Errata to Amended Final License Application

Attachment 3

Revised Pages of the APDBA and APDEFH

Yuba River Development Project

FERC Project No. 2246

July 2017

ERRATA
APPLICANT-PREPARED DRAFT BA

SECTION 6

Page BA6-82

6.5 Fisheries Instream Habitat Conditions

Aquatic habitat conditions under the Environmental Baseline for spring-run Chinook salmon, steelhead, and green sturgeon in the lower Yuba River are described in the following sections using modeled lower Yuba River flows, modeled and monitored water temperatures and fisheries studies conducted for this Relicensing. Modeled flows are used to quantify species-specific flow-dependent habitat availability, including spring-run Chinook salmon spawning, fry and juvenile rearing, steelhead spawning, fry and juvenile rearing, and green sturgeon adult holding and spawning. Modeled flows also are used to quantify the potential for spring-run Chinook salmon and steelhead redd dewatering, and spring-run Chinook salmon and steelhead juvenile isolation. Modeled flow-related outputs corresponding to species-specific lifestages for the above variables are presented as averages over the entire simulation period, by WYT[1], and as cumulative probability exceedance distributions. Modeled and monitored water temperatures are used in conjunction with species and lifestage-specific WTI values to assess lifestage-specific water temperature suitability. Field studies conducted for this Relicensing, in addition to RMT studies, are used to characterize potential effects of Narrows 2 operations on fish in the immediate vicinity of the Narrows 2 Development under the Environmental Baseline.

[1] For the analyses presented in this Applicant-Prepared Draft BA, WYT classifications are in accordance with the Yuba River Index (YRI). ~~Water year types based on the YRI are as defined in SWRCB Decision 1644. WYT designation uses DWR published Full Natural Flow for the Yuba River at Smartsville for water years 1970 to 1999, and for water years 2000 to 2010 uses the final determination for each year based on DWR Bulletin 120 and updates of Yuba River Unimpaired flow at Smartsville.~~ Water year types are based on the Yuba River Index as defined in SWRCB Decision 1644 using DWR published Full Natural Flow for the Yuba River at Smartsville for water years 1970 to 2010, DWR Bulletin 120 forecasts of Yuba River Unimpaired flow at Smartsville for 1970 through 2010, and available final DWR Bulletin 120 Updates of Yuba River Unimpaired flow at Smartsville for water years 1998 through 2010. Although WY 1977 is considered to be a conference year in YCWA's proposed conditions in Amended Appendix E2 of the Amended FLA, it is included in the water year type summary tables as a critical year, but discussed separately under the Proposed Action and Cumulative Condition analyses.

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6.5.1.2 Simulated Habitat Availability

6.5.1.2.1 Spring-run Chinook Salmon Spawning Habitat

Table 6.5-4 displays the long-term average and average by WYT spring-run Chinook salmon spawning WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios. Over the entire 41-year simulation period, long-term average spring-run Chinook salmon spawning habitat availability (WUA) in the lower Yuba River is substantially higher under the Environmental Baseline relative to the Without-Project scenario (long-term average of ~~98.8~~97.8 percent versus ~~75.1~~74.3 percent of the maximum WUA). The Environmental Baseline (i.e., "With Project" scenario) results in ~~12.7~~13.4 percent more maximum spawning habitat during wet WYs, ~~19.9~~18.5 percent more during above normal WYs, 25.0~~3~~ percent more during below normal WYs, 32.9 percent more during dry WYs, and ~~39.8~~38.5 percent more during critical WYs. The Environmental Baseline provides an average of over 80 percent (and even over ~~96~~95 percent) of maximum spawning WUA during all WYTs, whereas the Without-Project scenario provides an average of only about ~~56~~57 to ~~87~~85 percent of maximum spawning WUA during any WYT.

Table 6.5-4. Long-term and WYT average spring-run Chinook salmon spawning WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios.

