

Long-Term Operation – Biological Assessment

Appendix AB-O – Tributary Habitat Restoration

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	Sacramento River (10,000 ton target)	% target	Stanislaus River (3,000 ton target)	% target	American River (7,000 ton target)	% target
1999	25,000	250%	-	0%	6,000	86%
2000	32,000	320%	1,300	43%	-	0%
2001	0	0%	500	17%	-	0%
2002	15,000	150%	4,000	133%	-	0%
2003	8,800	88%	-	0%	-	0%
2004	8,500	85%	1,200	40%	-	0%
2005	7200	72%	2500	83%	-	0%
2006	6,000	60%	2,500	83%	-	0%
2007	6,000	60%	4,100	137%	0	0%
2008	8,300	83%	-	0%	7,000	100%
2009	9,900	99%	-	0%	10,600	151%
2010	5,500	55%	-	0%	16,000	229%
2011	5,000	50%	5000	167%	20,770	297%
2012	15,000	150%	3000	100%	24,510	350%
2013	14,000	140%	-	0%	6,000	86%
2014	0	0%	0	0%	10,000	143%
2015	0	0%	8,000	267%	0	0%
2016	32,000	320%	-	-	38,700	553%
2017	14,000	140%	-	-	-	-
2018	0	0%	0	-	0	-
2019	32,000	320%	-	-	22,000	314%
2020	2,000	20%	15,000	500%	-	-
2021	38,000	380%	8,000	267%	23,700	339%
2022	20,000	200%	-	-	-	-
TOTAL	358,200	138%	60,100	95%	185,280	120%

O.4.2 Stanislaus River

Table O-2. Historical gravel injection amounts (in tons and cubic yards) into the lower Stanislaus River

Year	Amount (Tons)	Amount (Cubic Yards)	Gravel Injection Location
1994	4605	3,070	-

Year	Amount (Tons)	Amount (Cubic Yards)	Gravel Injection Location
1995	0	0	-
1996	0	0	-
1997	19,772	13,181	Goodwin Cable Crossing area
1998	6,666	4,444	Goodwin Cable Crossing area
1999	13,000	7,647	18 riffles in lower Stanislaus River (Two-Mile Bar to city of Oakdale)
2000	2,148	1,432	Goodwin Cable Crossing area
2001	732	488	Goodwin Float Tube Pool - helicopter
2002	4,000	2,353	Goodwin Cable Crossing area
2003	0	0	-
2004	1,050	700	Goodwin Float Tube Pool - sluice
2005	2,500	1,471	-
2006	2,500	1,471	Goodwin Cable Crossing area
2007	17,118	11,412	Lover's Leap
2007	4,100	3,000	Goodwin Cable Crossing area
2008	0	0	Knights Ferry fire station
2009	0	0	-
2010	0	0	-
2011	5,000	2,941	Goodwin Cable Crossing area
2012	3,000	1,765	Goodwin Float Tube Pool - sluice
2012	13,600	8,000	Main channel and floodplain bench at Honolulu Bar
2013	0	0	-
2014	0	0	-
2015	7,059	4,706	Goodwin and cable crossing
2017	4,257	2,838	Buttonbush
2018	1,875	1,250	Rodden Road
2020	15,000	10,000	Goodwin Canyon (3000 tons in Float Tube Pool and 12000 tons at Cable Crossing)
TOTAL	112,982	82,169	-

Based on this conceptual model, increasing habitat availability and heterogeneity through restoration has the potential to increase salmon survival by providing refuge habitat from predators and adverse environmental conditions. Potential increases in food production and retention also can positively affect rearing survival.

Habitat restoration can affect juvenile salmon growth as well through effects on food production and retention. For example, creation of new floodplain habitat can increase local growth rates, given observed differences in food production and growth between floodplain and channel habitat (Jeffres et al. 2008). Gravel augmentations also can increase observed macroinvertebrate biomass (Merz and Chan 2005). Constructed side channels can create new food resources capable of being utilized by juvenile salmon (Heady and Merz 2007).

Habitat restoration also can support greater life-history diversity. For example, floodplain habitats have been observed to support greater life-history diversity, based on observations of size variability in the Yolo Bypass as a function of inundation period and temperature variability (Goertler et al. 2017). Habitat restoration can more broadly influence phenotypic and life-history expression by modifying the distribution of resources (Watters et al. 2003).

O.4.5 Datasets

Habitat restoration can have a positive impact on Federally listed native fish species, and its success is influenced by multiple factors, including hydrology, water quality, and fish population abundances and distribution. Monitoring of hydrodynamics, water quality, and fish populations has been ongoing for over forty years, for some datasets, and covers a large spatial extent of many of the Central Valley tributaries. These data and the following plots serve as the foundation and to illustrate patterns of interannual variability in historical hydrology and exports and trends in water quality. They also provide data and visualizations of trends in Federally listed native fish population abundances and distribution.

Presented in this section are three themes of empirical data: hydrodynamics, water quality parameters, and fish observations for Federally listed native fish species. Hydrodynamics datasets (Section 4.5.1, *Hydrodynamics*) include [Placeholder for datasets]. Water quality parameters (Section 4.5.2, *Water Quality Parameters*) include [Placeholder for datasets]. Fish observations (Section 4.5.3, *Fish Observations*) are separated into tributaries. The CVPIA Program has habitat restoration data for Stanislaus, American, Sacramento, and Clear Creek including spawning data (aerial, carcass), otolith and PBT genetics, and spawn weighted usable area (WUA) and redd dewatering.

