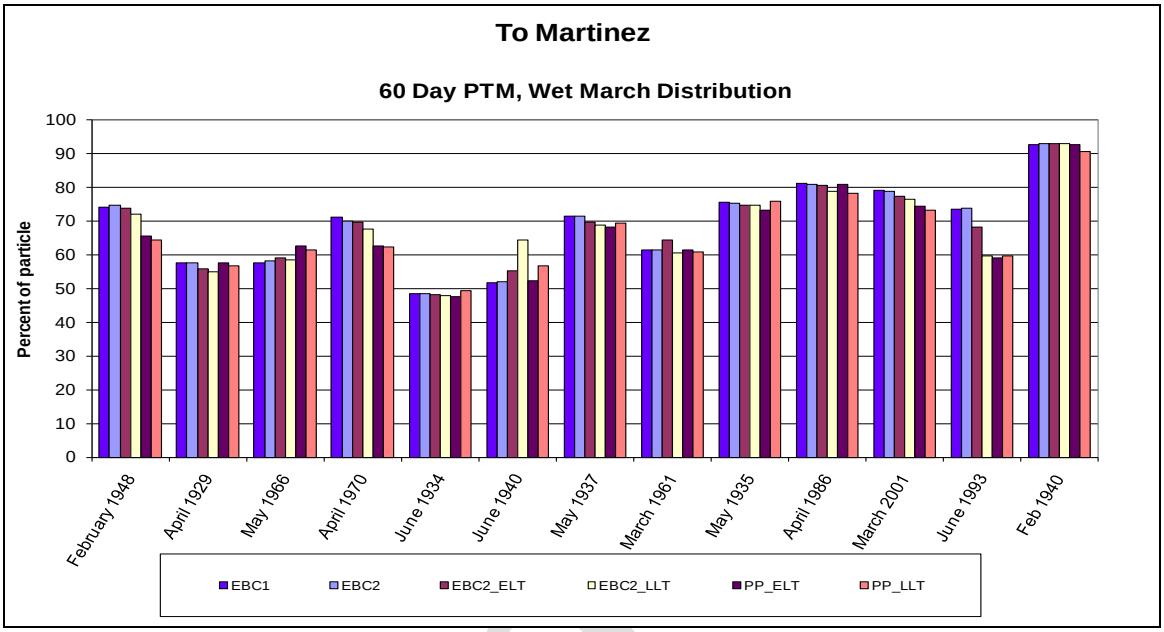

Figure C.5.3-18. Percentage of Particles Emigrating to Martinez after 60 Days; Wet March All-Female Distribution

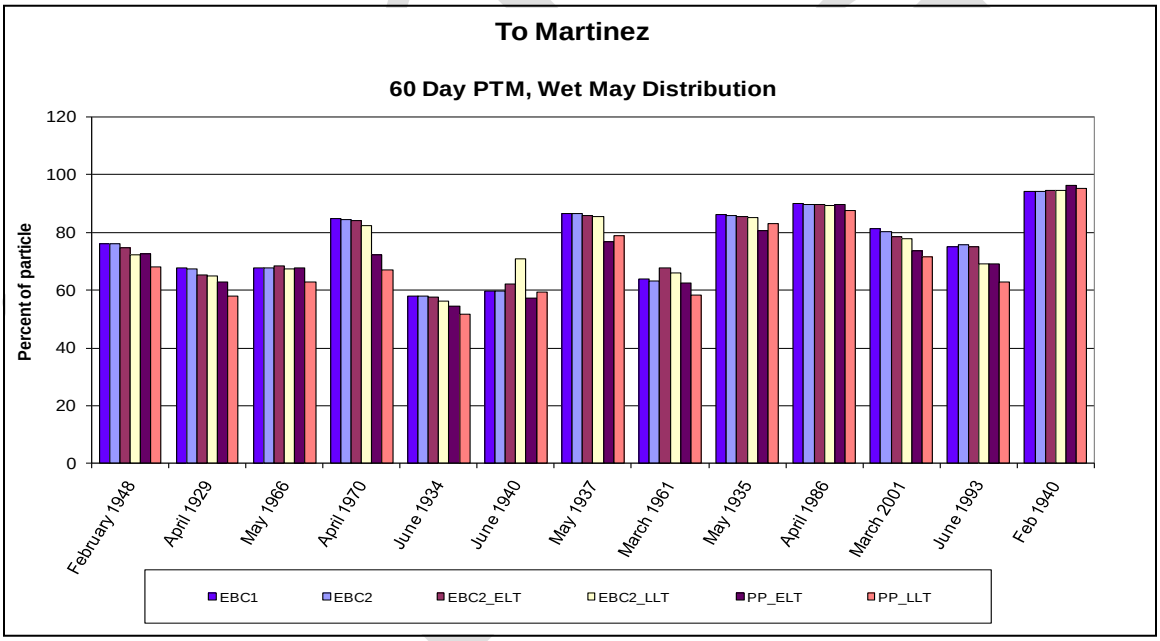

Figure C.5.3-19. Percentage of Particles Emigrating to Martinez after 60 Days; Wet May All-Female Distribution

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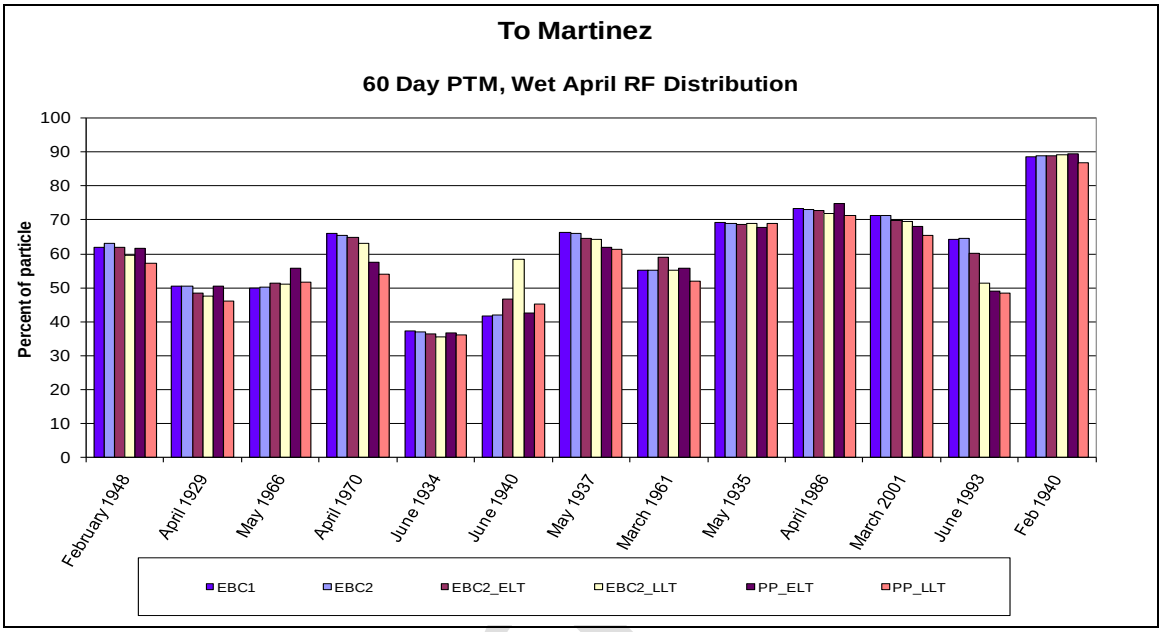

Figure C.5.3-20. Percentage of Particles Emigrating to Martinez after 60 Days; Wet April Ripe Female Distribution

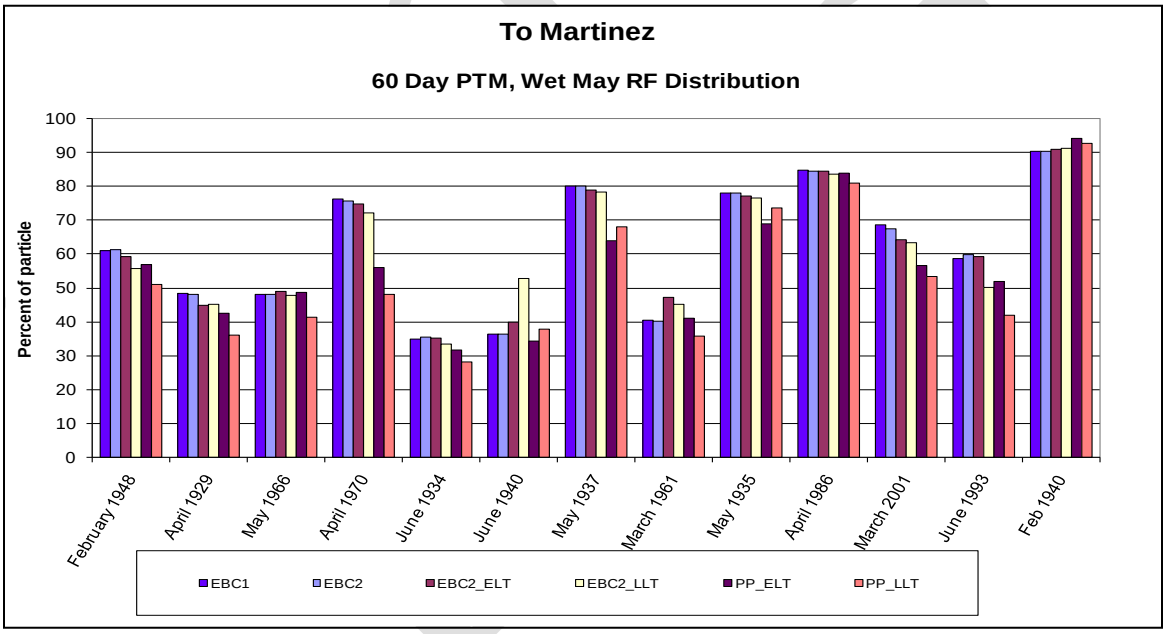

Figure C.5.3-21. Percentage of Particles Emigrating to Martinez after 60 Days; Wet May Ripe Female Distribution

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Table C.5.3-29. Average Difference[1] (Number of Runs) between Model Scenarios for Emigration Potential to Martinez for Particle Tracking Runs after 60 Days

Emigration to Martinez after 60 Days	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP _ELT	EBC2_LLT vs. PP _LLT
Uniform Distribution						
Average Increase	15.2 (1)	8.4 (2)	15.3 (1)	8.4 (2)	14.9 (1)	7.5 (2)
Average Decrease	-6.0 (12)	-6.4 (11)	-5.9 (12)	-6.2 (11)	-5.5 (12)	-4.9 (11)
Dry February Distribution						
Average Increase	2.1 (4)	6.3 (7)	1.9 (4)	6.2 (7)	3.3 (2)	6.2 (8)
Average Decrease	-8.4 (9)	-9.2 (6)	-8.2 (9)	-8.9 (6)	-5.4 (11)	-5.0 (5)
Dry April Distribution						
Average Increase	1.2 (4)	1.8 (1)	1.2 (4)	1.5 (1)	0.9 (3)	-
Average Decrease	-4.7 (9)	-6.0 (12)	-4.7 (9)	-6.0 (12)	-4.0 (10)	-4.8 (13)
Wet March Distribution						
Average Increase	2.7 (2)	2.4 (4)	1.7 (3)	2.4 (4)	2.0 (3)	1.2 (7)
Average Decrease	-3.9 (11)	-5.2 (9)	-4.3 (10)	-5.1 (9)	-3.8 (10)	-4.5 (6)
Wet May Distribution						
Average Increase	1.1 (2)	1.0 (1)	1.0 (2)	0.9 (1)	1.7 (1)	0.5 (1)
Average Decrease	-5.2 (11)	-7.3 (12)	-5.1 (11)	-7.2 (12)	-4.5 (12)	-6.5 (12)
Wet April Ripe Female Distribution						
Average Increase	1.9 (5)	2.6 (2)	1.8 (5)	2.3 (2)	1.8 (5)	0.4 (2)
Average Decrease	-4.2 (8)	-5.2 (11)	-4.2 (8)	-5.2 (11)	-4.0 (8)	-3.9 (11)
Wet May Ripe Female Distribution						
Average Increase	1.6 (3)	2.0 (2)	1.7 (3)	1.9 (2)	3.4 (1)	1.5 (1)
Average Decrease	-8.0 (10)	-11.0 (11)	-8.0 (10)	-10.9 (11)	-6.4 (12)	-9.0 (12)

[1] Values represent the difference in the percentage of particles reaching this destination. Negative values indicate lower emigration under the preliminary proposal when compared to the existing biological conditions.

Longfin Smelt

X2-Relative Abundance Regressions

Decreased transport flows in the lower Sacramento River have been identified as one mechanism that could adversely affect the growth and survival of larval longfin smelt. One way to evaluate this is use of the relationship developed by Kimmerer et al. (2009) between average January through June X2 and longfin smelt relative abundance based on trawl survey data, and using January through June X2. The mechanism underlying the correlation between outflow (expressed as X2) and longfin smelt abundance is not understood, and it may not reflect larval transport but instead some other relationship such as food. Results from the analysis using the Kimmerer et al. (2009) method for the fall midwater trawl suggest that once climate change has been factored out, the X2 values projected for the 20th exceedance percentile have the potential to reduce relative abundance by 17–20% under PP_ELT and PP_LLT compared with EBC2_ELT and EBC2_LLT (Table C.5.3-30 and Table C.5.3-31). Relative abundance under PP_ELT and PP_LLT was 26% and 36% lower than EBC1 (Table C.5.3-30 and Table C.5.3-31). The X2 values estimated for the 20th exceedance percentile suggested the potential for a 26% and 35% reduction in relative abundance under the early and late long-term preliminary proposal, respectively, relative to the EBC2 (Table C.5.3-30 and Table C.5.3-31).

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Based on the 80th percentile X2 position, when the effects of climate change were removed, estimated longfin smelt relative abundance in the PP_ELT and PP_LLT is potentially 17% and 2% lower, respectively, compared to the EBC data (Table C.5.3-30 and Table C.5.3-31). Estimates of longfin smelt relative abundance were 30% and 37% lower under the PP_ELT and PP_LLT, respectively, compared to EBC1. Relative abundance was 30% and 38% lower under the PP_ELT and PP_LLT, respectively, compared to EBC2.

The analyses based on the bay midwater trawl and otter trawl data provided similar results (Table C.5.3-30 and Table C.5.3-31).

Table C.5.3-30. Estimated Longfin Smelt Relative Abundance Using the X2 Abundance Regression, December through May X2, 20th and 80th Exceedance Percentiles, Based on Trawl Data

Longfin Smelt Estimated Abundance by Scenario						
Percentile	**EBC1**	**EBC2**	**EBC2_ELT**	**EBC2_LLT**	**PP_ELT**	**PP_LLT**
Fall Midwater Trawl						
20th percentile	1,722	1,703	1,577	1,330	1,266	1,102
80th percentile	16,183	16,258	13,641	10,350	11,328	10,115
Bay Midwater Trawl						
20th percentile	3,042	3,002	2,739	2,231	2,103	1,780
80th percentile	44,757	45,008	36,459	26,176	29,172	25,465
Bay Otter Trawl						
20th percentile	3,829	3,780	3,448	2,809	2,648	2,241
80th percentile	56,346	56,662	45,899	32,954	36,726	32,059

Table C.5.3-31. Difference (Kilometers) and Percent Difference between Model Scenarios for Longfin Smelt Estimated Relative Abundance Due to Position of X2[1], Based on Trawl Survey Results

Percentile	Comparison[2]	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Fall Midwater Trawl							
20th	Difference	-456	-620	-437	-601	-312	-228
	Percent difference	-26%	-36%	-26%	-35%	-20%	-17%
80th	Difference	-4,855	-6,068	-4,931	-6,144	-2,313	-235
	Percent difference	-30%	-37%	-30%	-38%	-17%	-2%
Bay Midwater Trawl							
20th	Difference	-939	-1,262	-899	-1,222	-636	-451
	Percent difference	-31%	-41%	-30%	-41%	-23%	-20%
80th	Difference	-15,585	-19,292	-15,835	-19,543	-7,286	-711
	Percent difference	-35%	-43%	-35%	-43%	-20%	-3%
Bay Otter Trawl							
20th	Difference	-1,182	-1,589	-1,132	-1,539	-800	-568
	Percent difference	-31%	-41%	-30%	-41%	-23%	-20%
80th	Difference	-19,620	-24,287	-19,936	-24,603	-9,173	-895
	Percent difference	-35%	-43%	-35%	-43%	-20%	-3%

[1] Based on Kimmerer et al. (2009) relationships of December through May X2.
[2] Negative values correspond with reductions in predicted longfin smelt abundance under the preliminary proposal.

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Summaries of estimated longfin smelt relative abundance and differences between PP and EBC scenarios based on this method averaged by water-year type from the X2-relative abundance regressions are provided in Table C.5.3-32, Table C.5.3-33, Table C.5.3-34, Table C.5.3-35, Table C.5.3-36, and Table C.5.3-37. These summaries illustrate the same general trends for the fall midwater trawl, bay midwater trawl, and bay otter trawl: average relative abundance of longfin smelt was lower under PP scenarios than EBC scenarios; differences between PP and EBC1/EBC2 scenarios were appreciably greater (more than double in a number of cases) than differences between PP and EBC2_ELT/EBC2_LLT scenarios; and differences between PP and EBC scenarios were lowest in critical water years and greater in the other water-year types.

Table C.5.3-32. Estimated Longfin Smelt Relative Abundance in the Fall Midwater Trawl Based on the X2–Abundance Regression of Kimmerer et al. (2009)

Water-Year Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
All	4835	4925	4518	3638	3864	3334
Wet	18338	18376	17015	12411	14976	12283
Above Normal	7820	7992	7547	5852	6035	4995
Below Normal	3762	3817	3458	2815	2757	2384
Dry	1914	1960	1727	1511	1481	1357
Critical	896	939	883	799	820	752

Table C.5.3-33. Estimated Differences between Scenarios for Longfin Smelt Relative Abundance in the Fall Midwater Trawl Based on the X2–Relative Abundance Regression of Kimmerer et al. (2009)

WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
All	-972 (-20%)	-1501 (-31%)	-1062 (-22%)	-1591 (-32%)	-654 (-14%)	-304 (-8%)
Wet	-3361 (-18%)	-6055 (-33%)	-3399 (-18%)	-6093 (-33%)	-2039 (-12%)	-128 (-1%)
Above Normal	-1786 (-23%)	-2825 (-36%)	-1957 (-24%)	-2996 (-37%)	-1512 (-20%)	-857 (-15%)
Below Normal	-1005 (-27%)	-1378 (-37%)	-1060 (-28%)	-1433 (-38%)	-702 (-20%)	-431 (-15%)
Dry	-433 (-23%)	-557 (-29%)	-479 (-24%)	-603 (-31%)	-246 (-14%)	-154 (-10%)
Critical	-75 (-8%)	-144 (-16%)	-118 (-13%)	-187 (-20%)	-63 (-7%)	-47 (-6%)

Table C.5.3-34. Estimated Longfin Smelt Relative Abundance in the Bay Midwater Trawl Based on the X2–Relative Abundance Regression of Kimmerer et al. (2009)

WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
All	10503	10738	9680	7465	8024	6724
Wet	52002	52131	47533	32553	40784	32149
Above Normal	18702	19194	17920	13207	13703	10922
Below Normal	7771	7908	7025	5487	5352	4496
Dry	3454	3554	3052	2600	2539	2286
Critical	1389	1469	1366	1210	1250	1126

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Table C.5.3-35. Estimated Differences between Scenarios for Longfin Smelt Relative Abundance in the Bay Midwater Trawl Based on the X2–Relative Abundance Regression of Kimmerer et al. (2009)

WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
All	-2479 (-24%)	-3779 (-36%)	-2714 (-25%)	-4013 (-37%)	-1656 (-17%)	-741 (-10%)
Wet	-11218 (-22%)	-19853 (-38%)	-11347 (-22%)	-19982 (-38%)	-6749 (-14%)	-404 (-1%)
Above Normal	-4999 (-27%)	-7780 (-42%)	-5491 (-29%)	-8272 (-43%)	-4218 (-24%)	-2285 (-17%)
Below Normal	-2419 (-31%)	-3276 (-42%)	-2556 (-32%)	-3412 (-43%)	-1673 (-24%)	-992 (-18%)
Dry	-915 (-26%)	-1168 (-34%)	-1015 (-29%)	-1268 (-36%)	-513 (-17%)	-314 (-12%)
Critical	-139 (-10%)	-263 (-19%)	-220 (-15%)	-344 (-23%)	-116 (-8%)	-84 (-7%)

Table C.5.3-36. Estimated Longfin Smelt Relative Abundance in the Bay Otter Trawl Based on the X2–Relative Abundance Regression of Kimmerer et al. (2009).

WY	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
All	13222	13518	12187	9398	10101	8465
Wet	65466	65629	59841	40982	51344	40473
Above Normal	23544	24164	22561	16627	17251	13750
Below Normal	9783	9956	8844	6908	6738	5660
Dry	4348	4474	3843	3273	3196	2878
Critical	1748	1850	1719	1523	1574	1417

Table C.5.3-37. Estimated Differences between Scenarios for Longfin Smelt Relative Abundance in the Bay Otter Trawl Based on the X2–Relative Abundance Regression of Kimmerer et al. (2009)

WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
All	-3120 (-24%)	-4757 (-36%)	-3416 (-25%)	-5053 (-37%)	-2085 (-17%)	-933 (-10%)
Wet	-14122 (-22%)	-24993 (-38%)	-14285 (-22%)	-25156 (-38%)	-8497 (-14%)	-508 (-1%)
Above Normal	-6293 (-27%)	-9794 (-42%)	-6913 (-29%)	-10414 (-43%)	-5310 (-24%)	-2877 (-17%)
Below Normal	-3046 (-31%)	-4124 (-42%)	-3218 (-32%)	-4296 (-43%)	-2107 (-24%)	-1248 (-18%)
Dry	-1152 (-26%)	-1470 (-34%)	-1278 (-29%)	-1596 (-36%)	-646 (-17%)	-395 (-12%)
Critical	-174 (-10%)	-331 (-19%)	-276 (-15%)	-433 (-23%)	-146 (-8%)	-106 (-7%)

Particle Tracking Modeling Evaluation

Another method for evaluating the potential effects of transport flows on larval smelt is to review the results of particle tracking modeling. Averaged over all model runs, there was little difference between PP and EBC scenarios in the number of particles reaching Martinez after 60 days (Table C.5.3-40).

The proportion of particles reaching Martinez ranges from about 39% to more than 98%, depending on the starting distribution and the number of days elapsed before evaluation of particle fate. Particle emigration potential to Martinez is generally higher in analyses conducted after 60 days relative to those conducted after 30 days. Emigration potential to Martinez under the PP_ELT and PP_LLT scenarios was lower relative to the EBC1 and EBC2 in, respectively, 9–11 of the 12 model runs for both starting distributions after 30 days (Figure C.5.3-22, Figure C.5.3-23, Table C.5.3-38.

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Averaged over all model runs, the number of particles reaching Martinez after 30 days under PP scenarios compared with EBC scenarios was around 3–5% lower (4–7% lower in relative terms) with the wetter distribution and 4.4–6.3% lower (5–8% lower in relative terms) under the drier distribution (Table C.5.3-40). After 60 days, emigration potential to Martinez under the PP_ELT and PP_LLT typically was lower in approximately half of the model runs (Figure C.5.3-24, Figure C.5.3-25), except in comparisons of the preliminary proposal to the EBC2 in the late long-term. In these cases, emigration to Martinez was lower in eight or nine of 12 model runs (Table C.5.3-39). The January 1929 model run was exceptional in that the PP_LLT showed a large increase in emigration potential for both starting distributions relative to all other modeled scenarios. When the preliminary proposal resulted in lower emigration potential than the existing biological conditions, the average difference ranged from 5.7% to 8.3%, depending on the starting distribution, after 30 days (Table C.5.3-38). After 60 days, when the preliminary proposal resulted in lower emigration potential than the existing biological conditions, the average difference ranged from 0.8% to 4.4%, depending on the starting distribution (Table C.5.3-40). These trends generally apply to the comparison of the preliminary proposal scenarios under future climate conditions (PP_ELT vs. EBC2_ELT and PP_LLT vs. EBC2_LLT). In analyses conducted after 60 days for the drier distribution, however, lower emigration potential was observed in eight or nine of 12 model runs under the preliminary proposal relative to the EBC2_ELT and EBC2_LLT (Table C.5.3-39), whereas approximately half of the model runs showed lower emigration potential under the preliminary proposal relative to existing conditions in the majority of the other comparisons made.

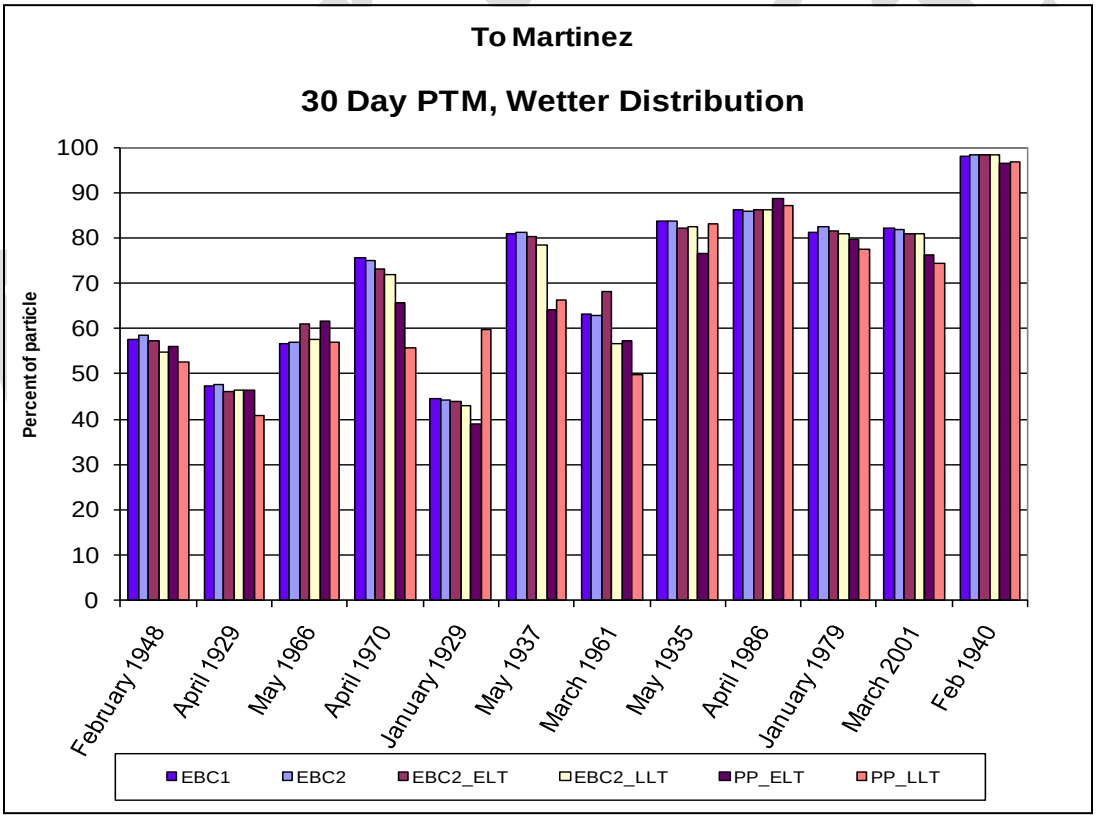

Figure C.5.3-22. Percentage of Particles Emigrating to Martinez after 30 Days, Wetter Distribution

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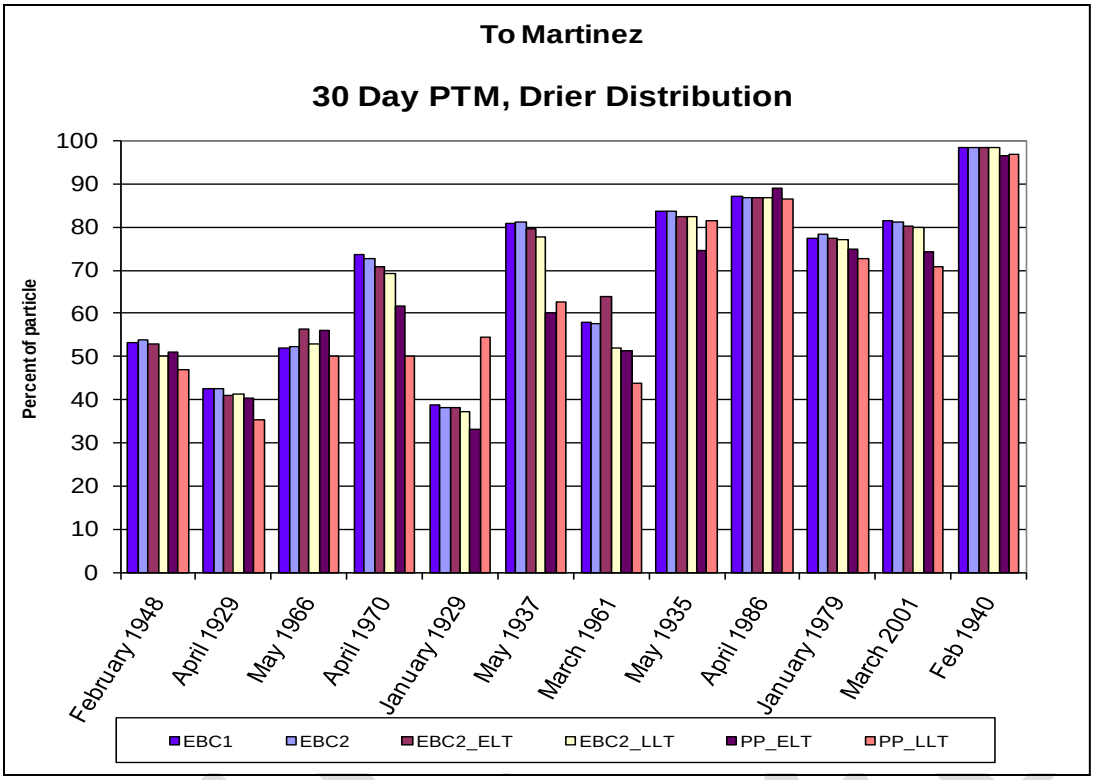

Figure C.5.3-23. Percentage of Particles Emigrating to Martinez after 30 Days, Drier Distribution

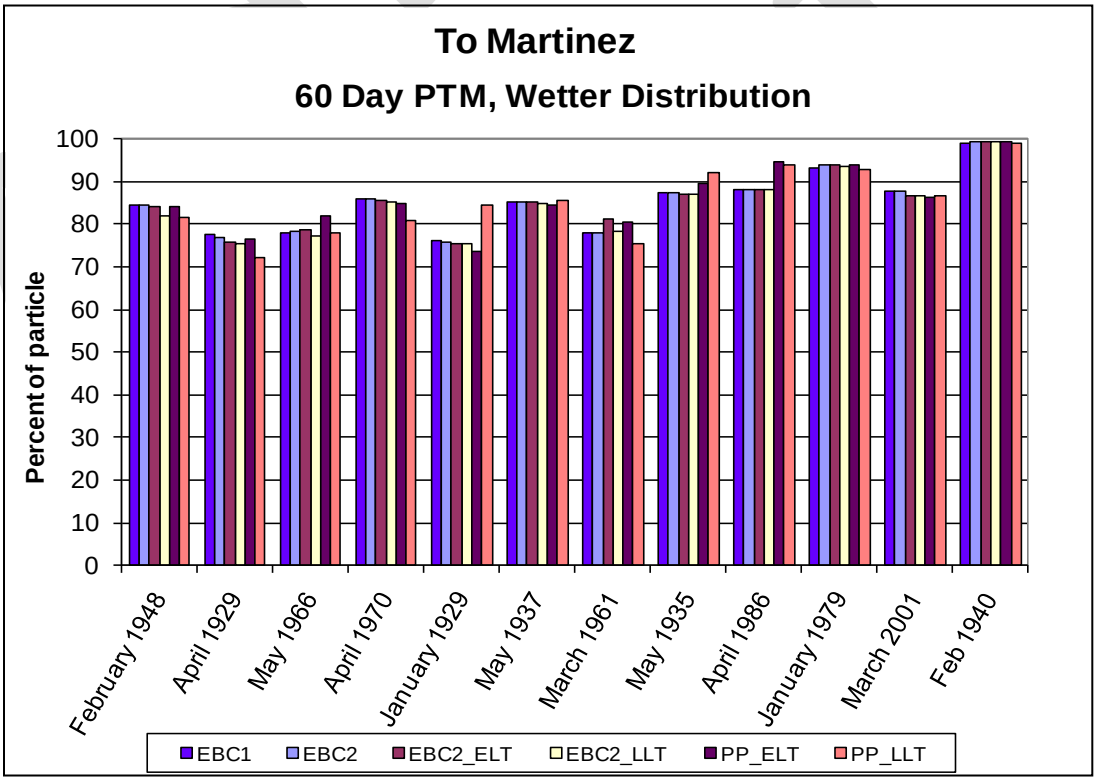

Figure C.5.3-24. Percentage of Particles Emigrating to Martinez after 60 Days, Wetter Distribution

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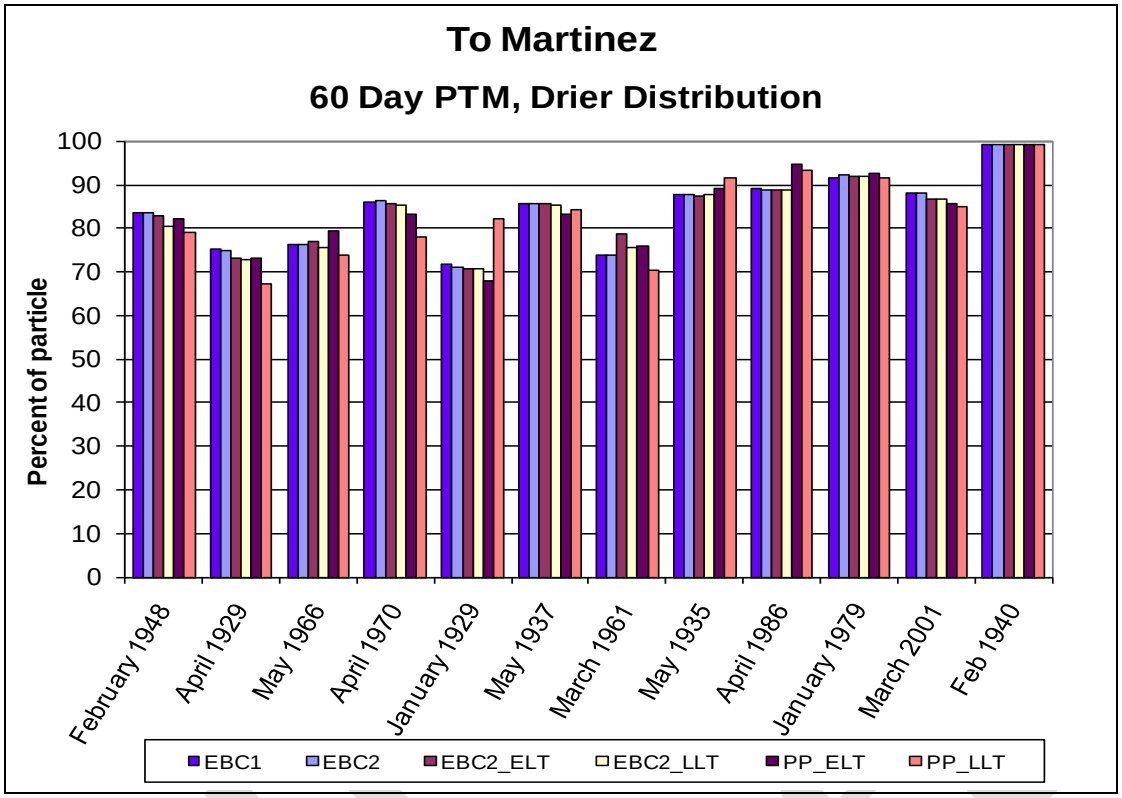

Figure C.5.3-25. Percentage of Particles Emigrating to Martinez after 60 Days, Drier Distribution

Table C.5.3-38. Average Difference[1] (Number of Runs) between Model Scenarios in Emigration Potential to Martinez for Particle Tracking Runs after 30 Days

Emigration to Martinez after 30 Days	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Wetter Distribution						
Higher Emigration	3.8 (2)	5.6 (3)	3.6 (2)	8.4 (2)	1.1 (3)	6.0 (3)
Lower Emigration	-5.7 (10)	-8.1 (9)	-5.8 (10)	-7.4 (10)	-6.1 (9)	-6.1 (9)
Drier Distribution						
Higher Emigration	3.1 (2)	15.7 (1)	2.9 (2)	16.2 (1)	2.0 (1)	17.1 (1)
Lower Emigration	-6.9 (10)	-8.2 (11)	-7.0 (10)	-8.3 (11)	-6.0 (11)	-6.4 (11)

[1] Values represent the difference in the percentage of particles reaching this destination. Negative values indicate lower emigration under the preliminary proposal when compared to the existing biological conditions.

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Table C.5.3-39. Average Difference[1] (Number of Runs) between Model Scenarios in Emigration Potential to Martinez for Particle Tracking Runs after 60 Days

Emigration to Martinez after 60 Days	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Wetter Distribution						
Higher Emigration	2.7 (6)	3.8 (5)	3.1 (5)	4.9 (4)	1.9 (7)	4.3 (5)
Lower Emigration	-1.2 (6)	-2.5 (7)	-0.9 (7)	-2.3 (8)	-0.8 (5)	-1.8 (7)
Drier Distribution						
Higher Emigration	2.3 (6)	3.7 (5)	2.1 (6)	6.5 (3)	2.6 (4)	6.6 (3)
Lower Emigration	-2.5 (6)	-4.4 (7)	-2.4 (6)	-3.5 (9)	-1.6 (8)	-2.7 (9)

[1] Values represent the difference in the percentage of particles reaching this destination. Negative values indicate lower emigration under the preliminary proposal when compared to the existing biological conditions.

Table C.5.3-40. Difference in Percentage of Particles Reaching Martinez between Model Scenarios (Relative Percentage Difference Is Indicated in Parentheses)

WY	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
30-Day, Wetter	-4.16 (-6%)	-4.69 (-7%)	-4.26 (-6%)	-4.8 (-7%)	-4.31 (-6%)	-3.07 (-4%)
30-Day, Drier	-5.28 (-8%)	-6.24 (-9%)	-5.34 (-8%)	-6.31 (-9%)	-5.37 (-8%)	-4.41 (-7%)
60-Day, Wetter	0.75 (1%)	0.11 (0%)	0.75 (1%)	0.12 (0%)	0.76 (1%)	0.72 (1%)
60-Day, Drier	-0.13 (0%)	-1.01 (-1%)	-0.15 (0%)	-1.03 (-1%)	-0.17 (0%)	-0.34 (0%)

C.5.3.1.3 Juvenile Chinook Salmon through-Delta Survival (Delta Passage Model)

The results of the Delta Passage Model (DPM) are presented below for the smolts of each run of Chinook salmon modeled (i.e., winter-run, spring-run, fall-run, and late fall–run from the Sacramento River watershed; fall-run from the Mokelumne River; and fall-run from the San Joaquin River watershed). Overall survival is presented, followed by the results of some of the important components of overall survival such as reach-specific survival and percentages of fish entering the interior Delta. Consideration of these additional components provides useful information as to the main mechanisms driving overall survival.

Winter-Run Chinook Salmon

Overall Survival through the Delta

Overall migrating smolt survival was similar among the four EBC scenarios, ranging from 13%–17% in several critical and dry years (1976, 1977, 1989, and 1991) to 36–41% in the wet years of 1982–1983 (Table C.5.3-41). Compared to the EBC scenarios, the PP_ELT and PP_LLT scenarios showed only slight differences in overall smolt survival within years (Table C.5.3-42; Figure C.5.3-26). The average difference in overall smolt survival across all years ranged from 0 to 0.1% (0 to 1% relative difference). As described in the methods, these results apply to actively migrating smolts and do not incorporate potential rearing and growth of fry or parr in the Delta.

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Table C.5.3-41. Percentage of Winter-Run Chinook Salmon Smolts Surviving through the Delta, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	20.0	18.9	18.8	18.7	19.0	18.5
1976 (C)	13.6	13.1	13.0	12.9	14.7	12.9
1977 (C)	13.2	13.5	14.3	15.8	14.0	13.9
1978 (AN)	31.9	31.9	32.6	33.9	31.0	32.2
1979 (BN)	18.9	18.5	18.5	18.5	17.5	17.6
1980 (AN)	33.0	32.8	32.9	32.5	34.8	34.1
1981 (D)	22.0	21.0	20.7	20.8	19.6	20.7
1982 (W)	36.1	36.0	36.4	36.5	37.7	38.1
1983 (W)	38.5	38.2	38.5	38.6	40.6	40.8
1984 (W)	30.1	30.1	31.3	30.9	31.1	30.7
1985 (D)	17.2	17.1	17.0	16.7	16.5	16.1
1986 (W)	27.6	27.3	27.8	27.9	27.5	27.7
1987 (D)	17.6	17.8	17.7	17.6	17.5	16.9
1988 (C)	21.0	21.0	20.3	20.4	19.2	19.6
1989 (D)	16.0	16.3	16.3	16.3	15.5	16.8
1990 (C)	16.3	16.5	16.2	16.1	15.2	15.7
1991 (C)	14.8	15.2	15.0	15.1	14.4	15.2
Average	22.8	22.7	22.8	22.9	22.7	22.8

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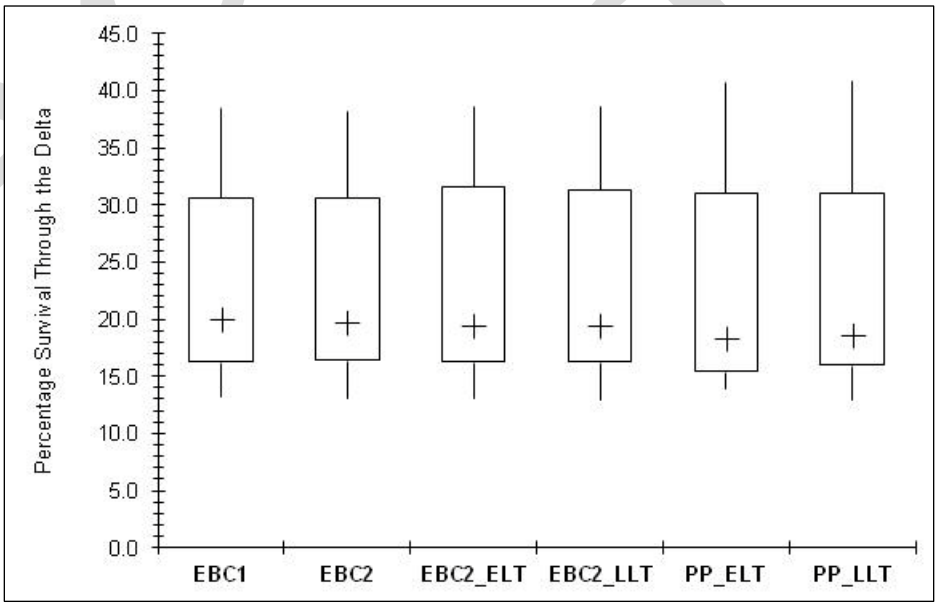
Table C.5.3-42. Difference between Scenarios in Percentage of Winter-Run Chinook Salmon Smolts Surviving through the Delta (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-0.9 (-5%)	-1.4 (-7%)	0.1 (1%)	-0.4 (-2%)	0.3 (1%)	-0.2 (-1%)
1976 (C)	1.1 (8%)	-0.7 (-5%)	1.6 (12%)	-0.2 (-2%)	1.6 (13%)	0.0 (0%)
1977 (C)	0.8 (6%)	0.7 (6%)	0.4 (3%)	0.4 (3%)	-0.4 (-3%)	-1.9 (-12%)
1978 (AN)	-0.8 (-3%)	0.4 (1%)	-0.8 (-3%)	0.4 (1%)	-1.6 (-5%)	-1.6 (-5%)
1979 (BN)	-1.4 (-7%)	-1.3 (-7%)	-1.0 (-5%)	-0.9 (-5%)	-1.0 (-6%)	-0.9 (-5%)
1980 (AN)	1.9 (6%)	1.1 (3%)	2.1 (6%)	1.3 (4%)	1.9 (6%)	1.6 (5%)
1981 (D)	-2.4 (-11%)	-1.3 (-6%)	-1.4 (-6%)	-0.3 (-1%)	-1.1 (-5%)	-0.1 (0%)
1982 (W)	1.6 (4%)	2.0 (6%)	1.7 (5%)	2.1 (6%)	1.3 (4%)	1.6 (4%)
1983 (W)	2.2 (6%)	2.3 (6%)	2.4 (6%)	2.6 (7%)	2.1 (5%)	2.2 (6%)
1984 (W)	1.0 (3%)	0.6 (2%)	1.0 (3%)	0.6 (2%)	-0.2 (-1%)	-0.2 (-1%)
1985 (D)	-0.7 (-4%)	-1.1 (-6%)	-0.5 (-3%)	-1.0 (-6%)	-0.5 (-3%)	-0.6 (-3%)
1986 (W)	-0.1 (0%)	0.1 (0%)	0.2 (1%)	0.4 (1%)	-0.3 (-1%)	-0.2 (-1%)
1987 (D)	-0.1 (0%)	-0.8 (-4%)	-0.3 (-1%)	-0.9 (-5%)	-0.1 (-1%)	-0.7 (-4%)
1988 (C)	-1.8 (-9%)	-1.5 (-7%)	-1.8 (-9%)	-1.4 (-7%)	-1.1 (-5%)	-0.8 (-4%)
1989 (D)	-0.5 (-3%)	0.8 (5%)	-0.8 (-5%)	0.5 (3%)	-0.8 (-5%)	0.5 (3%)
1990 (C)	-1.1 (-7%)	-0.6 (-4%)	-1.3 (-8%)	-0.8 (-5%)	-1.0 (-6%)	-0.4 (-3%)
1991 (C)	-0.4 (-3%)	0.4 (3%)	-0.8 (-5%)	0.0 (0%)	-0.6 (-4%)	0.1 (1%)
Average	-0.1 (0%)	0.0 (0%)	0.0 (0%)	0.1 (1%)	-0.1 (0%)	-0.1 (0%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-26. Winter-Run Chinook Salmon through-Delta Smolt Survival, Based on Delta Passage Model Results

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Percentage of Fish Entering the Yolo Bypass

The effect of notching the Fremont Weir as part of CM 2 Yolo Bypass Fisheries Enhancements was clear from the estimated percentage of winter-run Chinook salmon smolts entering the Yolo Bypass: averaged across all years, around 2.5%–3% more smolts entered the bypass under the PP scenarios (over 9% entering bypass on average) than under the EBC scenarios (less than 7% entering on average) (Table C.5.3-43, Table C.5.3-44, Figure C.5.3-27). In several low-flow years (1976, 1977, and 1985), no fish entered the bypass under any scenario. In years when a very small percentage of fish (2% or less) entered the bypass under EBC scenarios (e.g., 1979, 1981, and 1987–1989), the percentage entering the bypass under PP scenarios was several times greater, albeit still a relatively small percentage (5% or less) (Table C.5.3-44). In most higher-flow years when 10%–30% of fish were entering the bypass under EBC scenarios (1978, 1980, 1982–1984, and 1986), fish entry percentage under the PP scenarios was several percentage points higher. The exceptions were 1984, when PP scenarios averaged around 20% entry and EBC scenarios averaged 10%–12%, and 1986, when PP scenarios also averaged around 20% entry but EBC scenarios were only slightly lower at 18%–20%. Overall, the general effect of notching Fremont Weir under the PP scenarios would be higher winter-run Chinook salmon survival because it is assumed that the Yolo Bypass migration route has better survival than remaining in the mainstem Sacramento River. Of the three Chinook salmon races examined with the DPM, winter-run Chinook salmon would tend to benefit most from increased Yolo Bypass inundation because their outmigration period coincides most with the general period of bypass flooding.

Table C.5.3-43. Percentage of Winter-Run Chinook Salmon Smolts Entering the Yolo Bypass, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	3.2	2.1	1.9	1.9	6.2	5.9
1976 (C)	0.0	0.0	0.0	0.0	0.0	0.0
1977 (C)	0.0	0.0	0.0	0.0	0.0	0.0
1978 (AN)	9.9	10.0	11.0	13.3	15.9	17.9
1979 (BN)	0.6	0.4	0.5	0.4	4.2	4.4
1980 (AN)	20.2	19.7	20.6	18.2	25.1	23.0
1981 (D)	1.4	1.5	1.4	1.4	4.3	3.7
1982 (W)	15.9	15.7	17.7	17.7	22.1	21.4
1983 (W)	27.4	27.3	29.4	30.1	33.7	33.9
1984 (W)	10.0	10.0	12.2	12.0	20.6	20.4
1985 (D)	0.0	0.0	0.0	0.0	0.0	0.0
1986 (W)	18.3	18.0	18.8	19.4	20.2	20.6
1987 (D)	0.1	0.1	0.1	0.1	0.9	0.9
1988 (C)	1.7	2.0	1.8	1.9	5.7	5.6
1989 (D)	0.1	0.1	0.1	0.1	0.4	0.4
1990 (C)	0.0	0.0	0.0	0.0	0.5	0.5
1991 (C)	0.2	0.3	0.3	0.3	0.6	0.6
Average	6.4	6.3	6.8	6.9	9.4	9.4

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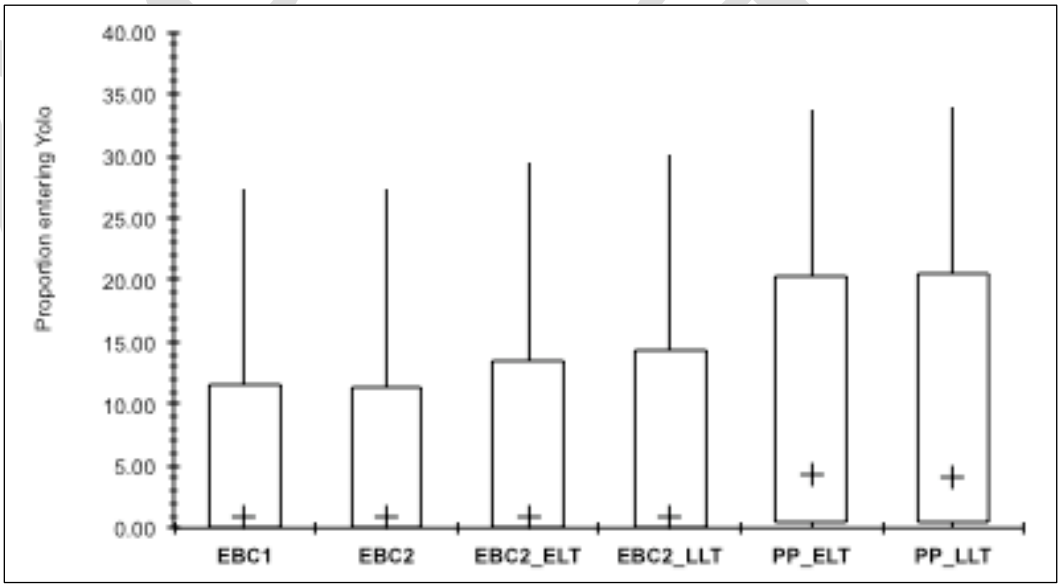
Table C.5.3-44. Difference between Scenarios in Percentage of Winter-Run Chinook Salmon Smolts Entering the Yolo Bypass (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	2.9 (91%)	2.7 (82%)	4.1 (190%)	3.8 (176%)	4.3 (220%)	4.0 (213%)
1976 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1977 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1978 (AN)	6.0 (60%)	8.0 (81%)	5.8 (58%)	7.9 (78%)	4.9 (44%)	4.6 (35%)
1979 (BN)	3.6 (607%)	3.8 (642%)	3.8 (913%)	4.0 (963%)	3.6 (695%)	3.9 (930%)
1980 (AN)	4.8 (24%)	2.7 (13%)	5.4 (27%)	3.2 (16%)	4.5 (22%)	4.8 (26%)
1981 (D)	2.9 (210%)	2.3 (162%)	2.9 (195%)	2.2 (149%)	3.0 (219%)	2.2 (157%)
1982 (W)	6.2 (39%)	5.5 (35%)	6.4 (41%)	5.8 (37%)	4.3 (24%)	3.8 (21%)
1983 (W)	6.3 (23%)	6.5 (24%)	6.3 (23%)	6.5 (24%)	4.3 (15%)	3.8 (13%)
1984 (W)	10.5 (105%)	10.4 (104%)	10.6 (105%)	10.4 (104%)	8.4 (69%)	8.5 (71%)
1985 (D)	0.0 (86971621%)	0.0 (0%)	0.0 (61%)	0.0 (-100%)	0.0 (86971621%)	0.0 (0%)
1986 (W)	1.9 (11%)	2.4 (13%)	2.2 (12%)	2.7 (15%)	1.4 (8%)	1.3 (6%)
1987 (D)	0.7 (590%)	0.7 (590%)	0.7 (563%)	0.7 (563%)	0.8 (704%)	0.7 (568%)
1988 (C)	3.9 (224%)	3.9 (223%)	3.7 (187%)	3.7 (185%)	3.9 (219%)	3.7 (189%)
1989 (D)	0.3 (387%)	0.3 (371%)	0.3 (377%)	0.3 (362%)	0.3 (406%)	0.3 (367%)
1990 (C)	0.5 (1285077079%)	0.5 (1352813049%)	0.5 (1285077079%)	0.5 (1352813049%)	0.5 (1285077079%)	0.5 (1352813049%)
1991 (C)	0.4 (154%)	0.4 (154%)	0.3 (102%)	0.3 (102%)	0.3 (126%)	0.3 (102%)
Average	3.0 (47%)	2.9 (46%)	3.1 (49%)	3.1 (48%)	2.6 (38%)	2.5 (36%)

Note: Positive values indicate greater percentage entry into Yolo Bypass under PP scenarios than under EBC scenarios.



Box and whisker plot shows entry distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage entry.

Figure C.5.3-27. Percentage of Winter-Run Chinook Salmon Smolts Entering the Yolo Bypass, Based on Delta Passage Model Results

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Sacramento River Survival from Freeport to Steamboat/Sutter Sloughs (Reach SAC1)

The percentage of winter-run Chinook salmon smolts surviving from Freeport to Steamboat/Sutter Sloughs under PP scenarios averaged 80% and was 1% lower than under EBC scenarios (Table C.5.3-45, Table C.5.3-46, Figure C.5.3-28), generally reflecting reduced flows and increased predation in the reach associated with the installation and operation of the north Delta diversions under the PP scenarios. Survival in this reach ranged from 70%–80% in lower flow years to over 90% in higher flow years.

Table C.5.3-45. Percentage of Winter-Run Chinook Salmon Smolts Surviving from Freeport to Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	82.3	81.5	81.5	81.2	80.3	79.7
1976 (C)	77.3	76.8	76.7	76.4	77.8	76.0
1977 (C)	75.2	75.1	75.5	76.4	75.6	74.8
1978 (AN)	85.6	85.6	86.0	86.4	83.2	83.7
1979 (BN)	80.5	80.4	80.3	80.3	78.4	78.4
1980 (AN)	87.3	87.3	87.3	87.2	86.2	85.9
1981 (D)	81.3	80.8	80.6	80.6	79.0	79.7
1982 (W)	91.2	91.2	91.4	91.4	89.7	89.6
1983 (W)	89.7	89.7	89.9	89.9	88.7	88.8
1984 (W)	87.7	87.7	88.3	88.0	85.0	84.5
1985 (D)	78.5	78.4	78.3	78.0	77.9	77.5
1986 (W)	82.9	82.8	82.9	82.7	81.3	81.4
1987 (D)	78.7	78.8	78.6	78.6	78.5	77.8
1988 (C)	80.0	80.0	79.6	79.5	77.8	77.9
1989 (D)	76.6	76.8	76.8	76.5	76.0	76.5
1990 (C)	78.0	78.0	77.8	77.4	77.1	77.1
1991 (C)	75.6	76.4	75.5	75.2	74.9	74.9
Average	81.7	81.6	81.6	81.5	80.4	80.3

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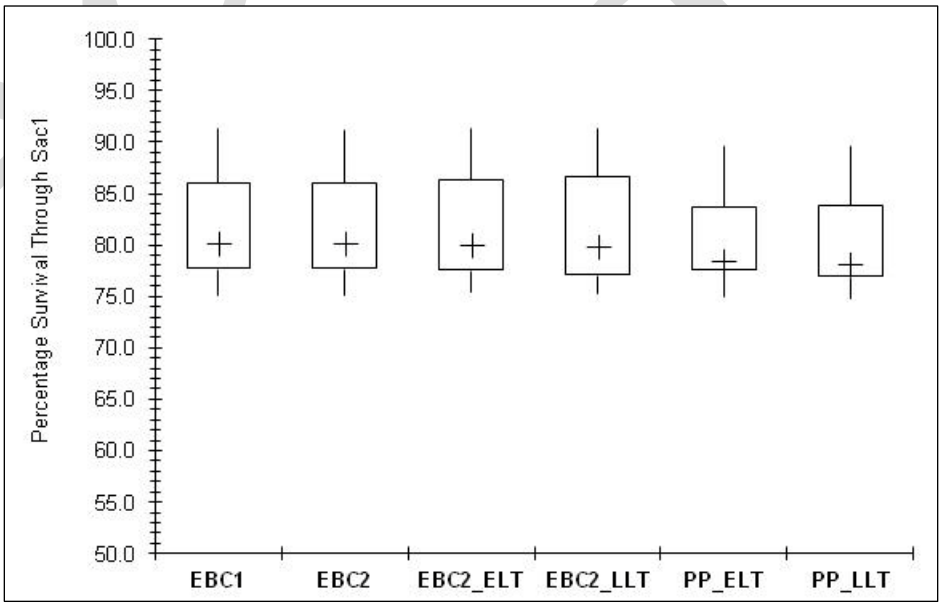
Table C.5.3-46. Difference between Scenarios in Percentage of Winter-Run Chinook Salmon Smolts Surviving from Freeport to Steamboat/Sutter Sloughs (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-2.0 (-2%)	-2.6 (-3%)	-1.2 (-1%)	-1.8 (-2%)	-1.1 (-1%)	-1.5 (-2%)
1976 (C)	0.5 (1%)	-1.3 (-2%)	1.0 (1%)	-0.8 (-1%)	1.1 (1%)	-0.4 (-1%)
1977 (C)	0.5 (1%)	-0.3 (0%)	0.6 (1%)	-0.2 (0%)	0.2 (0%)	-1.6 (-2%)
1978 (AN)	-2.3 (-3%)	-1.9 (-2%)	-2.3 (-3%)	-1.9 (-2%)	-2.8 (-3%)	-2.7 (-3%)
1979 (BN)	-2.1 (-3%)	-2.0 (-3%)	-2.1 (-3%)	-2.0 (-2%)	-2.0 (-2%)	-1.9 (-2%)
1980 (AN)	-1.1 (-1%)	-1.3 (-2%)	-1.1 (-1%)	-1.3 (-2%)	-1.1 (-1%)	-1.2 (-1%)
1981 (D)	-2.3 (-3%)	-1.6 (-2%)	-1.7 (-2%)	-1.0 (-1%)	-1.6 (-2%)	-0.8 (-1%)
1982 (W)	-1.6 (-2%)	-1.6 (-2%)	-1.6 (-2%)	-1.6 (-2%)	-1.7 (-2%)	-1.8 (-2%)
1983 (W)	-1.1 (-1%)	-0.9 (-1%)	-1.1 (-1%)	-0.9 (-1%)	-1.2 (-1%)	-1.1 (-1%)
1984 (W)	-2.8 (-3%)	-3.2 (-4%)	-2.8 (-3%)	-3.2 (-4%)	-3.4 (-4%)	-3.4 (-4%)
1985 (D)	-0.6 (-1%)	-1.1 (-1%)	-0.5 (-1%)	-1.0 (-1%)	-0.4 (-1%)	-0.5 (-1%)
1986 (W)	-1.5 (-2%)	-1.5 (-2%)	-1.5 (-2%)	-1.4 (-2%)	-1.5 (-2%)	-1.3 (-2%)
1987 (D)	-0.2 (0%)	-0.9 (-1%)	-0.3 (0%)	-1.0 (-1%)	-0.1 (0%)	-0.8 (-1%)
1988 (C)	-2.2 (-3%)	-2.1 (-3%)	-2.2 (-3%)	-2.1 (-3%)	-1.8 (-2%)	-1.6 (-2%)
1989 (D)	-0.6 (-1%)	0.0 (0%)	-0.9 (-1%)	-0.3 (0%)	-0.8 (-1%)	0.1 (0%)
1990 (C)	-0.9 (-1%)	-0.9 (-1%)	-0.9 (-1%)	-0.9 (-1%)	-0.7 (-1%)	-0.3 (0%)
1991 (C)	-0.7 (-1%)	-0.7 (-1%)	-1.4 (-2%)	-1.4 (-2%)	-0.6 (-1%)	-0.3 (0%)
Average	-1.2 (-2%)	-1.4 (-2%)	-1.2 (-1%)	-1.4 (-2%)	-1.1 (-1%)	-1.2 (-2%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-28. Percentage of Winter-Run Chinook Salmon Smolts Surviving from Freeport to Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

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Survival in Steamboat and Sutter Sloughs

The percentage of smolt winter-run Chinook salmon surviving in Steamboat and Sutter Sloughs under the PP scenarios averaged 52% (range 46%–62%), which was 1% lower than under EBC scenarios (Table C.5.3-47, Table C.5.3-48, Figure C.5.3-29). Differences within years ranged from 4.5% lower survival under PP_LLT (compared to EBC2_LLT in 1984) to 2.2% higher survival under PP_ELT (compared to EBC1 in 1977) (Table C.5.3-48).

Table C.5.3-47. Percentage of Winter-Run Chinook Salmon Smolts Surviving in Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	51.1	50.6	50.6	50.2	48.7	47.7
1976 (C)	47.0	46.8	46.7	46.4	47.1	46.1
1977 (C)	48.3	49.2	51.7	52.8	50.4	48.5
1978 (AN)	60.3	60.3	60.7	61.3	56.8	57.4
1979 (BN)	52.5	52.0	51.8	51.8	48.4	48.1
1980 (AN)	60.1	60.2	60.2	60.3	59.1	58.9
1981 (D)	53.1	52.3	52.0	52.0	49.2	50.2
1982 (W)	62.6	62.6	62.5	62.6	61.4	61.5
1983 (W)	62.8	62.8	62.8	62.5	61.9	62.1
1984 (W)	56.4	56.4	57.1	56.6	52.7	52.1
1985 (D)	48.1	48.0	47.9	47.4	47.6	47.0
1986 (W)	53.6	53.5	53.6	53.3	51.9	51.9
1987 (D)	54.6	54.5	54.5	54.4	53.1	52.9
1988 (C)	49.9	49.8	49.5	49.3	46.7	46.5
1989 (D)	49.0	49.1	49.0	48.8	48.1	48.5
1990 (C)	50.4	50.7	50.6	49.9	49.1	49.4
1991 (C)	47.0	46.7	46.9	47.0	46.3	46.8
Average	53.3	53.3	53.4	53.3	51.7	51.5

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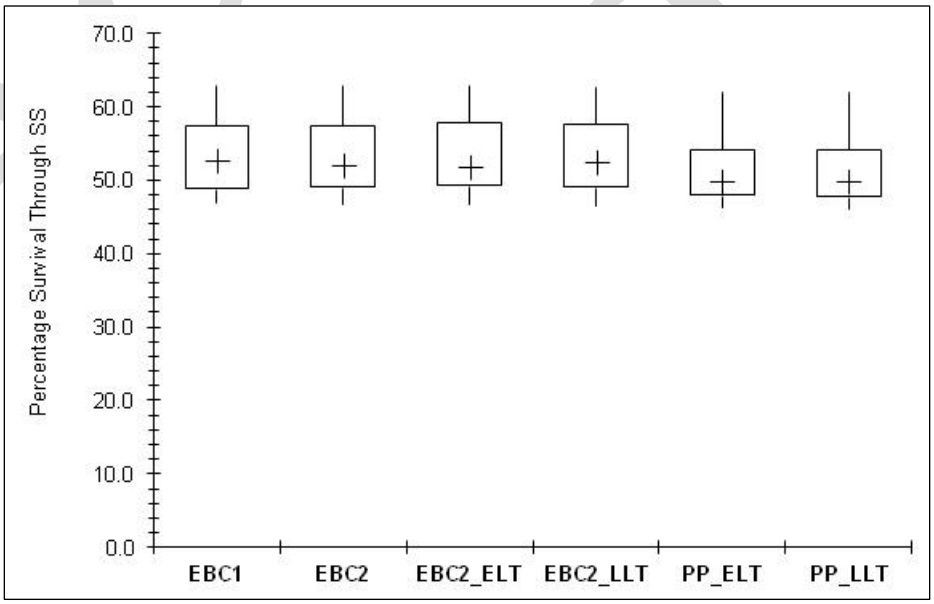
Table C.5.3-48. Difference between Scenarios in Percentage of Winter-Run Chinook Salmon Smolts Surviving in Steamboat/Sutter Sloughs (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-2.4 (-5%)	-3.4 (-7%)	-1.9 (-4%)	-2.9 (-6%)	-1.9 (-4%)	-2.5 (-5%)
1976 (C)	0.1 (0%)	-0.9 (-2%)	0.3 (1%)	-0.7 (-1%)	0.4 (1%)	-0.3 (-1%)
1977 (C)	2.2 (5%)	0.2 (1%)	1.2 (2%)	-0.7 (-1%)	-1.2 (-2%)	-4.3 (-8%)
1978 (AN)	-3.5 (-6%)	-2.9 (-5%)	-3.5 (-6%)	-2.9 (-5%)	-3.9 (-6%)	-4.0 (-6%)
1979 (BN)	-4.0 (-8%)	-4.3 (-8%)	-3.6 (-7%)	-3.8 (-7%)	-3.4 (-7%)	-3.6 (-7%)
1980 (AN)	-1.0 (-2%)	-1.2 (-2%)	-1.1 (-2%)	-1.2 (-2%)	-1.1 (-2%)	-1.4 (-2%)
1981 (D)	-3.9 (-7%)	-2.9 (-5%)	-3.2 (-6%)	-2.2 (-4%)	-2.9 (-5%)	-1.8 (-3%)
1982 (W)	-1.2 (-2%)	-1.1 (-2%)	-1.2 (-2%)	-1.0 (-2%)	-1.2 (-2%)	-1.0 (-2%)
1983 (W)	-0.9 (-1%)	-0.7 (-1%)	-0.9 (-1%)	-0.7 (-1%)	-0.9 (-1%)	-0.5 (-1%)
1984 (W)	-3.8 (-7%)	-4.4 (-8%)	-3.8 (-7%)	-4.4 (-8%)	-4.4 (-8%)	-4.5 (-8%)
1985 (D)	-0.6 (-1%)	-1.2 (-2%)	-0.4 (-1%)	-1.0 (-2%)	-0.3 (-1%)	-0.4 (-1%)
1986 (W)	-1.6 (-3%)	-1.7 (-3%)	-1.6 (-3%)	-1.7 (-3%)	-1.7 (-3%)	-1.4 (-3%)
1987 (D)	-1.4 (-3%)	-1.7 (-3%)	-1.4 (-3%)	-1.6 (-3%)	-1.4 (-2%)	-1.5 (-3%)
1988 (C)	-3.2 (-6%)	-3.3 (-7%)	-3.1 (-6%)	-3.3 (-7%)	-2.8 (-6%)	-2.8 (-6%)
1989 (D)	-0.9 (-2%)	-0.6 (-1%)	-1.0 (-2%)	-0.6 (-1%)	-0.9 (-2%)	-0.4 (-1%)
1990 (C)	-1.3 (-3%)	-1.0 (-2%)	-1.5 (-3%)	-1.2 (-2%)	-1.5 (-3%)	-0.5 (-1%)
1991 (C)	-0.8 (-2%)	-0.2 (0%)	-0.4 (-1%)	0.1 (0%)	-0.6 (-1%)	-0.2 (0%)
Average	-1.7 (-3%)	-1.8 (-3%)	-1.6 (-3%)	-1.8 (-3%)	-1.7 (-3%)	-1.8 (-3%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-29. Percentage of Winter-Run Chinook Salmon Smolts Surviving in Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

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Sacramento River Survival from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough (Reach SAC2)

There were only slight differences in average survival of winter-run Chinook salmon smolts in the SAC2 reach (Steamboat/Sutter Slough to Delta Cross Channel/Georgiana Slough) between the PP EBC scenarios, each averaging about 91% and ranging from 87–94% (Table C.5.3-49, Table C.5.3-50, Figure C.5.3-30). Under the PP scenarios, average survival was approximately 0.5% lower than under the EBC scenarios (Table C.5.3-50).

Table C.5.3-49. Percentage of Winter-Run Chinook Salmon Smolts Surviving from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	91.1	90.8	90.8	90.7	90.4	90.2
1976 (C)	88.9	88.7	88.6	88.5	89.3	88.2
1977 (C)	88.9	88.8	89.2	89.6	89.2	88.6
1978 (AN)	92.8	92.8	92.9	92.9	92.1	92.2
1979 (BN)	91.4	91.4	91.4	91.4	90.5	90.6
1980 (AN)	93.0	93.1	93.0	93.0	93.0	92.9
1981 (D)	91.0	90.8	90.7	90.7	89.9	90.3
1982 (W)	94.1	94.1	93.9	93.9	94.1	94.1
1983 (W)	94.0	94.0	93.9	93.8	93.9	93.9
1984 (W)	93.3	93.3	93.4	93.3	92.3	92.1
1985 (D)	90.7	90.6	90.6	90.4	90.3	90.2
1986 (W)	91.0	91.0	91.0	90.9	90.4	90.5
1987 (D)	89.6	89.7	89.6	89.5	89.5	89.1
1988 (C)	91.5	91.5	91.2	91.2	90.4	90.6
1989 (D)	88.7	88.8	88.8	88.6	88.4	88.7
1990 (C)	89.6	89.7	89.6	89.4	89.1	89.2
1991 (C)	87.6	88.0	87.6	87.7	87.3	87.5
Average	91.0	91.0	91.0	90.9	90.6	90.5

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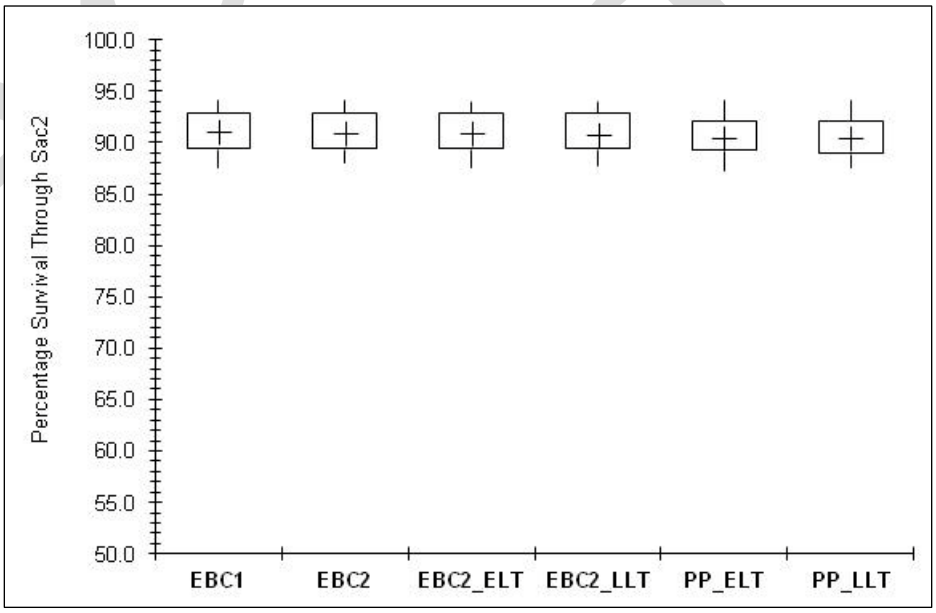
Table C.5.3-50. Difference between Scenarios in Percentage of Winter-Run Chinook Salmon Smolts Surviving from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-0.7 (-1%)	-0.9 (-1%)	-0.5 (0%)	-0.6 (-1%)	-0.4 (0%)	-0.5 (-1%)
1976 (C)	0.4 (1%)	-0.6 (-1%)	0.6 (1%)	-0.4 (0%)	0.7 (1%)	-0.3 (0%)
1977 (C)	0.3 (0%)	-0.3 (0%)	0.3 (0%)	-0.3 (0%)	0.0 (0%)	-1.0 (-1%)
1978 (AN)	-0.6 (-1%)	-0.5 (-1%)	-0.7 (-1%)	-0.5 (-1%)	-0.8 (-1%)	-0.7 (-1%)
1979 (BN)	-0.9 (-1%)	-0.8 (-1%)	-1.0 (-1%)	-0.8 (-1%)	-0.9 (-1%)	-0.8 (-1%)
1980 (AN)	-0.1 (0%)	-0.1 (0%)	-0.1 (0%)	-0.1 (0%)	-0.1 (0%)	-0.1 (0%)
1981 (D)	-1.1 (-1%)	-0.8 (-1%)	-0.9 (-1%)	-0.5 (-1%)	-0.8 (-1%)	-0.4 (0%)
1982 (W)	0.0 (0%)	0.1 (0%)	0.0 (0%)	0.1 (0%)	0.2 (0%)	0.2 (0%)
1983 (W)	-0.1 (0%)	-0.1 (0%)	-0.1 (0%)	-0.1 (0%)	0.0 (0%)	0.0 (0%)
1984 (W)	-1.0 (-1%)	-1.2 (-1%)	-1.0 (-1%)	-1.2 (-1%)	-1.1 (-1%)	-1.2 (-1%)
1985 (D)	-0.4 (0%)	-0.5 (-1%)	-0.3 (0%)	-0.5 (-1%)	-0.2 (0%)	-0.2 (0%)
1986 (W)	-0.5 (-1%)	-0.5 (-1%)	-0.5 (-1%)	-0.5 (-1%)	-0.5 (-1%)	-0.4 (0%)
1987 (D)	-0.1 (0%)	-0.5 (-1%)	-0.2 (0%)	-0.6 (-1%)	-0.1 (0%)	-0.4 (0%)
1988 (C)	-1.1 (-1%)	-0.9 (-1%)	-1.1 (-1%)	-0.9 (-1%)	-0.8 (-1%)	-0.6 (-1%)
1989 (D)	-0.3 (0%)	0.0 (0%)	-0.5 (-1%)	-0.2 (0%)	-0.4 (0%)	0.0 (0%)
1990 (C)	-0.5 (-1%)	-0.4 (0%)	-0.6 (-1%)	-0.5 (-1%)	-0.5 (-1%)	-0.2 (0%)
1991 (C)	-0.4 (0%)	-0.1 (0%)	-0.7 (-1%)	-0.5 (-1%)	-0.4 (0%)	-0.2 (0%)
Average	-0.4 (0%)	-0.5 (-1%)	-0.4 (0%)	-0.5 (-1%)	-0.4 (0%)	-0.4 (0%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-30. Percentage of Winter-Run Chinook Salmon Smolts Surviving from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough, Based on Delta Passage Model Results

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Percentage of Fish Entering Georgiana Slough and the Delta Cross Channel

The percentage of smolt winter-run Chinook salmon entering Georgiana Slough and the Delta Cross Channel under PP scenarios averaged 53% (range 38%–69%) and was 1–2% higher than the percentages under EBC scenarios (average 51%–52%; range 36%–69%)(Table C.5.3-51, Table C.5.3-52, Figure C.5.3-31). The proportion of fish entering Georgiana Slough and the Delta Cross Channel was higher under the PP scenarios in most years, ranging from a 3.9% reduction under PP_ELT (compared with EBC2_ELT in 1976) to a 5.2% increase under PP_ELT (compared with EBC2 in 1991) (Table C.5.3-52).

Table C.5.3-51. Percentage of Winter-Run Chinook Salmon Smolts Entering Georgiana Slough and the Delta Cross Channel, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	48.9	50.5	50.7	51.2	52.4	52.9
1976 (C)	58.7	60.5	60.9	62.1	57.1	61.9
1977 (C)	66.6	66.7	65.4	62.9	64.2	66.0
1978 (AN)	42.8	42.8	42.1	41.6	45.9	45.2
1979 (BN)	52.0	52.0	52.3	52.5	55.9	55.0
1980 (AN)	39.5	39.5	39.4	39.3	41.0	41.1
1981 (D)	50.5	51.8	52.3	52.5	55.1	52.8
1982 (W)	37.0	37.0	36.6	36.4	38.7	38.6
1983 (W)	37.0	37.0	36.7	36.5	38.0	37.8
1984 (W)	40.9	40.9	40.1	40.5	44.8	45.2
1985 (D)	55.8	56.0	56.4	57.5	56.9	57.7
1986 (W)	47.0	47.1	47.0	47.4	49.8	49.3
1987 (D)	56.2	56.0	56.6	57.0	56.0	57.6
1988 (C)	54.1	54.1	55.7	55.9	59.1	57.9
1989 (D)	61.6	60.8	61.0	62.3	63.1	60.6
1990 (C)	56.5	56.4	57.3	58.6	58.3	57.7
1991 (C)	66.6	63.6	67.1	68.6	68.8	67.9
Average	51.3	51.3	51.6	51.9	53.2	53.2

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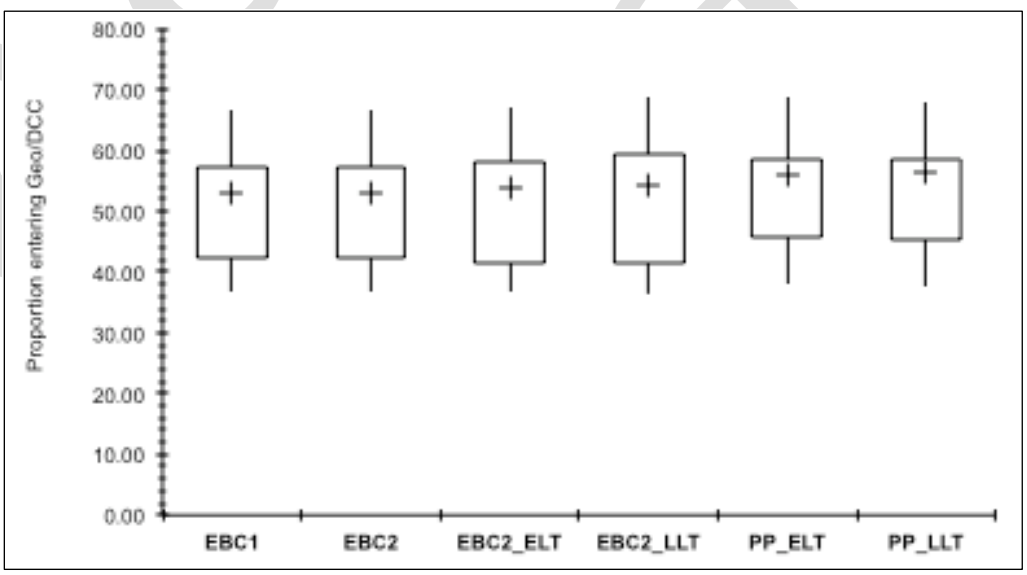
Table C.5.3-52. Difference between Scenarios in Percentage of Winter-Run Chinook Salmon Smolts Entering Georgiana Slough and the Delta Cross Channel (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	3.5 (7%)	4.0 (8%)	1.9 (4%)	2.4 (5%)	1.7 (3%)	1.7 (3%)
1976 (C)	-1.6 (-3%)	3.2 (5%)	-3.4 (-6%)	1.4 (2%)	-3.9 (-6%)	-0.2 (0%)
1977 (C)	-2.4 (-4%)	-0.6 (-1%)	-2.5 (-4%)	-0.7 (-1%)	-1.2 (-2%)	3.1 (5%)
1978 (AN)	3.0 (7%)	2.4 (6%)	3.1 (7%)	2.5 (6%)	3.8 (9%)	3.7 (9%)
1979 (BN)	3.8 (7%)	2.9 (6%)	3.9 (7%)	3.0 (6%)	3.6 (7%)	2.5 (5%)
1980 (AN)	1.5 (4%)	1.6 (4%)	1.5 (4%)	1.6 (4%)	1.6 (4%)	1.7 (4%)
1981 (D)	4.6 (9%)	2.3 (4%)	3.3 (6%)	1.0 (2%)	2.8 (5%)	0.2 (0%)
1982 (W)	1.7 (5%)	1.6 (4%)	1.7 (5%)	1.6 (4%)	2.1 (6%)	2.2 (6%)
1983 (W)	1.1 (3%)	0.8 (2%)	1.0 (3%)	0.8 (2%)	1.4 (4%)	1.3 (4%)
1984 (W)	3.9 (10%)	4.3 (11%)	3.9 (9%)	4.3 (10%)	4.7 (12%)	4.7 (12%)
1985 (D)	1.0 (2%)	1.8 (3%)	0.8 (1%)	1.7 (3%)	0.5 (1%)	0.2 (0%)
1986 (W)	2.8 (6%)	2.3 (5%)	2.7 (6%)	2.2 (5%)	2.8 (6%)	1.8 (4%)
1987 (D)	-0.2 (0%)	1.3 (2%)	0.0 (0%)	1.6 (3%)	-0.6 (-1%)	0.6 (1%)
1988 (C)	5.0 (9%)	3.8 (7%)	5.0 (9%)	3.8 (7%)	3.4 (6%)	1.9 (3%)
1989 (D)	1.5 (2%)	-1.0 (-2%)	2.3 (4%)	-0.2 (0%)	2.1 (3%)	-1.7 (-3%)
1990 (C)	1.7 (3%)	1.2 (2%)	1.8 (3%)	1.3 (2%)	1.0 (2%)	-0.9 (-2%)
1991 (C)	2.2 (3%)	1.3 (2%)	5.2 (8%)	4.3 (7%)	1.8 (3%)	-0.7 (-1%)
Average	2.0 (4%)	2.0 (4%)	1.9 (4%)	1.9 (4%)	1.6 (3%)	1.3 (3%)

Note: Negative values indicate lower percentage entry into Georgiana Slough/Delta Cross Channel under PP scenarios than under EBC scenarios.



Box and whisker plot shows entry distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage entry.

Figure C.5.3-31. Percentage of Winter-Run Chinook Salmon Smolts Entering Georgiana Slough and the Delta Cross Channel, Based on Delta Passage Model Results

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Sacramento River Survival from Delta Cross Channel/Georgiana Slough to Rio Vista (Reach SAC3)

Average survival of smolt winter-run Chinook salmon from the Delta Cross Channel/Georgiana Slough to Rio Vista under the PP scenarios was 53% (range 44%–66%) and was 2% lower than average survival under the EBC scenarios (55%; range 44%–67%) (Table C.5.3-53, Table C.5.3-54, Figure C.5.3-32). Survival was lower under the PP scenarios in most years, ranging from 4.0% lower survival under PP_ELT (compared with EBC1 in 1981) to 1.2% higher survival under PP_ELT (compared with EBC2_ELT in 1976) (Table C.5.3-54).

Table C.5.3-53. Percentage of Winter-Run Chinook Salmon Smolts Surviving from Delta Cross Channel/Georgiana Slough to Rio Vista, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	53.3	52.8	52.7	52.5	52.4	51.2
1976 (C)	47.8	47.0	46.8	46.5	48.0	46.2
1977 (C)	44.3	44.0	44.6	46.8	44.4	44.7
1978 (AN)	63.2	63.1	63.7	64.1	60.7	61.1
1979 (BN)	50.3	50.2	50.1	50.1	47.7	47.7
1980 (AN)	62.3	62.4	62.3	62.4	61.8	61.7
1981 (D)	55.8	54.8	54.7	54.8	51.8	53.2
1982 (W)	65.8	65.8	65.8	65.9	64.7	65.0
1983 (W)	67.0	67.0	67.1	67.2	65.9	66.1
1984 (W)	56.8	56.8	57.0	56.7	53.8	53.4
1985 (D)	49.8	49.7	49.8	49.8	49.5	49.0
1986 (W)	55.5	55.4	55.6	55.6	53.9	54.1
1987 (D)	51.7	51.6	51.6	51.5	50.7	50.2
1988 (C)	54.5	54.4	53.9	53.7	51.2	51.3
1989 (D)	49.9	50.0	50.0	49.9	49.1	49.5
1990 (C)	52.5	52.7	52.5	52.2	51.0	51.3
1991 (C)	49.9	49.9	49.9	50.2	49.1	49.4
Average	54.7	54.6	54.6	54.7	53.3	53.2

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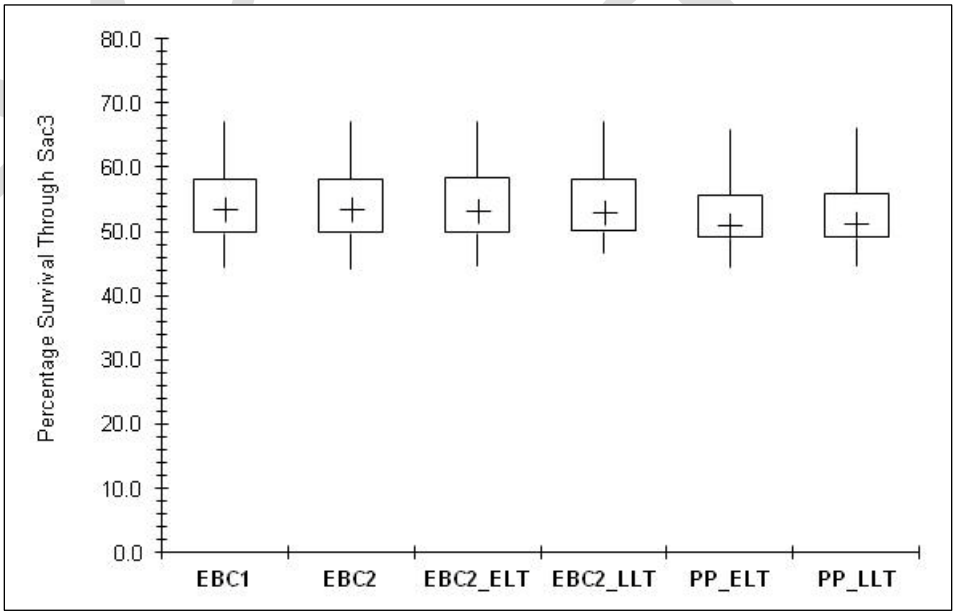
Table C.5.3-54. Difference between Scenarios in Percentage of Winter-Run Chinook Salmon Smolts Surviving from Delta Cross Channel/Georgiana Slough to Rio Vista (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-1.0 (-2%)	-2.1 (-4%)	-0.4 (-1%)	-1.6 (-3%)	-0.3 (-1%)	-1.3 (-2%)
1976 (C)	0.2 (0%)	-1.6 (-3%)	1.0 (2%)	-0.8 (-2%)	1.2 (3%)	-0.3 (-1%)
1977 (C)	0.1 (0%)	0.4 (1%)	0.3 (1%)	0.7 (1%)	-0.2 (0%)	-2.0 (-4%)
1978 (AN)	-2.4 (-4%)	-2.0 (-3%)	-2.4 (-4%)	-2.0 (-3%)	-3.0 (-5%)	-3.0 (-5%)
1979 (BN)	-2.6 (-5%)	-2.6 (-5%)	-2.5 (-5%)	-2.5 (-5%)	-2.5 (-5%)	-2.4 (-5%)
1980 (AN)	-0.5 (-1%)	-0.7 (-1%)	-0.6 (-1%)	-0.7 (-1%)	-0.5 (-1%)	-0.7 (-1%)
1981 (D)	-4.0 (-7%)	-2.6 (-5%)	-3.0 (-6%)	-1.6 (-3%)	-2.9 (-5%)	-1.6 (-3%)
1982 (W)	-1.1 (-2%)	-0.8 (-1%)	-1.1 (-2%)	-0.8 (-1%)	-1.1 (-2%)	-0.9 (-1%)
1983 (W)	-1.1 (-2%)	-0.9 (-1%)	-1.1 (-2%)	-0.9 (-1%)	-1.2 (-2%)	-1.0 (-2%)
1984 (W)	-2.9 (-5%)	-3.3 (-6%)	-2.9 (-5%)	-3.3 (-6%)	-3.2 (-6%)	-3.3 (-6%)
1985 (D)	-0.3 (-1%)	-0.8 (-2%)	-0.2 (0%)	-0.8 (-2%)	-0.2 (0%)	-0.8 (-2%)
1986 (W)	-1.6 (-3%)	-1.4 (-3%)	-1.5 (-3%)	-1.3 (-2%)	-1.7 (-3%)	-1.6 (-3%)
1987 (D)	-0.9 (-2%)	-1.5 (-3%)	-0.9 (-2%)	-1.5 (-3%)	-0.9 (-2%)	-1.3 (-3%)
1988 (C)	-3.3 (-6%)	-3.1 (-6%)	-3.2 (-6%)	-3.0 (-6%)	-2.7 (-5%)	-2.4 (-4%)
1989 (D)	-0.8 (-2%)	-0.4 (-1%)	-1.0 (-2%)	-0.6 (-1%)	-0.9 (-2%)	-0.4 (-1%)
1990 (C)	-1.5 (-3%)	-1.2 (-2%)	-1.7 (-3%)	-1.3 (-3%)	-1.5 (-3%)	-0.9 (-2%)
1991 (C)	-0.8 (-2%)	-0.6 (-1%)	-0.8 (-2%)	-0.6 (-1%)	-0.8 (-2%)	-0.8 (-2%)
Average	-1.4 (-3%)	-1.5 (-3%)	-1.3 (-2%)	-1.3 (-2%)	-1.3 (-2%)	-1.5 (-3%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-32. Percentage of Winter-Run Chinook Salmon Smolts Surviving from Delta Cross Channel/Georgiana Slough to Rio Vista, Based on Delta Passage Model Results

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Survival in the Interior Delta

Differences in south Delta export pumping between the PP and EBC scenarios (coupled with differences in Sacramento River flows downstream of Delta Cross Channel/Georgiana Slough; see *Methods*) drove differences in survival of smolt winter-run Chinook salmon in the Interior Delta. Average survival under the PP scenarios averaged 22%–23% and was approximately 3% higher than average survival under the EBC scenarios (Table C.5.3-55, Table C.5.3-56, Figure C.5.3-33). Survival in the interior Delta was appreciably greater (10%–18%) under PP scenarios in the wet years 1982–84. These three years had a relatively large influence on average survival; median survival under the PP scenarios was similar to median survival under the EBC scenarios (Figure C.5.3-33).