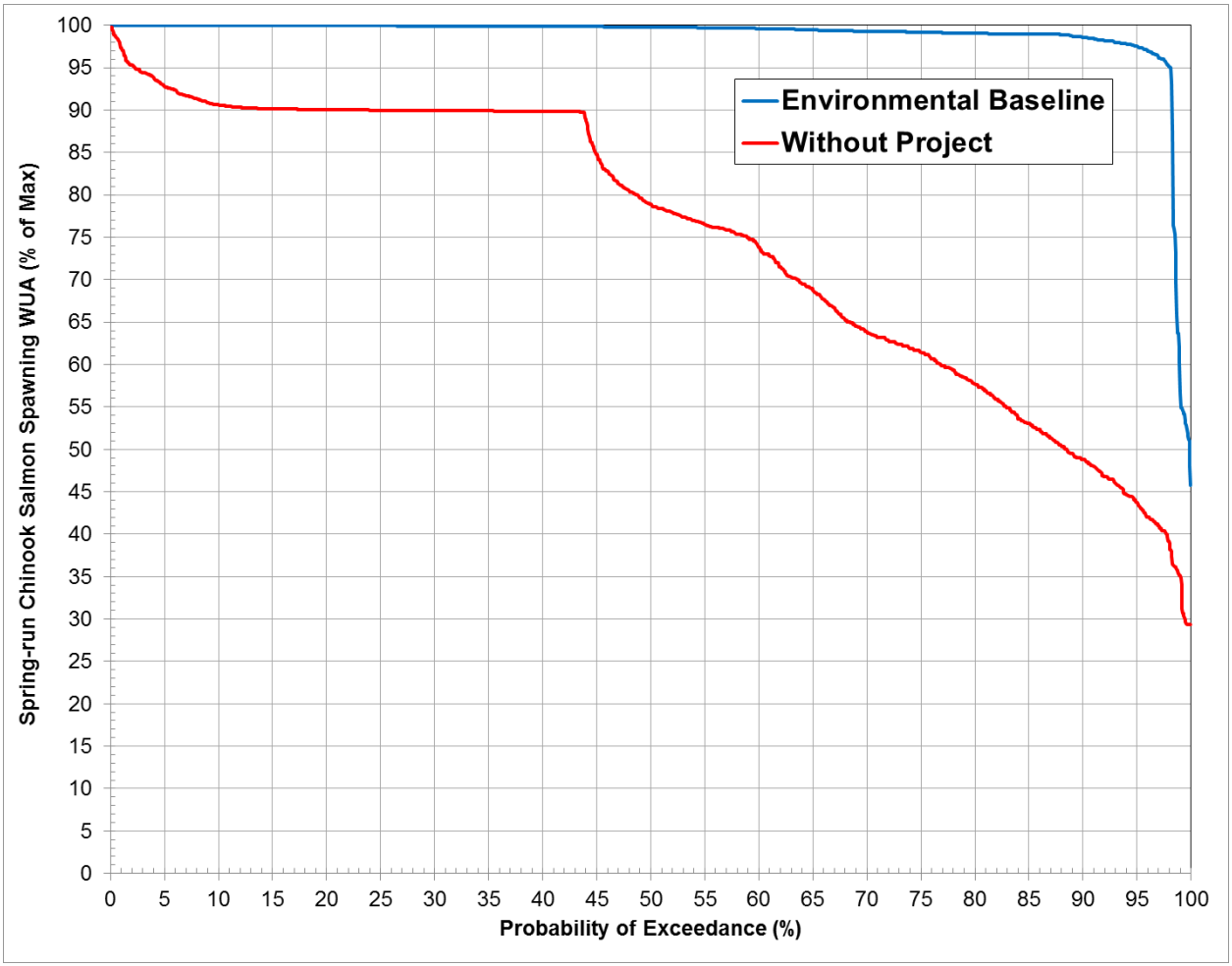
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Environmental Baseline~~	~~98.8~~	~~99.3~~	~~99.4~~	~~99.6~~	~~99.6~~	~~96.1~~
Without Project	75.1	86.6	79.5	74.3	66.7	56.3
Difference	23.7	12.7	19.9	25.3	32.9	39.8

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline	97.8	98.2	98.6	98.6	98.6	95.5
Without Project	74.3	84.8	80.1	73.6	65.7	57.0
Difference	23.5	13.4	18.5	25.0	32.9	38.5

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat duration for spring-run Chinook salmon spawning under the Environmental Baseline and Without-Project scenarios are presented in Figure 6.5-4. The Environmental Baseline provides very substantially greater amounts of spawning habitat availability over the entire exceedance probability distribution. Also, the Environmental Baseline achieves over 80 percent (and even

~~95~~94 percent) of maximum spawning WUA with about a 98 percent probability, by contrast to the Without-Project scenario which achieves 80 percent or more of maximum spawning WUA with about a 48 percent probability.