While some datasets include data gaps or shorter sampling efforts than others, overall, a large body of historic monitoring data within many of the Central Valley tributaries is available. These data sets, in conjunction with modeled data (i.e., CalSim 3, DSM2, USRDOM), serve as inputs for models that can be used to understand and predict the effects of CVP and SWP operations on environmental conditions and fish distributions and loss. Each data set is incorporated into one or multiple lines of evidence used to inform conclusions about both the magnitude and direction of differences among alternatives regarding habitat restoration and listed native fish populations abundance.

Table O-4. Chinook redd data for 2020 in the American River by location and river mile.
Description of 2nd half of table

Location	River Mile	# Redds
Nimbus Basin	23	1592
Upper Sailor Bar	23/ 22	1168
Lower Sailor Bar	22	662
Upper Sunrise	21	215
Sunrise	20	495
Lower Sunrise	20	438
Sacramento Bar	19	49
El Manto	19	5
El Manto	18	0
Rossmoor Bar	17	42
Ancil Hoffman	17	64
Upper River Bend	15	39
River Bend	14	4
Lower River Bend	13	13
Gristmill	12	3
Sara Park	11	1
Watt Ave	10	1
TOTAL 2020 REDD COUNT		4791
Gravel Project Sites:		# Redds
Nimbus Basin - main channel	-	926
Nimbus Basin - SC	-	529
Upper Sailor Bar - 2019 -Upper Pad	-	390
Upper Sailor Bar - 2019 -Lower Pad	-	521
Upper Sailor Bar - 2019 - SC	-	257
Lower Sailor Bar - 2012	-	87
Upper Sunrise - 2010	-	0
Upper Sunrise - 2011	-	21
Sacramento Bar - main channel	-	48
River Bend Park - main channel	-	1
River Bend Park SC	-	0
2008 Lower Sunrise Side Channel - WF		14
-	-	-
Fry production at 5,000 eggs/female and 30% egg to fry survival		
	Fry	7,186,500

Spawning habitat weighted usable area analysis in the upper Sacramento for winter-run Chinook salmon shows that for spawning flows below approximately 10,000 cfs, spawning habitat weighted usable area value peaks for Section 6 (Keswick- ACID (dam board in) and Section 5 (ACID to Cow Creek). For segment 4 (Cow Creek to Battle Creek and), spawning habitat decreases with flows below 5,000 cfs. The greatest weighted usable area for spawning habitat value is during Dry water years under EXP 3 and the lowest weighted usable area habitat value is during critical years under EXP1. Releases during the summer of dry and critically dry years are quite different for these two scenarios (Figure O-4). EXP1 is the lowest during the winter-run Chinook spawning month, which results in a low WUA habitat value, while EXP3 is closest to the peak of the WUA curve, which is at 10,000 cfs.