Table C.5.3-55. Percentage of Winter-Run Chinook Salmon Smolts Surviving through the Interior Delta, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	14.1	14.2	14.2	14.5	15.0	16.1
1976 (C)	14.3	14.6	14.7	14.7	16.6	15.8
1977 (C)	17.9	19.4	19.6	20.3	18.2	20.2
1978 (AN)	25.3	24.7	25.0	25.1	27.1	29.9
1979 (BN)	18.2	17.4	17.4	17.4	18.0	17.2
1980 (AN)	22.9	22.0	22.4	23.4	29.8	28.3
1981 (D)	18.4	17.0	16.4	16.9	16.3	17.4
1982 (W)	22.4	22.3	22.1	22.0	33.6	36.1
1983 (W)	24.7	22.1	21.6	21.2	39.7	39.6
1984 (W)	20.9	21.1	21.3	20.8	31.4	30.7
1985 (D)	16.5	16.2	16.3	16.0	16.0	15.5
1986 (W)	19.4	18.4	18.7	19.1	19.1	18.0
1987 (D)	17.3	17.9	18.0	17.7	18.7	17.5
1988 (C)	22.0	21.7	20.5	20.7	19.3	19.9
1989 (D)	19.3	19.6	19.7	20.4	19.3	22.0
1990 (C)	19.9	20.1	19.8	21.7	19.8	20.9
1991 (C)	21.5	22.6	22.3	23.6	21.8	23.8
Average	19.7	19.5	19.4	19.7	22.3	22.9

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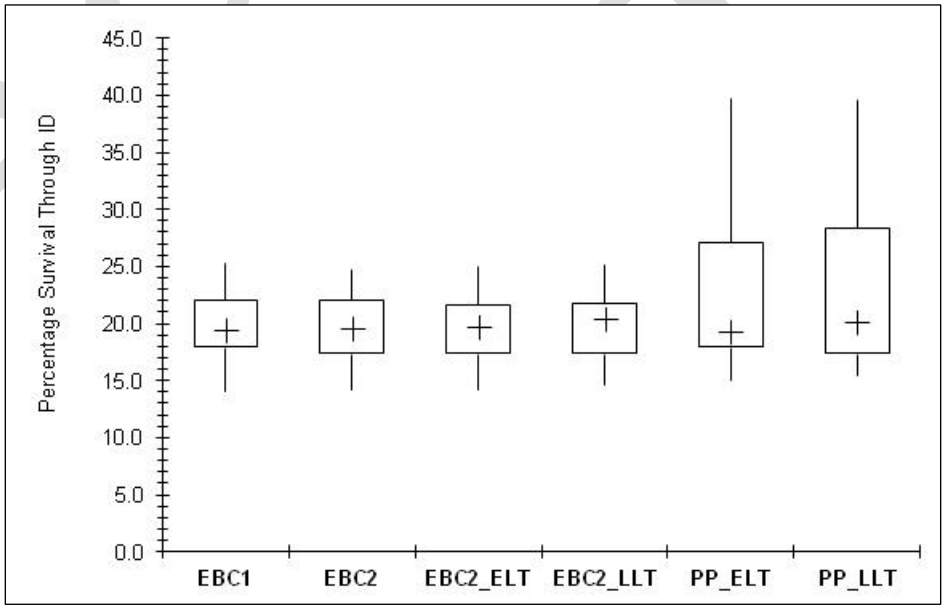
Table C.5.3-56. Difference between Scenarios in Percentage of Winter-Run Chinook Salmon Smolts Surviving through the Interior Delta (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	1.0 (7%)	2.0 (14%)	0.9 (6%)	1.9 (13%)	0.9 (6%)	1.5 (11%)
1976 (C)	2.3 (16%)	1.5 (11%)	2.0 (13%)	1.2 (8%)	1.9 (13%)	1.1 (8%)
1977 (C)	0.2 (1%)	2.2 (12%)	-1.3 (-6%)	0.7 (4%)	-1.4 (-7%)	-0.2 (-1%)
1978 (AN)	1.8 (7%)	4.6 (18%)	2.4 (10%)	5.1 (21%)	2.1 (9%)	4.7 (19%)
1979 (BN)	-0.2 (-1%)	-1.0 (-6%)	0.7 (4%)	-0.1 (-1%)	0.7 (4%)	-0.2 (-1%)
1980 (AN)	6.9 (30%)	5.4 (23%)	7.8 (36%)	6.3 (29%)	7.4 (33%)	4.9 (21%)
1981 (D)	-2.1 (-11%)	-1.0 (-5%)	-0.7 (-4%)	0.4 (2%)	-0.1 (-1%)	0.5 (3%)
1982 (W)	11.2 (50%)	13.7 (61%)	11.3 (51%)	13.9 (62%)	11.5 (52%)	14.2 (65%)
1983 (W)	15.0 (61%)	14.9 (61%)	17.6 (80%)	17.5 (79%)	18.1 (84%)	18.4 (87%)
1984 (W)	10.5 (50%)	9.9 (47%)	10.3 (49%)	9.7 (46%)	10.1 (47%)	9.9 (48%)
1985 (D)	-0.5 (-3%)	-1.0 (-6%)	-0.3 (-2%)	-0.8 (-5%)	-0.3 (-2%)	-0.5 (-3%)
1986 (W)	-0.3 (-1%)	-1.4 (-7%)	0.7 (4%)	-0.5 (-2%)	0.4 (2%)	-1.1 (-6%)
1987 (D)	1.4 (8%)	0.3 (2%)	0.8 (4%)	-0.3 (-2%)	0.6 (3%)	-0.1 (-1%)
1988 (C)	-2.7 (-12%)	-2.1 (-10%)	-2.4 (-11%)	-1.8 (-8%)	-1.1 (-6%)	-0.8 (-4%)
1989 (D)	0.0 (0%)	2.7 (14%)	-0.3 (-1%)	2.4 (12%)	-0.4 (-2%)	1.6 (8%)
1990 (C)	-0.1 (-1%)	1.1 (5%)	-0.4 (-2%)	0.8 (4%)	-0.1 (0%)	-0.8 (-4%)
1991 (C)	0.4 (2%)	2.3 (11%)	-0.7 (-3%)	1.2 (5%)	-0.5 (-2%)	0.2 (1%)
Average	2.6 (13%)	3.2 (16%)	2.8 (15%)	3.4 (17%)	2.9 (15%)	3.1 (16%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-33. Winter-Run Chinook Salmon Smolt Survival through the Interior Delta, Based on Delta Passage Model Results

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Spring-Run Chinook Salmon

Overall Survival through the Delta

Overall survival of spring-run Chinook salmon smolts through the Delta was similar among all scenarios, averaging 16–17% and ranging from 11%–38% (Table C.5.3-57, Figure C.5.3-34). Averaged over all years, the differences in survival between the PP and EBC scenarios were less than 1% (1–3% relative difference) (Table C.5.3-58). The differences ranged from 4.4% lower survival under PP_LLT (compared with EBC2 in 1978) to 3.0% higher survival under PP_ELT (compared with EBC2 in 1983). As described in the methods, these results apply to actively migrating smolts and do not incorporate potential rearing and growth of fry or parr in the Delta.

Table C.5.3-57. Percentage of Spring-Run Chinook Salmon Smolts Surviving through the Delta, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	24.1	24.0	24.1	24.0	21.2	21.1
1976 (C)	12.1	11.9	12.7	13.2	12.1	13.3
1977 (C)	12.6	12.8	12.8	12.5	12.6	12.4
1978 (AN)	27.1	27.1	26.3	25.5	23.7	22.7
1979 (BN)	15.7	15.2	15.0	14.8	14.4	14.4
1980 (AN)	18.9	19.1	18.8	18.5	18.4	18.4
1981 (D)	17.1	16.8	16.0	15.9	15.7	15.7
1982 (W)	36.6	36.6	36.5	36.0	37.5	36.9
1983 (W)	33.3	33.2	33.7	33.6	36.2	35.8
1984 (W)	18.6	18.5	18.2	17.8	17.8	17.8
1985 (D)	17.4	17.3	17.0	16.5	17.1	16.7
1986 (W)	19.4	19.4	18.8	18.3	18.8	18.6
1987 (D)	15.2	15.3	15.5	15.6	15.2	16.3
1988 (C)	11.5	11.7	11.6	11.7	11.2	11.7
1989 (D)	21.6	21.7	21.6	22.0	21.2	21.6
1990 (C)	15.9	15.8	15.6	15.7	15.4	15.7
1991 (C)	15.0	15.1	14.8	15.3	13.9	14.3
Average	19.5	19.5	19.4	19.2	19.0	19.0

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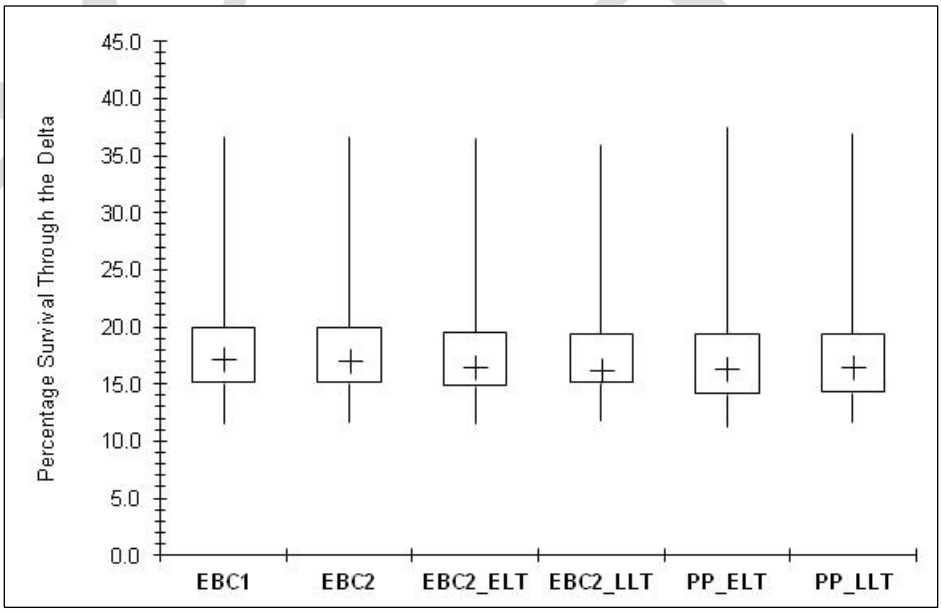
Table C.5.3-58. Difference between Scenarios in Percentage of Spring-Run Chinook Salmon Smolts Surviving through the Delta (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-2.8 (-12%)	-2.9 (-12%)	-2.7 (-11%)	-2.9 (-12%)	-2.9 (-12%)	-2.9 (-12%)
1976 (C)	0.0 (0%)	1.2 (10%)	0.2 (2%)	1.4 (12%)	-0.6 (-5%)	0.1 (1%)
1977 (C)	0.1 (1%)	-0.1 (-1%)	-0.1 (-1%)	-0.4 (-3%)	-0.2 (-1%)	-0.1 (-1%)
1978 (AN)	-3.4 (-12%)	-4.3 (-16%)	-3.4 (-12%)	-4.4 (-16%)	-2.6 (-10%)	-2.8 (-11%)
1979 (BN)	-1.3 (-8%)	-1.3 (-8%)	-0.8 (-6%)	-0.8 (-5%)	-0.6 (-4%)	-0.4 (-2%)
1980 (AN)	-0.5 (-3%)	-0.6 (-3%)	-0.7 (-4%)	-0.7 (-4%)	-0.4 (-2%)	-0.1 (-1%)
1981 (D)	-1.4 (-8%)	-1.4 (-8%)	-1.1 (-7%)	-1.1 (-6%)	-0.3 (-2%)	-0.2 (-1%)
1982 (W)	0.9 (2%)	0.3 (1%)	0.9 (2%)	0.3 (1%)	1.0 (3%)	0.9 (3%)
1983 (W)	2.9 (9%)	2.5 (8%)	3.0 (9%)	2.6 (8%)	2.5 (7%)	2.3 (7%)
1984 (W)	-0.8 (-4%)	-0.8 (-4%)	-0.6 (-3%)	-0.6 (-3%)	-0.4 (-2%)	0.0 (0%)
1985 (D)	-0.4 (-2%)	-0.8 (-4%)	-0.2 (-1%)	-0.6 (-3%)	0.0 (0%)	0.2 (1%)
1986 (W)	-0.6 (-3%)	-0.9 (-4%)	-0.5 (-3%)	-0.8 (-4%)	0.0 (0%)	0.3 (2%)
1987 (D)	0.0 (0%)	1.1 (7%)	-0.1 (-1%)	1.0 (6%)	-0.3 (-2%)	0.7 (4%)
1988 (C)	-0.3 (-3%)	0.1 (1%)	-0.5 (-4%)	0.0 (0%)	-0.3 (-3%)	-0.1 (-1%)
1989 (D)	-0.5 (-2%)	-0.1 (0%)	-0.6 (-3%)	-0.2 (-1%)	-0.5 (-2%)	-0.5 (-2%)
1990 (C)	-0.5 (-3%)	-0.2 (-1%)	-0.4 (-2%)	-0.1 (-1%)	-0.2 (-1%)	0.0 (0%)
1991 (C)	-1.1 (-8%)	-0.7 (-5%)	-1.2 (-8%)	-0.9 (-6%)	-1.0 (-6%)	-1.0 (-7%)
Average	-0.6 (-3%)	-0.5 (-3%)	-0.5 (-3%)	-0.5 (-2%)	-0.4 (-2%)	-0.2 (-1%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-34. Spring-Run Chinook Salmon Through-Delta Smolt Survival, Based on Delta Passage Model Results

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Percentage of Fish Entering the Yolo Bypass

Based on the timing of smolt migration (late February through May), smolt spring-run Chinook salmon would be expected to benefit less from increased winter flooding of the Yolo Bypass than winter-run. Notching of Fremont Weir under CM2 Yolo Bypass Fisheries Enhancements as part of the PP scenarios resulted in a greater percentage of smolt spring-run Chinook salmon entering the Yolo Bypass under PP scenarios (average 6%; range 0%–26%) than under EBC scenarios (average 4%; range 0%–24%)(Table C.5.3-59, Table C.5.3-60). The median percentage under the EBC scenarios was 0.2%–0.4% compared to 2.6% under the PP scenarios (Figure C.5.3-35), reflecting the increased frequency, magnitude, and duration of spills at the Fremont Weir.

Table C.5.3-59. Percentage of Spring-Run Chinook Salmon Smolts Entering the Yolo Bypass, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	7.1	7.0	7.4	6.8	8.8	9.4
1976 (C)	0.0	0.0	0.0	0.0	0.0	0.0
1977 (C)	0.0	0.0	0.0	0.0	0.0	0.0
1978 (AN)	4.6	4.7	5.3	5.6	12.9	12.0
1979 (BN)	0.0	0.0	0.0	0.0	0.1	0.1
1980 (AN)	0.7	0.7	0.8	0.7	3.0	2.9
1981 (D)	0.6	0.0	0.0	0.0	2.3	2.2
1982 (W)	23.8	23.8	24.7	24.6	26.2	26.1
1983 (W)	18.5	18.6	22.5	22.1	26.0	26.1
1984 (W)	0.0	0.0	0.0	0.0	3.5	3.3
1985 (D)	0.0	0.0	0.0	0.0	0.0	0.0
1986 (W)	7.9	7.3	8.0	8.2	7.9	8.2
1987 (D)	0.3	0.3	0.3	0.3	0.9	0.9
1988 (C)	0.0	0.0	0.0	0.0	0.0	0.0
1989 (D)	0.4	0.4	0.4	0.4	3.5	3.7
1990 (C)	0.0	0.0	0.0	0.0	0.0	0.0
1991 (C)	1.6	1.6	1.7	1.6	3.0	3.0
Average	3.9	3.8	4.2	4.1	5.8	5.8

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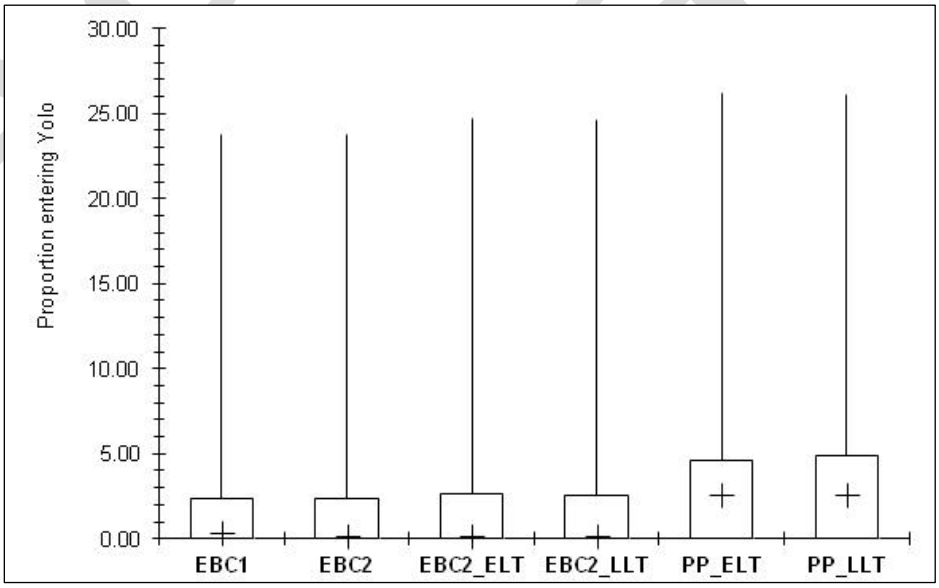
Table C.5.3-60. Difference between Scenarios in Percentage of Spring-Run Chinook Salmon Smolts Entering the Yolo Bypass (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	1.7 (24%)	2.4 (34%)	1.8 (26%)	2.5 (36%)	1.4 (18%)	2.6 (38%)
1976 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1977 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1978 (AN)	8.3 (181%)	7.4 (160%)	8.2 (173%)	7.3 (153%)	7.6 (144%)	6.4 (116%)
1979 (BN)	0.1 (359%)	0.1 (366%)	0.1 (640%)	0.1 (651%)	0.1 (530%)	0.1 (625%)
1980 (AN)	2.2 (308%)	2.2 (302%)	2.2 (308%)	2.2 (302%)	2.2 (264%)	2.2 (297%)
1981 (D)	1.7 (282%)	1.6 (271%)	2.3 (9659535700%)	2.2 (9362770295%)	2.3 (9659535700%)	2.2 (9362770295%)
1982 (W)	2.4 (10%)	2.3 (10%)	2.4 (10%)	2.3 (10%)	1.5 (6%)	1.5 (6%)
1983 (W)	7.5 (40%)	7.5 (41%)	7.4 (40%)	7.5 (40%)	3.5 (15%)	3.9 (18%)
1984 (W)	3.5 (14888706519%)	3.3 (13881063173%)	3.5 (14888706519%)	3.3 (13881063173%)	3.5 (14888706519%)	3.3 (13881063173%)
1985 (D)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1986 (W)	0.0 (0%)	0.3 (4%)	0.6 (9%)	0.9 (12%)	-0.1 (-1%)	0.0 (0%)
1987 (D)	0.6 (168%)	0.6 (169%)	0.5 (157%)	0.5 (158%)	0.5 (155%)	0.5 (160%)
1988 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1989 (D)	3.1 (799%)	3.3 (872%)	3.1 (781%)	3.3 (853%)	3.0 (681%)	3.3 (836%)
1990 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1991 (C)	1.4 (91%)	1.4 (91%)	1.4 (86%)	1.4 (87%)	1.2 (73%)	1.4 (86%)
Average	1.9 (50%)	1.9 (49%)	2.0 (52%)	2.0 (52%)	1.6 (38%)	1.6 (39%)

Note: Positive values indicate greater percentage entry into Yolo Bypass under PP scenarios than under EBC scenarios.



Box and whisker plot shows entry distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage entry.

Figure C.5.3-35. Percentage of Spring-Run Chinook Salmon Smolts Entering the Yolo Bypass, Based on Delta Passage Model Results

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Sacramento River Survival from Freeport to Steamboat/Sutter Sloughs (Reach SAC1)

The survival of smolt spring-run Chinook salmon from Freeport to Steamboat/Sutter Sloughs averaged 79% under the PP scenarios and 80% under the EBC scenarios (Table C.5.3-61). For the PP scenarios, survival ranged from 74% in 1977 to nearly 90% in 1983, reflecting the relatively large differences in flows between these years. Similarly, survival in 1977 and 1983 under the EBC scenarios ranged from 74% to 91%, respectively. Survival was slightly lower under the PP scenarios in nearly all years, averaging 1–2% lower on average (Table C.5.3-62, Figure C.5.3-36).

Table C.5.3-61. Percentage of Spring-Run Chinook Salmon Smolts Surviving from Freeport to Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	83.0	83.0	83.0	83.1	79.9	79.6
1976 (C)	76.3	76.1	76.6	76.9	75.9	76.8
1977 (C)	74.5	74.6	74.5	74.3	74.4	73.9
1978 (AN)	85.9	85.9	85.4	84.8	81.4	80.8
1979 (BN)	78.9	78.5	78.3	78.1	77.1	76.9
1980 (AN)	82.0	82.0	81.8	81.5	80.2	80.0
1981 (D)	79.2	79.0	78.4	78.3	77.3	77.5
1982 (W)	90.6	90.6	90.4	90.0	88.8	88.3
1983 (W)	90.9	90.9	91.1	90.7	89.9	89.3
1984 (W)	79.8	79.7	79.5	79.0	77.2	77.1
1985 (D)	77.1	77.0	76.8	76.4	76.9	76.5
1986 (W)	80.8	80.8	80.4	79.8	79.3	78.8
1987 (D)	77.0	77.1	77.3	77.0	77.3	77.9
1988 (C)	75.5	75.5	75.4	75.3	74.8	74.9
1989 (D)	82.0	82.0	81.9	82.1	80.6	80.6
1990 (C)	76.3	76.3	76.0	76.1	75.8	76.0
1991 (C)	78.1	78.1	77.9	78.0	76.7	76.7
Average	80.5	80.4	80.3	80.1	79.0	78.9

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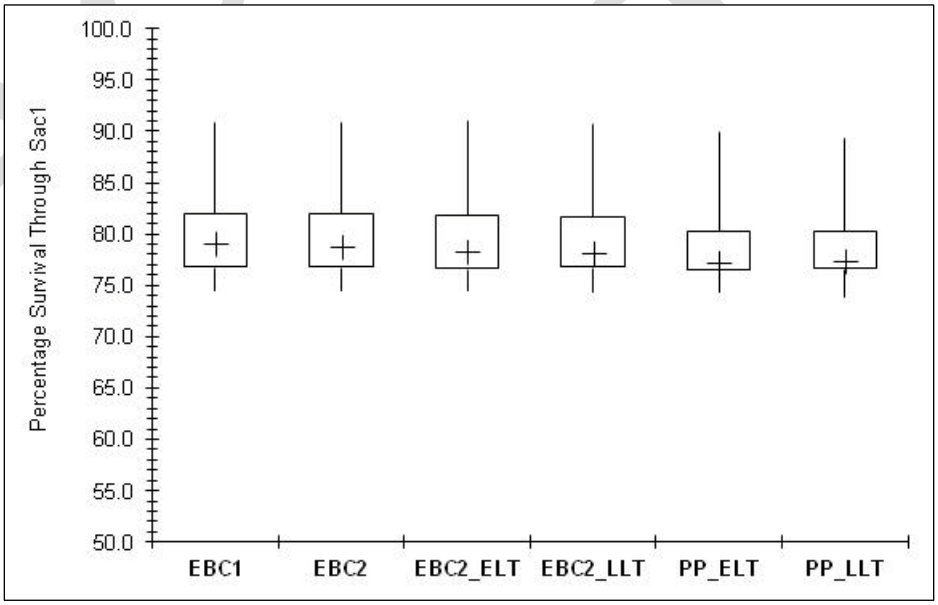
Table C.5.3-62. Difference between Scenarios in Percentage of Spring-Run Chinook Salmon Smolts Surviving from Freeport to Steamboat/Sutter Sloughs (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-3.1 (-4%)	-3.4 (-4%)	-3.1 (-4%)	-3.4 (-4%)	-3.1 (-4%)	-3.5 (-4%)
1976 (C)	-0.4 (0%)	0.6 (1%)	-0.2 (0%)	0.8 (1%)	-0.7 (-1%)	-0.1 (0%)
1977 (C)	-0.2 (0%)	-0.6 (-1%)	-0.2 (0%)	-0.6 (-1%)	-0.1 (0%)	-0.3 (0%)
1978 (AN)	-4.5 (-5%)	-5.1 (-6%)	-4.5 (-5%)	-5.1 (-6%)	-4.0 (-5%)	-4.0 (-5%)
1979 (BN)	-1.8 (-2%)	-2.0 (-3%)	-1.5 (-2%)	-1.7 (-2%)	-1.3 (-2%)	-1.2 (-2%)
1980 (AN)	-1.8 (-2%)	-1.9 (-2%)	-1.8 (-2%)	-1.9 (-2%)	-1.6 (-2%)	-1.5 (-2%)
1981 (D)	-1.9 (-2%)	-1.7 (-2%)	-1.7 (-2%)	-1.5 (-2%)	-1.1 (-1%)	-0.8 (-1%)
1982 (W)	-1.9 (-2%)	-2.3 (-3%)	-1.8 (-2%)	-2.3 (-3%)	-1.7 (-2%)	-1.7 (-2%)
1983 (W)	-0.9 (-1%)	-1.6 (-2%)	-1.0 (-1%)	-1.6 (-2%)	-1.1 (-1%)	-1.4 (-2%)
1984 (W)	-2.6 (-3%)	-2.7 (-3%)	-2.5 (-3%)	-2.6 (-3%)	-2.3 (-3%)	-1.9 (-2%)
1985 (D)	-0.3 (0%)	-0.7 (-1%)	-0.1 (0%)	-0.5 (-1%)	0.1 (0%)	0.0 (0%)
1986 (W)	-1.5 (-2%)	-2.0 (-2%)	-1.6 (-2%)	-2.0 (-3%)	-1.2 (-1%)	-1.0 (-1%)
1987 (D)	0.2 (0%)	0.9 (1%)	0.1 (0%)	0.8 (1%)	0.0 (0%)	0.9 (1%)
1988 (C)	-0.7 (-1%)	-0.6 (-1%)	-0.7 (-1%)	-0.6 (-1%)	-0.5 (-1%)	-0.4 (-1%)
1989 (D)	-1.3 (-2%)	-1.4 (-2%)	-1.4 (-2%)	-1.5 (-2%)	-1.3 (-2%)	-1.6 (-2%)
1990 (C)	-0.5 (-1%)	-0.3 (0%)	-0.5 (-1%)	-0.2 (0%)	-0.2 (0%)	-0.1 (0%)
1991 (C)	-1.4 (-2%)	-1.4 (-2%)	-1.4 (-2%)	-1.4 (-2%)	-1.2 (-2%)	-1.3 (-2%)
Average	-1.4 (-2%)	-1.5 (-2%)	-1.4 (-2%)	-1.5 (-2%)	-1.3 (-2%)	-1.2 (-1%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-36. Percentage of Spring-Run Chinook Salmon Smolts Surviving from Freeport to Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

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Survival in Steamboat and Sutter Sloughs

Survival of smolt spring-run Chinook salmon in Steamboat and Sutter Sloughs averaged 48% under the PP scenarios and 50% under the EBC scenarios (Table C.5.3-63). Survival under the PP scenarios ranged from 39%–62% under the PP scenarios and 41%–63% under the EBC scenarios. Survival was slightly lower under the PP scenarios in nearly all years, averaging 2% lower over the entire period (Table C.5.3-64, Table C.5.3-62Figure C.5.3-36).

Table C.5.3-63. Percentage of Spring-Run Chinook Salmon Smolts Surviving in Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	54.8	54.8	54.7	54.6	51.1	50.5
1976 (C)	44.9	45.0	44.8	45.4	43.8	45.7
1977 (C)	40.8	40.9	40.9	40.8	40.4	40.6
1978 (AN)	61.8	61.9	60.9	60.2	54.7	54.1
1979 (BN)	46.6	45.9	45.5	45.0	43.8	43.3
1980 (AN)	47.8	47.8	47.6	47.2	45.4	45.2
1981 (D)	42.9	42.3	41.5	41.4	39.3	39.1
1982 (W)	62.0	62.0	61.5	60.9	60.7	60.2
1983 (W)	62.3	62.3	62.8	62.4	61.8	61.0
1984 (W)	50.9	50.8	50.7	50.5	47.1	46.8
1985 (D)	46.4	46.3	46.2	45.5	46.2	45.0
1986 (W)	56.2	56.2	55.3	55.2	54.1	53.8
1987 (D)	51.1	51.4	51.2	51.6	47.8	47.7
1988 (C)	43.1	43.0	43.4	43.5	43.0	43.1
1989 (D)	50.1	50.2	49.9	50.2	48.3	48.3
1990 (C)	42.6	42.4	42.7	42.8	42.4	42.7
1991 (C)	46.1	46.4	45.9	46.6	44.1	44.5
Average	50.0	50.0	49.7	49.6	47.9	47.7

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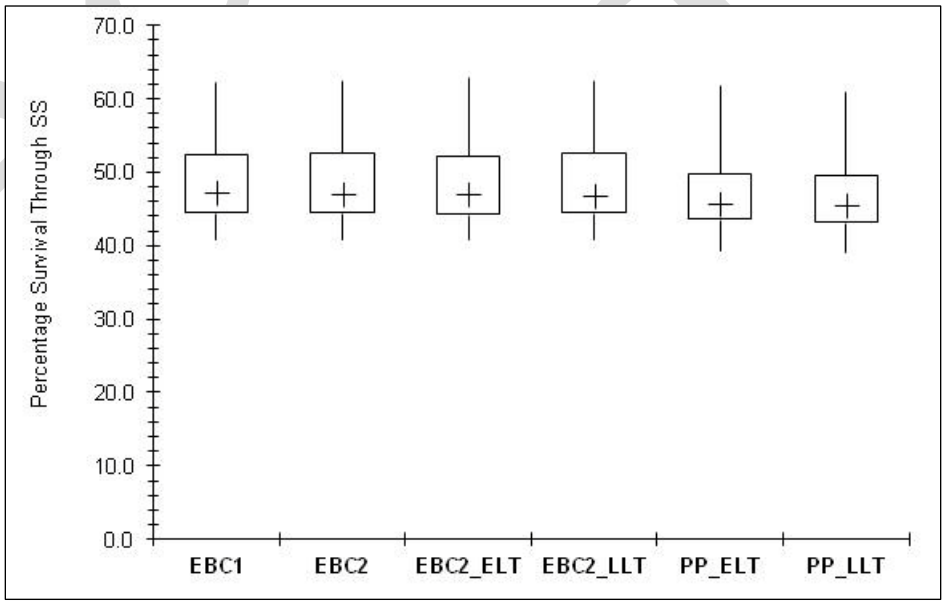
Table C.5.3-64. Difference between Scenarios in Percentage of Spring-Run Chinook Salmon Smolts Surviving in Steamboat/Sutter Sloughs (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-3.8 (-7%)	-4.4 (-8%)	-3.7 (-7%)	-4.3 (-8%)	-3.7 (-7%)	-4.1 (-7%)
1976 (C)	-1.1 (-2%)	0.8 (2%)	-1.2 (-3%)	0.7 (1%)	-0.9 (-2%)	0.2 (1%)
1977 (C)	-0.4 (-1%)	-0.2 (-1%)	-0.5 (-1%)	-0.4 (-1%)	-0.5 (-1%)	-0.3 (-1%)
1978 (AN)	-7.1 (-11%)	-7.7 (-12%)	-7.2 (-12%)	-7.7 (-13%)	-6.2 (-10%)	-6.1 (-10%)
1979 (BN)	-2.8 (-6%)	-3.2 (-7%)	-2.2 (-5%)	-2.6 (-6%)	-1.7 (-4%)	-1.6 (-4%)
1980 (AN)	-2.4 (-5%)	-2.7 (-6%)	-2.4 (-5%)	-2.7 (-6%)	-2.3 (-5%)	-2.1 (-4%)
1981 (D)	-3.6 (-8%)	-3.8 (-9%)	-3.0 (-7%)	-3.2 (-8%)	-2.2 (-5%)	-2.3 (-6%)
1982 (W)	-1.3 (-2%)	-1.8 (-3%)	-1.3 (-2%)	-1.7 (-3%)	-0.9 (-1%)	-0.6 (-1%)
1983 (W)	-0.5 (-1%)	-1.3 (-2%)	-0.5 (-1%)	-1.3 (-2%)	-1.0 (-2%)	-1.5 (-2%)
1984 (W)	-3.8 (-8%)	-4.1 (-8%)	-3.7 (-7%)	-4.0 (-8%)	-3.6 (-7%)	-3.6 (-7%)
1985 (D)	-0.2 (0%)	-1.4 (-3%)	-0.1 (0%)	-1.3 (-3%)	0.0 (0%)	-0.5 (-1%)
1986 (W)	-2.1 (-4%)	-2.5 (-4%)	-2.1 (-4%)	-2.4 (-4%)	-1.2 (-2%)	-1.4 (-3%)
1987 (D)	-3.3 (-6%)	-3.4 (-7%)	-3.6 (-7%)	-3.7 (-7%)	-3.4 (-7%)	-3.9 (-8%)
1988 (C)	-0.1 (0%)	0.0 (0%)	0.0 (0%)	0.1 (0%)	-0.3 (-1%)	-0.4 (-1%)
1989 (D)	-1.8 (-4%)	-1.8 (-4%)	-1.9 (-4%)	-1.9 (-4%)	-1.7 (-3%)	-1.9 (-4%)
1990 (C)	-0.2 (0%)	0.0 (0%)	0.0 (0%)	0.2 (1%)	-0.2 (-1%)	-0.2 (0%)
1991 (C)	-2.1 (-4%)	-1.6 (-3%)	-2.3 (-5%)	-1.8 (-4%)	-1.9 (-4%)	-2.1 (-4%)
Average	-2.2 (-4%)	-2.3 (-5%)	-2.1 (-4%)	-2.2 (-4%)	-1.9 (-4%)	-1.9 (-4%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-37. Percentage of Spring-Run Chinook Salmon Smolts Surviving in Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

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Sacramento River Survival from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough (Reach SAC2)

Survival of spring-run Chinook salmon smolts in the SAC2 reach (Steamboat/Sutter Slough to Delta Cross Channel/Georgiana Slough) under the PP scenarios was similar to that under the EBC scenarios, averaging about 90% and ranging from 88–94% under all scenarios (Table C.5.3-65, Table C.5.3-66, Figure C.5.3-38).

Table C.5.3-65. Percentage of Spring-Run Chinook Salmon Smolts Surviving from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	90.9	90.9	90.9	91.0	89.4	89.3
1976 (C)	88.0	87.9	88.3	88.3	88.0	88.4
1977 (C)	89.0	89.0	88.9	89.0	88.9	88.7
1978 (AN)	93.0	93.0	92.7	92.4	90.9	90.6
1979 (BN)	89.5	89.4	89.2	89.0	88.6	88.4
1980 (AN)	90.7	90.7	90.6	90.4	89.9	89.8
1981 (D)	90.2	90.1	89.8	89.8	89.3	89.5
1982 (W)	93.4	93.4	93.3	93.1	93.2	93.0
1983 (W)	93.8	93.8	93.8	93.8	94.0	93.8
1984 (W)	90.7	90.6	90.5	90.1	89.3	89.3
1985 (D)	90.6	90.5	90.4	90.2	90.4	90.3
1986 (W)	91.1	91.1	91.2	91.0	90.8	90.6
1987 (D)	88.8	88.6	88.6	88.8	89.4	90.0
1988 (C)	88.0	88.1	88.0	88.0	87.7	87.8
1989 (D)	91.0	91.1	91.0	91.1	90.6	90.6
1990 (C)	88.8	88.7	88.6	88.5	88.4	88.4
1991 (C)	89.1	89.1	89.0	89.1	88.4	88.5
Average	90.4	90.4	90.3	90.2	89.8	89.8

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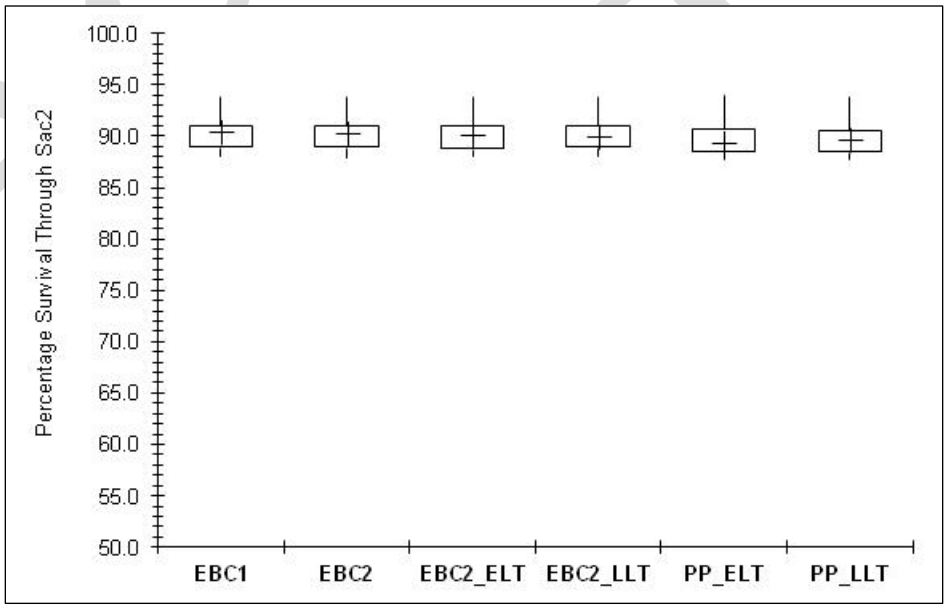
Table C.5.3-66. Difference between Scenarios in Percentage of Spring-Run Chinook Salmon Smolts Surviving from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-1.5 (-2%)	-1.6 (-2%)	-1.5 (-2%)	-1.6 (-2%)	-1.5 (-2%)	-1.7 (-2%)
1976 (C)	0.1 (0%)	0.4 (0%)	0.1 (0%)	0.5 (1%)	-0.3 (0%)	0.1 (0%)
1977 (C)	0.0 (0%)	-0.3 (0%)	0.0 (0%)	-0.3 (0%)	0.0 (0%)	-0.3 (0%)
1978 (AN)	-2.0 (-2%)	-2.4 (-3%)	-2.0 (-2%)	-2.4 (-3%)	-1.8 (-2%)	-1.8 (-2%)
1979 (BN)	-1.0 (-1%)	-1.1 (-1%)	-0.8 (-1%)	-1.0 (-1%)	-0.6 (-1%)	-0.6 (-1%)
1980 (AN)	-0.8 (-1%)	-1.0 (-1%)	-0.8 (-1%)	-0.9 (-1%)	-0.7 (-1%)	-0.6 (-1%)
1981 (D)	-0.9 (-1%)	-0.7 (-1%)	-0.8 (-1%)	-0.7 (-1%)	-0.5 (-1%)	-0.3 (0%)
1982 (W)	-0.3 (0%)	-0.4 (0%)	-0.2 (0%)	-0.4 (0%)	-0.1 (0%)	-0.1 (0%)
1983 (W)	0.1 (0%)	0.0 (0%)	0.1 (0%)	0.0 (0%)	0.1 (0%)	0.0 (0%)
1984 (W)	-1.3 (-1%)	-1.3 (-1%)	-1.3 (-1%)	-1.3 (-1%)	-1.1 (-1%)	-0.8 (-1%)
1985 (D)	-0.1 (0%)	-0.3 (0%)	-0.1 (0%)	-0.2 (0%)	0.1 (0%)	0.1 (0%)
1986 (W)	-0.3 (0%)	-0.5 (-1%)	-0.3 (0%)	-0.5 (-1%)	-0.4 (0%)	-0.4 (0%)
1987 (D)	0.7 (1%)	1.3 (1%)	0.8 (1%)	1.4 (2%)	0.8 (1%)	1.3 (1%)
1988 (C)	-0.3 (0%)	-0.2 (0%)	-0.4 (0%)	-0.3 (0%)	-0.3 (0%)	-0.2 (0%)
1989 (D)	-0.4 (0%)	-0.4 (0%)	-0.5 (-1%)	-0.5 (-1%)	-0.4 (0%)	-0.5 (-1%)
1990 (C)	-0.4 (0%)	-0.3 (0%)	-0.3 (0%)	-0.3 (0%)	-0.2 (0%)	-0.1 (0%)
1991 (C)	-0.7 (-1%)	-0.6 (-1%)	-0.7 (-1%)	-0.6 (-1%)	-0.6 (-1%)	-0.6 (-1%)
Average	-0.5 (-1%)	-0.6 (-1%)	-0.5 (-1%)	-0.5 (-1%)	-0.4 (0%)	-0.4 (0%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-38. Percentage of Spring-Run Chinook Salmon Smolts Surviving from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough, Based on Delta Passage Model Results

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Percentage of Fish Entering Georgiana Slough and the Delta Cross Channel

The percentage of smolt spring-run Chinook salmon entering Georgiana Slough and the Delta Cross Channel averaged 57% under the PP scenarios and 55%–56% under the EBC scenarios (Table C.5.3-67, Figure C.5.3-39). In most years, the percentage of fish entering Georgiana Slough and the Delta Cross Channel was higher under the PP scenarios, averaging 1%–2% higher than the EBC scenarios (Table C.5.3-68).

Table C.5.3-67. Percentage of Spring-Run Chinook Salmon Smolts Entering Georgiana Slough and the Delta Cross Channel, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	47.4	47.4	47.4	47.2	53.7	54.1
1976 (C)	65.7	66.1	63.1	61.9	64.8	60.1
1977 (C)	69.5	69.2	69.6	71.0	69.2	70.8
1978 (AN)	42.9	42.9	43.7	44.8	49.5	50.5
1979 (BN)	55.9	56.6	57.5	58.8	60.0	60.3
1980 (AN)	52.1	52.2	52.9	54.0	55.7	55.7
1981 (D)	58.8	59.0	60.8	61.1	62.5	60.6
1982 (W)	37.5	37.5	37.6	38.1	40.0	40.7
1983 (W)	37.1	37.1	36.8	37.1	38.1	38.7
1984 (W)	55.5	55.8	56.5	58.3	61.1	60.5
1985 (D)	60.0	60.4	61.4	62.8	60.6	61.0
1986 (W)	52.1	52.2	53.4	55.6	55.4	56.1
1987 (D)	62.2	61.9	61.3	62.2	59.8	56.9
1988 (C)	63.6	63.6	64.2	64.8	65.4	64.7
1989 (D)	50.3	50.2	50.4	50.0	51.4	50.9
1990 (C)	64.1	64.3	65.4	65.5	65.5	64.1
1991 (C)	61.7	61.7	62.5	62.4	64.9	64.1
Average	55.1	55.2	55.6	56.2	57.5	57.1

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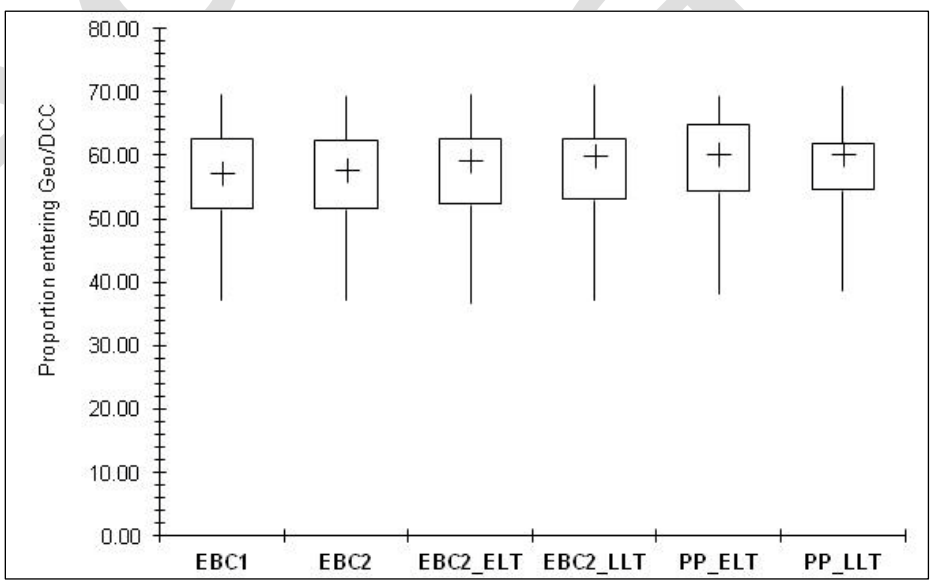
Table C.5.3-68. Difference between Scenarios in Percentage of Spring-Run Chinook Salmon Smolts Entering Georgiana Slough and the Delta Cross Channel (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	6.3 (13%)	6.7 (14%)	6.3 (13%)	6.7 (14%)	6.3 (13%)	6.9 (15%)
1976 (C)	-0.9 (-1%)	-5.5 (-8%)	-1.3 (-2%)	-6.0 (-9%)	1.7 (3%)	-1.7 (-3%)
1977 (C)	-0.3 (0%)	1.2 (2%)	0.0 (0%)	1.5 (2%)	-0.3 (0%)	-0.2 (0%)
1978 (AN)	6.6 (15%)	7.7 (18%)	6.5 (15%)	7.6 (18%)	5.8 (13%)	5.8 (13%)
1979 (BN)	4.2 (7%)	4.4 (8%)	3.5 (6%)	3.7 (7%)	2.6 (4%)	1.6 (3%)
1980 (AN)	3.6 (7%)	3.6 (7%)	3.6 (7%)	3.5 (7%)	2.9 (5%)	1.7 (3%)
1981 (D)	3.7 (6%)	1.8 (3%)	3.5 (6%)	1.6 (3%)	1.7 (3%)	-0.5 (-1%)
1982 (W)	2.5 (7%)	3.2 (8%)	2.5 (7%)	3.2 (8%)	2.4 (6%)	2.6 (7%)
1983 (W)	1.0 (3%)	1.6 (4%)	1.0 (3%)	1.6 (4%)	1.3 (4%)	1.6 (4%)
1984 (W)	5.6 (10%)	5.0 (9%)	5.3 (9%)	4.7 (8%)	4.6 (8%)	2.2 (4%)
1985 (D)	0.5 (1%)	1.0 (2%)	0.2 (0%)	0.6 (1%)	-0.9 (-1%)	-1.8 (-3%)
1986 (W)	3.3 (6%)	4.0 (8%)	3.2 (6%)	3.9 (8%)	2.0 (4%)	0.5 (1%)
1987 (D)	-2.4 (-4%)	-5.4 (-9%)	-2.0 (-3%)	-5.0 (-8%)	-1.5 (-2%)	-5.3 (-9%)
1988 (C)	1.9 (3%)	1.1 (2%)	1.8 (3%)	1.1 (2%)	1.2 (2%)	-0.1 (0%)
1989 (D)	1.1 (2%)	0.6 (1%)	1.2 (2%)	0.8 (2%)	1.0 (2%)	0.9 (2%)
1990 (C)	1.4 (2%)	0.0 (0%)	1.2 (2%)	-0.2 (0%)	0.1 (0%)	-1.4 (-2%)
1991 (C)	3.2 (5%)	2.4 (4%)	3.2 (5%)	2.4 (4%)	2.4 (4%)	1.7 (3%)
Average	2.4 (4%)	2.0 (4%)	2.3 (4%)	1.9 (3%)	1.9 (4%)	0.8 (1%)

Note: Negative values indicate lower percentage entry into Georgiana Slough/Delta Cross Channel under PP scenarios than under EBC scenarios.



Box and whisker plot shows entry distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage entry.

Figure C.5.3-39. Percentage of Spring-Run Chinook Salmon Smolts Entering Georgiana Slough and the Delta Cross Channel, Based on Delta Passage Model Results

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Sacramento River Survival from Delta Cross Channel/Georgiana Slough to Rio Vista (Reach SAC3)

Survival of spring-run Chinook salmon smolts from the Delta Cross Channel/Georgiana Slough to Rio Vista averaged 50% under the PP scenarios and 51%–52% under the EBC scenarios (Table C.5.3-69; Figure C.5.3-40). Survival was slightly lower under the PP scenarios in nearly all years, averaging 2% lower over the entire period (Table C.5.3-70). Survival differences between the PP and EBC scenarios ranged from a 6.7% reduction in survival under the PP_LLT scenario (compared to EBC1 and EBC2) to a 1.1% increase in survival under the PP_LLT scenario (compared to EBC2).

Table C.5.3-69. Percentage of Spring-Run Chinook Salmon Smolts Surviving from Delta Cross Channel/Georgiana Slough to Rio Vista, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	55.7	55.6	55.4	55.2	51.6	51.2
1976 (C)	44.3	44.0	44.7	45.4	43.9	45.0
1977 (C)	41.7	42.4	42.3	42.1	42.3	42.0
1978 (AN)	60.3	60.3	59.4	58.8	54.2	53.6
1979 (BN)	42.2	41.6	41.4	41.1	39.6	39.4
1980 (AN)	52.2	52.2	52.1	51.8	50.1	50.0
1981 (D)	54.5	54.2	53.4	53.3	52.0	52.3
1982 (W)	61.5	61.5	61.2	60.8	60.1	59.9
1983 (W)	65.7	65.7	65.9	65.8	65.2	64.5
1984 (W)	53.9	53.8	53.7	53.5	50.7	50.5
1985 (D)	52.3	52.2	52.1	51.8	52.0	51.5
1986 (W)	50.8	50.9	50.7	49.5	49.5	48.9
1987 (D)	45.6	46.0	46.0	45.7	44.8	45.5
1988 (C)	37.6	37.6	37.5	37.2	37.0	37.0
1989 (D)	56.5	56.5	56.5	56.7	54.4	54.1
1990 (C)	51.4	51.2	51.3	51.3	50.8	50.6
1991 (C)	51.0	51.5	50.8	51.6	49.2	49.6
Average	51.6	51.6	51.4	51.3	49.8	49.7

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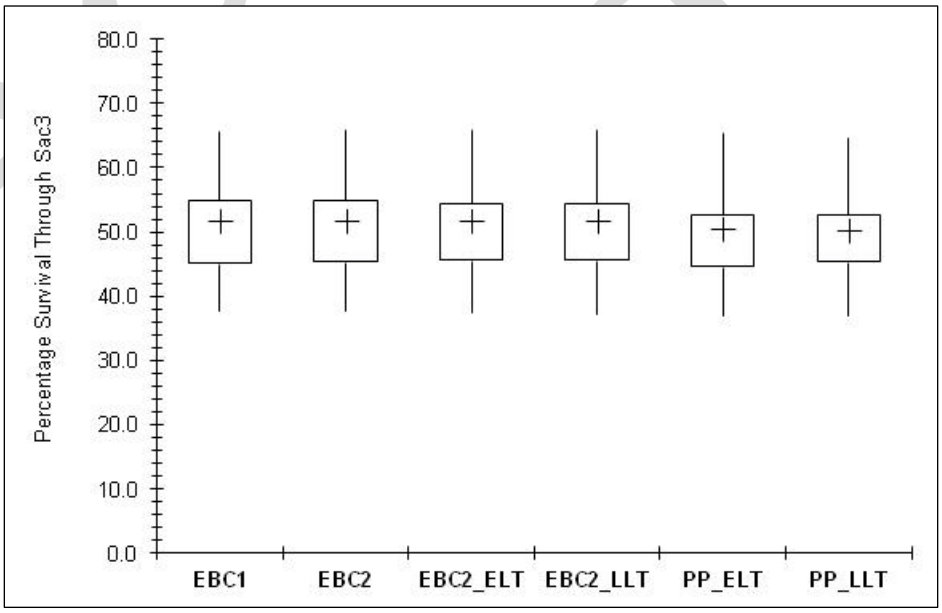
Table C.5.3-70. Difference between Scenarios in Percentage of Spring-Run Chinook Salmon Smolts Surviving from Delta Cross Channel/Georgiana Slough to Rio Vista (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-4.1 (-7%)	-4.5 (-8%)	-4.0 (-7%)	-4.4 (-8%)	-3.8 (-7%)	-4.0 (-7%)
1976 (C)	-0.4 (-1%)	0.7 (2%)	-0.1 (0%)	1.1 (2%)	-0.8 (-2%)	-0.4 (-1%)
1977 (C)	0.6 (1%)	0.3 (1%)	-0.1 (0%)	-0.3 (-1%)	0.0 (0%)	-0.1 (0%)
1978 (AN)	-6.1 (-10%)	-6.7 (-11%)	-6.1 (-10%)	-6.7 (-11%)	-5.2 (-9%)	-5.2 (-9%)
1979 (BN)	-2.6 (-6%)	-2.8 (-7%)	-2.0 (-5%)	-2.2 (-5%)	-1.8 (-4%)	-1.7 (-4%)
1980 (AN)	-2.0 (-4%)	-2.1 (-4%)	-2.0 (-4%)	-2.1 (-4%)	-1.9 (-4%)	-1.8 (-3%)
1981 (D)	-2.5 (-5%)	-2.2 (-4%)	-2.3 (-4%)	-1.9 (-4%)	-1.4 (-3%)	-1.0 (-2%)
1982 (W)	-1.4 (-2%)	-1.6 (-3%)	-1.4 (-2%)	-1.6 (-3%)	-1.1 (-2%)	-0.9 (-2%)
1983 (W)	-0.5 (-1%)	-1.2 (-2%)	-0.5 (-1%)	-1.2 (-2%)	-0.7 (-1%)	-1.3 (-2%)
1984 (W)	-3.2 (-6%)	-3.4 (-6%)	-3.1 (-6%)	-3.3 (-6%)	-3.0 (-6%)	-3.0 (-6%)
1985 (D)	-0.3 (-1%)	-0.8 (-1%)	-0.2 (0%)	-0.7 (-1%)	-0.1 (0%)	-0.2 (0%)
1986 (W)	-1.3 (-3%)	-1.9 (-4%)	-1.4 (-3%)	-2.1 (-4%)	-1.2 (-2%)	-0.6 (-1%)
1987 (D)	-0.8 (-2%)	-0.1 (0%)	-1.1 (-2%)	-0.5 (-1%)	-1.2 (-3%)	-0.2 (-1%)
1988 (C)	-0.6 (-2%)	-0.6 (-2%)	-0.6 (-2%)	-0.6 (-2%)	-0.5 (-1%)	-0.3 (-1%)
1989 (D)	-2.1 (-4%)	-2.4 (-4%)	-2.2 (-4%)	-2.5 (-4%)	-2.1 (-4%)	-2.7 (-5%)
1990 (C)	-0.5 (-1%)	-0.8 (-1%)	-0.4 (-1%)	-0.6 (-1%)	-0.5 (-1%)	-0.6 (-1%)
1991 (C)	-1.8 (-3%)	-1.5 (-3%)	-2.2 (-4%)	-1.9 (-4%)	-1.6 (-3%)	-2.0 (-4%)
Average	-1.7 (-3%)	-1.8 (-4%)	-1.8 (-3%)	-1.9 (-4%)	-1.6 (-3%)	-1.5 (-3%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate Maximum and Minimum Percentage Survival.

Figure C.5.3-40. Percentage of Spring-Run Chinook Salmon Smolts Surviving from Delta Cross Channel/Georgiana Slough to Rio Vista, Based on Delta Passage Model Results

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Survival in the Interior Delta

Survival of spring-run Chinook salmon smolts in the interior Delta averaged 24% under the PP scenarios and was approximately 3% greater than average survival under the EBC scenarios (Table C.5.3-71, Table C.5.3-72, Figure C.5.3-41). Higher survival under the PP scenarios reflected reduced south Delta export pumping, with the greatest effect on survival in high flow years (e.g., 1982–1983). However, lower interior Delta survival associated with higher export pumping occurred in some of the dry or critically dry years under the PP scenarios (1977, 1985, 1987, 1989, 1991).

Table C.5.3-71. Percentage of Spring-Run Chinook Salmon Smolts Surviving through the Interior Delta, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	20.0	20.0	20.0	20.3	23.1	22.3
1976 (C)	14.5	14.5	14.9	15.1	14.5	14.8
1977 (C)	22.8	22.6	22.8	22.7	22.0	22.3
1978 (AN)	22.1	22.1	21.3	20.5	28.5	27.3
1979 (BN)	18.4	18.1	18.3	18.6	21.7	22.4
1980 (AN)	20.0	21.1	20.4	20.3	25.2	25.0
1981 (D)	22.3	23.0	22.4	22.5	23.0	21.2
1982 (W)	16.6	16.9	16.3	16.7	31.9	30.8
1983 (W)	28.5	27.5	27.0	25.7	40.4	39.9
1984 (W)	18.0	18.0	17.8	17.8	23.8	23.9
1985 (D)	22.3	22.1	22.0	22.1	21.3	22.0
1986 (W)	14.5	15.3	13.3	13.2	19.3	19.1
1987 (D)	21.9	20.9	20.8	22.1	20.5	22.2
1988 (C)	15.8	16.5	16.2	17.0	16.2	17.2
1989 (D)	26.8	26.8	26.7	27.2	25.6	26.7
1990 (C)	25.3	25.2	25.0	25.3	25.1	25.0
1991 (C)	18.8	18.8	18.6	19.1	17.2	17.4
Average	20.5	20.5	20.2	20.4	23.5	23.5

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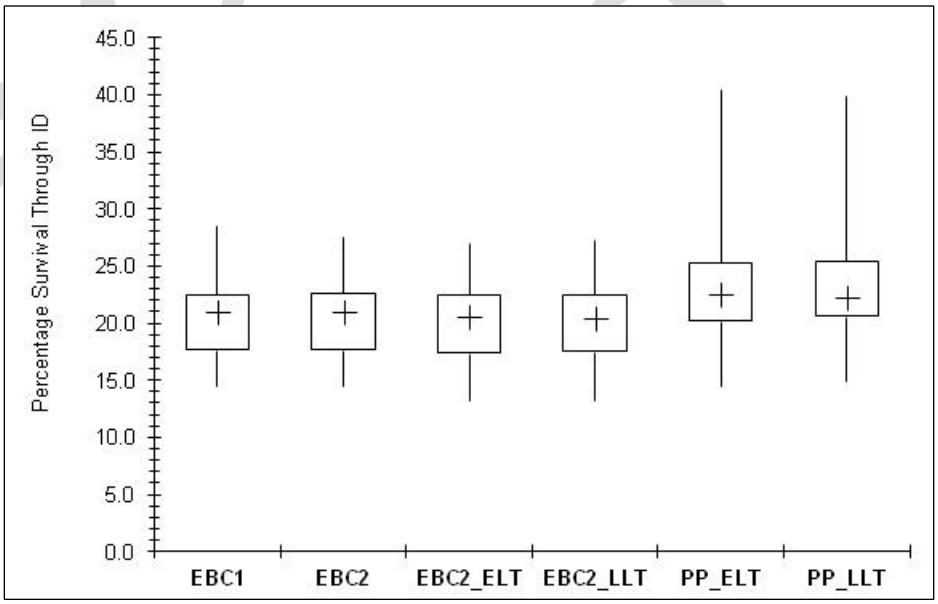
Table C.5.3-72. Difference between Scenarios in Percentage of Spring-Run Chinook Salmon Smolts Surviving through the Interior Delta (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	3.1 (15%)	2.3 (12%)	3.1 (15%)	2.3 (12%)	3.0 (15%)	2.0 (10%)
1976 (C)	0.0 (0%)	0.3 (2%)	0.1 (0%)	0.4 (3%)	-0.4 (-2%)	-0.3 (-2%)
1977 (C)	-0.8 (-4%)	-0.6 (-2%)	-0.5 (-2%)	-0.3 (-1%)	-0.8 (-3%)	-0.4 (-2%)
1978 (AN)	6.4 (29%)	5.2 (24%)	6.5 (29%)	5.2 (24%)	7.3 (34%)	6.8 (33%)
1979 (BN)	3.3 (18%)	4.0 (22%)	3.6 (20%)	4.2 (23%)	3.4 (19%)	3.8 (20%)
1980 (AN)	5.1 (26%)	5.0 (25%)	4.1 (19%)	3.9 (19%)	4.8 (23%)	4.7 (23%)
1981 (D)	0.7 (3%)	-1.1 (-5%)	0.1 (0%)	-1.7 (-8%)	0.6 (3%)	-1.2 (-6%)
1982 (W)	15.3 (92%)	14.2 (85%)	15.0 (89%)	13.9 (82%)	15.7 (96%)	14.0 (84%)
1983 (W)	11.9 (42%)	11.4 (40%)	13.0 (47%)	12.4 (45%)	13.4 (50%)	14.2 (55%)
1984 (W)	5.8 (32%)	5.9 (32%)	5.9 (33%)	6.0 (33%)	6.1 (34%)	6.1 (34%)
1985 (D)	-1.0 (-4%)	-0.3 (-1%)	-0.8 (-4%)	-0.2 (-1%)	-0.7 (-3%)	-0.2 (-1%)
1986 (W)	4.8 (33%)	4.5 (31%)	4.1 (27%)	3.8 (25%)	6.1 (46%)	5.9 (44%)
1987 (D)	-1.4 (-6%)	0.3 (1%)	-0.4 (-2%)	1.4 (7%)	-0.3 (-2%)	0.2 (1%)
1988 (C)	0.4 (3%)	1.4 (9%)	-0.3 (-2%)	0.7 (4%)	0.1 (0%)	0.2 (1%)
1989 (D)	-1.2 (-4%)	-0.1 (0%)	-1.2 (-5%)	-0.2 (-1%)	-1.1 (-4%)	-0.6 (-2%)
1990 (C)	-0.2 (-1%)	-0.3 (-1%)	-0.2 (-1%)	-0.3 (-1%)	0.1 (0%)	-0.3 (-1%)
1991 (C)	-1.6 (-9%)	-1.3 (-7%)	-1.6 (-8%)	-1.3 (-7%)	-1.5 (-8%)	-1.7 (-9%)
Average	3.0 (15%)	3.0 (15%)	3.0 (14%)	3.0 (14%)	3.3 (16%)	3.1 (15%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-41. Spring-Run Chinook Salmon Smolt Survival through the Interior Delta, Based on Delta Passage Model Results

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Fall-Run Chinook Salmon (Sacramento River)

Overall Survival through the Delta

Through-Delta survival of migrating smolt fall-run Chinook salmon originating in the Sacramento River watershed averaged 16% under the PP scenarios, and was approximately 1% lower than average survival under the EBC scenarios (Table C.5.3-73, Table C.5.3-74; Figure C.5.3-42). The differences ranged from 5.6% lower survival under PP_LLT (compared with EBC1 in 1982) to 3.3% higher survival under PP_LLT (compared with EBC1 and EBC2 in 1976). As described in the methods, these results apply to actively migrating smolts and do not incorporate potential rearing and growth of fry or parr in the Delta.

Table C.5.3-73. Percentage of Sacramento River Fall-Run Chinook Salmon Smolts Surviving through the Delta, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	26.5	26.3	25.2	23.7	18.2	17.3
1976 (C)	10.7	10.7	13.3	13.8	12.7	14.0
1977 (C)	12.0	12.3	12.3	12.1	12.1	12.3
1978 (AN)	19.7	19.4	18.3	17.4	16.2	15.9
1979 (BN)	16.5	16.2	15.6	15.2	14.0	13.9
1980 (AN)	16.2	16.2	15.5	14.9	14.1	13.9
1981 (D)	14.4	14.4	14.1	14.3	13.9	14.5
1982 (W)	27.0	26.9	25.9	23.7	22.6	21.4
1983 (W)	28.8	28.5	28.7	27.3	29.6	26.6
1984 (W)	14.5	14.4	14.1	13.7	12.9	13.3
1985 (D)	16.5	16.6	16.0	16.3	15.6	16.5
1986 (W)	16.1	15.9	15.0	14.5	14.2	14.6
1987 (D)	14.5	14.5	14.7	15.3	14.0	15.1
1988 (C)	10.3	10.3	10.4	10.2	10.1	10.2
1989 (D)	17.5	17.5	17.8	18.2	18.3	18.6
1990 (C)	15.3	15.3	14.8	14.7	14.5	14.4
1991 (C)	10.7	10.6	10.6	10.7	10.0	10.4
Average	16.9	16.8	16.6	16.2	15.5	15.5

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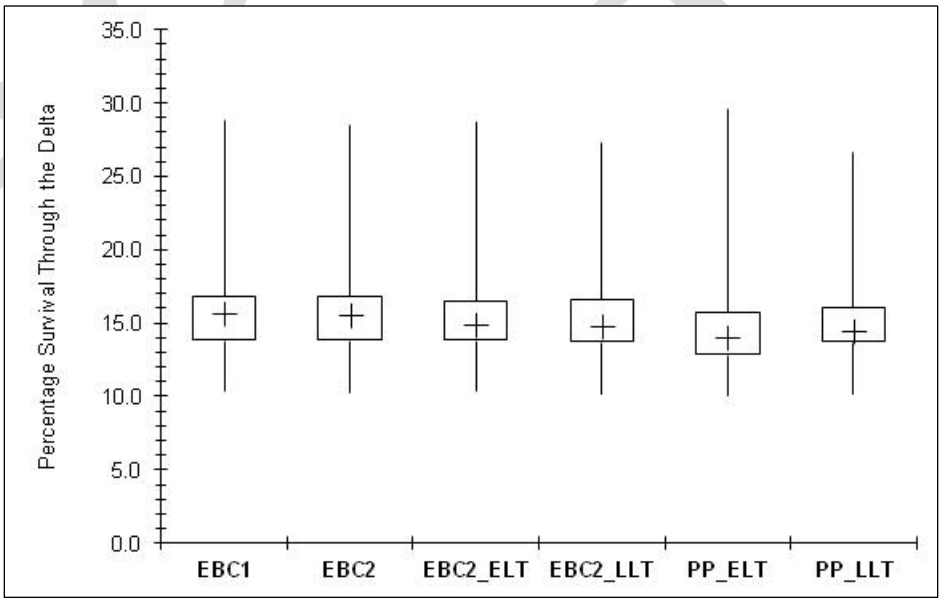
Table C.5.3-74. Difference between Scenarios in Percentage of Sacramento River Fall-Run Chinook Salmon Smolts Surviving through the Delta (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-8.3 (-31%)	-9.2 (-35%)	-8.1 (-31%)	-9.0 (-34%)	-7.0 (-28%)	-6.4 (-27%)
1976 (C)	2.0 (19%)	3.3 (31%)	2.0 (19%)	3.3 (30%)	-0.6 (-4%)	0.1 (1%)
1977 (C)	0.1 (1%)	0.3 (2%)	-0.1 (-1%)	0.1 (1%)	-0.1 (-1%)	0.2 (2%)
1978 (AN)	-3.5 (-18%)	-3.8 (-19%)	-3.2 (-17%)	-3.5 (-18%)	-2.1 (-11%)	-1.5 (-9%)
1979 (BN)	-2.5 (-15%)	-2.6 (-16%)	-2.2 (-13%)	-2.3 (-14%)	-1.5 (-10%)	-1.3 (-8%)
1980 (AN)	-2.1 (-13%)	-2.3 (-14%)	-2.0 (-13%)	-2.3 (-14%)	-1.4 (-9%)	-1.0 (-7%)
1981 (D)	-0.5 (-3%)	0.1 (0%)	-0.5 (-3%)	0.0 (0%)	-0.2 (-1%)	0.2 (1%)
1982 (W)	-4.4 (-16%)	-5.6 (-21%)	-4.3 (-16%)	-5.5 (-21%)	-3.2 (-12%)	-2.3 (-10%)
1983 (W)	0.8 (3%)	-2.2 (-8%)	1.1 (4%)	-1.9 (-7%)	0.9 (3%)	-0.7 (-2%)
1984 (W)	-1.6 (-11%)	-1.2 (-8%)	-1.5 (-10%)	-1.1 (-8%)	-1.2 (-8%)	-0.4 (-3%)
1985 (D)	-0.9 (-5%)	0.0 (0%)	-0.9 (-6%)	0.0 (0%)	-0.4 (-2%)	0.2 (2%)
1986 (W)	-1.9 (-12%)	-1.6 (-10%)	-1.6 (-10%)	-1.3 (-8%)	-0.7 (-5%)	0.1 (1%)
1987 (D)	-0.4 (-3%)	0.7 (5%)	-0.5 (-3%)	0.6 (4%)	-0.6 (-4%)	-0.2 (-1%)
1988 (C)	-0.3 (-3%)	-0.1 (-1%)	-0.2 (-2%)	0.0 (0%)	-0.3 (-3%)	0.0 (0%)
1989 (D)	0.8 (5%)	1.2 (7%)	0.8 (5%)	1.2 (7%)	0.5 (3%)	0.4 (2%)
1990 (C)	-0.8 (-5%)	-0.8 (-5%)	-0.8 (-5%)	-0.9 (-6%)	-0.4 (-2%)	-0.2 (-2%)
1991 (C)	-0.7 (-6%)	-0.3 (-3%)	-0.6 (-6%)	-0.2 (-2%)	-0.6 (-5%)	-0.3 (-3%)
Average	-1.4 (-8%)	-1.4 (-8%)	-1.3 (-8%)	-1.3 (-8%)	-1.1 (-7%)	-0.8 (-5%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-42. Sacramento River Fall-Run Chinook Salmon through-Delta Smolt Survival, Based on Delta Passage Model Results

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Percentage of Fish Entering the Yolo Bypass

Inundation of the Yolo Bypass occurred relatively infrequently during the primary fall-run Chinook salmon smolt emigration period (late March through June), resulting in a relatively low proportion of these smolts entering the Yolo Bypass (Table C.5.3-75; Figure C.5.3-43). Notching of the Fremont Weir as part of the CM2 Yolo Bypass Fisheries Enhancements had little effect on the average percentage of smolts entering the Yolo Bypass (0.3%–0.4% increase relative to EBC scenarios) (Table C.5.3-76). The highest percentages of fall-run smolts entering the Yolo Bypass occurred in the wet years 1982 and 1983 when significant flooding of the Yolo Bypass occurred through March and early April. In these years, the percentage of fall-run entering the Yolo Bypass ranged from 1.3% (EBC1 and EBC2 in 1983) to 9.6% (PP_ELT in 1982) with the greatest differences occurring in 1983 when 2%–3% more fish entered the bypass under the PP scenarios relative to the EBC scenarios.

Table C.5.3-75. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Entering the Yolo Bypass, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	0.2	0.2	0.2	0.2	0.3	0.3
1976 (C)	0.0	0.0	0.0	0.0	0.0	0.0
1977 (C)	0.0	0.0	0.0	0.0	0.0	0.0
1978 (AN)	0.9	0.9	1.0	1.0	2.7	2.3
1979 (BN)	0.0	0.0	0.0	0.0	0.0	0.0
1980 (AN)	0.0	0.0	0.0	0.0	0.0	0.0
1981 (D)	0.0	0.0	0.0	0.0	0.1	0.1
1982 (W)	9.1	9.1	9.5	9.4	9.6	9.4
1983 (W)	1.3	1.3	2.5	2.2	4.9	4.8
1984 (W)	0.0	0.0	0.0	0.0	0.1	0.1
1985 (D)	0.0	0.0	0.0	0.0	0.0	0.0
1986 (W)	0.1	0.1	0.1	0.1	0.1	0.1
1987 (D)	0.0	0.0	0.0	0.0	0.0	0.0
1988 (C)	0.0	0.0	0.0	0.0	0.0	0.0
1989 (D)	0.0	0.0	0.0	0.0	0.1	0.2
1990 (C)	0.0	0.0	0.0	0.0	0.0	0.0
1991 (C)	0.1	0.1	0.1	0.1	0.1	0.1
Average	0.7	0.7	0.8	0.8	1.1	1.0

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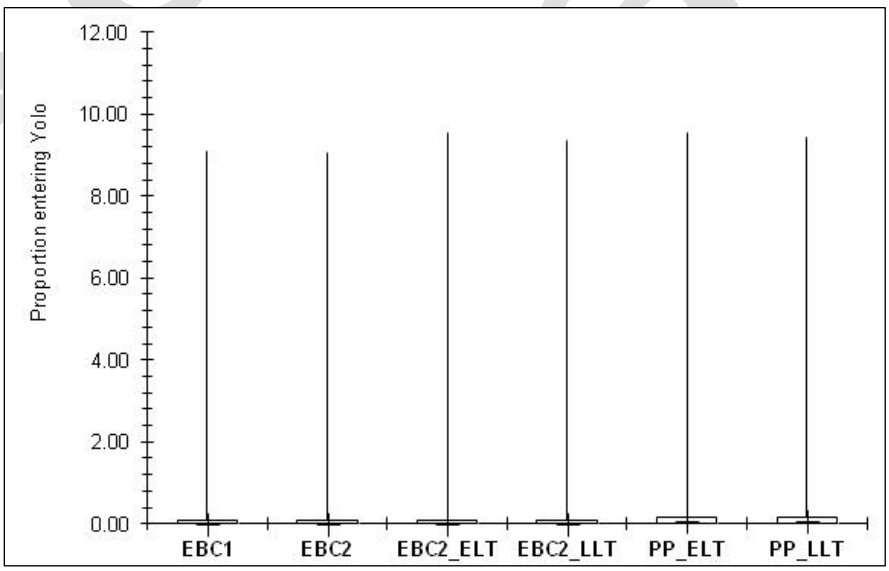
Table C.5.3-76. Difference between Scenarios in Percentage of Sacramento Fall-Run Chinook Salmon Smolts Entering the Yolo Bypass (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	0.1 (47%)	0.1 (66%)	0.1 (49%)	0.1 (68%)	0.1 (34%)	0.1 (70%)
1976 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1977 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1978 (AN)	1.8 (202%)	1.4 (155%)	1.8 (203%)	1.4 (156%)	1.6 (157%)	1.3 (131%)
1979 (BN)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1980 (AN)	0.0 (1309424474%)	0.0 (1307720841%)	0.0 (1309424474%)	0.0 (1307720841%)	0.0 (1309424474%)	0.0 (1307720841%)
1981 (D)	0.1 (433%)	0.1 (535%)	0.1 (4082067740%)	0.1 (4864412141%)	0.1 (4082067740%)	0.1 (4864412141%)
1982 (W)	0.5 (5%)	0.3 (4%)	0.5 (5%)	0.3 (4%)	0.0 (0%)	0.1 (1%)
1983 (W)	3.6 (279%)	3.5 (273%)	3.6 (277%)	3.5 (271%)	2.4 (99%)	2.7 (124%)
1984 (W)	0.1 (4635636026%)	0.1 (4406510970%)	0.1 (4635636026%)	0.1 (4406510970%)	0.1 (4635636026%)	0.1 (4406510970%)
1985 (D)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1986 (W)	0.0 (0%)	0.0 (5%)	0.0 (13%)	0.0 (18%)	0.0 (-5%)	0.0 (0%)
1987 (D)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1988 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1989 (D)	0.1 (1887%)	0.2 (2313%)	0.1 (1847%)	0.2 (2265%)	0.1 (1602%)	0.2 (2172%)
1990 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1991 (C)	0.0 (78%)	0.0 (79%)	0.0 (76%)	0.0 (76%)	0.0 (40%)	0.0 (76%)
Average	0.4 (54%)	0.3 (49%)	0.4 (55%)	0.3 (50%)	0.3 (34%)	0.3 (35%)

Note: Positive values indicate greater percentage entry into Yolo Bypass under PP scenarios than under EBC scenarios.



Box and whisker plot shows entry distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage entry.

Figure C.5.3-43. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Entering the Yolo Bypass, Based on Delta Passage Model Results

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Sacramento River Survival from Freeport to Steamboat/Sutter Sloughs (Reach SAC1)

The survival of smolt fall-run Chinook salmon from Freeport to Steamboat/Sutter Sloughs averaged 77% under the PP scenarios and 78% under the EBC scenarios (Table C.5.3-77Table C.5.3-61, Figure C.5.3-44). Differences in survival between the PP and EBC scenarios ranged from 5.4% lower survival under PP_LLT (compared to EBC1 and EBC2 in 1982) to 2.2% higher survival under PP_LLT (compared to EBC1 and EBC2 in 1976) (Table C.5.3-78). Averaged over all years, survival under the PP scenarios was 0.8%–1.5% lower than under the EBC scenarios.

Table C.5.3-77. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving from Freeport to Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	82.2	82.1	81.5	80.7	77.0	76.3
1976 (C)	73.9	73.9	75.7	76.1	75.1	76.1
1977 (C)	74.7	74.8	74.8	74.5	74.6	74.4
1978 (AN)	82.3	82.1	81.2	80.4	78.5	78.1
1979 (BN)	78.1	77.9	77.3	76.7	76.6	76.1
1980 (AN)	78.4	78.3	77.8	77.3	76.8	76.5
1981 (D)	76.8	76.8	76.5	76.6	76.5	76.8
1982 (W)	86.7	86.6	85.8	84.3	82.1	81.3
1983 (W)	90.2	90.1	89.8	88.3	88.0	85.8
1984 (W)	76.2	76.1	75.8	75.1	74.9	75.0
1985 (D)	76.2	76.2	75.7	75.8	75.6	75.9
1986 (W)	76.6	76.4	75.8	75.0	75.0	74.9
1987 (D)	77.3	77.3	77.4	77.8	77.3	78.1
1988 (C)	74.9	74.8	74.8	74.5	74.3	74.3
1989 (D)	77.4	77.4	77.6	77.8	77.9	77.6
1990 (C)	75.9	75.8	75.6	75.5	75.3	75.3
1991 (C)	74.9	74.8	74.7	74.6	74.3	74.2
Average	78.4	78.3	78.1	77.7	77.0	76.9

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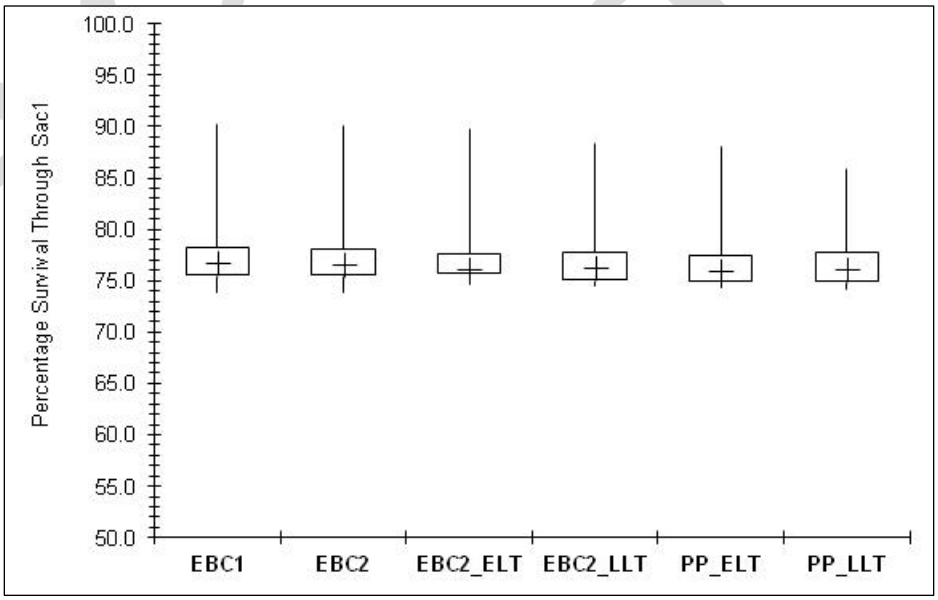
Table C.5.3-78. Difference between Scenarios in Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving from Freeport to Steamboat/Sutter Sloughs (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-5.1 (-6%)	-5.9 (-7%)	-5.0 (-6%)	-5.8 (-7%)	-4.5 (-5%)	-4.4 (-5%)
1976 (C)	1.2 (2%)	2.2 (3%)	1.2 (2%)	2.2 (3%)	-0.6 (-1%)	0.0 (0%)
1977 (C)	-0.2 (0%)	-0.4 (-1%)	-0.2 (0%)	-0.5 (-1%)	-0.2 (0%)	-0.2 (0%)
1978 (AN)	-3.8 (-5%)	-4.2 (-5%)	-3.6 (-4%)	-4.0 (-5%)	-2.7 (-3%)	-2.3 (-3%)
1979 (BN)	-1.5 (-2%)	-2.0 (-3%)	-1.3 (-2%)	-1.8 (-2%)	-0.7 (-1%)	-0.6 (-1%)
1980 (AN)	-1.6 (-2%)	-1.8 (-2%)	-1.5 (-2%)	-1.8 (-2%)	-1.0 (-1%)	-0.8 (-1%)
1981 (D)	-0.4 (0%)	0.0 (0%)	-0.4 (0%)	0.0 (0%)	0.0 (0%)	0.2 (0%)
1982 (W)	-4.6 (-5%)	-5.4 (-6%)	-4.5 (-5%)	-5.4 (-6%)	-3.7 (-4%)	-3.0 (-4%)
1983 (W)	-2.2 (-2%)	-4.4 (-5%)	-2.1 (-2%)	-4.3 (-5%)	-1.8 (-2%)	-2.5 (-3%)
1984 (W)	-1.3 (-2%)	-1.2 (-2%)	-1.2 (-2%)	-1.1 (-1%)	-0.9 (-1%)	-0.1 (0%)
1985 (D)	-0.6 (-1%)	-0.2 (0%)	-0.6 (-1%)	-0.2 (0%)	-0.1 (0%)	0.1 (0%)
1986 (W)	-1.7 (-2%)	-1.8 (-2%)	-1.4 (-2%)	-1.5 (-2%)	-0.8 (-1%)	-0.1 (0%)
1987 (D)	0.1 (0%)	0.8 (1%)	0.0 (0%)	0.8 (1%)	-0.1 (0%)	0.3 (0%)
1988 (C)	-0.6 (-1%)	-0.6 (-1%)	-0.5 (-1%)	-0.5 (-1%)	-0.5 (-1%)	-0.2 (0%)
1989 (D)	0.5 (1%)	0.2 (0%)	0.5 (1%)	0.2 (0%)	0.4 (0%)	-0.2 (0%)
1990 (C)	-0.6 (-1%)	-0.5 (-1%)	-0.6 (-1%)	-0.5 (-1%)	-0.3 (0%)	-0.2 (0%)
1991 (C)	-0.6 (-1%)	-0.6 (-1%)	-0.6 (-1%)	-0.6 (-1%)	-0.4 (-1%)	-0.4 (-1%)
Average	-1.3 (-2%)	-1.5 (-2%)	-1.3 (-2%)	-1.5 (-2%)	-1.1 (-1%)	-0.8 (-1%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-44. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving from Freeport to Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

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Survival in Steamboat and Sutter Sloughs

Survival of smolt fall-run Chinook salmon in Steamboat and Sutter Sloughs averaged 45% under the PP scenarios and 47% under the EBC scenarios (Table C.5.3-79, Figure C.5.3-45). Survival under the PP scenarios was lower than survival under the EBC scenarios in most years. Differences in survival between the PP and EBC scenarios ranged from 7.2% lower survival under PP_LLT (compared to EBC1 in 1982) to 1.2% higher survival under PP_LLT (compared to EBC1 in 1987) (Table C.5.3-80). Averaged over all years, survival under the PP scenarios was 1.2%–2.0% lower than under the EBC scenarios.

Table C.5.3-79. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving in Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	55.2	55.0	53.9	52.3	48.1	47.1
1976 (C)	46.8	46.6	46.3	46.7	45.6	46.6
1977 (C)	45.9	44.9	44.5	46.1	44.5	45.5
1978 (AN)	54.2	54.0	53.3	53.0	49.7	49.9
1979 (BN)	45.3	44.8	43.4	41.8	42.7	41.3
1980 (AN)	40.8	40.7	40.5	40.2	39.4	39.4
1981 (D)	38.0	37.9	37.8	37.9	37.7	38.3
1982 (W)	56.0	55.9	54.7	52.5	49.9	48.8
1983 (W)	60.6	60.6	60.5	58.7	58.5	55.0
1984 (W)	41.5	41.4	41.4	41.9	40.6	40.4
1985 (D)	51.7	51.7	51.5	51.5	51.4	51.1
1986 (W)	48.2	47.7	46.3	47.2	45.8	46.5
1987 (D)	46.7	46.9	47.2	48.8	46.3	47.9
1988 (C)	39.0	38.9	39.0	38.7	38.7	38.6
1989 (D)	49.5	49.5	49.5	49.8	50.5	50.2
1990 (C)	38.4	38.4	38.2	38.3	38.0	38.1
1991 (C)	44.3	44.2	44.1	44.4	43.7	43.9
Average	47.2	47.0	46.6	46.4	45.3	45.2

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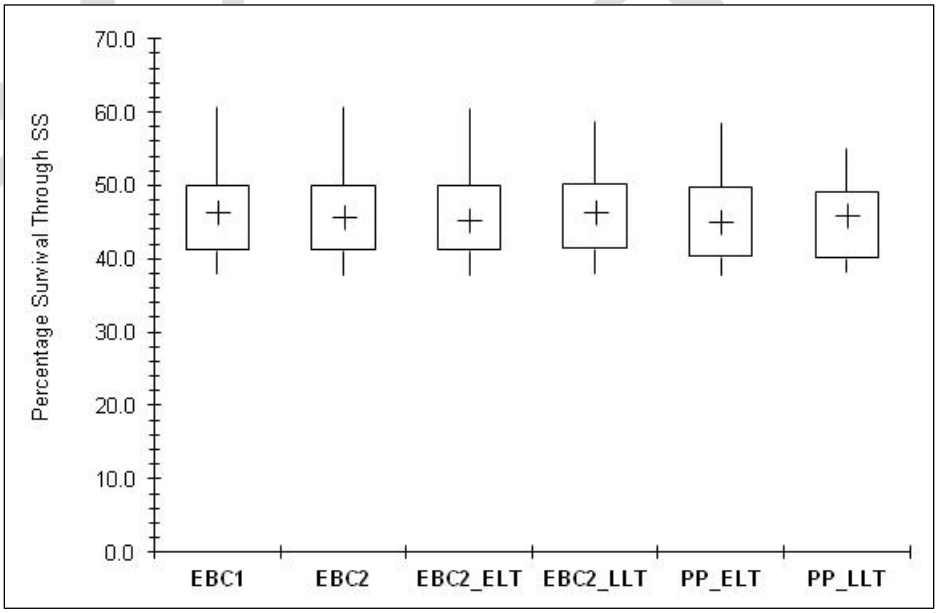
Table C.5.3-80. Difference between Scenarios in Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving in Steamboat/Sutter Sloughs (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-7.0 (-13%)	-8.0 (-15%)	-6.8 (-12%)	-7.8 (-14%)	-5.8 (-11%)	-5.1 (-10%)
1976 (C)	-1.3 (-3%)	-0.2 (0%)	-1.1 (-2%)	0.0 (0%)	-0.7 (-2%)	-0.1 (0%)
1977 (C)	-1.4 (-3%)	-0.4 (-1%)	-0.4 (-1%)	0.6 (1%)	0.0 (0%)	-0.7 (-1%)
1978 (AN)	-4.5 (-8%)	-4.3 (-8%)	-4.3 (-8%)	-4.1 (-8%)	-3.6 (-7%)	-3.0 (-6%)
1979 (BN)	-2.6 (-6%)	-4.0 (-9%)	-2.2 (-5%)	-3.6 (-8%)	-0.7 (-2%)	-0.5 (-1%)
1980 (AN)	-1.4 (-4%)	-1.4 (-3%)	-1.4 (-3%)	-1.4 (-3%)	-1.1 (-3%)	-0.8 (-2%)
1981 (D)	-0.2 (-1%)	0.3 (1%)	-0.1 (0%)	0.4 (1%)	-0.1 (0%)	0.3 (1%)
1982 (W)	-6.1 (-11%)	-7.2 (-13%)	-6.0 (-11%)	-7.1 (-13%)	-4.8 (-9%)	-3.6 (-7%)
1983 (W)	-2.1 (-4%)	-5.6 (-9%)	-2.2 (-4%)	-5.6 (-9%)	-2.0 (-3%)	-3.6 (-6%)
1984 (W)	-0.9 (-2%)	-1.1 (-3%)	-0.8 (-2%)	-1.0 (-2%)	-0.8 (-2%)	-1.5 (-4%)
1985 (D)	-0.3 (-1%)	-0.6 (-1%)	-0.3 (-1%)	-0.7 (-1%)	-0.1 (0%)	-0.5 (-1%)
1986 (W)	-2.3 (-5%)	-1.6 (-3%)	-1.8 (-4%)	-1.1 (-2%)	-0.5 (-1%)	-0.7 (-1%)
1987 (D)	-0.5 (-1%)	1.2 (2%)	-0.7 (-1%)	1.0 (2%)	-0.9 (-2%)	-0.9 (-2%)
1988 (C)	-0.3 (-1%)	-0.4 (-1%)	-0.2 (0%)	-0.3 (-1%)	-0.3 (-1%)	-0.1 (0%)
1989 (D)	1.0 (2%)	0.7 (1%)	1.0 (2%)	0.7 (1%)	1.0 (2%)	0.4 (1%)
1990 (C)	-0.5 (-1%)	-0.3 (-1%)	-0.5 (-1%)	-0.3 (-1%)	-0.2 (-1%)	-0.2 (0%)
1991 (C)	-0.6 (-1%)	-0.4 (-1%)	-0.5 (-1%)	-0.3 (-1%)	-0.5 (-1%)	-0.5 (-1%)
Average	-1.8 (-4%)	-2.0 (-4%)	-1.7 (-4%)	-1.8 (-4%)	-1.2 (-3%)	-1.2 (-3%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-45. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving in Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

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Sacramento River Survival from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough (Reach SAC2)

Survival of fall-run Chinook salmon smolts in the SAC2 reach (Steamboat/Sutter Slough to Delta Cross Channel/Georgiana Slough) under the PP scenarios was similar to that under the EBC scenarios, averaging around 89% and ranging from 86%–94% (Table C.5.3-81, Table C.5.3-82, Figure C.5.3-46). Averaged over all years, survival under the PP scenarios was 0.3%–0.6% lower than under the EBC scenarios.

Table C.5.3-81. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	91.9	91.9	91.6	91.2	89.4	89.0
1976 (C)	87.8	87.8	89.3	89.4	89.1	89.6
1977 (C)	88.1	87.9	87.9	87.9	87.8	87.8
1978 (AN)	91.1	91.0	90.5	90.1	89.3	89.0
1979 (BN)	89.0	88.8	88.5	88.0	88.0	87.7
1980 (AN)	90.6	90.5	90.2	89.9	89.7	89.5
1981 (D)	89.2	89.1	89.0	89.0	89.0	89.3
1982 (W)	93.0	93.0	92.6	92.0	91.1	90.8
1983 (W)	93.9	93.9	94.0	93.7	93.7	93.0
1984 (W)	87.4	87.3	87.0	86.4	86.4	86.6
1985 (D)	88.8	88.8	88.5	88.7	88.5	88.8
1986 (W)	89.7	89.6	89.6	89.6	89.3	89.4
1987 (D)	89.3	89.3	89.3	89.6	89.4	89.9
1988 (C)	88.6	88.6	88.6	88.4	88.3	88.3
1989 (D)	89.2	89.2	89.3	89.4	89.8	89.6
1990 (C)	89.3	89.3	89.1	88.9	88.8	88.7
1991 (C)	88.1	88.0	88.0	87.9	87.7	87.7
Average	89.7	89.7	89.6	89.4	89.1	89.1

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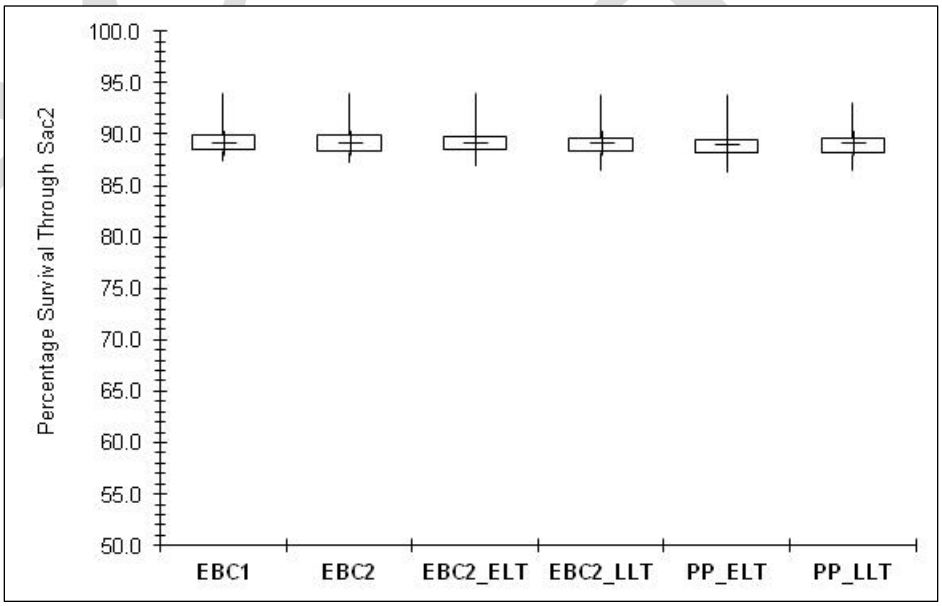
Table C.5.3-82. Difference between Scenarios in Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-2.5 (-3%)	-2.9 (-3%)	-2.5 (-3%)	-2.8 (-3%)	-2.2 (-2%)	-2.2 (-2%)
1976 (C)	1.3 (2%)	1.8 (2%)	1.3 (1%)	1.7 (2%)	-0.2 (0%)	0.1 (0%)
1977 (C)	-0.3 (0%)	-0.3 (0%)	-0.1 (0%)	-0.1 (0%)	-0.1 (0%)	-0.1 (0%)
1978 (AN)	-1.8 (-2%)	-2.1 (-2%)	-1.7 (-2%)	-2.0 (-2%)	-1.2 (-1%)	-1.1 (-1%)
1979 (BN)	-0.9 (-1%)	-1.3 (-1%)	-0.8 (-1%)	-1.1 (-1%)	-0.4 (0%)	-0.4 (0%)
1980 (AN)	-0.9 (-1%)	-1.1 (-1%)	-0.8 (-1%)	-1.0 (-1%)	-0.5 (-1%)	-0.4 (0%)
1981 (D)	-0.1 (0%)	0.1 (0%)	-0.1 (0%)	0.2 (0%)	0.1 (0%)	0.3 (0%)
1982 (W)	-1.9 (-2%)	-2.2 (-2%)	-1.9 (-2%)	-2.2 (-2%)	-1.5 (-2%)	-1.2 (-1%)
1983 (W)	-0.2 (0%)	-0.9 (-1%)	-0.2 (0%)	-0.9 (-1%)	-0.2 (0%)	-0.7 (-1%)
1984 (W)	-1.0 (-1%)	-0.8 (-1%)	-0.9 (-1%)	-0.7 (-1%)	-0.6 (-1%)	0.1 (0%)
1985 (D)	-0.3 (0%)	0.0 (0%)	-0.3 (0%)	0.0 (0%)	0.0 (0%)	0.2 (0%)
1986 (W)	-0.3 (0%)	-0.3 (0%)	-0.3 (0%)	-0.2 (0%)	-0.3 (0%)	-0.2 (0%)
1987 (D)	0.1 (0%)	0.6 (1%)	0.1 (0%)	0.6 (1%)	0.1 (0%)	0.3 (0%)
1988 (C)	-0.3 (0%)	-0.3 (0%)	-0.2 (0%)	-0.3 (0%)	-0.3 (0%)	-0.1 (0%)
1989 (D)	0.6 (1%)	0.4 (1%)	0.6 (1%)	0.5 (1%)	0.5 (1%)	0.2 (0%)
1990 (C)	-0.4 (-1%)	-0.6 (-1%)	-0.4 (0%)	-0.6 (-1%)	-0.2 (0%)	-0.2 (0%)
1991 (C)	-0.4 (0%)	-0.4 (0%)	-0.3 (0%)	-0.3 (0%)	-0.3 (0%)	-0.2 (0%)
Average	-0.6 (-1%)	-0.6 (-1%)	-0.5 (-1%)	-0.5 (-1%)	-0.4 (0%)	-0.3 (0%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-46. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving from Steamboat/ Sutter Sloughs to Delta Cross Channel/Georgiana Slough, Based on Delta Passage Model Results

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Percentage of Fish Entering Georgiana Slough and the Delta Cross Channel

The percentage of smolt fall-run Chinook salmon entering Georgiana Slough and the Delta Cross Channel averaged 62% under the PP scenarios and 60%–62% under the EBC scenarios (Table C.5.3-83, Figure C.5.3-47). Differences in the percentage of fish entering Georgiana Slough and the Delta Cross Channel between the PP and EBC scenarios ranged from an 11.8% reduction under PP_LLT (compared to EBC1 in 1976) to an 8.7% increase under PP_LLT (compared to EBC1 in 1982, and excluding 1975) (Table C.5.3-84). Averaged across all years, the percentage of fish entering Georgiana Slough and the Delta Cross Channel was higher under the PP scenarios, averaging 0.2%–2.5% higher than the EBC scenarios (Table C.5.3-68).