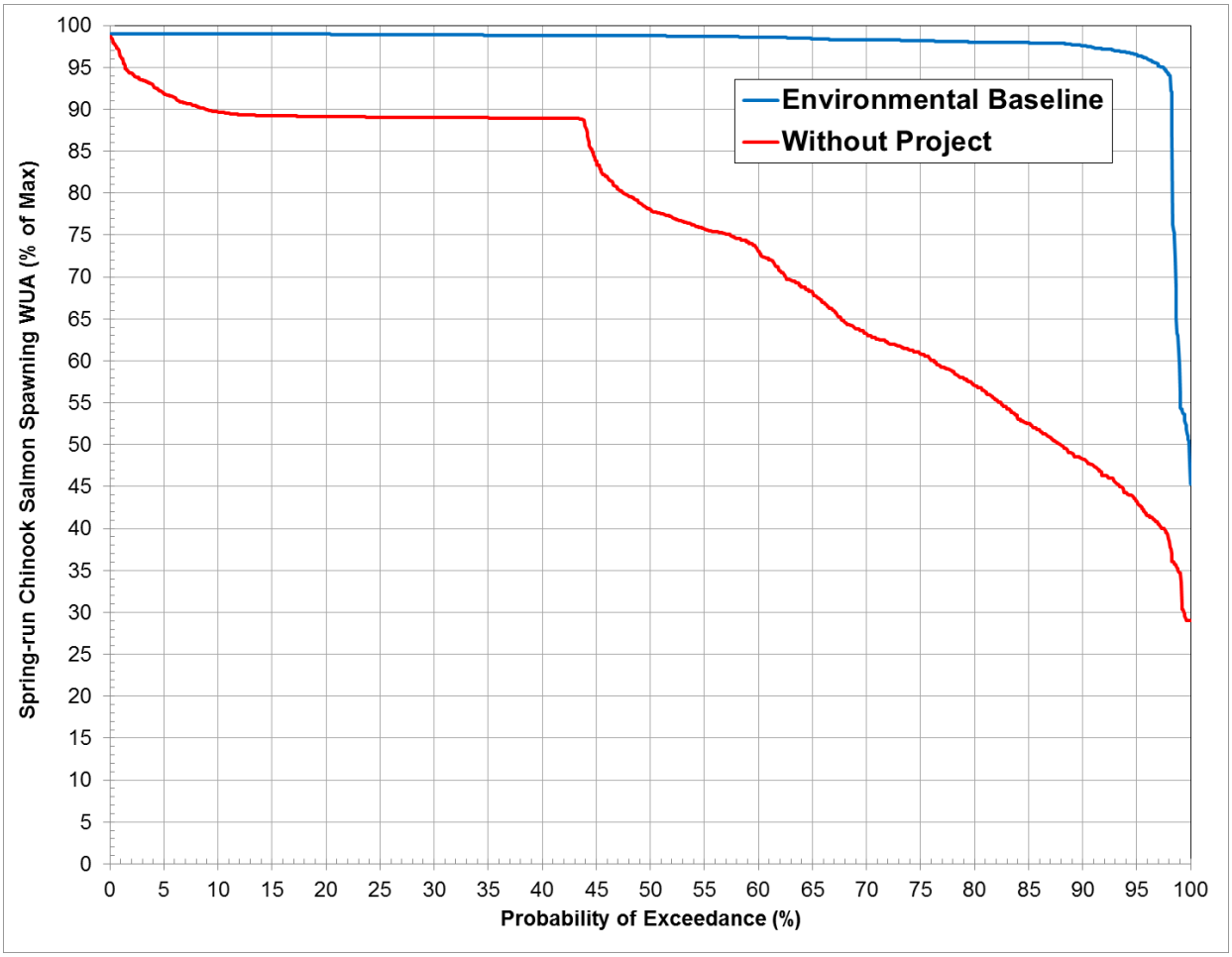


Figure 6.5-4. Spring-run Chinook salmon spawning habitat duration over the 41-year hydrologic period for the Environmental Baseline and Without-Project scenarios.

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6.5.1.2.2 Steelhead Spawning Habitat

Table 6.5-5 displays the long-term average and average by WYT steelhead spawning WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios. Over the entire 41-year simulation period, long-term average steelhead spawning habitat availability (WUA) in the lower Yuba River is very similar under the Environmental Baseline and the Without-Project scenarios (long-term average of ~~92.4~~91.4 vs. ~~92.5~~91.6 percent of maximum WUA). The Environmental Baseline results in ~~0.1~~0.3 percent less maximum spawning habitat during wet WYs, ~~1.2~~1.1 percent less during above normal WYs, 0.1 percent more during below normal WYs, ~~3.2~~3.0 percent less during dry WYs, and ~~1.~~0.5 percent more during critical WYs. Both the Environmental Baseline scenario and Without-Project scenario provide over 80 percent (and even over 90 percent) or more of maximum spawning WUA during all WYTs, except for during critical WYs (~~83.9~~83.8 and ~~82.9~~83.3 percent, respectively).

Table 6.5-5. Long-term and WYT average steelhead spawning WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios.