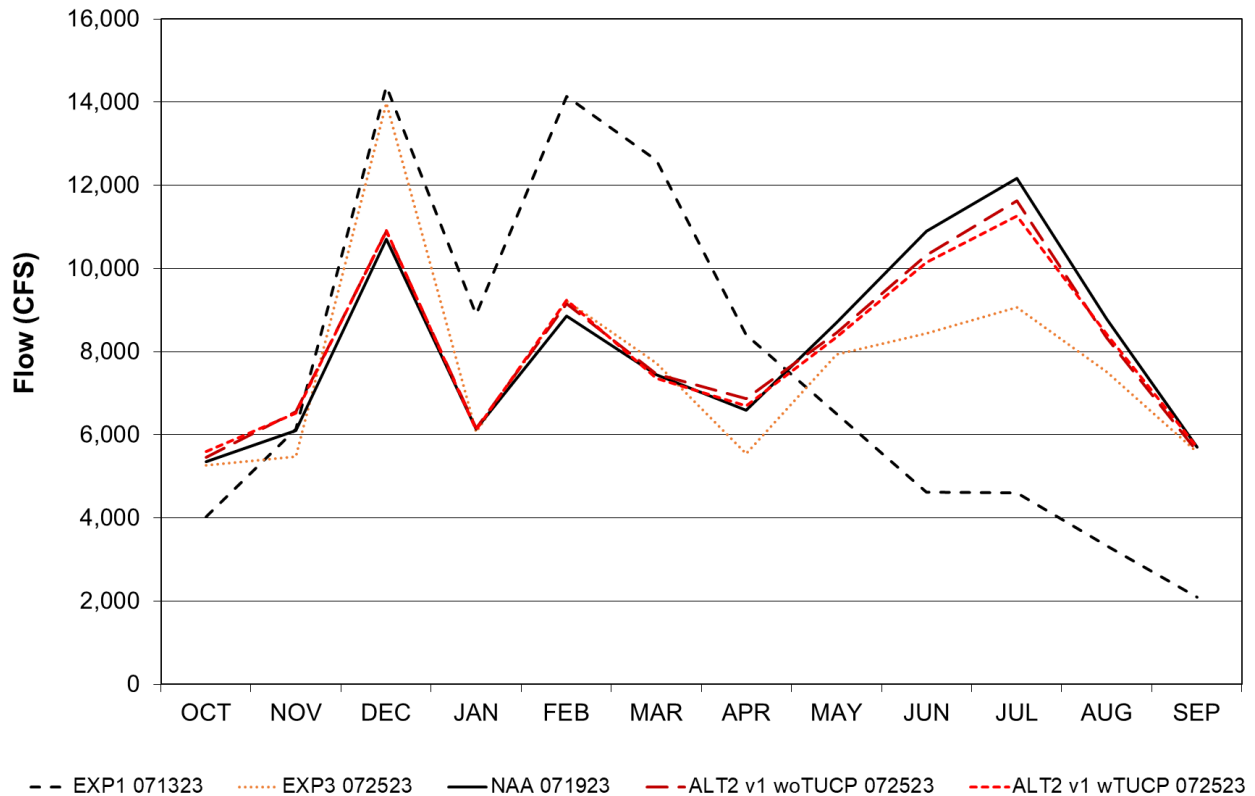


Figure O-4. Sacramento River Flow at Bend Bridge Dry and Critically Dry Years (40-30-30)

Table O-6. Winter-run Spawning WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	503,647	576,192	545,135	548,494	548,607	548,848
AN	477,951	594,047	518,502	522,694	523,507	530,681
BN	469,563	599,138	532,471	538,253	538,289	546,497

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
D	468,443	601,967	547,915	560,634	557,712	564,350
C	421,055	598,986	582,871	583,645	578,943	580,022
All	472,251	592,655	545,832	551,576	550,275	554,590

Table O-7. Winter-run Spawning WUA combined means weighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	545,135	547,715	548,572	548,494	548,607	548,848	543,711	548,569
AN	518,502	511,277	522,731	522,694	523,507	530,681	547,419	522,906
BN	532,471	527,984	538,123	538,253	538,289	546,497	554,780	534,410
D	547,915	549,027	561,083	560,634	557,712	564,350	552,224	558,365
C	582,871	578,374	582,443	583,645	578,943	580,022	581,003	585,336
All	545,832	544,283	551,495	551,576	550,275	554,590	554,232	550,661

Table O-8. Winter-run Spawning WUA combined mean percent differences between the EIS alternatives and the NAA, weighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	545,135	0.47	0.63	0.62	0.64	0.68	-0.26	0.63
AN	518,502	-1.39	0.82	0.81	0.97	2.35	5.58	0.85
BN	532,471	-0.84	1.06	1.09	1.09	2.63	4.19	0.36
D	547,915	0.20	2.40	2.32	1.79	3.00	0.79	1.91
C	582,871	-0.77	-0.07	0.13	-0.67	-0.49	-0.32	0.42
All	545,832	-0.28	1.04	1.05	0.81	1.60	1.54	0.88

[Placeholder narrative text for spring-run spawning]

Table O-9. Spring-run Spawning WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	439,130	451,262	340,515	343,070	342,592	342,214
AN	401,963	453,809	359,947	352,226	350,776	352,152

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
BN	330,606	451,585	429,354	428,824	431,627	430,136
D	273,640	452,989	440,725	440,399	441,154	440,956
C	247,091	459,597	443,545	448,282	435,218	435,186
All	344,395	453,360	399,692	399,840	398,123	397,909

Table O-10. Spring-run Spawning WUA combined means weighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	340,515	359,262	343,188	343,070	342,592	342,214	355,495	343,198
AN	359,947	415,812	352,157	352,226	350,776	352,152	380,542	352,056
BN	429,354	424,073	427,272	428,824	431,627	430,136	418,510	427,753
D	440,725	439,070	440,393	440,399	441,154	440,956	434,659	440,213
C	443,545	431,449	456,308	448,282	435,218	435,186	451,937	457,579
All	399,692	409,562	400,832	399,840	398,123	397,909	404,640	401,066

Table O-11. Spring-run Spawning WUA combined mean percent differences between the EIS alternatives and the NAA, weighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2v1 wTUCP	Alt2v1 woTUCP	Alt2Delta	Alt2All Watershed	Alt 3	Alt 4
W	340,515	5.51	0.78	0.75	0.61	0.50	4.40	0.79
AN	359,947	15.52	-2.16	-2.14	-2.55	-2.17	5.72	-2.19
BN	429,354	-1.23	-0.48	-0.12	0.53	0.18	-2.53	-0.37
D	440,725	-0.38	-0.08	-0.07	0.10	0.05	-1.38	-0.12
C	443,545	-2.73	2.88	1.07	-1.88	-1.88	1.89	3.16
All	399,692	2.47	0.29	0.04	-0.39	-0.45	1.24	0.34

[Placeholder narrative text for steelhead spawning in the Sac]

Table O-12. Steelhead Spawning WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	41,897	68,022	68,940	68,889	68,907	68,835

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
AN	53,504	82,616	85,350	86,419	86,071	85,715
BN	89,406	112,719	115,190	114,543	114,585	114,042
D	98,693	115,715	118,718	118,798	118,827	118,828
C	117,244	120,505	120,314	120,229	120,958	120,945
All	77,760	97,954	99,729	99,753	99,841	99,671

Table O-13. Steelhead Spawning WUA combined means weighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	68,940	68,257	68,872	68,889	68,907	68,835	68,905	68,974
AN	85,350	83,628	85,338	86,419	86,071	85,715	85,383	85,113
BN	115,190	113,671	114,540	114,543	114,585	114,042	115,340	114,529
D	118,718	118,760	118,804	118,798	118,827	118,828	119,787	118,762
C	120,314	121,510	119,788	120,229	120,958	120,945	121,177	120,064
All	99,729	99,225	99,528	99,753	99,841	99,671	100,145	99,557