Table C.5.3-83. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Entering Georgiana Slough and the Delta Cross Channel, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	46.2	46.3	47.7	49.2	56.7	58.4
1976 (C)	72.2	72.1	63.6	62.4	64.8	60.4
1977 (C)	74.6	74.2	74.3	75.9	74.4	74.5
1978 (AN)	50.1	50.6	52.9	54.8	57.3	58.0
1979 (BN)	57.6	58.4	60.5	63.0	62.2	63.7
1980 (AN)	57.7	57.9	59.9	61.7	62.5	62.8
1981 (D)	64.9	65.0	66.5	66.2	65.4	63.2
1982 (W)	42.3	42.4	43.9	46.2	49.9	51.0
1983 (W)	37.5	37.6	37.9	39.4	39.5	41.9
1984 (W)	61.5	61.8	63.2	65.8	65.4	64.2
1985 (D)	62.7	62.6	64.8	64.1	63.8	61.6
1986 (W)	58.9	59.8	62.3	65.6	64.1	63.8
1987 (D)	64.3	64.4	63.9	62.6	63.6	60.0
1988 (C)	66.2	66.8	66.7	68.0	67.3	66.8
1989 (D)	57.8	57.8	57.4	57.1	55.0	55.4
1990 (C)	68.2	68.3	69.7	70.3	70.4	69.6
1991 (C)	70.8	71.0	71.8	72.5	73.1	72.8
Average	59.6	59.8	60.4	61.5	62.1	61.7

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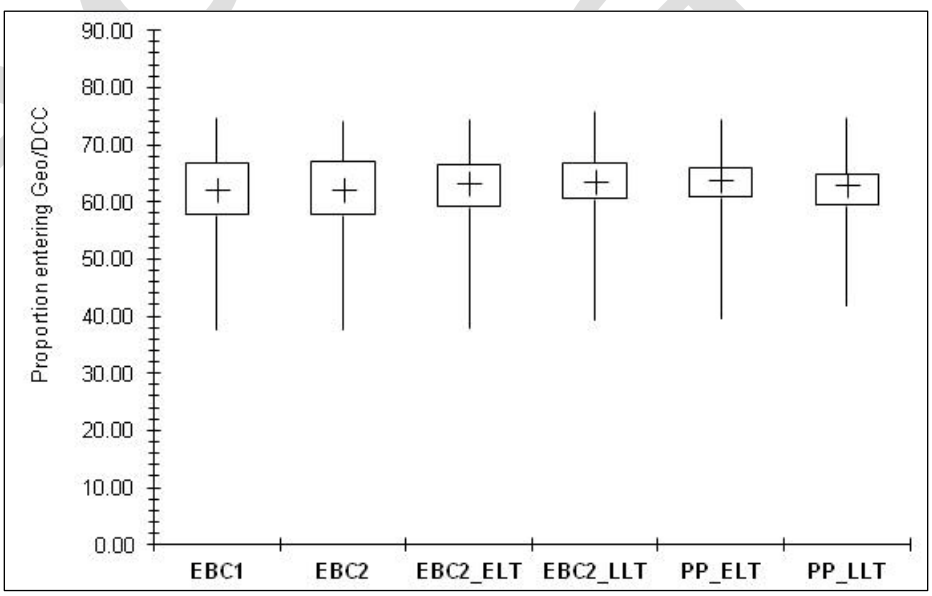
Table C.5.3-84. Difference between Scenarios in Percentage of Sacramento Fall-Run Chinook Salmon Smolts Entering Georgiana Slough and the Delta Cross Channel (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	10.5 (23%)	12.3 (27%)	10.4 (22%)	12.1 (26%)	9.0 (19%)	9.2 (19%)
1976 (C)	-7.5 (-10%)	-11.8 (-16%)	-7.4 (-10%)	-11.7 (-16%)	1.2 (2%)	-2.0 (-3%)
1977 (C)	-0.3 (0%)	-0.1 (0%)	0.2 (0%)	0.4 (0%)	0.1 (0%)	-1.3 (-2%)
1978 (AN)	7.3 (15%)	7.9 (16%)	6.7 (13%)	7.4 (15%)	4.4 (8%)	3.2 (6%)
1979 (BN)	4.7 (8%)	6.1 (11%)	3.8 (7%)	5.3 (9%)	1.7 (3%)	0.7 (1%)
1980 (AN)	4.8 (8%)	5.1 (9%)	4.6 (8%)	4.9 (8%)	2.6 (4%)	1.1 (2%)
1981 (D)	0.5 (1%)	-1.7 (-3%)	0.4 (1%)	-1.8 (-3%)	-1.1 (-2%)	-3.0 (-5%)
1982 (W)	7.6 (18%)	8.7 (21%)	7.5 (18%)	8.6 (20%)	6.1 (14%)	4.8 (10%)
1983 (W)	2.0 (5%)	4.4 (12%)	2.0 (5%)	4.3 (12%)	1.6 (4%)	2.5 (6%)
1984 (W)	3.9 (6%)	2.7 (4%)	3.6 (6%)	2.3 (4%)	2.2 (4%)	-1.7 (-3%)
1985 (D)	1.1 (2%)	-1.1 (-2%)	1.2 (2%)	-1.0 (-2%)	-1.0 (-2%)	-2.5 (-4%)
1986 (W)	5.1 (9%)	4.9 (8%)	4.3 (7%)	4.0 (7%)	1.7 (3%)	-1.8 (-3%)
1987 (D)	-0.8 (-1%)	-4.4 (-7%)	-0.8 (-1%)	-4.4 (-7%)	-0.4 (-1%)	-2.6 (-4%)
1988 (C)	1.1 (2%)	0.6 (1%)	0.5 (1%)	0.0 (0%)	0.6 (1%)	-1.2 (-2%)
1989 (D)	-2.7 (-5%)	-2.3 (-4%)	-2.8 (-5%)	-2.4 (-4%)	-2.4 (-4%)	-1.6 (-3%)
1990 (C)	2.2 (3%)	1.5 (2%)	2.1 (3%)	1.4 (2%)	0.7 (1%)	-0.7 (-1%)
1991 (C)	2.3 (3%)	2.0 (3%)	2.1 (3%)	1.7 (2%)	1.3 (2%)	0.3 (0%)
Average	2.5 (4%)	2.0 (3%)	2.3 (4%)	1.8 (3%)	1.7 (3%)	0.2 (0%)

Note: Negative values indicate lower percentage entry into Georgiana Slough/Delta Cross Channel under PP scenarios than under EBC scenarios.



Box and whisker plot shows entry distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage entry.

Figure C.5.3-47. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Entering Georgiana Slough and the Delta Cross Channel, Based on Delta Passage Model Results

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Sacramento River Survival from Delta Cross Channel/Georgiana Slough to Rio Vista (Reach SAC3)

Survival of fall-run Chinook salmon smolts in the SAC3 reach (Delta Cross Channel/Georgiana Slough to Rio Vista) averaged 47% under the PP scenarios and 48%–49% under the EBC scenarios (Table C.5.3-85; Figure C.5.3-48). Survival was lower under the PP scenarios in nearly all years, averaging 1%–2% lower over the entire period (Table C.5.3-86). Differences between the PP and EBC scenarios ranged from 6.4% lower in survival under PP_LLT (compared to EBC1 in 1982) to 3.5% higher survival under PP_LLT (compared to EBC1 in 1976).

Table C.5.3-85. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving from Delta Cross Channel/Georgiana Slough to Rio Vista, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	61.4	61.2	60.2	58.7	54.2	53.5
1976 (C)	39.8	40.2	42.1	43.0	41.3	43.3
1977 (C)	41.4	40.7	40.4	41.8	40.7	41.2
1978 (AN)	52.0	51.7	50.7	49.5	46.6	46.1
1979 (BN)	44.6	44.3	43.6	43.0	42.8	42.4
1980 (AN)	56.4	56.3	56.1	55.7	55.3	55.0
1981 (D)	50.5	50.6	49.8	50.2	50.2	50.6
1982 (W)	55.6	55.5	54.3	52.4	50.0	49.2
1983 (W)	61.6	61.6	61.6	60.3	60.0	57.0
1984 (W)	45.4	45.3	44.8	44.4	44.0	44.1
1985 (D)	50.5	50.5	50.2	49.9	50.1	50.3
1986 (W)	50.0	49.9	49.5	46.4	48.7	47.8
1987 (D)	43.5	43.7	43.9	43.1	43.9	43.7
1988 (C)	40.7	40.5	41.0	40.3	40.6	40.6
1989 (D)	48.2	48.1	48.6	48.9	49.4	48.7
1990 (C)	47.5	47.7	46.7	46.3	46.2	45.7
1991 (C)	40.8	41.0	40.7	40.9	40.1	40.3
Average	48.8	48.8	48.5	47.9	47.3	47.0

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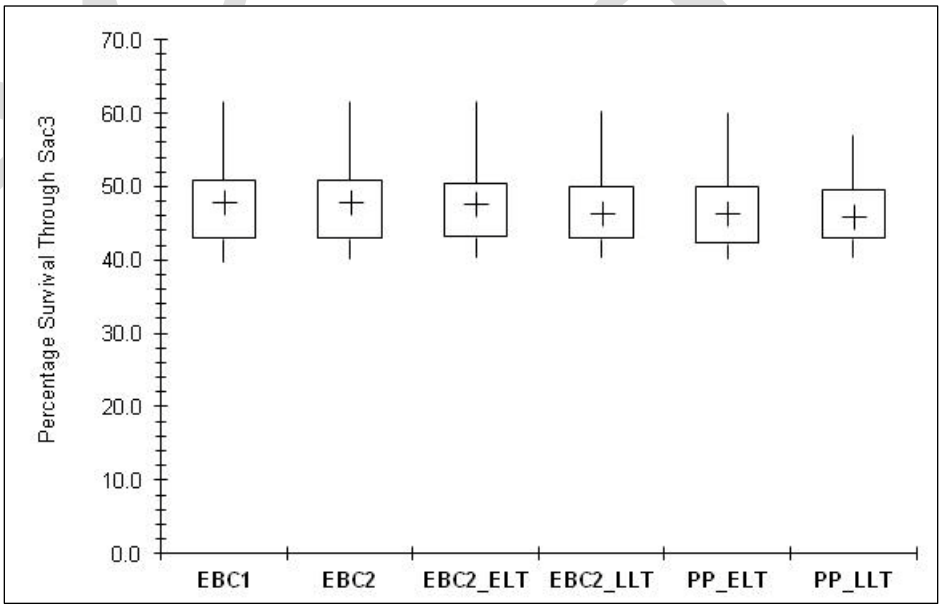
Table C.5.3-86. Difference between Scenarios in Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving from Delta Cross Channel/Georgiana Slough to Rio Vista (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-7.1 (-12%)	-7.9 (-13%)	-6.9 (-11%)	-7.7 (-13%)	-5.9 (-10%)	-5.2 (-9%)
1976 (C)	1.5 (4%)	3.5 (9%)	1.1 (3%)	3.0 (8%)	-0.7 (-2%)	0.3 (1%)
1977 (C)	-0.7 (-2%)	-0.2 (-1%)	0.0 (0%)	0.5 (1%)	0.3 (1%)	-0.6 (-1%)
1978 (AN)	-5.4 (-10%)	-5.9 (-11%)	-5.1 (-10%)	-5.6 (-11%)	-4.1 (-8%)	-3.4 (-7%)
1979 (BN)	-1.8 (-4%)	-2.2 (-5%)	-1.5 (-3%)	-1.9 (-4%)	-0.8 (-2%)	-0.6 (-1%)
1980 (AN)	-1.1 (-2%)	-1.4 (-2%)	-1.1 (-2%)	-1.3 (-2%)	-0.9 (-2%)	-0.7 (-1%)
1981 (D)	-0.3 (-1%)	0.1 (0%)	-0.3 (-1%)	0.0 (0%)	0.4 (1%)	0.3 (1%)
1982 (W)	-5.5 (-10%)	-6.4 (-12%)	-5.5 (-10%)	-6.3 (-11%)	-4.3 (-8%)	-3.2 (-6%)
1983 (W)	-1.7 (-3%)	-4.6 (-8%)	-1.7 (-3%)	-4.6 (-8%)	-1.7 (-3%)	-3.3 (-5%)
1984 (W)	-1.4 (-3%)	-1.4 (-3%)	-1.3 (-3%)	-1.2 (-3%)	-0.8 (-2%)	-0.3 (-1%)
1985 (D)	-0.4 (-1%)	-0.2 (0%)	-0.4 (-1%)	-0.2 (0%)	-0.1 (0%)	0.4 (1%)
1986 (W)	-1.3 (-3%)	-2.2 (-4%)	-1.2 (-2%)	-2.1 (-4%)	-0.8 (-2%)	1.4 (3%)
1987 (D)	0.4 (1%)	0.3 (1%)	0.2 (0%)	0.0 (0%)	0.0 (0%)	0.7 (2%)
1988 (C)	-0.1 (0%)	-0.2 (0%)	0.2 (0%)	0.1 (0%)	-0.4 (-1%)	0.3 (1%)
1989 (D)	1.2 (2%)	0.5 (1%)	1.3 (3%)	0.5 (1%)	0.8 (2%)	-0.2 (0%)
1990 (C)	-1.3 (-3%)	-1.8 (-4%)	-1.5 (-3%)	-2.0 (-4%)	-0.5 (-1%)	-0.6 (-1%)
1991 (C)	-0.7 (-2%)	-0.4 (-1%)	-0.9 (-2%)	-0.7 (-2%)	-0.6 (-1%)	-0.5 (-1%)
Average	-1.5 (-3%)	-1.8 (-4%)	-1.5 (-3%)	-1.7 (-4%)	-1.2 (-2%)	-0.9 (-2%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-48. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving from Delta Cross Channel/Georgiana Slough to Rio Vista, Based on Delta Passage Model Results

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Survival in the Interior Delta

Survival of smolt fall-run Chinook salmon in the interior Delta under the PP scenarios averaged 22% and ranged from 15%–37% (Table C.5.3-87, Table C.5.3-88, Figure C.5.3-49). Average survival under the EBC scenarios was similar (22%–23%) but the range was smaller (15%–31%). Averaged across years, the differences in survival between the PP and EBC scenarios were small (0.1%–0.6%). The differences in maximum survival are attributable to relatively large differences in survival in 1982–1983 associated with reductions in south Delta export pumping under the PP scenarios.

Table C.5.3-87. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving through the Interior Delta, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	33.2	33.1	32.3	31.2	25.6	24.6
1976 (C)	15.2	15.3	17.8	18.2	17.2	17.4
1977 (C)	21.5	22.1	22.2	21.4	21.6	21.9
1978 (AN)	19.3	19.1	17.9	17.2	20.6	20.1
1979 (BN)	26.3	26.2	26.0	27.1	21.2	22.4
1980 (AN)	25.5	25.6	24.8	24.4	22.7	22.2
1981 (D)	24.7	25.0	24.7	25.0	22.9	22.8
1982 (W)	16.0	16.1	15.3	14.5	22.6	20.8
1983 (W)	26.5	23.9	23.8	23.0	36.9	34.1
1984 (W)	20.4	20.3	20.1	20.0	17.8	18.4
1985 (D)	23.4	23.4	22.8	23.6	20.6	22.9
1986 (W)	22.2	22.1	20.9	21.0	20.2	20.9
1987 (D)	22.3	22.1	22.1	22.9	19.8	20.5
1988 (C)	15.3	15.4	15.6	15.5	15.4	15.5
1989 (D)	29.9	30.0	30.4	31.1	29.0	32.6
1990 (C)	27.6	27.7	27.2	27.0	26.7	26.3
1991 (C)	16.5	16.4	16.4	16.5	15.1	15.2
Average	22.7	22.6	22.4	22.3	22.1	22.3

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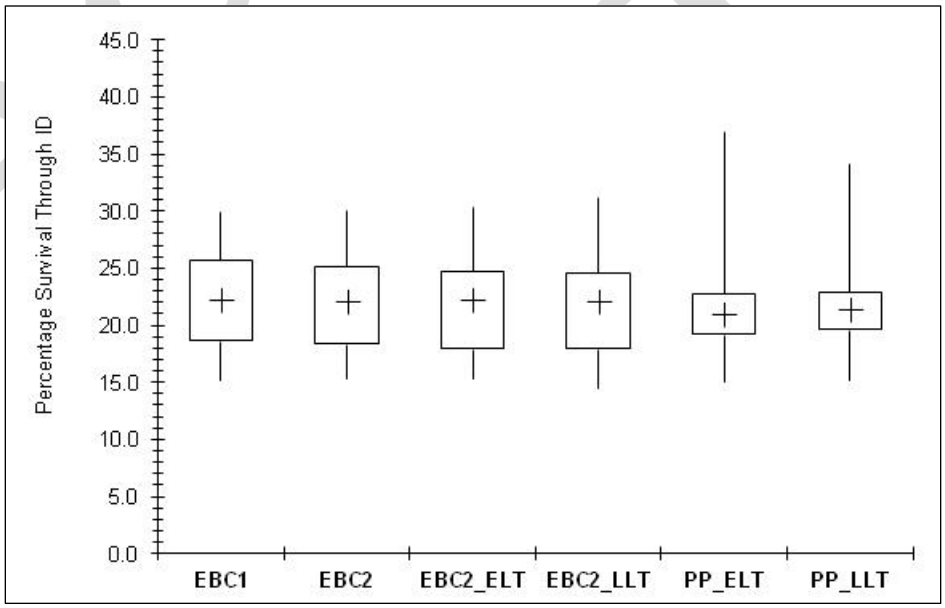
Table C.5.3-88. Difference between Scenarios in Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving through the Interior Delta (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-7.6 (-23%)	-8.7 (-26%)	-7.5 (-23%)	-8.5 (-26%)	-6.7 (-21%)	-6.6 (-21%)
1976 (C)	2.0 (13%)	2.2 (14%)	2.0 (13%)	2.1 (14%)	-0.6 (-3%)	-0.8 (-4%)
1977 (C)	0.1 (1%)	0.4 (2%)	-0.5 (-2%)	-0.2 (-1%)	-0.6 (-3%)	0.5 (2%)
1978 (AN)	1.3 (7%)	0.8 (4%)	1.5 (8%)	1.0 (5%)	2.7 (15%)	2.9 (17%)
1979 (BN)	-5.0 (-19%)	-3.8 (-14%)	-4.9 (-19%)	-3.7 (-14%)	-4.7 (-18%)	-4.7 (-17%)
1980 (AN)	-2.7 (-11%)	-3.3 (-13%)	-2.8 (-11%)	-3.4 (-13%)	-2.1 (-8%)	-2.2 (-9%)
1981 (D)	-1.9 (-8%)	-1.9 (-8%)	-2.1 (-9%)	-2.2 (-9%)	-1.8 (-7%)	-2.2 (-9%)
1982 (W)	6.6 (41%)	4.7 (29%)	6.5 (40%)	4.7 (29%)	7.3 (47%)	6.3 (44%)
1983 (W)	10.4 (39%)	7.6 (29%)	13.0 (55%)	10.3 (43%)	13.2 (55%)	11.2 (49%)
1984 (W)	-2.5 (-12%)	-2.0 (-10%)	-2.4 (-12%)	-1.9 (-9%)	-2.3 (-11%)	-1.6 (-8%)
1985 (D)	-2.7 (-12%)	-0.4 (-2%)	-2.8 (-12%)	-0.5 (-2%)	-2.1 (-9%)	-0.6 (-3%)
1986 (W)	-1.9 (-9%)	-1.3 (-6%)	-1.8 (-8%)	-1.2 (-6%)	-0.6 (-3%)	-0.2 (-1%)
1987 (D)	-2.5 (-11%)	-1.8 (-8%)	-2.3 (-11%)	-1.6 (-7%)	-2.4 (-11%)	-2.4 (-10%)
1988 (C)	0.1 (1%)	0.3 (2%)	0.0 (0%)	0.2 (1%)	-0.2 (-1%)	0.0 (0%)
1989 (D)	-0.9 (-3%)	2.7 (9%)	-1.0 (-3%)	2.6 (9%)	-1.3 (-4%)	1.5 (5%)
1990 (C)	-0.9 (-3%)	-1.3 (-5%)	-1.1 (-4%)	-1.5 (-5%)	-0.5 (-2%)	-0.7 (-3%)
1991 (C)	-1.5 (-9%)	-1.3 (-8%)	-1.3 (-8%)	-1.2 (-7%)	-1.4 (-8%)	-1.3 (-8%)
Average	-0.6 (-3%)	-0.4 (-2%)	-0.4 (-2%)	-0.3 (-1%)	-0.3 (-1%)	-0.1 (0%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-49. Sacramento Fall-Run Chinook Salmon Smolt Survival through the Interior Delta, Based on Delta Passage Model Results

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Late Fall–Run Chinook Salmon (Sacramento River)

Overall Survival through the Delta

Overall survival of migrating smolt late fall–run Chinook salmon through the Delta under the PP scenarios averaged around 15% and ranged from 11%–25% (Table C.5.3-89, Table C.5.3-73Figure C.5.3-50). Overall smolt survival through the Delta under the EBC scenarios was similar, averaging 15% and ranging from 11%–27%. Differences in survival ranged from 5.0% lower survival under PP_LLT (compared with EBC1 in 1983) to 2.5% higher survival under PP_LLT (compared with EBC1 in 1979) (Table C.5.3-90). Averaged across all years, overall Delta survival under the PP scenarios was 0.1%–0.9% lower than the EBC scenarios.

Table C.5.3-89. Percentage of Sacramento River Late Fall-Run Chinook Salmon Smolts Surviving through the Delta, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	13.5	16.4	16.1	16.2	12.0	13.1
1976 (C)	12.3	13.6	12.8	12.8	11.2	14.0
1977 (C)	10.7	10.5	10.9	11.4	11.2	11.4
1978 (AN)	12.9	13.1	13.3	13.7	12.6	13.6
1979 (BN)	11.7	12.8	12.8	13.0	11.7	14.2
1980 (AN)	13.4	13.1	13.1	13.3	12.7	14.4
1981 (D)	13.6	14.4	14.6	14.6	13.3	14.6
1982 (W)	20.8	20.7	20.9	21.7	20.8	20.4
1983 (W)	26.9	26.0	24.4	23.0	23.0	21.9
1984 (W)	25.4	26.3	26.2	25.6	24.9	24.9
1985 (D)	17.9	17.6	17.4	17.1	15.9	15.5
1986 (W)	13.1	13.5	13.3	13.7	12.8	15.0
1987 (D)	11.0	12.4	12.5	12.9	10.9	11.6
1988 (C)	14.5	14.3	14.2	14.6	14.2	15.0
1989 (D)	12.7	12.6	12.6	13.0	12.7	13.2
1990 (C)	12.0	12.1	12.3	12.4	14.0	13.8
1991 (C)	11.0	11.0	10.8	11.0	11.1	11.6
Average	14.9	15.3	15.2	15.3	14.4	15.2

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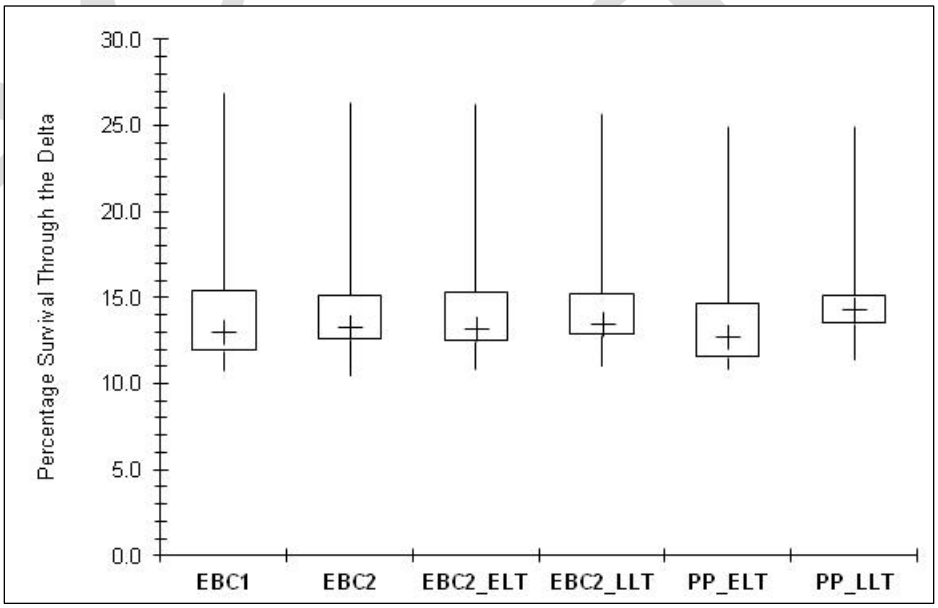
Table C.5.3-90. Difference between Scenarios in Percentage of Sacramento River Late Fall-Run Chinook Salmon Smolts Surviving through the Delta (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-1.5 (-11%)	-0.3 (-3%)	-4.4 (-27%)	-3.3 (-20%)	-4.1 (-25%)	-3.1 (-19%)
1976 (C)	-1.1 (-9%)	1.6 (13%)	-2.4 (-17%)	0.4 (3%)	-1.6 (-13%)	1.1 (9%)
1977 (C)	0.5 (4%)	0.7 (6%)	0.7 (7%)	0.9 (9%)	0.3 (3%)	0.0 (0%)
1978 (AN)	-0.3 (-2%)	0.7 (6%)	-0.5 (-4%)	0.5 (4%)	-0.7 (-6%)	-0.1 (-1%)
1979 (BN)	0.1 (1%)	2.5 (22%)	-1.0 (-8%)	1.4 (11%)	-1.0 (-8%)	1.2 (9%)
1980 (AN)	-0.8 (-6%)	1.0 (7%)	-0.5 (-4%)	1.3 (10%)	-0.4 (-3%)	1.1 (8%)
1981 (D)	-0.3 (-2%)	1.0 (7%)	-1.0 (-7%)	0.3 (2%)	-1.3 (-9%)	0.0 (0%)
1982 (W)	0.0 (0%)	-0.4 (-2%)	0.2 (1%)	-0.3 (-1%)	-0.1 (-1%)	-1.3 (-6%)
1983 (W)	-3.9 (-15%)	-5.0 (-19%)	-3.0 (-12%)	-4.1 (-16%)	-1.4 (-6%)	-1.2 (-5%)
1984 (W)	-0.5 (-2%)	-0.5 (-2%)	-1.4 (-5%)	-1.4 (-5%)	-1.2 (-5%)	-0.7 (-3%)
1985 (D)	-2.0 (-11%)	-2.4 (-13%)	-1.7 (-10%)	-2.1 (-12%)	-1.5 (-9%)	-1.6 (-9%)
1986 (W)	-0.4 (-3%)	1.9 (15%)	-0.7 (-5%)	1.6 (12%)	-0.6 (-4%)	1.3 (10%)
1987 (D)	-0.2 (-2%)	0.6 (5%)	-1.5 (-12%)	-0.7 (-6%)	-1.6 (-13%)	-1.3 (-10%)
1988 (C)	-0.3 (-2%)	0.5 (3%)	-0.1 (-1%)	0.7 (5%)	0.0 (0%)	0.4 (3%)
1989 (D)	0.1 (1%)	0.6 (4%)	0.1 (1%)	0.6 (5%)	0.2 (1%)	0.2 (2%)
1990 (C)	2.0 (17%)	1.8 (15%)	1.9 (16%)	1.7 (14%)	1.7 (14%)	1.4 (11%)
1991 (C)	0.1 (1%)	0.6 (6%)	0.1 (1%)	0.6 (6%)	0.3 (3%)	0.6 (5%)
Average	-0.5 (-3%)	0.3 (2%)	-0.9 (-6%)	-0.1 (-1%)	-0.8 (-5%)	-0.1 (-1%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-50. Sacramento River Late Fall-Run Chinook Salmon through-Delta Smolt Survival, Based on Delta Passage Model Results

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Percentage of Fish Entering the Yolo Bypass

Increases in inundation of the Yolo Bypass associated with modifications of the Fremont Weir had relatively small effects on the percentage of late fall–run Chinook salmon entering the Yolo Bypass because peak emigration of smolts occurs in the fall before the period of peak winter flows in the Sacramento River. Averaged across all years, the percentage of late fall–run Chinook salmon entering the Yolo Bypass under the PP scenarios was around 2%, an increase of approximately 0.5% over that under the EBC scenarios (Table C.5.3-91, Table C.5.3-92, Figure C.5.3-51). This increase reflects the relatively large differences in percent spills over the Fremont Weir in wet years 1982–1984.

Table C.5.3-91. Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Entering the Yolo Bypass, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	0.1	0.0	0.0	0.0	0.2	0.2
1976 (C)	0.0	0.0	0.0	0.0	0.0	0.0
1977 (C)	0.0	0.0	0.0	0.0	0.0	0.0
1978 (AN)	0.9	0.9	0.9	1.1	1.4	2.0
1979 (BN)	0.0	0.0	0.0	0.0	0.3	0.3
1980 (AN)	1.6	1.5	1.6	1.3	2.5	2.4
1981 (D)	0.1	0.1	0.1	0.1	0.3	0.3
1982 (W)	5.2	4.7	5.7	4.6	7.1	5.7
1983 (W)	2.8	2.8	3.2	2.8	5.1	5.0
1984 (W)	11.6	11.6	13.7	12.8	14.4	13.9
1985 (D)	0.0	0.3	0.0	0.0	0.5	0.0
1986 (W)	0.5	0.5	0.5	0.5	0.8	0.8
1987 (D)	0.0	0.0	0.0	0.0	0.0	0.0
1988 (C)	0.3	0.4	0.3	0.3	1.1	1.1
1989 (D)	0.0	0.0	0.0	0.0	0.0	0.0
1990 (C)	0.0	0.0	0.0	0.0	0.1	0.1
1991 (C)	0.0	0.0	0.0	0.0	0.0	0.0
Average	1.4	1.3	1.5	1.4	2.0	1.9

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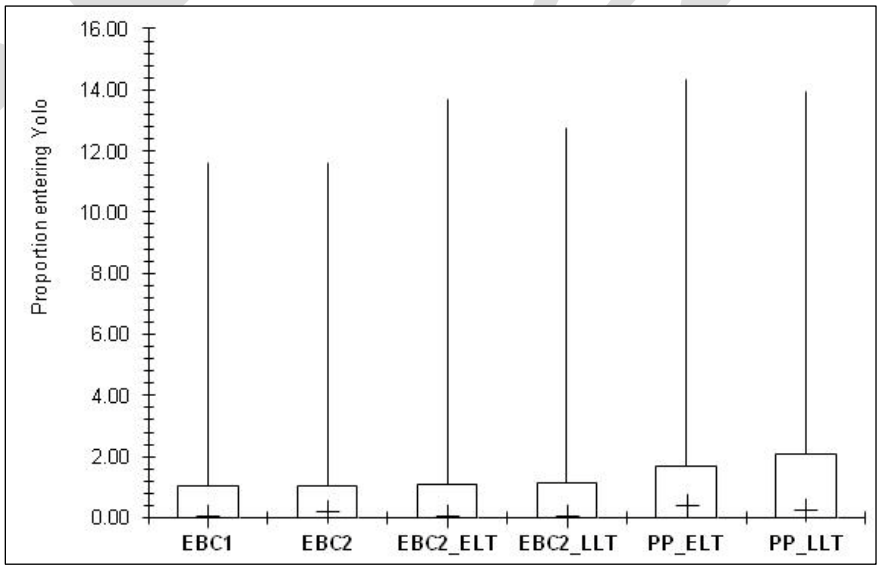
Table C.5.3-92. Difference between Scenarios in Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Entering the Yolo Bypass (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	0.1 (122%)	0.1 (98%)	0.1 (268%)	0.1 (229%)	0.1 (363%)	0.1 (274%)
1976 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1977 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1978 (AN)	0.6 (64%)	1.1 (131%)	0.6 (63%)	1.1 (129%)	0.5 (58%)	0.9 (80%)
1979 (BN)	0.3 (789436285%)	0.3 (871389871%)	0.3 (789436285%)	0.3 (871389871%)	0.2 (1287%)	0.3 (871389871%)
1980 (AN)	0.9 (57%)	0.7 (46%)	1.0 (63%)	0.8 (52%)	0.9 (58%)	1.0 (79%)
1981 (D)	0.2 (185%)	0.2 (154%)	0.2 (161%)	0.1 (133%)	0.2 (194%)	0.1 (140%)
1982 (W)	1.9 (36%)	0.4 (8%)	2.4 (52%)	1.0 (21%)	1.4 (24%)	1.0 (23%)
1983 (W)	2.3 (81%)	2.2 (77%)	2.3 (80%)	2.2 (76%)	1.9 (59%)	2.2 (77%)
1984 (W)	2.8 (24%)	2.3 (20%)	2.7 (24%)	2.3 (20%)	0.6 (5%)	1.2 (9%)
1985 (D)	0.5 (1587489890%)	0.0 (0%)	0.2 (59%)	-0.3 (-100%)	0.5 (1587489890%)	0.0 (0%)
1986 (W)	0.3 (53%)	0.3 (57%)	0.3 (55%)	0.3 (58%)	0.2 (47%)	0.2 (44%)
1987 (D)	0.0 (61189237%)	0.0 (60959593%)	0.0 (61189237%)	0.0 (60959593%)	0.0 (61189237%)	0.0 (60959593%)
1988 (C)	0.8 (236%)	0.7 (234%)	0.7 (206%)	0.7 (204%)	0.8 (252%)	0.7 (208%)
1989 (D)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1990 (C)	0.1 (210551176%)	0.1 (221883496%)	0.1 (210551176%)	0.1 (221883496%)	0.1 (210551176%)	0.1 (221883496%)
1991 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
Average	0.6 (46%)	0.5 (36%)	0.6 (47%)	0.5 (38%)	0.4 (29%)	0.5 (33%)

Note: Positive values indicate greater percentage entry into Yolo Bypass under PP scenarios than under EBC scenarios.



Box and whisker plot shows entry distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage entry.

Figure C.5.3-51. Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Entering the Yolo Bypass, Based on Delta Passage Model Results

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Sacramento River Survival from Freeport to Steamboat/Sutter Sloughs (Reach SAC1)

The survival of smolt late fall–run Chinook salmon in the SAC1 reach (Freeport to Steamboat/Sutter Sloughs) averaged 76%–77% under the PP scenarios and 77%–78% under the EBC scenarios (Table C.5.3-93, Figure C.5.3-52). Survival was lower under the PP scenarios than under the EBC scenarios in most years. Differences in survival between the PP and EBC scenarios ranged from 5.6% lower survival under PP_LLT (compared to EBC1 in) to 1.5% higher survival under PP_LLT (compared to EBC2 in 1990) (Table C.5.3-94). Averaged over all years, survival under the PP scenarios was 0.8%–1.5% lower than under the EBC scenarios.

Table C.5.3-93. Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving from Freeport to Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	77.6	79.3	78.7	78.9	75.2	76.3
1976 (C)	76.8	77.2	76.4	76.1	75.0	76.9
1977 (C)	72.7	72.3	72.5	72.7	73.2	72.5
1978 (AN)	77.1	78.1	78.0	78.3	75.8	76.4
1979 (BN)	76.5	76.7	76.6	76.6	75.6	77.6
1980 (AN)	77.6	77.6	77.4	77.6	75.9	77.3
1981 (D)	76.7	77.0	77.0	76.5	75.8	76.6
1982 (W)	82.4	82.3	82.6	83.2	80.9	80.3
1983 (W)	84.7	84.1	82.7	81.6	79.6	79.1
1984 (W)	84.1	85.4	85.2	84.7	80.9	80.9
1985 (D)	78.7	77.8	77.7	76.9	76.3	76.1
1986 (W)	75.5	76.2	76.1	76.6	74.8	76.6
1987 (D)	76.2	75.9	75.8	76.1	75.3	75.5
1988 (C)	75.7	75.4	75.3	75.5	75.2	76.8
1989 (D)	75.8	75.9	75.8	75.8	75.7	74.2
1990 (C)	73.6	73.4	74.0	73.7	74.5	74.9
1991 (C)	75.4	75.5	75.3	74.9	75.4	74.8
Average	77.5	77.7	77.5	77.4	76.2	76.6

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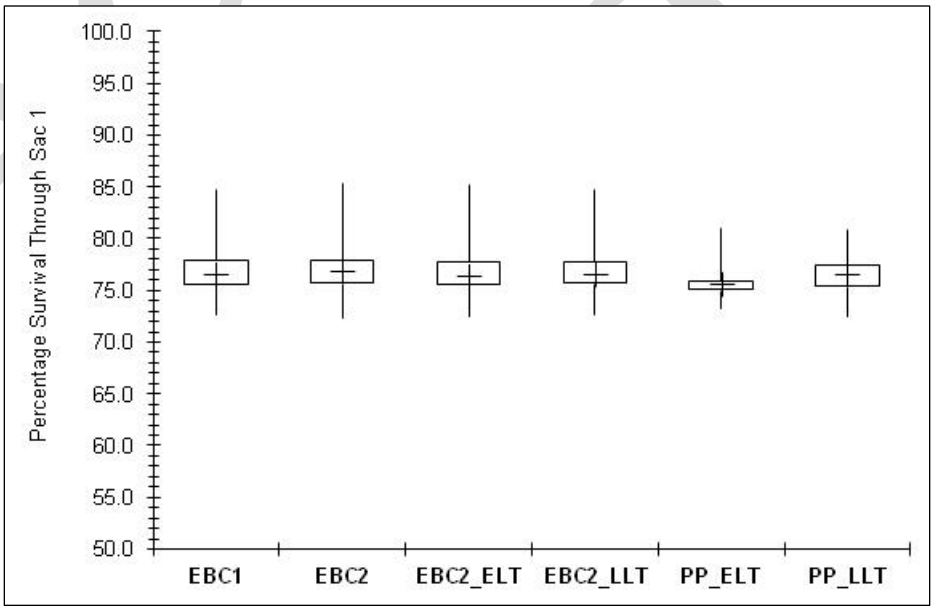
Table C.5.3-94. Difference between Scenarios in Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving from Freeport to Steamboat/Sutter Sloughs (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-2.5 (-3%)	-1.3 (-2%)	-4.2 (-5%)	-3.0 (-4%)	-3.5 (-4%)	-2.6 (-3%)
1976 (C)	-1.8 (-2%)	0.1 (0%)	-2.1 (-3%)	-0.3 (0%)	-1.4 (-2%)	0.8 (1%)
1977 (C)	0.5 (1%)	-0.2 (0%)	0.9 (1%)	0.2 (0%)	0.7 (1%)	-0.2 (0%)
1978 (AN)	-1.3 (-2%)	-0.6 (-1%)	-2.4 (-3%)	-1.7 (-2%)	-2.3 (-3%)	-1.9 (-2%)
1979 (BN)	-0.9 (-1%)	1.1 (1%)	-1.1 (-1%)	0.9 (1%)	-0.9 (-1%)	1.0 (1%)
1980 (AN)	-1.8 (-2%)	-0.3 (0%)	-1.8 (-2%)	-0.3 (0%)	-1.6 (-2%)	-0.3 (0%)
1981 (D)	-0.9 (-1%)	-0.1 (0%)	-1.1 (-1%)	-0.4 (0%)	-1.2 (-2%)	0.1 (0%)
1982 (W)	-1.6 (-2%)	-2.1 (-3%)	-1.5 (-2%)	-2.1 (-2%)	-1.7 (-2%)	-2.9 (-3%)
1983 (W)	-5.1 (-6%)	-5.6 (-7%)	-4.5 (-5%)	-5.0 (-6%)	-3.1 (-4%)	-2.5 (-3%)
1984 (W)	-3.1 (-4%)	-3.2 (-4%)	-4.4 (-5%)	-4.5 (-5%)	-4.2 (-5%)	-3.9 (-5%)
1985 (D)	-2.4 (-3%)	-2.7 (-3%)	-1.5 (-2%)	-1.8 (-2%)	-1.4 (-2%)	-0.8 (-1%)
1986 (W)	-0.6 (-1%)	1.1 (1%)	-1.4 (-2%)	0.3 (0%)	-1.3 (-2%)	-0.1 (0%)
1987 (D)	-0.9 (-1%)	-0.7 (-1%)	-0.5 (-1%)	-0.3 (0%)	-0.4 (-1%)	-0.6 (-1%)
1988 (C)	-0.5 (-1%)	1.1 (1%)	-0.2 (0%)	1.4 (2%)	-0.2 (0%)	1.3 (2%)
1989 (D)	-0.1 (0%)	-1.7 (-2%)	-0.2 (0%)	-1.7 (-2%)	-0.1 (0%)	-1.6 (-2%)
1990 (C)	1.0 (1%)	1.3 (2%)	1.1 (1%)	1.5 (2%)	0.5 (1%)	1.2 (2%)
1991 (C)	0.0 (0%)	-0.7 (-1%)	-0.1 (0%)	-0.7 (-1%)	0.1 (0%)	-0.2 (0%)
Average	-1.3 (-2%)	-0.9 (-1%)	-1.5 (-2%)	-1.0 (-1%)	-1.3 (-2%)	-0.8 (-1%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-52. Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving from Freeport to Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

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Survival in Steamboat and Sutter Sloughs

Survival of smolt late fall–run Chinook salmon in Steamboat and Sutter Sloughs averaged 46% under the PP scenarios and 47% under the EBC scenarios (Table C.5.3-95, Figure C.5.3-53). Survival under the PP scenarios was lower than under the EBC scenarios in most years. Differences in survival between the PP and EBC scenarios ranged from 4.4% lower survival under PP_ELT (compared to EBC1 in 1983) to 3.1% higher survival under PP_ELT (compared to EBC1 in 1990) (Table C.5.3-96). Averaged over all years, survival under the PP scenarios was 0.8%–1.5% lower than under the EBC scenarios.

Table C.5.3-95. Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving in Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	39.4	43.7	43.2	42.7	36.9	38.2
1976 (C)	45.0	46.3	45.8	45.7	42.9	46.5
1977 (C)	43.5	43.5	43.1	44.1	43.4	42.6
1978 (AN)	43.7	43.3	43.8	44.3	42.8	42.3
1979 (BN)	44.2	45.0	44.7	45.0	43.4	45.5
1980 (AN)	45.2	45.3	45.1	44.9	43.6	44.6
1981 (D)	45.6	46.0	46.2	46.0	44.6	45.0
1982 (W)	55.8	55.7	55.6	55.2	54.4	53.0
1983 (W)	59.4	58.9	58.2	58.4	55.0	55.1
1984 (W)	56.6	57.1	56.7	56.0	54.4	54.0
1985 (D)	51.7	51.3	51.0	50.2	50.0	49.3
1986 (W)	47.0	47.1	46.8	46.7	45.6	47.4
1987 (D)	44.2	45.6	45.1	45.8	43.6	43.4
1988 (C)	45.9	44.9	44.8	45.3	45.1	44.1
1989 (D)	45.3	44.9	44.5	45.8	45.0	45.4
1990 (C)	45.1	46.2	45.8	46.5	48.2	47.4
1991 (C)	42.1	41.3	41.3	41.4	41.4	41.9
Average	47.0	47.4	47.2	47.3	45.9	46.2

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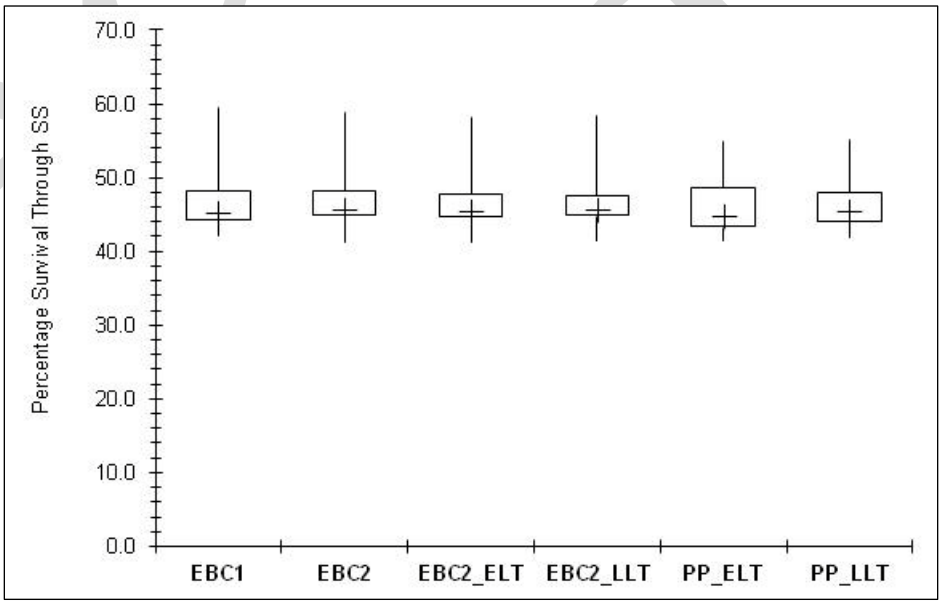
Table C.5.3-96. Difference between Scenarios in Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving in Steamboat/Sutter Sloughs (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-2.5 (-6%)	-1.2 (-3%)	-6.7 (-15%)	-5.5 (-13%)	-6.3 (-14%)	-4.6 (-11%)
1976 (C)	-2.1 (-5%)	1.5 (3%)	-3.4 (-7%)	0.2 (0%)	-2.8 (-6%)	0.8 (2%)
1977 (C)	-0.1 (0%)	-0.8 (-2%)	-0.2 (0%)	-0.9 (-2%)	0.3 (1%)	-1.5 (-3%)
1978 (AN)	-0.9 (-2%)	-1.4 (-3%)	-0.4 (-1%)	-1.0 (-2%)	-0.9 (-2%)	-2.0 (-5%)
1979 (BN)	-0.8 (-2%)	1.3 (3%)	-1.6 (-4%)	0.5 (1%)	-1.4 (-3%)	0.5 (1%)
1980 (AN)	-1.7 (-4%)	-0.7 (-1%)	-1.7 (-4%)	-0.7 (-2%)	-1.5 (-3%)	-0.3 (-1%)
1981 (D)	-1.0 (-2%)	-0.6 (-1%)	-1.3 (-3%)	-1.0 (-2%)	-1.6 (-3%)	-1.0 (-2%)
1982 (W)	-1.5 (-3%)	-2.8 (-5%)	-1.3 (-2%)	-2.7 (-5%)	-1.3 (-2%)	-2.2 (-4%)
1983 (W)	-4.4 (-7%)	-4.3 (-7%)	-3.9 (-7%)	-3.8 (-6%)	-3.2 (-6%)	-3.3 (-6%)
1984 (W)	-2.2 (-4%)	-2.6 (-5%)	-2.7 (-5%)	-3.1 (-5%)	-2.3 (-4%)	-2.0 (-4%)
1985 (D)	-1.7 (-3%)	-2.4 (-5%)	-1.3 (-3%)	-2.0 (-4%)	-1.0 (-2%)	-0.9 (-2%)
1986 (W)	-1.4 (-3%)	0.4 (1%)	-1.5 (-3%)	0.3 (1%)	-1.2 (-3%)	0.7 (2%)
1987 (D)	-0.7 (-2%)	-0.8 (-2%)	-2.1 (-5%)	-2.2 (-5%)	-1.6 (-3%)	-2.4 (-5%)
1988 (C)	-0.8 (-2%)	-1.7 (-4%)	0.2 (0%)	-0.8 (-2%)	0.3 (1%)	-1.1 (-3%)
1989 (D)	-0.2 (-1%)	0.1 (0%)	0.2 (0%)	0.5 (1%)	0.5 (1%)	-0.4 (-1%)
1990 (C)	3.1 (7%)	2.3 (5%)	2.0 (4%)	1.2 (3%)	2.4 (5%)	0.9 (2%)
1991 (C)	-0.7 (-2%)	-0.3 (-1%)	0.1 (0%)	0.6 (1%)	0.1 (0%)	0.5 (1%)
Average	-1.1 (-2%)	-0.8 (-2%)	-1.5 (-3%)	-1.2 (-3%)	-1.3 (-3%)	-1.1 (-2%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-53. Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving in Steamboat/Sutter Sloughs, Based on Delta Passage Model Results

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Sacramento River Survival from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough (Reach SAC2)

Survival of smolt late fall–run Chinook salmon in the SAC2 reach (Steamboat/Sutter Slough to Delta Cross Channel/Georgiana Slough) under the PP scenarios averaged 89% and ranged from 87%–91% (Table C.5.3-97, Figure C.5.3-54). Average survival under the PP scenarios was slightly lower than under the EBC scenarios (0.3%–0.7%) (Table C.5.3-98).

Table C.5.3-97. Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	89.1	89.9	89.5	89.7	87.5	88.0
1976 (C)	88.7	89.0	88.6	88.4	88.1	89.4
1977 (C)	88.7	88.4	88.5	88.2	88.4	88.4
1978 (AN)	88.0	88.0	87.9	88.8	88.0	88.0
1979 (BN)	88.6	89.5	89.6	89.4	88.6	89.4
1980 (AN)	89.4	89.5	89.5	89.5	88.6	89.3
1981 (D)	88.3	88.3	88.4	88.2	87.8	88.4
1982 (W)	89.1	89.2	89.1	89.5	88.6	88.5
1983 (W)	93.7	93.4	92.8	92.0	91.4	90.9
1984 (W)	90.4	91.7	91.5	91.3	88.6	88.6
1985 (D)	91.0	90.1	90.2	90.1	90.8	90.7
1986 (W)	89.8	90.0	89.7	89.7	88.9	89.7
1987 (D)	88.2	88.2	88.1	88.3	87.8	87.9
1988 (C)	89.2	88.7	88.6	88.7	88.5	88.0
1989 (D)	87.5	87.6	87.6	87.5	87.5	88.2
1990 (C)	88.9	89.1	89.5	89.2	89.8	89.6
1991 (C)	86.9	86.9	86.8	87.0	86.8	87.0
Average	89.1	89.3	89.2	89.1	88.6	88.8

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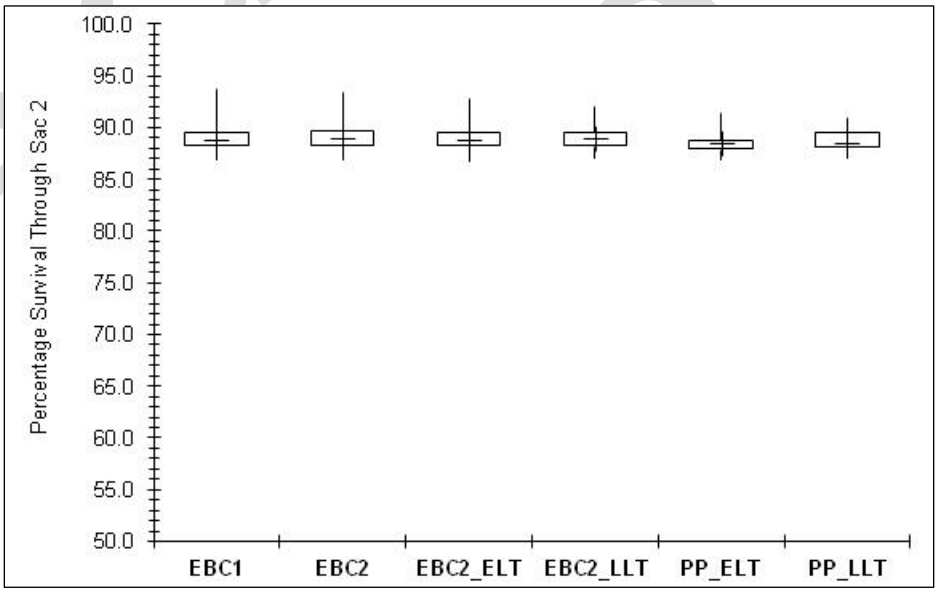
Table C.5.3-98. Difference between Scenarios in Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-1.6 (-2%)	-1.2 (-1%)	-2.4 (-3%)	-1.9 (-2%)	-2.1 (-2%)	-1.7 (-2%)
1976 (C)	-0.7 (-1%)	0.6 (1%)	-0.9 (-1%)	0.4 (0%)	-0.6 (-1%)	0.9 (1%)
1977 (C)	-0.3 (0%)	-0.3 (0%)	-0.1 (0%)	0.0 (0%)	-0.1 (0%)	0.2 (0%)
1978 (AN)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.1 (0%)	-0.8 (-1%)
1979 (BN)	-0.1 (0%)	0.8 (1%)	-1.0 (-1%)	-0.1 (0%)	-1.0 (-1%)	0.0 (0%)
1980 (AN)	-0.8 (-1%)	-0.1 (0%)	-0.9 (-1%)	-0.2 (0%)	-0.9 (-1%)	-0.2 (0%)
1981 (D)	-0.5 (-1%)	0.1 (0%)	-0.6 (-1%)	0.1 (0%)	-0.6 (-1%)	0.2 (0%)
1982 (W)	-0.5 (-1%)	-0.5 (-1%)	-0.6 (-1%)	-0.6 (-1%)	-0.6 (-1%)	-1.0 (-1%)
1983 (W)	-2.3 (-2%)	-2.7 (-3%)	-2.0 (-2%)	-2.5 (-3%)	-1.3 (-1%)	-1.1 (-1%)
1984 (W)	-1.8 (-2%)	-1.8 (-2%)	-3.1 (-3%)	-3.1 (-3%)	-3.0 (-3%)	-2.8 (-3%)
1985 (D)	-0.2 (0%)	-0.3 (0%)	0.7 (1%)	0.6 (1%)	0.5 (1%)	0.6 (1%)
1986 (W)	-0.8 (-1%)	-0.1 (0%)	-1.1 (-1%)	-0.4 (0%)	-0.8 (-1%)	0.0 (0%)
1987 (D)	-0.4 (0%)	-0.3 (0%)	-0.4 (0%)	-0.3 (0%)	-0.4 (0%)	-0.4 (0%)
1988 (C)	-0.6 (-1%)	-1.1 (-1%)	-0.2 (0%)	-0.7 (-1%)	-0.1 (0%)	-0.7 (-1%)
1989 (D)	-0.1 (0%)	0.6 (1%)	-0.1 (0%)	0.6 (1%)	-0.1 (0%)	0.7 (1%)
1990 (C)	0.9 (1%)	0.7 (1%)	0.7 (1%)	0.5 (1%)	0.3 (0%)	0.5 (1%)
1991 (C)	-0.1 (0%)	0.1 (0%)	0.0 (0%)	0.2 (0%)	0.0 (0%)	0.0 (0%)
Average	-0.6 (-1%)	-0.3 (0%)	-0.7 (-1%)	-0.4 (0%)	-0.6 (-1%)	-0.3 (0%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-54. Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving from Steamboat/Sutter Sloughs to Delta Cross Channel/Georgiana Slough, Based on Delta Passage Model Results

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Percentage of Fish Entering Georgiana Slough and the Delta Cross Channel

The percentage of late fall–run Chinook salmon entering Georgiana Slough and the Delta Cross Channel averaged 66% under PP_ELT and 64% under PP_LLT (Table C.5.3-99, Figure C.5.3-55). These percentages were 0.6%–3.9% higher than the averages under the EBC scenarios (Table C.5.3-100). Differences in the percentage of fish entering Georgiana Slough and the Delta Cross Channel between the PP and EBC scenarios ranged from a 6.1% reduction under PP_LLT (compared to EBC2_LLT in 1990) to a 13.1% increase under PP_LLT (compared to EBC1 in 1983).

Table C.5.3-99. Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Entering Georgiana Slough and the Delta Cross Channel, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	59.8	55.0	57.1	56.3	68.2	63.1
1976 (C)	62.0	60.1	62.3	63.3	68.8	61.2
1977 (C)	71.8	73.8	73.2	71.9	70.5	70.7
1978 (AN)	68.6	67.8	68.8	68.6	70.2	69.6
1979 (BN)	67.1	63.7	64.3	63.9	69.9	62.0
1980 (AN)	61.2	60.9	62.0	61.0	66.5	61.0
1981 (D)	66.0	64.6	64.1	65.7	68.5	64.2
1982 (W)	54.7	54.5	54.4	52.5	57.9	58.2
1983 (W)	43.9	44.9	47.8	51.1	55.1	57.0
1984 (W)	47.7	45.0	45.5	46.3	55.9	55.3
1985 (D)	55.9	57.9	57.1	58.3	62.8	61.9
1986 (W)	64.4	62.7	64.1	63.6	67.2	60.3
1987 (D)	67.5	66.6	67.2	65.8	69.7	67.2
1988 (C)	65.6	67.8	68.2	67.7	66.5	63.9
1989 (D)	71.0	70.7	71.2	70.6	70.0	70.4
1990 (C)	68.6	69.5	67.3	70.2	63.9	64.1
1991 (C)	75.2	75.0	76.1	76.3	74.5	73.2
Average	63.0	62.4	63.0	63.1	66.2	63.7

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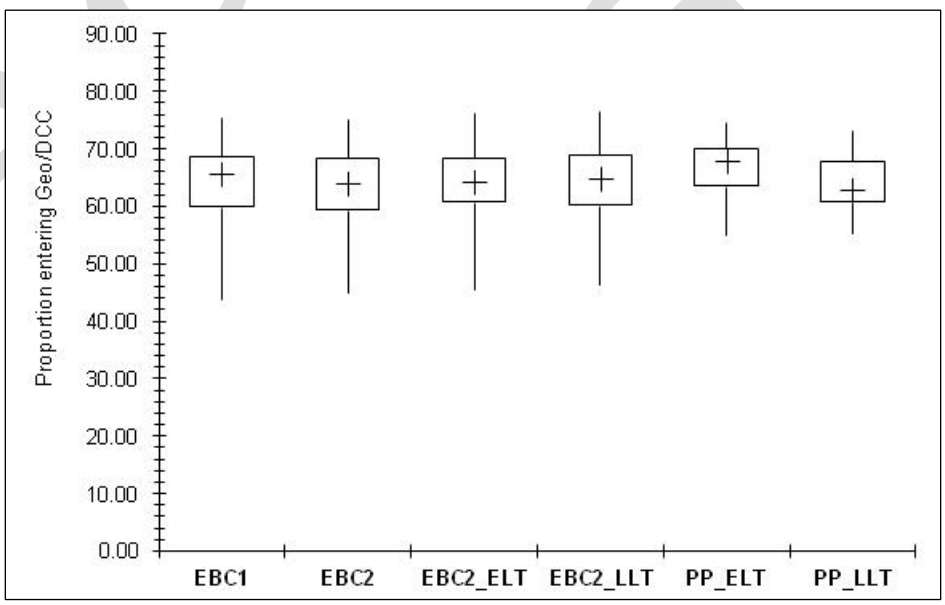
Table C.5.3-100. Difference between Scenarios in Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Entering Georgiana Slough and the Delta Cross Channel (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	8.4 (14%)	3.3 (5%)	13.2 (24%)	8.1 (15%)	11.2 (20%)	6.8 (12%)
1976 (C)	6.8 (11%)	-0.7 (-1%)	8.8 (15%)	1.2 (2%)	6.5 (11%)	-2.1 (-3%)
1977 (C)	-1.3 (-2%)	-1.1 (-2%)	-3.4 (-5%)	-3.2 (-4%)	-2.7 (-4%)	-1.2 (-2%)
1978 (AN)	1.6 (2%)	1.0 (1%)	2.4 (4%)	1.8 (3%)	1.4 (2%)	1.0 (1%)
1979 (BN)	2.8 (4%)	-5.1 (-8%)	6.2 (10%)	-1.7 (-3%)	5.6 (9%)	-2.0 (-3%)
1980 (AN)	5.3 (9%)	-0.2 (0%)	5.6 (9%)	0.1 (0%)	4.5 (7%)	0.0 (0%)
1981 (D)	2.5 (4%)	-1.8 (-3%)	4.0 (6%)	-0.4 (-1%)	4.4 (7%)	-1.6 (-2%)
1982 (W)	3.3 (6%)	3.6 (7%)	3.4 (6%)	3.8 (7%)	3.5 (6%)	5.7 (11%)
1983 (W)	11.2 (26%)	13.1 (30%)	10.2 (23%)	12.1 (27%)	7.3 (15%)	5.9 (11%)
1984 (W)	8.2 (17%)	7.6 (16%)	10.8 (24%)	10.3 (23%)	10.4 (23%)	9.0 (19%)
1985 (D)	6.9 (12%)	6.0 (11%)	4.8 (8%)	3.9 (7%)	5.6 (10%)	3.6 (6%)
1986 (W)	2.8 (4%)	-4.0 (-6%)	4.4 (7%)	-2.4 (-4%)	3.0 (5%)	-3.2 (-5%)
1987 (D)	2.3 (3%)	-0.2 (0%)	3.1 (5%)	0.6 (1%)	2.6 (4%)	1.4 (2%)
1988 (C)	0.8 (1%)	-1.7 (-3%)	-1.4 (-2%)	-3.9 (-6%)	-1.7 (-3%)	-3.8 (-6%)
1989 (D)	-1.0 (-1%)	-0.6 (-1%)	-0.6 (-1%)	-0.3 (0%)	-1.2 (-2%)	-0.2 (0%)
1990 (C)	-4.6 (-7%)	-4.5 (-7%)	-5.6 (-8%)	-5.4 (-8%)	-3.4 (-5%)	-6.1 (-9%)
1991 (C)	-0.7 (-1%)	-2.0 (-3%)	-0.6 (-1%)	-1.9 (-2%)	-1.6 (-2%)	-3.2 (-4%)
Average	3.3 (5%)	0.7 (1%)	3.9 (6%)	1.3 (2%)	3.3 (5%)	0.6 (1%)

Note: Negative values indicate lower percentage entry into Georgiana Slough/Delta Cross Channel under PP scenarios than under EBC scenarios.



Box and whisker plot shows entry distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage entry.

Figure C.5.3-55. Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Entering Georgiana Slough and the Delta Cross Channel, Based on Delta Passage Model Results

Note to Reader: This is a revised working draft prepared by the BDCP consultants. This document is currently undergoing review by the Department of Water Resources with input from the Department of Fish and Game, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and U.S. Bureau of Reclamation and does not necessarily reflect the position of the state or federal agencies. It is expected to go through several more revisions prior to being released for formal public review and comment in 2012. All members of the public will have an opportunity to provide comments on the public draft of a revised version of this document during the formal public review and comment period. Responses will be prepared only on comments submitted in the formal public review and comment period.

Sacramento River Survival from Delta Cross Channel/Georgiana Slough to Rio Vista (Reach SAC3)

Survival of late fall–run Chinook salmon smolts in the SAC3 reach (Delta Cross Channel/Georgiana Slough to Rio Vista) averaged 48% under the PP scenarios and 49% under the EBC scenarios (Table C.5.3-101, Figure C.5.3-56). Survival was lower under the PP scenarios in most years, averaging 0.4%–1.1% lower than the EBC scenarios (Table C.5.3-102). Differences between the PP and EBC scenarios ranged from 4.0% lower survival under PP_ELT (compared to EBC1 in 1983) to 2.5% higher survival under PP_LLT (compared to EBC2_LLT in 1976).

Table C.5.3-101. Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving from Delta Cross Channel/Georgiana Slough to Rio Vista, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	51.1	52.4	52.0	51.9	50.5	50.5
1976 (C)	41.4	42.0	41.3	41.0	39.6	43.5
1977 (C)	44.1	43.6	43.8	45.2	44.4	44.0
1978 (AN)	46.0	45.6	46.3	46.0	44.7	45.6
1979 (BN)	45.5	46.7	46.7	46.8	45.0	47.4
1980 (AN)	47.5	47.3	47.4	47.1	46.3	46.9
1981 (D)	49.6	49.7	49.9	49.5	48.4	49.2
1982 (W)	52.2	52.4	52.3	52.7	51.8	52.3
1983 (W)	55.4	55.0	53.9	53.6	51.4	51.9
1984 (W)	60.8	60.5	59.8	59.6	59.9	59.7
1985 (D)	50.5	50.8	50.4	50.0	49.0	47.8
1986 (W)	49.3	49.4	49.4	49.6	48.2	50.0
1987 (D)	45.5	45.7	45.5	45.9	44.3	44.8
1988 (C)	50.4	49.2	49.2	49.2	48.8	48.6
1989 (D)	45.5	45.8	46.0	45.1	45.0	44.9
1990 (C)	48.3	47.8	48.2	47.4	48.1	46.8
1991 (C)	44.4	45.0	44.8	44.7	44.6	44.8
Average	48.7	48.8	48.7	48.5	47.7	48.2

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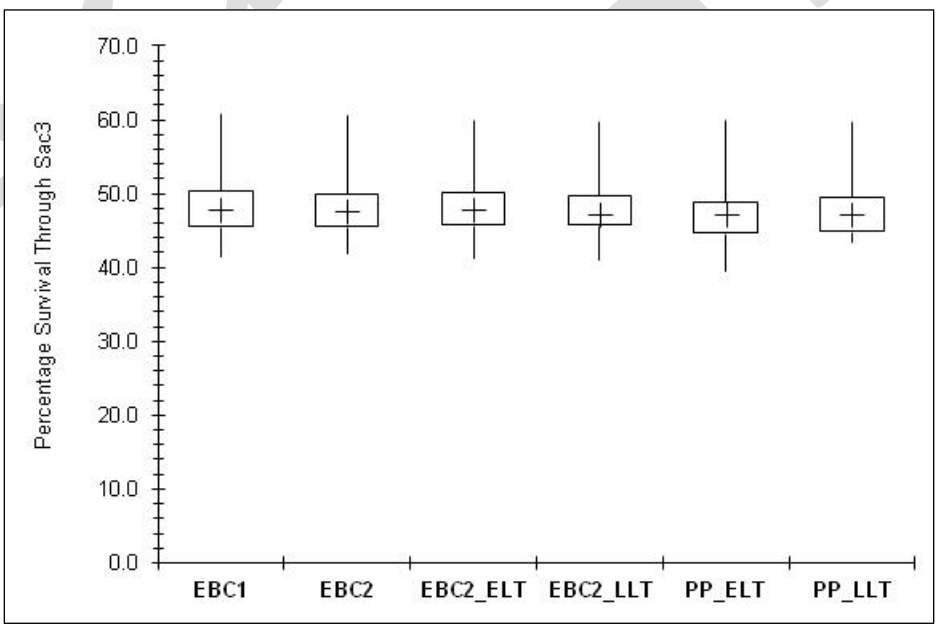
Table C.5.3-102. Difference between Scenarios in Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving from Delta Cross Channel/Georgiana Slough to Rio Vista (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-0.6 (-1%)	-0.6 (-1%)	-1.9 (-4%)	-1.9 (-4%)	-1.5 (-3%)	-1.3 (-3%)
1976 (C)	-1.8 (-4%)	2.1 (5%)	-2.4 (-6%)	1.5 (4%)	-1.7 (-4%)	2.5 (6%)
1977 (C)	0.2 (1%)	-0.2 (0%)	0.8 (2%)	0.4 (1%)	0.6 (1%)	-1.2 (-3%)
1978 (AN)	-1.3 (-3%)	-0.4 (-1%)	-0.9 (-2%)	0.0 (0%)	-1.6 (-3%)	-0.4 (-1%)
1979 (BN)	-0.5 (-1%)	1.9 (4%)	-1.6 (-4%)	0.7 (2%)	-1.6 (-4%)	0.6 (1%)
1980 (AN)	-1.2 (-2%)	-0.5 (-1%)	-1.0 (-2%)	-0.3 (-1%)	-1.1 (-2%)	-0.2 (0%)
1981 (D)	-1.2 (-2%)	-0.4 (-1%)	-1.3 (-3%)	-0.5 (-1%)	-1.5 (-3%)	-0.3 (-1%)
1982 (W)	-0.4 (-1%)	0.2 (0%)	-0.6 (-1%)	0.0 (0%)	-0.5 (-1%)	-0.4 (-1%)
1983 (W)	-4.0 (-7%)	-3.5 (-6%)	-3.5 (-6%)	-3.1 (-6%)	-2.5 (-5%)	-1.7 (-3%)
1984 (W)	-1.0 (-2%)	-1.1 (-2%)	-0.7 (-1%)	-0.8 (-1%)	0.1 (0%)	0.1 (0%)
1985 (D)	-1.5 (-3%)	-2.7 (-5%)	-1.8 (-4%)	-3.0 (-6%)	-1.4 (-3%)	-2.1 (-4%)
1986 (W)	-1.1 (-2%)	0.7 (1%)	-1.2 (-2%)	0.6 (1%)	-1.2 (-2%)	0.4 (1%)
1987 (D)	-1.2 (-3%)	-0.7 (-2%)	-1.4 (-3%)	-0.9 (-2%)	-1.2 (-3%)	-1.1 (-2%)
1988 (C)	-1.6 (-3%)	-1.8 (-4%)	-0.4 (-1%)	-0.7 (-1%)	-0.4 (-1%)	-0.6 (-1%)
1989 (D)	-0.5 (-1%)	-0.6 (-1%)	-0.8 (-2%)	-0.9 (-2%)	-1.0 (-2%)	-0.2 (0%)
1990 (C)	-0.1 (0%)	-1.4 (-3%)	0.3 (1%)	-1.0 (-2%)	-0.1 (0%)	-0.5 (-1%)
1991 (C)	0.2 (0%)	0.4 (1%)	-0.4 (-1%)	-0.1 (0%)	-0.2 (0%)	0.1 (0%)
Average	-1.0 (-2%)	-0.5 (-1%)	-1.1 (-2%)	-0.6 (-1%)	-1.0 (-2%)	-0.4 (-1%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-56. Percentage of Sacramento Fall-Run Chinook Salmon Smolts Surviving from Delta Cross Channel/Georgiana Slough to Rio Vista, Based on Delta Passage Model Results

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Survival in the Interior Delta

Survival of smolt late fall–run Chinook salmon in the interior Delta under the PP scenarios averaged 18% and ranged from 14%–27% (Table C.5.3-103, Figure C.5.3-57). Average survival under the EBC scenarios was 16%–17% and ranged from 12%–20%. Survival in the interior Delta under the PP scenarios was higher in most years, averaging 1.1%–2.7% higher than the EBC scenarios (Table C.5.3-104). Differences in survival between the PP and EBC scenarios ranged from 3.1% lower survival under PP_ELT (compared to EBC2_ELT in 1987) to 10.2% higher survival under PP_ELT (compared to EBC2_ELT in 1984).

Table C.5.3-103. Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving through the Interior Delta, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	13.7	15.9	17.6	17.9	17.0	17.1
1976 (C)	11.7	13.1	13.1	14.0	13.7	14.5
1977 (C)	16.6	17.1	17.9	17.9	17.7	18.8
1978 (AN)	14.8	14.8	15.5	15.7	15.1	17.3
1979 (BN)	14.3	15.0	15.4	15.8	17.1	17.2
1980 (AN)	13.7	12.5	13.2	13.8	14.7	17.3
1981 (D)	15.6	18.1	17.8	19.3	17.7	18.5
1982 (W)	17.7	17.4	17.8	19.6	19.3	19.5
1983 (W)	19.8	18.1	16.8	15.8	24.5	20.0
1984 (W)	17.0	16.7	16.4	17.1	26.6	26.5
1985 (D)	15.0	15.6	15.4	16.8	15.4	15.4
1986 (W)	14.7	14.6	15.2	16.0	16.4	17.6
1987 (D)	11.6	15.5	16.6	16.3	13.5	14.2
1988 (C)	16.5	18.6	18.4	19.3	17.5	18.6
1989 (D)	17.2	17.0	17.0	18.5	17.8	18.5
1990 (C)	15.5	15.8	15.3	17.0	18.0	18.1
1991 (C)	17.6	17.6	17.4	18.2	18.0	19.1
Average	15.5	16.1	16.3	17.0	17.6	18.1

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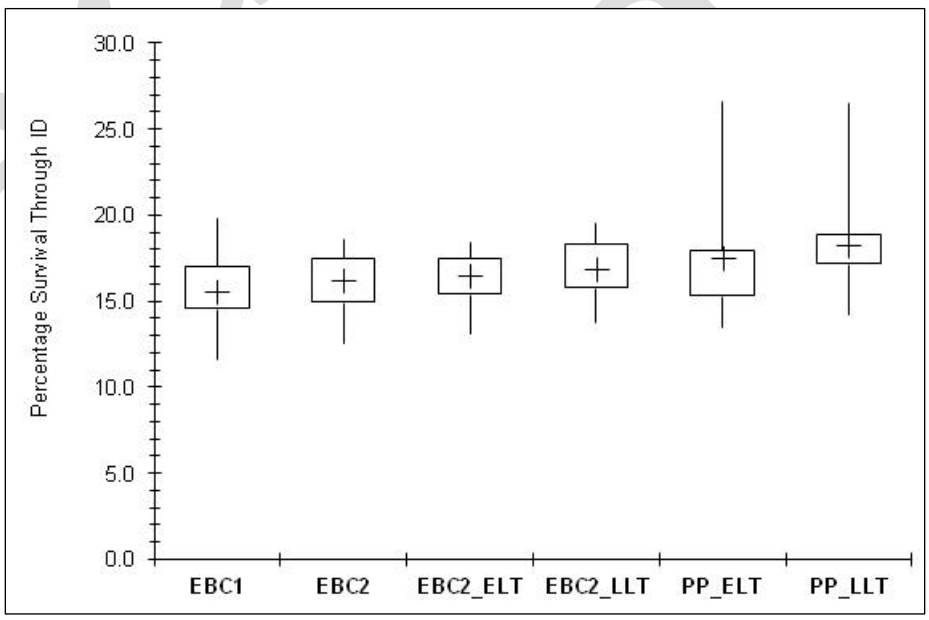
Table C.5.3-104. Difference between Scenarios in Percentage of Sacramento Late Fall-Run Chinook Salmon Smolts Surviving through the Interior Delta (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	3.3 (24%)	3.5 (25%)	1.0 (7%)	1.2 (8%)	-0.6 (-4%)	-0.8 (-4%)
1976 (C)	2.1 (18%)	2.8 (24%)	0.6 (5%)	1.4 (10%)	0.6 (5%)	0.4 (3%)
1977 (C)	1.1 (7%)	2.3 (14%)	0.6 (3%)	1.7 (10%)	-0.2 (-1%)	0.9 (5%)
1978 (AN)	0.3 (2%)	2.4 (16%)	0.3 (2%)	2.5 (17%)	-0.4 (-2%)	1.6 (10%)
1979 (BN)	2.8 (20%)	3.0 (21%)	2.1 (14%)	2.2 (15%)	1.6 (10%)	1.4 (9%)
1980 (AN)	1.1 (8%)	3.6 (27%)	2.2 (17%)	4.8 (38%)	1.5 (11%)	3.5 (25%)
1981 (D)	2.1 (13%)	2.9 (18%)	-0.4 (-2%)	0.4 (2%)	-0.1 (0%)	-0.9 (-4%)
1982 (W)	1.7 (9%)	1.8 (10%)	1.9 (11%)	2.1 (12%)	1.6 (9%)	-0.1 (0%)
1983 (W)	4.7 (23%)	0.2 (1%)	6.4 (35%)	1.9 (11%)	7.6 (45%)	4.2 (27%)
1984 (W)	9.6 (57%)	9.5 (56%)	9.9 (60%)	9.8 (59%)	10.2 (62%)	9.4 (55%)
1985 (D)	0.4 (2%)	0.3 (2%)	-0.3 (-2%)	-0.3 (-2%)	-0.1 (0%)	-1.5 (-9%)
1986 (W)	1.7 (11%)	2.9 (20%)	1.8 (12%)	3.0 (21%)	1.1 (7%)	1.6 (10%)
1987 (D)	1.9 (16%)	2.6 (22%)	-2.0 (-13%)	-1.3 (-8%)	-3.1 (-19%)	-2.1 (-13%)
1988 (C)	1.0 (6%)	2.2 (13%)	-1.1 (-6%)	0.0 (0%)	-1.0 (-5%)	-0.7 (-4%)
1989 (D)	0.6 (3%)	1.3 (8%)	0.8 (5%)	1.5 (9%)	0.9 (5%)	0.0 (0%)
1990 (C)	2.5 (16%)	2.6 (17%)	2.2 (14%)	2.3 (15%)	2.6 (17%)	1.1 (6%)
1991 (C)	0.5 (3%)	1.6 (9%)	0.5 (3%)	1.6 (9%)	0.7 (4%)	0.9 (5%)
Average	2.2 (14%)	2.7 (17%)	1.6 (10%)	2.0 (13%)	1.4 (8%)	1.1 (7%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-57. Sacramento Late Fall-Run Chinook Salmon Smolt Survival through the Interior Delta, Based on Delta Passage Model Results

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Fall-Run Chinook Salmon (San Joaquin River)

Overall Survival through the Delta

There was very little difference in overall Delta survival of San Joaquin River fall-run Chinook salmon smolts among the PP and EBC scenarios, averaging 14% across all years (Table C.5.3-105, Table C.5.3-106, Figure C.5.3-58). Survival ranged from 12% in some dry and critical water years (e.g., 1989, 1991) to 19% in the wettest years (1982 and 1983).

Table C.5.3-105. Percentage of San Joaquin River Fall-Run Chinook Salmon Smolts Surviving through the Delta, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	14.3	14.3	14.2	14.2	14.2	14.2
1976 (C)	13.2	13.2	13.1	12.8	13.1	13.6
1977 (C)	12.8	12.7	12.6	12.6	12.5	13.3
1978 (AN)	15.8	15.7	16.2	16.1	16.2	16.2
1979 (BN)	14.3	14.3	14.2	14.1	14.1	14.0
1980 (AN)	14.0	14.0	14.2	14.2	14.1	14.1
1981 (D)	14.2	14.3	14.0	13.8	13.9	14.2
1982 (W)	18.9	18.9	19.0	18.6	19.0	18.7
1983 (W)	19.2	19.2	19.4	19.6	19.4	19.7
1984 (W)	14.6	14.6	14.5	14.4	14.3	14.3
1985 (D)	14.2	14.2	14.3	13.7	14.2	14.1
1986 (W)	15.2	15.2	15.2	14.7	15.1	14.7
1987 (D)	12.7	12.6	12.5	12.4	12.5	12.9
1988 (C)	13.0	13.0	12.9	12.7	12.9	13.5
1989 (D)	12.0	12.0	11.8	11.7	11.5	12.6
1990 (C)	13.2	13.1	13.0	12.9	12.9	13.5
1991 (C)	12.0	11.9	11.8	11.6	11.5	12.2
Average	14.3	14.3	14.3	14.1	14.2	14.5

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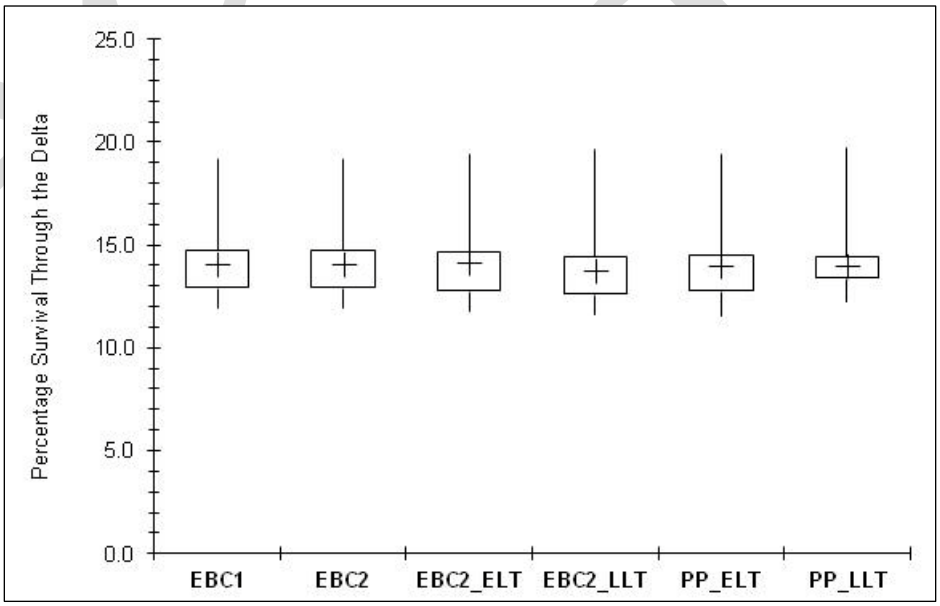
Table C.5.3-106. Difference between Scenarios in Percentage of San Joaquin River Fall-Run Chinook Salmon Smolts Surviving through the Delta (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-0.1 (0%)	-0.1 (-1%)	0.0 (0%)	-0.1 (-1%)	0.0 (0%)	0.0 (0%)
1976 (C)	-0.2 (-1%)	0.4 (3%)	-0.2 (-1%)	0.4 (3%)	0.0 (0%)	0.8 (6%)
1977 (C)	-0.3 (-2%)	0.5 (4%)	-0.2 (-2%)	0.6 (4%)	-0.1 (-1%)	0.7 (6%)
1978 (AN)	0.5 (3%)	0.4 (3%)	0.5 (3%)	0.4 (3%)	0.0 (0%)	0.0 (0%)
1979 (BN)	-0.2 (-1%)	-0.3 (-2%)	-0.2 (-1%)	-0.3 (-2%)	-0.1 (-1%)	-0.1 (-1%)
1980 (AN)	0.1 (1%)	0.1 (1%)	0.1 (1%)	0.1 (1%)	-0.1 (0%)	-0.1 (-1%)
1981 (D)	-0.4 (-3%)	-0.1 (0%)	-0.4 (-3%)	-0.1 (0%)	-0.2 (-1%)	0.4 (3%)
1982 (W)	0.1 (0%)	-0.2 (-1%)	0.1 (0%)	-0.2 (-1%)	0.0 (0%)	0.0 (0%)
1983 (W)	0.2 (1%)	0.5 (3%)	0.2 (1%)	0.5 (3%)	0.0 (0%)	0.1 (0%)
1984 (W)	-0.2 (-2%)	-0.2 (-2%)	-0.2 (-2%)	-0.2 (-2%)	-0.1 (-1%)	-0.1 (0%)
1985 (D)	0.1 (0%)	-0.1 (0%)	0.1 (0%)	0.0 (0%)	-0.1 (0%)	0.4 (3%)
1986 (W)	-0.1 (0%)	-0.5 (-3%)	-0.1 (0%)	-0.5 (-3%)	-0.1 (0%)	-0.1 (0%)
1987 (D)	-0.2 (-2%)	0.2 (2%)	-0.2 (-1%)	0.3 (2%)	-0.1 (-1%)	0.5 (4%)
1988 (C)	-0.2 (-1%)	0.4 (3%)	-0.2 (-1%)	0.4 (3%)	0.0 (0%)	0.8 (6%)
1989 (D)	-0.4 (-4%)	0.6 (5%)	-0.4 (-3%)	0.7 (6%)	-0.3 (-3%)	0.9 (8%)
1990 (C)	-0.3 (-2%)	0.3 (2%)	-0.2 (-2%)	0.3 (2%)	-0.2 (-1%)	0.5 (4%)
1991 (C)	-0.4 (-4%)	0.3 (2%)	-0.4 (-3%)	0.3 (3%)	-0.2 (-2%)	0.6 (5%)
Average	-0.1 (-1%)	0.1 (1%)	-0.1 (-1%)	0.2 (1%)	-0.1 (-1%)	0.3 (2%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-58. San Joaquin River Fall-Run Chinook Salmon Through-Delta Smolt Survival, Based on Delta Passage Model Results

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San Joaquin River Survival from Mossdale to Chipps Island

There was very little difference in survival of San Joaquin fall-run Chinook salmon smolts from Mossdale to Chipps Island between PP and EBC scenarios (Table C.5.3-107, Table C.5.3-108, Figure C.5.3-59). Survival averaged 19% under all scenarios and ranged from 17% in 1989 and 1991 (dry and critical years) to 24% in 1982 (wet year).

Table C.5.3-107. Percentage of San Joaquin River Fall-Run Chinook Salmon Smolts Surviving from Mossdale Chipps Island, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	19.5	19.5	19.5	19.5	19.5	19.6
1976 (C)	18.9	18.9	18.9	18.9	18.9	19.0
1977 (C)	17.6	17.6	17.6	17.6	17.5	17.6
1978 (AN)	21.4	21.4	21.9	21.9	21.9	22.0
1979 (BN)	18.8	18.8	18.7	18.5	18.7	18.5
1980 (AN)	18.4	18.4	18.7	18.7	18.6	18.7
1981 (D)	19.0	18.9	18.8	18.8	18.8	18.9
1982 (W)	24.4	24.4	24.5	24.1	24.5	24.2
1983 (W)	22.6	22.6	22.7	23.0	22.8	23.1
1984 (W)	19.2	19.2	19.1	19.0	19.0	19.1
1985 (D)	18.5	18.5	18.7	18.3	18.7	18.4
1986 (W)	20.3	20.3	20.2	19.3	20.2	19.3
1987 (D)	16.9	16.9	16.9	16.9	16.9	17.0
1988 (C)	17.9	17.9	17.9	17.9	17.9	18.0
1989 (D)	16.6	16.6	16.6	16.5	16.5	16.5
1990 (C)	17.8	17.7	17.7	17.6	17.7	17.7
1991 (C)	17.1	17.1	17.1	17.0	17.1	17.1
Average	19.1	19.1	19.1	19.0	19.1	19.1

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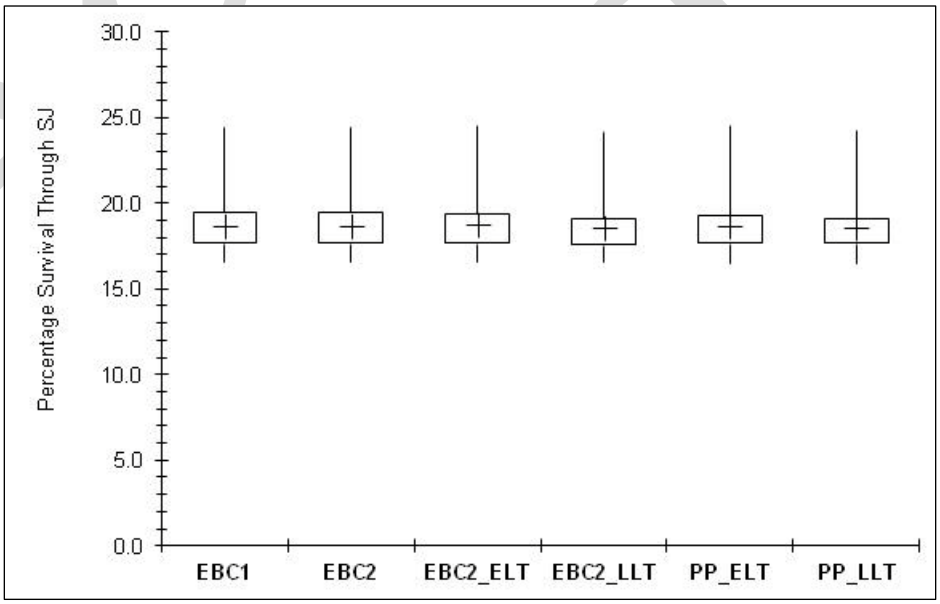
Table C.5.3-108. Difference between Scenarios in Percentage of San Joaquin River Fall-Run Chinook Salmon Smolts Surviving from Mossdale to Chipps Island (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1976 (C)	0.0 (0%)	0.0 (0%)	0.1 (0%)	0.1 (1%)	0.1 (0%)	0.1 (1%)
1977 (C)	-0.1 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1978 (AN)	0.5 (3%)	0.7 (3%)	0.6 (3%)	0.7 (3%)	0.0 (0%)	0.2 (1%)
1979 (BN)	-0.1 (-1%)	-0.3 (-2%)	-0.1 (0%)	-0.3 (-2%)	0.0 (0%)	0.0 (0%)
1980 (AN)	0.2 (1%)	0.3 (1%)	0.2 (1%)	0.3 (1%)	0.0 (0%)	0.0 (0%)
1981 (D)	-0.1 (-1%)	-0.1 (0%)	-0.1 (-1%)	0.0 (0%)	0.0 (0%)	0.1 (1%)
1982 (W)	0.1 (0%)	-0.2 (-1%)	0.1 (1%)	-0.2 (-1%)	0.1 (0%)	0.1 (0%)
1983 (W)	0.2 (1%)	0.5 (2%)	0.2 (1%)	0.5 (2%)	0.0 (0%)	0.1 (1%)
1984 (W)	-0.2 (-1%)	-0.1 (-1%)	-0.2 (-1%)	-0.1 (-1%)	0.0 (0%)	0.0 (0%)
1985 (D)	0.2 (1%)	-0.1 (-1%)	0.2 (1%)	-0.1 (-1%)	0.0 (0%)	0.1 (1%)
1986 (W)	-0.1 (-1%)	-1.0 (-5%)	-0.1 (-1%)	-0.9 (-5%)	0.0 (0%)	0.0 (0%)
1987 (D)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.1 (0%)	0.0 (0%)	0.1 (1%)
1988 (C)	-0.1 (0%)	0.1 (0%)	0.0 (0%)	0.1 (1%)	0.0 (0%)	0.2 (1%)
1989 (D)	-0.1 (-1%)	-0.1 (-1%)	-0.1 (-1%)	-0.1 (0%)	-0.1 (-1%)	0.0 (0%)
1990 (C)	-0.1 (0%)	-0.1 (0%)	-0.1 (0%)	-0.1 (0%)	0.0 (0%)	0.0 (0%)
1991 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.1 (1%)
Average	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.1 (0%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-59. San Joaquin River Fall-Run Chinook Salmon Smolt Survival from Mossdale to Chipps Island, Based on Delta Passage Model Results

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Percentage of San Joaquin River Fall-Run Chinook Salmon Smolts Entering Old River

The percentage of San Joaquin fall-run Chinook salmon entering Old River under PP_ELT averaged 56% and was 1.0%–1.8% higher than the average percentages entering Old River under EBC1, EBC2, and EBC2_ELT (Table C.5.3-109, Figure C.5.3-60). In contrast, the percentage of fish entering Old River under PP_LLT averaged 52% and was 1.6%–3.6% lower than the average percentages entering Old River under EBC1, EBC2, and EBC_LLT (Table C.5.3-110). The largest differences in the percentage of fish entering Old River occurred in 1989; the PP_LLT scenario resulted in a 12.5% reduction (compared to EBC2_LLT in 1989) while the PP_ELT resulted in a 5.6% increase (compared to EBC1 in 1989).