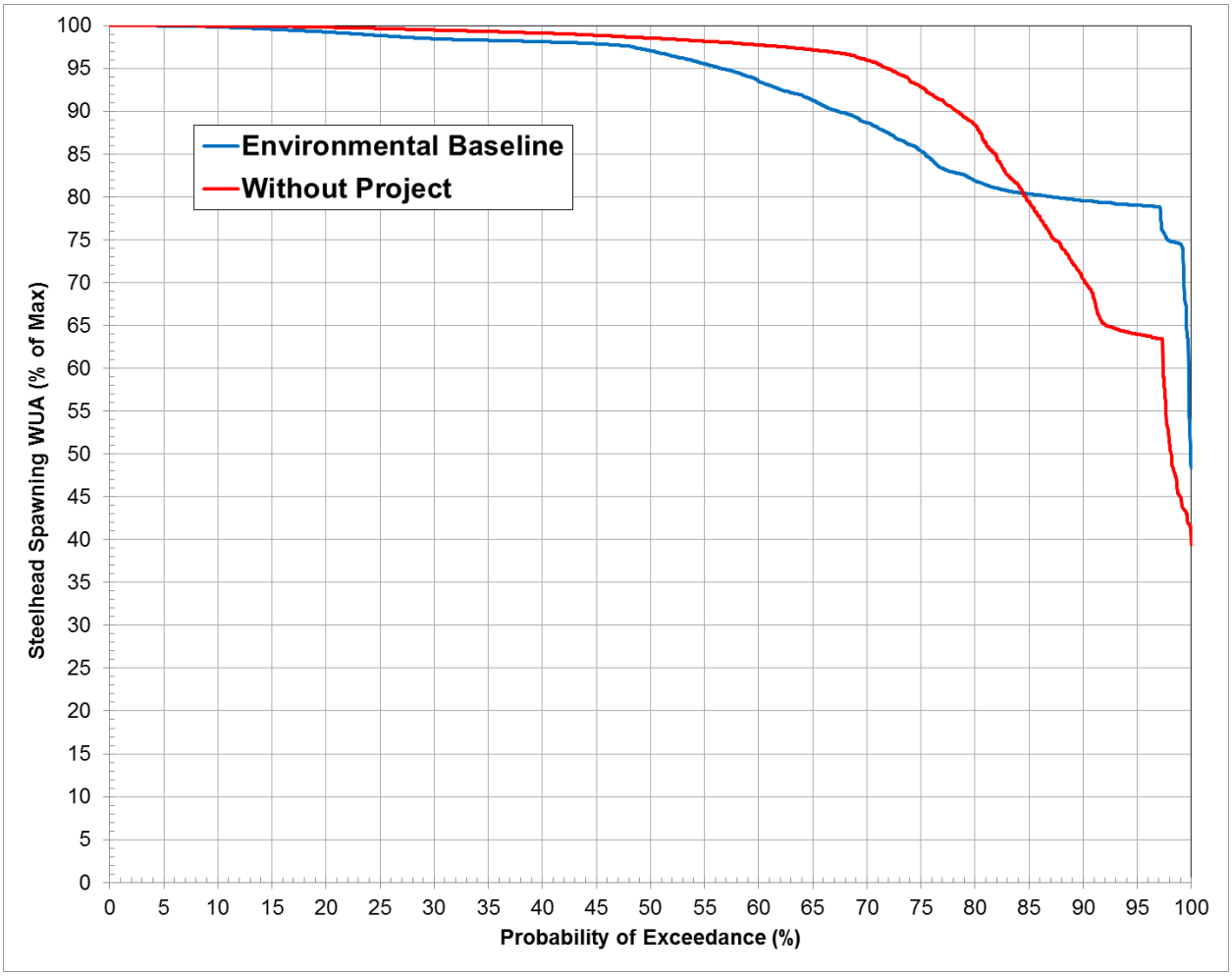
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Environmental Baseline~~	~~92.4~~	~~97.6~~	~~96.4~~	~~94.0~~	~~91.2~~	~~83.9~~
Without Project	92.5	97.7	97.6	93.9	94.4	82.9
Difference	-0.1	-0.1	-1.2	0.1	-3.2	1.0
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Environmental Baseline	91.4	96.5	95.4	93.1	90.4	83.8
Without Project	91.6	96.8	96.5	93.0	93.4	83.3
Difference	-0.2	-0.3	-1.1	0.1	-3.0	0.5

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat duration for steelhead spawning under the Environmental Baseline and Without-Project scenarios are presented in Figure 6.5-5. The Environmental Baseline provides similar but slightly lesser (about 1-2 percent of maximum WUA) amounts of spawning habitat availability over about the upper[2] 50 percent of the distribution, and slightly lesser amounts (about 2-7 percent of maximum WUA) over about 35 percent of the distribution. The Environmental Baseline and the Without-Project scenarios both achieve 80 percent or more of maximum spawning WUA[3] with about an 85 percent probability. The Environmental Baseline provides greater amounts of spawning WUA over the lowest about 15 percent of the distribution when less than 80 percent of maximum WUA is provided, and when spawning habitat is most limiting.

[2] In presenting habitat duration results, reference to the "upper" or "lower" parts of the distribution pertains to the y-axis (percent of maximum WUA).

[3] In the NMFS and USFWS Klamath Project Operations Biological Opinion (2013), NMFS reports that available instream habitat of 80 percent of maximum (WUA) has been used as a guideline to develop minimum flow needs for the conservation of anadromous salmonids, and that: (1) NMFS assumes that at least 80 percent of maximum available habitat provides a wide range of conditions and habitat abundance in which populations can grow and recover; (2) where habitat availability is 80 percent of maximum or greater, habitat is not expected to limit individual fitness or population productivity or distribution, nor adversely affect the function of essential features of (coho) salmon critical habitat.