Table O-14. Steelhead Spawning WUA combined mean percent differences between the EIS alternatives and the NAA, weighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	68,940	-0.99	-0.10	-0.07	-0.05	-0.15	-0.05	0.05
AN	85,350	-2.02	-0.01	1.25	0.85	0.43	0.04	-0.28
BN	115,190	-1.32	-0.56	-0.56	-0.53	-1.00	0.13	-0.57
D	118,718	0.04	0.07	0.07	0.09	0.09	0.90	0.04
C	120,314	0.99	-0.44	-0.07	0.54	0.52	0.72	-0.21
All	99,729	-0.51	-0.20	0.02	0.11	-0.06	0.42	-0.17

[Placeholder narrative text for fall-run spawning in the Sac]

Table O-15. Fall-run Spawning WUA combined means weighted by month and Sacramento River segment, including segment 3, for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	270,962	255,464	248,609	247,665	246,597	246,813
AN	271,725	265,598	260,323	257,011	254,853	255,899
BN	246,291	277,176	279,409	277,477	275,880	274,523
D	240,802	280,288	282,535	281,218	281,931	279,807
C	241,628	306,968	295,535	295,655	293,366	293,615
All	254,885	274,575	271,162	269,760	268,670	268,172

Table O-16. Fall-run Spawning WUA combined means weighted by month and Sacramento River segment, including segment 3, for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	248,609	251,195	247,735	247,665	246,597	246,813	253,861	248,051
AN	260,323	271,327	257,015	257,011	254,853	255,899	266,848	257,479
BN	279,409	278,724	277,187	277,477	275,880	274,523	272,376	275,650
D	282,535	282,309	281,169	281,218	281,931	279,807	281,449	281,806
C	295,535	293,889	299,876	295,655	293,366	293,615	300,890	298,829
All	271,162	273,059	270,353	269,760	268,670	268,172	272,874	270,231

Table O-17. Fall-run Spawning WUA combined mean percent differences between the EIS alternatives and the NAA, weighted by month and Sacramento River segment, including segment 3, for all water year types

WYT	NAA	Alt 1	Alt2v1 wTUCP	Alt2v1 woTUCP	Alt2Delta	Alt2All Watershed	Alt 3	Alt 4
W	248,609	1.04	-0.35	-0.38	-0.81	-0.72	2.11	-0.22
AN	260,323	4.23	-1.27	-1.27	-2.10	-1.70	2.51	-1.09
BN	279,409	-0.25	-0.79	-0.69	-1.26	-1.75	-2.52	-1.35
D	282,535	-0.08	-0.48	-0.47	-0.21	-0.97	-0.38	-0.26
C	295,535	-0.56	1.47	0.04	-0.73	-0.65	1.81	1.11
All	271,162	0.70	-0.30	-0.52	-0.92	-1.10	0.63	-0.34

[Placeholder narrative text for late fall-run spawning in the Sac]

Table O-18. Late Fall-run Spawning WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	128,356	116,362	173,702	172,176	172,601	172,584
AN	137,779	159,340	226,884	226,599	226,173	225,212
BN	165,162	227,012	257,048	255,026	254,051	253,848
D	200,893	253,854	280,192	274,857	276,405	275,625
C	242,151	312,104	308,625	304,394	308,616	309,708
All	171,781	205,891	243,156	240,372	241,296	241,106

Table O-19. Late Fall-run Spawning WUA combined means weighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	173,702	170,866	171,746	172,176	172,601	172,584	170,001	174,201
AN	226,884	210,084	223,076	226,599	226,173	225,212	213,486	226,719
BN	257,048	253,693	255,025	255,026	254,051	253,848	249,880	254,618
D	280,192	277,702	274,627	274,857	276,405	275,625	276,762	277,845
C	308,625	306,270	304,982	304,394	308,616	309,708	302,470	304,190
All	243,156	238,310	239,795	240,372	241,296	241,106	237,085	241,600

Table O-20. Late Fall-run Spawning WUA combined mean percent differences between the EIS alternatives and the NAA, weighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2v1 wTUCP	Alt2v1 woTUCP	Alt2Delta	Alt2All Watershed	Alt 3	Alt 4
W	173,702	-1.63	-1.13	-0.88	-0.63	-0.64	-2.13	0.29
AN	226,884	-7.40	-1.68	-0.13	-0.31	-0.74	-5.91	-0.07
BN	257,048	-1.31	-0.79	-0.79	-1.17	-1.24	-2.79	-0.95
D	280,192	-0.89	-1.99	-1.90	-1.35	-1.63	-1.22	-0.84
C	308,625	-0.76	-1.18	-1.37	0.00	0.35	-1.99	-1.44
All	243,156	-1.99	-1.38	-1.14	-0.76	-0.84	-2.50	-0.64

[placeholder narrative text winter-run fry and juvenile rearing, spring-run fry and juvenile rearing, and steelhead fry and juvenile rearing]

Table O-21. Winter-run Fry-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	266,854	268,280	235,210	234,984	234,656	234,938
AN	257,580	266,879	237,840	236,715	236,564	236,501
BN	228,209	265,673	254,387	253,464	253,344	252,334
D	210,866	264,051	257,409	256,880	257,399	257,864
C	188,143	262,792	257,398	259,957	255,456	255,519
All	232,888	265,748	247,838	247,705	246,996	247,008