Table C.5.3-109. Percentage of San Joaquin River Fall-Run Chinook Salmon Smolts Entering Old River, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	51.3	51.4	51.6	52.4	51.6	52.3
1976 (C)	57.7	57.4	59.0	61.6	59.5	54.1
1977 (C)	59.2	60.0	61.4	62.0	62.2	53.2
1978 (AN)	52.4	52.4	51.0	51.5	51.2	51.9
1979 (BN)	51.2	51.2	51.4	51.7	52.6	53.0
1980 (AN)	51.4	51.4	51.6	51.8	52.2	52.9
1981 (D)	52.1	52.1	54.3	56.8	56.2	53.1
1982 (W)	43.1	43.1	42.8	43.5	42.8	43.6
1983 (W)	40.9	41.0	40.2	39.6	40.0	39.5
1984 (W)	51.1	51.1	51.4	52.2	52.8	53.0
1985 (D)	52.2	52.3	52.2	57.1	53.0	52.2
1986 (W)	51.9	51.9	52.0	52.0	52.4	52.7
1987 (D)	57.8	58.2	59.5	61.5	60.8	55.4
1988 (C)	57.2	57.5	59.1	61.1	58.9	52.9
1989 (D)	61.3	61.6	63.0	64.8	66.9	52.3
1990 (C)	61.5	62.0	63.0	64.3	64.8	57.0
1991 (C)	61.7	62.1	63.8	65.5	66.5	58.3
Average	53.8	53.9	54.6	55.9	55.5	52.2

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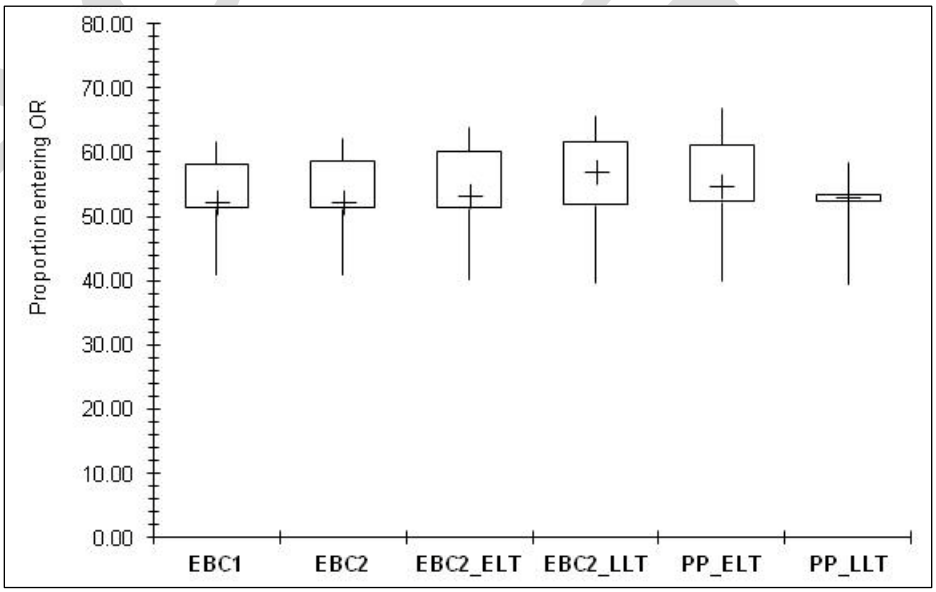
Table C.5.3-110. Difference between Scenarios in Percentage of San Joaquin River Fall-Run Chinook Salmon Smolts Entering Old River (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	0.3 (1%)	1.0 (2%)	0.3 (1%)	0.9 (2%)	0.1 (0%)	-0.1 (0%)
1976 (C)	1.8 (3%)	-3.6 (-6%)	2.2 (4%)	-3.3 (-6%)	0.5 (1%)	-7.5 (-12%)
1977 (C)	3.0 (5%)	-6.0 (-10%)	2.2 (4%)	-6.8 (-11%)	0.7 (1%)	-8.8 (-14%)
1978 (AN)	-1.2 (-2%)	-0.5 (-1%)	-1.2 (-2%)	-0.5 (-1%)	0.2 (0%)	0.5 (1%)
1979 (BN)	1.4 (3%)	1.8 (4%)	1.4 (3%)	1.8 (4%)	1.2 (2%)	1.4 (3%)
1980 (AN)	0.8 (2%)	1.6 (3%)	0.8 (2%)	1.5 (3%)	0.6 (1%)	1.1 (2%)
1981 (D)	4.2 (8%)	1.1 (2%)	4.1 (8%)	1.0 (2%)	1.9 (4%)	-3.7 (-7%)
1982 (W)	-0.3 (-1%)	0.5 (1%)	-0.4 (-1%)	0.5 (1%)	0.0 (0%)	0.1 (0%)
1983 (W)	-0.9 (-2%)	-1.4 (-3%)	-1.0 (-2%)	-1.5 (-4%)	-0.2 (-1%)	-0.2 (0%)
1984 (W)	1.7 (3%)	1.9 (4%)	1.7 (3%)	1.9 (4%)	1.4 (3%)	0.8 (2%)
1985 (D)	0.8 (2%)	0.0 (0%)	0.7 (1%)	-0.1 (0%)	0.8 (2%)	-4.9 (-9%)
1986 (W)	0.4 (1%)	0.8 (2%)	0.4 (1%)	0.8 (2%)	0.4 (1%)	0.7 (1%)
1987 (D)	2.9 (5%)	-2.5 (-4%)	2.6 (4%)	-2.8 (-5%)	1.3 (2%)	-6.2 (-10%)
1988 (C)	1.6 (3%)	-4.3 (-7%)	1.3 (2%)	-4.6 (-8%)	-0.3 (0%)	-8.1 (-13%)
1989 (D)	5.6 (9%)	-8.9 (-15%)	5.3 (9%)	-9.3 (-15%)	3.9 (6%)	-12.5 (-19%)
1990 (C)	3.3 (5%)	-4.4 (-7%)	2.8 (5%)	-4.9 (-8%)	1.8 (3%)	-7.3 (-11%)
1991 (C)	4.8 (8%)	-3.4 (-6%)	4.4 (7%)	-3.8 (-6%)	2.7 (4%)	-7.2 (-11%)
Average	1.8 (3%)	-1.6 (-3%)	1.6 (3%)	-1.7 (-3%)	1.0 (2%)	-3.6 (-7%)

Note: Negative values indicate lower percentage entry into Old River under PP scenarios than under EBC scenarios.



Box and whisker plot shows entry distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage entry.

Figure C.5.3-60. San Joaquin River Fall-Run Chinook Salmon Entering Old River, Based on Delta Passage Model Results

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San Joaquin River Fall-Run Chinook Salmon Survival in Old River

There was very little difference in survival of San Joaquin fall-run Chinook salmon smolts in Old River between the PP and EBC scenarios (Table C.5.3-111, Table C.5.3-112, Figure C.5.3-61Figure C.5.3-59). Survival averaged 10% under all scenarios and ranged from around 9% in 1976, 1989, and 1991 (dry and critical years) to 14% in 1983 (wet year).

Table C.5.3-111. Percentage of San Joaquin River Fall-Run Chinook Salmon Smolts Surviving in Old River, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	9.3	9.3	9.3	9.3	9.3	9.3
1976 (C)	9.0	9.0	9.0	9.1	9.1	9.1
1977 (C)	9.5	9.5	9.5	9.5	9.5	9.5
1978 (AN)	10.7	10.6	10.8	10.7	10.8	10.7
1979 (BN)	10.0	10.0	10.0	10.0	10.0	10.0
1980 (AN)	9.8	9.8	10.0	10.0	10.0	10.0
1981 (D)	9.9	10.0	10.0	10.0	10.0	10.0
1982 (W)	11.6	11.6	11.6	11.5	11.6	11.5
1983 (W)	14.3	14.3	14.4	14.5	14.3	14.4
1984 (W)	10.1	10.1	10.1	10.1	10.1	10.1
1985 (D)	10.3	10.3	10.3	10.2	10.3	10.2
1986 (W)	10.4	10.4	10.5	10.5	10.5	10.5
1987 (D)	9.6	9.6	9.6	9.6	9.6	9.6
1988 (C)	9.4	9.4	9.4	9.4	9.3	9.4
1989 (D)	9.1	9.1	9.1	9.1	9.1	9.1
1990 (C)	10.3	10.3	10.3	10.3	10.3	10.3
1991 (C)	8.8	8.8	8.8	8.7	8.7	8.7
Average	10.1	10.1	10.1	10.1	10.1	10.2

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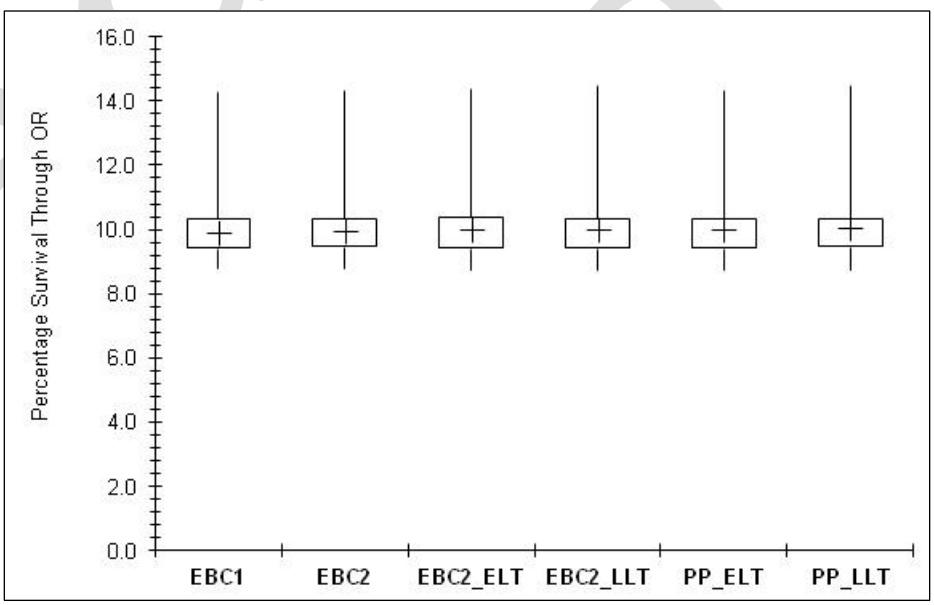
Table C.5.3-112. Difference between Scenarios in Percentage of San Joaquin River Fall-Run Chinook Salmon Smolts Surviving in Old River (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1976 (C)	0.0 (0%)	0.0 (0%)	0.1 (1%)	0.1 (1%)	0.0 (0%)	0.0 (0%)
1977 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1978 (AN)	0.1 (1%)	0.1 (1%)	0.1 (1%)	0.1 (1%)	0.0 (0%)	0.0 (0%)
1979 (BN)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1980 (AN)	0.2 (2%)	0.2 (2%)	0.2 (2%)	0.2 (2%)	0.0 (0%)	0.0 (0%)
1981 (D)	0.1 (1%)	0.1 (1%)	0.1 (1%)	0.1 (1%)	0.0 (0%)	0.0 (0%)
1982 (W)	-0.1 (-1%)	-0.1 (-1%)	-0.1 (-1%)	-0.1 (-1%)	0.0 (0%)	0.0 (0%)
1983 (W)	0.0 (0%)	0.2 (1%)	0.0 (0%)	0.1 (1%)	0.0 (0%)	0.0 (0%)
1984 (W)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1985 (D)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1986 (W)	0.1 (1%)	0.1 (1%)	0.1 (1%)	0.1 (1%)	0.0 (0%)	0.0 (0%)
1987 (D)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1988 (C)	0.0 (0%)	0.0 (0%)	-0.1 (-1%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1989 (D)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1990 (C)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
1991 (C)	0.0 (0%)	-0.1 (-1%)	0.0 (0%)	-0.1 (-1%)	0.0 (0%)	0.0 (0%)
Average	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-61. San Joaquin River Fall-Run Chinook Salmon Smolt Survival in Old River, Based on Delta Passage Model Results

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Fall-Run Chinook Salmon (Mokelumne River)

Overall Survival through the Delta

Overall survival of Mokelumne River fall-run Chinook salmon smolts through the Delta was similar among the PP and EBC scenarios, averaging 10% across all years (Table C.5.3-113, Figure C.5.3-62). Differences in survival between the PP and EBC scenarios ranged from 3.3% lower survival under PP_LLT (compared to EBC1 in 1979) to 5.9% higher survival under PP_ELT (compared to EBC2_ELT in 1983) (Table C.5.3-114). Averaged over all years, survival under the PP scenarios was 0.3%–0.6% lower than under the EBC scenarios.

Table C.5.3-113. Percentage of Mokelumne River Fall-Run Chinook Salmon Smolts Surviving through the Delta, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	14.9	14.9	15.2	14.5	11.4	10.7
1976 (C)	6.2	6.2	6.9	7.1	6.7	6.9
1977 (C)	10.3	10.5	10.4	10.6	10.5	11.3
1978 (AN)	5.5	5.4	5.1	4.8	6.0	5.8
1979 (BN)	14.0	13.9	13.7	13.6	10.8	10.7
1980 (AN)	12.3	12.2	11.9	11.6	10.1	9.7
1981 (D)	13.3	13.3	13.3	13.5	11.6	11.6
1982 (W)	7.7	7.7	7.4	6.8	10.0	9.0
1983 (W)	12.8	11.4	11.3	11.2	17.2	15.6
1984 (W)	7.9	7.9	7.9	7.8	6.7	7.0
1985 (D)	8.4	8.4	7.9	8.5	6.8	7.8
1986 (W)	14.3	14.2	13.8	13.5	12.8	12.9
1987 (D)	8.2	8.2	8.3	8.4	7.2	7.3
1988 (C)	6.1	6.1	6.2	6.1	6.0	5.9
1989 (D)	12.7	12.8	12.9	13.3	12.7	14.4
1990 (C)	9.4	9.4	9.3	9.2	8.9	8.8
1991 (C)	6.3	6.3	6.3	6.3	5.9	6.0
Average	10.0	9.9	9.9	9.8	9.5	9.5

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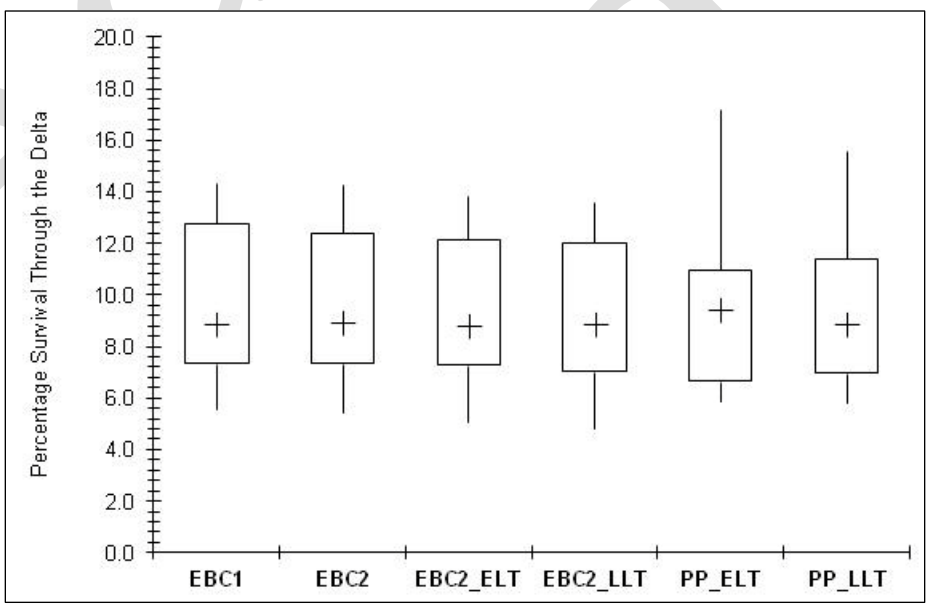
Table C.5.3-114. Difference between Scenarios in Percentage of Mokelumne River Fall-Run Chinook Salmon Smolts Surviving through the Delta (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-3.6 (-24%)	-4.2 (-28%)	-3.5 (-24%)	-4.1 (-28%)	-3.8 (-25%)	-3.7 (-26%)
1976 (C)	0.4 (7%)	0.7 (11%)	0.4 (7%)	0.7 (11%)	-0.2 (-3%)	-0.2 (-3%)
1977 (C)	0.2 (2%)	1.0 (10%)	0.1 (1%)	0.9 (8%)	0.1 (1%)	0.7 (6%)
1978 (AN)	0.5 (8%)	0.3 (5%)	0.6 (10%)	0.4 (7%)	0.9 (18%)	1.0 (21%)
1979 (BN)	-3.2 (-23%)	-3.3 (-23%)	-3.1 (-22%)	-3.2 (-23%)	-2.9 (-21%)	-2.8 (-21%)
1980 (AN)	-2.2 (-18%)	-2.6 (-21%)	-2.2 (-18%)	-2.5 (-21%)	-1.8 (-15%)	-1.9 (-16%)
1981 (D)	-1.7 (-13%)	-1.7 (-13%)	-1.7 (-13%)	-1.7 (-13%)	-1.7 (-13%)	-1.8 (-14%)
1982 (W)	2.3 (30%)	1.3 (17%)	2.3 (30%)	1.3 (17%)	2.6 (36%)	2.2 (32%)
1983 (W)	4.4 (34%)	2.8 (22%)	5.8 (51%)	4.2 (37%)	5.9 (52%)	4.4 (39%)
1984 (W)	-1.3 (-16%)	-0.9 (-12%)	-1.3 (-16%)	-0.9 (-11%)	-1.2 (-15%)	-0.8 (-10%)
1985 (D)	-1.6 (-19%)	-0.6 (-7%)	-1.6 (-19%)	-0.6 (-7%)	-1.1 (-14%)	-0.7 (-8%)
1986 (W)	-1.5 (-11%)	-1.4 (-10%)	-1.4 (-10%)	-1.3 (-9%)	-1.0 (-7%)	-0.6 (-5%)
1987 (D)	-0.9 (-12%)	-0.9 (-11%)	-1.0 (-12%)	-0.9 (-11%)	-1.0 (-13%)	-1.1 (-13%)
1988 (C)	-0.1 (-2%)	-0.2 (-3%)	-0.1 (-2%)	-0.1 (-2%)	-0.2 (-3%)	-0.2 (-3%)
1989 (D)	0.0 (0%)	1.6 (13%)	0.0 (0%)	1.6 (13%)	-0.2 (-2%)	1.1 (8%)
1990 (C)	-0.5 (-5%)	-0.6 (-6%)	-0.5 (-5%)	-0.6 (-6%)	-0.4 (-4%)	-0.4 (-5%)
1991 (C)	-0.4 (-7%)	-0.4 (-6%)	-0.4 (-7%)	-0.3 (-5%)	-0.4 (-7%)	-0.3 (-5%)
Average	-0.6 (-5%)	-0.5 (-5%)	-0.5 (-5%)	-0.4 (-4%)	-0.4 (-4%)	-0.3 (-3%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-62. Mokelumne River Fall-Run Chinook Salmon Through-Delta Smolt Survival, Based on Delta Passage Model Results

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Survival in the Interior Delta

Survival of Mokelumne River fall-run Chinook salmon in the interior Delta under the PP scenarios averaged 24% and ranged from 16%–37% (Table C.5.3-115, Figure C.5.3-63). Survival under the EBC scenarios averaged 25% and ranged from 14%–36%. Averaged over all years, survival in the interior Delta under the PP scenarios was 0.9%–1.5% lower than the EBC scenarios (Table C.5.3-116). Differences in survival between the PP and EBC scenarios ranged from 8.4% lower survival under PP_LLT (compared to EBC1 in 1979) to 12.7% higher survival under PP_ELT (compared to EBC2_ELT in 1983).

Table C.5.3-115. Percentage of Mokelumne River Fall-Run Chinook Salmon Smolts Surviving through the Interior Delta, Based on Delta Passage Model Results

Water Year	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
1975 (W)	38.4	38.2	39.0	37.2	29.2	27.5
1976 (C)	16.0	16.1	17.7	18.3	17.1	17.8
1977 (C)	22.3	22.6	22.5	23.0	22.7	24.4
1978 (AN)	16.3	16.0	14.9	14.1	17.7	17.1
1979 (BN)	35.9	35.6	35.1	34.8	27.6	27.5
1980 (AN)	27.7	27.6	26.8	26.2	22.7	21.9
1981 (D)	27.3	27.4	27.3	27.7	23.8	23.9
1982 (W)	18.3	18.3	17.6	16.2	23.8	21.4
1983 (W)	27.6	24.5	24.3	24.2	37.0	33.6
1984 (W)	21.6	21.6	21.4	21.3	18.1	19.1
1985 (D)	22.0	22.1	20.7	22.3	17.8	20.5
1986 (W)	34.5	34.3	33.2	32.6	30.8	31.1
1987 (D)	24.5	24.7	24.8	25.1	21.7	21.9
1988 (C)	16.7	16.6	16.8	16.7	16.3	16.2
1989 (D)	32.7	32.7	33.2	34.1	32.7	36.9
1990 (C)	26.8	26.8	26.5	26.3	25.4	25.1
1991 (C)	16.9	16.8	16.8	16.8	15.7	15.9
Average	25.0	24.8	24.6	24.5	23.5	23.6

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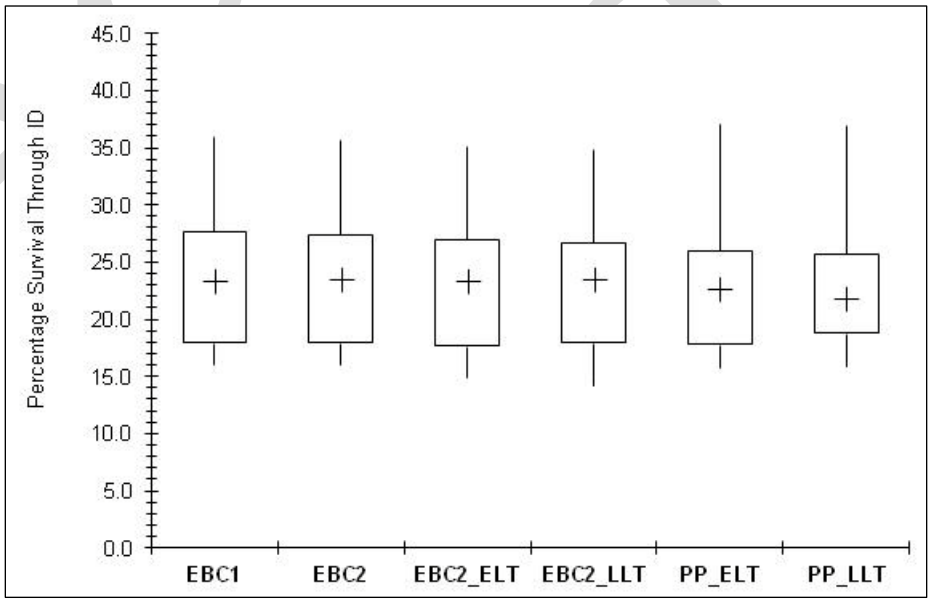
Table C.5.3-116. Difference between Scenarios in Percentage of Mokelumne River Fall-Run Chinook Salmon Smolts Surviving through the Interior Delta (Values in Parentheses Indicate Relative Percentage Change), Based on Delta Passage Model Results

Water Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
1975 (W)	-9.2 (-24%)	-10.8 (-28%)	-9.0 (-24%)	-10.7 (-28%)	-9.8 (-25%)	-9.6 (-26%)
1976 (C)	1.1 (7%)	1.8 (11%)	1.1 (7%)	1.8 (11%)	-0.6 (-3%)	-0.5 (-3%)
1977 (C)	0.4 (2%)	2.2 (10%)	0.1 (1%)	1.9 (8%)	0.2 (1%)	1.5 (6%)
1978 (AN)	1.4 (8%)	0.8 (5%)	1.6 (10%)	1.1 (7%)	2.7 (18%)	3.0 (21%)
1979 (BN)	-8.3 (-23%)	-8.4 (-23%)	-8.0 (-22%)	-8.1 (-23%)	-7.5 (-21%)	-7.3 (-21%)
1980 (AN)	-4.9 (-18%)	-5.8 (-21%)	-4.9 (-18%)	-5.7 (-21%)	-4.1 (-15%)	-4.3 (-16%)
1981 (D)	-3.5 (-13%)	-3.4 (-13%)	-3.5 (-13%)	-3.5 (-13%)	-3.4 (-13%)	-3.8 (-14%)
1982 (W)	5.5 (30%)	3.1 (17%)	5.5 (30%)	3.1 (17%)	6.2 (36%)	5.1 (32%)
1983 (W)	9.5 (34%)	6.0 (22%)	12.5 (51%)	9.1 (37%)	12.7 (52%)	9.4 (39%)
1984 (W)	-3.5 (-16%)	-2.5 (-12%)	-3.4 (-16%)	-2.5 (-11%)	-3.3 (-15%)	-2.2 (-10%)
1985 (D)	-4.2 (-19%)	-1.6 (-7%)	-4.3 (-19%)	-1.6 (-7%)	-2.9 (-14%)	-1.8 (-8%)
1986 (W)	-3.7 (-11%)	-3.4 (-10%)	-3.5 (-10%)	-3.1 (-9%)	-2.4 (-7%)	-1.5 (-5%)
1987 (D)	-2.8 (-12%)	-2.6 (-11%)	-3.0 (-12%)	-2.8 (-11%)	-3.1 (-13%)	-3.2 (-13%)
1988 (C)	-0.4 (-2%)	-0.5 (-3%)	-0.3 (-2%)	-0.4 (-2%)	-0.5 (-3%)	-0.5 (-3%)
1989 (D)	-0.1 (0%)	4.2 (13%)	-0.1 (0%)	4.1 (13%)	-0.6 (-2%)	2.8 (8%)
1990 (C)	-1.4 (-5%)	-1.7 (-6%)	-1.4 (-5%)	-1.7 (-6%)	-1.1 (-4%)	-1.2 (-5%)
1991 (C)	-1.2 (-7%)	-0.9 (-6%)	-1.2 (-7%)	-0.9 (-5%)	-1.1 (-7%)	-0.8 (-5%)
Average	-1.5 (-6%)	-1.4 (-6%)	-1.3 (-5%)	-1.2 (-5%)	-1.1 (-4%)	-0.9 (-4%)
Note: Negative values indicate lower survival under PP scenarios than under EBC scenarios.						



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-63. Mokelumne River Fall-Run Chinook Salmon Smolt Survival through the Interior Delta, Based on Delta Passage Model Results

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C.5.3.1.4 Nonphysical Barriers

CM16 Nonphysical Fish Barriers proposes to install and test nonphysical fish barriers to deter downstream migrating juvenile fish (primarily salmonids) from entering the interior Delta where survival is lower than on the mainstem Sacramento and San Joaquin Rivers. The basic analysis applied in Appendix B, in relation to effectiveness of nonphysical barriers in reducing entrainment at the entrances to Clifton Court Forebay and the Delta-Mendota Canal, also applies to the potential effectiveness of nonphysical barriers proposed for important channel divergences such as Sacramento River–Georgiana Slough and San Joaquin River–Old River. Considering water column position, hearing ability, and escape ability, barrier effectiveness has the potential to be high for salmonid juveniles and probably Sacramento splittail, with effectiveness for smelt possibly being affected by water velocity characteristics near the barriers (Table C.5.3-117). There is no evidence that sturgeon and lamprey would respond to the acoustic stimuli of the barriers, although previous barrier studies in the Delta did not focus on these species. Ongoing studies in the Delta at Georgiana Slough and head of Old River will further inform the potential effectiveness of nonphysical barriers, particularly with respect to the possibility of predation by fish such as striped bass, and regarding the effectiveness of the barriers in relation to flow rate.

In contrast to nonphysical barriers at the entrances to Clifton Court Forebay and the Delta-Mendota Canal, nonphysical barriers located at channel divergences such as Sacramento River–Georgiana Slough and San Joaquin River–Old River have the potential to impede upstream migrating adults of covered fish species, e.g., Chinook salmon, steelhead. As with downstream migrating fish, the potential for effect on upstream migrants is species-specific, and the mechanisms of effect are the same. To coincide with the main period of downstream juvenile migration (winter–spring), installation of nonphysical barriers at important channel divergences may occur during upstream migration periods of adults from all of the covered fish species with the exception of fall-run Chinook salmon. The potential for negative effects (e.g., delay) may be low for species with low hearing ability (sturgeon and lamprey). Species such as adult salmonids may be migrating upstream following the channel thalweg (Quinn 2005), and therefore the potential for negative effect would depend on the portion of the water column covered by the nonphysical barrier. For example, preliminary testing at Georgiana Slough required the nonphysical barrier to be situated at the middle of the water column because the relatively deep water and strong flows would have dispersed the bubble curtain and dispersed the acoustic stimulus. In contrast, the shallower water and lower flows allowed most of the water column at the head of Old River to be covered by the bubble curtain and acoustic stimulus. The latter situation would have more potential for negative effects on upstream migrating fish with moderate or good hearing ability (e.g., adult salmonids, Sacramento splittail). Given that nonphysical barriers would be situated at the entrances to various channels leading to the interior Delta, the effects generally would be expected to be limited to the portion of the population moving upstream by these routes; fish moving upstream on the mainstems of the rivers would not be expected to be affected. Potential delays of nonphysical barriers on covered fish species will be monitored during testing periods.

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Table C.5.3-117. Qualitative Assessment of Potential Effectiveness of Nonphysical Barriers for Guiding Covered Fish Species away from the Interior Delta

Species	Life Stage	Water Column Position	Hearing Ability	Escape Ability	Overall Potential Barrier Effectiveness
Chinook salmon (all races)	Juvenile	Upper	Moderate	High	High
Steelhead	Juvenile	Upper	Moderate	High	High
Delta smelt	Larva	Upper	Moderate	Low	Low
	Juvenile	Upper	Moderate	Low–Moderate	Moderate
	Adult	Upper	Moderate	Moderate	Moderate
Longfin smelt	Larva	Upper	Moderate	Low	Low
	Juvenile	Upper	Moderate	Low–Moderate	Moderate
	Adult	Upper	Moderate	Moderate	High
Sacramento splittail	Larva	Upper	High	Low	Low
	Juvenile	Middle	High	Moderate	High
	Adult	Middle	High	High	High
White sturgeon	Larva	Upper	Low	Low	Low
	Juvenile	Lower	Low	High	Low
Green sturgeon	Juvenile	Lower	Low	High	Low
Pacific lamprey	Macropthalmia	Upper	Low	Low	Low
	Adult	Upper	Low	Low	Low
River lamprey	Macropthalmia	Upper	Low	Low	Low
	Adult	Upper	Low	Low	Low

Overall Survival through the Delta with Non-Physical Barriers at Georgiana Slough and Old River (Delta Passage Model)

The DPM was used to perform a sensitivity analysis to evaluate the potential effect of non-physical barriers at Georgiana Slough and the head of Old River on survival of Chinook salmon smolts based on assumptions of 20%, 50%, and 80% barrier effectiveness (i.e., percentage of fish deterred from entering Georgiana Slough and Old River). As described in the methods section, these analyses assumed a median level of predators at the proposed north Delta intakes. The results for Sacramento River winter-run, spring-run, fall-run, and late fall–run Chinook salmon and San Joaquin River fall-run Chinook salmon are summarized below. Note that the results for EBC1, EBC2, EBC2_ELT, EBC2_LLT, PP_ELT, and PP_LLT are the same as those summarized above for overall through-Delta smolt survival; results for potential barrier effectiveness are reported corresponding to 20%, 50%, and 80% barrier effectiveness (i.e., PP_ELT_20, PP_ELT_50, PP_ELT_80, PP_LLT_20, PP_LLT_50, and PP_LLT_80).

Overall smolt survival of winter-run Chinook salmon through the Delta averaged approximately 23% under all PP and EBC scenarios (Figure C.5.3-64, Figure C.5.3-65). With the operation of a non-physical barrier at the junction of the Sacramento River and Georgiana Slough, average survival under PP_ELT and PP_LLT was greater that EBC scenarios by 0.7%–0.9%, 1.8%–2.1%, and 3.0%–3.3% based on assumed barrier effectiveness of 20%, 50%, and 80%, respectively.

Overall smolt survival of spring-run Chinook salmon through the Delta averaged approximately 19% under all PP and EBC scenarios (Figure C.5.3-66, Figure C.5.3-67). With the operation of a non-

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physical barrier at the junction of the Sacramento River and Georgiana Slough, average survival under the PP_ELT and PP_LLT scenarios was greater by 0.3%–0.6%, 1.3%–1.6%, and 2.2%–2.6% than the EBC scenarios based on an assumed barrier effectiveness of 20%, 50%, and 80%, respectively.

Overall smolt survival of Sacramento River fall-run Chinook salmon through the Delta averaged approximately 15% under the PP scenarios and 16% under the EBC scenarios (Figure C.5.3-68, Figure C.5.3-69). With the operation of a non-physical barrier at the junction of the Sacramento River and Georgiana Slough and an assumed effectiveness of 20%, there were little or no differences in overall smolt survival between the PP scenarios (PP_ELT_20 and PP_LLT_20) and the EBC scenarios, representing a slight increase in survival relative to PP_ELT and PP_LLT (no barrier). Assuming 50% effectiveness, average survival under PP_ELT_50 and PP_LLT_50 was 0.7%–1.3% higher than under the EBC scenarios. Assuming 80% effectiveness, average survival under PP_ELT_80 and PP_LLT_80 was 1.7%–2.3% higher than under the EBC scenarios.

Overall smolt survival of Sacramento River late fall–run Chinook salmon through the Delta averaged approximately 15% under all PP and EBC scenarios (Figure C.5.3-70, Figure C.5.3-71). With the operation of a non-physical barrier at the junction of the Sacramento River and Georgiana Slough and an assumed effectiveness of 20%, average survival was 0.2%–0.4% (PP_ELT_20) and 0.9%–1.1% (PP_LLT_20) higher than under the EBC scenarios. Assuming 50% effectiveness, average survival was 1.5%–1.7% (PP_ELT_50) and 2.1%–2.4% (PP_LLT_50) higher than under the EBC scenarios. Assuming 80% effectiveness, average survival was 6.3%–6.6% (PP_ELT_80) and 3.4%–3.6% (PP_LLT_80) higher than under the EBC scenarios.

Overall smolt survival of San Joaquin River fall-run Chinook salmon through the Delta averaged approximately 14% under all PP and EBC scenarios (Figure C.5.3-72, Figure C.5.3-73). With the operation of a non-physical barrier at the head of Old River, average survival under the PP_ELT and PP_LLT scenarios was greater by 0.9%–1.3%, 2.3%–2.6%, and 3.8%–4.0% relative to the EBC scenarios based on an assumed barrier effectiveness of 20%, 50%, and 80%, respectively.

Overall, the results of the sensitivity analysis for the potential effects on through-Delta survival on Chinook salmon smolts were consistent with the recent study by Perry et al. (in press), who found that, with the Delta Cross Channel closed (as would generally be the case during the smolt outmigration period under both PP and EBC conditions) through-Delta survival may be around 2–7% greater with no fish entering Georgiana Slough (a relative change in survival of around 5 to over 20%).

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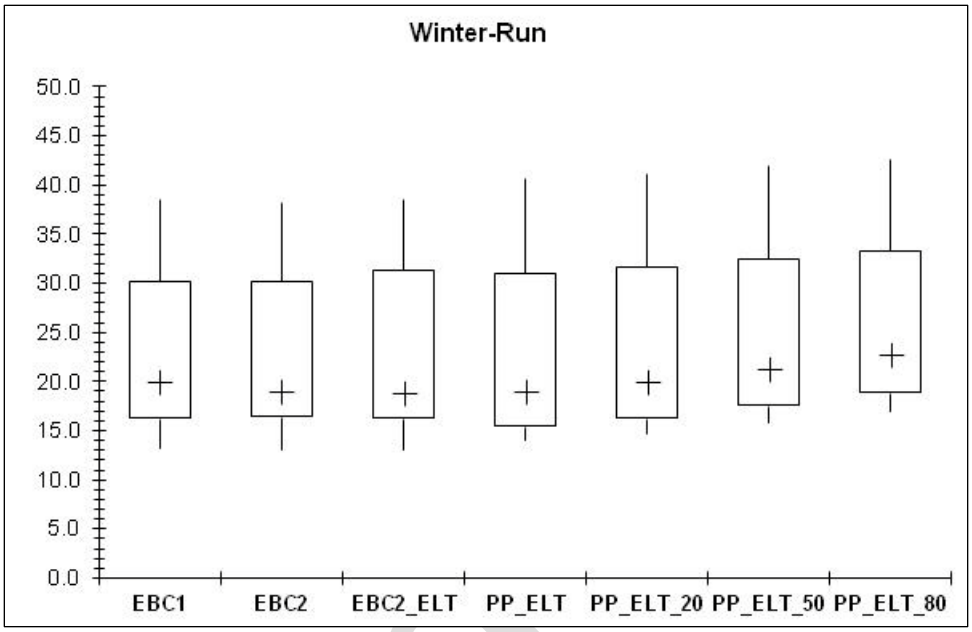
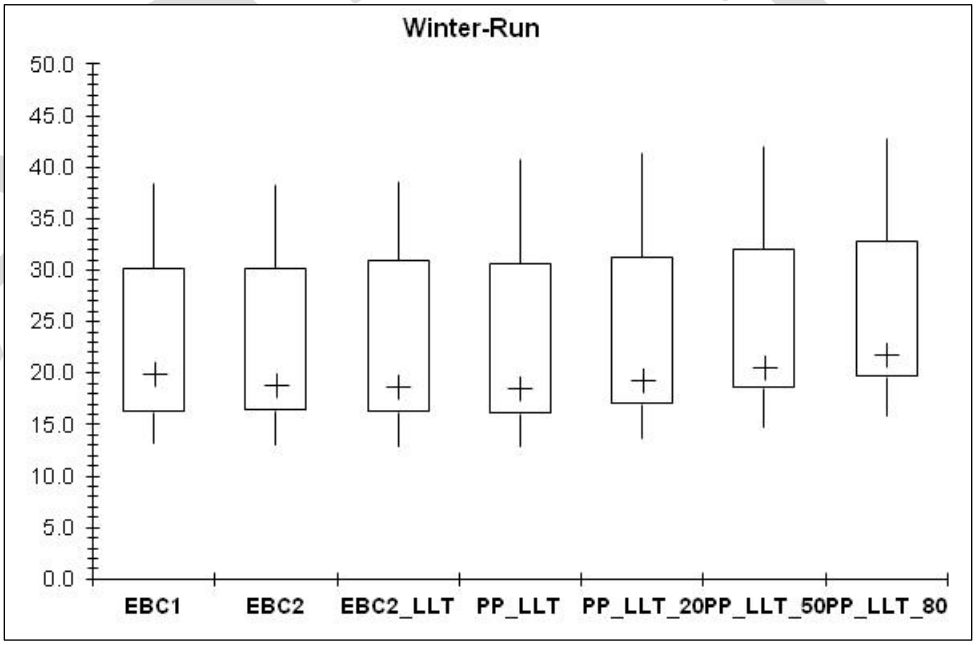


Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-64. Winter-Run Chinook Salmon Smolt Survival through Delta Assuming 20%, 50%, and 80% Effectiveness of a Non-Physical Barrier at Georgiana Slough (applied to PP_ELT scenario), Based on Delta Passage Model Results



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-65. Winter-Run Chinook Salmon Smolt Survival through Delta Assuming 20%, 50%, and 80% Effectiveness of a Non-Physical Barrier at Georgiana Slough (applied to PP_LLT scenario), Based on Delta Passage Model Results

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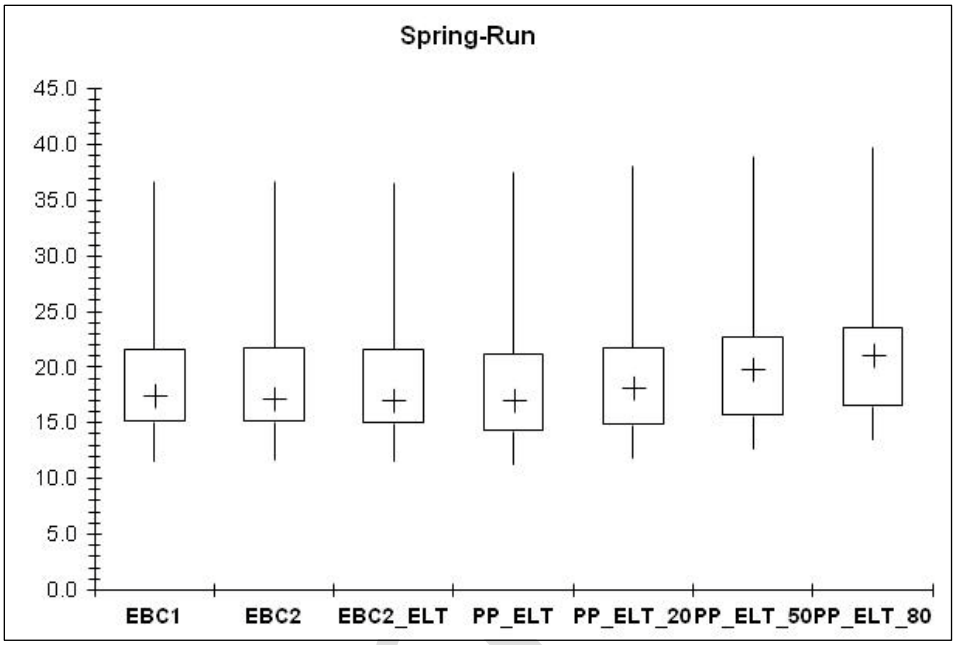
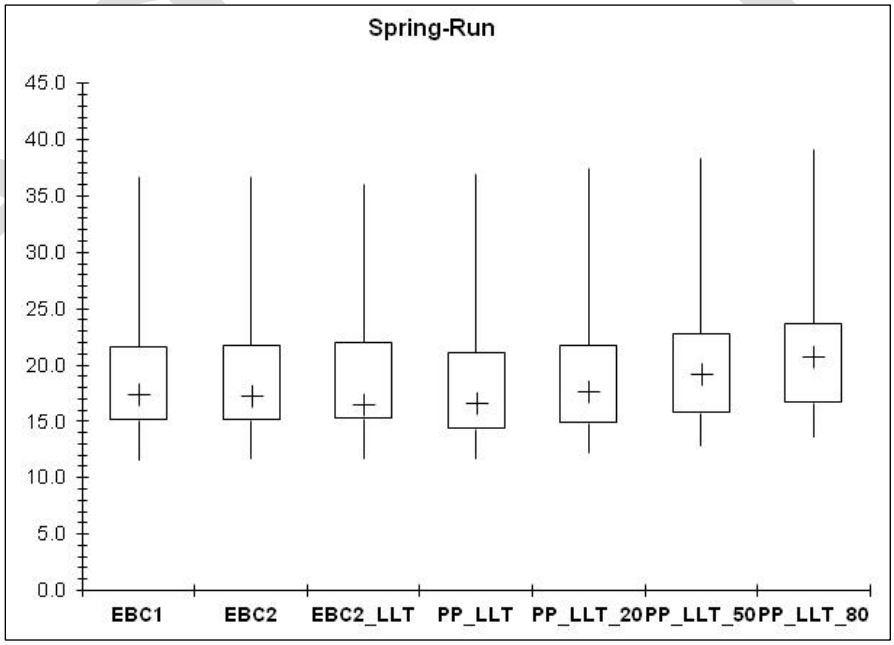


Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-66. Spring-Run Chinook Salmon Smolt Survival through Delta Assuming 20%, 50%, and 80% Effectiveness of a Non-Physical Barrier at Georgiana Slough (applied to PP_ELT scenario), Based on Delta Passage Model Results



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-67. Spring-Run Chinook Salmon Smolt Survival through Delta Assuming 20%, 50%, and 80% Effectiveness of a Non-Physical Barrier at Georgiana Slough (applied to PP_LLT scenario), Based on Delta Passage Model Results

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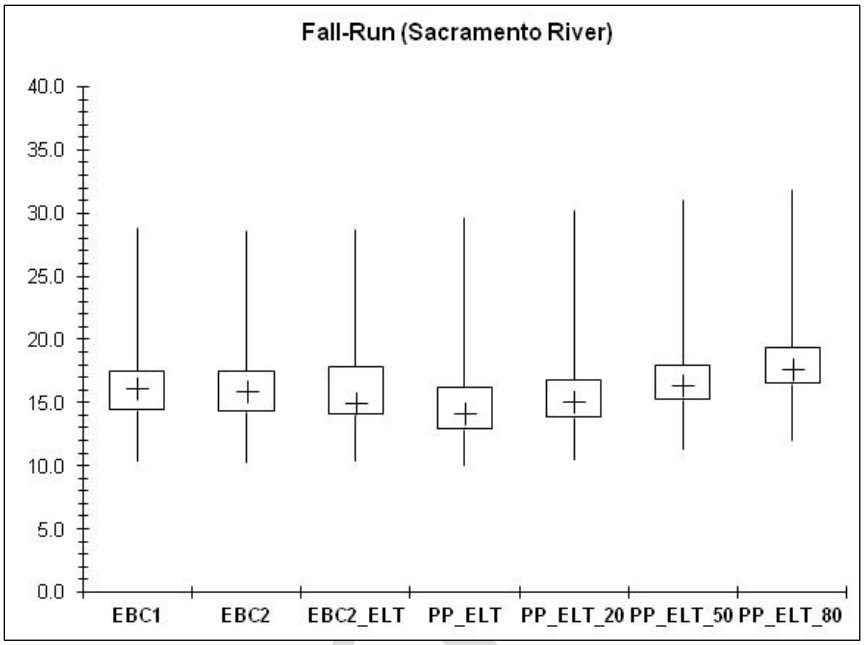
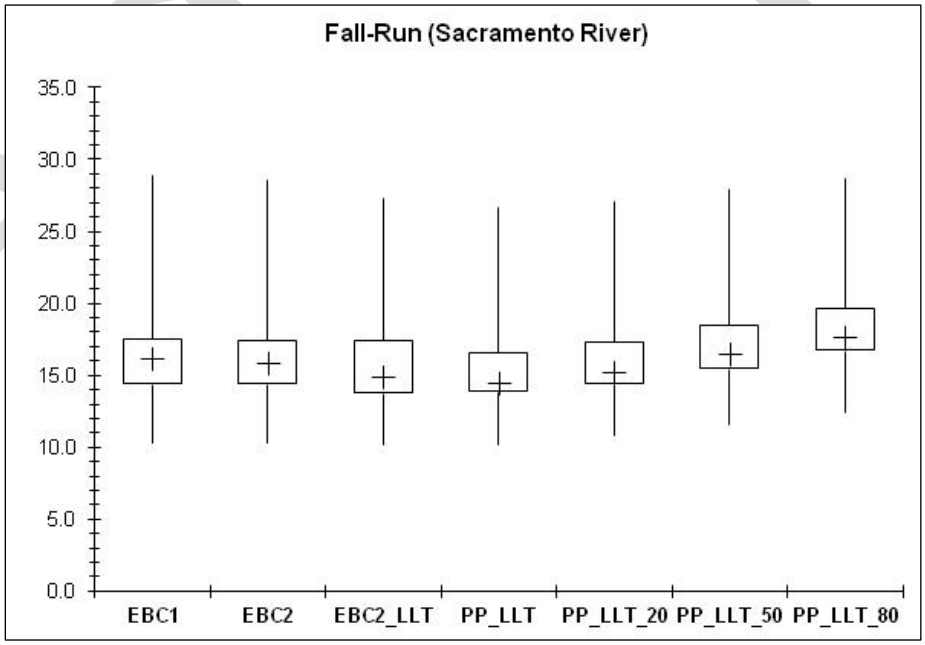


Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-68. Sacramento River Fall-Run Chinook Salmon Smolt Survival through Delta Assuming 20%, 50%, and 80% Effectiveness of a Non-Physical Barrier at Georgiana Slough (applied to PP_ELT scenario), Based on Delta Passage Model Results



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-69. Sacramento River Fall-Run Chinook Salmon Smolt Survival through Delta Assuming 20%, 50%, and 80% Effectiveness of a Non-Physical Barrier at Georgiana Slough (applied to PP_LLT scenario), Based on Delta Passage Model Results

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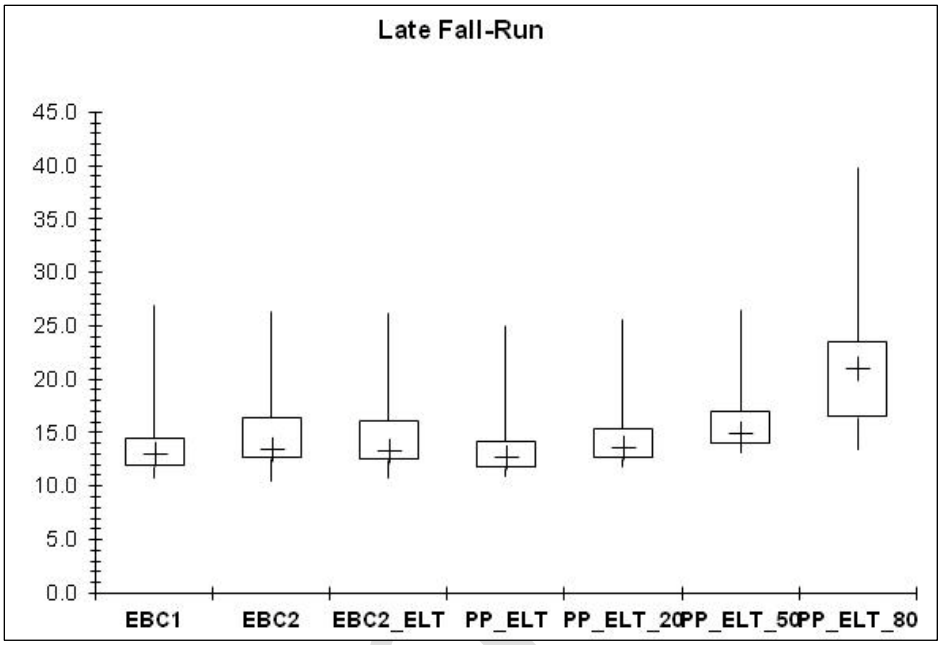
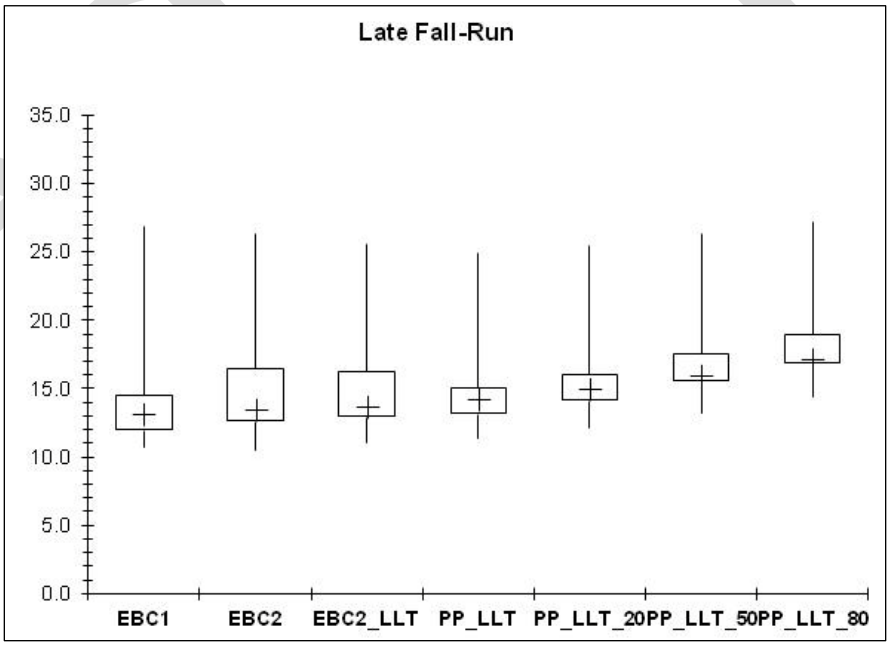


Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-70. Late Fall-Run Chinook Salmon Smolt Survival through Delta Assuming 20%, 50%, and 80% Effectiveness of a Non-Physical Barrier at Georgiana Slough (applied to PP_ELT scenario), Based on Delta Passage Model Results



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-71. Late Fall-Run Chinook Salmon Smolt Survival through Delta Assuming 20%, 50%, and 80% Effectiveness of a Non-Physical Barrier at Georgiana Slough (applied to PP_LLT scenario), Based on Delta Passage Model Results

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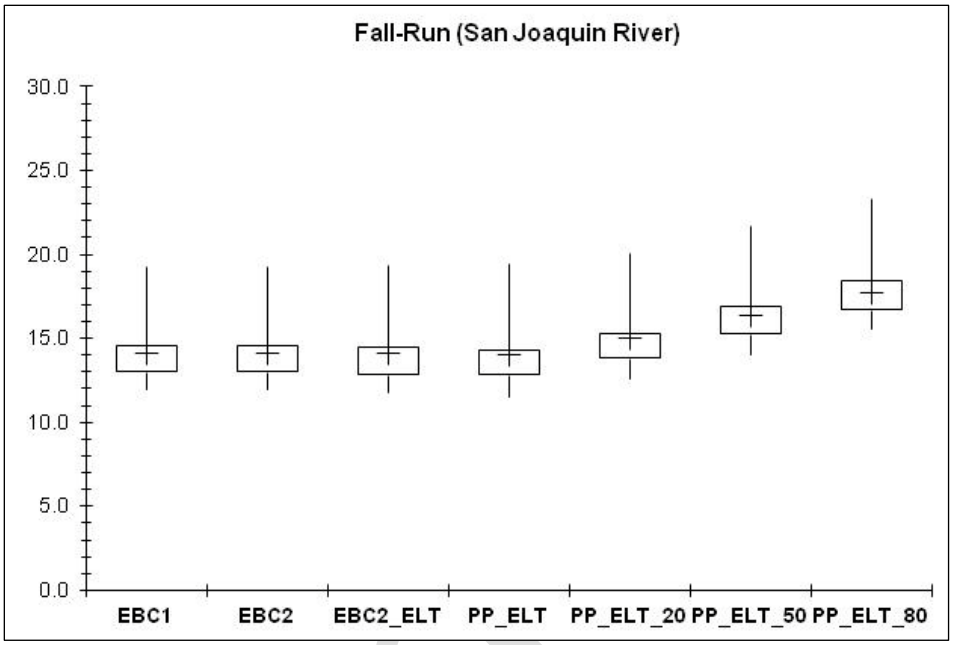
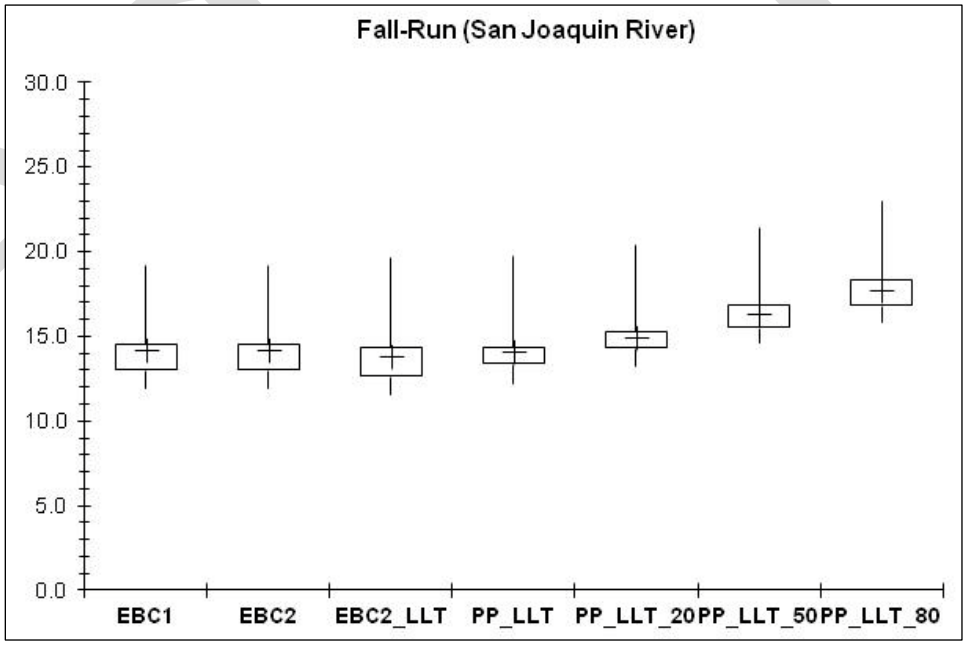


Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-72. San Joaquin River Fall-Run Chinook Salmon Smolt Survival through Delta Assuming 20%, 50%, and 80% Effectiveness of a Non-Physical Barrier at Head of Old River (applied to PP_ELT scenario), Based on Delta Passage Model Results



Box and whisker plot shows survival distribution across all modeled years. Median is marked with "+," upper and lower boundaries of the box indicate 75th and 25th percentiles, and upper and lower whiskers indicate maximum and minimum percentage survival.

Figure C.5.3-73. San Joaquin River Fall-Run Chinook Salmon Smolt Survival through Delta Assuming 20%, 50%, and 80% Effectiveness of a Non-Physical Barrier at Head of Old River (applied to PP_LLT scenario), Based on Delta Passage Model Results

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C.5.3.1.5 Nonphysical Fish Barriers

CM16 Nonphysical Fish Barriers proposes to install and test nonphysical fish barriers to deter downstream migrating juvenile fish (primarily salmonids) from entering the interior Delta where survival is lower than on the mainstem Sacramento and San Joaquin Rivers. The basic analysis applied in Appendix B, in relation to effectiveness of nonphysical barriers in reducing entrainment at the entrances to Clifton Court Forebay and the Delta-Mendota Canal, also applies to the potential effectiveness of nonphysical barriers proposed for important channel divergences such as Sacramento River–Georgiana Slough and San Joaquin River–Old River. Considering water column position, hearing ability, and escape ability, barrier effectiveness has the potential to be high for salmonid juveniles and probably Sacramento splittail, with effectiveness for smelt possibly being affected by water velocity characteristics near the barriers emitted (Table C.5.3-118). There is no evidence that sturgeon and lamprey would respond to the acoustic stimuli of the barriers, although previous barrier studies in the Delta did not focus on these species. Ongoing studies in the Delta at Georgiana Slough and head of Old River will further inform the potential effectiveness of nonphysical barriers, particularly with respect to the possibility of predation by fish such as striped bass, and regarding the effectiveness of the barriers in relation to flow rate.

In contrast to nonphysical barriers at the entrances to Clifton Court Forebay and the Delta-Mendota Canal, nonphysical barriers located at channel divergences such as Sacramento River–Georgiana Slough and San Joaquin River–Old River have the potential to impede upstream migrating adults of covered fish species, e.g., Chinook salmon, steelhead. As with downstream migrating fish, the potential for effect on upstream migrants is species-specific, and the mechanisms of effect are the same. To coincide with the main period of downstream juvenile migration (winter–spring), installation of nonphysical barriers at important channel divergences may occur during upstream migration periods of adults from all of the covered fish species with the exception of fall-run Chinook salmon. The potential for negative effects (e.g., delay) may be low for species with low hearing ability (sturgeon and lamprey). Species such as adult salmonids may be migrating upstream following the channel thalweg (Quinn 2005), and therefore the potential for negative effect would depend on the portion of the water column covered by the nonphysical barrier. For example, preliminary testing at Georgiana Slough required the nonphysical barrier to be situated at the middle of the water column because the relatively deep water and strong flows would have dispersed the bubble curtain and dispersed the acoustic stimulus. In contrast, the shallower water and lower flows allowed most of the water column at the head of Old River to be covered by the bubble curtain and acoustic stimulus. The latter situation would have more potential for negative effects on upstream migrating fish with moderate or good hearing ability (e.g., adult salmonids, Sacramento splittail). Given that nonphysical barriers would be situated at the entrances to various channels leading to the interior Delta, the effects generally would be expected to be limited to the portion of the population moving upstream by these routes; fish moving upstream on the mainstems of the rivers would not be expected to be affected. Potential delays of nonphysical barriers on covered fish species will be monitored during testing periods.

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Table C.5.3-118. Qualitative Assessment of Potential Effectiveness of Nonphysical Barriers for Guiding Covered Fish Species away from the Interior Delta

Species	Life Stage	Water Column Position	Hearing Ability	Escape Ability	Overall Potential Barrier Effectiveness
Chinook salmon (all races)	Juvenile	Upper	Moderate	High	High
Steelhead	Juvenile	Upper	Moderate	High	High
Delta smelt	Larva	Upper	Moderate	Low	Low
	Juvenile	Upper	Moderate	Low–Moderate	Moderate
	Adult	Upper	Moderate	Moderate	Moderate
Longfin smelt	Larva	Upper	Moderate	Low	Low
	Juvenile	Upper	Moderate	Low–Moderate	Moderate
	Adult	Upper	Moderate	Moderate	High
Sacramento splittail	Larva	Upper	High	Low	Low
	Juvenile	Middle	High	Moderate	High
	Adult	Middle	High	High	High
White sturgeon	Larva	Upper	Low	Low	Low
	Juvenile	Lower	Low	High	Low
Green sturgeon	Juvenile	Lower	Low	High	Low
Pacific lamprey	Macropthalmia	Upper	Low	Low	Low
	Adult	Upper	Low	Low	Low
River lamprey	Macropthalmia	Upper	Low	Low	Low
	Adult	Upper	Low	Low	Low

C.5.3.1.6 Suisun Marsh Salinity Control Structure

Salinity standards in Suisun Marsh are maintained through management of outflow and the operations of the Suisun Marsh Salinity Control Gates (SMSCG) approximately 10–20 days per year in October through May. The facility consists of three radial gates, a boat lock structure, and a maintenance channel equipped with removable flashboards. When the SMSCG are in operation, the flashboards are installed at the maintenance channel and the gates are operated tidally. Current operations also include the full opening of the boat lock. The SMSCG induce approximately 2,800 cfs of flow into the Suisun Marsh during operation, resulting in decreased salinity in the marsh and movement of the X2 position upstream. Fish migrating through Montezuma Slough must pass through this structure, which extends across the full width of Montezuma Slough. As such, operation of the gates also can inhibit passage of migrating adult Central Valley anadromous salmonids and green sturgeon. The late winter and spring downstream migration of Central Valley salmonids also overlaps the operational period of the SMSCG. As adult Central Valley anadromous salmonids travel between the ocean and their natal Central Valley streams, Montezuma Slough provides an alternative route to their primary migration corridor through Suisun Bay.

The preliminary proposal (CM1) includes coordination with the Suisun Marsh Charter Group over the term of the BDCP to seek amendments to the Suisun Marsh Plan that will provide for reducing the long-term operation of the Montezuma Slough Salinity Control Gate. This action will allow more water to flow past Chipps Island and will improve access of covered fish species to existing and future restored intertidal marsh habitats. However, the preliminary proposal also proposes to restore significant areas of tidal marsh in Suisun Marsh (CM4), which can change the tidal hydraulics

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in a way that may result in changes in salinity in the marsh (actual amount and direction of change is complicated and depends on tides, upstream flow rates, and exact location). Assuming salinity standards in the marsh stay the same under the preliminary proposal as under existing biological conditions, the preliminary proposal would need to coordinate with the Suisun Marsh Charter Group to address potential changes in salinity caused by preliminary proposal restoration to ensure that SMSCG operations are not increased. The analysis of passage at the SMSCG assumes that operations would stay the same or decrease, which is expected to result in passage similar to that which would occur without operation of the SMSCG.

Under current operations (with the boat lock held open and the flashboards in for 10–20 days), NMFS estimated that between 55% and 70% of the adult salmonids arriving at the SMSCG during its 10–20 days of annual operation will successfully pass upstream at the structure (National Marine Fisheries Service 2009). This rate of passage is virtually identical to the passage rate when the SMSCG is not operational (California Department of Water Resources and California Department of Fish and Game 2005). DFG telemetry studies indicate 30% to 45% of the adult salmonids do not pass the structure even when the gates are not operating. Adult salmonids that do not continue upstream past the SMSCG are expected to return downstream by backtracking through Montezuma Slough to Suisun Bay, and they likely find the alternative upstream route to their natal Central Valley streams through Suisun and Honker Bays. This backtracking likely reduces survival of adult salmonids, although the extent to which survival is lowered is unknown.

Little is known about adult green sturgeon upstream passage at the SMSCG. Acoustic tagging results from 2007 indicate adult green sturgeon migrate to the upper Sacramento River via Suisun and Honker Bays, not Montezuma Slough (Woodbury 2008 cited in National Marine Fisheries Service 2009), although the NMFS study's sample size was small (six adult sturgeon) and limited to 1 year of results. The results of the 2007 acoustic tagging study also suggest that green sturgeon require 4 to 6 weeks to pass upstream from San Francisco Bay to the upper Sacramento River, and it was not uncommon for sturgeon to interrupt their migration and linger in the vicinity of Rio Vista for up to 2 weeks (National Marine Fisheries Service unpublished data).

When the SMSCG are operating, green sturgeon, like salmon, have an opportunity to pass upstream through the boat locks or through the open gates during ebb tide. Based on the results of salmon telemetry studies, the operation of the SMSCG also may delay the upstream passage of an actively migrating adult green sturgeon by 3 to 4 days. Fish likely are impeded by the flashboards of the SMSCG along the northern shoreline, and the tidally operated gates reduce the hydrodynamic effect of flood tides downstream of the structure. Many species of fish are known to synchronize their movements through estuaries with the ebb and flow of the tides (Gibson 1992). Kelly and others (2007) report subadult sturgeon in San Francisco and San Pablo Bays typically move in the same direction as the prevailing current. The results of the 2007 acoustic tagging study indicate adult green sturgeon in the upper Delta and lower Sacramento River typically move against the prevailing tidal current (National Marine Fisheries Service unpublished data). Thus, adult green sturgeon are likely capable of continuing their upstream migration by navigating through the SMSCG on an ebb tide or through the continuously open boat lock when the SMSCG are being operated. The preliminary proposal would maintain or improve this level of passage because operation of the gates would stay the same or decrease under the PP.

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C.5.3.1.7 Passage Improvements at the Stockton Deep Water Ship Channel

The Deep Water Ship Channel has been identified as an impaired waterway by the State Water Resources Control Board (State Water Board) because of low dissolved oxygen concentrations during late summer and early fall and often fails to meet water quality objectives established by the Central Valley Regional Water Quality Control Board (Central Valley Water Board) for dissolved oxygen (Central Valley Regional Water Quality Control Board 2005, 2009). The combination of low flows, high loads of oxygen-demanding substances (algae from upstream, effluent from the City of Stockton Regional Wastewater Control Facility, and other unknown sources), and channel geometry contribute to low oxygen levels in the Deep Water Ship Channel (Central Valley Regional Water Quality Control Board 2005). The 7.5-mile low–dissolved oxygen area of the ship channel creates a barrier for upstream migration of adult fall-run Chinook salmon and Central Valley steelhead on the mainstem of the San Joaquin River (Hallock et al. 1970). Available data indicate that low dissolved oxygen that would affect salmonids is most likely to occur in September and October during the upstream migration period, and during June in the downstream migration period. This makes Chinook salmon more likely to be exposed to low dissolved oxygen levels than steelhead because peak migration for steelhead occurs outside of June, September, and October. Juvenile salmonids may be exposed to low dissolved oxygen periods during the end of their downstream migration period (primarily in June). Once spring-run Chinook salmon are reestablished in the San Joaquin River under the San Joaquin River Restoration Program, dissolved oxygen sags in the Deep Water Ship Channel likely will have similar effects on this run if sags were to occur during their adult migration period (expected to be approximately March through September). In addition, juvenile white sturgeon, which rear in the San Joaquin River, exhibit reduced foraging and growth rates at dissolved oxygen levels below 58% saturation (5.8 mg/L at 15°C) (Cech and Crocker 2002).

One potential solution to dissolved oxygen sags in the Deep Water Ship Channel, a dissolved oxygen aeration system, has been installed and is undergoing field testing by DWR. Results suggest that the aeration facility is effective at raising dissolved oxygen levels in much of the channel. Long-term funding for operations and maintenance has not yet been secured, and there are currently no mandates by the Central Valley Water Board that require contributors to the sag to fund the preliminary proposal. Under CM14, the preliminary proposal would share in funding the long-term operation and maintenance costs associated with the preliminary proposal.

Studies conducted by DWR show that the aeration system can be effective at meeting the Basin Plan objectives for dissolved oxygen of 5 mg/L (or 6 mg/L from September through November) as long as the inflowing biochemical oxygen demand (BOD) does not exceed the capacity of the aeration facility to produce oxygen (California Department of Water Resources 2010). During periods when BOD is higher than the capacity of the aeration facility, the Basin Plan objectives may not be met, but the number of days that the objectives could be met is increased with the aeration facility. CM14 also includes adaptive management and monitoring to allow for future adjustments to the aeration facility operations to improve its effectiveness at meeting the Basin Plan objectives for dissolved oxygen in the Deep Water Ship Channel. Even without further improvements to the current aeration facility operations, the long-term funding for operations and maintenance would reduce the likelihood that migrating Chinook salmon, steelhead, and white sturgeon would experience a passage impediment in the San Joaquin River, lessen the number of stressors encountered by adults, and increase the likelihood of San Joaquin River fish returning to the San Joaquin River to spawn.

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C.5.3.1.8 Fremont Weir Adult Fish Passage (Conservation Measure 2, Yolo Bypass Fisheries Enhancements)

Records of Fish Rescued at Fremont Weir

Information about the number of upstream migrating adult anadromous fish that might become stranded at the Fremont Weir is limited. The existing fish ladder is thought to be largely ineffective. Few records were kept of adult and juvenile fish rescued from 1955 through 1968 by DFG (undated report). Fish collected during this time period were mostly Chinook salmon and steelhead. Annual numbers of fish were generally in the tens or hundreds, and where age was noted, the majority were juveniles, with adults numbering in the tens or single digits. More recent data from 2002 onward indicate that Chinook salmon, steelhead, and sturgeon have been collected (California Department of Fish and Game undated report) (Table C.5.3-119). Note that sturgeon and salmonid rescue and mortality were largely unreported even in these later years. Green sturgeon are of particular interest because the adult population estimates are much lower than other species, yet appreciable numbers appear to be stranded at Fremont Weir and in the Yolo Bypass scour ponds. Of the green sturgeon rescued in 2011, all were sexually mature individuals (Healey and Vincik 2011). Israel and May (2010) estimated that at least 10–28 individual green sturgeon spawned in the upper Sacramento River based on molecular techniques whereas somewhat older estimates by Moyle (2002) suggested 140–1,600 adults. These estimates suggest that a sizable percentage of the green sturgeon adult population may be stranded occasionally at Fremont Weir.

Table C.5.3-119. Recent Numbers of Fish Rescued at Fremont Weir

		Chinook Salmon		Steelhead		Sturgeon	
Year	Date	Adult	Juvenile	Adult	Juvenile	Adult (Green)	Adult (White)
2002[1]	1/11	1	25–30				1
2004[1]	3/11–3/13	14	25				27
2005[1]	5/26		1				
2006[1]	1/26	4	several				1
2006[1]	2/14, 2/16	1	>100	6			21
2011[2]	4/11–4/18	54 (includes Tisdale Weir)	75 (includes Tisdale Weir)		(Collected, abundance not documented)	16	18

Sources: [1] California Department of Fish and Game undated report; [2] Healey and Vincik 2011.

DRERIP Evaluation of Fremont Weir and Yolo Bypass Inundation

The 2009 DRERIP evaluation of the Fremont Weir and Yolo Bypass inundation suggested there could be two main outcomes (one positive and one negative) of increased Yolo Bypass inundation and improved passage at the Fremont Weir and Sacramento Weir. The DRERIP evaluation suggested that the positive outcome from improving passage at the Fremont and Sacramento Weirs would far outweigh the potential increase in numbers of fish stranding at the weirs because the magnitude of the positive outcome to the population was 4 (high importance) in comparison to a magnitude of only 1 (low importance) for the negative outcome. The DRERIP evaluation summary was as follows:

1. Reduced losses due to stranding, illegal harvest, and blocked or delayed passage for Chinook salmon, steelhead, and green/white sturgeon (Positive outcome P6)

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a. Green and white sturgeon: Adult passage of white and green sturgeon is likely constrained in the Yolo Bypass (Harrell and Sommer 2003). Current configuration of Fremont and Sacramento weirs creates stranding and poaching problems for white and green sturgeon (Sommer et al. 2005; Israel et al. 2009; Israel and Klimley 2008); hence efforts to improve passage and redesign weirs would reduce poaching and stranding.

1) Magnitude of outcome to the population = 4. Blocked passage and resulting legal and illegal harvest are substantial; loss of spawners is particularly harmful to the populations. Frequent poaching has been well documented by DFG.

2) Certainty of the outcome = 4: Studies within the Yolo Bypass have identified the problem (California Department of Fish and Game unpublished data; Harrell and Sommer 2003; Harrell et al. in prep.).

b. Steelhead: Adult passage of salmon (and steelhead) likely is constrained in the Yolo Bypass (Harrell and Sommer 2003). Current Fremont and Sacramento Weirs create stranding problems for salmon (Sommer et al. 2005); hence efforts to improve passage and redesign weirs would reduce poaching and stranding.

1) Magnitude of outcome to the population = 4: Blocked passage is more of a problem than stranding.

2) Certainty of the outcome = 3: Studies within the Yolo Bypass have identified the stranding problem (California Department of Fish and Game unpublished data; Harrell and Sommer 2003; Harrell et al. in prep.), but it is less well-documented for steelhead because of relatively low catch of adults.

c. Chinook salmon (all races): Adult passage of salmon likely is constrained in the Yolo Bypass (Harrell and Sommer 2003). Current Fremont and Sacramento Weirs create stranding problems for salmon (Sommer et al. 2005); hence efforts to improve passage and redesign weirs would reduce poaching and stranding. Williams (2006) indicates that water flowing through the Yolo Bypass attracts migrating adult salmon into this seasonal floodplain habitat; however, the Fremont Weir at the top of the bypass does not allow salmon passage. This barrier represents either a serious delay to upstream migration or a dead end.

1) Magnitude of outcome to the population = 4: A serious delay in salmon spawning has been documented. Blocked passage involved an extensive (~100 mile) increase in passage.

2) Certainty of the outcome = 3–4: Studies within the Yolo Bypass have identified the problem (California Department of Fish and Game unpublished data; Harrell and Sommer 2003; Harrell et al. in prep.). The certainty is lower for spring- and winter-run salmon because of lower numbers and lower catch rates in sampling.

2. Increased stranding of covered species (negative outcome)

a. Green and white sturgeon, steelhead, and Chinook salmon (all races)

1) Magnitude of outcome to the population = 1. Blocked passage would be minimal behind the modified weir as it will be designed to improve passage. There is some possibility of reduced passage if migrating salmon encounter the modified structure when it is closed or there is insufficient flow to allow passage.

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2) Certainty of the outcome = 4: The assumption is that the problem of blocked passage will be resolved by the modifications to the weir (in the original DRERIP assessment, this conclusion was applied to the sturgeons but is equally applicable to adult salmonids).

Experimental Ramps

CM2 includes an action to construct experimental ramps to allow for the effective passage of adult sturgeon and lamprey from the Yolo Bypass over Fremont Weir. A number of features to increase upstream passage of adult lamprey (e.g., reduced velocity, continuous attachment areas, rounding corners, and provision of ramp structures) have been implemented successfully in the Pacific Northwest (Moser and Mesa 2009; Moser et al. 2011). Therefore, experimental ramps under the preliminary proposal that include such features will allow for improved passage of adult lamprey.

Laboratory studies have been conducted on experimental ramps on which adult white sturgeon could potentially pass (Webber et al. 2007). Although the entire design of such ramps that allows for successful passage has not yet been developed, specific attribute including energy-dissipating baffles have allowed for successful passage of white sturgeon. With additional research under CM2 to identify the additional key attributes that would allow for successful passage of sturgeon passage, the preliminary proposal should improve passage over Fremont Weir, although there is low certainty that this will occur because those attributes have not yet been identified.

C.5.3.1.9 Attraction and Upstream Migration Flows

Delta Region

Summary of Flows within the Delta Region

CALSIM flow data for the Delta subregion averaged by water-year type, month, and scenario, together with average monthly differences between scenarios, are provided in Table C.5.3-1 through Table C.5.3-18 and Table C.5.3-120 through Table C.5.3-123. These data form the basis for the summary of changes in attraction and migration flows.

Table C.5.3-120. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Sacramento River at Rio Vista Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	71,111	70,016	75,510	78,551	70,205	72,415
	AN	41,963	40,537	41,416	42,919	37,937	37,439
	BN	20,943	20,264	20,388	19,991	18,597	18,693
	D	14,895	14,766	15,032	14,927	13,853	14,703
	C	11,853	12,139	12,114	12,601	11,688	10,822
	AVG	37,268	36,610	38,556	39,721	35,738	36,443
Feb	W	80,958	79,915	87,232	89,989	80,666	83,061
	AN	52,542	50,466	53,615	55,363	50,869	50,658
	BN	30,159	29,018	30,231	29,442	25,883	25,747
	D	19,320	19,411	19,318	19,422	16,937	17,247
	C	12,247	12,437	12,074	11,956	11,366	11,812
	AVG	44,541	43,759	46,674	47,675	42,821	43,660
Mar	W	63,763	63,456	66,275	68,663	59,359	61,586

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
	AN	46,750	45,497	47,974	48,513	41,165	41,050
	BN	20,980	19,944	19,629	19,562	15,823	15,626
	D	17,656	17,428	17,341	17,679	14,858	14,726
	C	10,710	10,649	10,603	10,684	9,930	9,981
	AVG	36,084	35,567	36,744	37,655	32,261	32,895
Apr	W	38,214	38,344	38,692	38,422	32,507	32,024
	AN	22,726	22,759	22,234	21,855	17,016	16,986
	BN	14,652	14,471	14,295	14,207	12,609	12,777
	D	10,331	10,391	10,216	10,299	9,806	10,550
	C	7,665	7,654	7,520	7,816	7,505	7,883
	AVG	21,333	21,360	21,306	21,211	18,201	18,291
May	W	26,933	26,681	24,220	20,046	17,188	14,306
	AN	17,008	16,714	15,857	14,948	12,096	11,801
	BN	10,924	10,595	9,862	9,355	9,298	9,443
	D	8,135	7,919	7,840	8,564	8,000	9,032
	C	5,305	5,216	5,656	5,554	5,252	5,350
	AVG	15,456	15,217	14,232	12,833	11,332	10,641
Jun	W	16,557	16,350	12,993	11,418	8,474	8,002
	AN	9,887	9,964	8,634	9,220	6,661	7,583
	BN	7,001	6,873	6,677	7,241	6,347	6,703
	D	6,020	6,124	6,250	6,335	5,788	5,820
	C	4,333	4,340	4,304	4,513	3,927	4,020
	AVG	9,847	9,795	8,525	8,257	6,590	6,657
Jul	W	11,125	10,893	11,207	12,181	6,737	7,996
	AN	12,128	12,323	12,544	12,927	7,935	8,132
	BN	11,686	11,884	11,667	11,357	7,425	6,831
	D	10,523	10,390	10,105	10,307	7,253	5,916
	C	7,736	6,891	6,866	6,596	3,964	4,453
	AVG	10,739	10,575	10,604	10,921	6,737	6,842
Aug	W	8,507	8,541	8,527	8,650	3,565	3,826
	AN	8,538	8,877	9,013	9,648	4,774	5,174
	BN	8,371	8,428	8,062	8,753	4,274	4,224
	D	9,264	8,484	7,525	7,417	4,432	4,505
	C	4,390	4,250	3,823	3,615	3,119	3,157
	AVG	8,052	7,930	7,610	7,806	3,988	4,142
Sep	W	10,767	21,707	20,717	21,199	3,324	3,165
	AN	6,788	12,001	12,961	12,832	3,107	3,359
	BN	6,283	6,221	6,538	6,197	3,056	3,158
	D	6,116	5,415	4,432	3,644	3,031	3,477
	C	3,588	3,392	3,215	2,996	3,084	3,630
	AVG	7,348	11,386	11,025	10,896	3,147	3,329
Oct	W	8,718	8,036	7,867	8,287	5,367	8,615
	AN	6,183	5,292	5,518	7,207	4,132	8,846
	BN	6,258	5,898	5,416	6,976	4,486	9,224
	D	5,312	4,889	5,221	5,727	4,018	7,496
	C	5,215	4,745	4,684	4,969	4,541	9,015

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
	AVG	6,667	6,097	6,058	6,858	4,619	8,566
Nov	W	15,829	17,253	17,184	15,879	11,461	10,636
	AN	11,333	13,013	13,102	12,156	7,866	6,298
	BN	8,184	9,490	9,448	9,071	5,534	4,870
	D	8,733	8,630	8,539	8,061	6,528	5,178
	C	5,473	5,865	5,586	5,565	4,409	4,346
	AVG	10,793	11,748	11,671	10,946	7,808	6,898
Dec	W	43,367	40,285	44,292	40,431	42,647	38,576
	AN	19,040	19,570	20,375	19,936	18,233	19,338
	BN	13,987	14,169	15,099	14,049	14,295	13,609
	D	11,999	11,960	11,868	11,687	11,786	11,385
	C	8,131	7,681	7,341	7,186	8,051	7,752
	AVG	22,749	21,806	23,283	21,753	22,397	21,019

Table C.5.3-121. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Sacramento River at Rio Vista[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	-907 (-1.3%)	1304 (1.8%)	188 (0.3%)	2399 (3.4%)	-5306 (-7%)	-6136 (-7.8%)
	AN	-4025 (-9.6%)	-4524 (-10.8%)	-2600 (-6.4%)	-3099 (-7.6%)	-3478 (-8.4%)	-5480 (-12.8%)
	BN	-2346 (-11.2%)	-2250 (-10.7%)	-1667 (-8.2%)	-1571 (-7.8%)	-1791 (-8.8%)	-1298 (-6.5%)
	D	-1042 (-7%)	-191 (-1.3%)	-913 (-6.2%)	-63 (-0.4%)	-1179 (-7.8%)	-224 (-1.5%)
	C	-165 (-1.4%)	-1031 (-8.7%)	-451 (-3.7%)	-1318 (-10.9%)	-426 (-3.5%)	-1780 (-14.1%)
	AVG	-1530 (-4.1%)	-826 (-2.2%)	-872 (-2.4%)	-168 (-0.5%)	-2818 (-7.3%)	-3279 (-8.3%)
Feb	W	-292 (-0.4%)	2103 (2.6%)	751 (0.9%)	3147 (3.9%)	-6567 (-7.5%)	-6928 (-7.7%)
	AN	-1673 (-3.2%)	-1885 (-3.6%)	403 (0.8%)	192 (0.4%)	-2745 (-5.1%)	-4705 (-8.5%)
	BN	-4276 (-14.2%)	-4412 (-14.6%)	-3135 (-10.8%)	-3271 (-11.3%)	-4348 (-14.4%)	-3696 (-12.6%)
	D	-2382 (-12.3%)	-2072 (-10.7%)	-2474 (-12.7%)	-2164 (-11.1%)	-2381 (-12.3%)	-2175 (-11.2%)
	C	-880 (-7.2%)	-435 (-3.5%)	-1071 (-8.6%)	-625 (-5%)	-708 (-5.9%)	-143 (-1.2%)
	AVG	-1720 (-3.9%)	-881 (-2%)	-938 (-2.1%)	-99 (-0.2%)	-3853 (-8.3%)	-4015 (-8.4%)
Mar	W	-4404 (-6.9%)	-2178 (-3.4%)	-4097 (-6.5%)	-1870 (-2.9%)	-6916 (-10.4%)	-7077 (-10.3%)
	AN	-5585 (-11.9%)	-5700 (-12.2%)	-4332 (-9.5%)	-4447 (-9.8%)	-6809 (-14.2%)	-7463 (-15.4%)
	BN	-5157 (-24.6%)	-5354 (-25.5%)	-4122 (-20.7%)	-4319 (-21.7%)	-3806 (-19.4%)	-3936 (-20.1%)
	D	-2798 (-15.8%)	-2930 (-16.6%)	-2570 (-14.7%)	-2702 (-15.5%)	-2483 (-14.3%)	-2953 (-16.7%)
	C	-780 (-7.3%)	-729 (-6.8%)	-719 (-6.8%)	-668 (-6.3%)	-673 (-6.3%)	-703 (-6.6%)
	AVG	-3823 (-10.6%)	-3189 (-8.8%)	-3306 (-9.3%)	-2672 (-7.5%)	-4482 (-12.2%)	-4759 (-12.6%)
Apr	W	-5707 (-14.9%)	-6189 (-16.2%)	-5838 (-15.2%)	-6320 (-16.5%)	-6186 (-16%)	-6398 (-16.7%)
	AN	-5711 (-25.1%)	-5740 (-25.3%)	-5743 (-25.2%)	-5772 (-25.4%)	-5218 (-23.5%)	-4868 (-22.3%)
	BN	-2044 (-13.9%)	-1876 (-12.8%)	-1862 (-12.9%)	-1694 (-11.7%)	-1686 (-11.8%)	-1430 (-10.1%)
	D	-526 (-5.1%)	219 (2.1%)	-585 (-5.6%)	159 (1.5%)	-410 (-4%)	252 (2.4%)
	C	-160 (-2.1%)	218 (2.8%)	-148 (-1.9%)	230 (3%)	-15 (-0.2%)	67 (0.9%)
	AVG	-3133 (-14.7%)	-3043 (-14.3%)	-3159 (-14.8%)	-3069 (-14.4%)	-3105 (-14.6%)	-2920 (-13.8%)
May	W	-9745 (-36.2%)	-12626 (-46.9%)	-9493 (-35.6%)	-12375 (-46.4%)	-7032 (-29%)	-5739 (-28.6%)
	AN	-4912 (-28.9%)	-5207 (-30.6%)	-4618 (-27.6%)	-4913 (-29.4%)	-3761 (-23.7%)	-3147 (-21.1%)
	BN	-1626 (-14.9%)	-1482 (-13.6%)	-1297 (-12.2%)	-1153 (-10.9%)	-563 (-5.7%)	88 (0.9%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
	D	-135 (-1.7%)	897 (11%)	81 (1%)	1113 (14%)	160 (2%)	468 (5.5%)
	C	-53 (-1%)	45 (0.9%)	35 (0.7%)	134 (2.6%)	-404 (-7.1%)	-204 (-3.7%)
	AVG	-4124 (-26.7%)	-4815 (-31.2%)	-3884 (-25.5%)	-4576 (-30.1%)	-2900 (-20.4%)	-2192 (-17.1%)
Jun	W	-8083 (-48.8%)	-8555 (-51.7%)	-7875 (-48.2%)	-8347 (-51.1%)	-4519 (-34.8%)	-3416 (-29.9%)
	AN	-3226 (-32.6%)	-2304 (-23.3%)	-3303 (-33.1%)	-2381 (-23.9%)	-1973 (-22.9%)	-1637 (-17.8%)
	BN	-654 (-9.3%)	-298 (-4.3%)	-527 (-7.7%)	-171 (-2.5%)	-331 (-5%)	-538 (-7.4%)
	D	-232 (-3.9%)	-200 (-3.3%)	-336 (-5.5%)	-304 (-5%)	-462 (-7.4%)	-516 (-8.1%)
	C	-406 (-9.4%)	-312 (-7.2%)	-414 (-9.5%)	-320 (-7.4%)	-378 (-8.8%)	-493 (-10.9%)
	AVG	-3257 (-33.1%)	-3190 (-32.4%)	-3205 (-32.7%)	-3138 (-32%)	-1935 (-22.7%)	-1600 (-19.4%)
Jul	W	-4388 (-39.4%)	-3129 (-28.1%)	-4156 (-38.2%)	-2897 (-26.6%)	-4470 (-39.9%)	-4185 (-34.4%)
	AN	-4193 (-34.6%)	-3996 (-32.9%)	-4389 (-35.6%)	-4191 (-34%)	-4609 (-36.7%)	-4795 (-37.1%)
	BN	-4261 (-36.5%)	-4855 (-41.5%)	-4458 (-37.5%)	-5052 (-42.5%)	-4241 (-36.4%)	-4526 (-39.8%)
	D	-3270 (-31.1%)	-4608 (-43.8%)	-3137 (-30.2%)	-4474 (-43.1%)	-2853 (-28.2%)	-4391 (-42.6%)
	C	-3772 (-48.8%)	-3283 (-42.4%)	-2927 (-42.5%)	-2438 (-35.4%)	-2903 (-42.3%)	-2143 (-32.5%)
	AVG	-4002 (-37.3%)	-3897 (-36.3%)	-3838 (-36.3%)	-3733 (-35.3%)	-3867 (-36.5%)	-4079 (-37.4%)
Aug	W	-4942 (-58.1%)	-4681 (-55%)	-4975 (-58.3%)	-4714 (-55.2%)	-4962 (-58.2%)	-4824 (-55.8%)
	AN	-3764 (-44.1%)	-3364 (-39.4%)	-4103 (-46.2%)	-3703 (-41.7%)	-4239 (-47%)	-4474 (-46.4%)
	BN	-4097 (-48.9%)	-4147 (-49.5%)	-4154 (-49.3%)	-4205 (-49.9%)	-3788 (-47%)	-4529 (-51.7%)
	D	-4832 (-52.2%)	-4759 (-51.4%)	-4052 (-47.8%)	-3979 (-46.9%)	-3093 (-41.1%)	-2912 (-39.3%)
	C	-1272 (-29%)	-1233 (-28.1%)	-1131 (-26.6%)	-1093 (-25.7%)	-705 (-18.4%)	-458 (-12.7%)
	AVG	-4064 (-50.5%)	-3910 (-48.6%)	-3942 (-49.7%)	-3788 (-47.8%)	-3622 (-47.6%)	-3664 (-46.9%)
Sep	W	-7443 (-69.1%)	-7602 (-70.6%)	-18383 (-84.7%)	-18542 (-85.4%)	-17394 (-84%)	-18034 (-85.1%)
	AN	-3681 (-54.2%)	-3429 (-50.5%)	-8894 (-74.1%)	-8642 (-72%)	-9855 (-76%)	-9473 (-73.8%)
	BN	-3227 (-51.4%)	-3125 (-49.7%)	-3165 (-50.9%)	-3063 (-49.2%)	-3482 (-53.3%)	-3039 (-49%)
	D	-3085 (-50.4%)	-2639 (-43.2%)	-2384 (-44%)	-1938 (-35.8%)	-1400 (-31.6%)	-167 (-4.6%)
	C	-504 (-14.1%)	41 (1.2%)	-308 (-9.1%)	237 (7%)	-131 (-4.1%)	634 (21.1%)
	AVG	-4201 (-57.2%)	-4019 (-54.7%)	-8239 (-72.4%)	-8057 (-70.8%)	-7878 (-71.5%)	-7567 (-69.5%)
Oct	W	-3351 (-38.4%)	-102 (-1.2%)	-2669 (-33.2%)	580 (7.2%)	-2500 (-31.8%)	328 (4%)
	AN	-2051 (-33.2%)	2663 (43.1%)	-1160 (-21.9%)	3554 (67.2%)	-1386 (-25.1%)	1639 (22.7%)
	BN	-1773 (-28.3%)	2965 (47.4%)	-1412 (-23.9%)	3326 (56.4%)	-931 (-17.2%)	2248 (32.2%)
	D	-1294 (-24.4%)	2184 (41.1%)	-871 (-17.8%)	2608 (53.3%)	-1203 (-23%)	1769 (30.9%)
	C	-674 (-12.9%)	3800 (72.9%)	-204 (-4.3%)	4270 (90%)	-143 (-3.1%)	4046 (81.4%)
	AVG	-2048 (-30.7%)	1899 (28.5%)	-1478 (-24.2%)	2469 (40.5%)	-1439 (-23.8%)	1708 (24.9%)
Nov	W	-4368 (-27.6%)	-5193 (-32.8%)	-5792 (-33.6%)	-6617 (-38.4%)	-5723 (-33.3%)	-5243 (-33%)
	AN	-3467 (-30.6%)	-5035 (-44.4%)	-5147 (-39.6%)	-6715 (-51.6%)	-5237 (-40%)	-5858 (-48.2%)
	BN	-2650 (-32.4%)	-3314 (-40.5%)	-3957 (-41.7%)	-4620 (-48.7%)	-3914 (-41.4%)	-4200 (-46.3%)
	D	-2205 (-25.3%)	-3555 (-40.7%)	-2102 (-24.4%)	-3453 (-40%)	-2011 (-23.6%)	-2883 (-35.8%)
	C	-1065 (-19.4%)	-1128 (-20.6%)	-1456 (-24.8%)	-1519 (-25.9%)	-1177 (-21.1%)	-1219 (-21.9%)
	AVG	-2985 (-27.7%)	-3894 (-36.1%)	-3940 (-33.5%)	-4850 (-41.3%)	-3863 (-33.1%)	-4048 (-37%)
Dec	W	-719 (-1.7%)	-4791 (-11%)	2363 (5.9%)	-1708 (-4.2%)	-1645 (-3.7%)	-1855 (-4.6%)
	AN	-808 (-4.2%)	297 (1.6%)	-1338 (-6.8%)	-232 (-1.2%)	-2143 (-10.5%)	-598 (-3%)
	BN	308 (2.2%)	-378 (-2.7%)	126 (0.9%)	-560 (-4%)	-804 (-5.3%)	-440 (-3.1%)
	D	-213 (-1.8%)	-614 (-5.1%)	-174 (-1.5%)	-575 (-4.8%)	-82 (-0.7%)	-302 (-2.6%)
	C	-80 (-1%)	-380 (-4.7%)	370 (4.8%)	70 (0.9%)	710 (9.7%)	566 (7.9%)
	AVG	-352 (-1.5%)	-1730 (-7.6%)	591 (2.7%)	-787 (-3.6%)	-886 (-3.8%)	-734 (-3.4%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.							