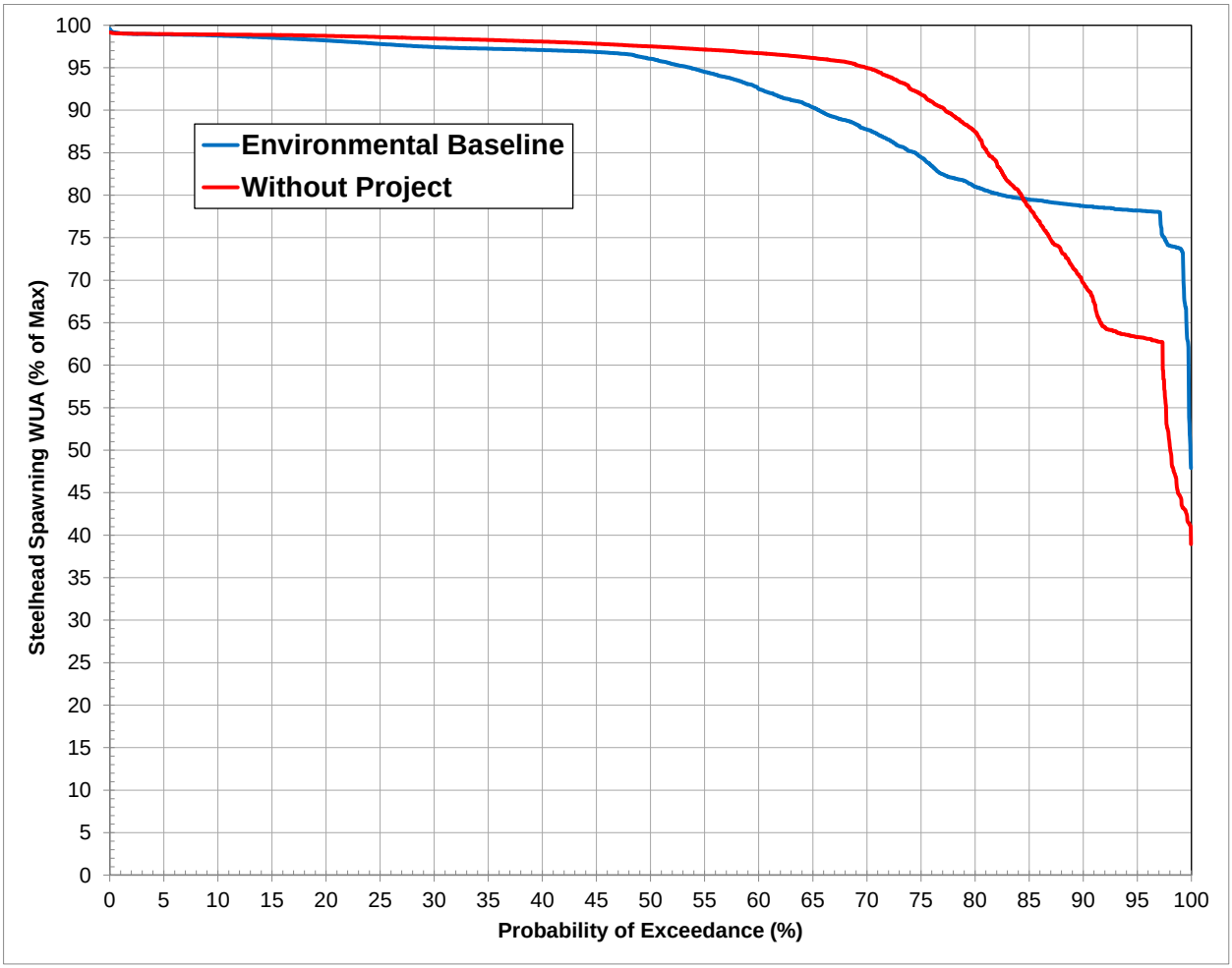


Figure 6.5-5. Steelhead spawning habitat duration over the 41-year hydrologic period for the Environmental Baseline and Without-Project scenarios.

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6.5.2.2.1 Spring-run Chinook Salmon

Estimation of potential spring-run Chinook salmon redd dewatering indicates that the long-term average of the percentage of redds built within a given year would have the potential to be dewatered with slightly less frequency under the Environmental Baseline relative to the Without-Project scenario. Under both scenarios, the potential for redd dewatering is very low, averaging only about 0.01 percent and 0.10 percent annually, respectively over the entire period of evaluation. To put this into context, an estimated 1,148 and 1,465 spring-run Chinook salmon redds were constructed in the lower Yuba River during 2009 and 2010, respectively. Correspondingly, applying the 41-year average, it is estimated that essentially no spring-run Chinook salmon redd would be expected to be dewatered under the Environmental Baseline, and only about 1 spring-run Chinook salmon redd would be expected to be dewatered under the Without-Project scenario during each of these two years.

The percentage of redds potentially dewatered would be very small, and similar between the Environmental Baseline and Without-Project scenarios during all WYTs (Table 6.5-10). The largest difference between the Environmental Baseline and Without-Project scenarios potential spring-run Chinook salmon redd dewatering occurs during dry WYs, when the probability of redd dewatering is slightly less under the Environmental Baseline, relative to the Without-Project scenario.

The long-term and WYT averages of the percentage of egg pockets dewatered indicates that no egg pockets would be expected to be dewatered under the Environmental Baseline or the Without-Project scenarios.

Table 6.5-10. Estimated spring-run Chinook salmon redd and egg pocket potential dewatering under the Environmental Baseline scenario relative to the Without-Project scenario.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Environmental Baseline	Without Project	Difference	Environmental Baseline	Without Project	Difference
Long-term (All WYs)	0.01%	0.10%	-0.09%	0.00%	0.00%	0.00%
Wet	0.02%	0.14%	-0.12%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.05%	-0.04%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.01%	-0.01%	0.00%	0.00%	0.00%
Dry	0.00%	0.20%	-0.20%	0.00%	0.00%	0.00%
Critical	0.00%	0.04%	-0.04%	0.00%	0.00%	0.00%
WYT Categories	**Redd Dewatering Index (%)**			**Egg Pocket Dewatering Index (%)**		
	Environmental Baseline	**Without Project**	**Difference**	**Environmental Baseline**	**Without Project**	**Difference**
Long-term (All WYs)	0.01%	0.10%	-0.09%	0.00%	0.00%	0.00%
Wet	0.02%	0.14%	-0.12%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.03%	-0.02%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.01%	-0.01%	0.00%	0.00%	0.00%
Dry	0.00%	0.25%	-0.25%	0.00%	0.00%	0.00%
Critical	0.00%	0.04%	-0.04%	0.00%	0.00%	0.00%