Table O-22. Winter-run Fry-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	235,210	237,442	234,968	234,984	234,656	234,938	240,093	234,997
AN	237,840	245,321	236,761	236,715	236,564	236,501	242,387	236,813
BN	254,387	251,034	253,021	253,464	253,344	252,334	257,933	252,214
D	257,409	256,959	256,873	256,880	257,399	257,864	259,847	257,277
C	257,398	253,475	263,028	259,957	255,456	255,519	262,727	262,259
All	247,838	248,220	248,095	247,705	246,996	247,008	251,909	247,946

Table O-23. Winter-run Fry-rearing WUA combined mean percent differences between the EIS alternatives and the NAA, weighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	235,210	0.95	-0.10	-0.10	-0.24	-0.12	2.08	-0.09
AN	237,840	3.15	-0.45	-0.47	-0.54	-0.56	1.91	-0.43
BN	254,387	-1.32	-0.54	-0.36	-0.41	-0.81	1.39	-0.85
D	257,409	-0.17	-0.21	-0.21	0.00	0.18	0.95	-0.05
C	257,398	-1.52	2.19	0.99	-0.75	-0.73	2.07	1.89
All	247,838	0.15	0.10	-0.05	-0.34	-0.33	1.64	0.04

Table O-24. Winter-run Juvenile-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	137,825	141,579	136,563	136,574	136,480	136,502
AN	136,925	136,994	134,859	134,439	134,260	134,429
BN	128,529	136,520	133,640	133,246	133,121	132,936
D	129,802	136,889	136,003	135,658	135,872	135,853
C	123,629	137,292	135,317	135,360	135,209	135,298
All	131,931	138,215	135,453	135,245	135,200	135,208

Table O-25. Winter-run Juvenile-rearing WUA combined means unweighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	136,563	136,945	136,582	136,574	136,480	136,502	137,149	136,587
AN	134,859	135,568	134,399	134,439	134,260	134,429	135,149	134,599
BN	133,640	133,516	133,217	133,246	133,121	132,936	133,037	133,030
D	136,003	136,234	135,643	135,658	135,872	135,853	135,789	135,874
C	135,317	135,259	136,207	135,360	135,209	135,298	136,203	136,324
All	135,453	135,691	135,360	135,245	135,200	135,208	135,635	135,431

Table O-26. Winter-run Juvenile-rearing WUA combined mean percent differences between the EIS alternatives and the NAA, unweighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	136,563	0.28	0.01	0.01	-0.06	-0.04	0.43	0.02
AN	134,859	0.53	-0.34	-0.31	-0.44	-0.32	0.21	-0.19
BN	133,640	-0.09	-0.32	-0.29	-0.39	-0.53	-0.45	-0.46
D	136,003	0.17	-0.26	-0.25	-0.10	-0.11	-0.16	-0.09
C	135,317	-0.04	0.66	0.03	-0.08	-0.01	0.66	0.74
All	135,453	0.18	-0.07	-0.15	-0.19	-0.18	0.13	-0.02

Table O-27. Spring-run Fry-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	416,795	457,583	455,508	453,691	454,147	453,937
AN	413,508	480,525	491,821	489,252	489,809	485,585
BN	416,041	537,650	528,229	523,994	524,594	520,618
D	431,463	554,191	549,399	542,669	546,266	544,527
C	484,777	595,099	580,491	567,869	565,212	565,304
All	430,544	520,166	516,082	510,841	511,587	509,814

Table O-28. Spring-run Fry-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	455,508	459,294	453,553	453,691	454,147	453,937	451,157	455,905
AN	491,821	489,832	488,294	489,252	489,809	485,585	484,558	492,029
BN	528,229	519,813	523,923	523,994	524,594	520,618	530,257	523,900
D	549,399	542,581	541,788	542,669	546,266	544,527	553,984	545,807
C	580,491	568,482	579,203	567,869	565,212	565,304	577,040	576,456
All	516,082	511,765	512,255	510,841	511,587	509,814	514,811	513,976

Table O-29. Spring-run Fry-rearing WUA combined mean percent differences between the EIS alternatives and the NAA, weighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	455,508	0.83	-0.43	-0.40	-0.30	-0.34	-0.96	0.09
AN	491,821	-0.40	-0.72	-0.52	-0.41	-1.27	-1.48	0.04
BN	528,229	-1.59	-0.82	-0.80	-0.69	-1.44	0.38	-0.82
D	549,399	-1.24	-1.39	-1.23	-0.57	-0.89	0.83	-0.65
C	580,491	-2.07	-0.22	-2.17	-2.63	-2.62	-0.59	-0.70
All	516,082	-0.84	-0.74	-1.02	-0.87	-1.21	-0.25	-0.41

Table O-30. Spring-run Juvenile-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	182,154	183,641	176,621	175,478	175,359	175,491
AN	187,247	192,085	191,772	189,570	188,849	189,116
BN	182,973	209,016	205,613	203,723	203,074	202,858
D	192,028	216,519	217,257	214,433	215,220	214,642
C	193,690	229,142	226,675	223,881	224,132	224,786
All	187,336	204,369	201,520	199,430	199,407	199,410

Table O-31. Spring-run Juvenile-rearing WUA combined means unweighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	176,621	177,085	175,420	175,478	175,359	175,491	178,542	176,308
AN	191,772	193,605	188,962	189,570	188,849	189,116	191,760	190,139
BN	205,613	205,328	203,557	203,723	203,074	202,858	203,781	202,808
D	217,257	217,108	214,448	214,433	215,220	214,642	214,799	215,985
C	226,675	225,580	225,044	223,881	224,132	224,786	222,811	224,606
All	201,520	201,681	199,471	199,430	199,407	199,410	200,552	200,065