Table C.5.3-122. Average Monthly Flows (Cubic Feet per Second) By Water-Year Type for Delta Outflow Estimated From CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	85,900	84,432	91,158	94,620	91,537	93,735
	AN	49,448	47,574	48,959	51,100	47,621	48,196
	BN	22,968	22,129	22,263	22,301	21,336	21,763
	D	14,736	14,587	14,754	14,732	13,634	15,816
	C	11,343	12,118	12,173	12,651	11,354	12,882
	AVG	43,289	42,487	44,889	46,372	44,290	45,847
Feb	W	96,835	95,560	104,533	107,085	106,071	107,800
	AN	62,321	60,457	64,163	65,873	66,184	65,435
	BN	36,766	35,439	37,266	36,084	35,985	35,010
	D	20,915	20,907	20,936	21,461	18,637	19,127
	C	12,991	13,053	12,553	12,798	11,919	12,373
	AVG	52,594	51,697	55,330	56,338	55,297	55,743
Mar	W	78,956	78,235	81,693	84,471	82,703	84,947
	AN	54,171	52,769	55,754	56,737	54,328	54,848
	BN	24,029	22,941	22,522	22,467	21,382	21,443
	D	19,880	19,489	19,388	19,985	16,912	17,264
	C	11,911	11,640	11,948	12,215	11,308	11,551
	AVG	43,172	42,427	43,911	45,097	43,191	44,102
Apr	W	54,394	54,471	54,860	54,562	48,665	48,246
	AN	31,975	31,907	31,183	30,576	24,174	24,457
	BN	21,928	21,726	21,218	20,641	16,506	16,714
	D	14,142	14,196	13,450	13,413	11,417	12,324
	C	9,053	9,012	8,881	9,294	8,537	9,012
	AVG	30,099	30,085	29,833	29,603	25,542	25,754
May	W	41,040	40,498	38,276	32,880	31,850	27,984
	AN	24,200	23,780	23,131	21,709	17,683	16,919
	BN	16,299	15,887	14,740	13,596	11,506	12,204
	D	10,487	10,211	9,737	10,375	9,103	10,508
	C	6,000	5,905	6,341	6,286	6,037	6,196
	AVG	22,517	22,139	21,103	19,121	17,532	16,646
Jun	W	23,451	23,008	18,080	15,640	16,890	15,739
	AN	11,801	11,836	10,177	10,676	10,048	10,625
	BN	8,004	8,046	8,067	8,943	8,702	9,688
	D	6,636	6,750	7,123	7,689	7,512	7,844
	C	5,322	5,322	5,345	5,632	5,345	5,365
	AVG	12,765	12,661	10,945	10,560	10,743	10,706

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jul	W	11,441	11,342	10,817	11,407	9,266	9,186
	AN	9,430	9,580	10,657	12,225	8,575	8,891
	BN	7,151	7,435	7,613	7,668	6,482	6,388
	D	5,024	5,103	5,548	6,448	5,406	5,397
	C	4,238	4,279	4,953	5,832	4,219	5,344
	AVG	7,951	8,014	8,232	8,984	7,104	7,271
Aug	W	5,341	5,032	4,412	4,308	4,202	4,000
	AN	4,000	4,000	4,009	4,713	4,000	4,175
	BN	4,000	4,000	4,120	5,129	3,857	4,088
	D	4,829	4,759	4,617	5,348	3,687	4,470
	C	4,077	4,484	4,141	4,433	3,396	3,919
	AVG	4,618	4,565	4,308	4,754	3,882	4,132
Sep	W	9,569	19,685	18,873	20,078	5,096	4,185
	AN	3,672	11,771	11,810	11,581	3,154	3,077
	BN	3,445	3,279	3,795	3,428	3,000	3,190
	D	3,350	3,165	3,067	3,021	3,000	3,979
	C	3,000	3,000	3,000	3,036	3,035	5,689
	AVG	5,334	9,658	9,473	9,754	3,692	4,028
Oct	W	6,487	7,509	8,133	9,520	5,830	9,685
	AN	4,021	5,273	6,500	8,982	4,161	9,717
	BN	4,477	5,420	6,206	8,054	4,448	10,487
	D	4,157	5,242	6,017	7,294	4,565	8,757
	C	4,158	4,682	4,969	6,607	4,724	10,195
	AVG	4,931	5,914	6,638	8,276	4,910	9,698
Nov	W	14,232	17,295	17,346	15,987	13,185	12,336
	AN	9,683	12,587	12,410	11,529	8,029	6,760
	BN	5,864	8,762	8,694	8,681	4,932	4,493
	D	6,943	8,651	8,375	8,052	5,815	5,494
	C	5,045	6,494	5,988	5,725	4,216	5,163
	AVG	9,193	11,671	11,515	10,844	8,091	7,629
Dec	W	48,185	44,649	49,759	45,191	51,097	45,940
	AN	18,014	18,190	19,384	19,119	19,120	20,042
	BN	11,950	11,724	13,284	12,231	13,722	12,524
	D	8,884	8,278	8,467	8,828	8,680	8,634
	C	5,531	5,283	5,505	6,560	6,160	5,562
	AVG	22,714	21,411	23,546	22,113	24,149	22,347

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Table C.5.3-123. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Delta Outflow[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	5637 (6.6%)	7835 (9.1%)	7105 (8.4%)	9302 (11%)	379 (0.4%)	-885 (-0.9%)
	AN	-1826 (-3.7%)	-1251 (-2.5%)	47 (0.1%)	622 (1.3%)	-1338 (-2.7%)	-2904 (-5.7%)
	BN	-1632 (-7.1%)	-1205 (-5.2%)	-793 (-3.6%)	-366 (-1.7%)	-927 (-4.2%)	-538 (-2.4%)
	D	-1101 (-7.5%)	1081 (7.3%)	-953 (-6.5%)	1229 (8.4%)	-1119 (-7.6%)	1084 (7.4%)
	C	11 (0.1%)	1540 (13.6%)	-764 (-6.3%)	764 (6.3%)	-819 (-6.7%)	232 (1.8%)
	AVG	1001 (2.3%)	2558 (5.9%)	1803 (4.2%)	3360 (7.9%)	-599 (-1.3%)	-525 (-1.1%)
Feb	W	9236 (9.5%)	10964 (11.3%)	10511 (11%)	12239 (12.8%)	1538 (1.5%)	714 (0.7%)
	AN	3863 (6.2%)	3113 (5%)	5727 (9.5%)	4977 (8.2%)	2021 (3.1%)	-438 (-0.7%)
	BN	-781 (-2.1%)	-1756 (-4.8%)	546 (1.5%)	-429 (-1.2%)	-1281 (-3.4%)	-1074 (-3%)
	D	-2278 (-10.9%)	-1788 (-8.5%)	-2269 (-10.9%)	-1779 (-8.5%)	-2298 (-11%)	-2334 (-10.9%)
	C	-1072 (-8.2%)	-618 (-4.8%)	-1133 (-8.7%)	-680 (-5.2%)	-633 (-5%)	-425 (-3.3%)
	AVG	2703 (5.1%)	3149 (6%)	3600 (7%)	4046 (7.8%)	-33 (-0.1%)	-596 (-1.1%)
Mar	W	3747 (4.7%)	5992 (7.6%)	4467 (5.7%)	6712 (8.6%)	1010 (1.2%)	476 (0.6%)
	AN	157 (0.3%)	677 (1.2%)	1559 (3%)	2079 (3.9%)	-1426 (-2.6%)	-1890 (-3.3%)
	BN	-2647 (-11%)	-2586 (-10.8%)	-1560 (-6.8%)	-1498 (-6.5%)	-1140 (-5.1%)	-1024 (-4.6%)
	D	-2968 (-14.9%)	-2617 (-13.2%)	-2577 (-13.2%)	-2225 (-11.4%)	-2476 (-12.8%)	-2722 (-13.6%)
	C	-604 (-5.1%)	-360 (-3%)	-333 (-2.9%)	-90 (-0.8%)	-641 (-5.4%)	-664 (-5.4%)
	AVG	19 (0%)	930 (2.2%)	764 (1.8%)	1675 (3.9%)	-720 (-1.6%)	-995 (-2.2%)
Apr	W	-5729 (-10.5%)	-6148 (-11.3%)	-5806 (-10.7%)	-6224 (-11.4%)	-6195 (-11.3%)	-6316 (-11.6%)
	AN	-7801 (-24.4%)	-7519 (-23.5%)	-7733 (-24.2%)	-7451 (-23.4%)	-7009 (-22.5%)	-6119 (-20%)
	BN	-5422 (-24.7%)	-5214 (-23.8%)	-5220 (-24%)	-5012 (-23.1%)	-4713 (-22.2%)	-3927 (-19%)
	D	-2725 (-19.3%)	-1818 (-12.9%)	-2779 (-19.6%)	-1872 (-13.2%)	-2033 (-15.1%)	-1090 (-8.1%)
	C	-517 (-5.7%)	-41 (-0.5%)	-475 (-5.3%)	0 (0%)	-344 (-3.9%)	-282 (-3%)
	AVG	-4558 (-15.1%)	-4345 (-14.4%)	-4543 (-15.1%)	-4330 (-14.4%)	-4291 (-14.4%)	-3849 (-13%)
May	W	-9190 (-22.4%)	-13056 (-31.8%)	-8649 (-21.4%)	-12515 (-30.9%)	-6426 (-16.8%)	-4897 (-14.9%)
	AN	-6517 (-26.9%)	-7280 (-30.1%)	-6098 (-25.6%)	-6861 (-28.9%)	-5449 (-23.6%)	-4790 (-22.1%)
	BN	-4793 (-29.4%)	-4095 (-25.1%)	-4381 (-27.6%)	-3683 (-23.2%)	-3235 (-21.9%)	-1392 (-10.2%)
	D	-1385 (-13.2%)	21 (0.2%)	-1108 (-10.9%)	297 (2.9%)	-634 (-6.5%)	133 (1.3%)
	C	37 (0.6%)	196 (3.3%)	133 (2.2%)	291 (4.9%)	-304 (-4.8%)	-90 (-1.4%)
	AVG	-4984 (-22.1%)	-5871 (-26.1%)	-4607 (-20.8%)	-5493 (-24.8%)	-3571 (-16.9%)	-2475 (-12.9%)
Jun	W	-6561 (-28%)	-7711 (-32.9%)	-6118 (-26.6%)	-7268 (-31.6%)	-1190 (-6.6%)	100 (0.6%)
	AN	-1753 (-14.9%)	-1176 (-10%)	-1788 (-15.1%)	-1211 (-10.2%)	-129 (-1.3%)	-51 (-0.5%)
	BN	698 (8.7%)	1684 (21%)	656 (8.2%)	1642 (20.4%)	635 (7.9%)	745 (8.3%)
	D	876 (13.2%)	1209 (18.2%)	762 (11.3%)	1095 (16.2%)	389 (5.5%)	155 (2%)
	C	23 (0.4%)	43 (0.8%)	23 (0.4%)	43 (0.8%)	-1 (0%)	-267 (-4.7%)
	AVG	-2022 (-15.8%)	-2058 (-16.1%)	-1919 (-15.2%)	-1955 (-15.4%)	-202 (-1.8%)	146 (1.4%)
Jul	W	-2175 (-19%)	-2255 (-19.7%)	-2076 (-18.3%)	-2156 (-19%)	-1551 (-14.3%)	-2221 (-19.5%)
	AN	-856 (-9.1%)	-540 (-5.7%)	-1005 (-10.5%)	-690 (-7.2%)	-2083 (-19.5%)	-3334 (-27.3%)
	BN	-669 (-9.4%)	-763 (-10.7%)	-953 (-12.8%)	-1047 (-14.1%)	-1130 (-14.8%)	-1280 (-16.7%)
	D	383 (7.6%)	374 (7.4%)	304 (6%)	295 (5.8%)	-141 (-2.5%)	-1051 (-16.3%)
	C	-19 (-0.4%)	1107 (26.1%)	-60 (-1.4%)	1065 (24.9%)	-734 (-14.8%)	-488 (-8.4%)
	AVG	-848 (-10.7%)	-680 (-8.6%)	-910 (-11.4%)	-743 (-9.3%)	-1128 (-13.7%)	-1713 (-19.1%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-1139 (-21.3%)	-1341 (-25.1%)	-830 (-16.5%)	-1032 (-20.5%)	-210 (-4.8%)	-308 (-7.2%)
	AN	0 (0%)	175 (4.4%)	0 (0%)	175 (4.4%)	-9 (-0.2%)	-538 (-11.4%)
	BN	-143 (-3.6%)	88 (2.2%)	-143 (-3.6%)	88 (2.2%)	-263 (-6.4%)	-1041 (-20.3%)
	D	-1142 (-23.6%)	-358 (-7.4%)	-1073 (-22.5%)	-289 (-6.1%)	-930 (-20.2%)	-877 (-16.4%)
	C	-681 (-16.7%)	-158 (-3.9%)	-1088 (-24.3%)	-564 (-12.6%)	-745 (-18%)	-514 (-11.6%)
	AVG	-736 (-15.9%)	-486 (-10.5%)	-682 (-14.9%)	-433 (-9.5%)	-426 (-9.9%)	-622 (-13.1%)
Sep	W	-4473 (-46.7%)	-5384 (-56.3%)	-14589 (-74.1%)	-15500 (-78.7%)	-13777 (-73%)	-15893 (-79.2%)
	AN	-518 (-14.1%)	-595 (-16.2%)	-8617 (-73.2%)	-8694 (-73.9%)	-8656 (-73.3%)	-8504 (-73.4%)
	BN	-445 (-12.9%)	-256 (-7.4%)	-279 (-8.5%)	-89 (-2.7%)	-795 (-21%)	-238 (-6.9%)
	D	-350 (-10.5%)	628 (18.8%)	-165 (-5.2%)	813 (25.7%)	-67 (-2.2%)	957 (31.7%)
	C	35 (1.2%)	2689 (89.6%)	35 (1.2%)	2689 (89.6%)	35 (1.2%)	2653 (87.4%)
	AVG	-1642 (-30.8%)	-1306 (-24.5%)	-5966 (-61.8%)	-5630 (-58.3%)	-5780 (-61%)	-5726 (-58.7%)
Oct	W	-657 (-10.1%)	3199 (49.3%)	-1679 (-22.4%)	2176 (29%)	-2303 (-28.3%)	165 (1.7%)
	AN	140 (3.5%)	5696 (141.7%)	-1112 (-21.1%)	4444 (84.3%)	-2338 (-36%)	735 (8.2%)
	BN	-28 (-0.6%)	6010 (134.3%)	-972 (-17.9%)	5066 (93.5%)	-1758 (-28.3%)	2433 (30.2%)
	D	407 (9.8%)	4600 (110.6%)	-677 (-12.9%)	3516 (67.1%)	-1453 (-24.1%)	1463 (20.1%)
	C	566 (13.6%)	6037 (145.2%)	42 (0.9%)	5513 (117.8%)	-245 (-4.9%)	3588 (54.3%)
	AVG	-20 (-0.4%)	4767 (96.7%)	-1004 (-17%)	3784 (64%)	-1727 (-26%)	1422 (17.2%)
Nov	W	-1047 (-7.4%)	-1897 (-13.3%)	-4110 (-23.8%)	-4959 (-28.7%)	-4161 (-24%)	-3652 (-22.8%)
	AN	-1655 (-17.1%)	-2923 (-30.2%)	-4558 (-36.2%)	-5826 (-46.3%)	-4382 (-35.3%)	-4768 (-41.4%)
	BN	-933 (-15.9%)	-1371 (-23.4%)	-3831 (-43.7%)	-4269 (-48.7%)	-3763 (-43.3%)	-4188 (-48.2%)
	D	-1128 (-16.2%)	-1449 (-20.9%)	-2836 (-32.8%)	-3157 (-36.5%)	-2560 (-30.6%)	-2558 (-31.8%)
	C	-829 (-16.4%)	118 (2.3%)	-2277 (-35.1%)	-1330 (-20.5%)	-1772 (-29.6%)	-562 (-9.8%)
	AVG	-1102 (-12%)	-1564 (-17%)	-3580 (-30.7%)	-4042 (-34.6%)	-3424 (-29.7%)	-3215 (-29.6%)
Dec	W	2912 (6%)	-2245 (-4.7%)	6448 (14.4%)	1291 (2.9%)	1338 (2.7%)	749 (1.7%)
	AN	1106 (6.1%)	2027 (11.3%)	930 (5.1%)	1851 (10.2%)	-264 (-1.4%)	923 (4.8%)
	BN	1771 (14.8%)	574 (4.8%)	1998 (17%)	801 (6.8%)	437 (3.3%)	293 (2.4%)
	D	-204 (-2.3%)	-250 (-2.8%)	402 (4.9%)	356 (4.3%)	213 (2.5%)	-194 (-2.2%)
	C	629 (11.4%)	31 (0.6%)	878 (16.6%)	280 (5.3%)	655 (11.9%)	-998 (-15.2%)
	AVG	1435 (6.3%)	-367 (-1.6%)	2738 (12.8%)	936 (4.4%)	603 (2.6%)	234 (1.1%)

[1] A positive value indicates higher average outflows in the preliminary proposal than in existing biological conditions.

Steelhead

Juvenile

Hydrodynamic conditions in the interior Delta are thought to affect the quality and availability of juvenile salmonid rearing habitat. Although the Delta is strongly influenced by natural tidal cycles, hydraulic residence time and net downstream flows are affected by south Delta water exports and the volume of water flowing into and through the Delta. Hydraulic residence time is an important attribute that affects primary and secondary production of food resources for fish within the Delta. Net downstream flow in the Delta is an important attribute that affects the movement and transport of fish and other organisms and organic material from upstream areas downstream to the LSZ of the estuary (e.g., Suisun Bay) where many of the species of juvenile fish rear. This attribute also affects the rate of downstream juvenile migration, which is assumed directly related to their survival rate.

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Two general indicators of habitat conditions in the interior Delta that have been used to assess changes in habitat conditions are OMR flows and Delta outflow. In addition, Sacramento River flow at Rio Vista has been used to assess migration rate, and survival, of the juveniles downstream of the proposed locations of the new north Delta intakes. Results of the CALSIM hydrologic model were used to evaluate potential changes in habitat conditions for juvenile salmonid rearing in the interior Delta. For purposes of this effects analysis it was assumed that juvenile rearing and migration by steelhead would occur within the Delta during the fall, winter, and spring months extending from October through May.

Results of a comparative analysis of the magnitude of OMR flows were used as one indicator of potential changes in habitat conditions in the interior Delta. For purposes of this effects analysis it has been assumed that a reduction in OMR reverse flows (i.e., an increase in seaward flows) would contribute to improved rearing conditions for juvenile steelhead in the interior Delta. The behavioral response and effects of reducing OMR reverse flows on juvenile steelhead migration, rearing, survival, and growth are uncertain. Acoustic tag experiments have been initiated in the Delta in recent years that will provide information in the future that can be used to further assess the response of juvenile salmonids to reductions in OMR reverse flows and other Delta hydrodynamic conditions. CALSIM model results for OMR reverse flows, by month and water-year type, over the period from October through May, for PP and EBC1 and EBC2 conditions are summarized in Table C.5.3-11 and Table C.5.3-12. The effects analysis focuses on differences between EBC2_ELT and PP_ELT and between EBC2_LLT and PP_LLT to eliminate the confounding effect of climate change in assessing PP effects.

Results of this analysis predict that there would be a substantial reduction in the magnitude of OMR reverse flows in wet, above-normal, and below-normal water years under PP (PP_ELT and PP_LLT) operations relative to EBC2 (EBC2_ELT and EBC2_LLT). The major reduction in OMR reverse flows under preliminary proposal operations reflects dual facility exports that result in water exports from the lower Sacramento River in the north Delta and a reduction in exports from the south Delta with a corresponding increase in positive OMR flows. The October through May OMR flows would be improved for PP_ELT and PP_LLT to a positive net flow of approximately 3,000 to 7,000 cfs in January through May of a wet year compared to approximately -2,000 to +2,500 cfs for EBC2_ELT and EBC2_LLT. OMR flows were negative under both EBC2 and PP operations in October through December of wet years, although the flows were substantially less negative under PP than EBC2 operations in both November and January. This change in wet years represents a substantial improvement in the magnitude and direction of flows in the central and south Delta that would be expected to improve juvenile survival during downstream migration through the Delta. As noted above, however, the behavioral response of juvenile steelhead to more positive OMR flows and the effects on survival, growth, rearing, and migration are uncertain. The change in operations in above-normal water years would be expected to result in improved habitat conditions for January through March, with a reduction in the average OMR reverse flows (i.e., increase in average OMR flows) for the period from about -3,500 cfs for EBC2_ELT and EBC2_LLT to positive flows of about 1,300 cfs for PP_ELT and 1,500 cfs for PP_LLT. These changes in south Delta hydrodynamics represent substantial improvement in habitat conditions for juvenile rearing and migration and improved juvenile survival. OMR flows in April and May of above-normal water years would be lower for PP than for EBC2 operations, but the most negative flow in either month is -625 cfs (for PP_LLT in April). Such moderately negative flows are not expected to adversely affect habitat or survival for the juveniles. The changes in OMR reverse flows for PP operations in below-normal years would not be as great as observed in wetter years, but would contribute to a small incremental improvement in

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OMR reverse flows when compared to EBC2, while the changes in dry and critical water years would be even smaller and likely would not result in substantive changes in juvenile habitat or survival. The changes in OMR reverse flows under PP operations would contribute to improved habitat and improved juvenile survival in wet, above-normal, and below-normal water years, resulting in net biological benefits. The improvement in net downstream flows in the central and south Delta would be expected to provide greater biological benefit to those juvenile steelhead migrating downstream from the San Joaquin, Cosumnes, and Mokelumne River systems, although juvenile steelhead migrating into the Delta from the Sacramento River system also would benefit from the reduction in OMR reverse flows.

Average Delta outflows generally declined from the EBC2 to PP scenarios during October through May, the juvenile steelhead period of Delta rearing and migration, but the majority of reductions were less than 10% (Table C.5.3-122, Table C.5.3-123). Reductions for individual months were generally greatest during October and November, ranging from 10% for EBC2_LLT to PP_LLT in November of critical years to 48% for the same comparison in November of below-normal years. In contrast, the changes from EBC2_LLT to PP_LLT in October were consistently positive, ranging from 2% for wet water-year types to 54% for critical water years.

Results of comparisons of CALSIM flow estimates for the Sacramento River at Rio Vista indicate that average October through May flows are reduced for PP conditions relative to EBC2 in all water-year types except critical water years in the late long-term (Table C.5.3-120, Table C.5.3-121). The reductions exceed 10% for both the early and late long-term scenarios in wet and above-normal years, and for the early long-term scenarios in below-normal water years. The biggest reductions are expected to occur in October and November. In contrast, all changes from EBC2_LLT to PP_LLT in October are positive, ranging from 4% in wet years to 81% in critical years.

Adult

DSM2-QUAL Fingerprinting Analysis

Percentage of Flows from Sacramento River

Adult steelhead use olfactory cues to return to their natal streams and rivers to spawn. For purposes of this analysis it is assumed that the strength at a location of the olfactory cue attracting adult steelhead into the Sacramento River would be directly related to the percentage of water at the location that originated from the Sacramento River. This percentage, as estimated for Collinsville, was used to represent the Sacramento River attraction flow. For purposes of this effects analysis, it was assumed that adult migration by adult steelhead would occur within the Delta during the fall and winter, extending from September through March, with peak migration occurring from December through February. Results of the fingerprinting analysis for water of Sacramento River origin, which estimates the mean percentage of water that originated in the Sacramento River, are summarized in Table C.5.3-124. The results show that the proportion of flows originating in the Sacramento River were generally lower (3% to 12% lower) under PP_ELT and PP_LLT relative to EBC2_ELT and EBC2_LLT, respectively, depending on month and time period.

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Table C.5.3-124. Summary of Fingerprinting Analysis of the Percentage (%) of Water at Collinsville That Originated in the Sacramento River (September through March)

Month	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
September	60	67	65	65	53	53
October	60	65	64	68	56	64
November	60	65	64	66	57	61
December	67	68	67	66	63	63
January	76	77	75	75	72	71
February	75	76	74	72	68	67
March	78	78	77	76	69	67

Percentage of Flows from San Joaquin River

The results of the fingerprinting analysis for San Joaquin–origin water at Collinsville showed very little (1% to 3%) difference between PP and EBC scenarios, with very low proportions of San Joaquin River water for both scenarios (Table C.5.3-125).

Table C.5.3-125. San Joaquin River Flows as a Percentage (%) of Water in the Delta at Collinsville during the September through March Adult Steelhead Migration Period

Month	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
September	0.3	0.2	0.2	0.1	1.6	1.1
October	0.2	0.2	0.2	0.3	3.0	1.8
November	0.4	0.6	0.8	1.0	3.3	3.1
December	0.9	0.9	1.0	1.0	1.5	1.5
January	1.6	1.6	1.7	1.7	2.7	2.7
February	1.4	1.5	1.5	1.5	3.6	3.4
March	2.6	2.6	2.6	2.8	6.2	6.1

CALSIM Flow Analysis: Sacramento River at Rio Vista

In addition to percentage of water from different sources, the total amount of flow may influence attraction of adult steelhead, especially for large differences in total flow. Therefore, Sacramento River flow at Rio Vista was used to represent Sacramento River attraction flow. Rio Vista flow generally declines during the September through March adult migration period under the PP scenarios relative to EBC2 scenarios, with reductions of greater than 10% in the majority of months and water-year types (Table C.5.3-120, Table C.5.3-121). Reductions are large for September of wet, above-normal, and below-normal years, ranging from 49% for the late long-term in below-normal years to 84% and 85% for the early and late long-term scenarios, respectively, in wet years. The flow reductions are likely to have the most impact when flows are already low, as is generally true in September. Flow consistently increased in October for the late long-term scenarios, ranging from a 4% increase in wet years to an 81% increase in critical years. Based on these results, it was concluded that PP operations would result in an incremental reduction in attraction flows in the lower Sacramento River, particularly for September of wetter years.

Sacramento River flow at Rio Vista generally declines during the September through March adult migration period under the PP_ELT scenario relative to the EBC1 scenario, with reductions of greater than 10% in most months and water-year types. Reductions are very large for September of

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all water-year types except critical years, ranging from 50% for dry years to 69% for wet years. The reductions from EBC1 to PP_ELT are greater than those for the EBC2 to PP scenarios for the other year types. Based on these results of comparisons between EBC1 and PP_ELT scenarios, as was true for the results based on comparisons between of PP and EBC2 scenarios, it was concluded that the proposed PP_ELT operations would result in an incremental reduction in attraction flow in the lower Sacramento River, particularly for September of wetter years.

Kelt

Average flows into Georgiana Slough and the Delta Cross Channel during the January through April period of kelt migration are summarized, by month and water-year type, in Table C.5.3-15 and Table C.5.3-16. These flows under PP operations were reduced from EBC2 in all water-year types, with the greatest reduction in wet and above-normal years. Average OMR flows during the kelt migration period are summarized in Table C.5.3-11 and Table C.5.3-12. Positive OMR flows occurred consistently in wet and above-normal years under PP operations. OMR was less negative in below-normal years, but there was little difference for dry and critical years, except that OMR was substantially less negative under PP_LLT than EBC2_LLT operations in critical years. Delta outflows during the kelt migration period are summarized in Table C.5.3-122 and Table C.5.3-123. Delta outflows were consistently lower under PP operations than under EBC2 operations, although the reduction was less than 10%, except for the reduction from EBC2_ELT to PP_ELT in dry years, which was 12%.

Winter-Run Chinook Salmon

Juvenile

The biological significance of reduced flows in the tidally influenced reach of the lower Sacramento River on juvenile Chinook salmon migration and survival has been identified as an issue of concern in this effects analysis, although there is a high degree of uncertainty in the potential effect on survival. Average flows in the lower Sacramento River at Rio Vista, which is used to represent the lower Sacramento River, during the winter-run juvenile migration period of November through April, are shown by month and water-year type in Table C.5.3-120 and Table C.5.3-121. These results show that the average November through April flows are reduced under PP operations for all water-year types, when compared to EBC2 operations. Differences in average flows within individual months ranged from 48% lower flow under PP_LLT compared to EBC2_LLT in November of above-normal years to 10% higher flow under PP_LLT compared to EBC2_LLT in December of critical years. The DPM has been used to further assess the potential effect of flow reduction in the lower Sacramento River on juvenile winter-run salmon survival.

Adult

DSM2-QUAL Fingerprinting Analysis

Fingerprint analyses determined that attraction flow, as estimated by the percentage of Sacramento River water at Collinsville, consistently declined from EBC2 to PP operations about 3% to 5% during the December through February migration period for winter-run adults (Table C.5.3-126). The reductions in percentage are small in comparison with the magnitude of change in dilution reported to cause a significant change in migration by Fretwell (1989) and, therefore, are not expected to affect winter-run migration. However, uncertainty remains with regard to adult salmon behavioral response to anticipated changes in lower Sacramento River flow percentages.

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Table C.5.3-126. Predicted Percentage (%) of Water at Collinsville Originating in the Sacramento River during the December through February Adult Winter-Run Chinook Salmon Migration Period

	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
December	67	68	67	66	63	63
January	76	77	75	75	72	71
February	75	76	74	72	68	67

CALSIM Flow Analysis: Sacramento River at Rio Vista

In addition to percentage of water from different sources, the total amount of flow may influence attraction of adult winter-run Chinook salmon, especially for large differences in total flow. Sacramento River flow at Rio Vista consistently declines during the December through February adult migration period under the PP scenarios relative to EBC2 scenarios, except in December of critical years (Table C.5.3-120, Table C.5.3-121). Most reductions were less than 10%, and the greatest reduction was 14%, which occurred for the early long-term scenarios in February of below-normal years, as well as the late long-term scenarios in January of critical years. Based on these results, it was concluded that preliminary proposal operations would result in a minor reduction in attraction flows in the lower Sacramento River.

Spring-Run Chinook Salmon

Juvenile

The effects of changed flows on juvenile spring-run Chinook salmon survival (smolts) through the Delta are analyzed more fully in the section discussing the results of the DPM. CALSIM flow summaries for Rio Vista showed that average flows for PP scenarios were lower (10–15%) than EBC scenarios during the December through May juvenile migration period in wet, above-normal, and below-normal years, with lesser differences in dry and critical years (Table C.5.3-120, Table C.5.3-121). Of note were the average differences between months, which estimated that flows under PP scenarios in March through May would be considerably lower (up to 30%, accounting for climate change) than under EBC scenarios. There was less average difference between PP and EBC scenarios for Delta outflow in December through May, although flows were slightly lower under PP scenarios and there were differences in overall patterns between months. The general patterns were quite consistent for the different comparisons across time periods (i.e., comparisons between PP_ELT/PP_LLT and EBC1/EBC2, comparisons between PP_ELT/PP_LLT and EBC2_ELT/EBC2_LLT).

Adult

DSM2-QUAL Fingerprinting Analysis

Percentage of Flows from Sacramento River

Results of fingerprint simulation modeling estimated that there would be an 8% reduction in olfactory cues for PP_ELT compared to EBC2_ELT in April and a 3% reduction in May (Table C.5.3-127). The reduction in predicted olfactory cues for PP_LLT relative to EBC2_LLT would be 9% in April and 4% in May (Table C.5.3-127). The percentage of water originating at Collinsville in EBC1/EBC2 was 5–10% greater than under PP scenarios. The reduction in olfactory cues (percentage of Sacramento River water at Collinsville predicted using DSM2 modeling within the fingerprint analysis) is small in comparison with the magnitude of change in dilution reported to

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cause a significant change in migration by Fretwell (1989) and is expected to be within the broad range of olfactory cues and migration conditions that currently occur within the lower reach of the Sacramento River. There is, however, uncertainty in the adult behavioral response to anticipated changes in lower Sacramento River flows and olfactory cues that may result in greater upstream attraction delays as adults search for the cue within the Delta prior to migrating upstream into the river. Further, the change in olfactory cues in the lower Sacramento River and mixing of waters within the Delta under the future preliminary proposal operations may have less of an adverse effect on adult attraction than current conditions of south Delta exports, OMR reverse flows, and blending of Sacramento and San Joaquin River water, and the blending of olfactory cues, under current conditions.

Table C.5.3-127. Fingerprinting Analysis of Proportion of Water at Collinsville Originating in the Sacramento River for Model Scenarios during the April through May Peak Spring-Run Chinook Salmon Upstream Migration Period

Month	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
April	77	77	76	75	68	67
May	69	69	67	65	64	61

Percentage of Flows from San Joaquin River

The fingerprinting analysis showed that the proportion of flows originating in the San Joaquin River was greater for PP scenarios relative to EBC scenarios (Table C.5.3-128), as is expected, because the north Delta intake structures would be diverting water from the Sacramento River with a reduction in water diversion from the south Delta. Although the relative change is substantial (e.g., more than double the percentage of flow in the San Joaquin under PP scenarios than under EBC scenarios), the percentage of flow attributable to San Joaquin River water under all scenarios is quite low (less than 10%). This suggested that preliminary proposal conditions would result in an incremental increase in olfactory cues associated with attraction flows in the lower San Joaquin River, but the increase in attraction flows and cues would be small.

Table C.5.3-128. Fingerprinting Analysis of Proportion of Water at Collinsville Originating in the San Joaquin River for Model Scenarios, March through April

	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
March	2.6	2.6	2.6	2.8	6.2	6.1
April	6.3	6.2	6.2	6.6	8.8	9.1

CALSIM Flows

Adult spring-run Chinook salmon attraction flows based on Sacramento River CALSIM model results for instream flows at Rio Vista during the upstream migration period (April and May) are summarized in Table C.5.3-120 and Table C.5.3-121.

Flow estimates for EBC1 generally were similar to those for EBC2. Flows originating in the Sacramento River were less for preliminary proposal conditions relative to EBC scenarios, as is expected, because the north Delta intake structures would be diverting water from the Sacramento River upstream of Collinsville. The estimated level of average flow reduction between EBC2_ELT and PP_ELT was greatest in wet and above-normal water years (16% and 29% reduction in April and

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May of wet years and 23% and 24% reduction in April and May of above-normal years). The estimated average reduction in below-normal years was 12% in April and 6% in May of ELT. In dry years the average reduction was estimated to be 4% in April and an increase of 2% in May. In critically dry years there was no estimated change in April and a 7% reduction in flows in May. Under late long-term operations the pattern was similar with the greatest flow average reductions under PP_LLT in wet (17% in April and 29% in May) and above-normal years (22% in April and 21% in May). In below-normal years there was a 10% average reduction under PP_LLT estimated in April and an increase of 1% in May. In dry years there were estimated average increases in flows of 2% in April and 5% in May under PP_LLT. In critically dry years there was an increase of 1% in April under PP_LLT and a reduction of 4% in May.

Fall-Run Chinook Salmon

Juvenile

CALSIM flow simulations for Rio Vista during the main fall-run migration period (February through May) estimated that flows under the PP_ELT vs. EBC2_ELT would be lower in all months (4–29%) except in April of critically dry years when there is no change and in May of dry years where there is a slight increase of 2%. Under PP_LLT vs. EBC2_LLT scenarios would be lower in all months (1–29%) except for May in below-normal years (1%), April and May of dry years (2% and 5%), and April of critically dry years (1%) (Table C.5.3-120, Table C.5.3-121).

Adult

DSM2-QUAL Fingerprinting Analysis

Percentage of Flows from Sacramento River

Results of fingerprint simulation modeling predicted that there would be a 12% reduction in olfactory cues for PP_ELT compared to EBC2_ELT in September, and an 8% reduction in October (Table C.5.3-129). The reduction in predicted olfactory cues for PP_LLT relative to EBC2_LLT would be 12% in September and 4% in October. Based on results of the studies conducted by Fretwell (1989), it was concluded that a reduction in olfactory cues of 10% or less would not adversely affect adult attraction and that reductions greater than 20% would significantly affect adult attraction. The reduction in olfactory cues (percentage of Sacramento River water at Collinsville predicted using DSM2 modeling within the fingerprint analysis) is small (<10%) in October in comparison with the magnitude of change in dilution reported to cause a significant change in migration by Fretwell (1989). The reduction in olfactory cues in September (12% under ELT and LLT) is approaching a magnitude where significant adverse effects may occur to adult fall-run Chinook salmon attraction within the lower reach of the Sacramento River. There is, however, uncertainty in the adult behavioral response to anticipated changes in lower Sacramento River flows and olfactory cues that may result in greater upstream attraction delays as adults search for the cue within the Delta prior to migrating upstream into the river. Further, the change in olfactory cues in the lower Sacramento River and mixing of waters within the Delta under the future preliminary proposal operations may have less of an adverse effect on adult attraction than current conditions of south Delta exports, OMR reverse flows, and blending of Sacramento and San Joaquin River water, and the blending of olfactory cues, under current conditions.

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Table C.5.3-129. Fingerprinting Analysis of the Proportion of Water at Collinsville Originating in the Sacramento River during the September through October Adult Fall-Run Chinook Salmon Migration Period

Month	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
September	60	67	65	65	53	53
October	60	65	64	68	56	64

Percentage of Flows from San Joaquin River

Results of the fingerprint analysis showed a small increase in olfactory cues from the San Joaquin River passing downstream through the Delta under preliminary proposal operations (Table C.5.3-130). Olfactory cues are an important factor in adult attraction and migration (Quinn 2005). These results indicate that there would be a small benefit of preliminary proposal operations in improving olfactory signals from the San Joaquin River.

Table C.5.3-130. Fingerprinting Analysis of the Percentage (%) of Water at Collinsville Originating in the San Joaquin River

Month	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
September	0.3	0.2	0.2	0.1	1.6	1.1
October	0.2	0.2	0.2	0.3	3.0	1.8
November	0.4	0.6	0.8	1.0	3.3	3.1

CALSIM Flows

Attraction flows for upstream-migrating adult fall-run Chinook salmon based on CALSIM model results for instream flows modeled in the Sacramento River at Rio Vista during the migration period are summarized in Table C.5.3-120 and Table C.5.3-121.

Differences in the percentage of attraction flows that are less than 5% between existing biological conditions and preliminary proposal operations were assumed to be within the range of error of the simulation models and below the ability to detect actual differences that would be biologically meaningful. The analysis predicts that differences in flows originating in the Sacramento River would be reduced to a greater degree in September of wet and above-normal years than under other conditions. In a comparison of PP_ELT to EBC2_ELT flows, the change in lower Sacramento River flow was estimated to be a reduction of 84% in September and 32% reduction in October with an average reduction of 58% in wet years and a reduction of 76% in above-normal years in September and 25% in October. The changes in flows in both September and October in below-normal and dry year comparisons of PP_ELT and EBC2_ELT were reduced by 53% in September, but were increased by 32% in October of wet years. In the PP_LLT and EBC2_LLT comparisons, river flow was estimated to be reduced by 74% in September but increased by 23% in October of wet years. A similar pattern was observed in above-normal years with a reduction in September of 74% and an increase in October of 23%. In other water years, flow was reduced by 49% in September and increased by 32% in October of below-normal years; increased by 5% and 31% in September and October, respectively, in dry years; and increased by 21% and 81% in September and October, respectively, of critically dry years. This is expected, because the north Delta intake structures would be diverting water from the Sacramento River under the constraints of the bypass flow criteria. These results are similar to those of the fingerprint analysis in showing a significant reduction in attraction flows in

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September with the greatest change in wetter years. A significant reduction in flows also occurs under EBC1 conditions compared to EBC2 conditions in September during wet and above-normal water years. Based on these results, it was concluded that preliminary proposal operations would result in an incremental reduction in olfactory cues associated with attraction flows in the lower Sacramento River.

Late Fall–Run Chinook Salmon

Juvenile

CALSIM flow simulations for Rio Vista during the main late fall–run migration period (January through March) estimated that flows under the PP_ELT and PP_LLT scenarios on average would be lower than flows in EBC2_ELT and EBC2_LLT by 7–10% in wet years, 8–14% in above-normal years, 9–19% in below-normal years, 8–14% in dry years, and 4–6% in critical years (Table C.5.3-120, Table C.5.3-121).

Adult

DSM2-QUAL Fingerprinting Analysis

Results of fingerprint simulation modeling predicted that there would be a 4% reduction in olfactory cues for PP_ELT compared to EBC2_ELT in December, a 3% reduction in January, and a 6% reduction in February (Table C.5.3-131). The reduction in predicted olfactory cues for PP_LLT relative to EBC2_LLT would be 3% in December, 4% in January, and 5% in February. Based on results of the studies conducted by Fretwell (1989), it was concluded that a reduction in olfactory cues of 10% or less would not adversely affect adult attraction and that reductions greater than 20% would significantly affect adult attraction. The reduction in olfactory cues (percentage of Sacramento River water at Collinsville predicted using DSM2 modeling within the fingerprint analysis) is small (6% or less) in December, January, and February under both ELT and LLT operations. Based on results that show a 6% or less change in olfactory cues, which was below the 10% criterion based on results from Fretwell (1989), it was concluded that reduction in flow was not likely to adversely affect adult attraction. There is, however, uncertainty in the adult behavioral response to anticipated changes in lower Sacramento River flows and olfactory cues that may result in greater upstream attraction delays as adults search for the cue within the Delta prior to migrating upstream into the river. Further, the change in olfactory cues in the lower Sacramento River and mixing of waters within the Delta under the future preliminary proposal operations may have less of an adverse effect on adult attraction than current conditions of south Delta exports, OMR reverse flows, and blending of Sacramento and San Joaquin River water, and the blending of olfactory cues, under current conditions.

Table C.5.3-131. Fingerprinting Analysis of the Proportion of Water at Collinsville Originating in the Sacramento River during the December through February Adult Late Fall–Run Chinook Salmon Migration Period

Month	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
December	67	68	67	66	63	63
January	76	77	75	75	72	71
February	75	76	74	72	68	67

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CALSIM Flows

Differences in the percentage of attraction flows that are less than 5% between existing biological conditions, and preliminary proposal operations were assumed to be within the range of error of the simulation models and below the ability to detect actual differences that would be biologically meaningful. The analysis predicts that differences in flows originating in the Sacramento River typically would be reduced to a greater degree in February than in other months. During the PP_ELT and EBC2_ELT comparison, the change in lower Sacramento River flow at Rio Vista was estimated to be a reduction of 4–8%, depending on month, in wet years and a reduction of 5–11% in above-normal years (Table C.5.3-120, Table C.5.3-121). Changes in flows in PP_ELT vs. EBC2_ELT decreased in below-normal years (5–14%) and dry years (1–12%). In critically dry years, flows increased 10% in December and decreased in January and February 4% and 6%, respectively. During the PP_LLT vs. EBC2_LLT comparisons, river flow was estimated to be reduced by 8–10%, depending on month, in wet years. A similar pattern was observed in above-normal years with a reduction of 8–15%. The reduction in below-normal years ranged 6–20%, dry years ranged 2–17%, and in critically dry years the change in flows ranged from a decrease of 1% to 14%, depending on month. This is expected because the north Delta intake structures would be diverting water from the Sacramento River under the constraints of the bypass flow criteria. These results vary from the fingerprint analysis in that the reduction in flows in some months exceeded 10%. No relationship has been developed on the relationship between seasonal flows in the lower Sacramento River and adult late fall–run Chinook salmon attraction and upstream migration. Based on these results, it was concluded that preliminary proposal operations could result in an incremental reduction in cues associated with attraction flows in the lower Sacramento River.

White Sturgeon

Juvenile

Results of CALSIM modeling of Delta outflow during the late winter and spring (February through May) show a pattern of greatest outflows typically during the winter (February through March), with a declining trend in outflow through the spring (Table C.5.3-122, Table C.5.3-123). Delta outflow is greatest in wet years and declines substantially with reduced hydrology as conditions become dry and critically dry. Average Delta outflow differences between PP and EBC scenarios were quite low in wet and critical years, although when comparing within the same time periods (PP_ELT vs. EBC2_ELT and PP_LLT vs. LLT) the average differences between scenarios in wet years were relatively minor in January through February, whereas the PP scenarios had appreciably lower flows than EBC scenarios in March through April). On average, Delta outflows in above-normal, below-normal, and dry water years were around 10–20% lower under PP scenarios than EBC scenarios.

Green Sturgeon

Adult

Differences in attraction flows between PP and EBC scenarios for adult green sturgeon at Rio Vista were appreciable in most water-year types. Average differences in flows during the attraction period (November–July) ranged from around 19–21% lower under PP scenarios in wet and above-normal years to 9% lower under PP scenarios in critical years (Table C.5.3-120, Table C.5.3-121). There were considerable intermonth differences in flows, ranging from somewhat greater average flows under PP scenarios (e.g., December of critical years) to average flows that were 40% or more

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lower under PP scenarios compared to EBC scenarios (e.g., November of above-normal and below-normal years).

Pacific Lamprey

Macropthalmia

Estimated Sacramento River flows between December and May at Rio Vista are shown in Table C.5.3-120 and Figure C.5.3-74 through Figure C.5.3-79 and differences between PP and EBC scenarios are shown in Table C.5.3-121. This location is downstream of the intake such that lower flows are expected when water is exported at higher rates.

Predicted average monthly differences for model scenario PP_ELT relative to EBC1 range from a reduction in flows in PP_ELT in December of 352 cfs (2% of total flow) to a reduction of 4,124 cfs (27%) in May. Predicted reductions for PP_LLT relative to EBC1 range from 826 cfs (-2%) to 4,815 cfs (-31%). Predicted average monthly differences for model scenario PP_ELT relative to EBC2 range from an increase in flows in PP_ELT in December of 591 cfs (3% of total flow) to a reduction of 3,884 cfs (26%) in May. Predicted reductions for PP_LLT relative to EBC2 range from 99 cfs (<1%) to 4,576 cfs (30%).

Isolating the effect of the preliminary proposal from the effects of climate change in the early long-term, predicted reductions for PP_ELT relative to EBC_ELT range from 886 cfs (-4%) to 4,482 cfs (-13%) (Table C.5.3-121). Late long-term predicted reductions for PP_LLT relative to EBC_LLT range from 734 cfs (-3%) to 4,759 cfs (-13%).

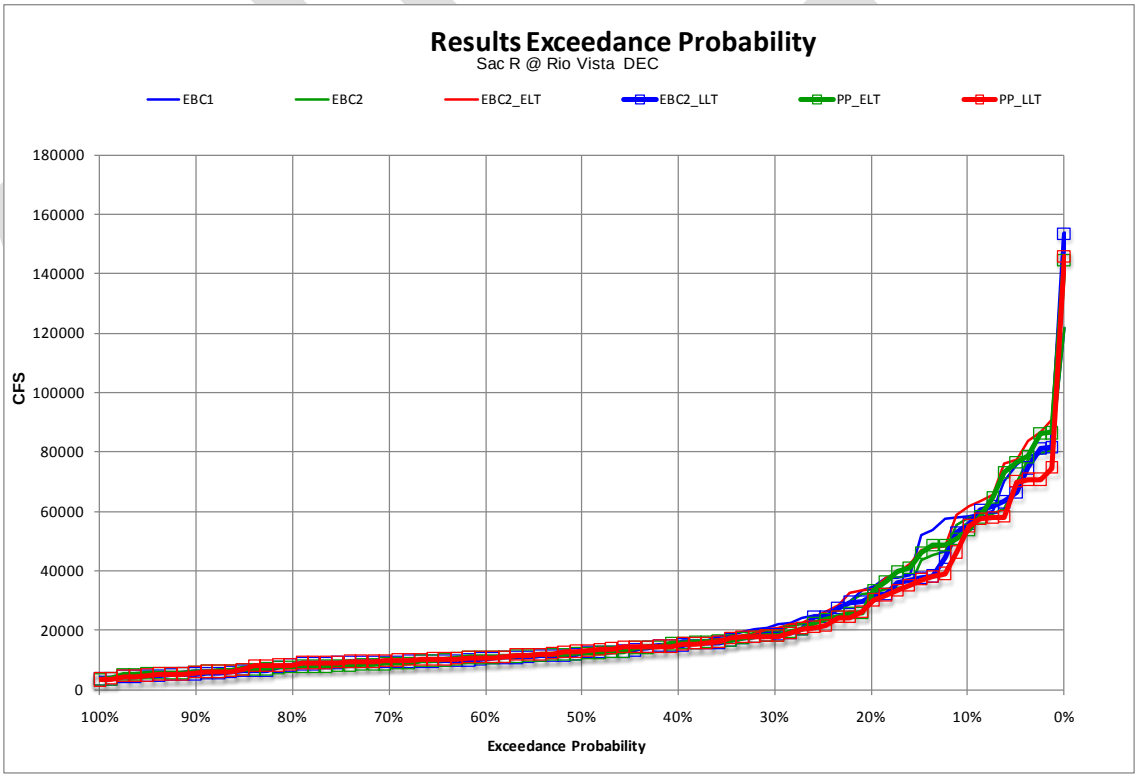

Figure C.5.3-74. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River at Rio Vista, December

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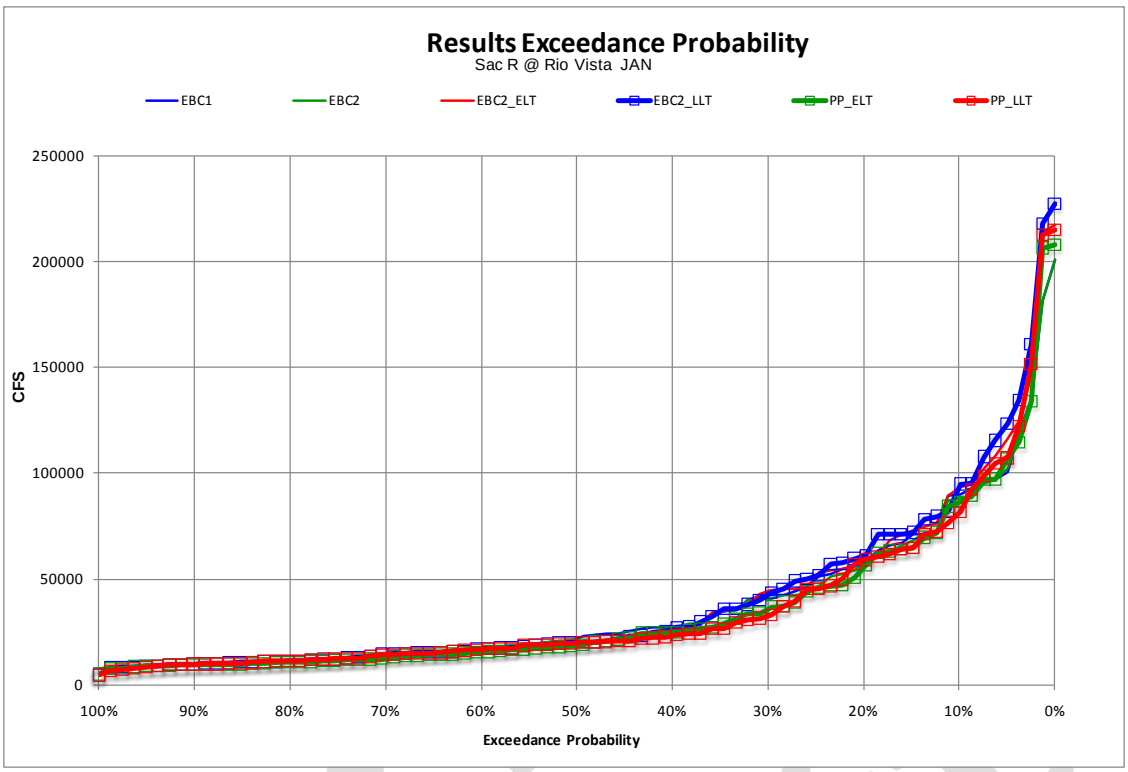

Figure C.5.3-75. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River at Rio Vista, January

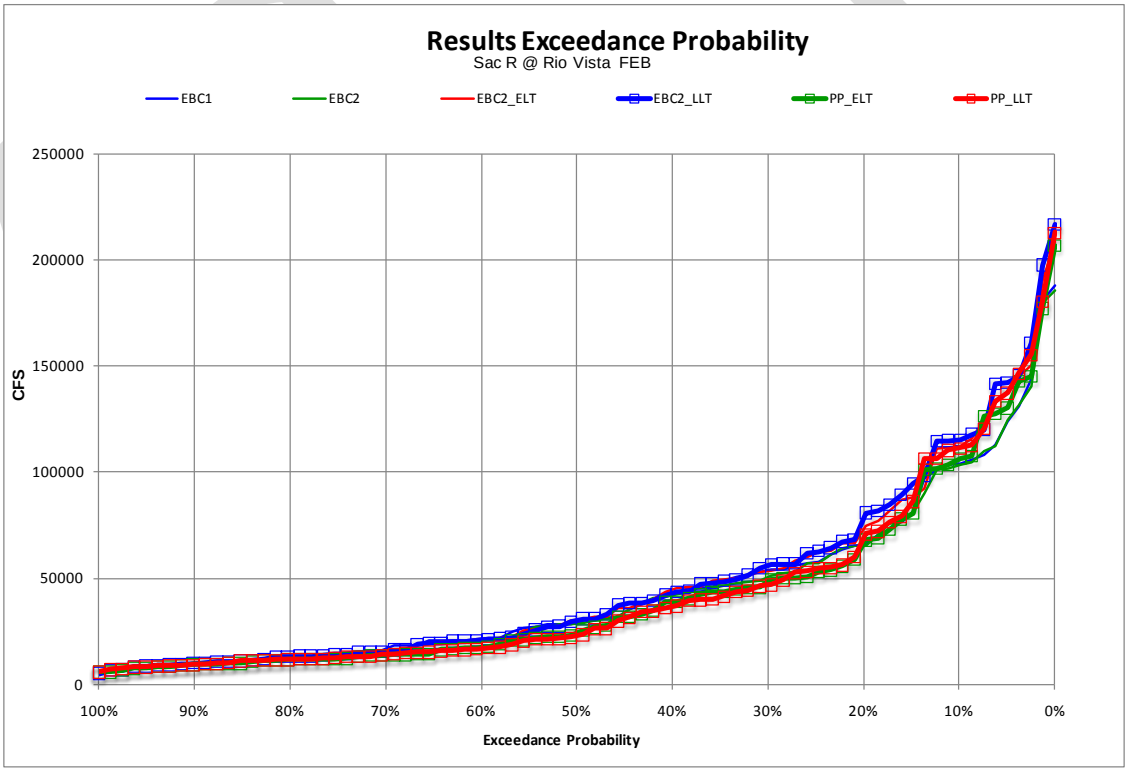

Figure C.5.3-76. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River at Rio Vista, February

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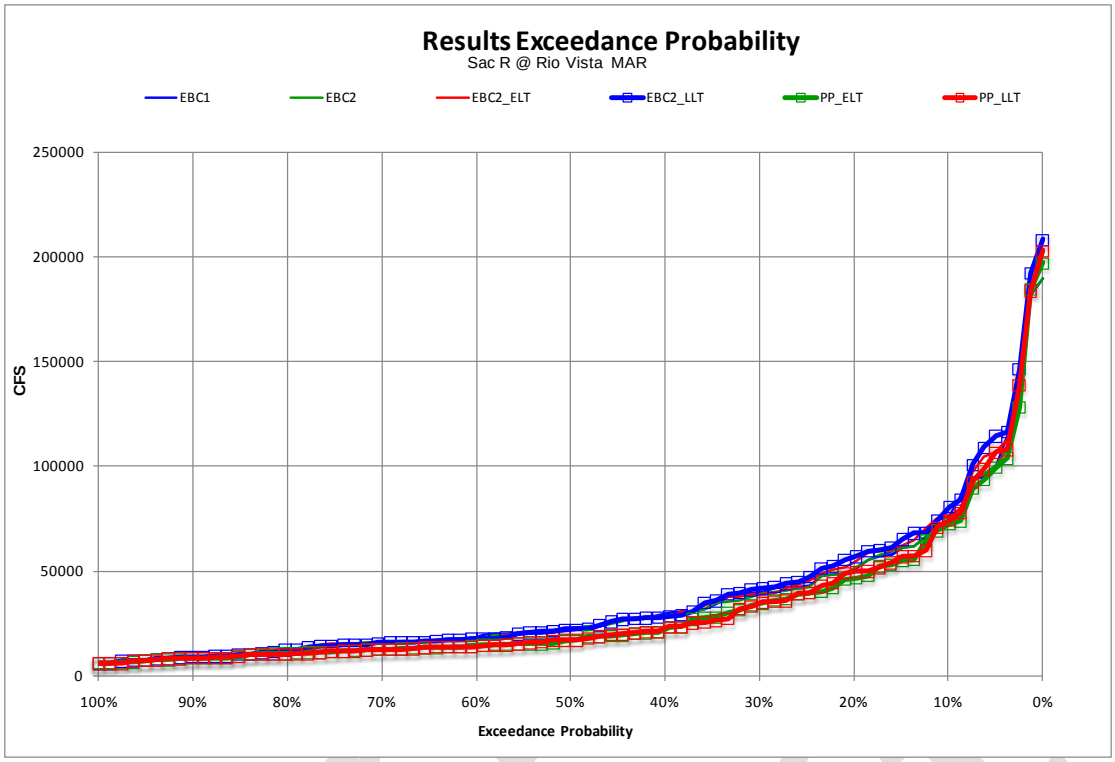

Figure C.5.3-77. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River at Rio Vista, March

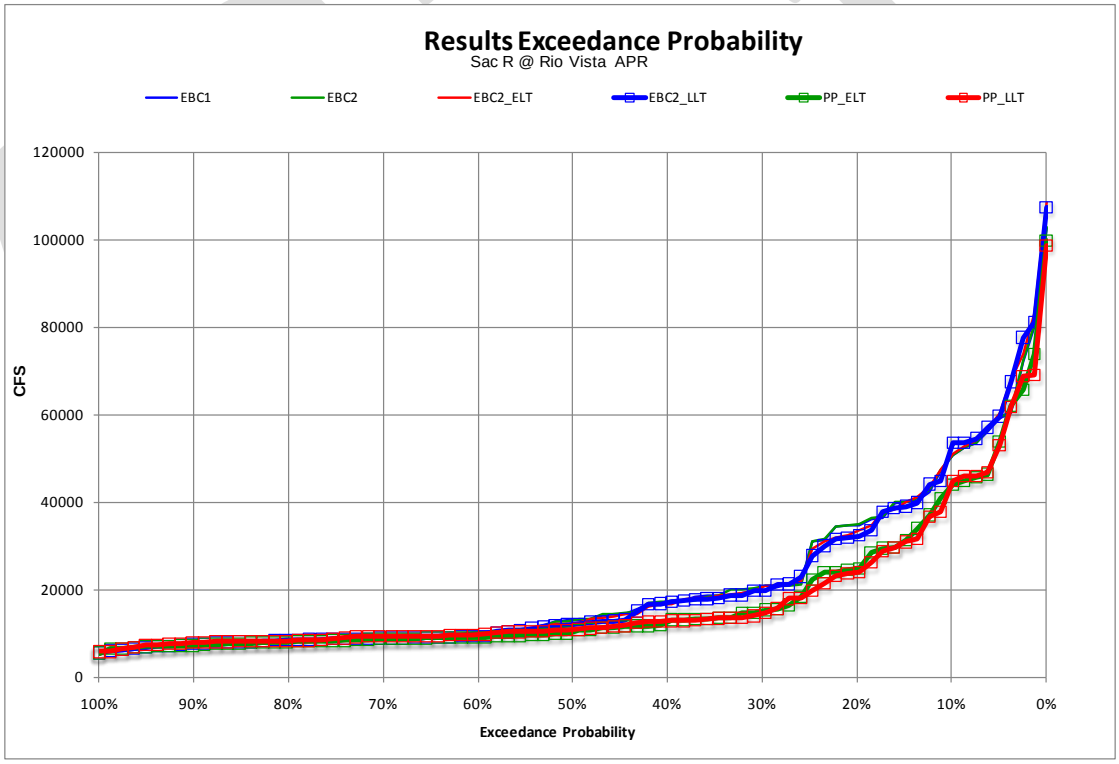

Figure C.5.3-78. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River at Rio Vista, April

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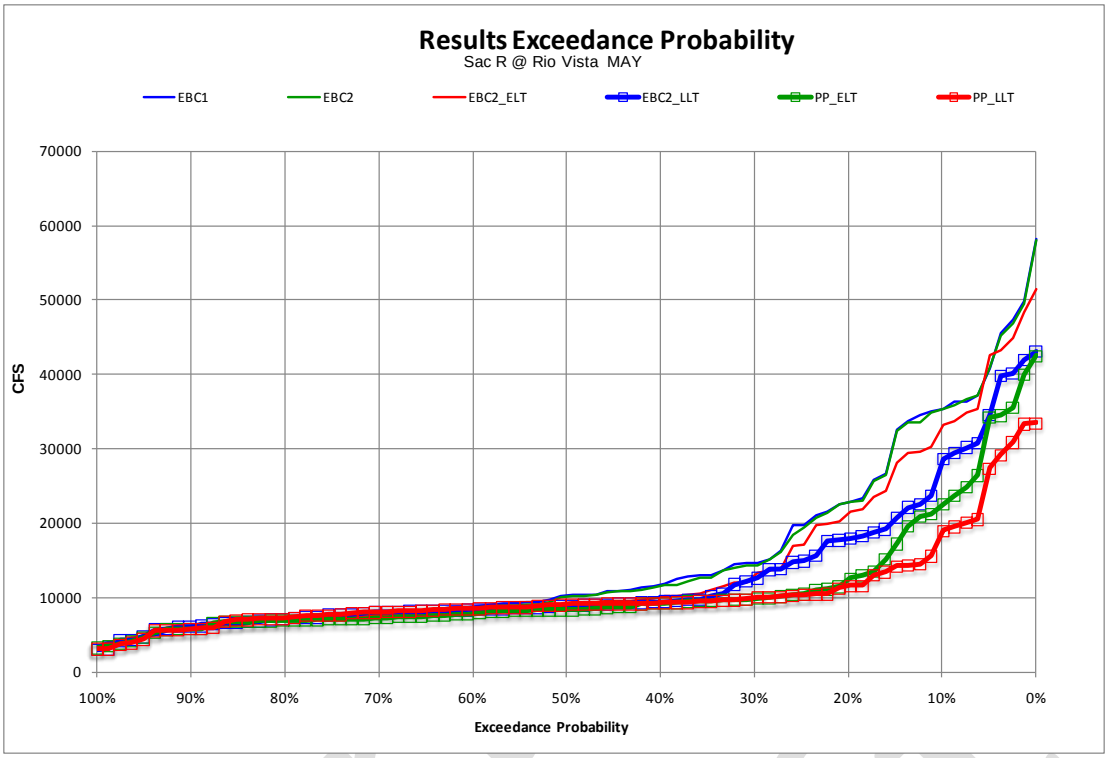

Figure C.5.3-79. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River at Rio Vista, May

Adult

It is hypothesized that lamprey are attracted to upstream spawning habitat by chemical cues, possibly by pheromones released by ammocoetes in silty backwaters near spawning grounds (Luzier et al. 2009); although, there is conflicting data supporting this (Clemens et al. 2010). The potential dependence on attraction cues suggests that flows may be important to upstream lamprey migration. The analysis assessed changes to predicted flows by evaluating the proportion of water at a key decision location, Collinsville, coming from the Sacramento River versus the San Joaquin River.

Sacramento versus San Joaquin River Source Flows

DSM2 source-water fingerprinting was used to determine the average percent composition of water from the Sacramento and San Joaquin Rivers at the confluence (Collinsville) during the upstream migration period for Pacific lamprey (January through June) (Moyle 2002). Because inputs of this model are based on CALSIM outputs, the amount of model error is propagated, resulting in lower certainty of DSM2 model results than CALSIM results.

Percentage of Flows from Sacramento River

The average percent composition of water from the Sacramento River during January through June is predicted to be 6% lower for PP_ELT relative to EBC1 (Figure C.5.3-80 and Table C.5.3-132). The greatest difference for PP_ELT relative to EBC1 during this period occurs in March (10% lower). The average percent composition of water from the Sacramento River during January through June is predicted to be 8% lower for PP_LLT relative to EBC1. The greatest difference for PP_LLT relative to EBC1 is also predicted to be during March (11% lower). The average percent composition of water from the Sacramento River during January through June is predicted to be 7% lower for PP_ELT

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relative to EBC2. The greatest difference for PP_ELT relative to EBC2 during this period occurs in March (10% lower). The average percent composition of water from the Sacramento River during January through June is predicted to be 8% lower for PP_LLT relative to EBC2. The greatest difference for PP_LLT relative to EBC2 also is predicted to be during March and April (11% lower).

By comparing the EBC2 and preliminary proposal in the two climate change scenarios, one can remove the effects of climate change and evaluate the effects of the preliminary proposal. Average percent composition of water from the Sacramento River during January through June is predicted to be 5% lower for PP_ELT relative EBC2_ELT. The greatest reductions are predicted to occur during March and April (8% lower). Average percent composition of water from the Sacramento River over the 6-month period is predicted to be 6% lower for PP_LLT relative to EBC2_LLT. The greatest reductions are predicted to occur during March and April (11% lower).

These results suggest a small reduction in Sacramento River water that may have a small effect on the attraction ability of Pacific lamprey migrating into the Sacramento River.

Percentage of Flows from San Joaquin River

The average percent composition of water from the San Joaquin River during January through June is predicted to be 2% greater for PP_ELT relative to EBC1 (Figure C.5.3-80 and Table C.5.3-132). This difference represents a percent increase in water inputs from the San Joaquin River of 68% during these months. The average percent composition of water from the San Joaquin River during January through June is predicted to be 2% greater for PP_LLT relative to EBC1. This difference represents a 65% increase in water inputs from the San Joaquin River during these months. The average percent composition of water from the San Joaquin River during January through June is predicted to be 2% greater for PP_ELT relative to EBC2. This difference represents a percent increase in water inputs from the San Joaquin River of 62% during these months. The average percent composition of water from the San Joaquin River during January through June is predicted to be 2% greater for PP_LLT relative to EBC2. This difference represents a 59% increase in water inputs from the San Joaquin River during these months.

With the effects of climate change removed, the average percent composition of water from the San Joaquin River during January through June is predicted to be 1% greater for PP_ELT preliminary proposal relative to EBC2_ELT. This difference represents a percent increase in water inputs from the San Joaquin River of 62% during this period. Average percent composition of water from the San Joaquin River during January through June is predicted to be 1% greater for PP_LLT relative to EBC2_LLT. This difference represents a percent increase in water inputs from the San Joaquin River of 53% during this period.

These results suggest a large proportional increase in San Joaquin River water in both the early and late long-term periods that is likely to increase greatly the attraction ability of Pacific lamprey migrating into the San Joaquin River.

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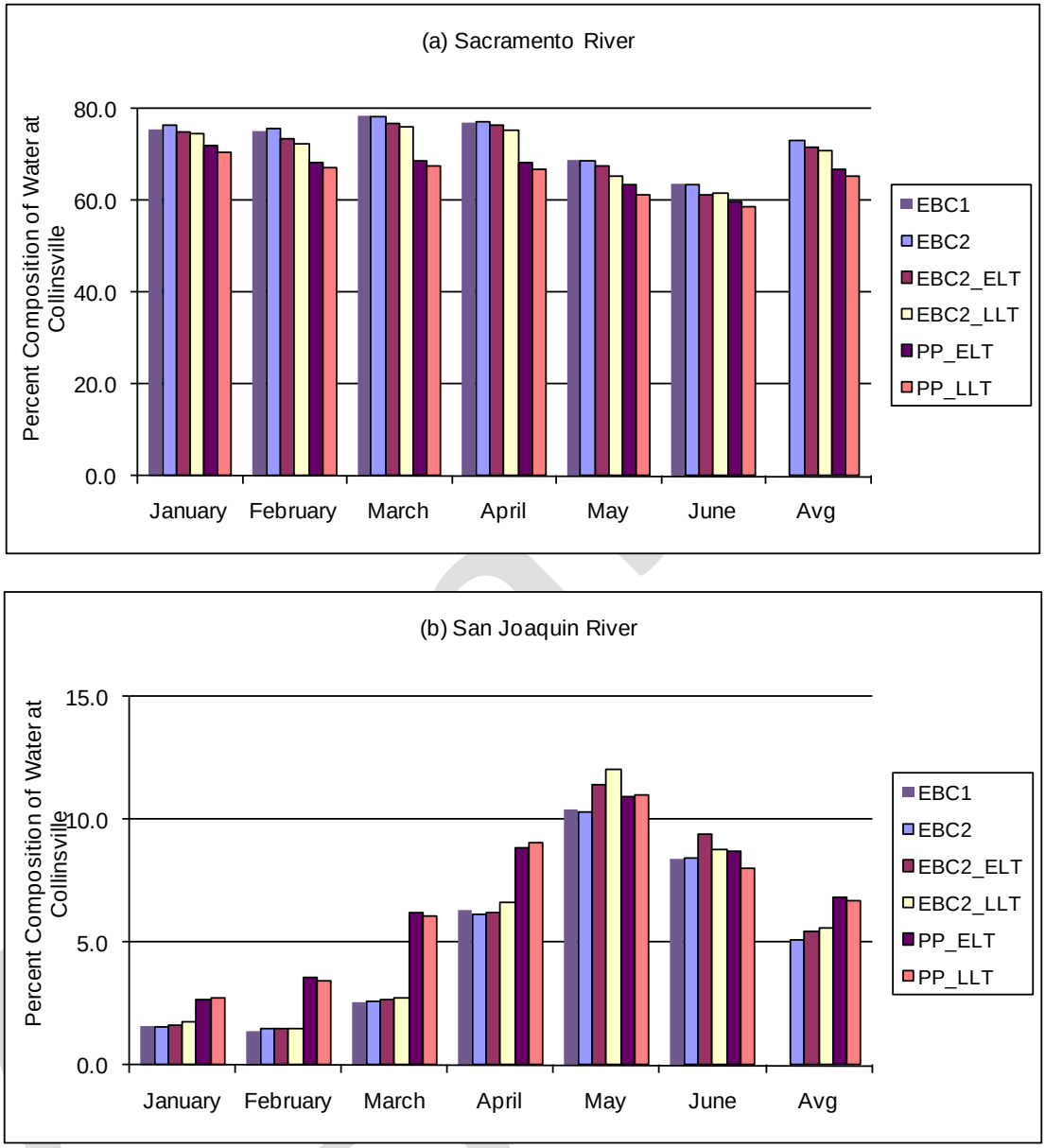

Figure C.5.3-80. Percent Composition of Water at Collinsville That Originated from (a) the Sacramento River and (b) the San Joaquin River, for January through June

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Table C.5.3-132. Difference and Percent Difference between Model Scenarios in Percent Composition of Water at Collinsville from the Sacramento and San Joaquin Rivers, for January through June

Month	Comparison[1]	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Sacramento River							
January	Difference	-3.4	-4.9	-4.5	-6.0	-3.0	-3.9
	Percent difference	-4.6%	-6.5%	-5.9%	-7.8%	-4.0%	-5.3%
February	Difference	-6.6	-8.0	-7.2	-8.6	-5.2	-5.3
	Percent difference	-8.8%	-10.6%	-9.5%	-11.3%	-7.0%	-7.4%
March	Difference	-9.9	-11.0	-9.6	-10.7	-8.4	-8.5
	Percent difference	-12.6%	-14.0%	-12.3%	-13.7%	-10.9%	-11.2%
April	Difference	-9.0	-10.5	-9.1	-10.5	-8.4	-8.5
	Percent difference	-11.7%	13.5%	-11.7%	-13.6%	-10.9%	-11.2%
May	Difference	-5.4	-7.6	-5.2	-7.4	-3.9	-4.0
	Percent difference	-7.8%	-11.0%	-7.5%	-10.7%	-5.8%	-6.1%
June	Difference	-4.0	-5.0	-3.7	-4.7	-1.6	-3.0
	Percent difference	-6.2%	-7.8%	-5.8%	-7.4%	-2.5%	-4.9%
Average	Difference	-6.4	-7.8	-6.5	-8.0	-5.1	-5.5
	Percent difference	-8.6%	-10.6%	-8.8%	-10.8%	-6.9%	-7.7%
San Joaquin River							
January	Difference	1.1	1.1	1.0	1.1	0.9	1.0
	Percent difference	65.0%	67.8%	61.4%	64.1%	61.4%	55.8%
February	Difference	2.2	2.0	2.0	1.9	2.1	1.9
	Percent difference	155.5%	142.9	143.6%	131.6%	143.6%	124.8%
March	Difference	3.6	3.5	3.5	3.4	3.4	3.3
	Percent difference	138.9%	133.8%	133.7%	128.7%	133.7%	119.7%
April	Difference	2.5	2.8	2.6	2.8	2.2	2.5
	Percent difference	40.2%	43.8	42.1%	45.8%	42.1%	37.3%
May	Difference	0.5	0.6	-0.5	-0.4	-1.1	-1.1
	Percent difference	4.9%	5.6	-4.3%	-3.7%	-4.3%	-9.0%
June	Difference	0.3	-0.4	-0.7	-1.4	-0.1	-0.8
	Percent difference	3.3%	-5.0	-7.7%	-15.1%	-7.7%	-9.0%
Average	Difference	1.7	1.6	1.7	1.6	1.3	1.1
	Percent difference	68.0	64.8	61.5%	58.6%	61.5%	53.3%

[1] Positive values indicate a higher value in the preliminary proposal than in the EBC.

River Lamprey

Macropthalmia

See results for Pacific lamprey macropthalmia.

Adult

There is little evidence and low certainty that river lamprey are attracted to spawning grounds based on chemical cues, although it is possible that they exhibit some large-scale homing behavior to some extent as has been hypothesized for sea lamprey (Li et al. 1995; Luzier et al. 2009). Therefore, although results of flow changes in rivers are quantified below, caution should be used in applying these conclusions because of the low certainty associated with them.

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Sacramento versus San Joaquin River Source Flows

DSM2 source-water fingerprinting was used to determine the average percent composition of water from the Sacramento and San Joaquin Rivers at the confluence (Collinsville) during the upstream migration period for river lamprey (September through November) (Moyle 2002). Because inputs of this model are based on CALSIM outputs, the amount of model error is propagated, resulting in lower certainty of DSM2 model results than CALSIM results.

Percentage of Flows from Sacramento River

The average percent composition of water from the Sacramento River during September through November is predicted to be 5% lower for PP_ELT relative to EBC1 (Figure C.5.3-81 and Table C.5.3-133). The greatest difference for PP_ELT relative to EBC1 during this period occurs in September (8% lower). The average percent composition of water from the Sacramento River over the 3-month period is predicted to be 1% lower for PP_LLT relative to EBC1. The greatest difference for PP_LLT relative to EBC1 is also predicted to be during September (7% lower). The average percent composition of water from the Sacramento River during September through November is predicted to be 11% lower for PP_ELT relative to EBC2. The greatest difference for PP_ELT relative to EBC2 during this period occurs in September (14% lower). The average percent composition of water from the Sacramento River over the 3-month period is predicted to be 6% lower for PP_LLT relative to EBC2. The greatest difference for PP_LLT relative to EBC2 also is predicted to be during September (6% lower).

By comparing the EBC2 and preliminary proposal in the two climate change scenarios, one can remove the effects of climate change and evaluate the effects of the preliminary proposal. Average percent composition of water from the Sacramento River over the 3-month period is predicted to be 9% lower for PP_ELT relative EBC2_ELT. The greatest reductions are predicted to occur during September (13% lower). Average percent composition of water from the Sacramento River over the 3-month period is predicted to be 7% lower for PP_LLT relative to EBC2_LLT. The greatest reductions are predicted to occur during September (11% lower).

These results suggest a small reduction in Sacramento River water that may have a small effect on the attraction ability of river lamprey migrating into the Sacramento River.

Percentage of Flows from San Joaquin River

The average percent composition of water from the San Joaquin River from September to November is predicted to be 2% greater for PP_ELT relative to EBC1 (Figure C.5.3-81 and Table C.5.3-133). This difference represents a percent increase in water inputs from the San Joaquin River of 837% during these months. The average percent composition of water from the San Joaquin River over the 3-month period is predicted to be 2% greater for PP_LLT relative to EBC1. This difference represents a 586% increase in water inputs from the San Joaquin River during these months. The average percent composition of water from the San Joaquin River from September through November is predicted to be 2% greater for PP_ELT relative to EBC2. This difference represents a percent increase in water inputs from the San Joaquin River of 784% during these months. The average percent composition of water from the San Joaquin River over the 3-month period is predicted to be 2% greater for PP_LLT relative to EBC2. This difference represents a 516% increase in water inputs from the San Joaquin River during these months.

With the effects of climate change removed, the average percent composition of water from the San Joaquin River over the 3-month period is predicted to be 2% greater for PP_ELT preliminary proposal relative to EBC2_ELT. This difference represents a percent increase in water inputs from

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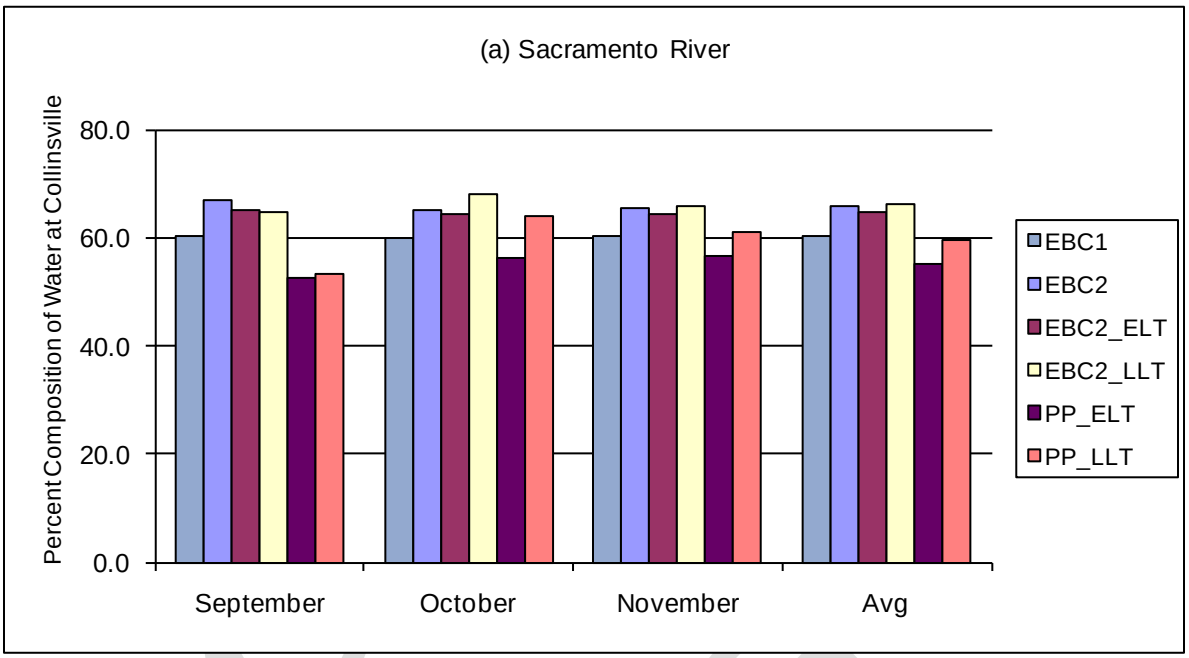
the San Joaquin River of 584% during this period. Average percent composition of water from the San Joaquin River over the 3-month period is predicted to be 2% greater for PP_LLT relative to EBC2_LLT. This difference represents a percent increase in water inputs from the San Joaquin River of 300% during this period.

These results suggest a large proportional increase in San Joaquin River water in both the early and late long-term periods that is likely to greatly increase the attraction ability of lamprey migrating into the San Joaquin River.



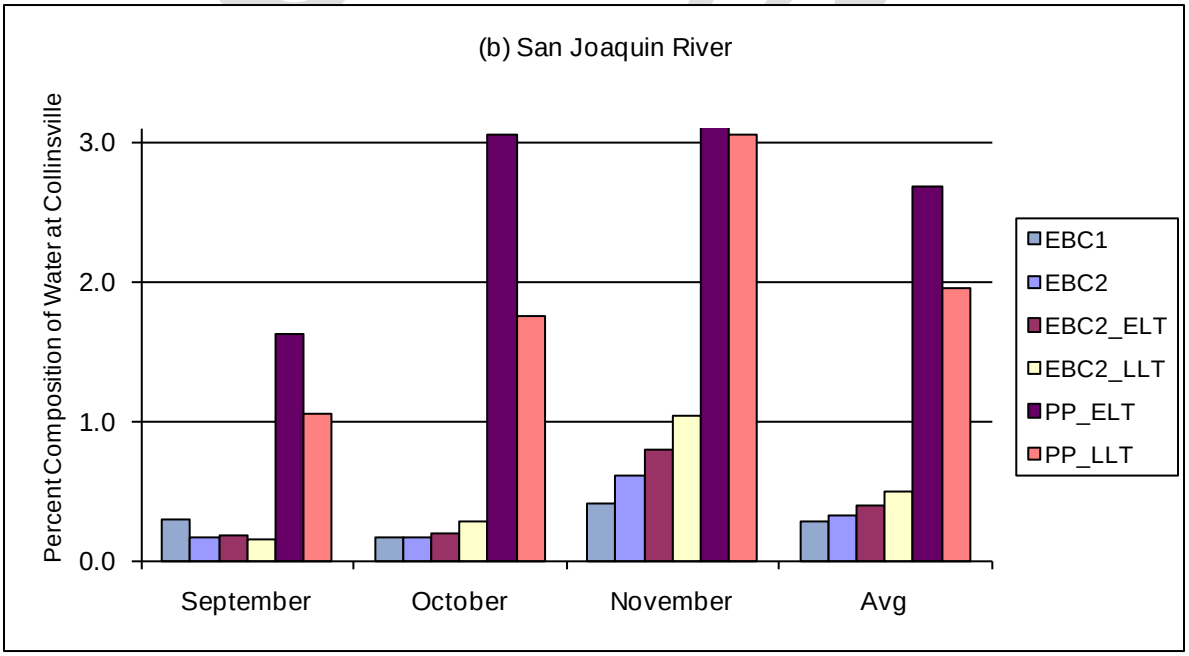


Figure C.5.3-81. Percent Composition of Water at Collinsville That Originated from (a) the Sacramento River and (b) San Joaquin River, September through November

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Table C.5.3-133. Difference (Percent) and Percent Difference between Model Scenarios in Percent Composition of Water at Collinsville for the Sacramento and San Joaquin Rivers, September through November

Month	Comparison[1]	Sacramento River					
		EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC_LLT vs. PP_LLT
Sacramento River							
September	Difference	-7.8	-7.1	-14.2	-13.5	-12.6	-11.4
	Percent Difference	-12.9%	-11.8%	-21.2%	-20.2%	-19.3%	-17.6%
October	Difference	-3.9	4.0	-9.0	-1.1	-8.1	-4.1
	Percent Difference	-6.5%	6.7%	-13.8%	-1.7%	-12.7%	-6.0%
November	Difference	-3.6	0.8	-8.7	-4.3	-7.6	-4.7
	Percent Difference	-6.0%	1.4%	-13.4%	-6.6%	-11.8%	-7.1%
Average	Difference	-5.1	-0.7	-10.6	-6.3	-9.4	-6.7
	Percent Difference	-8.5%	-1.2%	-16.2%	-9.6%	-14.6%	-10.1%
San Joaquin River							
September	Difference	1.3	0.8	1.5	0.9	1.4	0.9
	Percent Difference	467.8%	267.8%	1,425.7%	521.0%	795.2%	614.5%
October	Difference	2.9	1.6	2.9	1.6	2.9	1.5
	Percent Difference	1,775.6%	978.8%	1,638.8%	936.9%	1,496.0%	516.2%
November	Difference	2.9	2.6	2.7	2.4	2.5	2.0
	Percent Difference	724.7%	653.8%	370.6%	398.5%	317.9%	195.1%
Average	Difference	2.4	1.7	2.4	1.6	2.3	1.5
	Percent Difference	838.6%	586.2%	784.3%	516.1%	583.9%	299.6%

[1] Positive values indicate a higher value in the preliminary proposal than in the existing biological conditions (EBC).

Sacramento River Region

Summary of Flows in the Sacramento River Region (Excluding Tributary Subregions)

CALSIM flow data for the Sacramento River subregion (excluding tributary subregions) averaged by water-year type, month, and scenario, together with average monthly differences between scenarios, are provided in Table C.5.3-134 to Table C.5.3-141. These form the basis for the summary of changes in attraction and migration flows.