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

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6.5.2.2.2 Steelhead

Estimations of steelhead redd and egg pocket dewatering under the Environmental Baseline and Without-Project scenarios are very different than those observed for spring-run Chinook salmon. Potential steelhead redd and egg pocket dewatering estimates are much higher for steelhead relative to spring-run Chinook salmon. However, the increased potential redd dewatering for steelhead is due to high flow events (storm flows) occurring during their spawning and

incubation period (i.e., January through May), which exceed the combined flow capacity at the Narrows 1 and Narrows 2 facilities (4,130 cfs).

Estimation of potential steelhead redd dewatering indicates that the long-term average of the percentage of redds built within a given year would be dewatered for at least 1 day with a similar frequency under the Environmental Baseline (19.2 percent) and Without-Project (20.2 percent) scenarios. To put this into context, an estimated 227 steelhead redds were constructed in the lower Yuba River during 2010. Correspondingly, applying the 41-year average, it is estimated that about 44 steelhead redds would potentially have been dewatered under the Environmental Baseline, and about 46 steelhead redds would potentially have been dewatered under the Without-Project scenario.

The highest estimated percentage of redds potentially dewatered occurs during wet WYTs for both the Environmental Baseline (~~35.91~~34.0 percent) and the Without-Project scenario (~~30.14~~29.41 percent) (Table 6.5-11). Under the Environmental Baseline, the percentage of redds potentially dewatered generally decreases as the WYTs become drier from wet to critical. The largest differences between the Environmental Baseline and Without-Project scenarios occur during the drier WYTs (i.e., below normal, dry and critical), with substantially less estimated steelhead redd dewatering occurring under the Environmental Baseline.

Table 6.5-11. Estimated steelhead redd and egg pocket potential dewatering under the Environmental Baseline scenario relative to the Without-Project scenario.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Environmental Baseline	Without Project	Difference	Environmental Baseline	Without Project	Difference
Long-term (All WYs)	19.17%	20.24%	-1.07%	9.54%	10.84%	-1.30%
Wet	35.91%	30.14%	5.77%	20.04%	18.28%	1.76%
Above Normal	17.16%	17.30%	-0.14%	6.82%	9.28%	-2.46%
Below Normal	14.87%	20.43%	-5.56%	5.89%	10.68%	-4.79%
Dry	4.42%	14.98%	-10.56%	0.75%	4.85%	-4.10%
Critical	2.26%	6.98%	-4.72%	0.58%	1.95%	-1.37%
WYT Categories	**Redd Dewatering Index (%)**			**Egg Pocket Dewatering Index (%)**		
	Environmental Baseline	**Without Project**	**Difference**	**Environmental Baseline**	**Without Project**	**Difference**
Long-term (All WYs)	19.17%	20.24%	-1.07%	9.54%	10.84%	-1.30%
Wet	34.00%	29.41%	4.59%	18.97%	17.74%	1.23%
Above Normal	19.53%	17.07%	2.46%	7.60%	9.20%	-1.60%
Below Normal	14.87%	20.43%	-5.56%	5.89%	10.68%	-4.79%
Dry	5.39%	14.51%	-9.12%	0.92%	5.40%	-4.48%
Critical	2.06%	8.08%	-6.02%	0.52%	2.03%	-1.51%

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

The highest estimated percentage of egg pockets potentially dewatered occurs during wet WYTs for both the Environmental Baseline (~~20.04~~18.97 percent) and the Without-Project scenario (~~18.28~~17.74 percent)**.** Under the Environmental Baseline, the percentage of egg pockets potentially dewatered generally decreases as the WYTs become drier from wet to critical. With the exception of wet WYTs, potential egg pocket dewatering was somewhat less under the Environmental Baseline than under the Without-Project scenario.

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6.5.3.2.1 Spring-run Chinook Salmon Fry In-channel Rearing Habitat