Table O-32. Spring-run Juvenile-rearing WUA combined mean percent differences between the EIS alternatives and the NAA, unweighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	176,621	0.26	-0.68	-0.65	-0.71	-0.64	1.09	-0.18
AN	191,772	0.96	-1.47	-1.15	-1.52	-1.38	-0.01	-0.85
BN	205,613	-0.14	-1.00	-0.92	-1.23	-1.34	-0.89	-1.36
D	217,257	-0.07	-1.29	-1.30	-0.94	-1.20	-1.13	-0.59
C	226,675	-0.48	-0.72	-1.23	-1.12	-0.83	-1.70	-0.91
All	201,520	0.08	-1.02	-1.04	-1.05	-1.05	-0.48	-0.72

Table O-33. Steelhead Fry-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	517,053	429,915	369,731	369,270	369,217	369,514
AN	532,254	412,169	370,176	370,052	369,569	368,182
BN	524,923	399,469	379,819	377,485	378,388	375,573
D	506,445	397,856	383,413	381,072	382,286	383,068
C	500,494	400,888	395,872	415,011	412,754	411,061
All	515,476	409,637	379,021	380,946	380,961	380,262

Table O-34. Steelhead Fry-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	369,731	369,951	369,257	369,270	369,217	369,514	376,385	369,261
AN	370,176	377,065	370,059	370,052	369,569	368,182	371,535	370,069
BN	379,819	375,275	376,446	377,485	378,388	375,573	382,589	376,785
D	383,413	380,264	380,896	381,072	382,286	383,068	388,407	380,574
C	395,872	395,783	418,908	415,011	412,754	411,061	418,050	411,478
All	379,021	378,472	381,336	380,946	380,961	380,262	386,317	380,136

Table O-35. Steelhead Fry-rearing WUA combined mean percent differences between the EIS alternatives and the NAA, weighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	369,731	0.06	-0.13	-0.12	-0.14	-0.06	1.80	-0.13
AN	370,176	1.86	-0.03	-0.03	-0.16	-0.54	0.37	-0.03
BN	379,819	-1.20	-0.89	-0.61	-0.38	-1.12	0.73	-0.80
D	383,413	-0.82	-0.66	-0.61	-0.29	-0.09	1.30	-0.74
C	395,872	-0.02	5.82	4.83	4.26	3.84	5.60	3.94
All	379,021	-0.14	0.61	0.51	0.51	0.33	1.92	0.29

Table O-36. Steelhead Juvenile-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	169,059	170,656	164,114	163,190	163,063	163,166
AN	173,183	176,981	176,458	174,604	174,015	174,225
BN	168,711	191,453	188,133	186,665	186,134	185,880
D	176,487	197,392	197,910	195,623	196,298	195,845
C	176,722	207,617	205,617	203,335	203,506	204,054
All	172,688	187,459	184,750	183,055	183,030	183,024

Table O-37. Steelhead Juvenile-rearing WUA combined means unweighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	164,114	164,551	163,146	163,190	163,063	163,166	165,783	163,881
AN	176,458	177,999	174,141	174,604	174,015	174,225	176,511	175,097
BN	188,133	188,009	186,549	186,665	186,134	185,880	186,435	185,951
D	197,910	197,849	195,606	195,623	196,298	195,845	195,894	196,900
C	205,617	204,775	204,251	203,335	203,506	204,054	202,427	204,063
All	184,750	184,946	183,086	183,055	183,030	183,024	183,952	183,610

Table O-38. Steelhead Juvenile-rearing WUA combined mean percent differences between the EIS alternatives and the NAA, unweighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	164,114	0.27	-0.59	-0.56	-0.64	-0.58	1.02	-0.14
AN	176,458	0.87	-1.31	-1.05	-1.38	-1.27	0.03	-0.77
BN	188,133	-0.07	-0.84	-0.78	-1.06	-1.20	-0.90	-1.16
D	197,910	-0.03	-1.16	-1.16	-0.81	-1.04	-1.02	-0.51
C	205,617	-0.41	-0.66	-1.11	-1.03	-0.76	-1.55	-0.76
All	184,750	0.11	-0.90	-0.92	-0.93	-0.93	-0.43	-0.62

Table O-39. Fall-run Fry-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	116,325	132,264	177,821	176,841	177,013	176,998
AN	128,166	176,574	229,007	229,343	228,862	228,191
BN	181,832	268,021	295,355	291,907	290,983	290,331
D	216,169	292,780	317,204	313,867	314,902	313,433
C	281,564	351,518	344,867	339,484	344,537	345,060
All	180,081	235,993	266,237	263,724	264,592	264,108

Table O-40. Fall-run Fry-rearing WUA combined means unweighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	177,821	175,517	176,638	176,841	177,013	176,998	174,415	177,805
AN	229,007	217,392	226,428	229,343	228,862	228,191	219,760	228,283
BN	295,355	289,712	291,889	291,907	290,983	290,331	287,489	291,396
D	317,204	316,040	313,453	313,867	314,902	313,433	317,316	315,155
C	344,867	345,067	343,041	339,484	344,537	345,060	344,619	341,795
All	266,237	262,621	263,725	263,724	264,592	264,108	262,503	264,457