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Table C.5.3-134. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Sacramento River at Keswick Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	16,526	15,889	17,330	18,233	18,199	18,615
	AN	8,318	7,634	7,776	8,205	9,121	7,987
	BN	4,502	4,285	4,340	4,184	4,860	5,666
	D	3,996	3,873	4,098	4,096	4,136	4,371
	C	3,490	3,673	3,794	4,238	3,915	3,452
	AVG	8,614	8,274	8,829	9,215	9,416	9,503
Feb	W	18,577	18,356	20,349	20,853	20,557	20,844
	AN	14,409	14,184	15,081	15,297	16,672	16,741
	BN	5,981	5,701	6,456	5,544	6,689	6,245
	D	3,684	3,738	3,447	3,410	3,510	3,609
	C	3,599	3,600	3,394	3,372	3,366	3,586
	AVG	10,355	10,217	11,015	11,039	11,363	11,442
Mar	W	16,200	16,195	16,399	17,065	16,412	17,202
	AN	9,131	8,429	8,662	8,818	9,333	8,558
	BN	5,200	4,756	4,306	4,318	4,870	4,873
	D	3,903	3,872	3,858	3,814	3,670	3,732
	C	3,487	3,617	3,608	3,583	3,809	3,867
	AVG	8,728	8,560	8,577	8,800	8,764	8,924
Apr	W	9,418	9,396	9,254	9,131	9,312	9,088
	AN	6,182	6,093	5,712	5,536	5,868	6,137
	BN	5,426	5,167	4,934	5,009	5,475	5,722
	D	5,803	5,578	5,497	5,533	5,839	6,308
	C	6,472	6,298	6,343	6,550	6,357	6,733
	AVG	7,038	6,899	6,748	6,733	6,958	7,127
May	W	9,508	9,450	8,183	7,149	8,357	7,871
	AN	7,709	7,692	7,307	7,783	8,329	8,868
	BN	7,193	6,954	6,411	6,272	7,423	7,346
	D	7,349	7,175	7,075	7,681	8,073	8,957
	C	6,715	6,639	6,900	7,316	7,224	7,586
	AVG	7,967	7,856	7,321	7,233	7,965	8,124
Jun	W	10,375	10,463	10,063	10,274	10,761	11,776
	AN	11,147	11,369	11,403	12,032	12,546	13,789
	BN	10,758	10,752	10,573	10,947	11,466	11,599
	D	11,224	11,251	11,464	11,898	12,087	12,498
	C	10,392	10,598	11,041	11,350	10,920	11,750
	AVG	10,742	10,838	10,797	11,160	11,457	12,195
Jul	W	12,779	12,947	13,477	14,098	13,677	14,172
	AN	14,056	14,313	14,541	15,098	14,605	14,686
	BN	12,965	13,021	13,195	13,177	13,251	12,134
	D	13,302	13,451	13,650	13,727	13,198	12,593
	C	12,849	12,597	12,124	11,935	12,067	11,451
	AVG	13,123	13,219	13,424	13,689	13,400	13,155

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	11,029	11,012	10,447	10,491	10,402	10,302
	AN	10,449	10,695	10,835	11,641	10,524	10,580
	BN	10,139	10,201	9,876	10,261	10,024	9,462
	D	10,627	10,775	10,464	10,986	9,454	8,874
	C	9,473	9,517	8,380	7,348	7,719	7,004
	AVG	10,476	10,557	10,108	10,269	9,755	9,403
Sep	W	9,385	12,374	12,012	12,833	7,756	6,998
	AN	5,862	8,183	9,209	9,898	6,598	6,253
	BN	5,492	5,472	5,677	5,601	5,832	5,284
	D	5,985	5,660	4,982	4,469	5,299	4,722
	C	5,563	5,276	4,827	4,368	4,794	4,927
	AVG	6,899	8,070	7,926	8,094	6,285	5,794
Oct	W	6,886	6,530	6,491	7,034	6,213	8,025
	AN	7,145	6,313	6,090	7,152	5,835	8,462
	BN	6,396	6,328	5,835	7,072	5,774	8,950
	D	6,128	5,922	5,899	6,494	5,403	8,106
	C	5,902	5,613	5,452	5,752	5,776	7,875
	AVG	6,530	6,196	6,038	6,752	5,841	8,242
Nov	W	6,672	7,721	7,620	7,539	6,445	6,401
	AN	6,224	6,917	7,357	7,134	5,187	4,457
	BN	5,088	5,783	5,926	5,936	4,459	4,241
	D	5,669	5,408	5,439	5,406	4,926	4,319
	C	4,822	4,874	4,789	4,710	4,315	4,196
	AVG	5,845	6,348	6,399	6,324	5,277	4,968
Dec	W	12,766	11,441	12,808	11,022	14,260	11,953
	AN	5,531	5,482	5,729	5,377	5,055	5,376
	BN	5,413	5,200	5,857	5,195	5,815	5,412
	D	4,215	3,915	3,883	3,936	4,243	4,206
	C	3,828	3,534	3,593	3,582	3,911	3,645
	AVG	7,267	6,694	7,278	6,557	7,758	6,958

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Table C.5.3-135. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Sacramento River at Keswick[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	1673 (10.1%)	2089 (12.6%)	2311 (14.5%)	2726 (17.2%)	869 (5%)	382 (2.1%)
	AN	803 (9.7%)	-330 (-4%)	1487 (19.5%)	353 (4.6%)	1345 (17.3%)	-217 (-2.6%)
	BN	358 (8%)	1164 (25.9%)	574 (13.4%)	1381 (32.2%)	519 (12%)	1483 (35.4%)
	D	141 (3.5%)	376 (9.4%)	263 (6.8%)	498 (12.9%)	38 (0.9%)	275 (6.7%)
	C	425 (12.2%)	-38 (-1.1%)	243 (6.6%)	-220 (-6%)	122 (3.2%)	-786 (-18.5%)
	AVG	802 (9.3%)	890 (10.3%)	1142 (13.8%)	1229 (14.9%)	587 (6.7%)	288 (3.1%)
Feb	W	1979 (10.7%)	2267 (12.2%)	2201 (12%)	2488 (13.6%)	208 (1%)	-9 (0%)
	AN	2263 (15.7%)	2332 (16.2%)	2488 (17.5%)	2557 (18%)	1591 (10.6%)	1444 (9.4%)
	BN	708 (11.8%)	263 (4.4%)	988 (17.3%)	544 (9.5%)	233 (3.6%)	700 (12.6%)
	D	-173 (-4.7%)	-74 (-2%)	-228 (-6.1%)	-129 (-3.5%)	63 (1.8%)	199 (5.8%)
	C	-233 (-6.5%)	-12 (-0.3%)	-234 (-6.5%)	-14 (-0.4%)	-28 (-0.8%)	214 (6.4%)
	AVG	1007 (9.7%)	1087 (10.5%)	1146 (11.2%)	1226 (12%)	348 (3.2%)	403 (3.7%)
Mar	W	212 (1.3%)	1002 (6.2%)	217 (1.3%)	1007 (6.2%)	14 (0.1%)	137 (0.8%)
	AN	202 (2.2%)	-573 (-6.3%)	904 (10.7%)	129 (1.5%)	671 (7.8%)	-260 (-2.9%)
	BN	-330 (-6.3%)	-327 (-6.3%)	113 (2.4%)	117 (2.5%)	563 (13.1%)	555 (12.9%)
	D	-233 (-6%)	-171 (-4.4%)	-202 (-5.2%)	-140 (-3.6%)	-188 (-4.9%)	-82 (-2.1%)
	C	322 (9.2%)	380 (10.9%)	192 (5.3%)	250 (6.9%)	201 (5.6%)	283 (7.9%)
	AVG	36 (0.4%)	196 (2.2%)	204 (2.4%)	364 (4.3%)	187 (2.2%)	124 (1.4%)
Apr	W	-106 (-1.1%)	-330 (-3.5%)	-84 (-0.9%)	-308 (-3.3%)	58 (0.6%)	-43 (-0.5%)
	AN	-314 (-5.1%)	-45 (-0.7%)	-225 (-3.7%)	44 (0.7%)	156 (2.7%)	601 (10.9%)
	BN	49 (0.9%)	296 (5.5%)	308 (6%)	555 (10.7%)	541 (11%)	714 (14.2%)
	D	37 (0.6%)	505 (8.7%)	261 (4.7%)	730 (13.1%)	342 (6.2%)	775 (14%)
	C	-114 (-1.8%)	261 (4%)	59 (0.9%)	435 (6.9%)	14 (0.2%)	183 (2.8%)
	AVG	-80 (-1.1%)	88 (1.3%)	59 (0.9%)	227 (3.3%)	211 (3.1%)	393 (5.8%)
May	W	-1151 (-12.1%)	-1637 (-17.2%)	-1093 (-11.6%)	-1579 (-16.7%)	174 (2.1%)	722 (10.1%)
	AN	620 (8%)	1159 (15%)	637 (8.3%)	1176 (15.3%)	1022 (14%)	1085 (13.9%)
	BN	230 (3.2%)	153 (2.1%)	470 (6.8%)	392 (5.6%)	1012 (15.8%)	1074 (17.1%)
	D	725 (9.9%)	1608 (21.9%)	898 (12.5%)	1782 (24.8%)	998 (14.1%)	1275 (16.6%)
	C	509 (7.6%)	871 (13%)	585 (8.8%)	947 (14.3%)	324 (4.7%)	270 (3.7%)
	AVG	-1 (0%)	157 (2%)	110 (1.4%)	268 (3.4%)	644 (8.8%)	890 (12.3%)
Jun	W	386 (3.7%)	1401 (13.5%)	299 (2.9%)	1314 (12.6%)	699 (6.9%)	1502 (14.6%)
	AN	1399 (12.6%)	2642 (23.7%)	1177 (10.4%)	2421 (21.3%)	1144 (10%)	1758 (14.6%)
	BN	708 (6.6%)	840 (7.8%)	714 (6.6%)	847 (7.9%)	892 (8.4%)	651 (6%)
	D	864 (7.7%)	1274 (11.4%)	836 (7.4%)	1247 (11.1%)	624 (5.4%)	600 (5%)
	C	528 (5.1%)	1358 (13.1%)	321 (3%)	1152 (10.9%)	-121 (-1.1%)	400 (3.5%)
	AVG	715 (6.7%)	1453 (13.5%)	619 (5.7%)	1358 (12.5%)	660 (6.1%)	1035 (9.3%)
Jul	W	898 (7%)	1393 (10.9%)	730 (5.6%)	1226 (9.5%)	200 (1.5%)	75 (0.5%)
	AN	549 (3.9%)	629 (4.5%)	292 (2%)	373 (2.6%)	64 (0.4%)	-412 (-2.7%)
	BN	286 (2.2%)	-831 (-6.4%)	231 (1.8%)	-887 (-6.8%)	56 (0.4%)	-1043 (-7.9%)
	D	-104 (-0.8%)	-709 (-5.3%)	-253 (-1.9%)	-858 (-6.4%)	-452 (-3.3%)	-1133 (-8.3%)
	C	-782 (-6.1%)	-1399 (-10.9%)	-530 (-4.2%)	-1146 (-9.1%)	-57 (-0.5%)	-484 (-4.1%)
	AVG	277 (2.1%)	32 (0.2%)	181 (1.4%)	-64 (-0.5%)	-25 (-0.2%)	-534 (-3.9%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-627 (-5.7%)	-727 (-6.6%)	-610 (-5.5%)	-710 (-6.5%)	-45 (-0.4%)	-189 (-1.8%)
	AN	75 (0.7%)	131 (1.3%)	-171 (-1.6%)	-116 (-1.1%)	-311 (-2.9%)	-1061 (-9.1%)
	BN	-115 (-1.1%)	-677 (-6.7%)	-177 (-1.7%)	-739 (-7.2%)	148 (1.5%)	-798 (-7.8%)
	D	-1174 (-11%)	-1754 (-16.5%)	-1322 (-12.3%)	-1902 (-17.6%)	-1011 (-9.7%)	-2112 (-19.2%)
	C	-1754 (-18.5%)	-2469 (-26.1%)	-1798 (-18.9%)	-2513 (-26.4%)	-661 (-7.9%)	-344 (-4.7%)
	AVG	-722 (-6.9%)	-1073 (-10.2%)	-802 (-7.6%)	-1154 (-10.9%)	-353 (-3.5%)	-865 (-8.4%)
Sep	W	-1629 (-17.4%)	-2387 (-25.4%)	-4618 (-37.3%)	-5377 (-43.4%)	-4256 (-35.4%)	-5835 (-45.5%)
	AN	736 (12.5%)	390 (6.7%)	-1585 (-19.4%)	-1930 (-23.6%)	-2611 (-28.4%)	-3645 (-36.8%)
	BN	339 (6.2%)	-209 (-3.8%)	360 (6.6%)	-188 (-3.4%)	155 (2.7%)	-317 (-5.7%)
	D	-687 (-11.5%)	-1263 (-21.1%)	-362 (-6.4%)	-938 (-16.6%)	316 (6.4%)	254 (5.7%)
	C	-769 (-13.8%)	-635 (-11.4%)	-482 (-9.1%)	-349 (-6.6%)	-33 (-0.7%)	559 (12.8%)
	AVG	-614 (-8.9%)	-1106 (-16%)	-1785 (-22.1%)	-2276 (-28.2%)	-1640 (-20.7%)	-2300 (-28.4%)
Oct	W	-673 (-9.8%)	1139 (16.5%)	-318 (-4.9%)	1494 (22.9%)	-279 (-4.3%)	990 (14.1%)
	AN	-1310 (-18.3%)	1317 (18.4%)	-478 (-7.6%)	2148 (34%)	-254 (-4.2%)	1310 (18.3%)
	BN	-623 (-9.7%)	2553 (39.9%)	-554 (-8.8%)	2622 (41.4%)	-61 (-1%)	1877 (26.5%)
	D	-725 (-11.8%)	1977 (32.3%)	-518 (-8.8%)	2184 (36.9%)	-496 (-8.4%)	1611 (24.8%)
	C	-126 (-2.1%)	1973 (33.4%)	164 (2.9%)	2263 (40.3%)	324 (5.9%)	2124 (36.9%)
	AVG	-689 (-10.5%)	1713 (26.2%)	-355 (-5.7%)	2046 (33%)	-197 (-3.3%)	1491 (22.1%)
Nov	W	-227 (-3.4%)	-271 (-4.1%)	-1276 (-16.5%)	-1320 (-17.1%)	-1175 (-15.4%)	-1138 (-15.1%)
	AN	-1037 (-16.7%)	-1767 (-28.4%)	-1730 (-25%)	-2460 (-35.6%)	-2170 (-29.5%)	-2677 (-37.5%)
	BN	-629 (-12.4%)	-846 (-16.6%)	-1324 (-22.9%)	-1542 (-26.7%)	-1468 (-24.8%)	-1695 (-28.5%)
	D	-743 (-13.1%)	-1350 (-23.8%)	-483 (-8.9%)	-1089 (-20.1%)	-513 (-9.4%)	-1087 (-20.1%)
	C	-507 (-10.5%)	-627 (-13%)	-559 (-11.5%)	-678 (-13.9%)	-474 (-9.9%)	-514 (-10.9%)
	AVG	-569 (-9.7%)	-877 (-15%)	-1072 (-16.9%)	-1380 (-21.7%)	-1123 (-17.5%)	-1356 (-21.4%)
Dec	W	1495 (11.7%)	-812 (-6.4%)	2820 (24.6%)	512 (4.5%)	1453 (11.3%)	931 (8.4%)
	AN	-476 (-8.6%)	-155 (-2.8%)	-426 (-7.8%)	-106 (-1.9%)	-674 (-11.8%)	-1 (0%)
	BN	402 (7.4%)	-1 (0%)	615 (11.8%)	212 (4.1%)	-43 (-0.7%)	217 (4.2%)
	D	29 (0.7%)	-8 (-0.2%)	328 (8.4%)	292 (7.5%)	360 (9.3%)	270 (6.9%)
	C	82 (2.2%)	-183 (-4.8%)	376 (10.7%)	111 (3.1%)	318 (8.8%)	63 (1.8%)
	AVG	491 (6.8%)	-309 (-4.3%)	1064 (15.9%)	263 (3.9%)	480 (6.6%)	401 (6.1%)

[1]A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

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Table C.5.3-136. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Sacramento River Upstream of Red Bluff Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	28,036	27,416	29,368	30,390	30,226	30,761
	AN	16,725	16,067	16,267	16,885	17,611	16,662
	BN	9,381	9,215	9,267	9,146	9,783	10,623
	D	7,098	7,028	7,262	7,262	7,294	7,532
	C	6,143	6,389	6,497	6,942	6,620	6,160
	AVG	15,396	15,095	15,819	16,278	16,401	16,560
Feb	W	30,255	30,054	32,712	33,472	32,915	33,458
	AN	23,492	23,295	24,422	24,828	26,003	26,269
	BN	12,005	11,748	12,508	11,614	12,737	12,301
	D	8,947	9,030	8,785	8,790	8,848	8,985
	C	6,599	6,643	6,404	6,378	6,380	6,595
	AVG	18,010	17,899	18,947	19,092	19,292	19,490
Mar	W	25,004	25,034	25,473	26,210	25,488	26,347
	AN	16,599	15,943	16,222	16,428	16,878	16,160
	BN	9,333	8,924	8,438	8,474	8,994	9,018
	D	8,385	8,392	8,349	8,300	8,160	8,216
	C	5,999	6,175	6,126	6,101	6,334	6,377
	AVG	14,669	14,540	14,621	14,876	14,805	14,995
Apr	W	15,172	15,191	15,078	14,842	15,136	14,796
	AN	10,477	10,423	9,983	9,761	10,136	10,362
	BN	8,711	8,496	8,239	8,282	8,767	8,990
	D	7,948	7,763	7,654	7,661	7,990	8,433
	C	7,742	7,611	7,628	7,829	7,645	8,003
	AVG	10,709	10,610	10,445	10,376	10,652	10,765
May	W	12,541	12,504	11,224	10,073	11,397	10,790
	AN	10,012	10,017	9,623	10,047	10,642	11,122
	BN	8,781	8,580	8,030	7,875	9,024	8,939
	D	8,677	8,540	8,424	9,012	9,410	10,277
	C	7,746	7,721	7,956	8,348	8,278	8,615
	AVG	9,979	9,900	9,351	9,208	9,989	10,092
Jun	W	11,905	12,002	11,591	11,720	12,286	13,210
	AN	12,001	12,225	12,227	12,789	13,358	14,534
	BN	11,464	11,496	11,304	11,651	12,172	12,287
	D	11,777	11,834	12,028	12,441	12,633	13,028
	C	10,885	11,123	11,539	11,881	11,413	12,227
	AVG	11,666	11,783	11,723	12,046	12,372	13,062
Jul	W	13,255	13,418	13,937	14,525	14,132	14,586
	AN	14,129	14,381	14,594	15,142	14,649	14,716
	BN	13,011	13,090	13,272	13,258	13,304	12,205
	D	13,368	13,541	13,741	13,826	13,273	12,687
	C	13,005	12,771	12,344	12,149	12,237	11,749
	AVG	13,329	13,435	13,643	13,898	13,600	13,367

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	11,284	11,261	10,700	10,735	10,653	10,543
	AN	10,580	10,824	10,968	11,775	10,655	10,714
	BN	10,202	10,285	9,971	10,364	10,103	9,565
	D	10,747	10,913	10,610	11,143	9,591	9,034
	C	9,590	9,656	8,632	7,665	7,935	7,330
	AVG	10,630	10,719	10,292	10,464	9,929	9,600
Sep	W	9,856	12,843	12,494	13,312	8,238	7,476
	AN	6,279	8,606	9,634	10,320	7,024	6,680
	BN	5,821	5,824	6,038	5,963	6,184	5,649
	D	6,391	6,098	5,424	4,911	5,742	5,178
	C	5,887	5,645	5,279	4,838	5,161	5,393
	AVG	7,302	8,491	8,365	8,535	6,712	6,238
Oct	W	8,020	7,686	7,662	8,188	7,399	9,200
	AN	8,112	7,306	7,108	8,162	6,863	9,484
	BN	7,094	7,038	6,544	7,778	6,492	9,678
	D	6,903	6,716	6,690	7,287	6,206	8,902
	C	6,670	6,420	6,254	6,537	6,580	8,691
	AVG	7,432	7,122	6,971	7,675	6,784	9,183
Nov	W	9,876	11,032	10,966	10,821	9,791	9,671
	AN	8,144	8,918	9,362	9,098	7,194	6,407
	BN	6,791	7,565	7,710	7,682	6,243	5,971
	D	7,548	7,370	7,421	7,347	6,901	6,249
	C	5,811	5,905	5,805	5,703	5,329	5,186
	AVG	7,990	8,576	8,642	8,521	7,518	7,154
Dec	W	21,015	19,736	21,554	19,613	23,015	20,551
	AN	10,019	10,030	10,370	10,053	9,710	10,073
	BN	8,408	8,235	8,921	8,228	8,891	8,460
	D	7,292	7,053	7,044	7,091	7,408	7,372
	C	5,628	5,393	5,465	5,433	5,792	5,498
	AVG	11,989	11,469	12,221	11,446	12,710	11,857

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Table C.5.3-137. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Sacramento River Upstream of Red Bluff[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	2189 (7.8%)	2725 (9.7%)	2810 (10.3%)	3346 (12.2%)	858 (2.9%)	371 (1.2%)
	AN	887 (5.3%)	-63 (-0.4%)	1544 (9.6%)	595 (3.7%)	1345 (8.3%)	-224 (-1.3%)
	BN	402 (4.3%)	1241 (13.2%)	568 (6.2%)	1408 (15.3%)	516 (5.6%)	1476 (16.1%)
	D	196 (2.8%)	435 (6.1%)	266 (3.8%)	504 (7.2%)	32 (0.4%)	271 (3.7%)
	C	477 (7.8%)	17 (0.3%)	232 (3.6%)	-228 (-3.6%)	123 (1.9%)	-782 (-11.3%)
	AVG	1005 (6.5%)	1164 (7.6%)	1306 (8.7%)	1465 (9.7%)	582 (3.7%)	282 (1.7%)
Feb	W	2660 (8.8%)	3203 (10.6%)	2860 (9.5%)	3404 (11.3%)	203 (0.6%)	-13 (0%)
	AN	2512 (10.7%)	2777 (11.8%)	2708 (11.6%)	2973 (12.8%)	1581 (6.5%)	1441 (5.8%)
	BN	732 (6.1%)	297 (2.5%)	989 (8.4%)	553 (4.7%)	229 (1.8%)	687 (5.9%)
	D	-100 (-1.1%)	37 (0.4%)	-183 (-2%)	-46 (-0.5%)	62 (0.7%)	195 (2.2%)
	C	-218 (-3.3%)	-4 (-0.1%)	-262 (-3.9%)	-48 (-0.7%)	-24 (-0.4%)	216 (3.4%)
	AVG	1282 (7.1%)	1480 (8.2%)	1393 (7.8%)	1592 (8.9%)	345 (1.8%)	398 (2.1%)
Mar	W	484 (1.9%)	1343 (5.4%)	453 (1.8%)	1312 (5.2%)	14 (0.1%)	136 (0.5%)
	AN	279 (1.7%)	-439 (-2.6%)	935 (5.9%)	217 (1.4%)	656 (4%)	-268 (-1.6%)
	BN	-338 (-3.6%)	-314 (-3.4%)	70 (0.8%)	94 (1.1%)	557 (6.6%)	545 (6.4%)
	D	-225 (-2.7%)	-168 (-2%)	-232 (-2.8%)	-175 (-2.1%)	-189 (-2.3%)	-83 (-1%)
	C	334 (5.6%)	378 (6.3%)	158 (2.6%)	202 (3.3%)	207 (3.4%)	275 (4.5%)
	AVG	136 (0.9%)	326 (2.2%)	265 (1.8%)	455 (3.1%)	184 (1.3%)	119 (0.8%)
Apr	W	-36 (-0.2%)	-376 (-2.5%)	-55 (-0.4%)	-395 (-2.6%)	58 (0.4%)	-46 (-0.3%)
	AN	-341 (-3.3%)	-115 (-1.1%)	-287 (-2.8%)	-61 (-0.6%)	153 (1.5%)	601 (6.2%)
	BN	56 (0.6%)	279 (3.2%)	271 (3.2%)	494 (5.8%)	528 (6.4%)	707 (8.5%)
	D	42 (0.5%)	485 (6.1%)	228 (2.9%)	671 (8.6%)	337 (4.4%)	772 (10.1%)
	C	-97 (-1.3%)	261 (3.4%)	34 (0.4%)	392 (5.1%)	17 (0.2%)	173 (2.2%)
	AVG	-57 (-0.5%)	56 (0.5%)	42 (0.4%)	155 (1.5%)	207 (2%)	389 (3.7%)
May	W	-1144 (-9.1%)	-1751 (-14%)	-1107 (-8.9%)	-1714 (-13.7%)	173 (1.5%)	717 (7.1%)
	AN	630 (6.3%)	1110 (11.1%)	625 (6.2%)	1106 (11%)	1019 (10.6%)	1076 (10.7%)
	BN	243 (2.8%)	158 (1.8%)	444 (5.2%)	359 (4.2%)	994 (12.4%)	1064 (13.5%)
	D	733 (8.5%)	1600 (18.4%)	870 (10.2%)	1737 (20.3%)	986 (11.7%)	1265 (14%)
	C	532 (6.9%)	869 (11.2%)	557 (7.2%)	894 (11.6%)	323 (4.1%)	267 (3.2%)
	AVG	10 (0.1%)	113 (1.1%)	89 (0.9%)	192 (1.9%)	637 (6.8%)	883 (9.6%)
Jun	W	381 (3.2%)	1305 (11%)	285 (2.4%)	1208 (10.1%)	696 (6%)	1490 (12.7%)
	AN	1357 (11.3%)	2533 (21.1%)	1133 (9.3%)	2309 (18.9%)	1131 (9.3%)	1744 (13.6%)
	BN	708 (6.2%)	823 (7.2%)	677 (5.9%)	791 (6.9%)	869 (7.7%)	636 (5.5%)
	D	856 (7.3%)	1250 (10.6%)	799 (6.7%)	1194 (10.1%)	605 (5%)	587 (4.7%)
	C	528 (4.9%)	1342 (12.3%)	290 (2.6%)	1104 (9.9%)	-126 (-1.1%)	346 (2.9%)
	AVG	705 (6%)	1396 (12%)	589 (5%)	1280 (10.9%)	649 (5.5%)	1016 (8.4%)
Jul	W	877 (6.6%)	1332 (10%)	713 (5.3%)	1168 (8.7%)	195 (1.4%)	61 (0.4%)
	AN	519 (3.7%)	586 (4.2%)	268 (1.9%)	335 (2.3%)	54 (0.4%)	-426 (-2.8%)
	BN	293 (2.3%)	-806 (-6.2%)	215 (1.6%)	-884 (-6.8%)	32 (0.2%)	-1053 (-7.9%)
	D	-95 (-0.7%)	-681 (-5.1%)	-267 (-2%)	-854 (-6.3%)	-467 (-3.4%)	-1139 (-8.2%)
	C	-767 (-5.9%)	-1256 (-9.7%)	-534 (-4.2%)	-1022 (-8%)	-107 (-0.9%)	-400 (-3.3%)
	AVG	271 (2%)	37 (0.3%)	165 (1.2%)	-69 (-0.5%)	-43 (-0.3%)	-531 (-3.8%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-630 (-5.6%)	-741 (-6.6%)	-607 (-5.4%)	-718 (-6.4%)	-46 (-0.4%)	-192 (-1.8%)
	AN	74 (0.7%)	134 (1.3%)	-170 (-1.6%)	-110 (-1%)	-313 (-2.9%)	-1061 (-9%)
	BN	-99 (-1%)	-637 (-6.2%)	-182 (-1.8%)	-720 (-7%)	132 (1.3%)	-799 (-7.7%)
	D	-1156 (-10.8%)	-1713 (-15.9%)	-1323 (-12.1%)	-1880 (-17.2%)	-1019 (-9.6%)	-2109 (-18.9%)
	C	-1655 (-17.3%)	-2260 (-23.6%)	-1721 (-17.8%)	-2326 (-24.1%)	-697 (-8.1%)	-335 (-4.4%)
	AVG	-702 (-6.6%)	-1031 (-9.7%)	-791 (-7.4%)	-1120 (-10.4%)	-364 (-3.5%)	-865 (-8.3%)
Sep	W	-1618 (-16.4%)	-2380 (-24.2%)	-4605 (-35.9%)	-5368 (-41.8%)	-4256 (-34.1%)	-5837 (-43.8%)
	AN	744 (11.9%)	401 (6.4%)	-1582 (-18.4%)	-1926 (-22.4%)	-2610 (-27.1%)	-3640 (-35.3%)
	BN	363 (6.2%)	-172 (-2.9%)	360 (6.2%)	-175 (-3%)	146 (2.4%)	-314 (-5.3%)
	D	-649 (-10.2%)	-1213 (-19%)	-357 (-5.8%)	-920 (-15.1%)	318 (5.9%)	267 (5.4%)
	C	-725 (-12.3%)	-494 (-8.4%)	-483 (-8.6%)	-252 (-4.5%)	-118 (-2.2%)	555 (11.5%)
	AVG	-591 (-8.1%)	-1064 (-14.6%)	-1779 (-21%)	-2253 (-26.5%)	-1654 (-19.8%)	-2297 (-26.9%)
Oct	W	-620 (-7.7%)	1180 (14.7%)	-287 (-3.7%)	1514 (19.7%)	-263 (-3.4%)	1012 (12.4%)
	AN	-1248 (-15.4%)	1373 (16.9%)	-443 (-6.1%)	2178 (29.8%)	-245 (-3.4%)	1323 (16.2%)
	BN	-602 (-8.5%)	2583 (36.4%)	-546 (-7.8%)	2639 (37.5%)	-52 (-0.8%)	1899 (24.4%)
	D	-696 (-10.1%)	1999 (29%)	-510 (-7.6%)	2185 (32.5%)	-484 (-7.2%)	1615 (22.2%)
	C	-91 (-1.4%)	2020 (30.3%)	160 (2.5%)	2270 (35.4%)	326 (5.2%)	2154 (32.9%)
	AVG	-648 (-8.7%)	1751 (23.6%)	-338 (-4.7%)	2061 (28.9%)	-187 (-2.7%)	1508 (19.7%)
Nov	W	-85 (-0.9%)	-205 (-2.1%)	-1240 (-11.2%)	-1361 (-12.3%)	-1175 (-10.7%)	-1150 (-10.6%)
	AN	-949 (-11.7%)	-1736 (-21.3%)	-1724 (-19.3%)	-2511 (-28.2%)	-2167 (-23.2%)	-2691 (-29.6%)
	BN	-548 (-8.1%)	-820 (-12.1%)	-1322 (-17.5%)	-1594 (-21.1%)	-1468 (-19%)	-1711 (-22.3%)
	D	-647 (-8.6%)	-1299 (-17.2%)	-468 (-6.4%)	-1120 (-15.2%)	-520 (-7%)	-1097 (-14.9%)
	C	-483 (-8.3%)	-626 (-10.8%)	-576 (-9.8%)	-719 (-12.2%)	-477 (-8.2%)	-518 (-9.1%)
	AVG	-472 (-5.9%)	-836 (-10.5%)	-1058 (-12.3%)	-1422 (-16.6%)	-1124 (-13%)	-1367 (-16%)
Dec	W	2000 (9.5%)	-464 (-2.2%)	3279 (16.6%)	815 (4.1%)	1460 (6.8%)	938 (4.8%)
	AN	-309 (-3.1%)	53 (0.5%)	-319 (-3.2%)	43 (0.4%)	-659 (-6.4%)	20 (0.2%)
	BN	483 (5.7%)	51 (0.6%)	655 (8%)	224 (2.7%)	-31 (-0.3%)	231 (2.8%)
	D	116 (1.6%)	80 (1.1%)	355 (5%)	319 (4.5%)	363 (5.2%)	280 (4%)
	C	164 (2.9%)	-130 (-2.3%)	399 (7.4%)	104 (1.9%)	327 (6%)	65 (1.2%)
	AVG	721 (6%)	-132 (-1.1%)	1241 (10.8%)	388 (3.4%)	489 (4%)	411 (3.6%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

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Table C.5.3-138. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Sacramento River at Wilkins Slough Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	19,353	19,303	19,469	19,532	19,519	19,580
	AN	17,171	16,610	16,633	16,718	17,373	17,510
	BN	12,568	12,439	12,377	12,195	12,686	13,462
	D	8,948	8,905	8,961	9,262	8,923	9,610
	C	7,881	8,109	8,195	8,641	8,326	7,860
	AVG	13,912	13,816	13,887	14,019	14,075	14,329
Feb	W	20,039	19,993	20,153	20,235	20,181	20,259
	AN	19,332	19,264	19,342	19,332	19,943	19,390
	BN	14,659	14,508	14,659	14,476	14,881	14,800
	D	11,552	11,624	11,508	11,544	11,549	11,721
	C	8,574	8,595	8,335	8,303	8,310	8,537
	AVG	15,476	15,445	15,469	15,466	15,609	15,610
Mar	W	18,336	18,386	18,463	18,473	18,464	18,532
	AN	17,853	17,804	17,824	17,743	17,923	17,830
	BN	12,365	12,173	11,681	11,712	12,147	12,230
	D	11,469	11,511	11,414	11,322	11,353	11,527
	C	8,291	8,474	8,404	8,380	8,611	8,641
	AVG	14,269	14,280	14,192	14,165	14,303	14,368
Apr	W	14,570	14,571	14,496	14,313	14,551	14,341
	AN	11,566	11,489	11,341	11,102	11,429	11,698
	BN	8,545	8,395	8,169	8,240	8,668	8,940
	D	6,763	6,631	6,516	6,551	6,836	7,314
	C	5,768	5,728	5,745	5,951	5,744	6,105
	AVG	10,100	10,028	9,922	9,879	10,107	10,284
May	W	11,724	11,607	10,716	9,712	10,887	10,387
	AN	8,521	8,452	8,195	8,726	9,153	9,755
	BN	6,995	6,780	6,343	6,241	7,182	7,212
	D	5,995	5,833	5,784	6,427	6,663	7,634
	C	5,342	5,288	5,515	5,908	5,819	6,157
	AVG	8,256	8,129	7,757	7,697	8,332	8,529
Jun	W	8,509	8,435	8,230	8,423	8,879	9,837
	AN	7,793	7,896	7,987	8,595	9,032	10,262
	BN	7,241	7,259	7,209	7,636	7,904	8,180
	D	7,289	7,348	7,645	8,162	8,135	8,685
	C	7,137	7,356	7,782	8,305	7,625	8,450
	AVG	7,719	7,759	7,826	8,239	8,388	9,160
Jul	W	8,665	8,594	9,180	9,819	9,320	9,801
	AN	9,012	9,106	9,395	10,008	9,361	9,482
	BN	8,202	8,250	8,621	8,698	8,439	7,554
	D	8,891	9,076	9,388	9,638	8,794	8,402
	C	9,259	9,005	8,727	8,662	8,455	8,373
	AVG	8,774	8,776	9,096	9,446	8,934	8,854

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	7,751	7,517	7,019	7,096	6,942	6,863
	AN	7,022	7,126	7,337	8,204	6,975	7,104
	BN	6,677	6,719	6,575	7,055	6,510	6,159
	D	7,411	7,559	7,346	7,985	6,194	5,805
	C	7,141	7,175	6,488	6,022	5,705	5,690
	AVG	7,297	7,283	6,984	7,289	6,528	6,374
Sep	W	9,625	12,510	12,197	13,037	7,921	7,192
	AN	5,913	8,146	9,199	9,896	6,589	6,267
	BN	5,416	5,361	5,602	5,545	5,721	5,230
	D	5,940	5,606	4,954	4,460	5,267	4,746
	C	5,534	5,269	5,008	4,639	4,821	5,248
	AVG	6,955	8,076	7,990	8,186	6,314	5,900
Oct	W	7,529	7,141	7,127	7,650	6,888	8,688
	AN	6,986	6,133	6,041	7,153	5,777	8,444
	BN	6,176	6,062	5,572	6,808	5,527	8,729
	D	5,854	5,601	5,641	6,259	5,160	7,880
	C	5,813	5,511	5,395	5,754	5,663	7,924
	AVG	6,600	6,233	6,123	6,851	5,935	8,370
Nov	W	9,709	10,954	10,912	10,979	9,614	9,732
	AN	8,305	9,098	9,556	9,278	7,378	6,529
	BN	6,859	7,604	7,751	7,693	6,276	5,943
	D	7,466	7,354	7,408	7,312	6,862	6,208
	C	5,203	5,270	5,180	5,101	4,661	4,599
	AVG	7,865	8,488	8,566	8,504	7,388	7,092
Dec	W	17,949	17,565	17,950	17,388	18,207	17,900
	AN	10,884	10,987	11,066	10,896	10,706	11,380
	BN	8,546	8,358	8,384	8,345	8,494	8,616
	D	9,004	8,770	8,742	8,799	9,111	9,099
	C	6,245	5,980	6,034	6,030	6,375	6,097
	AVG	11,633	11,405	11,544	11,346	11,723	11,701

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Table C.5.3-139. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Sacramento River at Wilkins Slough[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	167 (0.9%)	227 (1.2%)	216 (1.1%)	277 (1.4%)	50 (0.3%)	47 (0.2%)
	AN	202 (1.2%)	339 (2%)	763 (4.6%)	900 (5.4%)	740 (4.4%)	792 (4.7%)
	BN	118 (0.9%)	894 (7.1%)	247 (2%)	1023 (8.2%)	309 (2.5%)	1267 (10.4%)
	D	-25 (-0.3%)	662 (7.4%)	18 (0.2%)	705 (7.9%)	-38 (-0.4%)	348 (3.8%)
	C	445 (5.6%)	-21 (-0.3%)	217 (2.7%)	-249 (-3.1%)	131 (1.6%)	-781 (-9%)
	AVG	162 (1.2%)	416 (3%)	258 (1.9%)	512 (3.7%)	188 (1.4%)	309 (2.2%)
Feb	W	142 (0.7%)	219 (1.1%)	188 (0.9%)	266 (1.3%)	28 (0.1%)	24 (0.1%)
	AN	611 (3.2%)	58 (0.3%)	679 (3.5%)	127 (0.7%)	601 (3.1%)	58 (0.3%)
	BN	222 (1.5%)	140 (1%)	374 (2.6%)	292 (2%)	222 (1.5%)	324 (2.2%)
	D	-3 (0%)	170 (1.5%)	-74 (-0.6%)	98 (0.8%)	41 (0.4%)	177 (1.5%)
	C	-263 (-3.1%)	-36 (-0.4%)	-284 (-3.3%)	-57 (-0.7%)	-25 (-0.3%)	234 (2.8%)
	AVG	133 (0.9%)	134 (0.9%)	165 (1.1%)	166 (1.1%)	140 (0.9%)	145 (0.9%)
Mar	W	127 (0.7%)	196 (1.1%)	78 (0.4%)	147 (0.8%)	0 (0%)	59 (0.3%)
	AN	70 (0.4%)	-23 (-0.1%)	120 (0.7%)	27 (0.1%)	100 (0.6%)	87 (0.5%)
	BN	-219 (-1.8%)	-136 (-1.1%)	-27 (-0.2%)	57 (0.5%)	466 (4%)	518 (4.4%)
	D	-116 (-1%)	58 (0.5%)	-158 (-1.4%)	16 (0.1%)	-61 (-0.5%)	205 (1.8%)
	C	320 (3.9%)	350 (4.2%)	138 (1.6%)	167 (2%)	207 (2.5%)	261 (3.1%)
	AVG	35 (0.2%)	100 (0.7%)	23 (0.2%)	88 (0.6%)	111 (0.8%)	203 (1.4%)
Apr	W	-19 (-0.1%)	-229 (-1.6%)	-20 (-0.1%)	-229 (-1.6%)	55 (0.4%)	29 (0.2%)
	AN	-137 (-1.2%)	132 (1.1%)	-60 (-0.5%)	209 (1.8%)	87 (0.8%)	596 (5.4%)
	BN	123 (1.4%)	395 (4.6%)	273 (3.2%)	545 (6.5%)	499 (6.1%)	700 (8.5%)
	D	73 (1.1%)	551 (8.2%)	205 (3.1%)	683 (10.3%)	320 (4.9%)	763 (11.6%)
	C	-24 (-0.4%)	337 (5.8%)	16 (0.3%)	377 (6.6%)	-1 (0%)	154 (2.6%)
	AVG	7 (0.1%)	185 (1.8%)	79 (0.8%)	256 (2.6%)	186 (1.9%)	406 (4.1%)
May	W	-837 (-7.1%)	-1337 (-11.4%)	-720 (-6.2%)	-1220 (-10.5%)	172 (1.6%)	676 (7%)
	AN	633 (7.4%)	1234 (14.5%)	701 (8.3%)	1303 (15.4%)	958 (11.7%)	1029 (11.8%)
	BN	186 (2.7%)	216 (3.1%)	402 (5.9%)	432 (6.4%)	838 (13.2%)	970 (15.5%)
	D	668 (11.1%)	1639 (27.3%)	830 (14.2%)	1801 (30.9%)	879 (15.2%)	1208 (18.8%)
	C	478 (8.9%)	816 (15.3%)	532 (10.1%)	870 (16.4%)	305 (5.5%)	249 (4.2%)
	AVG	76 (0.9%)	273 (3.3%)	203 (2.5%)	400 (4.9%)	575 (7.4%)	832 (10.8%)
Jun	W	371 (4.4%)	1329 (15.6%)	445 (5.3%)	1403 (16.6%)	649 (7.9%)	1414 (16.8%)
	AN	1239 (15.9%)	2469 (31.7%)	1136 (14.4%)	2366 (30%)	1045 (13.1%)	1667 (19.4%)
	BN	663 (9.2%)	939 (13%)	645 (8.9%)	921 (12.7%)	695 (9.6%)	544 (7.1%)
	D	846 (11.6%)	1396 (19.1%)	787 (10.7%)	1337 (18.2%)	490 (6.4%)	522 (6.4%)
	C	488 (6.8%)	1313 (18.4%)	269 (3.7%)	1094 (14.9%)	-156 (-2%)	145 (1.8%)
	AVG	669 (8.7%)	1441 (18.7%)	629 (8.1%)	1402 (18.1%)	562 (7.2%)	921 (11.2%)
Jul	W	655 (7.6%)	1135 (13.1%)	727 (8.5%)	1207 (14%)	140 (1.5%)	-18 (-0.2%)
	AN	349 (3.9%)	470 (5.2%)	255 (2.8%)	376 (4.1%)	-34 (-0.4%)	-526 (-5.3%)
	BN	237 (2.9%)	-649 (-7.9%)	189 (2.3%)	-697 (-8.4%)	-182 (-2.1%)	-1144 (-13.2%)
	D	-97 (-1.1%)	-489 (-5.5%)	-282 (-3.1%)	-674 (-7.4%)	-594 (-6.3%)	-1236 (-12.8%)
	C	-804 (-8.7%)	-886 (-9.6%)	-550 (-6.1%)	-632 (-7%)	-271 (-3.1%)	-289 (-3.3%)
	AVG	160 (1.8%)	81 (0.9%)	158 (1.8%)	78 (0.9%)	-162 (-1.8%)	-592 (-6.3%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-809 (-10.4%)	-888 (-11.5%)	-575 (-7.6%)	-654 (-8.7%)	-77 (-1.1%)	-233 (-3.3%)
	AN	-47 (-0.7%)	82 (1.2%)	-152 (-2.1%)	-22 (-0.3%)	-362 (-4.9%)	-1100 (-13.4%)
	BN	-167 (-2.5%)	-518 (-7.8%)	-209 (-3.1%)	-560 (-8.3%)	-65 (-1%)	-896 (-12.7%)
	D	-1217 (-16.4%)	-1606 (-21.7%)	-1365 (-18.1%)	-1754 (-23.2%)	-1152 (-15.7%)	-2180 (-27.3%)
	C	-1436 (-20.1%)	-1451 (-20.3%)	-1469 (-20.5%)	-1485 (-20.7%)	-783 (-12.1%)	-333 (-5.5%)
	AVG	-769 (-10.5%)	-923 (-12.6%)	-755 (-10.4%)	-908 (-12.5%)	-456 (-6.5%)	-915 (-12.6%)
Sep	W	-1703 (-17.7%)	-2432 (-25.3%)	-4589 (-36.7%)	-5318 (-42.5%)	-4276 (-35.1%)	-5844 (-44.8%)
	AN	675 (11.4%)	354 (6%)	-1557 (-19.1%)	-1879 (-23.1%)	-2610 (-28.4%)	-3629 (-36.7%)
	BN	305 (5.6%)	-186 (-3.4%)	360 (6.7%)	-131 (-2.4%)	119 (2.1%)	-315 (-5.7%)
	D	-673 (-11.3%)	-1194 (-20.1%)	-339 (-6.1%)	-860 (-15.3%)	313 (6.3%)	286 (6.4%)
	C	-713 (-12.9%)	-285 (-5.2%)	-448 (-8.5%)	-21 (-0.4%)	-187 (-3.7%)	610 (13.1%)
	AVG	-641 (-9.2%)	-1055 (-15.2%)	-1761 (-21.8%)	-2175 (-26.9%)	-1676 (-21%)	-2286 (-27.9%)
Oct	W	-641 (-8.5%)	1159 (15.4%)	-253 (-3.5%)	1546 (21.7%)	-239 (-3.3%)	1038 (13.6%)
	AN	-1209 (-17.3%)	1458 (20.9%)	-356 (-5.8%)	2311 (37.7%)	-264 (-4.4%)	1291 (18%)
	BN	-649 (-10.5%)	2553 (41.3%)	-535 (-8.8%)	2667 (44%)	-45 (-0.8%)	1921 (28.2%)
	D	-695 (-11.9%)	2026 (34.6%)	-442 (-7.9%)	2279 (40.7%)	-481 (-8.5%)	1621 (25.9%)
	C	-150 (-2.6%)	2111 (36.3%)	152 (2.8%)	2413 (43.8%)	269 (5%)	2170 (37.7%)
	AVG	-665 (-10.1%)	1770 (26.8%)	-298 (-4.8%)	2137 (34.3%)	-188 (-3.1%)	1519 (22.2%)
Nov	W	-95 (-1%)	23 (0.2%)	-1340 (-12.2%)	-1222 (-11.2%)	-1298 (-11.9%)	-1247 (-11.4%)
	AN	-927 (-11.2%)	-1776 (-21.4%)	-1720 (-18.9%)	-2569 (-28.2%)	-2178 (-22.8%)	-2750 (-29.6%)
	BN	-583 (-8.5%)	-915 (-13.3%)	-1328 (-17.5%)	-1660 (-21.8%)	-1475 (-19%)	-1750 (-22.7%)
	D	-604 (-8.1%)	-1259 (-16.9%)	-492 (-6.7%)	-1147 (-15.6%)	-546 (-7.4%)	-1104 (-15.1%)
	C	-542 (-10.4%)	-604 (-11.6%)	-609 (-11.6%)	-671 (-12.7%)	-519 (-10%)	-501 (-9.8%)
	AVG	-477 (-6.1%)	-774 (-9.8%)	-1100 (-13%)	-1397 (-16.5%)	-1178 (-13.8%)	-1412 (-16.6%)
Dec	W	258 (1.4%)	-49 (-0.3%)	642 (3.7%)	335 (1.9%)	257 (1.4%)	512 (2.9%)
	AN	-178 (-1.6%)	496 (4.6%)	-281 (-2.6%)	393 (3.6%)	-360 (-3.2%)	485 (4.4%)
	BN	-52 (-0.6%)	70 (0.8%)	136 (1.6%)	258 (3.1%)	110 (1.3%)	271 (3.3%)
	D	107 (1.2%)	95 (1.1%)	341 (3.9%)	329 (3.7%)	369 (4.2%)	300 (3.4%)
	C	129 (2.1%)	-148 (-2.4%)	394 (6.6%)	117 (2%)	340 (5.6%)	67 (1.1%)
	AVG	89 (0.8%)	68 (0.6%)	318 (2.8%)	297 (2.6%)	178 (1.5%)	355 (3.1%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

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Table C.5.3-140. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Sacramento River at Verona Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	44,589	44,222	45,074	45,567	44,870	45,067
	AN	34,120	32,683	32,939	33,671	33,141	32,916
	BN	20,175	19,166	19,324	19,121	18,544	18,786
	D	14,756	14,410	14,643	14,782	14,436	15,085
	C	12,085	12,116	12,331	13,051	12,499	11,627
	AVG	27,583	27,013	27,430	27,795	27,241	27,327
Feb	W	49,892	49,358	50,745	51,326	49,793	50,352
	AN	39,162	38,278	39,631	39,749	39,699	39,417
	BN	26,429	25,327	25,717	25,341	24,540	24,541
	D	18,402	18,272	18,079	18,090	17,479	17,520
	C	12,822	12,706	12,387	12,325	11,951	12,509
	AVG	31,979	31,446	32,062	32,192	31,373	31,600
Mar	W	43,455	43,320	44,098	44,624	42,235	42,706
	AN	39,477	38,721	39,691	39,687	38,389	38,335
	BN	21,484	20,234	19,717	19,448	18,964	18,812
	D	17,868	17,665	17,411	17,649	17,075	16,892
	C	11,903	11,767	11,765	11,789	11,722	11,725
	AVG	28,888	28,456	28,700	28,877	27,711	27,786
Apr	W	32,219	32,298	32,102	31,636	29,978	29,537
	AN	22,250	22,228	21,717	21,313	20,403	20,833
	BN	14,459	14,169	13,834	13,857	14,203	14,968
	D	11,113	11,051	10,967	10,903	11,736	12,659
	C	9,420	9,374	9,304	9,489	9,656	10,042
	AVG	19,759	19,710	19,488	19,298	18,905	19,218
May	W	26,193	26,069	23,714	20,229	23,921	21,507
	AN	17,079	16,918	16,427	16,002	18,306	18,195
	BN	11,451	11,175	10,653	10,534	13,197	13,324
	D	9,283	9,116	9,086	9,841	10,311	11,262
	C	7,125	7,030	7,408	7,611	7,500	7,725
	AVG	15,840	15,679	14,820	13,828	15,878	15,359
Jun	W	18,367	18,331	15,664	15,304	17,751	17,666
	AN	13,590	13,754	12,877	13,574	16,355	17,364
	BN	11,062	11,101	10,888	11,320	13,848	13,654
	D	10,429	10,681	10,702	10,780	11,231	11,395
	C	8,911	9,132	9,441	9,827	9,003	9,623
	AVG	13,295	13,401	12,441	12,576	14,169	14,383
Jul	W	16,253	16,417	17,144	17,965	14,519	15,434
	AN	17,488	17,919	18,014	18,338	15,347	15,534
	BN	16,698	16,871	16,823	16,598	13,962	12,649
	D	16,352	16,474	16,245	16,465	13,570	11,470
	C	14,476	13,644	13,348	12,457	10,029	9,976
	AVG	16,271	16,321	16,464	16,651	13,680	13,304

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	12,464	12,763	13,393	14,016	11,502	11,675
	AN	13,691	14,088	14,684	15,828	12,766	12,848
	BN	13,389	13,543	13,098	14,074	11,021	10,373
	D	14,688	13,865	13,057	13,018	10,409	9,604
	C	9,207	9,262	8,300	8,085	7,856	7,564
	AVG	12,813	12,820	12,713	13,204	10,831	10,568
Sep	W	14,279	23,282	22,873	23,592	11,413	10,567
	AN	10,537	17,532	18,667	19,044	10,489	10,363
	BN	9,961	10,138	10,768	10,576	9,005	8,608
	D	10,542	9,828	8,618	7,664	8,967	8,432
	C	7,764	7,552	7,264	6,832	7,174	7,794
	AVG	11,220	14,941	14,777	14,755	9,710	9,328
Oct	W	11,503	10,891	10,681	11,232	10,607	12,506
	AN	9,381	8,866	8,617	9,890	9,135	11,699
	BN	9,867	9,327	8,868	10,146	9,206	12,239
	D	8,681	8,342	8,515	8,989	8,179	11,158
	C	8,543	7,996	7,862	8,104	8,749	11,622
	AVG	9,861	9,344	9,181	9,900	9,348	11,917
Nov	W	15,307	16,396	16,176	15,754	14,678	14,508
	AN	11,792	12,842	13,177	12,817	11,072	9,715
	BN	9,852	10,604	10,676	10,437	8,874	8,454
	D	10,157	9,877	10,024	9,731	9,389	8,622
	C	7,341	7,438	7,283	7,223	6,748	6,668
	AVG	11,565	12,145	12,146	11,846	10,838	10,334
Dec	W	33,840	31,867	33,224	31,254	33,041	31,026
	AN	17,572	18,022	18,415	18,481	17,425	19,160
	BN	13,099	13,270	13,257	13,028	13,675	13,674
	D	12,685	12,540	12,465	12,532	13,101	12,890
	C	9,770	9,084	8,724	8,627	9,923	9,804
	AVG	19,752	19,089	19,506	18,852	19,689	19,240

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Table C.5.3-141. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Sacramento River at Verona[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	281 (0.6%)	478 (1.1%)	647 (1.5%)	845 (1.9%)	-205 (-0.5%)	-500 (-1.1%)
	AN	-980 (-2.9%)	-1205 (-3.5%)	458 (1.4%)	233 (0.7%)	202 (0.6%)	-755 (-2.2%)
	BN	-1632 (-8.1%)	-1390 (-6.9%)	-623 (-3.2%)	-380 (-2%)	-780 (-4%)	-335 (-1.8%)
	D	-320 (-2.2%)	329 (2.2%)	27 (0.2%)	675 (4.7%)	-207 (-1.4%)	303 (2.1%)
	C	414 (3.4%)	-458 (-3.8%)	383 (3.2%)	-489 (-4%)	168 (1.4%)	-1424 (-10.9%)
	AVG	-343 (-1.2%)	-257 (-0.9%)	228 (0.8%)	314 (1.2%)	-189 (-0.7%)	-468 (-1.7%)
Feb	W	-99 (-0.2%)	460 (0.9%)	436 (0.9%)	995 (2%)	-952 (-1.9%)	-973 (-1.9%)
	AN	538 (1.4%)	255 (0.7%)	1421 (3.7%)	1139 (3%)	68 (0.2%)	-332 (-0.8%)
	BN	-1889 (-7.1%)	-1888 (-7.1%)	-787 (-3.1%)	-786 (-3.1%)	-1177 (-4.6%)	-800 (-3.2%)
	D	-924 (-5%)	-883 (-4.8%)	-793 (-4.3%)	-752 (-4.1%)	-600 (-3.3%)	-571 (-3.2%)
	C	-871 (-6.8%)	-313 (-2.4%)	-755 (-5.9%)	-197 (-1.6%)	-437 (-3.5%)	183 (1.5%)
	AVG	-605 (-1.9%)	-379 (-1.2%)	-73 (-0.2%)	154 (0.5%)	-688 (-2.1%)	-592 (-1.8%)
Mar	W	-1220 (-2.8%)	-749 (-1.7%)	-1085 (-2.5%)	-615 (-1.4%)	-1863 (-4.2%)	-1918 (-4.3%)
	AN	-1088 (-2.8%)	-1142 (-2.9%)	-332 (-0.9%)	-386 (-1%)	-1302 (-3.3%)	-1352 (-3.4%)
	BN	-2520 (-11.7%)	-2672 (-12.4%)	-1270 (-6.3%)	-1422 (-7%)	-753 (-3.8%)	-636 (-3.3%)
	D	-793 (-4.4%)	-977 (-5.5%)	-590 (-3.3%)	-774 (-4.4%)	-336 (-1.9%)	-758 (-4.3%)
	C	-181 (-1.5%)	-179 (-1.5%)	-45 (-0.4%)	-43 (-0.4%)	-42 (-0.4%)	-65 (-0.5%)
	AVG	-1177 (-4.1%)	-1101 (-3.8%)	-746 (-2.6%)	-670 (-2.4%)	-990 (-3.4%)	-1090 (-3.8%)
Apr	W	-2242 (-7%)	-2682 (-8.3%)	-2321 (-7.2%)	-2761 (-8.5%)	-2124 (-6.6%)	-2099 (-6.6%)
	AN	-1848 (-8.3%)	-1418 (-6.4%)	-1825 (-8.2%)	-1395 (-6.3%)	-1315 (-6.1%)	-480 (-2.3%)
	BN	-256 (-1.8%)	509 (3.5%)	33 (0.2%)	798 (5.6%)	369 (2.7%)	1111 (8%)
	D	623 (5.6%)	1545 (13.9%)	685 (6.2%)	1608 (14.5%)	769 (7%)	1756 (16.1%)
	C	235 (2.5%)	622 (6.6%)	282 (3%)	669 (7.1%)	352 (3.8%)	553 (5.8%)
	AVG	-854 (-4.3%)	-541 (-2.7%)	-806 (-4.1%)	-493 (-2.5%)	-583 (-3%)	-80 (-0.4%)
May	W	-2272 (-8.7%)	-4687 (-17.9%)	-2148 (-8.2%)	-4563 (-17.5%)	208 (0.9%)	1278 (6.3%)
	AN	1227 (7.2%)	1116 (6.5%)	1388 (8.2%)	1277 (7.6%)	1879 (11.4%)	2194 (13.7%)
	BN	1746 (15.2%)	1872 (16.3%)	2023 (18.1%)	2149 (19.2%)	2544 (23.9%)	2789 (26.5%)
	D	1028 (11.1%)	1979 (21.3%)	1195 (13.1%)	2146 (23.5%)	1225 (13.5%)	1421 (14.4%)
	C	376 (5.3%)	600 (8.4%)	471 (6.7%)	695 (9.9%)	92 (1.2%)	114 (1.5%)
	AVG	38 (0.2%)	-481 (-3%)	199 (1.3%)	-320 (-2%)	1058 (7.1%)	1531 (11.1%)
Jun	W	-616 (-3.4%)	-701 (-3.8%)	-580 (-3.2%)	-665 (-3.6%)	2087 (13.3%)	2362 (15.4%)
	AN	2765 (20.3%)	3774 (27.8%)	2601 (18.9%)	3610 (26.2%)	3478 (27%)	3790 (27.9%)
	BN	2786 (25.2%)	2592 (23.4%)	2747 (24.7%)	2553 (23%)	2960 (27.2%)	2334 (20.6%)
	D	803 (7.7%)	966 (9.3%)	551 (5.2%)	714 (6.7%)	529 (4.9%)	615 (5.7%)
	C	92 (1%)	712 (8%)	-129 (-1.4%)	491 (5.4%)	-438 (-4.6%)	-204 (-2.1%)
	AVG	874 (6.6%)	1089 (8.2%)	768 (5.7%)	982 (7.3%)	1728 (13.9%)	1807 (14.4%)
Jul	W	-1734 (-10.7%)	-819 (-5%)	-1899 (-11.6%)	-983 (-6%)	-2626 (-15.3%)	-2531 (-14.1%)
	AN	-2141 (-12.2%)	-1954 (-11.2%)	-2571 (-14.3%)	-2385 (-13.3%)	-2666 (-14.8%)	-2804 (-15.3%)
	BN	-2736 (-16.4%)	-4048 (-24.2%)	-2910 (-17.2%)	-4222 (-25%)	-2861 (-17%)	-3949 (-23.8%)
	D	-2782 (-17%)	-4882 (-29.9%)	-2904 (-17.6%)	-5004 (-30.4%)	-2674 (-16.5%)	-4995 (-30.3%)
	C	-4446 (-30.7%)	-4499 (-31.1%)	-3615 (-26.5%)	-3668 (-26.9%)	-3319 (-24.9%)	-2481 (-19.9%)
	AVG	-2592 (-15.9%)	-2967 (-18.2%)	-2641 (-16.2%)	-3017 (-18.5%)	-2784 (-16.9%)	-3347 (-20.1%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-962 (-7.7%)	-789 (-6.3%)	-1261 (-9.9%)	-1088 (-8.5%)	-1892 (-14.1%)	-2342 (-16.7%)
	AN	-926 (-6.8%)	-844 (-6.2%)	-1323 (-9.4%)	-1241 (-8.8%)	-1918 (-13.1%)	-2981 (-18.8%)
	BN	-2368 (-17.7%)	-3016 (-22.5%)	-2522 (-18.6%)	-3169 (-23.4%)	-2077 (-15.9%)	-3701 (-26.3%)
	D	-4279 (-29.1%)	-5084 (-34.6%)	-3456 (-24.9%)	-4261 (-30.7%)	-2648 (-20.3%)	-3414 (-26.2%)
	C	-1351 (-14.7%)	-1643 (-17.8%)	-1406 (-15.2%)	-1698 (-18.3%)	-444 (-5.3%)	-521 (-6.4%)
	AVG	-1982 (-15.5%)	-2245 (-17.5%)	-1988 (-15.5%)	-2252 (-17.6%)	-1881 (-14.8%)	-2636 (-20%)
Sep	W	-2866 (-20.1%)	-3712 (-26%)	-11869 (-51%)	-12715 (-54.6%)	-11459 (-50.1%)	-13025 (-55.2%)
	AN	-47 (-0.4%)	-173 (-1.6%)	-7043 (-40.2%)	-7169 (-40.9%)	-8177 (-43.8%)	-8680 (-45.6%)
	BN	-955 (-9.6%)	-1353 (-13.6%)	-1132 (-11.2%)	-1530 (-15.1%)	-1763 (-16.4%)	-1968 (-18.6%)
	D	-1575 (-14.9%)	-2110 (-20%)	-861 (-8.8%)	-1396 (-14.2%)	349 (4%)	768 (10%)
	C	-591 (-7.6%)	30 (0.4%)	-378 (-5%)	243 (3.2%)	-90 (-1.2%)	963 (14.1%)
	AVG	-1511 (-13.5%)	-1892 (-16.9%)	-5231 (-35%)	-5613 (-37.6%)	-5068 (-34.3%)	-5427 (-36.8%)
Oct	W	-896 (-7.8%)	1003 (8.7%)	-283 (-2.6%)	1615 (14.8%)	-73 (-0.7%)	1274 (11.3%)
	AN	-246 (-2.6%)	2318 (24.7%)	269 (3%)	2833 (32%)	518 (6%)	1809 (18.3%)
	BN	-661 (-6.7%)	2372 (24%)	-121 (-1.3%)	2912 (31.2%)	338 (3.8%)	2093 (20.6%)
	D	-502 (-5.8%)	2477 (28.5%)	-163 (-2%)	2816 (33.8%)	-336 (-3.9%)	2169 (24.1%)
	C	205 (2.4%)	3078 (36%)	752 (9.4%)	3626 (45.3%)	887 (11.3%)	3518 (43.4%)
	AVG	-513 (-5.2%)	2056 (20.9%)	3 (0%)	2573 (27.5%)	166 (1.8%)	2017 (20.4%)
Nov	W	-629 (-4.1%)	-799 (-5.2%)	-1718 (-10.5%)	-1888 (-11.5%)	-1499 (-9.3%)	-1246 (-7.9%)
	AN	-720 (-6.1%)	-2077 (-17.6%)	-1770 (-13.8%)	-3127 (-24.3%)	-2105 (-16%)	-3102 (-24.2%)
	BN	-978 (-9.9%)	-1398 (-14.2%)	-1730 (-16.3%)	-2150 (-20.3%)	-1802 (-16.9%)	-1983 (-19%)
	D	-767 (-7.6%)	-1534 (-15.1%)	-487 (-4.9%)	-1254 (-12.7%)	-635 (-6.3%)	-1109 (-11.4%)
	C	-594 (-8.1%)	-673 (-9.2%)	-691 (-9.3%)	-770 (-10.4%)	-535 (-7.3%)	-555 (-7.7%)
	AVG	-727 (-6.3%)	-1231 (-10.6%)	-1307 (-10.8%)	-1811 (-14.9%)	-1309 (-10.8%)	-1512 (-12.8%)
Dec	W	-799 (-2.4%)	-2814 (-8.3%)	1175 (3.7%)	-841 (-2.6%)	-183 (-0.6%)	-229 (-0.7%)
	AN	-147 (-0.8%)	1588 (9%)	-597 (-3.3%)	1138 (6.3%)	-990 (-5.4%)	679 (3.7%)
	BN	575 (4.4%)	575 (4.4%)	404 (3%)	403 (3%)	418 (3.1%)	646 (5%)
	D	416 (3.3%)	205 (1.6%)	561 (4.5%)	350 (2.8%)	637 (5.1%)	358 (2.9%)
	C	153 (1.6%)	34 (0.3%)	840 (9.2%)	720 (7.9%)	1199 (13.7%)	1177 (13.6%)
	AVG	-63 (-0.3%)	-512 (-2.6%)	600 (3.1%)	151 (0.8%)	184 (0.9%)	388 (2.1%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

Steelhead

Juvenile

Sacramento River flow upstream of Red Bluff is used to represent flow conditions in the mainstem of the upper river below Keswick Dam. There generally was little difference between PP and EBC scenarios in flows upstream of Red Bluff during the juvenile steelhead migration period (October through May) (Table C.5.3-136, Table C.5.3-137). Average October through May differences were low, generally less than 5%, although with some variability for individual months. Differences in average flows within individual months ranged from 30% lower flow under PP_LLT compared to EBC2_LLT in November of above-normal years to 40% higher flow under PP_ELT compared to EBC2_ELT in January of wet years.

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Adult

Instream flows in the mainstem Sacramento River affect habitat quantity and quality for adult steelhead upstream migration and holding prior to spawning. For purposes of this analysis, instream flows upstream of Red Bluff were compared monthly over the period from September through March under EBC and proposed PP operations (Table C.5.3-136, Table C.5.3-137). Average September through March differences were low, generally less than 5%, although with some variability for individual months. Differences in average flows within individual months ranged from 44% lower flow under PP_LLT compared to EBC2_LLT in September of wet years to 40% higher flow under PP_ELT compared to EBC2_ELT in January of wet years.

Kelt

Specific instream flow needs within Central Valley rivers for kelt migration have not been determined. Flows in the Sacramento River and other Central Valley rivers where steelhead spawn that would potentially be affected by preliminary proposal operations are typically within the range that would be considered to be suitable for kelt migration. Average Sacramento River flows upstream of Red Bluff during March and April and differences between scenarios are shown in Table C.5.3-136 and Table C.5.3-137. Comparison of instream flows showed that habitat (e.g., water depth, velocity) would be similar (less than 5% difference for PP relative to EBC2), although instream flows were generally greater for PP conditions. Average March through April differences in flow upstream of Red Bluff were low, generally less than 5%, although with some variability for individual months. Differences in average flows in March and April ranged from -2% lower flow under both PP_LLT compared to EBC2_LLT in March of wet years and PP_ELT compared to EBC2_ELT in March of dry years, to 10% higher flow under PP_LLT compared to EBC2_LLT in April of dry years. Based on these results it was concluded that instream habitat conditions for upstream migration of steelhead kelts in the upper reaches of the Sacramento River under PP operations would be similar to those under EBC2 operations.

Winter-Run Chinook Salmon

Juvenile

There generally was little difference between PP and EBC scenarios in RBDD flows during the juvenile winter-run Chinook salmon migration period (November through April) (Table C.5.3-136, Table C.5.3-137). Average November through April differences were low, generally less than 5%, although with some variability for individual months. Differences in average flows within individual months ranged from 30% lower flow under PP_LLT compared to EBC2_LLT in November of above-normal years to 40% higher flow under PP_ELT compared to EBC2_ELT in January of wet years.

Spring-Run Chinook Salmon

Juvenile

Average flows in the Sacramento River upstream of Red Bluff during the juvenile spring-run Chinook salmon migration period (December through May) are shown in Table C.5.3-136 and Table C.5.3-137. Average flows upstream of Red Bluff generally are estimated to be comparable between EBC and PP scenarios, or somewhat greater under PP scenarios.

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Adult

The average flows in the Sacramento River upstream of Red Bluff during the adult spring-run Chinook salmon upstream migration period (April through May) were similar in wet and critical years, whereas in other water-year types average flows under PP were modestly greater (up to 12% when accounting for climate change) than flows under EBC scenarios (Table C.5.3-136, Table C.5.3-137). There was some variability between PP scenarios and EBC scenarios across different time periods and months.

Fall-Run Chinook Salmon

Juvenile

Average migration flows for juvenile fall-run Chinook salmon in February through May upstream of Red Bluff were generally quite comparable between PP and EBC scenarios or slightly greater under PP scenarios (Table C.5.3-136, Table C.5.3-137).

Adult

Flows in the Sacramento River upstream of Red Bluff during the adult fall-run Chinook salmon upstream migration period are presented in Table C.5.3-136 and Table C.5.3-137. Flows in September and October under PP_ELT vs. EBC2_ELT scenarios were 34% and -3% lower. In above-normal water-year types, the differences between PP_ELT and EBC2_ELT scenarios were 27% lower in September and 3% lower in October. There was little difference between PP_ELT and EBC2_ELT in below-normal years, with a 2% increase in September and a 1% decrease in October. In dry years there is a 6% increase in September and a 7% decrease in October and in critically dry years it is 2% less and 5% more. Overall in PP_ELT and EBC2_ELT scenarios, wet years average a 15–19% decrease and dry years average a 1% net increase. PP_LLT vs. EBC2_LLT scenarios in wet years have a 44% decrease in flows during September and a 12 % increase in flows in October. In above-normal years there is a similar scenario, with a 33% decrease in September and a 16% increase in October. Below-normal years show a slight decrease of 5% in September and an increase of 24% in October. In dry years there is a net increase in September and October of 5% and 22%. Critically dry years have the same pattern, with increases of 11% and 33% over September and October. Overall in wet years there was an average decrease of 10–16%, and in dry years there was an average increase of 10–22%.

Late Fall–Run Chinook Salmon

Juvenile

See discussion for fall-run Chinook salmon above.

Adult

Flows in the Sacramento River upstream of Red Bluff during the adult late fall–run Chinook salmon upstream migration period are presented in Table C.5.3-136 and Table C.5.3-137. On average, flows in December through February under PP_ELT vs. EBC2_ELT scenarios were 1–40% higher. In above-normal water-year types, the differences between PP_ELT and EBC2_ELT scenarios were 6% lower in December and 6–8% higher in January and February. In below-normal years there is a 0% increase in December and a 2–6% increase in January and February. In dry years there is a 5% increase in December and a 0–1% decrease in January and February. In critically dry years it is a 6%

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increase and 0–2% increase in the two following months. Overall in PP_ELT and EBC2_ELT scenarios wet years average a 3–16% increase, and dry years average a 2% increase. PP_LLT vs. EBC2_LLT scenarios in wet years have a 5% increase in flows during December and a 1% and 0% increase in flows in January and February. In above-normal years there is a similar scenario with a 0% increase in December and a 1% decrease in January followed by a 6% increase in February. Below-normal years show a slight increase of 3% in December, an increase of 16% in January, and a 6% increase in February. In dry years there is a net increase in all months of 4%, 4%, and 2%. Critically dry years have a slight increase of 1% in December, a decrease of 11% in January, and a marginal increase of 3% in February. Overall in wet years there was an average increase of 2%, and in dry years there was an average increase of 1%.

White Sturgeon

Larva

Downstream migration of larval white sturgeon is assisted by higher flows, although it is unclear whether elevated flows may increase recruitment to less-suitable rearing habitat (Israel et al. 2009). Fish (2010) found that year class indices for juvenile white sturgeon, based on the number of juvenile white sturgeon observed each year in SWP and CVP salvage and yearling (age 1+) sturgeon collected in the DFG Bay study fishery sampling, were greatest when April through July outflows at Chipps Island exceeded 60,000 cfs[1]. However, the CALSIM model for analyzing preliminary proposal–related effects did not include a CALSIM node at Chipps Island and, although tightly correlated, gaps in the outflow regime were expressed that make it difficult to specify necessary spring outflow for white sturgeon recruitment. As a result, this analysis relied on the 1995 USFWS Anadromous Fish Restoration Program Plan, which indicated that flows of 31,000 cfs at Verona and 17,700 cfs at Grimes (Wilkins Slough used as surrogate) from February through May are ideal for adult access, spawning habitat conditions, and downstream larval transport during wet and above normal years, when sturgeon recruitment is greatest. In addition, the analysis compared exceedances above 15,000 cfs, 20,000 cfs, and 25,000 cfs in Delta outflow during April and May of wet and above-normal years per recommendations by the Anadromous Fish Restoration Program (U.S. Fish and Wildlife Service 1995). Israel and coauthors (2009) indicate that spring flows are important for downstream migrating larval white sturgeon in the Sacramento River. February through May CALSIM flow outputs were reviewed at Verona and Wilkins Slough for all water-year types, with an examination of the average number of months per year exceeding the thresholds.

The analysis showed that there was little or no difference between PP and EBC scenarios in the average number of months per year exceeding the 17,700 cfs flow threshold in the Sacramento River at Wilkins Slough in any water-year type (Table C.5.3-142).

A similar different pattern was evident at Verona (Table C.5.3-143). There was little difference between EBC and PP scenarios in any water-year type.

[1] This effects analysis assumed that this period would apply to larvae, as well.

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Table C.5.3-142. Average Number of Months per Year (February through May) Exceeding a Flow Threshold for White Sturgeon Larval Transport of 17,700 Cubic Feet per Second at Sacramento River at Wilkins Slough

Water-Year Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Wet	1.9	1.8	1.8	1.8	1.8	1.8
AN	1.4	1.6	1.5	1.6	1.6	1.7
BN	0.6	0.4	0.4	0.4	0.5	0.4
Dry	0.3	0.3	0.3	0.3	0.3	0.3
Critical	0.1	0.1	0.1	0.1	0.1	0.1

Table C.5.3-143. Average Number of Months per Year (February through May) Exceeding a Flow Threshold for White Sturgeon Larval Transport of 31,000 Cubic Feet per Second at Verona

Water-Year Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Wet	2.6	2.6	2.3	2.2	2.2	2.0
AN	1.7	1.7	1.7	1.5	1.7	1.6
BN	0.5	0.4	0.4	0.4	0.4	0.3
Dry	0.3	0.3	0.2	0.2	0.1	0.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0

The percent exceedance of Delta outflow above the three flow thresholds from USFWS (1995) under PP_ELT and PP_LLT were minorly to moderately lower (8% to 33%) than EBC2_ELT and EBC2_LLT in April (Table C.5.3-144). Exceedances during May under the preliminary proposal were either similar or moderately lower (by up to 25%) than EBC2 under the same time period, depending on flow threshold and water-year type. Further, exceedances during the April-May averaged period under the preliminary proposal were either similar or moderately lower (by up to 42%) than EBC2 under the same time period, depending on flow threshold and water-year type. These results indicate that there are small to moderate reductions in the ability to meet Anadromous Fish Restoration Program flow thresholds based on Delta outflow for green and white sturgeon.

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Table C.5.3-144. Percentage of Months in which Average Delta Outflow is Predicted to Exceed 15,000, 20,000, and 25,000 Cubic Feet per Second in April and May of Wet and Above-Normal Water Years

Flow	Water-Year Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
April							
15,000 cfs	Wet	96	96	96	96	85	81
	Above Normal	92	92	92	92	67	67
20,000 cfs	Wet	85	85	85	85	73	73
	Above Normal	75	75	75	67	42	42
25,000 cfs	Wet	81	81	81	77	62	65
	Above Normal	58	58	58	50	33	42
May							
15,000 cfs	Wet	54	54	46	27	23	31
	Above Normal	67	67	58	58	33	42
20,000 cfs	Wet	27	27	19	19	15	19
	Above Normal	50	50	42	33	25	17
25,000 cfs	Wet	19	19	15	15	15	12
	Above Normal	42	42	33	25	25	17
April–May Average							
15,000 cfs	Wet	100	100	96	92	77	89
	Above Normal	100	100	100	92	58	75
20,000 cfs	Wet	81	81	77	81	73	73
	Above Normal	75	67	58	58	58	50
25,000 cfs	Wet	73	73	73	73	62	58
	Above Normal	58	58	58	58	25	25

Juvenile

Average flow in the Sacramento River at Verona during the juvenile white sturgeon migration period (June through September) was lower under PP scenarios than EBC scenarios in all water-year types (Table C.5.3-140, Table C.5.3-141). The difference in flows between PP scenarios and EBC scenarios was greater in wet and above-normal years, being as much as 20% lower under PP scenarios. There was significant variability in the average flow differences between PP and EBC scenarios by month within each water-year type, e.g., in above-normal years, average June flow under PP_ELT/PP_LLT was nearly 30% greater than EBC2_ELT/EBC2_LLT, whereas average September flow was nearly 50% greater under the PP scenarios.

Adult

On average there was very little difference between flows under PP and EBC scenarios during the November through May adult white sturgeon migration period at Wilkins Slough and Verona (Table C.5.3-138, Table C.5.3-139; Table C.5.3-140, Table C.5.3-141). However, there were some notable differences when examining individual months separately. Average flows under PP scenarios were up to 30% lower in November compared to EBC scenarios, whereas flows in May under PP scenarios were appreciably higher than under EBC scenarios in above-normal, below-normal, and critical years.

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There was little difference between PP and EBC scenarios in the average number of months per year exceeding the flow threshold of 5,300 cfs proposed for Knights Landing attraction flows (Wilkins Slough was used as a proxy in the present analysis) by Shaffter (1997), regardless of water-year type (Table C.5.3-145).

Table C.5.3-145. Average Number of Months per Year (November through May) Exceeding a Flow Threshold for White Sturgeon Adult Attraction Flows of 5,300 Cubic Feet per Second at Sacramento River at Wilkins Slough

Water-Year Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Wet	6.7	6.7	6.7	6.5	6.7	6.6
Above Normal	6.5	6.3	6.3	6.2	6.3	6.4
Below Normal	5.2	4.9	4.9	4.9	5.2	5.4
Dry	4.9	4.9	4.8	5.2	5.2	5.5
Critical	3.5	3.5	3.6	3.6	3.5	3.8

Green Sturgeon

Larva

Trends in flows during the green sturgeon larval transport period (August through October) were essentially the same in the Sacramento River at Keswick, Red Bluff, and Wilkins Slough. Flows under PP scenarios were somewhat lower than under EBC scenarios in wet and above-normal years, with average differences of around 10–13% and more variability when comparing differences in individual months (Table C.5.3-134, Table C.5.3-135; Table C.5.3-136, Table C.5.3-137; Table C.5.3-140, Table C.5.3-141). There was also variability between months for other water-year types, with the overall average comparisons generally showing similar flows in PP and EBC scenarios in below-normal and dry years and similar or slightly higher flows under PP scenarios in critical years.

Juvenile

This analysis was conducted to investigate the flows in the middle and lower Sacramento River during periods of downstream migrating young-of-the-year (YOY) juvenile green sturgeon. CALSIM locations selected for the analysis of this portion of the Sacramento River included Wilkins Slough and Verona. Israel and Klimley (2008) indicates that the duration of this downstream migration, notably for YOY green sturgeon, is from August through March. As some larger juveniles may occur in this portion of the river in April, May, and June, an additional review was completed of this period. In the absence of flow threshold criteria during this downstream migration, the analysis focuses on the percent change in flow during this period. Reduced flows during this period may result in biological effects on this life stage, including downstream migration delays.

Patterns of changes in flows between PP and EBC scenarios were generally similar for Wilkins Slough and Verona. For YOY juveniles in August through March, average flows under PP scenarios were similar compared with EBC scenarios in dry, below-normal, and above-normal years (Table C.5.3-138, Table C.5.3-139; Table C.5.3-140, Table C.5.3-141). In wet and above-normal years, flows under PP scenarios were somewhat lower than under EBC scenarios. There was variability when comparing individual months, however, including some appreciably lower average flows under PP scenarios than under EBC scenarios (e.g., 40–50% lower flows in August and September of wet and above-normal years). For older juveniles in April through June, average flows under PP scenarios

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were modestly higher (up to 20%) than EBC scenarios in most water-year types except critical, for which the average flows between PP and EBC scenarios were similar.

Adult

There generally was little difference between PP and EBC scenarios in attraction flows for adult green sturgeon at Keswick from November through July (Table C.5.3-134, Table C.5.3-135). Average differences were low, generally less than 5%, although with some variability for individual months. Differences in average flows within individual months ranged from 38% lower flow under PP_LLT compared to EBC2_LLT in November of above-normal years to 35% higher flow under PP_LLT compared to EBC2_LLT in January of below-normal years. The only average difference that was greater than 5% was for above-normal years, for which average PP_LLT flows were 7% more than EBC2_LLT flows.

As with Keswick, flows at the Sacramento River at Verona during the November through July green sturgeon attraction flow period on average were not greatly different between PP and EBC scenarios (Table C.5.3-140, Table C.5.3-141). There were some months with appreciably lower or higher average flows under PP scenarios relative to EBC scenarios, e.g., lower flows under PP scenarios in July of most water-year types and higher flows under PP scenarios in May and June of above and below-normal years. On average, however, the difference between PP and EBC scenarios was less than 5%.

Pacific Lamprey

Macropthalmia

Predicted average monthly flow rates in the Sacramento River upstream of Red Bluff between December and May are presented in Table C.5.3-136, and differences between model scenarios are presented in Table C.5.3-137. Exceedance plots by month are presented in Figure C.5.3-82 through Figure C.5.3-87.

Predicted monthly average flows are between 57 cfs (<1%) lower and 1,282 cfs (7%) higher in the PP_ELT relative to the EBC1. Predicted monthly average flows are between 132 cfs (1%) lower and 1,480 cfs (8%) higher in the PP_LLT relative to the EBC1. Predicted monthly average flows in the PP_ELT are 42 to 1,241 cfs (<1% to 11%) greater than flows in the EBC2. Predicted monthly average flows in the PP_LLT are 155 to 1,592 cfs (2% to 9%) greater than flows in the EBC2.

Isolating the effect of the preliminary proposal from the effects of climate change provided generally similar results. In the early long-term, predicted monthly average flows in the PP_ELT are 184 to 637 cfs (1% to 7%) greater than flows in the EBC2_ELT. In the late long-term, monthly average predicted flows in the PP_LLT are 119 to 883 cfs (1% to 10%) greater than flows in the EBC2_LLT.

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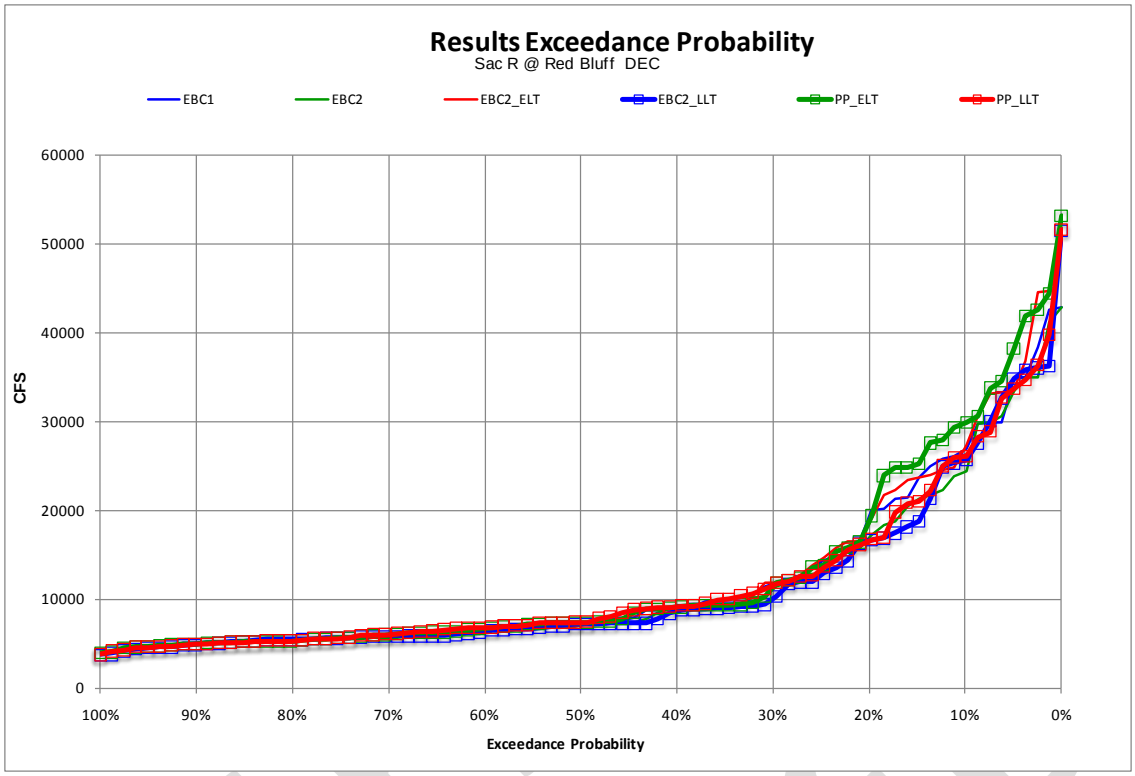

Figure C.5.3-82. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River Upstream of Red Bluff, December

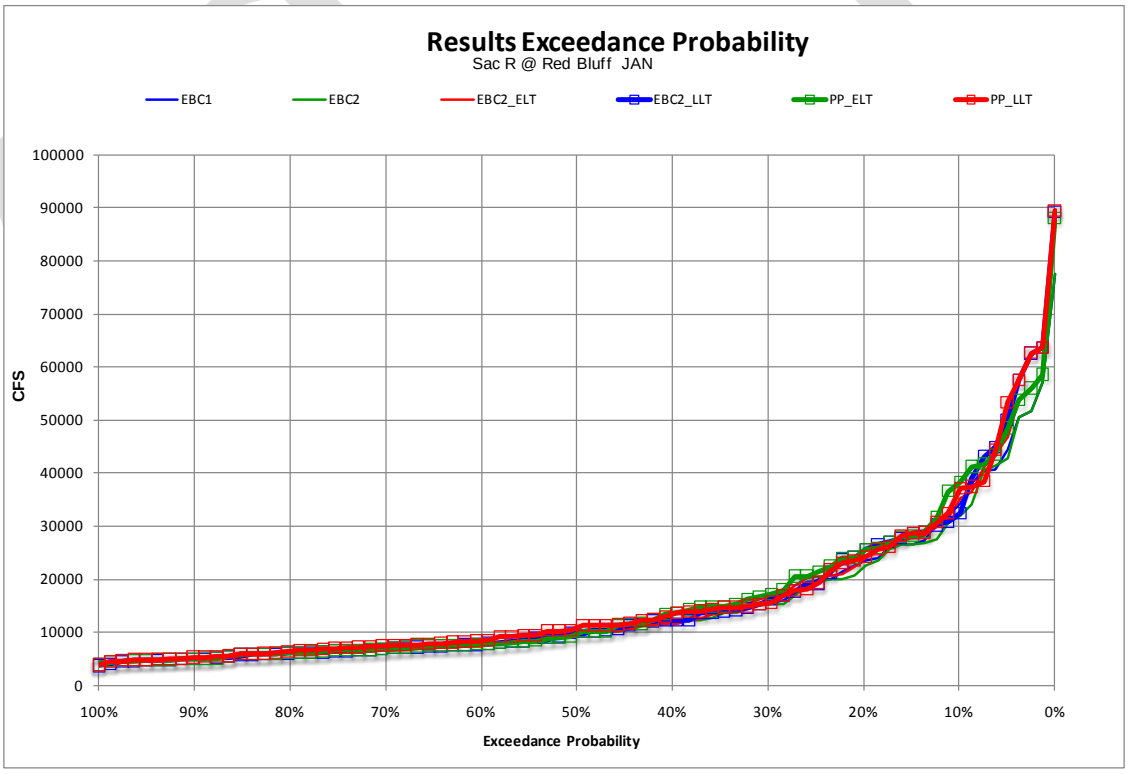

Figure C.5.3-83. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River Upstream of Red Bluff, January

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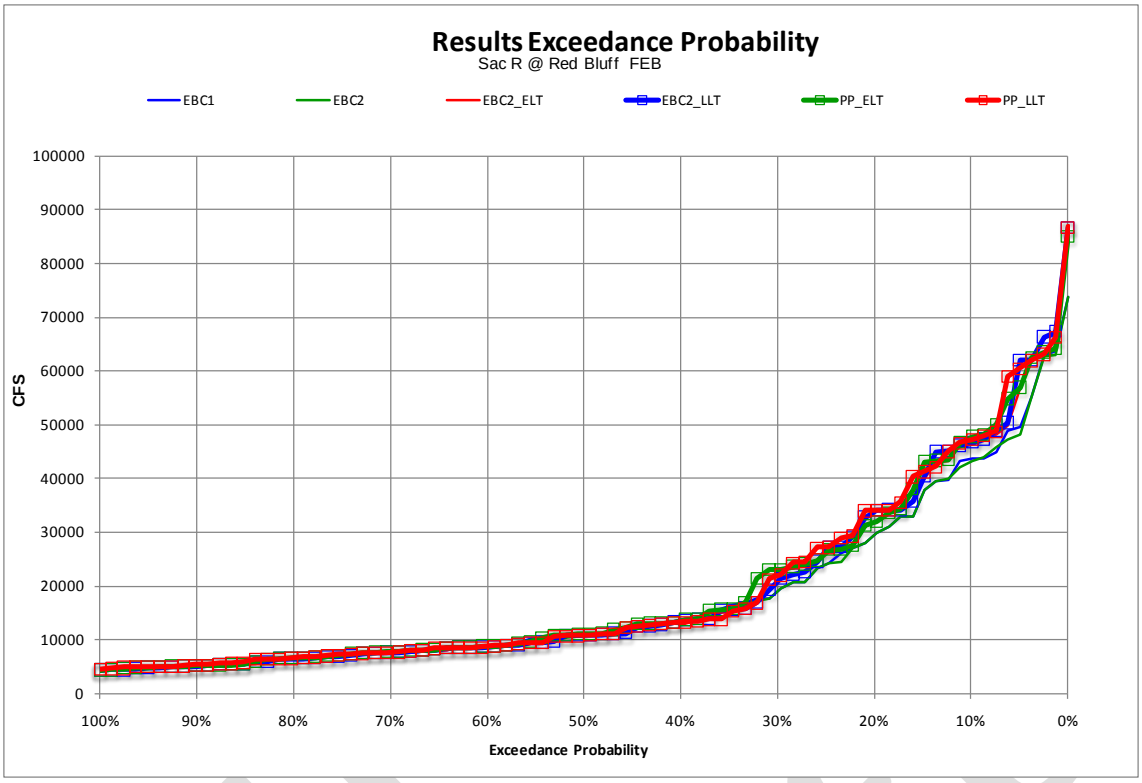

Figure C.5.3-84. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River Upstream of Red Bluff, February

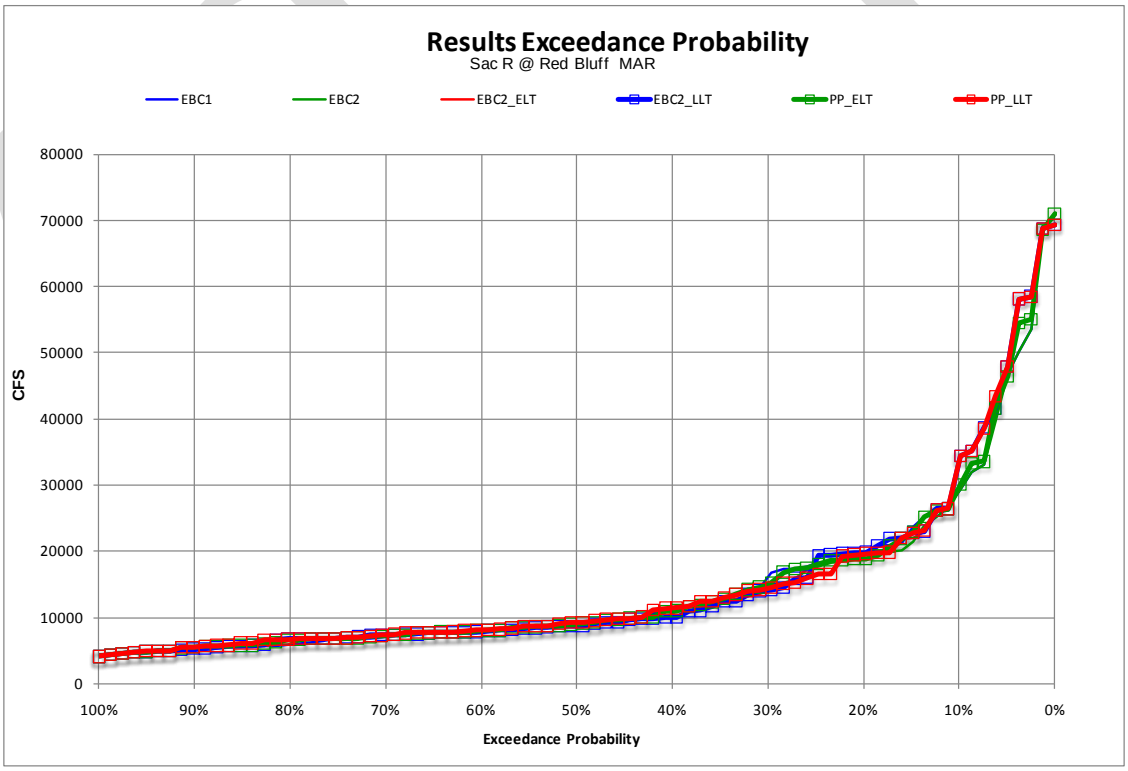

Figure C.5.3-85. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River Upstream of Red Bluff, March

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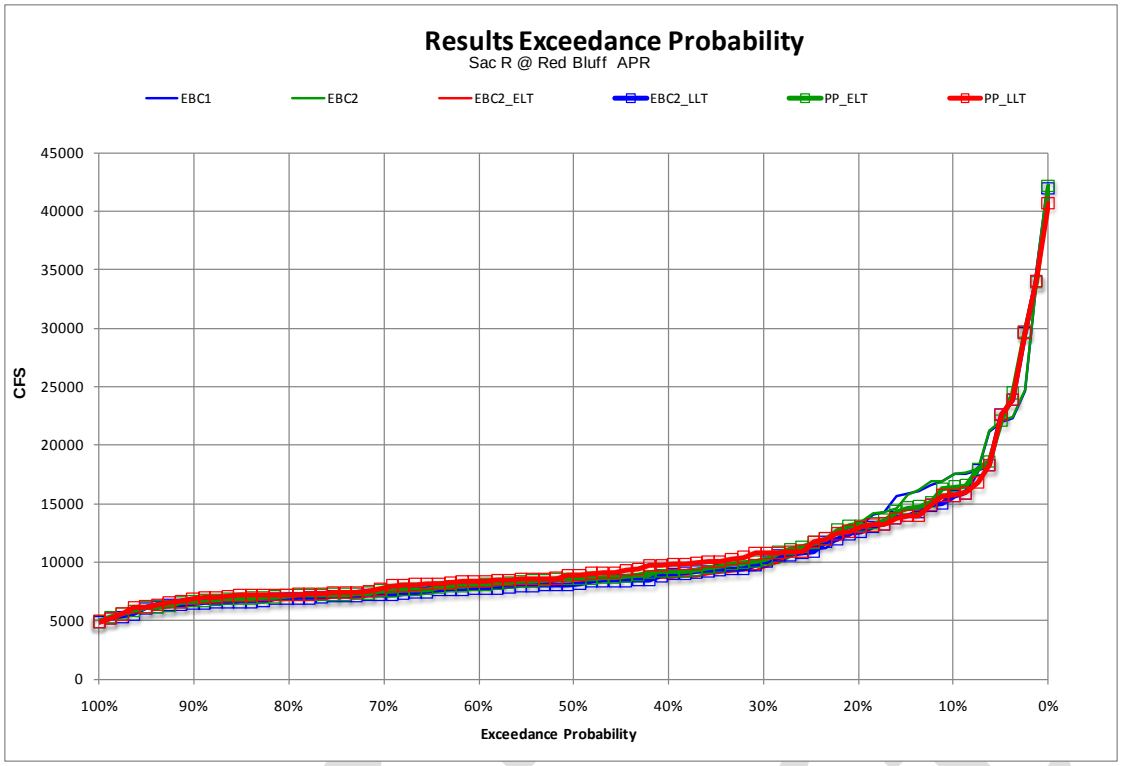

Figure C.5.3-86. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River Upstream of Red Bluff, April

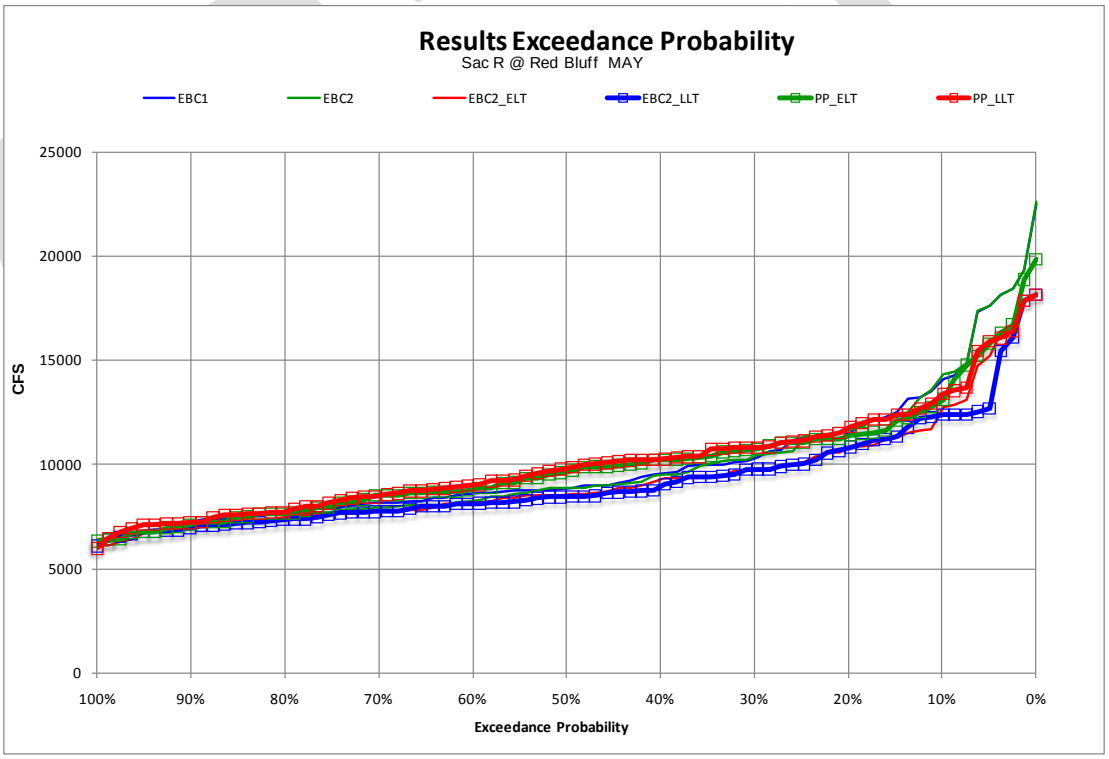

Figure C.5.3-87. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River Upstream of Red Bluff, May

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Adult

There are no fingerprinting tools available to evaluate the relative contribution of smaller tributaries to overall flows upstream of the Delta. However, an evaluation of flow rates from CALSIM outputs along the likely migration pathways of Pacific lamprey during January through June provides information on how the preliminary proposal is predicted to affect adult attraction flows.

Flows in the Sacramento River upstream of Red Bluff for each model scenario between January and June are presented in Table C.5.3-136, and differences between model scenarios in mean flows are presented in Table C.5.3-137.

Mean monthly flows under PP_ELT are predicted to be 57 cfs (<1%) lower to 1,282 cfs (7%) greater than under EBC1 in the Sacramento River upstream of Red Bluff between January and June. Mean monthly flows under PP_LLT are predicted to be 56 to 1,480 cfs (<1% to 8%) greater than EBC1. Mean monthly flows under PP_ELT are predicted to be 42 to 1,393 cfs (<1% to 8%) greater than under EBC2. Mean monthly flows under PP_LLT are predicted to be 155 to 1,465 cfs (2% to 10%) greater than under EBC2.

Isolating the effect of the preliminary proposal from the effects of climate change, mean monthly flows under PP_ELT are predicted to be 184 to 649 cfs (1% to 6%) greater than under EBC2_ELT. Mean monthly flows under PP_LLT are predicted to be 119 to 1,016 cfs (1% to 8%) greater than under EBC2_LLT.

Other than during May and June, these differences are very minor. During May and June, these differences are considered a small benefit to Pacific lamprey adult attraction flows if lamprey are attracted to upstream olfactory cues.

River Lamprey

Macropthalmia

See results for Pacific lamprey macropthalmia.

Adult

Exceedance plots for flows in the Sacramento River upstream of Red Bluff for each model scenario between September and November are presented in Figure C.5.3-88, Figure C.5.3-89, and Figure C.5.3-90, and differences between model scenarios in mean flows are presented in Table C.5.3-137.

Mean flows under the PP_ELT are predicted to be 472 cfs (6%) to 648 cfs (9%) lower than flows under the EBC1. Mean flows under the PP_LLT are predicted to be 1,064 cfs (15%) lower to 1,751 cfs (24%) higher than flows under the EBC1. Mean flows under the PP_ELT are predicted to be 338 cfs (5%) to 1,779 cfs (21%) lower than flows under the EBC2. Mean flows under the PP_LLT are predicted to be 2,253 cfs (27%) lower to 2,061 cfs (29%) higher than flows under the EBC2.

Isolating the effect of the preliminary proposal from the effect of climate change, mean flows under the PP_ELT are predicted to be 187 (3%) to 1,653 cfs (20%) lower than flows under the EBC2_ELT. Mean flows under the PP_LLT are predicted to be 2,297 cfs (27%) lower to 1,508 cfs (20%) higher than flows under the EBC2_LLT.