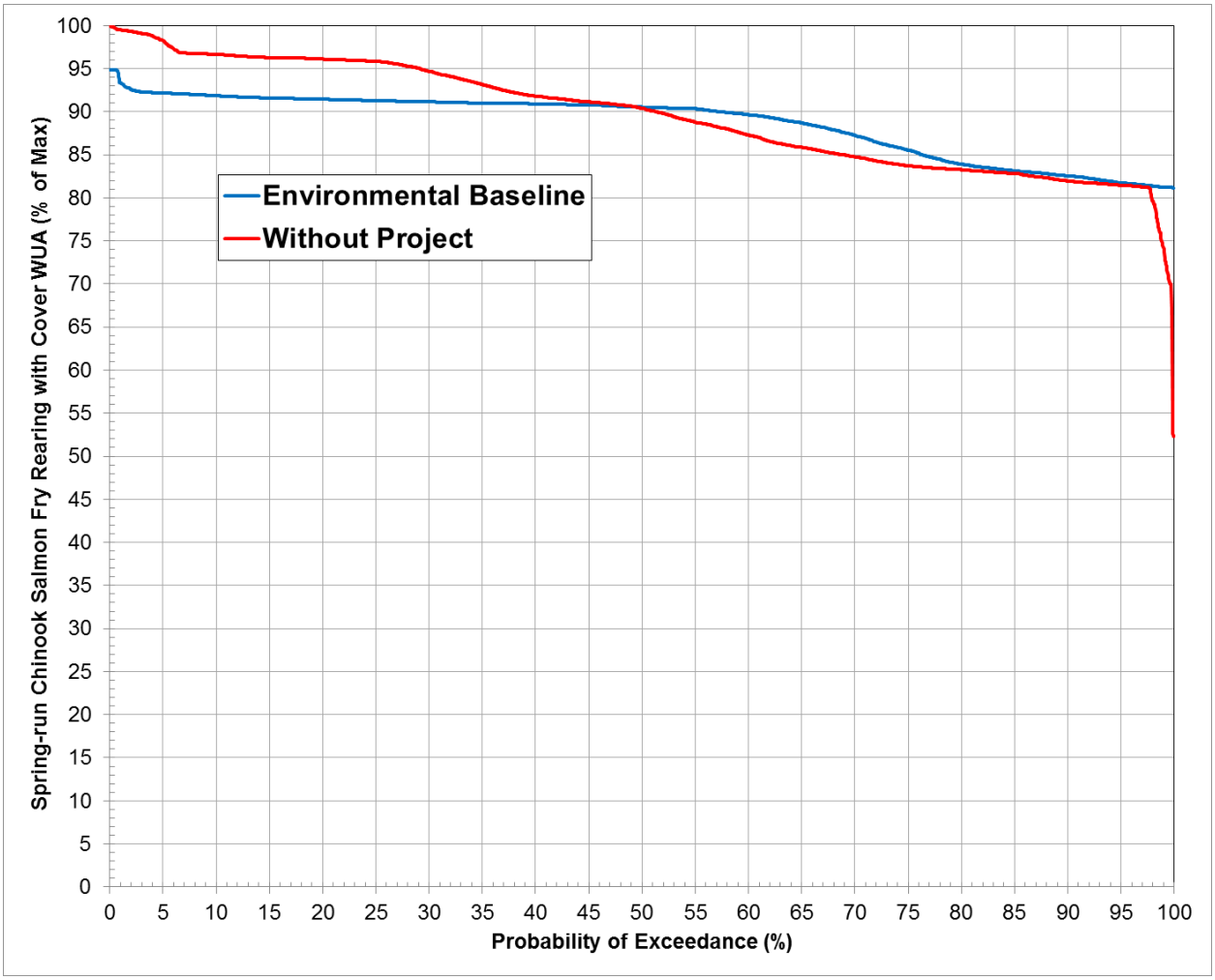
Table 6.5-12 displays the long-term average and average by WYT spring-run Chinook salmon fry rearing in-channel habitat (percent of maximum WUA) under the Environmental Baseline and Without-Project scenarios. Over the entire 41-year simulation period, long-term average fry rearing habitat availability (WUA) in the lower Yuba River is similar under the Environmental Baseline and Without-Project scenarios (long-term average of ~~88.6~~84.2 percent and ~~89.5~~85.1 percent of the maximum WUA, respectively). The Environmental Baseline results in 0.3 percent more ~~the same amount of~~ maximum fry rearing habitat during wet WYs, ~~0.3~~0.1 percent ~~more~~less during above normal WYs, 1.~~8~~9 percent less during below normal WYs, ~~2.0~~1.9 percent less during dry WYs, and 1.3 percent less during critical WYs. Both the Environmental Baseline and Without-Project scenarios provide an average of over 80 percent of maximum fry rearing in-channel WUA during all WYTs,

Table 6.5-12. Long-term and WYT average spring-run Chinook salmon fry rearing in-channel WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Environmental Baseline~~	~~88.6~~	~~88.6~~	~~88.9~~	~~87.6~~	~~88.2~~	~~89.7~~
Without Project	89.5	88.6	88.6	89.5	90.2	91.0
Difference	-0.9	0.0	0.3	-1.9	-2.0	-1.3
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Environmental Baseline	84.2	84.3	84.3	83.2	83.7	85.1
Without Project	85.1	84.0	84.4	85.0	85.6	86.4
Difference	-0.9	0.3	-0.1	-1.8	-1.9	-1.3

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat duration for spring-run Chinook salmon in-channel fry rearing habitat under the Environmental Baseline and Without-Project scenarios is presented in Figure 6.5-18. The Environmental Baseline provides slightly less (about 5 percent of maximum WUA) amounts of fry rearing habitat availability over the upper about 40 percent of the exceedance distribution, although the amounts remain over ~~90~~85 percent of maximum WUA. The Environmental Baseline scenario achieves over 80 percent of maximum WUA over about 78 percent of the ~~entire~~ exceedance distribution, whereas the Without-Project scenario provides less than 80 percent maximum WUA ~~for the lowermost (about 3 percent)~~ over about the lower 30 percent of the distribution, particularly for the lowermost 3 percent.