Table O-41. Fall-run Fry-rearing WUA combined mean percent differences between the EIS alternatives and the NAA, unweighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	177,821	-1.30	-0.67	-0.55	-0.45	-0.46	-1.92	-0.01
AN	229,007	-5.07	-1.13	0.15	-0.06	-0.36	-4.04	-0.32
BN	295,355	-1.91	-1.17	-1.17	-1.48	-1.70	-2.66	-1.34
D	317,204	-0.37	-1.18	-1.05	-0.73	-1.19	0.04	-0.65
C	344,867	0.06	-0.53	-1.56	-0.10	0.06	-0.07	-0.89
All	266,237	-1.36	-0.94	-0.94	-0.62	-0.80	-1.40	-0.67

Table O-42. Fall-run Juvenile-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	149,520	177,624	167,061	166,986	167,013	167,070
AN	158,113	184,813	173,315	173,471	173,501	172,640
BN	176,455	201,053	188,565	187,747	188,449	187,141
D	184,222	203,830	192,553	193,236	193,811	194,576
C	207,643	215,987	207,891	209,372	207,499	206,366
All	173,199	195,275	184,459	184,713	184,689	184,351

Table O-43. Fall-run Juvenile-rearing WUA combined means unweighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	167,061	165,808	166,997	166,986	167,013	167,070	164,405	166,980
AN	173,315	171,758	173,451	173,471	173,501	172,640	171,616	173,477
BN	188,565	185,016	187,349	187,747	188,449	187,141	192,391	187,171
D	192,553	190,916	192,941	193,236	193,811	194,576	197,892	192,681
C	207,891	203,702	213,653	209,372	207,499	206,366	215,240	211,970
All	184,459	182,188	185,256	184,713	184,689	184,351	186,623	184,891

Table O-44. Fall-run Juvenile-rearing WUA combined mean percent differences between the EIS alternatives and the NAA, unweighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	167,061	-0.75	-0.04	-0.05	-0.03	0.00	-1.59	-0.05
AN	173,315	-0.90	0.08	0.09	0.11	-0.39	-0.98	0.09
BN	188,565	-1.88	-0.64	-0.43	-0.06	-0.76	2.03	-0.74
D	192,553	-0.85	0.20	0.35	0.65	1.05	2.77	0.07
C	207,891	-2.02	2.77	0.71	-0.19	-0.73	3.54	1.96
All	184,459	-1.23	0.43	0.14	0.13	-0.06	1.17	0.23

Table O-45. Late Fall-run Fry-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	398,085	443,727	408,175	407,907	407,868	407,993
AN	417,558	446,301	413,558	413,850	414,305	409,047
BN	441,256	454,261	424,557	424,582	426,992	419,988
D	450,014	459,884	432,209	432,163	433,380	435,731
C	503,760	476,380	466,993	472,641	463,016	458,930
All	437,953	455,086	427,057	427,919	427,158	425,107

Table O-46. Late Fall-run Fry-rearing WUA combined means unweighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	408,175	409,503	407,911	407,907	407,868	407,993	404,002	407,950
AN	413,558	418,974	414,442	413,850	414,305	409,047	413,311	414,684
BN	424,557	423,266	423,934	424,582	426,992	419,988	438,344	423,485
D	432,209	425,394	431,906	432,163	433,380	435,731	448,418	431,687
C	466,993	450,647	483,744	472,641	463,016	458,930	493,127	475,630
All	427,057	423,703	429,602	427,919	427,158	425,107	436,407	428,215

Table O-47. Late Fall-run Fry-rearing WUA combined mean percent differences between the EIS alternatives and the NAA, unweighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	408,175	0.33	-0.06	-0.07	-0.08	-0.04	-1.02	-0.06
AN	413,558	1.31	0.21	0.07	0.18	-1.09	-0.06	0.27
BN	424,557	-0.30	-0.15	0.01	0.57	-1.08	3.25	-0.25
D	432,209	-1.58	-0.07	-0.01	0.27	0.81	3.75	-0.12
C	466,993	-3.50	3.59	1.21	-0.85	-1.73	5.60	1.85
All	427,057	-0.79	0.60	0.20	0.02	-0.46	2.19	0.27

Table O-48. Late Fall-run Juvenile-rearing WUA combined means weighted by month and Sacramento River segment for all water year types (Biological Assessment Results)

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	190,694	175,454	146,115	146,382	146,289	146,525
AN	199,677	169,711	138,604	139,000	138,957	140,412
BN	203,839	164,775	136,531	137,706	138,187	139,757
D	200,968	164,733	141,755	143,664	143,393	145,519
C	196,226	168,088	158,342	165,568	164,259	163,625
All	197,669	168,976	144,248	146,204	145,984	146,945

Table O-49. Late Fall-run Juvenile-rearing WUA combined means unweighted by month and Sacramento River segment for all water year types (EIS Results)

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	146,115	145,066	146,404	146,382	146,289	146,525	146,985	146,362
AN	138,604	138,055	138,927	139,000	138,957	140,412	140,532	139,121
BN	136,531	137,398	136,858	137,706	138,187	139,757	139,595	136,582
D	141,755	141,398	143,677	143,664	143,393	145,519	140,093	142,919
C	158,342	154,956	168,956	165,568	164,259	163,625	165,254	167,397
All	144,248	143,406	146,593	146,204	145,984	146,945	146,020	146,127