These results suggest that, other than under the PP_LLT in October, the preliminary proposal would have a small to moderate adverse effect on river lamprey adult attraction flows if lamprey are attracted to upstream olfactory cues.

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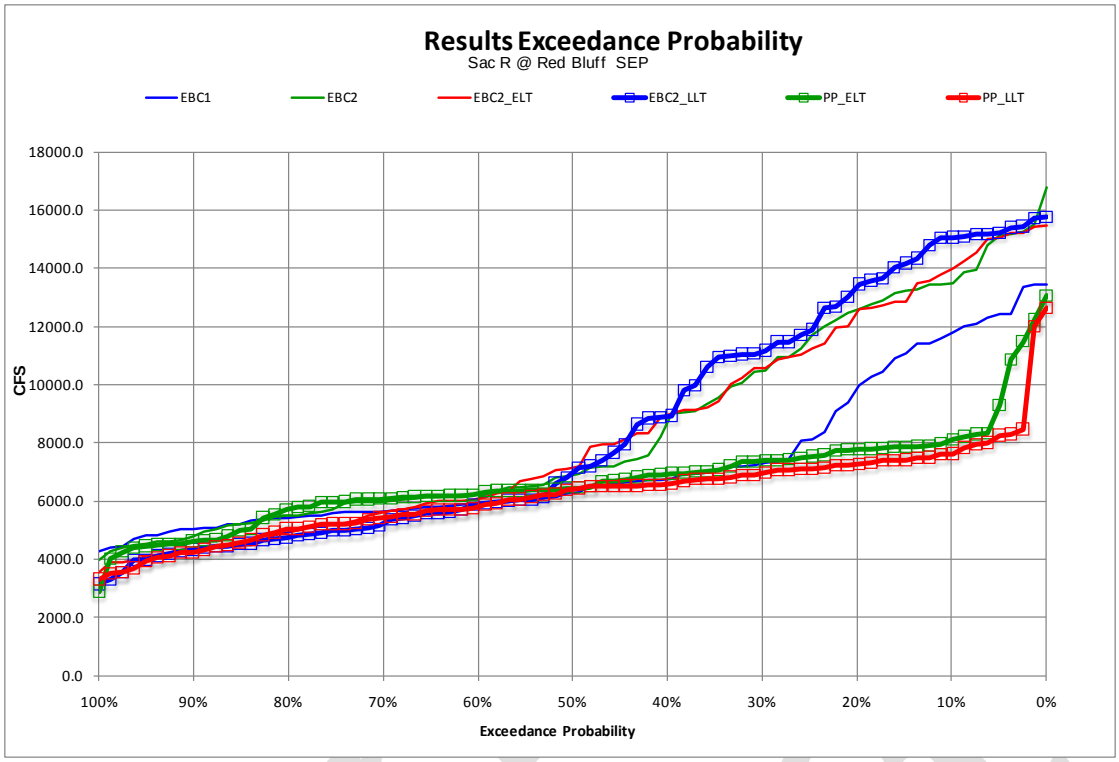

Figure C.5.3-88. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River Upstream of Red Bluff, September

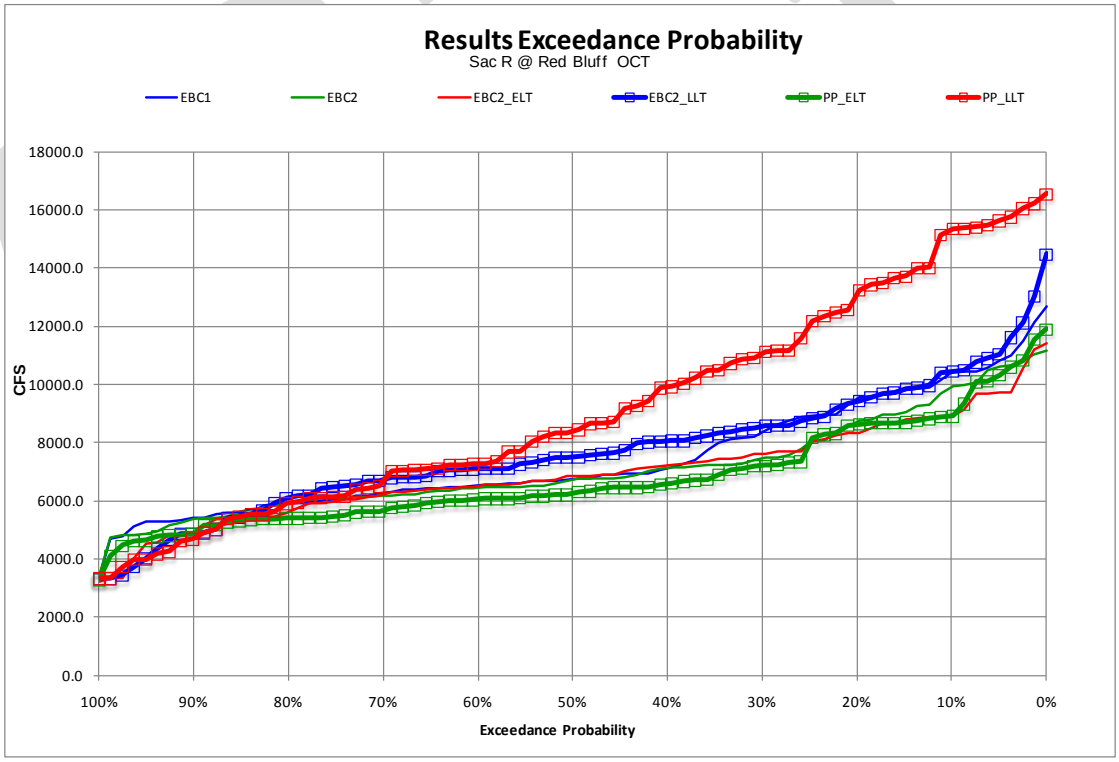

Figure C.5.3-89. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River Upstream of Red Bluff, October

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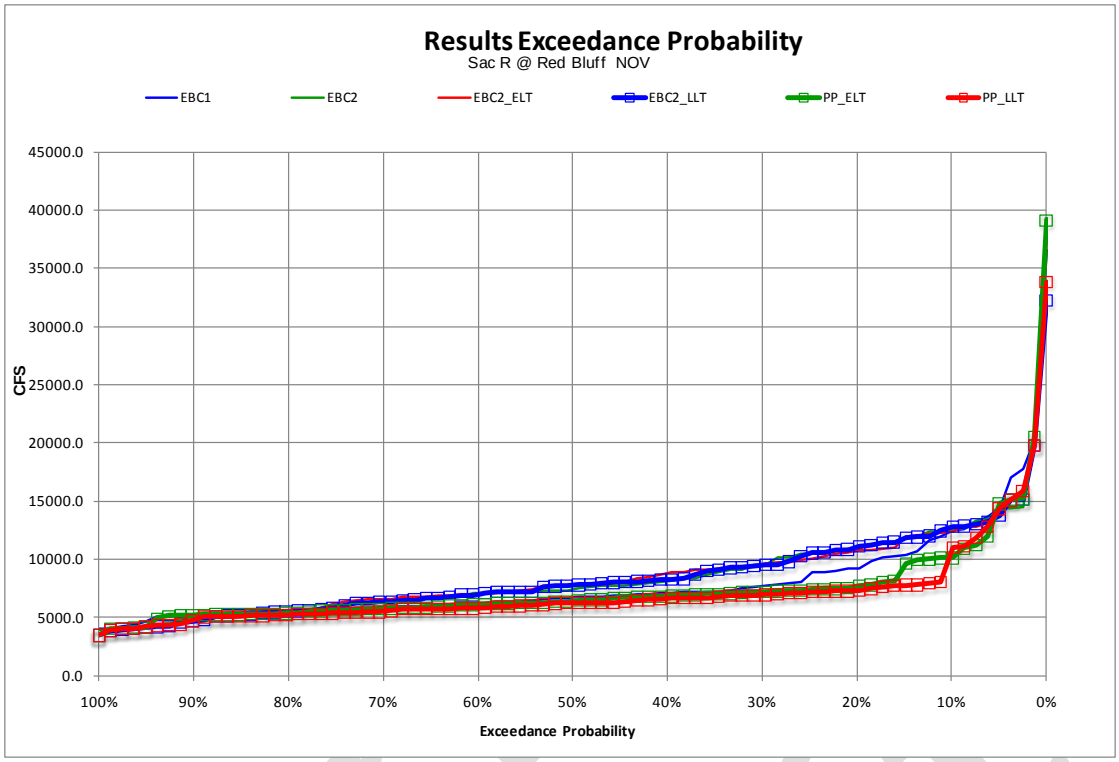

Figure C.5.3-90. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Sacramento River Upstream of Red Bluff, November

Trinity River Subregion

Summary of Flows

CALSIM flow data for the Trinity River subregion (Trinity River below Lewiston) averaged by water-year type, month, and scenario, together with average monthly differences between scenarios, are provided in Table C.5.3-146 and Table C.5.3-147. These data form the basis for the summary of changes in attraction and migration flows.

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Table C.5.3-146. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Trinity River below Lewiston Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	1,440	1,396	1,570	1,518	1,638	1,457
	AN	300	316	300	300	381	483
	BN	358	300	300	300	459	464
	D	300	300	300	300	300	300
	C	300	300	300	287	300	278
	AVG	671	650	703	684	763	718
Feb	W	1,056	1,026	1,209	1,495	1,352	1,400
	AN	689	813	773	784	843	1,043
	BN	517	517	559	568	559	641
	D	300	300	300	300	300	300
	C	300	300	300	300	300	300
	AVG	634	642	702	795	757	816
Mar	W	1,209	1,141	1,335	1,385	1,449	1,347
	AN	436	436	475	519	475	519
	BN	319	319	302	300	302	300
	D	300	300	300	300	300	300
	C	300	300	300	300	300	300
	AVG	611	590	654	676	690	664
Apr	W	721	721	740	844	743	844
	AN	469	469	561	513	467	458
	BN	507	507	508	504	508	504
	D	529	529	529	529	529	529
	C	575	575	580	580	580	580
	AVG	584	584	605	630	592	622
May	W	4,636	4,636	4,620	4,620	4,620	4,620
	AN	4,462	4,462	4,450	4,416	4,450	4,416
	BN	3,774	3,774	3,763	3,865	3,763	3,865
	D	3,216	3,216	3,216	3,216	3,216	3,216
	C	2,092	2,092	1,973	1,973	1,973	1,973
	AVG	3,779	3,779	3,753	3,766	3,753	3,766
Jun	W	3,371	3,371	3,613	3,560	3,613	3,560
	AN	2,488	2,488	2,663	3,188	2,663	3,188
	BN	1,672	1,672	1,767	1,767	1,767	1,767
	D	1,251	1,251	1,251	1,251	1,251	1,251
	C	783	783	783	783	783	783
	AVG	2,108	2,108	2,226	2,286	2,226	2,286
Jul	W	1,289	1,289	1,161	1,103	1,161	1,103
	AN	1,048	1,048	1,048	1,048	1,048	1,048
	BN	869	869	916	916	916	916
	D	667	667	667	667	667	667
	C	450	450	450	413	450	413
	AVG	923	923	890	866	890	866

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	450	450	450	450	450	450
	AN	450	450	450	450	450	450
	BN	450	450	450	450	450	450
	D	450	450	450	450	450	450
	C	450	450	413	338	413	337
	AVG	450	450	445	434	445	434
Sep	W	450	450	450	450	450	450
	AN	450	450	450	450	450	450
	BN	450	450	450	450	450	450
	D	450	450	450	450	450	450
	C	450	450	356	265	413	259
	AVG	450	450	436	423	445	422
Oct	W	373	373	373	373	373	373
	AN	373	373	337	311	342	323
	BN	346	346	346	346	346	346
	D	373	373	352	346	373	352
	C	373	373	342	311	373	290
	AVG	368	368	354	344	364	344
Nov	W	489	491	510	414	424	385
	AN	300	275	275	275	275	275
	BN	300	300	300	300	300	300
	D	300	300	283	283	283	283
	C	300	300	263	225	275	225
	AVG	360	357	354	318	328	309
Dec	W	1,072	1,022	1,281	837	1,393	1,011
	AN	300	300	300	300	300	300
	BN	300	300	300	300	300	300
	D	300	300	300	300	300	283
	C	300	300	300	275	300	250
	AVG	545	529	611	466	647	514

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Table C.5.3-147. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Trinity River below Lewiston[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	199 (13.8%)	17 (1.2%)	242 (17.4%)	61 (4.3%)	69 (4.4%)	-62 (-4.1%)
	AN	81 (26.9%)	183 (60.9%)	65 (20.6%)	167 (53%)	81 (26.9%)	183 (60.9%)
	BN	101 (28.1%)	105 (29.4%)	159 (53%)	164 (54.6%)	159 (53%)	164 (54.6%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	0 (0%)	-22 (-7.2%)	0 (0%)	-22 (-7.2%)	0 (0%)	-9 (-3.1%)
	AVG	92 (13.7%)	47 (7%)	114 (17.5%)	68 (10.5%)	61 (8.7%)	34 (5%)
Feb	W	295 (28%)	344 (32.5%)	326 (31.7%)	374 (36.4%)	143 (11.8%)	-95 (-6.4%)
	AN	153 (22.3%)	354 (51.4%)	29 (3.6%)	230 (28.3%)	70 (9%)	260 (33.1%)
	BN	43 (8.2%)	125 (24.2%)	42 (8.2%)	125 (24.1%)	0 (0%)	73 (12.9%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AVG	123 (19.5%)	182 (28.7%)	115 (17.9%)	173 (27%)	55 (7.9%)	20 (2.6%)
Mar	W	240 (19.9%)	138 (11.4%)	308 (27%)	206 (18%)	114 (8.5%)	-38 (-2.8%)
	AN	39 (8.9%)	83 (19.1%)	39 (8.9%)	83 (19.1%)	0 (0%)	0 (0%)
	BN	-16 (-5.1%)	-19 (-5.8%)	-16 (-5.1%)	-19 (-5.8%)	0 (0%)	0 (0%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AVG	79 (12.9%)	53 (8.6%)	101 (17.1%)	74 (12.6%)	36 (5.5%)	-12 (-1.8%)
Apr	W	22 (3.1%)	122 (17%)	22 (3.1%)	122 (17%)	4 (0.5%)	0 (0%)
	AN	-3 (-0.6%)	-11 (-2.3%)	-3 (-0.6%)	-11 (-2.3%)	-95 (-16.9%)	-54 (-10.6%)
	BN	1 (0.2%)	-3 (-0.7%)	1 (0.2%)	-3 (-0.7%)	0 (0%)	0 (0%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	5 (0.9%)	5 (0.9%)	5 (0.9%)	5 (0.9%)	0 (0%)	0 (0%)
	AVG	8 (1.3%)	37 (6.4%)	8 (1.3%)	37 (6.4%)	-13 (-2.1%)	-8 (-1.3%)
May	W	-16 (-0.3%)	-16 (-0.3%)	-16 (-0.3%)	-16 (-0.3%)	0 (0%)	0 (0%)
	AN	-12 (-0.3%)	-46 (-1%)	-12 (-0.3%)	-46 (-1%)	0 (0%)	0 (0%)
	BN	-12 (-0.3%)	90 (2.4%)	-12 (-0.3%)	90 (2.4%)	0 (0%)	0 (0%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	-119 (-5.7%)	-119 (-5.7%)	-119 (-5.7%)	-119 (-5.7%)	0 (0%)	0 (0%)
	AVG	-26 (-0.7%)	-14 (-0.4%)	-26 (-0.7%)	-14 (-0.4%)	0 (0%)	0 (0%)
Jun	W	242 (7.2%)	189 (5.6%)	242 (7.2%)	189 (5.6%)	0 (0%)	0 (0%)
	AN	175 (7%)	700 (28.1%)	175 (7%)	700 (28.1%)	0 (0%)	0 (0%)
	BN	96 (5.7%)	96 (5.7%)	96 (5.7%)	96 (5.7%)	0 (0%)	0 (0%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AVG	119 (5.6%)	179 (8.5%)	119 (5.6%)	179 (8.5%)	0 (0%)	0 (0%)
Jul	W	-128 (-9.9%)	-185 (-14.4%)	-128 (-9.9%)	-185 (-14.4%)	0 (0%)	0 (0%)
	AN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	47 (5.4%)	47 (5.4%)	47 (5.4%)	47 (5.4%)	0 (0%)	0 (0%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	0 (0%)	-38 (-8.3%)	0 (0%)	-38 (-8.3%)	0 (0%)	0 (0%)
	AVG	-33 (-3.5%)	-56 (-6.1%)	-33 (-3.5%)	-56 (-6.1%)	0 (0%)	0 (0%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	-38 (-8.3%)	-113 (-25%)	-38 (-8.3%)	-113 (-25%)	0 (0%)	0 (0%)
	AVG	-5 (-1.2%)	-16 (-3.7%)	-5 (-1.2%)	-16 (-3.7%)	0 (0%)	0 (0%)
Sep	W	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	-37 (-8.3%)	-191 (-42.4%)	-38 (-8.3%)	-191 (-42.4%)	57 (16%)	-6 (-2.3%)
	AVG	-5 (-1.2%)	-28 (-6.2%)	-5 (-1.2%)	-28 (-6.2%)	8 (1.9%)	-1 (-0.2%)
Oct	W	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AN	-31 (-8.3%)	-50 (-13.4%)	-31 (-8.3%)	-50 (-13.4%)	5 (1.4%)	12 (3.9%)
	BN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	0 (0%)	-21 (-5.6%)	0 (0%)	-21 (-5.6%)	21 (5.9%)	6 (1.9%)
	C	0 (0%)	-83 (-22.3%)	0 (0%)	-83 (-22.3%)	31 (9.1%)	-21 (-6.8%)
	AVG	-5 (-1.2%)	-24 (-6.5%)	-5 (-1.2%)	-24 (-6.5%)	10 (2.8%)	0 (0%)
Nov	W	-65 (-13.3%)	-104 (-21.3%)	-67 (-13.7%)	-106 (-21.6%)	-86 (-16.9%)	-29 (-7.1%)
	AN	-25 (-8.3%)	-25 (-8.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	-17 (-5.6%)	-17 (-5.6%)	-17 (-5.6%)	-17 (-5.6%)	0 (0%)	0 (0%)
	C	-25 (-8.3%)	-75 (-25%)	-25 (-8.3%)	-75 (-25%)	12 (4.5%)	0 (0%)
	AVG	-32 (-8.8%)	-51 (-14.2%)	-29 (-8%)	-48 (-13.5%)	-26 (-7.2%)	-9 (-2.9%)
Dec	W	322 (30%)	-61 (-5.7%)	371 (36.4%)	-11 (-1.1%)	112 (8.8%)	174 (20.8%)
	AN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	0 (0%)	-17 (-5.5%)	0 (0%)	-17 (-5.5%)	0 (0%)	-17 (-5.5%)
	C	0 (0%)	-50 (-16.7%)	0 (0%)	-50 (-16.7%)	0 (0%)	-25 (-9%)
	AVG	102 (18.7%)	-30 (-5.6%)	118 (22.3%)	-14 (-2.7%)	36 (5.8%)	48 (10.3%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

Steelhead

Juvenile

Trinity River flow downstream of Lewiston Reservoir is used to represent flow conditions in the Trinity River. Differences in average Trinity River flow between PP and EBC scenarios during the juvenile steelhead migration period (October through May) were low, generally less than 5%, although variability for individual months was considerable (Table C.5.3-146, Table C.5.3-147). In particular, flows in January under PP_ELT and PP_LLT were 27% and 61%, respectively, above flows under EBC2_ELT and EBC2_LLT in above-normal years and 53% and 55%, respectively, above flows under EBC2_ELT and EBC2_LLT in below-normal years. The largest reductions in flow, 17% lower under PP_ELT compared to EBC2_ELT, were for November of wet years and April of above-normal

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years. Based on these results, it was concluded that flow conditions for migration of steelhead juveniles in the Trinity River under PP operations would be generally similar to those under EBC2 operations, but with large differences for the months and water years noted above.

Adult

No specific criteria exist for assessing the potential effects of a change in olfactory cues that affect the attraction of migrating adult steelhead to the Trinity River. In the absence of such criteria, it is assumed that the larger the increase in the flow of the Trinity River downstream of Lewiston Reservoir during the adult upstream migration period, the greater the attraction to the river. Average Trinity River flows during the September through March migration period are summarized in Table C.5.3-146, and differences between scenarios are summarized in Table C.5.3-147.

Average September through March differences in Trinity River flows were 5% or less for most of the water-year types, but were 14% higher under PP_ELT compared to EBC2_ELT in above-normal years and 10% higher for the same comparison in below-normal years. Several differences in average flows within individual months were considerable. In particular, flows in January under PP_ELT and PP_LLT were 27% and 61%, respectively, above flows under EBC2_ELT and EBC2_LLT in above-normal years and 53% and 55%, respectively, above flows under EBC2_ELT and EBC2_LLT in below-normal years. The largest reduction in flow, 17% lower under PP_ELT compared to EBC2_ELT, was for November of wet years. Based on these results, it was concluded that flow conditions for migration of steelhead juveniles in the Trinity River under PP operations would be generally similar to those under EBC2 operations, but with large differences for the months and water years noted above.

Kelt

Flows in the Trinity River downstream of Lewiston Reservoir were compared for the period from January through April to represent the period of kelt migration. Results by month and water-year type are shown in Table C.5.3-146 and Table C.5.3-147.

Most average January through April differences in Trinity River flow were 5% or less, but larger differences included a 21% increased flow under PP_LLT compared to EBC2_LLT for above-normal years, and 11% and 17% increases under PP_ELT compared to EBC2_ELT and PP_LLT compared to EBC2_LLT, respectively, for below-normal years (Table C.5.3-147). Several differences in average flows within individual months were considerable. In particular, flows in January under PP_ELT and PP_LLT were 27% and 61%, respectively, above flows under EBC2_ELT and EBC2_LLT in above-normal years and 53% and 55%, respectively, above flows under EBC2_ELT and EBC2_LLT in below-normal years. The largest reduction in flow, 17% lower under PP_ELT compared to EBC2_ELT, was for April of above-normal years. Based on these results, it was concluded that instream habitat conditions for upstream migration of steelhead kelts in the Trinity River under PP operations would be generally similar to those under EBC2 operations, but with large differences for the months and water years noted above.

Spring-Run Chinook Salmon

Juvenile

Average flows in the Trinity River below Lewiston during the spring-run Chinook salmon juvenile migration period (November through May) generally were similar between PP and EBC scenarios, or somewhat greater under PP scenarios (Table C.5.3-146, Table C.5.3-147). A trend of slightly

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greater average flows under PP scenarios in wet, above-normal, and below-normal years was attributable to individual months in which flows were considerably greater under PP scenarios, e.g., in January of below-normal years, for which average flows under PP_ELT/PP_LLT were more than 50% greater than flows under EBC scenarios.

Adult

In general there was little difference in average flows between PP and EBC scenarios in the Trinity River at Lewiston during the adult spring-run Chinook salmon migration period of April through May (Table C.5.3-146, Table C.5.3-147). The only modest difference occurred in April of above-normal years, for which flows under PP_ELT/PP_LLT were on average 5–8% lower than under EBC2_ELT and EBC2_LLT.

Fall-Run Chinook Salmon

Juvenile

Flows in the Trinity River are presented in Table C.5.3-146 and generally show little difference between PP and EBC scenarios during the February through May juvenile fall-run Chinook salmon migration period.

Adult

Adult fall-run Chinook salmon migrate upstream into the Trinity River primarily during September through October. CALSIM modeling results were used to assess potential effects of existing biological conditions and preliminary proposal operations for attracting adult fall-run Chinook salmon into the river. Attraction flows in the Trinity River provide environmental cues for adult migration.

Attraction flow analysis for upstream-migrating adult fall-run Chinook salmon based on CALSIM Trinity River instream flow modeling during the migration period are summarized in Table C.5.3-146 and Table C.5.3-147.

No specific criteria exist for assessing the potential effects of flow change on olfactory cues that affect the attraction of adult fall-run Chinook salmon to migrate upstream into the Trinity River. Thus, it was assumed in this effects analysis that the larger the reduction in the percentage of flow originating from the Trinity River during the adult upstream migration period, the greater the potential effect. Differences in the percentage of attraction flows that are less than 5% between existing biological conditions and preliminary proposal operations were assumed to be within the range of error of the simulation models and below the ability to detect actual differences that would be biologically meaningful. The analysis predicts that Trinity River flows would be comparable (less than 5% differences) between the preliminary proposal operations and existing biological conditions. Based on these results, it was concluded that preliminary proposal operations would not result in an effect on olfactory cues or associated attraction flows in the river.

Clear Creek Subregion

CALSIM flow data for the Clear Creek subregion (Clear Creek below Whiskeytown) averaged by water-year type, month, and scenario, together with average monthly differences between scenarios, are provided in Table C.5.3-148 and Table C.5.3-149. Based on these results, no appreciable effects of the preliminary proposal on migration or attraction flows are expected in this subregion.

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Table C.5.3-148. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Clear Creek below Whiskeytown Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	220	220	309	339	309	339
	AN	192	192	192	192	192	192
	BN	189	189	189	189	189	189
	D	184	192	192	192	192	192
	C	155	168	166	159	171	163
	AVG	193	197	225	233	225	234
Feb	W	220	220	249	257	249	257
	AN	197	196	196	196	196	196
	BN	189	189	189	189	189	189
	D	184	192	192	192	192	192
	C	155	168	166	168	171	163
	AVG	194	197	206	209	207	208
Mar	W	200	200	207	259	207	258
	AN	197	205	203	196	196	196
	BN	189	189	192	202	189	196
	D	186	192	192	192	192	192
	C	155	168	166	168	171	163
	AVG	188	193	194	212	194	210
Apr	W	200	200	200	200	200	200
	AN	197	196	196	196	196	196
	BN	189	189	192	189	189	189
	D	188	192	192	192	192	192
	C	155	168	166	168	171	163
	AVG	189	191	191	191	191	190
May	W	277	277	277	277	277	277
	AN	277	277	277	277	277	277
	BN	263	269	269	269	269	269
	D	264	264	264	264	264	264
	C	211	224	224	224	224	224
	AVG	262	265	265	265	265	265
Jun	W	200	200	200	200	200	200
	AN	200	200	200	200	200	200
	BN	181	186	186	186	186	186
	D	180	180	180	180	180	180
	C	115	120	120	131	120	120
	AVG	180	181	181	183	181	181
Jul	W	85	85	85	85	85	85
	AN	85	85	85	85	85	85
	BN	85	85	85	85	85	85
	D	85	85	85	85	85	85
	C	85	85	99	85	94	98
	AVG	85	85	87	85	86	87

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	85	85	85	85	85	85
	AN	85	85	85	85	85	85
	BN	85	85	85	85	85	85
	D	85	85	85	85	85	85
	C	94	94	85	71	94	78
	AVG	86	86	85	83	86	84
Sep	W	150	150	150	150	150	150
	AN	150	150	150	150	150	150
	BN	150	150	150	150	150	150
	D	144	150	150	150	150	150
	C	133	133	121	96	121	83
	AVG	146	148	146	142	146	140
Oct	W	198	198	198	198	198	198
	AN	183	183	183	183	183	183
	BN	189	179	179	182	179	189
	D	175	183	183	183	183	178
	C	150	167	165	142	167	154
	AVG	182	185	185	182	185	184
Nov	W	198	198	198	198	198	198
	AN	185	185	180	182	180	182
	BN	184	189	189	189	189	189
	D	177	184	184	177	176	180
	C	155	168	158	145	158	158
	AVG	183	187	185	182	183	184
Dec	W	198	198	198	198	198	198
	AN	185	192	192	192	192	192
	BN	189	189	189	189	189	189
	D	177	189	189	189	189	189
	C	155	168	166	156	171	150
	AVG	184	189	189	187	190	187

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Table C.5.3-149. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Clear Creek below Whiskeytown

Month	WY Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	88 (40.1%)	118 (53.6%)	88 (40.1%)	118 (53.6%)	0 (0%)	0 (-0.1%)
	AN	0 (-0.1%)	0 (-0.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	7 (3.9%)	7 (3.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	16 (10.2%)	8 (5%)	3 (1.5%)	-6 (-3.3%)	5 (2.9%)	4 (2.3%)
	AVG	32 (16.5%)	40 (20.8%)	28 (14.4%)	37 (18.6%)	1 (0.3%)	0 (0.2%)
Feb	W	29 (13.3%)	38 (17.1%)	29 (13.3%)	38 (17.1%)	0 (0%)	0 (-0.1%)
	AN	-1 (-0.4%)	-1 (-0.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	7 (3.9%)	7 (3.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	16 (10.2%)	8 (5%)	3 (1.5%)	-6 (-3.3%)	5 (2.9%)	-5 (-3.2%)
	AVG	13 (6.7%)	15 (7.5%)	10 (4.9%)	11 (5.6%)	1 (0.3%)	-1 (-0.4%)
Mar	W	7 (3.3%)	58 (29.2%)	7 (3.3%)	58 (29.1%)	0 (0%)	0 (-0.1%)
	AN	-1 (-0.4%)	-1 (-0.4%)	-10 (-4.6%)	-10 (-4.6%)	-7 (-3.7%)	0 (0%)
	BN	0 (0%)	6 (3.3%)	0 (0%)	6 (3.3%)	-3 (-1.4%)	-6 (-3%)
	D	6 (3.2%)	6 (3.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	16 (10.2%)	8 (5%)	3 (1.5%)	-6 (-3.3%)	5 (2.9%)	-5 (-3.2%)
	AVG	6 (3%)	22 (11.7%)	1 (0.5%)	17 (9%)	-1 (-0.4%)	-2 (-0.9%)
Apr	W	0 (0%)	0 (0%)	0 (-0.1%)	0 (-0.1%)	0 (0%)	0 (-0.1%)
	AN	-1 (-0.4%)	-1 (-0.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	-3 (-1.4%)	0 (0%)
	D	3 (1.7%)	3 (1.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	16 (10.2%)	8 (5%)	3 (1.5%)	-6 (-3.3%)	5 (2.9%)	-5 (-3.2%)
	AVG	3 (1.5%)	2 (0.9%)	0 (0.2%)	-1 (-0.5%)	0 (0.1%)	-1 (-0.4%)
May	W	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	6 (2.2%)	6 (2.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	13 (6.2%)	13 (6.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AVG	3 (1.1%)	3 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Jun	W	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	5 (2.6%)	5 (2.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	5 (4.7%)	5 (4.7%)	0 (0%)	0 (0%)	0 (0%)	-11 (-8.2%)
	AVG	2 (0.9%)	2 (0.9%)	0 (0%)	0 (0%)	0 (0%)	-2 (-0.9%)
Jul	W	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	9 (10%)	13 (15.5%)	9 (10%)	13 (15.5%)	-5 (-5.2%)	13 (15.5%)
	AVG	1 (1.5%)	2 (2.3%)	1 (1.5%)	2 (2.3%)	-1 (-0.9%)	2 (2.3%)

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Month	WY Year	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	0 (-0.3%)	-16 (-17.4%)	0 (-0.3%)	-16 (-17.4%)	9 (10.6%)	7 (10%)
	AVG	0 (0%)	-2 (-2.8%)	0 (0%)	-2 (-2.8%)	1 (1.6%)	1 (1.3%)
Sep	W	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	6 (3.8%)	6 (3.8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	-13 (-9.4%)	-50 (-37.5%)	-13 (-9.4%)	-50 (-37.5%)	0 (0%)	-13 (-13%)
	AVG	-1 (-0.4%)	-6 (-4.2%)	-2 (-1.2%)	-7 (-5%)	0 (0%)	-2 (-1.3%)
Oct	W	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	-11 (-5.7%)	0 (0%)	0 (0%)	11 (6%)	0 (0%)	7 (4.1%)
	D	8 (4.8%)	3 (1.7%)	0 (0%)	-5 (-3%)	0 (0%)	-5 (-3%)
	C	17 (11.1%)	4 (2.8%)	0 (0%)	-12 (-7.5%)	2 (1.1%)	13 (8.8%)
	AVG	2 (1.3%)	1 (0.7%)	0 (0%)	-1 (-0.6%)	0 (0.1%)	2 (1.1%)
Nov	W	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	AN	-5 (-2.8%)	-3 (-1.8%)	-5 (-2.7%)	-3 (-1.7%)	0 (0%)	0 (0%)
	BN	6 (3.1%)	6 (3.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	-1 (-0.6%)	2 (1.4%)	-8 (-4.5%)	-5 (-2.6%)	-8 (-4.5%)	3 (1.8%)
	C	3 (2.2%)	3 (1.9%)	-10 (-5.9%)	-10 (-6.2%)	0 (0%)	13 (8.6%)
	AVG	0 (0.3%)	1 (0.8%)	-4 (-2.1%)	-3 (-1.6%)	-2 (-1%)	3 (1.4%)
Dec	W	0 (0%)	0 (0%)	0 (-0.1%)	0 (-0.1%)	0 (-0.1%)	0 (0%)
	AN	7 (3.6%)	7 (3.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	BN	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	D	12 (6.6%)	12 (6.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	C	16 (10.2%)	-5 (-3.1%)	3 (1.5%)	-18 (-10.8%)	5 (2.9%)	-6 (-3.6%)
	AVG	6 (3.2%)	3 (1.5%)	0 (0.2%)	-3 (-1.4%)	1 (0.4%)	-1 (-0.4%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

Feather River Subregion

CALSIM flow data for the Feather River subregion averaged by water-year type, month, and scenario, together with average monthly differences between scenarios, are provided in Table C.5.3-150 through Table C.5.3-153. These form the basis for the summary of changes in attraction and migration flows.

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Table C.5.3-150. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Feather River at Thermalito Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	11,257	10,642	11,528	11,896	14,103	14,399
	AN	4,434	3,470	3,419	2,838	5,255	4,107
	BN	2,640	1,703	1,692	1,441	2,462	1,584
	D	1,798	1,448	1,477	1,459	1,918	2,168
	C	1,459	1,222	1,378	1,648	1,840	1,403
	AVG	5,277	4,669	4,970	4,995	6,351	6,118
Feb	W	12,466	11,548	13,732	14,787	15,171	16,622
	AN	7,411	5,403	5,793	5,809	8,987	8,138
	BN	3,916	2,797	2,280	1,897	3,202	3,281
	D	1,817	1,620	1,642	1,659	1,964	1,866
	C	1,610	1,477	1,467	1,482	1,483	1,829
	AVG	6,340	5,502	6,166	6,444	7,320	7,699
Mar	W	12,895	12,392	13,977	14,772	14,314	14,988
	AN	7,733	6,950	8,568	8,568	9,517	10,417
	BN	3,373	2,441	2,347	1,985	2,672	2,333
	D	2,017	1,701	1,521	1,762	2,481	2,172
	C	1,697	1,478	1,590	1,634	1,670	1,667
	AVG	6,487	5,953	6,653	6,902	7,176	7,396
Apr	W	6,472	6,510	6,652	6,408	6,770	6,389
	AN	2,251	2,257	2,240	2,170	2,233	2,504
	BN	1,205	1,119	1,132	1,203	1,533	2,152
	D	1,286	1,328	1,448	1,470	2,103	2,681
	C	1,389	1,375	1,384	1,407	1,827	1,903
	AVG	3,073	3,078	3,150	3,084	3,464	3,627
May	W	7,528	7,539	6,380	4,740	6,492	5,415
	AN	3,340	3,262	3,342	3,101	4,322	4,350
	BN	1,205	1,149	1,316	1,749	3,128	3,667
	D	1,591	1,586	1,862	2,223	2,297	2,552
	C	1,574	1,520	1,877	1,790	1,748	1,762
	AVG	3,661	3,635	3,420	3,005	3,985	3,798
Jun	W	5,062	5,139	3,659	4,211	5,181	5,281
	AN	3,301	3,385	3,107	3,930	5,722	6,278
	BN	2,707	2,752	3,153	3,552	5,533	5,456
	D	3,134	3,352	3,432	3,284	3,593	3,496
	C	2,695	2,700	2,812	2,666	2,646	2,563
	AVG	3,632	3,725	3,318	3,628	4,601	4,667
Jul	W	6,490	6,748	7,835	8,577	5,365	6,392
	AN	8,757	9,113	9,434	9,488	7,157	7,576
	BN	8,981	9,094	8,936	8,833	6,475	6,216
	D	8,294	8,266	7,980	8,099	5,997	4,420
	C	6,703	6,040	6,144	5,217	3,224	2,936
	AVG	7,674	7,724	8,041	8,157	5,642	5,597

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	3,308	3,906	5,462	6,228	4,088	4,584
	AN	6,042	6,384	6,948	7,346	5,636	5,708
	BN	6,295	6,448	6,348	6,868	4,502	4,251
	D	7,036	6,106	5,633	4,990	4,265	3,859
	C	2,613	2,625	2,236	2,163	2,652	2,034
	AVG	4,935	4,998	5,396	5,634	4,214	4,159
Sep	W	2,280	8,458	8,400	8,327	1,263	1,172
	AN	2,253	7,021	7,172	6,899	1,680	1,902
	BN	2,466	2,710	3,161	3,068	1,353	1,455
	D	2,366	1,999	1,473	1,052	1,668	1,658
	C	1,421	1,529	1,451	1,345	1,715	1,744
	AVG	2,201	4,835	4,788	4,601	1,494	1,518
Oct	W	3,456	3,204	3,025	3,051	3,153	3,260
	AN	2,386	2,770	2,577	2,741	3,361	3,303
	BN	3,183	2,801	2,820	2,862	3,211	3,043
	D	2,688	2,667	2,786	2,652	2,958	3,220
	C	2,472	2,267	2,233	2,102	2,924	3,506
	AVG	2,940	2,817	2,756	2,747	3,117	3,256
Nov	W	3,292	2,992	2,812	2,470	2,860	2,747
	AN	1,824	2,003	1,915	2,119	2,114	1,915
	BN	2,101	2,043	1,950	1,900	1,762	1,854
	D	1,859	1,733	1,729	1,664	1,801	1,811
	C	1,854	1,860	1,803	1,876	1,901	2,016
	AVG	2,349	2,243	2,148	2,058	2,191	2,160
Dec	W	7,157	5,414	5,543	3,948	7,691	5,927
	AN	2,951	3,328	3,344	3,344	3,382	4,443
	BN	2,176	2,515	2,096	2,102	2,732	2,748
	D	2,364	2,343	2,202	2,229	2,865	2,690
	C	2,609	2,152	1,781	1,694	2,759	2,889
	AVG	3,973	3,462	3,349	2,837	4,433	4,012

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Table C.5.3-151. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Feather River at Thermalito[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	2846 (25.3%)	3141 (27.9%)	3461 (32.5%)	3757 (35.3%)	2575 (22.3%)	2503 (21%)
	AN	821 (18.5%)	-327 (-7.4%)	1785 (51.4%)	637 (18.4%)	1836 (53.7%)	1269 (44.7%)
	BN	-177 (-6.7%)	-1056 (-40%)	760 (44.6%)	-119 (-7%)	770 (45.5%)	143 (9.9%)
	D	120 (6.7%)	370 (20.6%)	470 (32.5%)	720 (49.7%)	441 (29.9%)	709 (48.6%)
	C	381 (26.1%)	-57 (-3.9%)	618 (50.6%)	181 (14.8%)	462 (33.6%)	-245 (-14.9%)
	AVG	1074 (20.4%)	841 (15.9%)	1682 (36%)	1449 (31%)	1381 (27.8%)	1124 (22.5%)
Feb	W	2705 (21.7%)	4156 (33.3%)	3623 (31.4%)	5074 (43.9%)	1439 (10.5%)	1835 (12.4%)
	AN	1576 (21.3%)	727 (9.8%)	3584 (66.3%)	2735 (50.6%)	3194 (55.1%)	2329 (40.1%)
	BN	-714 (-18.2%)	-635 (-16.2%)	405 (14.5%)	484 (17.3%)	922 (40.4%)	1384 (73%)
	D	148 (8.1%)	49 (2.7%)	344 (21.2%)	245 (15.1%)	322 (19.6%)	206 (12.4%)
	C	-128 (-7.9%)	219 (13.6%)	6 (0.4%)	352 (23.8%)	16 (1.1%)	347 (23.4%)
	AVG	980 (15.5%)	1358 (21.4%)	1819 (33.1%)	2197 (39.9%)	1154 (18.7%)	1255 (19.5%)
Mar	W	1419 (11%)	2093 (16.2%)	1922 (15.5%)	2595 (20.9%)	337 (2.4%)	216 (1.5%)
	AN	1784 (23.1%)	2684 (34.7%)	2567 (36.9%)	3467 (49.9%)	949 (11.1%)	1849 (21.6%)
	BN	-701 (-20.8%)	-1040 (-30.8%)	231 (9.5%)	-108 (-4.4%)	325 (13.8%)	348 (17.6%)
	D	464 (23%)	156 (7.7%)	780 (45.8%)	471 (27.7%)	960 (63.1%)	410 (23.3%)
	C	-27 (-1.6%)	-30 (-1.7%)	192 (13%)	190 (12.8%)	80 (5%)	34 (2.1%)
	AVG	689 (10.6%)	908 (14%)	1224 (20.6%)	1443 (24.2%)	524 (7.9%)	493 (7.1%)
Apr	W	298 (4.6%)	-84 (-1.3%)	260 (4%)	-121 (-1.9%)	119 (1.8%)	-19 (-0.3%)
	AN	-18 (-0.8%)	252 (11.2%)	-24 (-1.1%)	246 (10.9%)	-7 (-0.3%)	333 (15.4%)
	BN	328 (27.2%)	948 (78.7%)	413 (36.9%)	1033 (92.3%)	401 (35.4%)	949 (78.9%)
	D	817 (63.5%)	1395 (108.5%)	775 (58.3%)	1353 (101.9%)	654 (45.2%)	1211 (82.3%)
	C	438 (31.5%)	514 (37%)	452 (32.9%)	528 (38.4%)	443 (32.1%)	495 (35.2%)
	AVG	391 (12.7%)	554 (18%)	386 (12.5%)	548 (17.8%)	314 (10%)	543 (17.6%)
May	W	-1036 (-13.8%)	-2113 (-28.1%)	-1048 (-13.9%)	-2124 (-28.2%)	112 (1.8%)	675 (14.2%)
	AN	982 (29.4%)	1010 (30.2%)	1060 (32.5%)	1089 (33.4%)	980 (29.3%)	1249 (40.3%)
	BN	1923 (159.5%)	2462 (204.3%)	1980 (172.4%)	2519 (219.3%)	1812 (137.6%)	1919 (109.7%)
	D	706 (44.4%)	960 (60.3%)	711 (44.8%)	965 (60.8%)	436 (23.4%)	328 (14.8%)
	C	174 (11%)	188 (11.9%)	228 (15%)	242 (15.9%)	-129 (-6.9%)	-28 (-1.5%)
	AVG	324 (8.8%)	137 (3.7%)	350 (9.6%)	163 (4.5%)	565 (16.5%)	793 (26.4%)
Jun	W	120 (2.4%)	219 (4.3%)	43 (0.8%)	142 (2.8%)	1522 (41.6%)	1070 (25.4%)
	AN	2421 (73.3%)	2977 (90.2%)	2337 (69%)	2893 (85.5%)	2615 (84.2%)	2349 (59.8%)
	BN	2826 (104.4%)	2749 (101.6%)	2781 (101.1%)	2704 (98.3%)	2379 (75.5%)	1904 (53.6%)
	D	459 (14.6%)	363 (11.6%)	241 (7.2%)	145 (4.3%)	161 (4.7%)	212 (6.5%)
	C	-49 (-1.8%)	-131 (-4.9%)	-55 (-2%)	-137 (-5.1%)	-166 (-5.9%)	-103 (-3.8%)
	AVG	968 (26.7%)	1035 (28.5%)	875 (23.5%)	942 (25.3%)	1282 (38.7%)	1040 (28.7%)
Jul	W	-1125 (-17.3%)	-98 (-1.5%)	-1383 (-20.5%)	-355 (-5.3%)	-2470 (-31.5%)	-2185 (-25.5%)
	AN	-1599 (-18.3%)	-1181 (-13.5%)	-1955 (-21.5%)	-1536 (-16.9%)	-2276 (-24.1%)	-1912 (-20.2%)
	BN	-2505 (-27.9%)	-2764 (-30.8%)	-2618 (-28.8%)	-2878 (-31.6%)	-2461 (-27.5%)	-2616 (-29.6%)
	D	-2297 (-27.7%)	-3874 (-46.7%)	-2269 (-27.5%)	-3846 (-46.5%)	-1983 (-24.8%)	-3678 (-45.4%)
	C	-3479 (-51.9%)	-3767 (-56.2%)	-2817 (-46.6%)	-3105 (-51.4%)	-2921 (-47.5%)	-2281 (-43.7%)
	AVG	-2032 (-26.5%)	-2078 (-27.1%)	-2082 (-27%)	-2127 (-27.5%)	-2399 (-29.8%)	-2561 (-31.4%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	780 (23.6%)	1276 (38.6%)	182 (4.7%)	678 (17.4%)	-1374 (-25.2%)	-1644 (-26.4%)
	AN	-406 (-6.7%)	-334 (-5.5%)	-747 (-11.7%)	-675 (-10.6%)	-1312 (-18.9%)	-1637 (-22.3%)
	BN	-1793 (-28.5%)	-2044 (-32.5%)	-1946 (-30.2%)	-2197 (-34.1%)	-1847 (-29.1%)	-2617 (-38.1%)
	D	-2772 (-39.4%)	-3177 (-45.2%)	-1841 (-30.2%)	-2246 (-36.8%)	-1368 (-24.3%)	-1131 (-22.7%)
	C	39 (1.5%)	-579 (-22.2%)	28 (1.1%)	-591 (-22.5%)	417 (18.6%)	-129 (-6%)
	AVG	-721 (-14.6%)	-776 (-15.7%)	-784 (-15.7%)	-839 (-16.8%)	-1182 (-21.9%)	-1475 (-26.2%)
Sep	W	-1017 (-44.6%)	-1108 (-48.6%)	-7195 (-85.1%)	-7286 (-86.1%)	-7137 (-85%)	-7155 (-85.9%)
	AN	-572 (-25.4%)	-351 (-15.6%)	-5341 (-76.1%)	-5119 (-72.9%)	-5492 (-76.6%)	-4997 (-72.4%)
	BN	-1113 (-45.1%)	-1011 (-41%)	-1357 (-50.1%)	-1255 (-46.3%)	-1808 (-57.2%)	-1613 (-52.6%)
	D	-698 (-29.5%)	-707 (-29.9%)	-331 (-16.6%)	-341 (-17.1%)	195 (13.2%)	606 (57.6%)
	C	294 (20.7%)	323 (22.8%)	186 (12.2%)	215 (14.1%)	264 (18.2%)	399 (29.7%)
	AVG	-706 (-32.1%)	-683 (-31%)	-3340 (-69.1%)	-3317 (-68.6%)	-3294 (-68.8%)	-3084 (-67%)
Oct	W	-303 (-8.8%)	-196 (-5.7%)	-50 (-1.6%)	56 (1.7%)	128 (4.2%)	209 (6.8%)
	AN	974 (40.8%)	917 (38.4%)	591 (21.3%)	533 (19.2%)	784 (30.4%)	562 (20.5%)
	BN	28 (0.9%)	-140 (-4.4%)	410 (14.6%)	242 (8.6%)	391 (13.9%)	181 (6.3%)
	D	270 (10.1%)	532 (19.8%)	292 (10.9%)	553 (20.7%)	172 (6.2%)	568 (21.4%)
	C	453 (18.3%)	1035 (41.9%)	657 (29%)	1239 (54.7%)	691 (30.9%)	1404 (66.8%)
	AVG	177 (6%)	316 (10.7%)	301 (10.7%)	440 (15.6%)	361 (13.1%)	509 (18.5%)
Nov	W	-433 (-13.1%)	-545 (-16.6%)	-132 (-4.4%)	-245 (-8.2%)	48 (1.7%)	277 (11.2%)
	AN	290 (15.9%)	91 (5%)	110 (5.5%)	-88 (-4.4%)	199 (10.4%)	-204 (-9.6%)
	BN	-339 (-16.1%)	-248 (-11.8%)	-280 (-13.7%)	-189 (-9.3%)	-188 (-9.6%)	-47 (-2.5%)
	D	-58 (-3.1%)	-48 (-2.6%)	68 (3.9%)	78 (4.5%)	72 (4.2%)	147 (8.8%)
	C	47 (2.5%)	162 (8.7%)	42 (2.2%)	156 (8.4%)	98 (5.5%)	140 (7.5%)
	AVG	-158 (-6.7%)	-189 (-8%)	-53 (-2.3%)	-83 (-3.7%)	43 (2%)	103 (5%)
Dec	W	534 (7.5%)	-1230 (-17.2%)	2278 (42.1%)	513 (9.5%)	2149 (38.8%)	1979 (50.1%)
	AN	431 (14.6%)	1492 (50.6%)	53 (1.6%)	1115 (33.5%)	38 (1.1%)	1099 (32.9%)
	BN	556 (25.6%)	573 (26.3%)	217 (8.6%)	233 (9.3%)	636 (30.3%)	646 (30.8%)
	D	501 (21.2%)	327 (13.8%)	522 (22.3%)	347 (14.8%)	663 (30.1%)	461 (20.7%)
	C	150 (5.8%)	280 (10.7%)	606 (28.2%)	736 (34.2%)	978 (54.9%)	1195 (70.5%)
	AVG	460 (11.6%)	39 (1%)	970 (28%)	550 (15.9%)	1084 (32.4%)	1175 (41.4%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

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Table C.5.3-152. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for Feather River at the Confluence with the Sacramento River Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	23,533	22,926	24,852	26,106	27,417	28,604
	AN	12,430	11,484	11,755	11,953	13,597	13,232
	BN	6,499	5,581	5,658	5,575	6,433	5,715
	D	4,621	4,292	4,390	4,412	4,835	5,143
	C	3,646	3,429	3,551	3,837	4,011	3,587
	AVG	11,938	11,346	12,049	12,509	13,429	13,636
Feb	W	27,039	26,129	29,508	31,065	30,944	32,896
	AN	14,818	12,840	14,119	14,599	17,311	16,932
	BN	9,153	8,053	8,081	7,892	9,009	9,278
	D	4,402	4,223	4,365	4,436	4,689	4,645
	C	3,237	3,118	3,086	3,096	3,109	3,452
	AVG	13,744	12,922	14,212	14,761	15,367	16,017
Mar	W	24,172	23,698	25,585	26,784	25,931	27,009
	AN	19,990	19,240	21,173	21,490	22,118	23,340
	BN	8,136	7,237	7,175	6,882	7,547	7,254
	D	5,073	4,794	4,626	4,940	5,599	5,336
	C	2,933	2,620	2,695	2,756	2,847	2,844
	AVG	13,521	13,001	13,846	14,300	14,393	14,806
Apr	W	15,897	15,955	16,056	15,852	16,188	15,845
	AN	9,832	9,848	9,733	9,585	9,734	9,924
	BN	5,401	5,328	5,232	5,189	5,644	6,147
	D	4,152	4,198	4,233	4,137	4,890	5,354
	C	3,298	3,280	3,195	3,185	3,650	3,692
	AVG	8,796	8,811	8,805	8,689	9,129	9,242
May	W	14,387	14,390	12,987	10,385	13,112	11,072
	AN	8,068	7,986	7,777	6,884	8,770	8,143
	BN	4,704	4,642	4,534	4,509	6,357	6,432
	D	3,652	3,642	3,660	3,767	4,100	4,094
	C	2,389	2,332	2,492	2,321	2,367	2,284
	AVG	7,697	7,665	7,198	6,237	7,773	7,034
Jun	W	10,222	10,273	7,790	7,199	9,308	8,247
	AN	6,391	6,454	5,485	5,598	8,032	7,792
	BN	4,495	4,524	4,346	4,342	6,711	6,243
	D	3,853	4,055	3,776	3,367	3,928	3,582
	C	2,782	2,778	2,678	2,522	2,496	2,316
	AVG	6,197	6,271	5,236	4,951	6,500	5,946
Jul	W	8,177	8,423	8,536	8,734	5,837	6,307
	AN	9,322	9,657	9,442	9,223	6,968	7,031
	BN	9,380	9,492	8,985	8,725	6,411	5,998
	D	8,290	8,241	7,690	7,674	5,607	3,932
	C	6,450	5,878	5,831	4,891	2,812	2,564
	AVG	8,322	8,374	8,164	8,009	5,607	5,291

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	4,923	5,478	6,656	7,222	4,827	5,092
	AN	7,080	7,395	7,790	8,089	6,201	6,149
	BN	7,236	7,365	7,098	7,570	5,022	4,700
	D	7,711	6,760	6,185	5,487	4,650	4,216
	C	2,841	2,849	2,408	2,340	2,799	2,130
	AVG	5,941	5,977	6,172	6,313	4,726	4,554
Sep	W	4,351	10,549	10,426	10,329	3,280	3,162
	AN	4,194	8,970	9,070	8,773	3,574	3,772
	BN	4,252	4,508	4,896	4,786	3,089	3,190
	D	4,179	3,831	3,281	2,848	3,352	3,344
	C	2,054	2,138	2,052	1,964	2,241	2,316
	AVG	3,937	6,581	6,490	6,289	3,154	3,172
Oct	W	4,176	3,919	3,741	3,746	3,896	3,987
	AN	2,630	2,999	2,839	2,988	3,643	3,557
	BN	3,754	3,362	3,394	3,437	3,803	3,625
	D	3,033	3,002	3,139	2,987	3,324	3,572
	C	2,938	2,727	2,701	2,566	3,388	3,977
	AVG	3,446	3,314	3,266	3,243	3,643	3,770
Nov	W	4,697	4,467	4,407	3,825	4,438	4,078
	AN	3,065	3,310	3,220	3,186	3,391	2,958
	BN	2,687	2,668	2,589	2,455	2,388	2,400
	D	2,342	2,253	2,284	2,125	2,342	2,268
	C	2,084	2,118	2,073	2,107	2,152	2,216
	AVG	3,216	3,161	3,115	2,873	3,140	2,958
Dec	W	12,409	10,699	11,909	10,246	14,063	12,227
	AN	5,193	5,602	6,005	6,000	6,048	7,105
	BN	3,079	3,441	3,342	3,249	3,987	3,899
	D	2,838	2,844	2,787	2,811	3,450	3,273
	C	2,975	2,540	2,152	2,054	3,135	3,256
	AVG	6,279	5,796	6,152	5,599	7,241	6,777

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Table C.5.3-153. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Feather River at the Confluence with the Sacramento River[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	3884 (16.5%)	5071 (21.6%)	4491 (19.6%)	5679 (24.8%)	2565 (10.3%)	2499 (9.6%)
	AN	1167 (9.4%)	803 (6.5%)	2112 (18.4%)	1748 (15.2%)	1842 (15.7%)	1279 (10.7%)
	BN	-66 (-1%)	-784 (-12.1%)	852 (15.3%)	134 (2.4%)	775 (13.7%)	140 (2.5%)
	D	213 (4.6%)	522 (11.3%)	543 (12.7%)	851 (19.8%)	444 (10.1%)	731 (16.6%)
	C	365 (10%)	-60 (-1.6%)	582 (17%)	158 (4.6%)	460 (12.9%)	-250 (-6.5%)
	AVG	1491 (12.5%)	1697 (14.2%)	2083 (18.4%)	2289 (20.2%)	1380 (11.5%)	1127 (9%)
Feb	W	3905 (14.4%)	5857 (21.7%)	4815 (18.4%)	6767 (25.9%)	1436 (4.9%)	1831 (5.9%)
	AN	2492 (16.8%)	2113 (14.3%)	4471 (34.8%)	4092 (31.9%)	3192 (22.6%)	2332 (16%)
	BN	-143 (-1.6%)	125 (1.4%)	956 (11.9%)	1225 (15.2%)	928 (11.5%)	1386 (17.6%)
	D	287 (6.5%)	243 (5.5%)	466 (11%)	422 (10%)	324 (7.4%)	209 (4.7%)
	C	-128 (-4%)	215 (6.6%)	-9 (-0.3%)	334 (10.7%)	23 (0.7%)	356 (11.5%)
	AVG	1623 (11.8%)	2273 (16.5%)	2445 (18.9%)	3095 (24%)	1155 (8.1%)	1256 (8.5%)
Mar	W	1760 (7.3%)	2838 (11.7%)	2234 (9.4%)	3312 (14%)	346 (1.4%)	226 (0.8%)
	AN	2128 (10.6%)	3350 (16.8%)	2878 (15%)	4100 (21.3%)	945 (4.5%)	1850 (8.6%)
	BN	-589 (-7.2%)	-882 (-10.8%)	310 (4.3%)	17 (0.2%)	372 (5.2%)	372 (5.4%)
	D	526 (10.4%)	264 (5.2%)	805 (16.8%)	542 (11.3%)	973 (21%)	397 (8%)
	C	-86 (-2.9%)	-89 (-3%)	226 (8.6%)	223 (8.5%)	151 (5.6%)	87 (3.2%)
	AVG	872 (6.4%)	1284 (9.5%)	1392 (10.7%)	1805 (13.9%)	547 (4%)	506 (3.5%)
Apr	W	291 (1.8%)	-52 (-0.3%)	233 (1.5%)	-110 (-0.7%)	132 (0.8%)	-7 (0%)
	AN	-98 (-1%)	92 (0.9%)	-114 (-1.2%)	76 (0.8%)	1 (0%)	339 (3.5%)
	BN	244 (4.5%)	747 (13.8%)	317 (5.9%)	820 (15.4%)	413 (7.9%)	959 (18.5%)
	D	739 (17.8%)	1203 (29%)	692 (16.5%)	1157 (27.6%)	657 (15.5%)	1218 (29.4%)
	C	352 (10.7%)	394 (11.9%)	370 (11.3%)	412 (12.6%)	455 (14.2%)	507 (15.9%)
	AVG	333 (3.8%)	446 (5.1%)	318 (3.6%)	430 (4.9%)	323 (3.7%)	553 (6.4%)
May	W	-1275 (-8.9%)	-3314 (-23%)	-1279 (-8.9%)	-3318 (-23.1%)	125 (1%)	687 (6.6%)
	AN	702 (8.7%)	75 (0.9%)	784 (9.8%)	156 (2%)	993 (12.8%)	1259 (18.3%)
	BN	1653 (35.1%)	1728 (36.7%)	1716 (37%)	1791 (38.6%)	1823 (40.2%)	1924 (42.7%)
	D	448 (12.3%)	442 (12.1%)	458 (12.6%)	452 (12.4%)	440 (12%)	327 (8.7%)
	C	-21 (-0.9%)	-104 (-4.4%)	36 (1.5%)	-47 (-2%)	-124 (-5%)	-36 (-1.6%)
	AVG	76 (1%)	-663 (-8.6%)	108 (1.4%)	-631 (-8.2%)	575 (8%)	797 (12.8%)
Jun	W	-914 (-8.9%)	-1975 (-19.3%)	-965 (-9.4%)	-2026 (-19.7%)	1517 (19.5%)	1048 (14.6%)
	AN	1640 (25.7%)	1401 (21.9%)	1577 (24.4%)	1338 (20.7%)	2546 (46.4%)	2195 (39.2%)
	BN	2216 (49.3%)	1748 (38.9%)	2187 (48.3%)	1719 (38%)	2365 (54.4%)	1901 (43.8%)
	D	75 (2%)	-271 (-7%)	-127 (-3.1%)	-473 (-11.7%)	152 (4%)	215 (6.4%)
	C	-286 (-10.3%)	-467 (-16.8%)	-282 (-10.2%)	-462 (-16.6%)	-182 (-6.8%)	-206 (-8.2%)
	AVG	303 (4.9%)	-250 (-4%)	229 (3.7%)	-325 (-5.2%)	1264 (24.1%)	995 (20.1%)
Jul	W	-2340 (-28.6%)	-1870 (-22.9%)	-2586 (-30.7%)	-2115 (-25.1%)	-2699 (-31.6%)	-2427 (-27.8%)
	AN	-2354 (-25.3%)	-2291 (-24.6%)	-2689 (-27.8%)	-2626 (-27.2%)	-2474 (-26.2%)	-2191 (-23.8%)
	BN	-2969 (-31.7%)	-3382 (-36.1%)	-3080 (-32.5%)	-3493 (-36.8%)	-2574 (-28.6%)	-2727 (-31.3%)
	D	-2682 (-32.4%)	-4357 (-52.6%)	-2634 (-32%)	-4309 (-52.3%)	-2083 (-27.1%)	-3742 (-48.8%)
	C	-3639 (-56.4%)	-3887 (-60.3%)	-3066 (-52.2%)	-3314 (-56.4%)	-3020 (-51.8%)	-2328 (-47.6%)
	AVG	-2715 (-32.6%)	-3031 (-36.4%)	-2766 (-33%)	-3082 (-36.8%)	-2557 (-31.3%)	-2718 (-33.9%)

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-96 (-2%)	169 (3.4%)	-651 (-11.9%)	-386 (-7%)	-1830 (-27.5%)	-2130 (-29.5%)
	AN	-879 (-12.4%)	-931 (-13.2%)	-1194 (-16.1%)	-1246 (-16.8%)	-1589 (-20.4%)	-1940 (-24%)
	BN	-2214 (-30.6%)	-2535 (-35%)	-2343 (-31.8%)	-2664 (-36.2%)	-2076 (-29.3%)	-2869 (-37.9%)
	D	-3061 (-39.7%)	-3496 (-45.3%)	-2110 (-31.2%)	-2544 (-37.6%)	-1535 (-24.8%)	-1272 (-23.2%)
	C	-41 (-1.4%)	-711 (-25%)	-50 (-1.8%)	-719 (-25.2%)	392 (16.3%)	-210 (-9%)
	AVG	-1215 (-20.5%)	-1387 (-23.3%)	-1252 (-20.9%)	-1423 (-23.8%)	-1447 (-23.4%)	-1759 (-27.9%)
Sep	W	-1071 (-24.6%)	-1190 (-27.3%)	-7269 (-68.9%)	-7387 (-70%)	-7146 (-68.5%)	-7168 (-69.4%)
	AN	-620 (-14.8%)	-423 (-10.1%)	-5396 (-60.2%)	-5199 (-58%)	-5496 (-60.6%)	-5002 (-57%)
	BN	-1162 (-27.3%)	-1062 (-25%)	-1419 (-31.5%)	-1318 (-29.2%)	-1807 (-36.9%)	-1596 (-33.3%)
	D	-827 (-19.8%)	-835 (-20%)	-479 (-12.5%)	-487 (-12.7%)	71 (2.2%)	496 (17.4%)
	C	187 (9.1%)	262 (12.7%)	104 (4.8%)	178 (8.3%)	189 (9.2%)	352 (17.9%)
	AVG	-783 (-19.9%)	-765 (-19.4%)	-3427 (-52.1%)	-3409 (-51.8%)	-3335 (-51.4%)	-3117 (-49.6%)
Oct	W	-280 (-6.7%)	-189 (-4.5%)	-24 (-0.6%)	68 (1.7%)	155 (4.1%)	241 (6.4%)
	AN	1012 (38.5%)	927 (35.2%)	644 (21.5%)	558 (18.6%)	803 (28.3%)	569 (19%)
	BN	50 (1.3%)	-129 (-3.4%)	442 (13.1%)	263 (7.8%)	409 (12%)	187 (5.4%)
	D	291 (9.6%)	540 (17.8%)	321 (10.7%)	570 (19%)	184 (5.9%)	585 (19.6%)
	C	450 (15.3%)	1039 (35.4%)	661 (24.2%)	1250 (45.8%)	687 (25.4%)	1412 (55%)
	AVG	197 (5.7%)	324 (9.4%)	329 (9.9%)	456 (13.8%)	378 (11.6%)	527 (16.2%)
Nov	W	-259 (-5.5%)	-618 (-13.2%)	-29 (-0.6%)	-388 (-8.7%)	31 (0.7%)	253 (6.6%)
	AN	326 (10.6%)	-107 (-3.5%)	80 (2.4%)	-353 (-10.7%)	170 (5.3%)	-229 (-7.2%)
	BN	-299 (-11.1%)	-287 (-10.7%)	-280 (-10.5%)	-268 (-10%)	-201 (-7.8%)	-55 (-2.2%)
	D	0 (0%)	-74 (-3.2%)	89 (4%)	15 (0.7%)	58 (2.5%)	144 (6.8%)
	C	68 (3.3%)	132 (6.3%)	35 (1.6%)	99 (4.7%)	79 (3.8%)	109 (5.2%)
	AVG	-76 (-2.4%)	-258 (-8%)	-21 (-0.7%)	-203 (-6.4%)	25 (0.8%)	85 (3%)
Dec	W	1654 (13.3%)	-182 (-1.5%)	3365 (31.4%)	1529 (14.3%)	2155 (18.1%)	1982 (19.3%)
	AN	855 (16.5%)	1912 (36.8%)	447 (8%)	1503 (26.8%)	43 (0.7%)	1105 (18.4%)
	BN	907 (29.5%)	819 (26.6%)	545 (15.8%)	457 (13.3%)	645 (19.3%)	650 (20%)
	D	612 (21.6%)	435 (15.3%)	606 (21.3%)	429 (15.1%)	662 (23.8%)	461 (16.4%)
	C	160 (5.4%)	281 (9.5%)	595 (23.4%)	717 (28.2%)	983 (45.7%)	1202 (58.5%)
	AVG	962 (15.3%)	499 (7.9%)	1445 (24.9%)	982 (16.9%)	1089 (17.7%)	1178 (21%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

Steelhead

Juvenile

Feather River flow at the confluence with the Sacramento River is used to represent flow conditions in the mainstem of this river. Differences in average Feather River flow between PP and EBC scenario flows during the juvenile steelhead migration period (October through May) were generally greater than 10%, with increases in flow under PP operations for all water-year types (Table C.5.3-152, Table C.5.3-153). Differences in the average flows within individual months ranged from 8% lower flow under PP_ELT compared to EBC2_ELT in November of below-normal years to 59% higher flow under PP_LLT compared to EBC2_LLT in December of critical years. Based on these

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results, it was concluded that flow conditions for migration of steelhead juveniles in the Feather River under PP operations would be better than those under EBC2 operations.

Adult

No specific criteria exist for assessing the potential effects of a change in olfactory cues that affect the attraction of migrating adult steelhead to the Feather River. In the absence of such criteria, it is assumed that the larger the increase in the flow of the Feather River at the Sacramento River confluence during the adult upstream migration period, the greater the attraction to the river. Average Feather River flows at the confluence with the Sacramento River during the December through March migration period are summarized in Table C.5.3-152 and Table C.5.3-153.

No specific criteria exist for assessing the potential effects of a change in attraction flows of olfactory cues that affect the attraction of adult steelhead to migrate upstream into the Feather River. In the absence of specific criteria, it has been assumed in this effects analysis that the larger the reduction in the flow of the Feather River at the Sacramento River confluence during the adult upstream migration period, the greater the potential effect. Average September through March differences in Feather River flows were below 5% for wet, above-normal, and below-normal water-year types. The differences were 10% or greater for dry and critical years, ranging from an increase of 10% from EBC2_ELT to PP_ELT for dry years to an increase of 21% from EBC2_LLT to PP_LLT for critical years. Differences in average flows within individual months ranged from 69% lower flow under both PP_ELT compared to EBC2_ELT and PP_LLT compared to EBC2_LLT in September of wet years to 59% higher flow under PP_LLT compared to EBC2_LLT in December of critical years. Based on these results, it was concluded that attraction flow conditions for upstream migration of steelhead adults in the Feather River under PP operations generally would be better than those under EBC2 operations.

Differences in the percentage of attraction flows that are less than 5% between PP and EBC2 are assumed to be within the range of error of the simulation models and below the ability to detect actual differences that would be biologically significant. The results of the attraction flow analysis showed that attraction flows in the Feather River at the confluence with the Sacramento River were greater for PP_ELT and PP_LLT relative to EBC2_ELT and EBC2_LLT, respectively. The attraction flows in wet years were approximately 7% greater for PP conditions, 11% to 12% greater for above-normal water years, 11% greater for below-normal water years, 11% to 15% greater for dry water year conditions, and 12% to 14% greater in critically dry water years when compared to EBC2_ELT and EBC2_LLT conditions. No information is available, however, to quantify the relationship between Feather River flow and attraction and upstream migration by adult steelhead. Although there is no quantitative information available on the behavioral response of adult steelhead to attraction flows in the lower Feather River, it was concluded based on best professional judgment that the increase in flows would contribute to an incremental increase in attraction, but there is a high degree of uncertainty regarding the magnitude of potential benefit to adult steelhead or the effects of increased attraction cues on subsequent reproductive success and abundance of steelhead produced in the Feather River.

Kelt

Migration habitat for downstream passage by steelhead kelts on the Feather River is expected to be within a range that would be suitable for kelt migration. Flows in the Feather River at the confluence with the Sacramento River were compared for the period from January through April to represent

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the period of kelt migration. Results of the comparison of CALSIM simulation model results for model scenarios, by month and water-year type, are shown in Table C.5.3-152 and Table C.5.3-153.

Average January through April differences in Feather River flow were 10% or more except for wet and critical year types, ranging from increases of 10% from both EBC2_LLT to PP_LLT for above-normal years and EBC2_ELT to PP_ELT for below-normal years to an increase of 15% from EBC2_LLT to PP_LLT for dry years. Differences within individual months ranged from 7% lower flow under PP_LLT compared to EBC2_LLT in January of critical years to 29% higher flow under PP_LLT compared to EBC2_LLT in April of dry years. Based on these results it was concluded that instream habitat conditions for upstream migration of steelhead kelts in the Feather River under PP operations would be better than those under EBC2 operations.

Although there is seasonal variation in the water temperatures and instream flows during the period of kelt migration under PP and EBC2, habitat conditions for EBC2 and PP conditions in the Feather River are considered to be suitable for kelt migration. Comparison of instream flows showed that habitat (e.g., water depth, velocity) would be similar or greater for kelt migration in response to the generally greater instream flows for PP relative to EBC2. In wet years the instream flows would be approximately 1% to 4% greater for PP, 3% to 7% greater in above-normal water years, 6% to 11% greater in below-normal years, 18% greater in dry years, and 10% greater in critically dry water years relative to EBC2_ELT and EBC2_LLT. Based on these results, it was concluded that instream habitat conditions for downstream migration of adult steelhead kelts in the Feather River would be better under PP conditions than those estimated for EBC2. The increase in instream flows for PP conditions would be expected to contribute to an incremental improvement in habitat for adult steelhead kelts. No information is available, however, to quantify the potential benefits of increased instream flows on kelt migration or survival. Because instream flows are substantial for PP and EBC2, the incremental increase in flows is not likely to have substantive benefits to the adult steelhead population. Therefore, PP_ELT and PP_LLT conditions are expected to provide a small incremental benefit of improved habitat conditions for kelt migration relative to EBC2_ELT and EBC2_LLT.

Spring-Run Chinook Salmon

Juvenile

In all water years, average flows under PP conditions were moderately greater (generally up to 20%) than under EBC scenarios in the Feather River at the confluence with the Sacramento River (Table C.5.3-152, Table C.5.3-153). In some cases there were major flow differences between PP and EBC scenarios for certain comparisons but only in one or two months, e.g., in critical years December flows were considerably higher (around 50%) under PP_ELT/PP_LLT compared with EBC2_ELT/EBC_LLT, whereas there was little difference when comparing PP_ELT/PP_LLT with EBC1 and EBC2.

Adult

Average flows in the Feather River at the confluence with the Sacramento River during the adult spring-run Chinook salmon migration period (April through May) generally were similar between PP and EBC scenarios in wet years (Table C.5.3-152, Table C.5.3-153). In other water-year types, average flows under PP scenarios were greater, ranging from 5–7% greater in critical years to up to 30% greater in below-normal years.

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Fall-Run Chinook Salmon

Juvenile

Flows in the Feather River at the confluence with the Sacramento River during the fall-run juvenile migration period (February through May) are presented in Table C.5.3-152. On average, there was little difference in flow between PP and EBC scenarios in wet years (Table C.5.3-153). Flows under PP scenarios were generally greater under PP scenarios in other water-year types.

Adult

The analysis of Feather River flows at the confluence with the Sacramento River during the September through October fall-run Chinook salmon adult migration period (Table C.5.3-152, Table C.5.3-153) shows substantial reductions in flows (37–69%) in September of wet, above-normal, and below-normal years under EBC2 conditions compared to preliminary proposal conditions. Flows also were greatly reduced under EBC1 conditions compared to EBC2 conditions during wet and above-normal water years during September. Flows were greater (2–9%) in September under EBC2_ELT in dry and critically dry years. Flows under PP_ELT vs. EBC2_ELT were comparable or higher (6–25%) during October in all water years. Flows in September under early long-term preliminary proposal operations compared to EBC2_ELT were reduced 69% in wet years, 61% in above-normal years, and 37% in below-normal years, and were increased 2% in dry years and 9% in critically dry years. Flows in September under late long-term preliminary proposal operations followed a similar pattern with reductions of 69% in wet years, 57% in above-normal years, and 33% in below-normal years with increased flows in dry (17%) and critically dry (18%) years. Flows also were increased substantially in October in dry (20%) and critically dry (55%) years. No relationships have been developed that quantify the attraction of adult fall-run Chinook salmon and flows in the lower Feather River. The substantial reduction in flow in September has the potential to result in delayed upstream migration and increased risk of straying. The increase in flow in dry and critical water years has the potential to increase adult attraction and upstream migration.

Green Sturgeon

Larva

The relative differences in average flows between PP and EBC scenarios during the larval transport flow period (August through October) were quite similar for the two analyzed sites on the Feather River (Feather River at the confluence with the Sacramento River and Feather River at Thermalito) (Table C.5.3-150, Table C.5.3-151; Table C.5.3-152, Table C.5.3-153), as would be expected given the sites' relative proximity to each other. Average flows under the PP scenarios were substantially lower than under EBC scenarios in wet, above-normal, and dry years; accounting for climate change (by considering only ELT and LLT comparisons), the average difference was around 20–35%, with some variability in the comparisons for individual months. In contrast, in dry and critical years average flows were similar or appreciably increased under PP scenarios relative to EBC scenarios (Table C.5.3-150, Table C.5.3-151; Table C.5.3-152, Table C.5.3-153).

Adult

Green sturgeon adult attraction flows in November through July at the confluence of the Feather River with the Sacramento River were on average slightly greater (5–13%) under PP scenarios than EBC scenarios for dry, below-normal, and above-normal years (Table C.5.3-152, Table C.5.3-153);

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the average differences between PP and EBC scenarios in wet and critical years were less than 5%. There was more variability evident when differences between individual months were compared, e.g., average flows in July were often appreciably lower under PP scenarios compared with EBC scenarios, whereas average PP flows in December and January were noticeably greater.

Pacific Lamprey

Macropthalmia

Average monthly flow rates in the Feather River at the confluence with the Sacramento River between December and May are presented in Table C.5.3-152, and differences between model scenarios are presented in Table C.5.3-153. Exceedance plots by scenario are presented in Figure C.5.3-91 through Figure C.5.3-96.

Predicted monthly average flows are greater for PP_ELT relative to EBC1 and EBC2 in all months. Predicted monthly average flows in the PP_ELT are 76 to 1,623 cfs (1% to 12%) greater than flows in the EBC1. Monthly average predicted flows in the PP_ELT are 108 to 2,445 cfs (1% to 19%) greater than flows in the EBC2. Monthly average predicted flows are greater for PP_LLT relative to EBC1 in December through April, with monthly average predicted flows in the PP_LLT of 446 to 2,273 cfs (5% to 17%) greater than flows in the EBC. Monthly average predicted flows in the PP_LLT during May are 663 cfs (9%) lower under PP_LLT compared to EBC1. Monthly average predicted flows are greater for PP_LLT relative to EBC in December through April, with monthly average predicted flows in the PP_LLT of 431 to 3,095 cfs (5% to 24%) greater than flows in the EBC2. Monthly average predicted flows in the PP_LLT during May are 631 cfs (8%) lower under PP_LLT compared to EBC2.

Isolating the effect of the preliminary proposal from the effects of climate change provided generally similar results (Table C.5.3-153). Early long-term monthly average predicted flows in the PP_ELT are 324 to 1,380 cfs (4% to 18%) greater than flows in the EBC2_ELT. With the exception of May, late long-term monthly average predicted flows in the PP_LLT range from 1,203 cfs (15%) lower to 1,178 cfs (21%) greater than flows in the EBC2_LLT.

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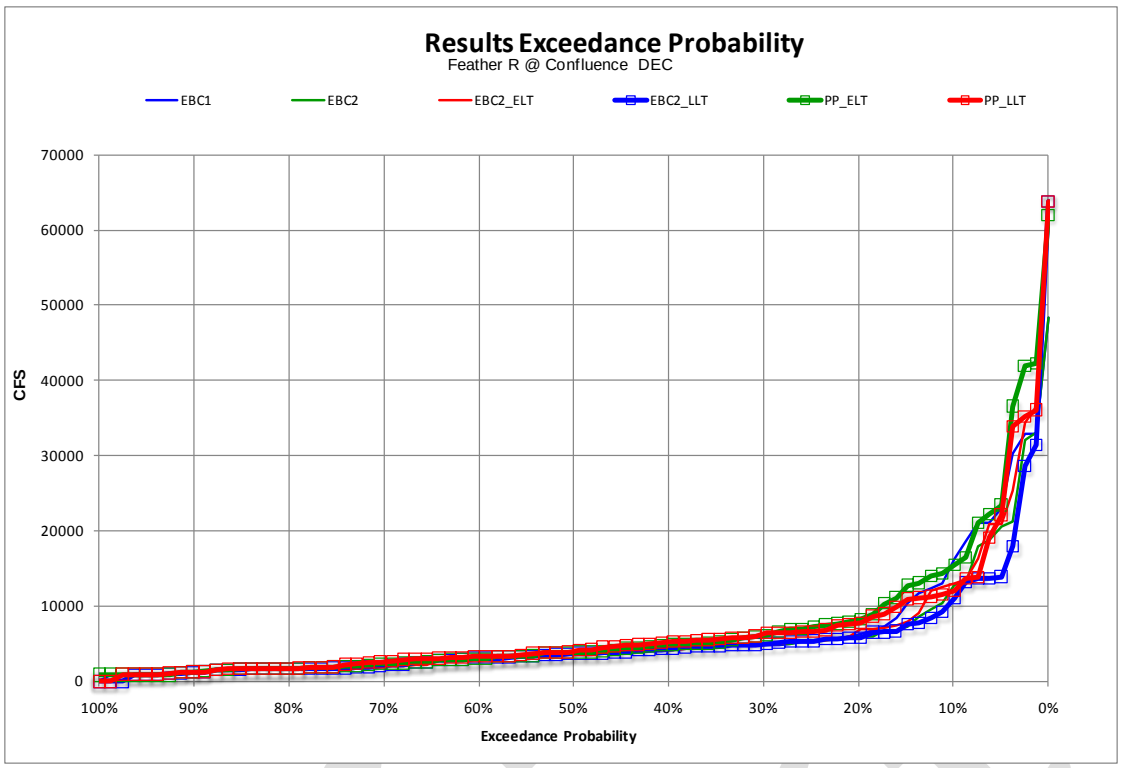

Figure C.5.3-91. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, December

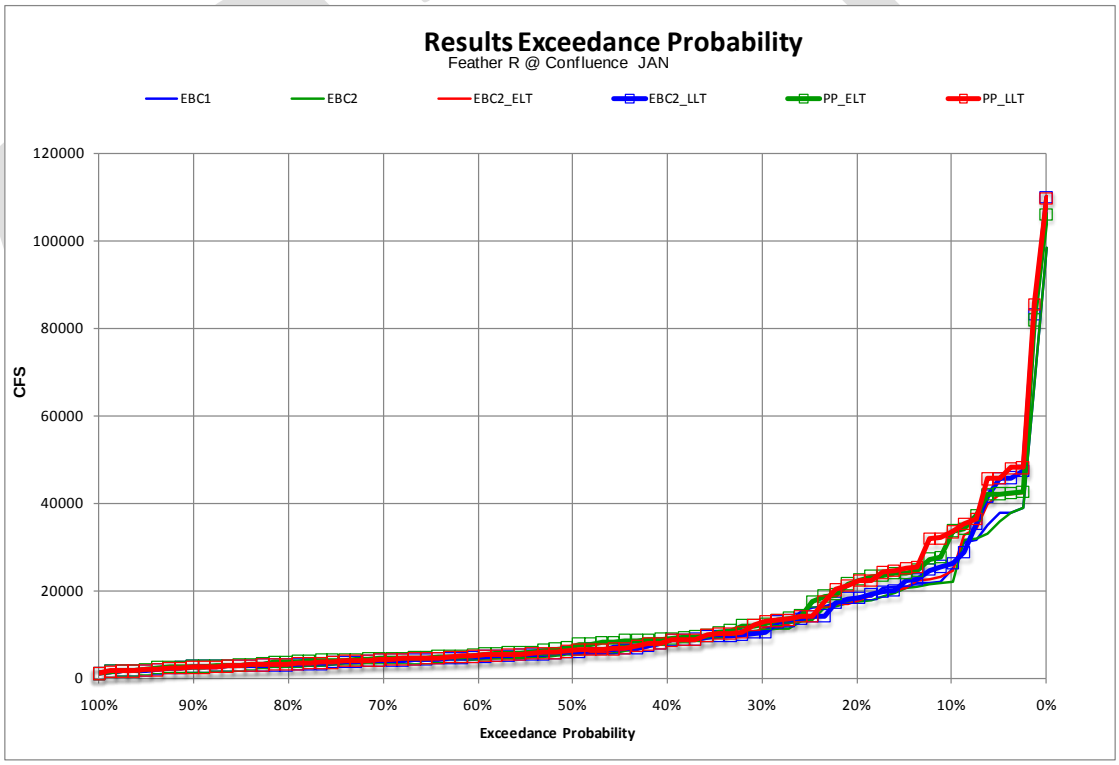

Figure C.5.3-92. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, January

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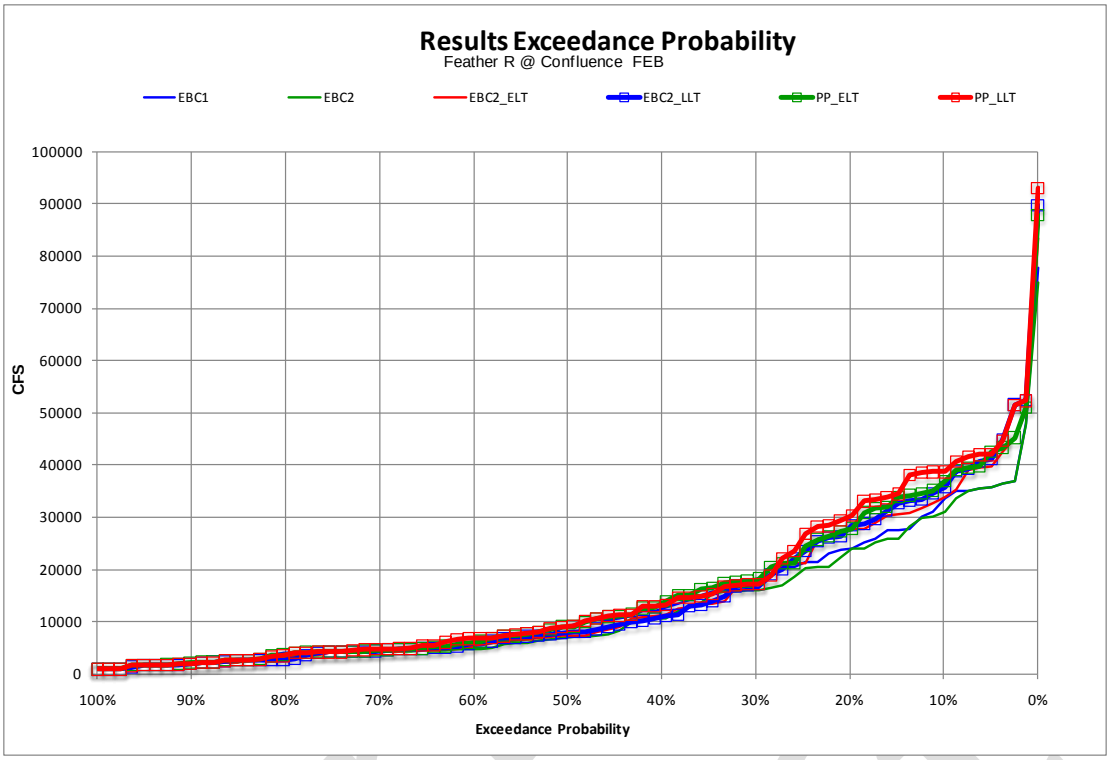

Figure C.5.3-93. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, February

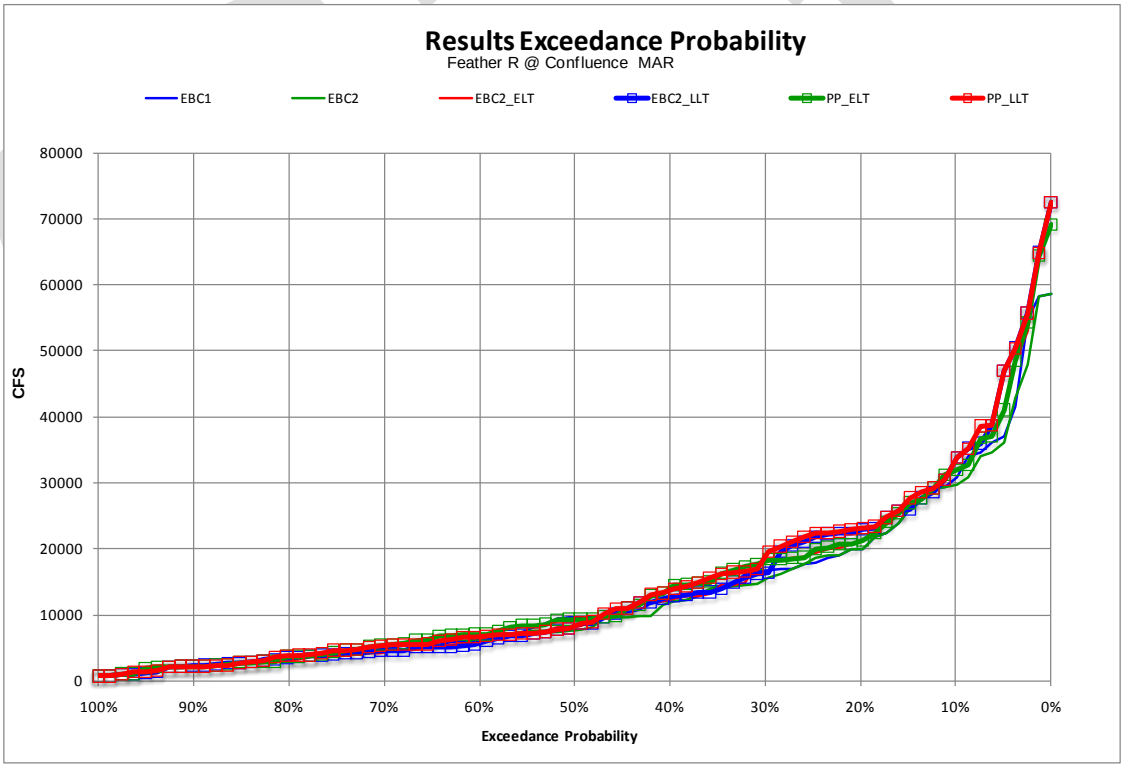

Figure C.5.3-94. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, March

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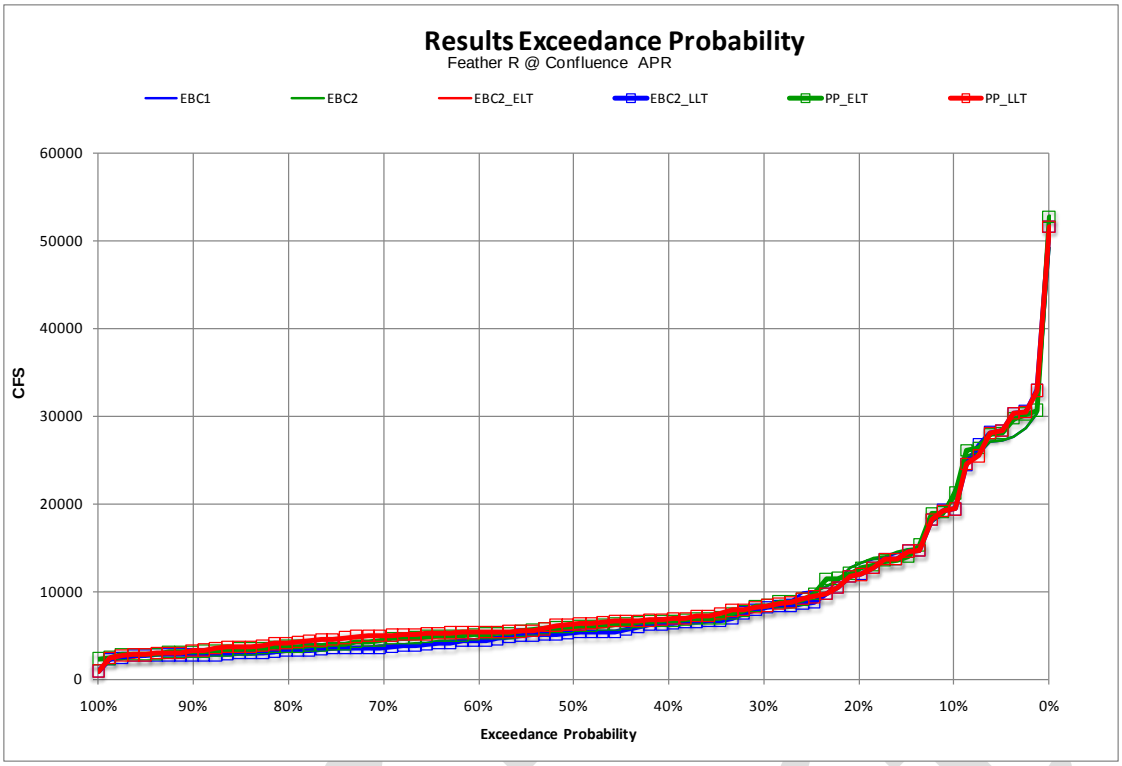

Figure C.5.3-95. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, April

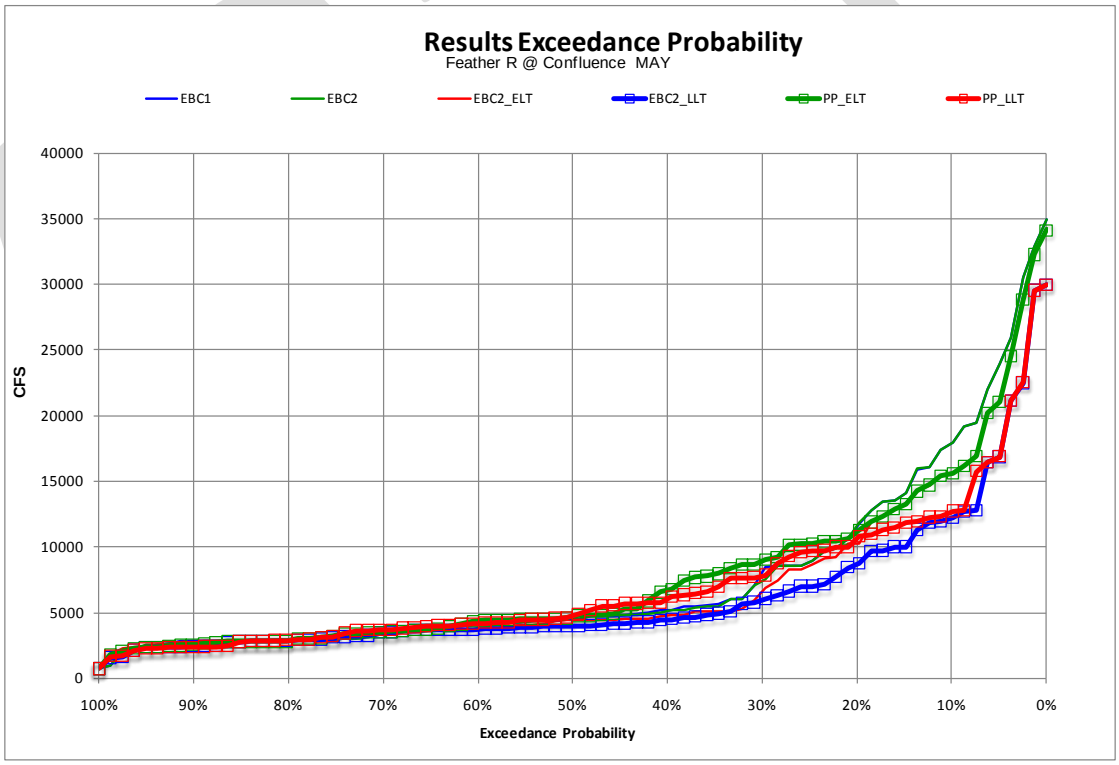

Figure C.5.3-96. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, May

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Adult

Average flows in the Feather River at the confluence with the Sacramento River for each model scenario for the Pacific lamprey upstream migration period between January and June are presented in Table C.5.3-152, and differences between model scenarios in mean flows are presented in Table C.5.3-153.