Table O-50. Late Fall-run Juvenile-rearing WUA combined mean percent differences between the EIS alternatives and the NAA, unweighted by month and Sacramento River segment for all water year types

WYT	NAA	Alt 1	Alt2wTUC PwoVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AIIVA	Alt 3	Alt 4
W	146,115	-0.72	0.20	0.18	0.12	0.28	0.60	0.17
AN	138,604	-0.40	0.23	0.29	0.25	1.30	1.39	0.37
BN	136,531	0.63	0.24	0.86	1.21	2.36	2.24	0.04
D	141,755	-0.25	1.36	1.35	1.16	2.65	-1.17	0.82
C	158,342	-2.14	6.70	4.56	3.74	3.34	4.37	5.72
All	144,248	-0.58	1.63	1.36	1.20	1.87	1.23	1.30

[Placeholder for text for Spring run Chinook and steelhead in Clear Creek. Include tables of average WUA for spawning habitat for different WYTs]

Table O-51. Mean Weighted Usable Area for Combined Lower Alluvial, Upper Alluvial and Canyon Segments by Water Year Type, Steelhead Spawning in Clear Creek

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	35,270	35,662	41,196	43,452	43,452	43,452
AN	35,517	36,262	41,305	43,489	43,489	43,489
BN	32,763	35,167	40,891	43,288	43,295	43,289
D	34,675	37,190	39,588	42,470	42,470	42,470
C	28,227	30,931	36,610	38,618	38,618	38,618
All	33,584	35,267	40,037	42,418	42,420	42,419

Table O-52. Mean Weighted Usable Area for Combined Upper Alluvial and Canyon Segments by Water Year Type, Spring-run Spawning in Clear Creek

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	2,540	5,714	5,752	5,064	5,064	5,064
AN	2,494	5,875	5,643	5,048	5,048	5,048
BN	764	4,170	5,459	4,540	4,561	4,530
D	773	3,287	5,719	5,051	5,051	5,051
C	563	2,926	5,069	4,141	4,215	4,123
All	1,473	4,430	5,567	4,817	4,832	4,812

Table O-53. Mean Weighted Usable Area for Combined Lower Alluvial, Upper Alluvial and Canyon Segments by Water Year Type, Steelhead Fry Rearing in Clear Creek

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	103,078	101,495	88,993	88,538	88,538	88,538
AN	102,954	100,028	88,425	87,994	87,994	87,994
BN	94,135	89,982	88,095	87,994	87,994	87,994
D	93,406	90,963	87,185	87,818	87,818	87,818
C	86,196	84,587	86,766	86,337	86,375	86,375
All	96,429	93,985	87,962	87,839	87,845	87,845

Table O-54. Mean Weighted Usable Area for Combined Lower Alluvial, Upper Alluvial and Canyon Segments by Water Year Type, Steelhead Juvenile Rearing in Clear Creek

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	192,931	254,577	237,237	222,263	222,247	222,247

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
AN	181,198	245,210	232,940	220,041	220,041	220,041
BN	127,122	202,905	229,783	213,121	212,171	211,988
D	119,511	176,737	235,731	220,420	220,420	220,420
C	100,134	144,778	209,260	190,231	190,605	190,750
All	146,974	207,715	230,456	214,739	214,623	214,613

Table O-55. Mean Weighted Usable Area for Combined Lower Alluvial, Upper Alluvial and Canyon Segments by Water Year Type, Spring-run Fry Rearing in Clear Creek

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	185,685	182,813	140,622	148,763	148,758	148,758
AN	181,031	177,134	137,690	145,540	145,540	145,540
BN	145,477	146,556	134,759	144,090	144,017	144,028
D	145,037	142,854	133,683	144,044	144,044	144,044
C	112,753	121,738	127,090	134,599	134,589	134,573
All	156,372	156,130	135,326	144,072	144,056	144,055

Table O-56. Mean Weighted Usable Area for Combined Lower Alluvial, Upper Alluvial and Canyon Segments by Water Year Type, Spring-run Juvenile Rearing in Clear Creek

WYT	EXP 1	EXP 3	NAA	Alt2woTUCPwoVA	Alt2woTUCPDeltaVA	Alt2woTUCPAIIVA
W	231,315	252,978	209,203	206,168	206,168	206,168
AN	230,519	244,602	208,363	205,538	205,538	205,538
BN	194,655	208,445	208,363	205,538	205,538	205,538
D	181,157	193,208	206,955	202,898	202,898	202,898
C	157,449	155,298	184,309	176,143	177,144	177,655
All	200,748	213,816	204,411	200,378	200,538	200,619

O.5.2 CVPIA DSMs

This section will summarize results from Attachment O.2 *CVPIA SIT DSM Habitat Modeling*. This line of evidence was used in the Initial Alternative Report. Results will provide an evaluation of the change in the suitable acres for adults spawning and juvenile rearing.

O.6 Uncertainty

Hydrodynamic and water quality effects of tributary restoration on refuge habitat and food quantity and quality stressors are well documented. Habitat restoration monitoring lacks

mechanistic models to explain individual effects on fish from these restoration actions. Uncertainty remains around how individual effects on survival and growth, from tributary habitat restoration, may affect Endangered Species Act (ESA) listed species populations.

Special studies of high value that may reduce uncertainty about the effectiveness of tributary habitat restoration for ESA listed salmonids include:

Tributary Habitat Restoration Effectiveness for salmonid fishes

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