Mean monthly flows under PP_ELT are predicted to be 76 to 1,623 cfs (1% to 12%) greater than under EBC1 in the Feather River at the confluence with the Sacramento River between January and June. Mean monthly flows under PP_LLT are predicted to be 663 cfs (9%) lower to 2,273 cfs (17%) greater than under EBC1. Mean monthly flows under PP_ELT are predicted to be 1,320 cfs (21%) lower to 2,445 cfs (19%) greater than under EBC2. Mean monthly flows under PP_LLT are predicted to be 631 cfs (8%) lower to 3,095 cfs (24%) greater than under EBC2.

Isolating the effect of the preliminary proposal from the effects of climate change, mean monthly flows under PP_ELT are predicted to be 324 to 1,264 cfs (4% to 24%) greater than under EBC2_ELT. Mean monthly flows under PP_LLT are predicted to be 1,203 cfs (15%) lower to 1,256 cfs (9%) greater than under EBC2_LLT.

These results suggest that, other than in May in the late long-term, there are small benefits of the preliminary proposal on Pacific lamprey attraction in the Feather River if lamprey are attracted to upstream olfactory cues. In May, there is a small adverse effect on Pacific lamprey attraction in the Feather River if lamprey are attracted to upstream olfactory cues.

River Lamprey

Macropthalmia

See results for Pacific lamprey macropthalmia.

Adult

Average flows during the September through November river lamprey adult migration period in the Feather River at the confluence with the Sacramento River are presented in Table C.5.3-152, and differences between scenarios are presented in Table C.5.3-153; exceedance plots are presented in Figure C.5.3-97 through Figure C.5.3-99.

Mean flows under the PP_ELT are predicted to be 783 cfs (20%) lower to 197 cfs (6%) higher than flows under the EBC1. Mean flows under the PP_LLT are predicted to be 765 cfs (19%) lower to 324 cfs (9%) higher than flows under the EBC1. Mean flows under the PP_ELT are predicted to be 3,427 cfs (52%) lower to 329 cfs (10%) higher than flows under the EBC2. Mean flows under the PP_LLT are predicted to be 3,409 cfs (52%) lower to 456 cfs (14%) higher than flows under the EBC2.

Isolating the effect of the preliminary proposal from the effect of climate change, mean flows under the PP_ELT are predicted to be 3,335 cfs (51%) lower to 378 cfs (12%) lower than flows under the EBC2_ELT. Mean flows under the PP_LLT are predicted to be 3,117 cfs (50%) lower to 527 cfs (16%) higher than flows under the EBC2_LLT.

These results suggest that effects of the preliminary proposal on river lamprey upstream attraction flows are highly variable among months, ranging from moderate adverse effects in September to small benefits in October.

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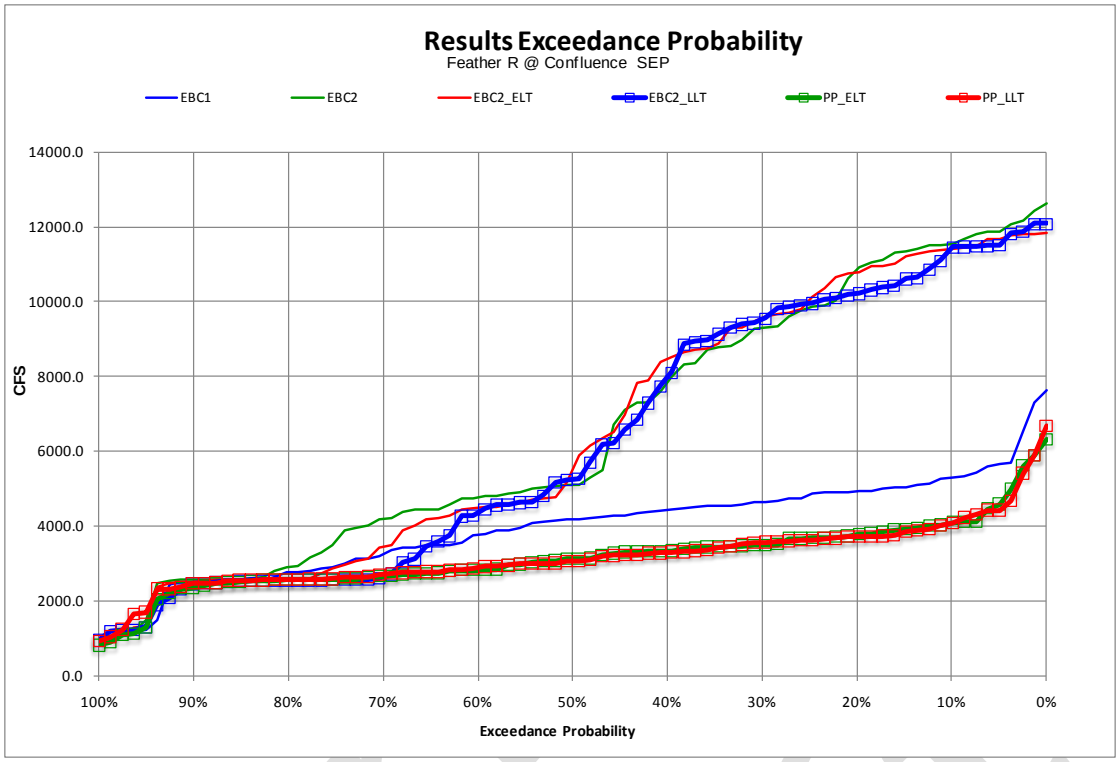

Figure C.5.3-97. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, September

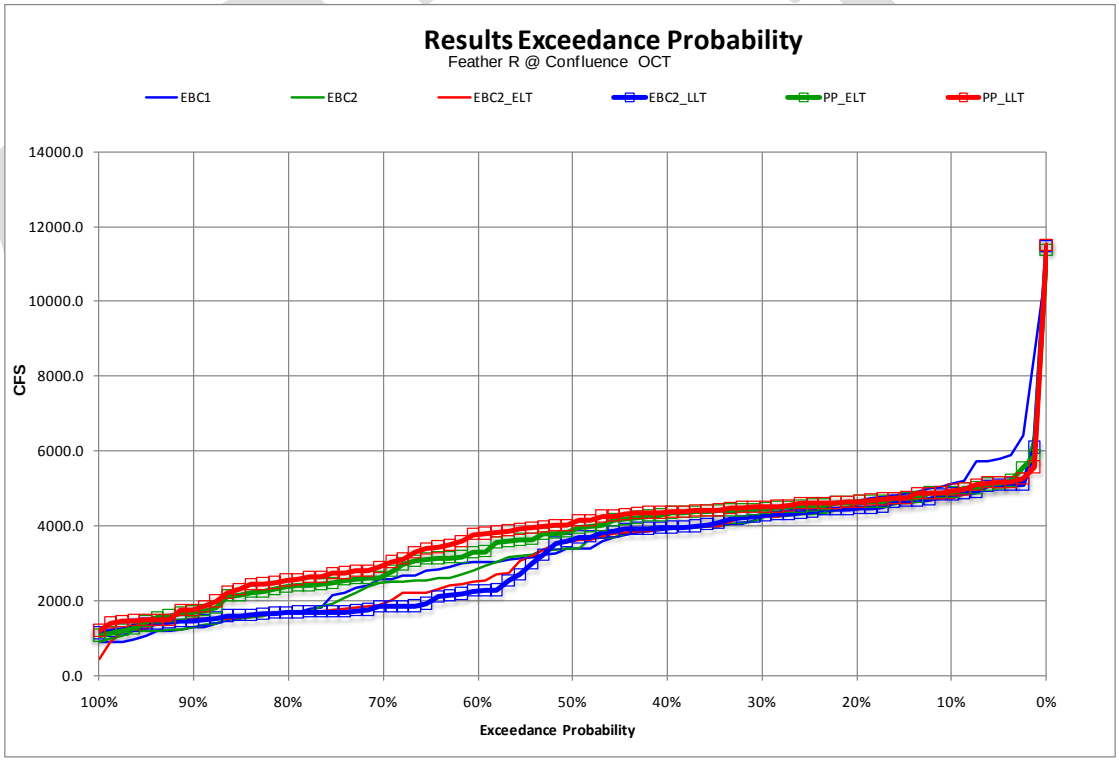

Figure C.5.3-98. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, October

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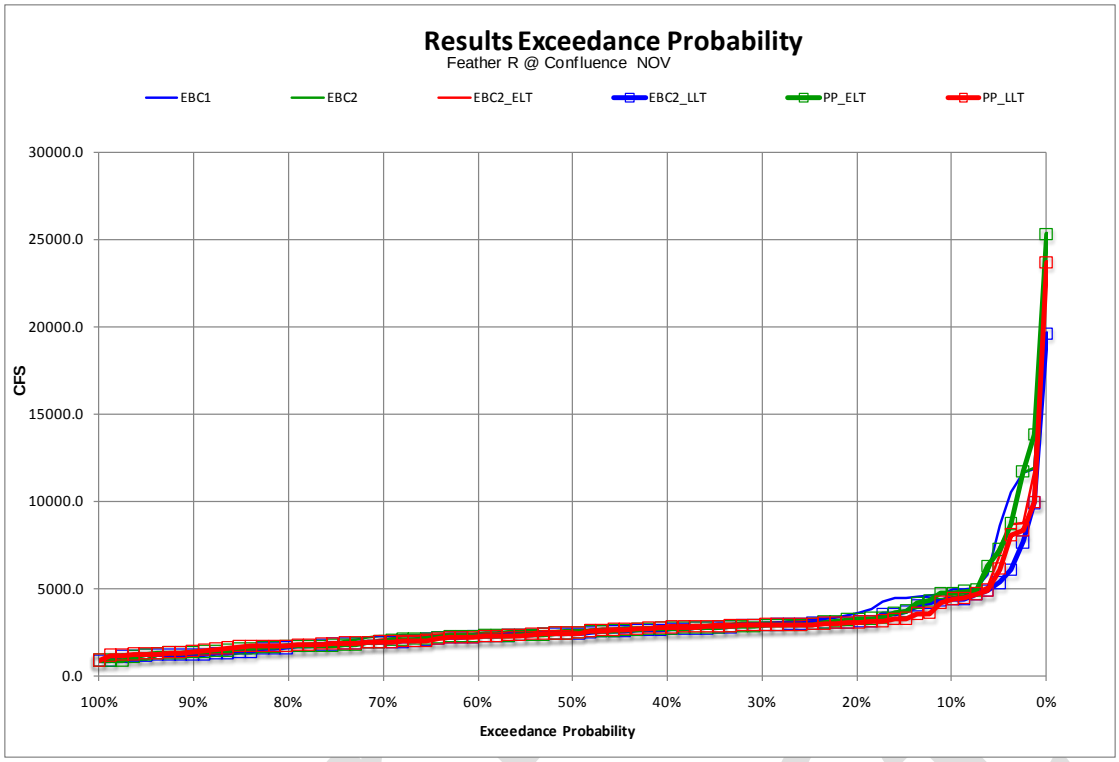

Figure C.5.3-99. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the Feather River at the Confluence with the Sacramento River, November

American River Subregion

CALSIM flow data for the American River subregion averaged by water-year type, month, and scenario, together with average monthly differences between scenarios, are provided in Table C.5.3-154, Table C.5.3-155, Table C.5.3-156, and Table C.5.3-157. These data form the basis for the summary of changes in attraction and migration flows.

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Table C.5.3-154. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for American River below Nimbus Estimated from CALSIM II]

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	8,806	8,633	10,113	11,036	10,106	11,011
	AN	4,833	4,527	4,941	5,805	5,013	5,803
	BN	2,392	2,264	2,334	2,073	2,140	2,149
	D	1,723	1,650	1,620	1,506	1,635	1,535
	C	1,474	1,468	1,241	1,095	1,305	1,109
	AVG	4,502	4,363	4,865	5,194	4,853	5,207
Feb	W	9,294	9,117	10,422	11,102	10,483	11,122
	AN	6,469	6,207	7,220	8,153	7,662	8,361
	BN	4,360	4,133	4,706	4,961	4,880	5,174
	D	1,852	1,776	1,769	1,844	1,772	1,923
	C	1,185	1,165	1,073	1,007	1,146	1,055
	AVG	5,218	5,065	5,710	6,112	5,835	6,210
Mar	W	6,089	6,054	6,454	6,992	6,452	6,987
	AN	5,454	5,336	5,762	5,790	5,812	5,870
	BN	2,429	2,386	2,622	2,794	2,679	2,688
	D	2,191	2,058	2,184	2,314	2,253	2,113
	C	939	948	888	938	851	862
	AVG	3,762	3,698	3,947	4,187	3,973	4,123
Apr	W	5,300	5,197	5,368	5,508	5,365	5,519
	AN	3,546	3,454	3,356	3,298	3,351	3,337
	BN	3,126	2,977	3,117	2,970	3,104	3,156
	D	1,837	1,883	1,761	1,888	1,929	2,012
	C	1,156	1,188	1,091	1,255	1,246	1,289
	AVG	3,305	3,249	3,271	3,334	3,327	3,407
May	W	6,157	5,968	5,673	4,592	5,692	4,718
	AN	3,885	3,649	3,148	2,521	3,362	2,944
	BN	2,930	2,798	2,466	1,969	2,715	2,517
	D	1,790	1,717	1,629	1,686	1,790	2,134
	C	1,182	1,196	1,319	992	1,120	1,009
	AVG	3,587	3,456	3,231	2,676	3,317	2,973
Jun	W	6,003	5,774	4,521	3,694	5,059	4,568
	AN	3,346	3,270	2,855	3,022	3,758	3,857
	BN	2,863	2,646	2,558	2,883	3,568	3,768
	D	2,506	2,417	2,564	2,596	2,909	2,552
	C	1,824	1,656	1,297	1,025	1,625	1,258
	AVG	3,699	3,534	3,041	2,825	3,639	3,400
Jul	W	4,108	3,896	3,571	3,860	3,758	3,530
	AN	4,638	4,425	4,634	4,927	4,476	4,253
	BN	4,744	4,835	4,544	4,328	3,954	3,660
	D	3,577	3,270	3,091	3,143	2,884	2,494
	C	1,784	1,476	1,670	2,022	1,398	1,895
	AVG	3,838	3,642	3,509	3,670	3,359	3,191

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	3,520	3,265	2,576	2,132	2,351	2,159
	AN	2,542	2,604	2,200	1,944	1,962	1,810
	BN	2,495	2,445	2,313	2,324	2,107	1,633
	D	2,613	2,313	1,779	1,620	1,530	1,328
	C	1,500	1,326	1,308	1,100	811	940
	AVG	2,707	2,535	2,115	1,874	1,847	1,657
Sep	W	4,025	4,307	3,982	3,622	2,538	1,906
	AN	2,764	3,106	2,645	2,044	1,623	1,500
	BN	2,370	2,106	1,915	1,605	1,506	1,363
	D	1,856	1,574	1,373	1,182	1,330	1,141
	C	1,164	1,055	761	594	1,147	588
	AVG	2,663	2,680	2,389	2,068	1,759	1,393
Oct	W	1,723	1,620	1,700	1,634	1,547	1,823
	AN	1,706	1,422	1,609	1,732	1,456	1,976
	BN	1,602	1,530	1,517	1,767	1,645	2,177
	D	1,468	1,341	1,479	1,258	1,299	1,717
	C	1,461	1,405	1,375	1,655	1,522	2,080
	AVG	1,605	1,483	1,559	1,592	1,492	1,920
Nov	W	3,527	3,475	3,436	2,612	3,280	2,578
	AN	3,181	3,486	3,187	2,554	2,793	2,120
	BN	2,067	2,233	1,985	1,716	2,168	1,647
	D	2,176	2,063	1,725	1,424	1,754	1,394
	C	1994	1,966	1,707	1,608	1,941	1,655
	AVG	2706	2,734	2,523	2,043	2,488	1,957
Dec	W	6302	5,691	6,671	6,171	7,097	6,435
	AN	3137	2,995	3,089	2,933	3,029	2,966
	BN	2676	2,519	2,857	2,527	3,135	2,704
	D	1741	1,696	1,643	1,351	1,583	1,349
	C	1524	1,463	1,374	1,251	1,484	1,239
	AVG	3519	3,259	3,617	3,297	3,794	3,413

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Table C.5.3-155. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for American River below Nimbus[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	1300 (14.8%)	2205 (25%)	1474 (17.1%)	2378 (27.5%)	-6 (-0.1%)	-25 (-0.2%)
	AN	180 (3.7%)	970 (20.1%)	486 (10.7%)	1276 (28.2%)	72 (1.5%)	-2 (0%)
	BN	-253 (-10.6%)	-243 (-10.2%)	-124 (-5.5%)	-115 (-5.1%)	-194 (-8.3%)	76 (3.7%)
	D	-88 (-5.1%)	-188 (-10.9%)	-15 (-0.9%)	-115 (-7%)	15 (0.9%)	29 (1.9%)
	C	-169 (-11.5%)	-365 (-24.8%)	-163 (-11.1%)	-360 (-24.5%)	64 (5.2%)	14 (1.3%)
	AVG	351 (7.8%)	705 (15.7%)	490 (11.2%)	843 (19.3%)	-12 (-0.2%)	13 (0.3%)
Feb	W	1189 (12.8%)	1828 (19.7%)	1366 (15%)	2005 (22%)	60 (0.6%)	20 (0.2%)
	AN	1193 (18.4%)	1892 (29.2%)	1455 (23.4%)	2154 (34.7%)	442 (6.1%)	208 (2.5%)
	BN	520 (11.9%)	814 (18.7%)	746 (18%)	1041 (25.2%)	174 (3.7%)	213 (4.3%)
	D	-80 (-4.3%)	70 (3.8%)	-4 (-0.2%)	147 (8.3%)	3 (0.2%)	79 (4.3%)
	C	-39 (-3.3%)	-130 (-11%)	-19 (-1.6%)	-110 (-9.4%)	72 (6.7%)	48 (4.8%)
	AVG	617 (11.8%)	992 (19%)	770 (15.2%)	1145 (22.6%)	125 (2.2%)	97 (1.6%)
Mar	W	363 (6%)	899 (14.8%)	398 (6.6%)	933 (15.4%)	-2 (0%)	-5 (-0.1%)
	AN	358 (6.6%)	416 (7.6%)	476 (8.9%)	534 (10%)	50 (0.9%)	79 (1.4%)
	BN	250 (10.3%)	259 (10.7%)	293 (12.3%)	303 (12.7%)	57 (2.2%)	-106 (-3.8%)
	D	62 (2.8%)	-79 (-3.6%)	195 (9.5%)	55 (2.7%)	69 (3.1%)	-202 (-8.7%)
	C	-88 (-9.3%)	-77 (-8.2%)	-96 (-10.2%)	-86 (-9.1%)	-37 (-4.1%)	-76 (-8.1%)
	AVG	211 (5.6%)	361 (9.6%)	275 (7.4%)	425 (11.5%)	26 (0.7%)	-63 (-1.5%)
Apr	W	65 (1.2%)	219 (4.1%)	168 (3.2%)	322 (6.2%)	-2 (0%)	11 (0.2%)
	AN	-194 (-5.5%)	-209 (-5.9%)	-103 (-3%)	-118 (-3.4%)	-4 (-0.1%)	38 (1.2%)
	BN	-22 (-0.7%)	31 (1%)	127 (4.3%)	180 (6%)	-13 (-0.4%)	187 (6.3%)
	D	91 (5%)	175 (9.5%)	45 (2.4%)	129 (6.8%)	168 (9.5%)	124 (6.6%)
	C	91 (7.9%)	133 (11.5%)	58 (4.9%)	101 (8.5%)	155 (14.2%)	34 (2.7%)
	AVG	22 (0.7%)	102 (3.1%)	78 (2.4%)	159 (4.9%)	56 (1.7%)	73 (2.2%)
May	W	-465 (-7.6%)	-1438 (-23.4%)	-276 (-4.6%)	-1249 (-20.9%)	18 (0.3%)	127 (2.8%)
	AN	-523 (-13.5%)	-941 (-24.2%)	-288 (-7.9%)	-705 (-19.3%)	214 (6.8%)	423 (16.8%)
	BN	-215 (-7.3%)	-413 (-14.1%)	-82 (-2.9%)	-281 (-10%)	250 (10.1%)	548 (27.8%)
	D	0 (0%)	344 (19.2%)	73 (4.3%)	417 (24.3%)	161 (9.9%)	448 (26.6%)
	C	-62 (-5.2%)	-173 (-14.6%)	-76 (-6.3%)	-187 (-15.6%)	-200 (-15.1%)	17 (1.7%)
	AVG	-270 (-7.5%)	-614 (-17.1%)	-139 (-4%)	-483 (-14%)	86 (2.7%)	296 (11.1%)
Jun	W	-945 (-15.7%)	-1435 (-23.9%)	-715 (-12.4%)	-1206 (-20.9%)	538 (11.9%)	874 (23.7%)
	AN	412 (12.3%)	511 (15.3%)	487 (14.9%)	586 (17.9%)	903 (31.6%)	834 (27.6%)
	BN	704 (24.6%)	904 (31.6%)	922 (34.9%)	1122 (42.4%)	1010 (39.5%)	885 (30.7%)
	D	403 (16.1%)	47 (1.9%)	492 (20.3%)	135 (5.6%)	344 (13.4%)	-44 (-1.7%)
	C	-199 (-10.9%)	-566 (-31%)	-31 (-1.9%)	-398 (-24%)	329 (25.3%)	234 (22.8%)
	AVG	-60 (-1.6%)	-299 (-8.1%)	105 (3%)	-134 (-3.8%)	599 (19.7%)	575 (20.3%)
Jul	W	-350 (-8.5%)	-578 (-14.1%)	-138 (-3.5%)	-365 (-9.4%)	187 (5.2%)	-330 (-8.5%)
	AN	-162 (-3.5%)	-385 (-8.3%)	52 (1.2%)	-172 (-3.9%)	-158 (-3.4%)	-674 (-13.7%)
	BN	-790 (-16.7%)	-1084 (-22.8%)	-881 (-18.2%)	-1175 (-24.3%)	-590 (-13%)	-668 (-15.4%)
	D	-693 (-19.4%)	-1084 (-30.3%)	-386 (-11.8%)	-777 (-23.7%)	-207 (-6.7%)	-650 (-20.7%)
	C	-386 (-21.7%)	111 (6.2%)	-78 (-5.3%)	419 (28.4%)	-273 (-16.3%)	-127 (-6.3%)
	AVG	-478 (-12.5%)	-646 (-16.8%)	-283 (-7.8%)	-451 (-12.4%)	-150 (-4.3%)	-479 (-13%)

Draft

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Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Aug	W	-1170 (-33.2%)	-1362 (-38.7%)	-914 (-28%)	-1106 (-33.9%)	-225 (-8.7%)	27 (1.2%)
	AN	-580 (-22.8%)	-732 (-28.8%)	-642 (-24.7%)	-794 (-30.5%)	-238 (-10.8%)	-135 (-6.9%)
	BN	-388 (-15.5%)	-862 (-34.6%)	-337 (-13.8%)	-812 (-33.2%)	-206 (-8.9%)	-692 (-29.8%)
	D	-1082 (-41.4%)	-1285 (-49.2%)	-783 (-33.8%)	-985 (-42.6%)	-248 (-14%)	-292 (-18%)
	C	-690 (-46%)	-560 (-37.3%)	-516 (-38.9%)	-386 (-29.1%)	-497 (-38%)	-160 (-14.5%)
	AVG	-860 (-31.8%)	-1050 (-38.8%)	-689 (-27.2%)	-878 (-34.6%)	-269 (-12.7%)	-217 (-11.6%)
Sep	W	-1486 (-36.9%)	-2118 (-52.6%)	-1769 (-41.1%)	-2401 (-55.7%)	-1444 (-36.3%)	-1716 (-47.4%)
	AN	-1141 (-41.3%)	-1264 (-45.7%)	-1483 (-47.7%)	-1606 (-51.7%)	-1022 (-38.6%)	-543 (-26.6%)
	BN	-865 (-36.5%)	-1008 (-42.5%)	-600 (-28.5%)	-744 (-35.3%)	-409 (-21.4%)	-242 (-15.1%)
	D	-526 (-28.3%)	-715 (-38.5%)	-243 (-15.5%)	-433 (-27.5%)	-43 (-3.1%)	-41 (-3.5%)
	C	-18 (-1.5%)	-577 (-49.5%)	92 (8.7%)	-467 (-44.3%)	386 (50.7%)	-6 (-1%)
	AVG	-904 (-33.9%)	-1270 (-47.7%)	-920 (-34.4%)	-1286 (-48%)	-630 (-26.4%)	-675 (-32.6%)
Oct	W	-175 (-10.2%)	100 (5.8%)	-73 (-4.5%)	203 (12.5%)	-152 (-9%)	188 (11.5%)
	AN	-250 (-14.6%)	270 (15.8%)	34 (2.4%)	554 (39%)	-152 (-9.5%)	244 (14.1%)
	BN	43 (2.7%)	575 (35.9%)	115 (7.5%)	647 (42.3%)	129 (8.5%)	410 (23.2%)
	D	-169 (-11.5%)	249 (17%)	-42 (-3.2%)	376 (28%)	-180 (-12.2%)	459 (36.5%)
	C	61 (4.2%)	620 (42.4%)	117 (8.3%)	676 (48.1%)	146 (10.6%)	426 (25.7%)
	AVG	-113 (-7%)	315 (19.6%)	10 (0.6%)	437 (29.5%)	-67 (-4.3%)	329 (20.7%)
Nov	W	-247 (-7%)	-949 (-26.9%)	-195 (-5.6%)	-897 (-25.8%)	-156 (-4.5%)	-34 (-1.3%)
	AN	-388 (-12.2%)	-1061 (-33.3%)	-693 (-19.9%)	-1366 (-39.2%)	-394 (-12.4%)	-434 (-17%)
	BN	101 (4.9%)	-421 (-20.3%)	-66 (-2.9%)	-587 (-26.3%)	182 (9.2%)	-70 (-4.1%)
	D	-422 (-19.4%)	-783 (-36%)	-310 (-15%)	-670 (-32.5%)	29 (1.7%)	-31 (-2.1%)
	C	-53 (-2.7%)	-339 (-17%)	-25 (-1.3%)	-311 (-15.8%)	235 (13.8%)	48 (3%)
	AVG	-218 (-8.1%)	-749 (-27.7%)	-246 (-9%)	-777 (-28.4%)	-35 (-1.4%)	-86 (-4.2%)
Dec	W	796 (12.6%)	134 (2.1%)	1406 (24.7%)	744 (13.1%)	426 (6.4%)	264 (4.3%)
	AN	-108 (-3.4%)	-171 (-5.5%)	35 (1.2%)	-29 (-1%)	-60 (-1.9%)	33 (1.1%)
	BN	459 (17.2%)	28 (1%)	616 (24.4%)	184 (7.3%)	278 (9.7%)	177 (7%)
	D	-157 (-9%)	-392 (-22.5%)	-113 (-6.6%)	-347 (-20.5%)	-60 (-3.7%)	-3 (-0.2%)
	C	-40 (-2.6%)	-285 (-18.7%)	22 (1.5%)	-224 (-15.3%)	110 (8%)	-12 (-1%)
	AVG	275 (7.8%)	-106 (-3%)	534 (16.4%)	154 (4.7%)	177 (4.9%)	116 (3.5%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.

Draft

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Table C.5.3-156. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for American River at the Confluence with the Sacramento River Estimated from CALSIM II

Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	8,748	8,560	10,031	10,960	10,021	10,932
	AN	4,806	4,482	4,895	5,760	4,968	5,764
	BN	2,326	2,179	2,246	1,988	2,049	2,063
	D	1,654	1,565	1,535	1,424	1,551	1,458
	C	1,403	1,379	1,152	1,008	1,215	1,027
	AVG	4,443	4,287	4,786	5,118	4,773	5,132
Feb	W	9,183	8,982	10,275	10,947	10,336	10,967
	AN	6,422	6,139	7,148	8,073	7,589	8,280
	BN	4,309	4,058	4,631	4,888	4,806	5,100
	D	1,781	1,686	1,679	1,756	1,682	1,835
	C	1,119	1,074	985	921	1,057	970
	AVG	5,142	4,967	5,607	6,007	5,732	6,104
Mar	W	5,979	5,915	6,304	6,837	6,301	6,832
	AN	5,364	5,224	5,641	5,661	5,687	5,739
	BN	2,340	2,271	2,503	2,672	2,558	2,565
	D	2,121	1,968	2,095	2,224	2,163	2,022
	C	864	843	785	836	749	759
	AVG	3,672	3,583	3,826	4,063	3,851	3,999
Apr	W	5,156	4,997	5,164	5,300	5,162	5,310
	AN	3,383	3,238	3,136	3,079	3,131	3,117
	BN	2,984	2,788	2,927	2,778	2,913	2,966
	D	1,672	1,673	1,550	1,677	1,717	1,802
	C	996	985	886	1,059	1,046	1,094
	AVG	3,152	3,046	3,066	3,128	3,122	3,202
May	W	5,959	5,711	5,415	4,332	5,433	4,459
	AN	3,700	3,411	2,911	2,285	3,125	2,708
	BN	2,733	2,555	2,222	1,726	2,472	2,273
	D	1,605	1,484	1,399	1,454	1,558	1,901
	C	1,014	992	1,118	790	917	806
	AVG	3,398	3,217	2,993	2,438	3,078	2,733
Jun	W	5,743	5,456	4,206	3,388	4,743	4,261
	AN	3,103	2,973	2,562	2,736	3,463	3,566
	BN	2,631	2,358	2,274	2,603	3,282	3,483
	D	2,282	2,140	2,289	2,320	2,632	2,272
	C	1,621	1,412	1,052	793	1,382	1,026
	AVG	3,462	3,244	2,753	2,545	3,351	3,117
Jul	W	3,844	3,578	3,264	3,560	3,446	3,223
	AN	4,399	4,131	4,344	4,635	4,178	3,954
	BN	4,509	4,548	4,257	4,038	3,658	3,363
	D	3,347	2,987	2,807	2,858	2,596	2,209
	C	1,568	1,218	1,421	1,784	1,141	1,651
	AVG	3,597	3,349	3,221	3,385	3,066	2,901

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Month	WY Type	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	3,295	2,990	2,304	1,858	2,077	1,887
	AN	2,313	2,327	1,921	1,663	1,684	1,534
	BN	2,265	2,164	2,035	2,048	1,834	1,362
	D	2,395	2,049	1,516	1,357	1,270	1,071
	C	1,314	1,094	1,097	899	598	744
	AVG	2,488	2,268	1,852	1,612	1,585	1,400
Sep	W	3,846	4,090	3,771	3,415	2,329	1,699
	AN	2,594	2,894	2,437	1,838	1,417	1,296
	BN	2,205	1,902	1,712	1,402	1,305	1,166
	D	1,691	1,371	1,177	987	1,135	949
	C	1,011	877	591	427	981	421
	AVG	2,495	2,474	2,189	1,870	1,561	1,197
Oct	W	1,607	1,479	1,561	1,499	1,415	1,695
	AN	1,597	1,291	1,481	1,613	1,334	1,855
	BN	1,472	1,376	1,364	1,617	1,502	2,042
	D	1,344	1,190	1,333	1,114	1,156	1,579
	C	1,342	1,260	1,232	1,517	1,381	1,945
	AVG	1,486	1,338	1,418	1,454	1,356	1,789
Nov	W	3,472	3,402	3,363	2,540	3,208	2,504
	AN	3,100	3,389	3,089	2,455	2,696	2,019
	BN	1,990	2,137	1,889	1,618	2,070	1,544
	D	2,094	1,964	1,624	1,326	1,655	1,291
	C	1,897	1,849	1,590	1,489	1,823	1,540
	AVG	2,632	2,641	2,430	1,950	2,395	1,862
Dec	W	6,255	5,627	6,607	6,115	7,035	6,379
	AN	3,072	2,909	3,007	2,856	2,950	2,899
	BN	2,609	2,433	2,774	2,445	3,049	2,628
	D	1,675	1,614	1,564	1,275	1,508	1,273
	C	1,443	1,364	1,278	1,158	1,385	1,156
	AVG	3,457	3,179	3,539	3,224	3,717	3,344

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Table C.5.3-157. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for American River at the Confluence with the Sacramento River[1]

Month	WY Type	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	1274 (14.6%)	2185 (25%)	1461 (17.1%)	2372 (27.7%)	-10 (-0.1%)	-28 (-0.3%)
	AN	162 (3.4%)	958 (19.9%)	486 (10.8%)	1282 (28.6%)	72 (1.5%)	4 (0.1%)
	BN	-277 (-11.9%)	-264 (-11.3%)	-130 (-6%)	-116 (-5.3%)	-197 (-8.8%)	75 (3.7%)
	D	-103 (-6.2%)	-197 (-11.9%)	-14 (-0.9%)	-107 (-6.9%)	16 (1.1%)	33 (2.3%)
	C	-188 (-13.4%)	-376 (-26.8%)	-163 (-11.9%)	-351 (-25.5%)	63 (5.5%)	20 (2%)
	AVG	330 (7.4%)	690 (15.5%)	485 (11.3%)	845 (19.7%)	-13 (-0.3%)	15 (0.3%)
Feb	W	1153 (12.6%)	1784 (19.4%)	1353 (15.1%)	1984 (22.1%)	60 (0.6%)	20 (0.2%)
	AN	1167 (18.2%)	1858 (28.9%)	1450 (23.6%)	2142 (34.9%)	441 (6.2%)	208 (2.6%)
	BN	497 (11.5%)	792 (18.4%)	748 (18.4%)	1042 (25.7%)	175 (3.8%)	212 (4.3%)
	D	-98 (-5.5%)	54 (3%)	-3 (-0.2%)	149 (8.8%)	3 (0.2%)	79 (4.5%)
	C	-62 (-5.6%)	-149 (-13.3%)	-17 (-1.6%)	-104 (-9.7%)	71 (7.2%)	49 (5.3%)
	AVG	591 (11.5%)	963 (18.7%)	766 (15.4%)	1138 (22.9%)	125 (2.2%)	97 (1.6%)
Mar	W	322 (5.4%)	852 (14.3%)	387 (6.5%)	917 (15.5%)	-2 (0%)	-5 (-0.1%)
	AN	322 (6%)	374 (7%)	463 (8.9%)	515 (9.9%)	46 (0.8%)	77 (1.4%)
	BN	219 (9.3%)	225 (9.6%)	287 (12.7%)	294 (12.9%)	56 (2.2%)	-108 (-4%)
	D	42 (2%)	-99 (-4.7%)	195 (9.9%)	54 (2.7%)	68 (3.3%)	-202 (-9.1%)
	C	-115 (-13.3%)	-105 (-12.2%)	-94 (-11.1%)	-84 (-10%)	-35 (-4.5%)	-77 (-9.2%)
	AVG	179 (4.9%)	326 (8.9%)	269 (7.5%)	416 (11.6%)	25 (0.7%)	-64 (-1.6%)
Apr	W	6 (0.1%)	155 (3%)	165 (3.3%)	314 (6.3%)	-2 (0%)	11 (0.2%)
	AN	-252 (-7.4%)	-266 (-7.9%)	-107 (-3.3%)	-121 (-3.7%)	-5 (-0.2%)	38 (1.2%)
	BN	-71 (-2.4%)	-18 (-0.6%)	125 (4.5%)	177 (6.4%)	-14 (-0.5%)	188 (6.8%)
	D	45 (2.7%)	130 (7.8%)	45 (2.7%)	130 (7.8%)	168 (10.8%)	126 (7.5%)
	C	51 (5.1%)	98 (9.9%)	62 (6.3%)	110 (11.1%)	160 (18%)	35 (3.3%)
	AVG	-30 (-0.9%)	50 (1.6%)	77 (2.5%)	156 (5.1%)	56 (1.8%)	74 (2.4%)
May	W	-526 (-8.8%)	-1500 (-25.2%)	-278 (-4.9%)	-1252 (-21.9%)	18 (0.3%)	126 (2.9%)
	AN	-574 (-15.5%)	-991 (-26.8%)	-286 (-8.4%)	-703 (-20.6%)	214 (7.3%)	423 (18.5%)
	BN	-262 (-9.6%)	-461 (-16.9%)	-83 (-3.2%)	-282 (-11%)	250 (11.3%)	546 (31.6%)
	D	-47 (-2.9%)	296 (18.5%)	73 (4.9%)	416 (28.1%)	159 (11.4%)	447 (30.7%)
	C	-97 (-9.5%)	-208 (-20.5%)	-75 (-7.5%)	-185 (-18.7%)	-201 (-18%)	16 (2%)
	AVG	-320 (-9.4%)	-665 (-19.6%)	-139 (-4.3%)	-484 (-15%)	85 (2.8%)	296 (12.1%)
Jun	W	-999 (-17.4%)	-1481 (-25.8%)	-713 (-13.1%)	-1195 (-21.9%)	538 (12.8%)	873 (25.8%)
	AN	360 (11.6%)	463 (14.9%)	491 (16.5%)	594 (20%)	901 (35.2%)	831 (30.4%)
	BN	651 (24.7%)	852 (32.4%)	923 (39.2%)	1124 (47.7%)	1008 (44.3%)	880 (33.8%)
	D	350 (15.3%)	-10 (-0.4%)	491 (23%)	131 (6.1%)	343 (15%)	-48 (-2.1%)
	C	-239 (-14.8%)	-595 (-36.7%)	-29 (-2.1%)	-385 (-27.3%)	330 (31.4%)	233 (29.4%)
	AVG	-111 (-3.2%)	-346 (-10%)	107 (3.3%)	-128 (-3.9%)	598 (21.7%)	572 (22.5%)
Jul	W	-398 (-10.3%)	-621 (-16.2%)	-131 (-3.7%)	-355 (-9.9%)	183 (5.6%)	-338 (-9.5%)
	AN	-220 (-5%)	-445 (-10.1%)	47 (1.1%)	-177 (-4.3%)	-166 (-3.8%)	-682 (-14.7%)
	BN	-851 (-18.9%)	-1147 (-25.4%)	-889 (-19.6%)	-1185 (-26.1%)	-599 (-14.1%)	-676 (-16.7%)
	D	-751 (-22.4%)	-1138 (-34%)	-390 (-13.1%)	-778 (-26%)	-210 (-7.5%)	-649 (-22.7%)
	C	-427 (-27.2%)	83 (5.3%)	-77 (-6.3%)	433 (35.6%)	-280 (-19.7%)	-132 (-7.4%)
	AVG	-531 (-14.8%)	-695 (-19.3%)	-283 (-8.5%)	-448 (-13.4%)	-156 (-4.8%)	-484 (-14.3%)

Draft

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Aug	W	-1217 (-36.9%)	-1407 (-42.7%)	-913 (-30.5%)	-1103 (-36.9%)	-227 (-9.8%)	30 (1.6%)
	AN	-629 (-27.2%)	-779 (-33.7%)	-643 (-27.6%)	-793 (-34.1%)	-237 (-12.3%)	-129 (-7.8%)
	BN	-430 (-19%)	-902 (-39.8%)	-330 (-15.2%)	-801 (-37%)	-200 (-9.8%)	-686 (-33.5%)
	D	-1125 (-47%)	-1324 (-55.3%)	-779 (-38%)	-978 (-47.7%)	-246 (-16.2%)	-285 (-21%)
	C	-716 (-54.5%)	-570 (-43.4%)	-497 (-45.4%)	-351 (-32%)	-499 (-45.5%)	-156 (-17.3%)
	AVG	-903 (-36.3%)	-1088 (-43.7%)	-683 (-30.1%)	-868 (-38.3%)	-268 (-14.5%)	-212 (-13.2%)
Sep	W	-1517 (-39.4%)	-2147 (-55.8%)	-1761 (-43.1%)	-2391 (-58.5%)	-1442 (-38.2%)	-1716 (-50.3%)
	AN	-1177 (-45.4%)	-1298 (-50.1%)	-1477 (-51%)	-1599 (-55.2%)	-1020 (-41.8%)	-542 (-29.5%)
	BN	-901 (-40.8%)	-1040 (-47.1%)	-597 (-31.4%)	-736 (-38.7%)	-407 (-23.8%)	-236 (-16.8%)
	D	-555 (-32.8%)	-742 (-43.9%)	-236 (-17.2%)	-422 (-30.8%)	-41 (-3.5%)	-38 (-3.9%)
	C	-29 (-2.9%)	-590 (-58.3%)	104 (11.9%)	-456 (-52%)	391 (66.1%)	-6 (-1.3%)
	AVG	-933 (-37.4%)	-1297 (-52%)	-913 (-36.9%)	-1277 (-51.6%)	-628 (-28.7%)	-673 (-36%)
Oct	W	-192 (-12%)	87 (5.4%)	-64 (-4.3%)	216 (14.6%)	-146 (-9.4%)	196 (13.1%)
	AN	-263 (-16.5%)	258 (16.1%)	42 (3.3%)	564 (43.7%)	-148 (-10%)	242 (15%)
	BN	30 (2%)	570 (38.7%)	126 (9.1%)	667 (48.4%)	138 (10.1%)	426 (26.3%)
	D	-188 (-14%)	236 (17.5%)	-34 (-2.9%)	389 (32.7%)	-176 (-13.2%)	465 (41.8%)
	C	39 (2.9%)	603 (44.9%)	121 (9.6%)	685 (54.3%)	149 (12.1%)	428 (28.2%)
	AVG	-130 (-8.7%)	303 (20.4%)	18 (1.3%)	450 (33.6%)	-61 (-4.3%)	335 (23%)
Nov	W	-264 (-7.6%)	-968 (-27.9%)	-194 (-5.7%)	-898 (-26.4%)	-155 (-4.6%)	-35 (-1.4%)
	AN	-403 (-13%)	-1081 (-34.9%)	-693 (-20.4%)	-1371 (-40.4%)	-392 (-12.7%)	-436 (-17.8%)
	BN	81 (4.1%)	-445 (-22.4%)	-67 (-3.1%)	-593 (-27.7%)	181 (9.6%)	-74 (-4.6%)
	D	-439 (-21%)	-803 (-38.3%)	-309 (-15.7%)	-673 (-34.3%)	31 (1.9%)	-35 (-2.6%)
	C	-74 (-3.9%)	-357 (-18.8%)	-26 (-1.4%)	-310 (-16.8%)	233 (14.7%)	50 (3.4%)
	AVG	-236 (-9%)	-770 (-29.3%)	-246 (-9.3%)	-780 (-29.5%)	-35 (-1.4%)	-88 (-4.5%)
Dec	W	780 (12.5%)	124 (2%)	1408 (25%)	752 (13.4%)	427 (6.5%)	264 (4.3%)
	AN	-121 (-3.9%)	-173 (-5.6%)	41 (1.4%)	-11 (-0.4%)	-57 (-1.9%)	43 (1.5%)
	BN	440 (16.9%)	19 (0.7%)	616 (25.3%)	195 (8%)	276 (9.9%)	183 (7.5%)
	D	-167 (-10%)	-402 (-24%)	-106 (-6.6%)	-341 (-21.1%)	-56 (-3.6%)	-2 (-0.2%)
	C	-58 (-4%)	-287 (-19.9%)	21 (1.6%)	-208 (-15.2%)	108 (8.4%)	-2 (-0.2%)
	AVG	260 (7.5%)	-113 (-3.3%)	537 (16.9%)	165 (5.2%)	178 (5%)	120 (3.7%)

[1] A positive value indicates higher average flows in the preliminary proposal than in EBC.

Steelhead

Juvenile

American River flow at the confluence with the Sacramento River is used to represent flow conditions in the mainstem of this river. Differences in average American River flow between PP and EBC scenarios during the juvenile steelhead migration period (October through May) were low, generally 5% or less, although with some variability for individual months (Table C.5.3-156, Table C.5.3-157). Differences in average flows within individual months ranged from 18% lower flow under both PP_LLT compared to EBC2_LLT in October of above-normal years and PP_ELT compared to EBC2_ELT in May of critical years to 42% higher flow under PP_LLT compared to EBC2_LLT in October of dry years. Based on these results, it was concluded that flow conditions for migration of steelhead juveniles in the American River under PP operations would be similar to those under EBC2 operations.

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Adult

Attraction flows for upstream migrating adult steelhead based on results of CALSIM model results for instream flows modeled on the American River at the confluence with the Sacramento River during the September through March migration period are summarized, by month and water-year type, in Table C.5.3-156 and Table C.5.3-157.

No specific criteria exist for assessing the potential effects of a change in olfactory cues that affect the attraction of migrating adult steelhead to the American River. In the absence of such criteria, it is assumed that the larger the increase in the flow of the American River at the Sacramento River confluence during the adult upstream migration period, the greater the attraction to the river. Average American River flows at the confluence with the Sacramento River during the September through March migration period are summarized in Table C.5.3-156.

Average September through March differences in American River flows were 5% or below for most of the water-year types but were 17% higher under PP_ELT compared to EBC2_ELT for critical years. Differences in average flows within individual months ranged from 50% lower flow under PP_LLT compared to EBC2_LLT in September of wet years to 66% higher flow under PP_ELT compared to EBC2_ELT in September of critical years. Based on these results, it was concluded that attraction flow conditions for upstream migration of steelhead adults in the American River under PP operations generally would be similar to those under EBC2 operations, although conditions under PP_ELT operations in critical years would be improved.

No specific criteria exist for assessing the potential effects of a change in attraction flows of olfactory cues that affect the attraction of adult steelhead to migrate upstream into the lower American River. In the absence of specific criteria it has been assumed in this effects analysis that the larger the reduction in the flow of the American River at the Sacramento River confluence during the adult upstream migration period, the greater the potential effect. Differences in the percentage of attraction flows that are less than 5% for PP relative to EBC2 are assumed to be within the range of error of the simulation models and below the ability to detect actual differences that would be biologically significant. The results of the attraction flow analysis showed that differences between EBC2 and PP conditions were within 5% of each other for all scenarios. Based on results of these analyses it was concluded that preliminary proposal operations would have no effect on instream flows and physical habitat for adult steelhead attraction within the American River.

Kelt

Flows in the American River at the confluence with the Sacramento River were compared for the period from January through April to represent the period of kelt migration (Table C.5.3-156, Table C.5.3-157).

Average January through April differences in American River flow were low, generally 5% or less, although with some variability for individual months (Table C.5.3-156). Differences within individual months also were low, with no differences in flow of 10% or more except for an 11% increased flow under PP_ELT compared to EBC2_ELT in April of dry years and an 18% higher flow under PP_ELT compared to EBC2_ELT in April of critical years. Based on these results, it was concluded that instream habitat conditions for upstream migration of steelhead kelts in the American River under PP operations generally would be similar to those under EBC2 operations, although conditions under PP_ELT operations in April of dry and critical years would be improved.

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Fall-Run Chinook Salmon

Juvenile

Downstream migration flows for juvenile fall-run Chinook salmon produced in the American River from February through May generally were estimated to be similar between PP and EBC scenarios, with modestly greater flows under PP scenarios in certain water-year types (above-normal, below-normal, and dry) (Table C.5.3-156, Table C.5.3-157).

Adult

American River flows at the confluence with the Sacramento River during the September through October adult fall-run Chinook salmon migration period show appreciable reductions in flows in September of wet, above-normal, below-normal, and dry years under preliminary proposal conditions compared to EBC conditions (Table C.5.3-156, Table C.5.3-157). Flows were greater in September under preliminary proposal operations in critically dry years. Late long-term flows under EBC2 and preliminary proposal operations were comparable or higher during October in all water years. Flows in September under early long-term preliminary proposal operations were reduced 38% in wet years, 42% in above-normal years, 24% in below-normal years, and 4% in dry years and were increased 66% in critically dry years. Flows in September under late long-term preliminary proposal operations followed a similar pattern with reductions of 50% in wet years, 29% in above-normal years, 17% in below-normal years, 4% in dry years, and 1% in critically dry years. Late long-term flows were increased substantially in October in above-normal (25%), below-normal (50%), dry (18%), and critically dry (58%) years, but were reduced in wet years by 13%. No relationships have been developed that quantify the attraction of adult fall-run Chinook salmon and flows in the lower American River. The substantial reduction in flow in September has the potential to result in delayed upstream migration and increased risk of straying. The increase in flow in critical water years and in October of all years has the potential to increase adult attraction and upstream migration.

Pacific Lamprey

Macropthalmia

Average monthly flow rates in the American River at the confluence with the Sacramento River between December and May are presented in Table C.5.3-156 and Figure C.5.3-100 through Figure C.5.3-105, and differences between model scenarios are presented in Table C.5.3-157. Few differences among model scenarios in monthly average flow between December and May are visually evident.

Predicted monthly average flows in the PP_ELT are between 320 cfs (9%) lower and 591 cfs (12%) greater than flows in the EBC1. Predicted monthly average flows are between 665 cfs (20%) lower and 963 cfs (19%) greater for PP_LLT relative to EBC1. Predicted monthly average flows in the PP_ELT are 77 to 766 cfs (3 to 17%) greater than flows in the EBC2 in all months except for May, in which flows are reduced by 139 cfs (4%). Predicted monthly average flows are 156 cfs (5%) lower and 1,138 cfs (23%) greater for PP_LLT relative to EBC2 in all months except May, in which flows are reduced by 484 cfs (15%).

Isolating the effect of the preliminary proposal from the effects of climate change, early long-term predicted monthly average flows in the PP_ELT are 13 cfs (<1%) lower to 178 cfs (5%) greater than flows in the EBC2_ELT. Late long-term predicted monthly average flows in the PP_LLT are 64 cfs (2%) lower to 295 cfs (12%) greater than flows in the EBC2_LLT.

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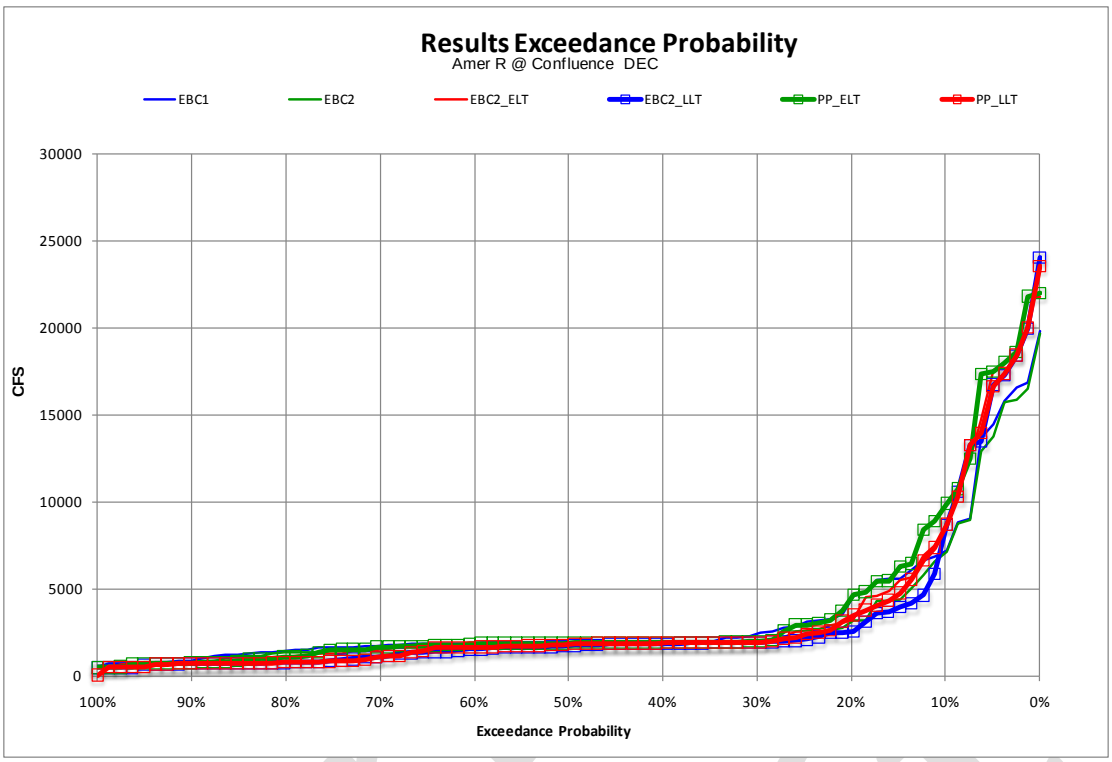

Figure C.5.3-100. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, December

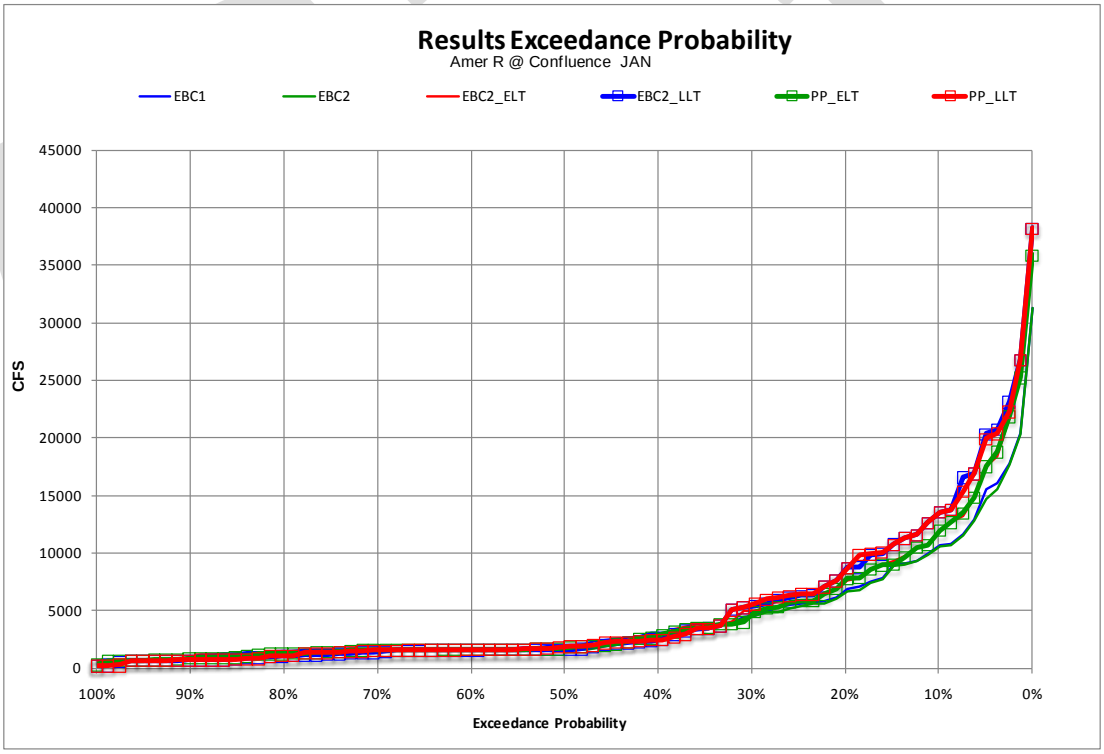

Figure C.5.3-101. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, January

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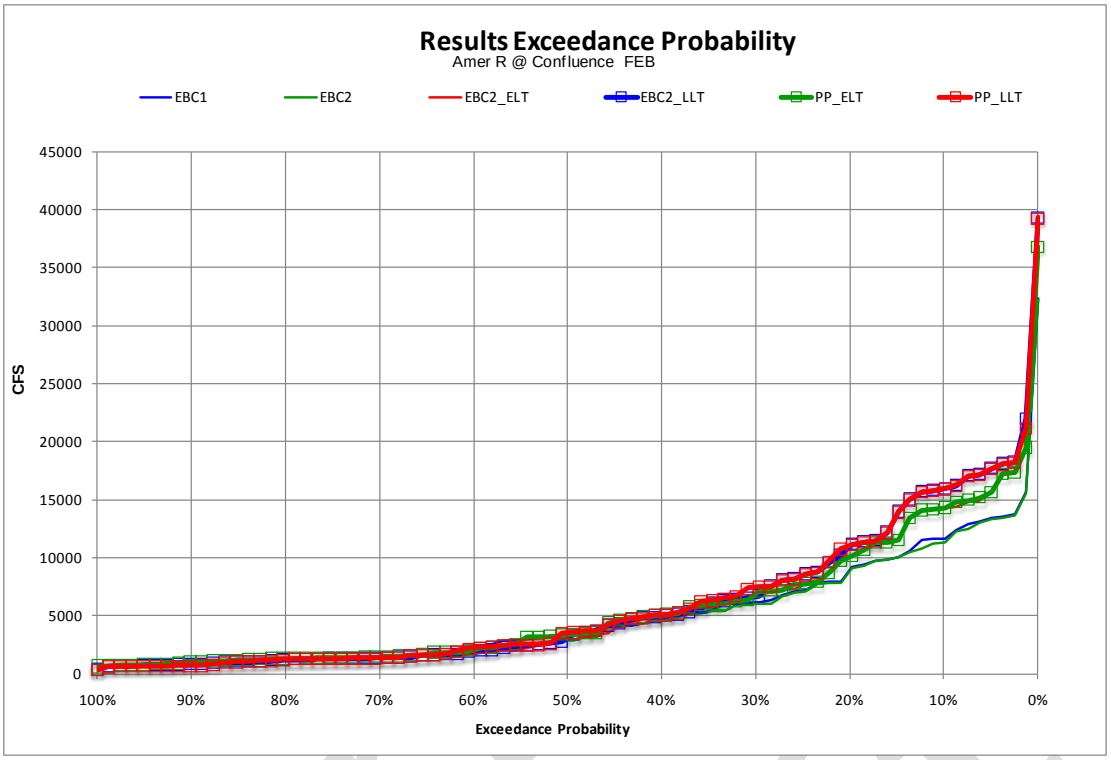

Figure C.5.3-102. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, February

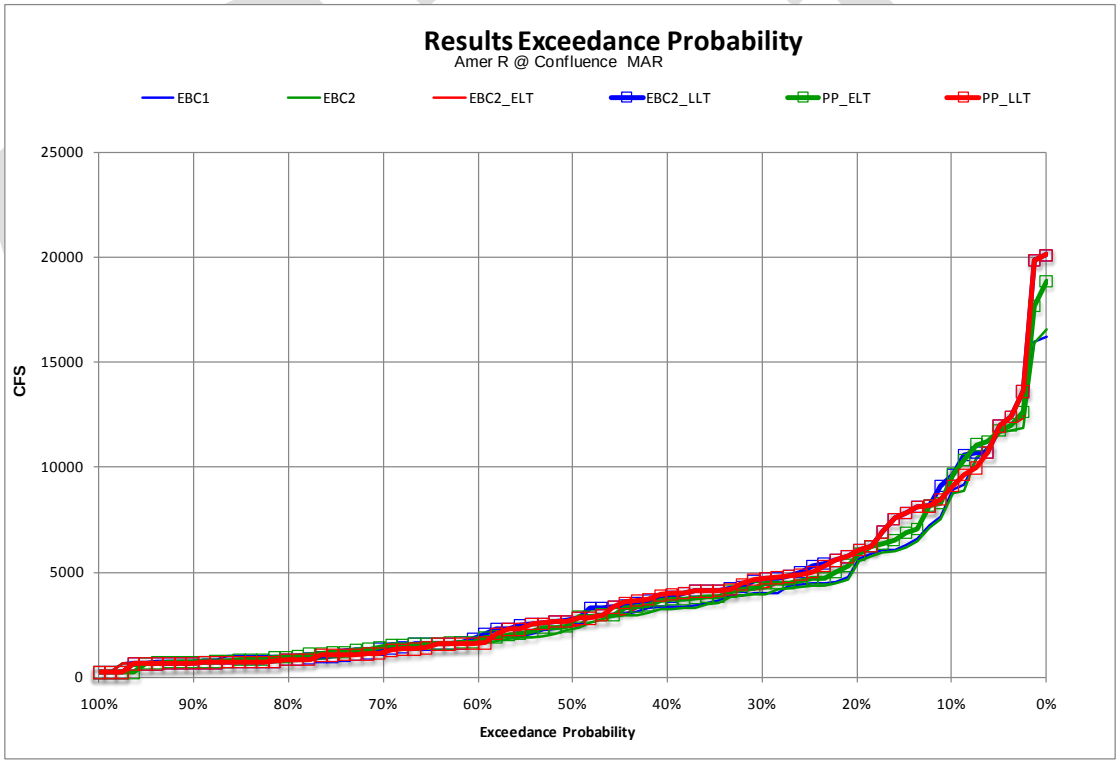

Figure C.5.3-103. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, March

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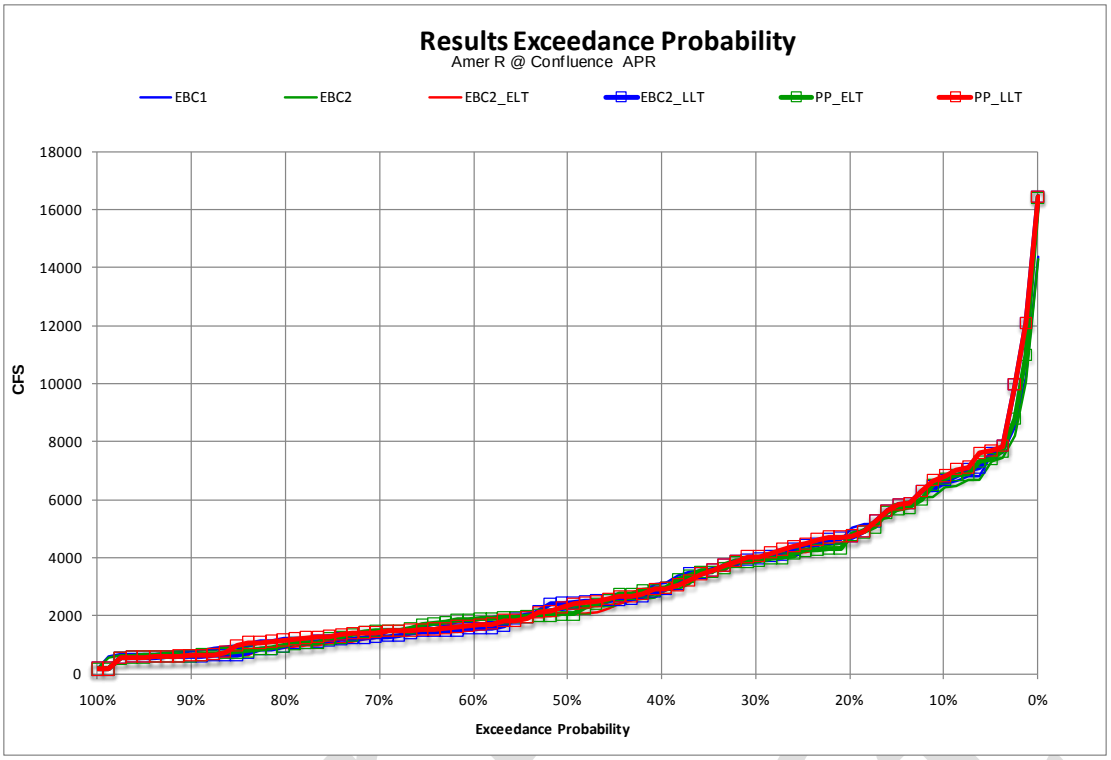

Figure C.5.3-104. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, April

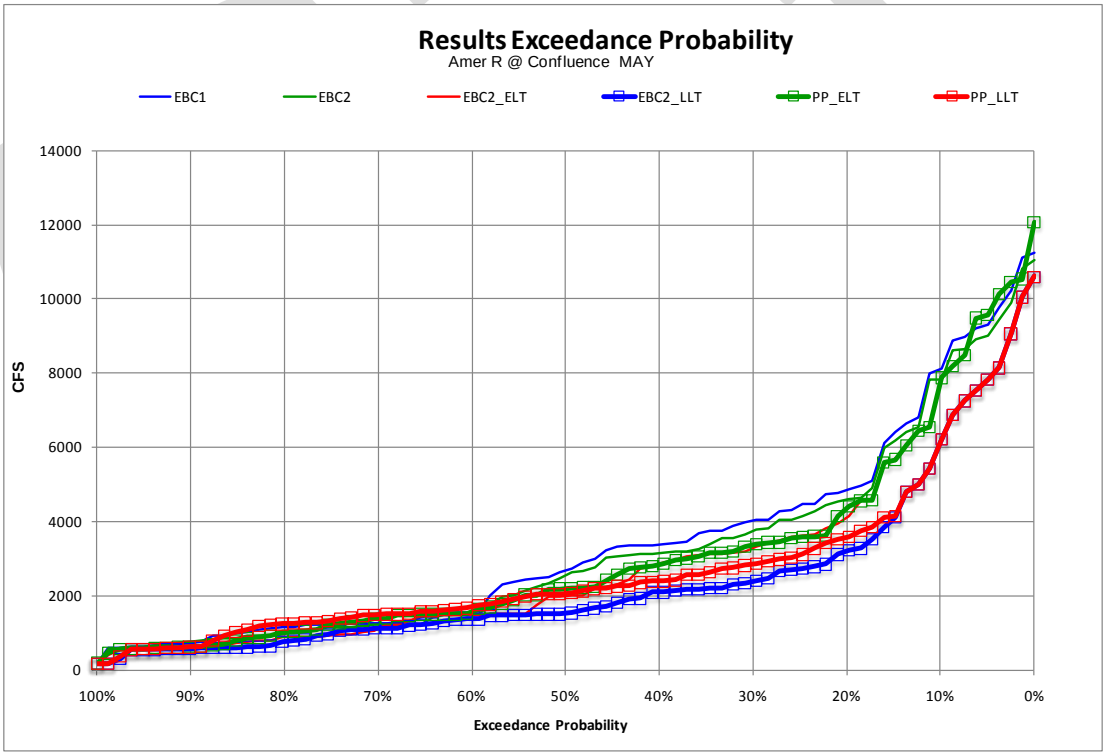

Figure C.5.3-105. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, May

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Adult

Exceedance plots for flows in the American River at the confluence with the Sacramento River for each model scenario between January and June are presented in Table C.5.3-156 and differences between model scenarios in mean flows are presented in Table C.5.3-157.

Mean monthly flows under PP_ELT are predicted to be 320 cfs (9%) lower to 591 cfs (12%) greater than under EBC1 between January and June. Mean monthly flows under PP_LLT are predicted to be 665 cfs (20%) lower to 963 cfs (19%) greater than under EBC1. Mean monthly flows under PP_ELT are predicted to be 139 cfs (4%) lower to 766 cfs (15%) greater than under EBC2. Mean monthly flows under PP_LLT are predicted to be 484 cfs (15%) lower to 1,138 cfs (23%) greater than under EBC2.

Isolating the effect of the preliminary proposal from the effects of climate change, mean monthly flows under PP_ELT are predicted to be 13 cfs (<1%) lower to 598 cfs (22%) greater than under EBC2_ELT. Mean monthly flows under PP_LLT are predicted to be 64 cfs (2%) to 572 cfs (23%) greater than under EBC2_LLT.

These results suggest that, other than in May in the late long-term, there are negligible effects of the preliminary proposal on Pacific lamprey attraction in the American River if lamprey are attracted to upstream olfactory cues. In May, flow increases due to the preliminary proposal in the late long-term are expected to provide a small benefit to adult attraction flows if lamprey are attracted to upstream olfactory cues.

River Lamprey

Macropthalmia

See results for Pacific lamprey macropthalmia.

Adult

Exceedance plots for flows in the American River at the confluence with the Sacramento River for each model scenario between September and November are presented in Figure C.5.3-106, Figure C.5.3-107, and Figure C.5.3-108, and differences between model scenarios in mean flows are presented in Table C.5.3-157.

Mean flows under the PP_ELT are predicted to be 130 cfs (9%) lower to 933 cfs (37%) higher than flows under the EBC1. Mean flows under the PP_LLT are predicted to be 1,297 cfs (52%) lower to 303 cfs (20%) higher than flows under the EBC1. Mean flows under the PP_ELT are predicted to be 913 cfs (37%) lower to 18 cfs (1%) higher than flows under the EBC2. Mean flows under the PP_LLT are predicted to be 1,277 cfs (52%) lower to 450 cfs (34%) higher than flows under the EBC2.

Isolating the effect of the preliminary proposal from the effect of climate change, mean flows under the PP_ELT are predicted to be 35 cfs (1%) to 628 cfs (29%) lower than flows under the EBC2_ELT. Mean flows under the PP_LLT are predicted to be 673 cfs (36%) lower to 335 cfs (23%) higher than flows under the EBC2_LLT.

These results suggest that effects of the preliminary proposal on river lamprey upstream attraction flows are highly variable among months, ranging from moderate adverse effects to moderate benefits.

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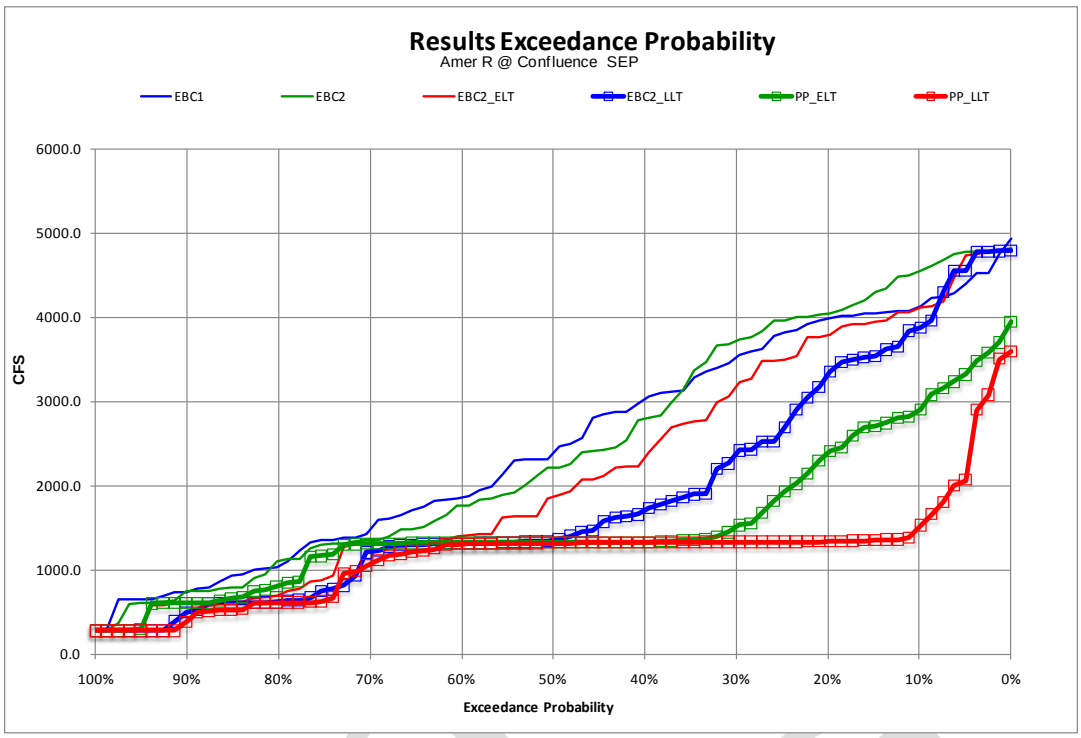

Figure C.5.3-106. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, September

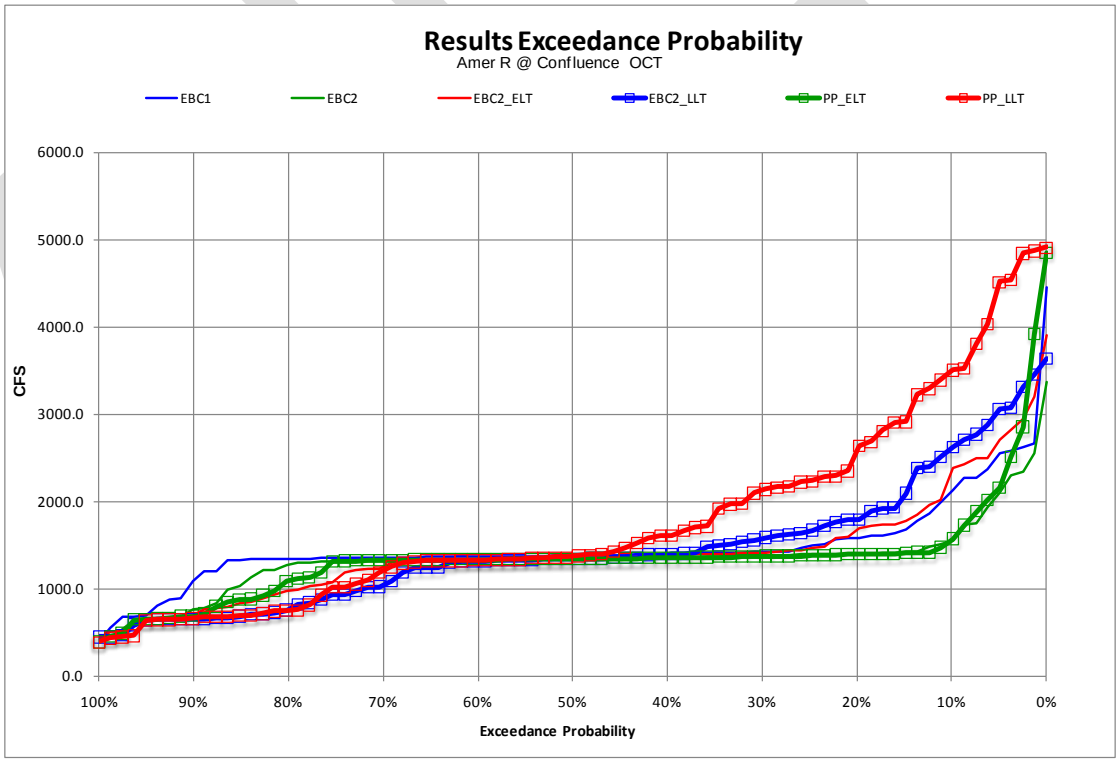

Figure C.5.3-107. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, October

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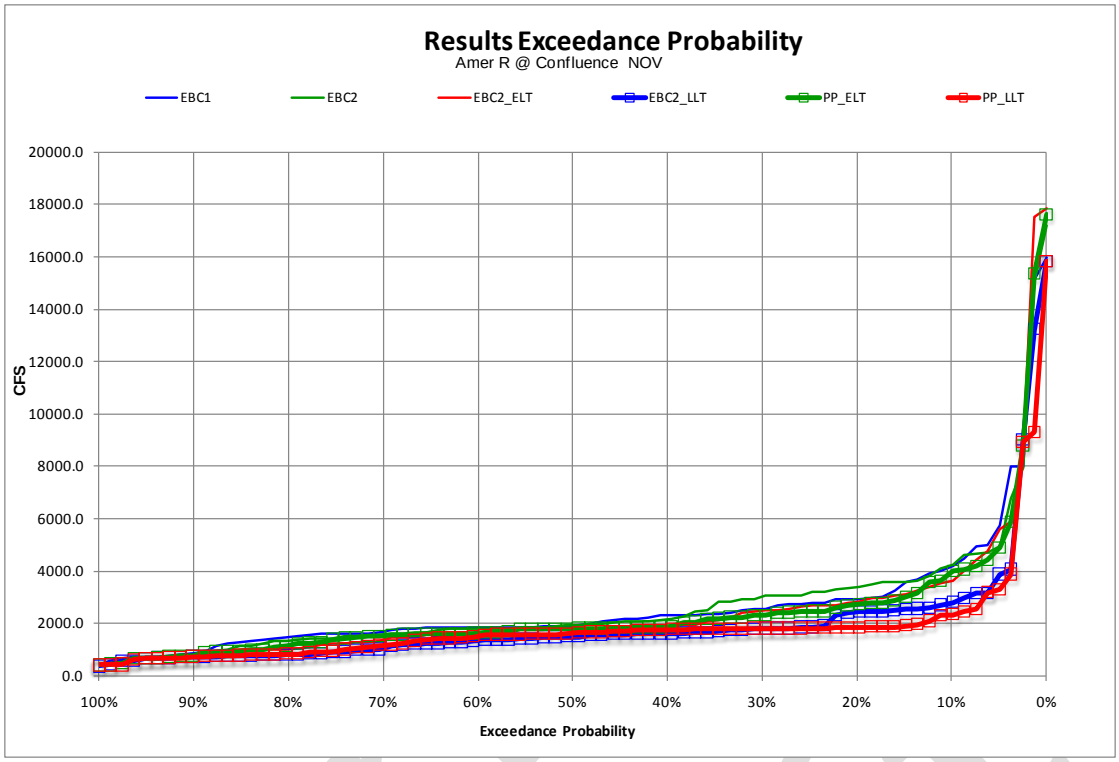

Figure C.5.3-108. Probability of Exceedance Plot for Model Scenarios of Mean Monthly Flow Rate of the American River at the Confluence with the Sacramento River, November

Stanislaus River Subregion

CALSIM flow data for the Stanislaus River subregion (Stanislaus River at the confluence with the San Joaquin River) averaged by water-year type, month, and scenario, together with average monthly differences between scenarios, are provided in Table C.5.3-158 and Table C.5.3-159. Based on these results, no appreciable effects of the preliminary proposal on migration or attraction flows are expected in this subregion.

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Table C.5.3-158. Average Monthly Flows (Cubic Feet per Second) by Water-Year Type for the Stanislaus River at the Confluence with the San Joaquin River Estimated from CALSIM II

Month	WY Type[1]	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Jan	W	956	945	968	885	968	885
	AN	843	833	911	963	912	963
	BN	416	403	382	369	382	369
	D	403	403	393	366	393	366
	C	314	296	278	265	278	265
	AVG	635	624	638	615	638	615
Feb	W	1,285	1,271	1,500	1,236	1,500	1,238
	AN	917	887	985	858	985	858
	BN	551	527	522	438	522	438
	D	562	504	411	359	410	359
	C	490	364	349	348	349	348
	AVG	827	780	847	723	847	724
Mar	W	2,063	2,055	2,259	2,217	2,260	2,216
	AN	1,295	1,299	1,108	956	1,108	956
	BN	732	718	642	548	642	547
	D	559	533	431	390	431	390
	C	541	445	445	444	445	444
	AVG	1,167	1,140	1,134	1,071	1,135	1,071
Apr	W	2,054	2,063	2,047	1,965	2,047	1,965
	AN	1,719	1,719	1,605	1,535	1,605	1,534
	BN	1,494	1,470	1,344	1,211	1,344	1,210
	D	1,438	1,415	1,320	1,199	1,320	1,198
	C	823	791	720	670	721	670
	AVG	1,562	1,551	1,475	1,387	1,475	1,387
May	W	1,653	1,675	1,688	1,613	1,688	1,614
	AN	1,389	1,395	1,292	1,243	1,294	1,243
	BN	1,238	1,227	1,094	898	1,092	898
	D	1,140	1,105	1,039	916	1,040	916
	C	715	672	648	627	649	627
	AVG	1,271	1,263	1,211	1,125	1,211	1,125
Jun	W	1,608	1,618	1,786	1,763	1,785	1,761
	AN	1,134	1,142	1,087	985	1,084	984
	BN	663	654	609	568	605	566
	D	447	418	383	364	383	365
	C	332	307	308	296	309	294
	AVG	932	926	952	914	951	912
Jul	W	1,064	1,120	1,070	1,080	1,070	1,080
	AN	489	484	456	454	456	454
	BN	450	430	427	425	427	425
	D	398	345	355	359	356	360
	C	337	329	318	310	317	312
	AVG	607	610	588	590	588	590

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Month	WY Type[1]	EBC1	EBC2	EBC2_ELT	EBC2_LLT	PP_ELT	PP_LLT
Aug	W	930	937	843	717	843	717
	AN	476	476	455	454	455	454
	BN	423	423	422	418	422	418
	D	387	387	384	382	384	382
	C	341	360	341	338	341	338
	AVG	560	566	530	491	530	491
Sep	W	1,040	1,028	965	863	965	863
	AN	502	503	477	474	477	474
	BN	417	417	413	407	413	407
	D	395	396	392	390	392	390
	C	324	340	327	317	327	327
	AVG	595	594	567	533	567	535
Oct	W	897	908	869	845	869	846
	AN	873	872	844	822	844	825
	BN	903	903	851	844	851	844
	D	984	984	980	925	980	925
	C	689	687	670	612	669	612
	AVG	867	869	840	808	840	808
Nov	W	426	424	427	408	427	408
	AN	580	574	591	524	591	524
	BN	341	341	341	334	341	334
	D	345	345	337	321	337	321
	C	325	326	311	308	311	309
	AVG	410	409	409	386	409	386
Dec	W	512	530	526	429	526	418
	AN	722	711	767	697	767	697
	BN	331	331	331	353	331	353
	D	317	317	310	294	310	294
	C	289	290	275	272	275	272
	AVG	450	453	459	417	459	414

[1] Water-year type was determined using the San Joaquin River Water-Year Type Classification

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Table C.5.3-159. Differences in Average Monthly Flows (Cubic Feet per Second) between Model Scenarios for Stanislaus River at the Confluence with the San Joaquin River[1]

Month	WY Type[2]	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
Jan	W	44 (3.5%)	10 (0.8%)	66 (5.5%)	32 (2.6%)	0 (0%)	0 (0%)
	AN	-9 (-2.5%)	-33 (-9%)	-7 (-1.9%)	-30 (-8.5%)	2 (0.5%)	0 (0%)
	BN	-6 (-1.6%)	-36 (-9.6%)	-7 (-1.9%)	-37 (-9.9%)	0 (0%)	0 (0%)
	D	-7 (-2%)	-8 (-2.1%)	-7 (-2%)	-8 (-2.1%)	0 (0%)	0 (0%)
	C	-47 (-15.9%)	-72 (-24.1%)	-23 (-8.5%)	-48 (-17.4%)	0 (0%)	0 (0%)
	AVG	3 (0.5%)	-20 (-3.2%)	14 (2.2%)	-9 (-1.5%)	0 (0%)	0 (0%)
Feb	W	164 (10.8%)	-2 (-0.1%)	195 (13.1%)	28 (1.9%)	0 (0%)	0 (0%)
	AN	201 (36.5%)	-169 (-30.8%)	169 (29%)	-201 (-34.6%)	1 (0.1%)	4 (1.2%)
	BN	-100 (-19.4%)	-163 (-31.7%)	-49 (-10.6%)	-112 (-24.2%)	0 (0%)	0 (0%)
	D	-103 (-21.6%)	-126 (-26.4%)	-41 (-9.9%)	-65 (-15.5%)	0 (0%)	0 (0%)
	C	-149 (-30.2%)	-150 (-30.4%)	-11 (-3%)	-12 (-3.3%)	0 (0%)	0 (0%)
	AVG	20 (2.4%)	-103 (-12.5%)	68 (8.7%)	-56 (-7.1%)	0 (0%)	1 (0.1%)
Mar	W	166 (7.7%)	48 (2.2%)	171 (8%)	53 (2.5%)	1 (0%)	0 (0%)
	AN	-165 (-14.6%)	-216 (-19.2%)	-163 (-14.5%)	-214 (-19%)	0 (0%)	0 (0%)
	BN	-157 (-19.7%)	-237 (-29.7%)	-151 (-19.1%)	-231 (-29.1%)	0 (0%)	0 (0%)
	D	-83 (-17.2%)	-109 (-22.6%)	-45 (-10.2%)	-71 (-15.9%)	0 (0%)	0 (-0.1%)
	C	-104 (-19.2%)	-105 (-19.3%)	0 (0%)	-1 (-0.2%)	0 (0%)	0 (0%)
	AVG	-32 (-2.7%)	-96 (-8.2%)	-5 (-0.5%)	-69 (-6.1%)	0 (0%)	0 (0%)
Apr	W	-40 (-1.9%)	-106 (-5%)	-42 (-2%)	-108 (-5.1%)	0 (0%)	0 (0%)
	AN	-108 (-6.4%)	-222 (-13.2%)	-58 (-3.5%)	-173 (-10.5%)	0 (0%)	0 (0%)
	BN	-83 (-5.6%)	-198 (-13.4%)	-107 (-7.1%)	-221 (-14.7%)	-1 (0%)	-1 (0%)
	D	-133 (-10.3%)	-270 (-20.9%)	-117 (-9.2%)	-254 (-19.9%)	1 (0%)	0 (0%)
	C	-99 (-13.5%)	-108 (-14.6%)	-67 (-9.5%)	-75 (-10.7%)	1 (0.1%)	0 (0%)
	AVG	-86 (-5.5%)	-175 (-11.2%)	-76 (-4.9%)	-164 (-10.6%)	0 (0%)	0 (0%)
May	W	5 (0.3%)	-60 (-3.5%)	4 (0.2%)	-61 (-3.5%)	0 (0%)	1 (0%)
	AN	-106 (-7.6%)	-268 (-19.4%)	-76 (-5.6%)	-238 (-17.6%)	3 (0.2%)	0 (0%)
	BN	-78 (-6.6%)	-186 (-15.6%)	-125 (-10.1%)	-233 (-18.8%)	-2 (-0.2%)	0 (0%)
	D	-112 (-11.5%)	-210 (-21.5%)	-89 (-9.4%)	-187 (-19.6%)	1 (0.1%)	0 (0%)
	C	-57 (-8.2%)	-70 (-10.1%)	-10 (-1.6%)	-23 (-3.6%)	1 (0.1%)	0 (0%)
	AVG	-60 (-4.7%)	-146 (-11.5%)	-52 (-4.1%)	-138 (-11%)	0 (0%)	0 (0%)
Jun	W	139 (8.6%)	-2 (-0.1%)	129 (7.9%)	-12 (-0.7%)	-1 (-0.1%)	-3 (-0.2%)
	AN	-44 (-4.7%)	100 (10.7%)	-37 (-4%)	107 (11.6%)	-5 (-0.6%)	-1 (-0.1%)
	BN	-32 (-3.9%)	-86 (-10.4%)	-35 (-4.2%)	-89 (-10.6%)	-2 (-0.3%)	1 (0.1%)
	D	-47 (-11.1%)	-60 (-14.1%)	-25 (-6.2%)	-38 (-9.3%)	0 (0%)	0 (0%)
	C	-22 (-6.5%)	-42 (-12.5%)	3 (1%)	-17 (-5.5%)	1 (0.4%)	-2 (-0.6%)
	AVG	18 (2%)	-20 (-2.1%)	25 (2.7%)	-14 (-1.5%)	-1 (-0.1%)	-1 (-0.1%)
Jul	W	-6 (-0.6%)	-92 (-9%)	-57 (-5.3%)	-143 (-13.3%)	0 (0%)	0 (0%)
	AN	-18 (-3.8%)	186 (40.3%)	-5 (-1%)	199 (44.4%)	0 (0%)	0 (0%)
	BN	-27 (-5.8%)	-25 (-5.5%)	-10 (-2.3%)	-9 (-1.9%)	0 (0%)	1 (0.3%)
	D	-28 (-7.3%)	-30 (-7.9%)	7 (1.9%)	4 (1.2%)	1 (0.4%)	0 (0%)
	C	-23 (-6.9%)	-26 (-7.5%)	-16 (-4.7%)	-18 (-5.4%)	-2 (-0.6%)	3 (0.8%)
	AVG	-19 (-3.1%)	-17 (-2.8%)	-21 (-3.5%)	-19 (-3.2%)	0 (0%)	1 (0.1%)
Aug	W	-87 (-9.7%)	-200 (-22.3%)	-94 (-10.4%)	-207 (-22.9%)	0 (0%)	0 (0%)

Admin Draft

Note to Reader: This is a revised working draft prepared by the BDCP consultants. This document is currently undergoing review by the Department of Water Resources with input from the Department of Fish and Game, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and U.S. Bureau of Reclamation and does not necessarily reflect the position of the state or federal agencies. It is expected to go through several more revisions prior to being released for formal public review and comment in 2012. All members of the public will have an opportunity to provide comments on the public draft of a revised version of this document during the formal public review and comment period. Responses will be prepared only on comments submitted in the formal public review and comment period.

Month	WY Type[2]	EBC1 vs. PP_ELT	EBC1 vs. PP_LLT	EBC2 vs. PP_ELT	EBC2 vs. PP_LLT	EBC2_ELT vs. PP_ELT	EBC2_LLT vs. PP_LLT
	AN	-3 (-0.6%)	-11 (-2.6%)	-3 (-0.6%)	-12 (-2.6%)	0 (0%)	0 (0%)
	BN	-9 (-2%)	-12 (-2.7%)	-9 (-2%)	-12 (-2.7%)	0 (0%)	0 (0%)
	D	-2 (-0.4%)	-2 (-0.6%)	-2 (-0.5%)	-2 (-0.6%)	0 (0%)	0 (0%)
	C	-1 (-0.2%)	-5 (-1.5%)	-26 (-7.2%)	-30 (-8.4%)	-1 (-0.3%)	0 (0.1%)
	AVG	-30 (-5.4%)	-68 (-12.2%)	-36 (-6.4%)	-74 (-13.2%)	0 (0%)	0 (0%)
Sep	W	-77 (-7.6%)	-169 (-16.9%)	-65 (-6.6%)	-158 (-15.9%)	0 (0%)	0 (0%)
	AN	-8 (-1.8%)	-18 (-3.7%)	-8 (-1.8%)	-18 (-3.7%)	0 (0%)	0 (0%)
	BN	-11 (-2.6%)	-17 (-3.8%)	-11 (-2.6%)	-17 (-3.9%)	0 (0%)	0 (0%)
	D	-2 (-0.4%)	-3 (-0.7%)	-2 (-0.5%)	-3 (-0.7%)	0 (0%)	0 (0%)
	C	4 (1.3%)	3 (0.9%)	-17 (-4.9%)	-18 (-5.3%)	0 (0%)	14 (4.4%)
	AVG	-27 (-4.6%)	-59 (-10%)	-27 (-4.5%)	-59 (-9.9%)	0 (0%)	2 (0.4%)
Oct	W	-23 (-2.4%)	-44 (-4.4%)	-28 (-2.8%)	-49 (-4.9%)	0 (0%)	0 (0%)
	AN	-57 (-7.1%)	-73 (-9.1%)	-65 (-7.9%)	-81 (-9.9%)	0 (0%)	1 (0.1%)
	BN	-37 (-4.3%)	-60 (-7%)	-39 (-4.5%)	-62 (-7.1%)	0 (0%)	3 (0.3%)
	D	-6 (-0.7%)	-15 (-1.7%)	-6 (-0.7%)	-15 (-1.7%)	0 (0%)	0 (0%)
	C	-21 (-3.3%)	-136 (-21.4%)	-19 (-2.9%)	-133 (-21.2%)	0 (0%)	0 (-0.1%)
	AVG	-27 (-3.1%)	-58 (-6.7%)	-29 (-3.4%)	-61 (-7%)	0 (0%)	1 (0.1%)
Nov	W	12 (2%)	-42 (-7%)	18 (3.2%)	-35 (-5.9%)	0 (0%)	0 (0%)
	AN	-9 (-3.1%)	-20 (-6.6%)	-11 (-3.6%)	-21 (-7.1%)	0 (0%)	0 (0%)
	BN	1 (0.3%)	-22 (-6.7%)	-1 (-0.2%)	-24 (-7.2%)	0 (0%)	0 (0%)
	D	-6 (-1.6%)	-6 (-1.7%)	-6 (-1.6%)	-6 (-1.7%)	0 (0%)	0 (0%)
	C	-18 (-5.6%)	-21 (-6.6%)	-20 (-6%)	-23 (-7%)	0 (0%)	1 (0.2%)
	AVG	-1 (-0.3%)	-24 (-5.9%)	0 (0%)	-23 (-5.6%)	0 (0%)	0 (0%)
Dec	W	44 (5.7%)	-93 (-12.3%)	36 (4.6%)	-101 (-13.2%)	0 (0%)	-10 (-1.5%)
	AN	-9 (-3.1%)	-19 (-6.6%)	-8 (-2.8%)	-19 (-6.3%)	0 (0%)	0 (0%)
	BN	1 (0.3%)	6 (1.8%)	-1 (-0.2%)	4 (1.2%)	0 (0%)	0 (0%)
	D	-6 (-1.7%)	-6 (-1.8%)	-6 (-1.7%)	-6 (-1.8%)	0 (0%)	0 (0%)
	C	-18 (-6.7%)	-22 (-8.1%)	-20 (-7.3%)	-23 (-8.7%)	0 (0%)	0 (0%)
	AVG	9 (2%)	-36 (-8%)	6 (1.3%)	-39 (-8.6%)	0 (0%)	-3 (-0.8%)

[1] A positive value indicates higher average flows in the preliminary proposal than in existing biological conditions.
[2] Water-year type was determined using the San Joaquin River Water-Year Type Classification

San Joaquin River Subregion (San Joaquin River at Vernalis)

CALSIM flow data for the San Joaquin River at Vernalis averaged by water-year type, month, and scenario, together with average monthly differences between scenarios, are provided in Table C.5.3-9 and Table C.5.3-10. This location is technically within the south Delta subregion but is taken to represent the flows from the San Joaquin River subregion. Based on these results, no appreciable effects of the preliminary proposal on migration or attraction flows are expected in this subregion.

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