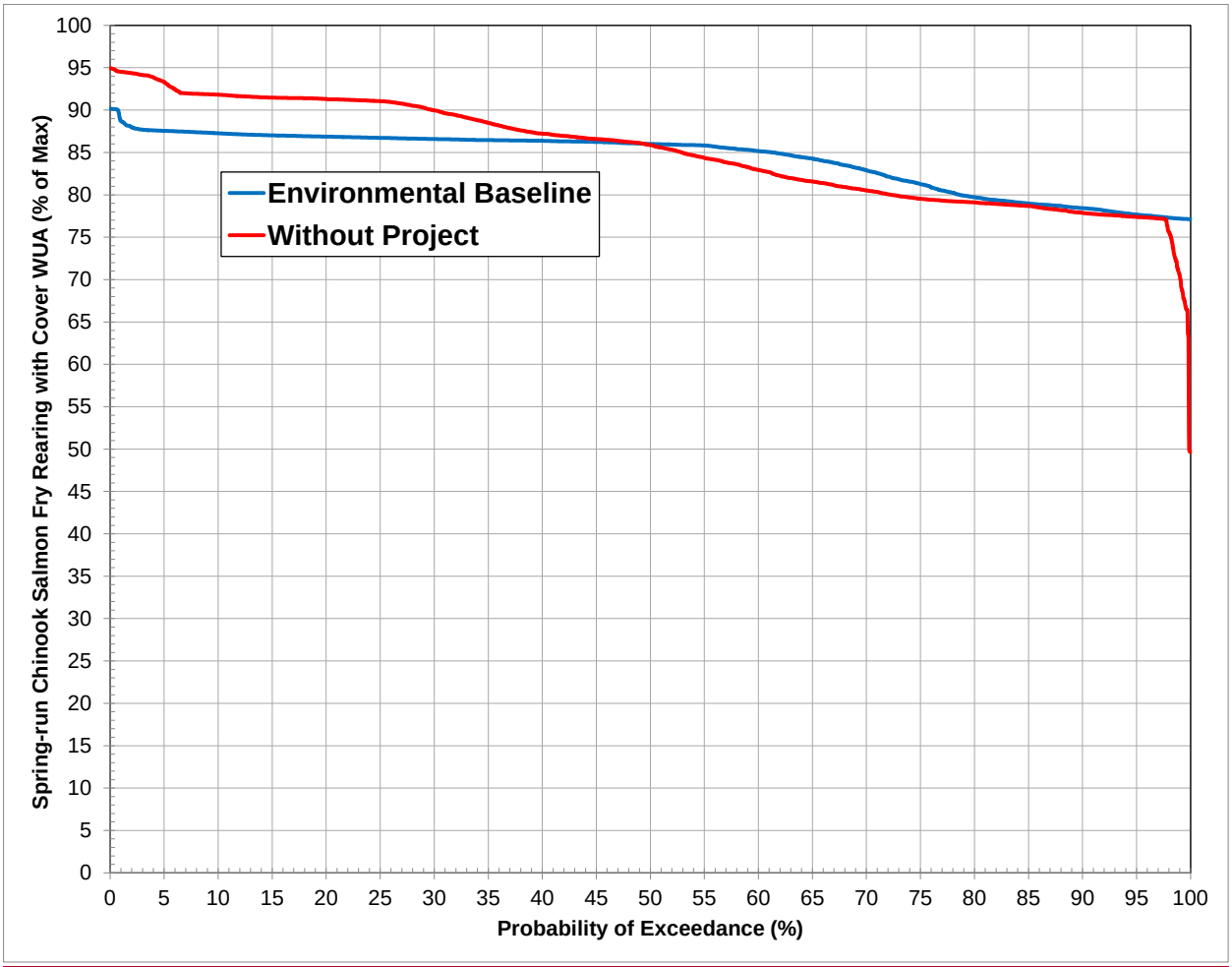


Figure 6.5-18. Spring-run Chinook salmon fry rearing in-channel habitat duration over the 41-year hydrologic period for the Environmental Baseline and Without-Project scenarios.

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6.5.3.2.2 Spring-run Chinook Salmon Juvenile In-channel Rearing Habitat

Table 6.5-13 displays the long-term average and average by WYT spring-run Chinook salmon juvenile rearing in-channel habitat (percent of maximum WUA) under the Environmental Baseline and Without-Project scenarios. Over the entire 41-year simulation period, long-term average juvenile rearing WUA in the lower Yuba River is substantially higher under the Environmental Baseline relative to the Without-Project scenario (long-term average of ~~96.3~~90.5 percent versus ~~79.6~~74.8 percent of maximum WUA). The Environmental Baseline also results in substantially more juvenile rearing habitat during all WYTs, ranging from ~~13.9~~13.5 percent more during wet WYs to ~~21.3~~19.4 percent more during critical WYs. The Environmental Baseline scenario provides an average of over 80 percent (and even up to or over ~~95~~90 percent) or more of maximum juvenile in-channel rearing WUA during all WYTs, whereas the Without-Project

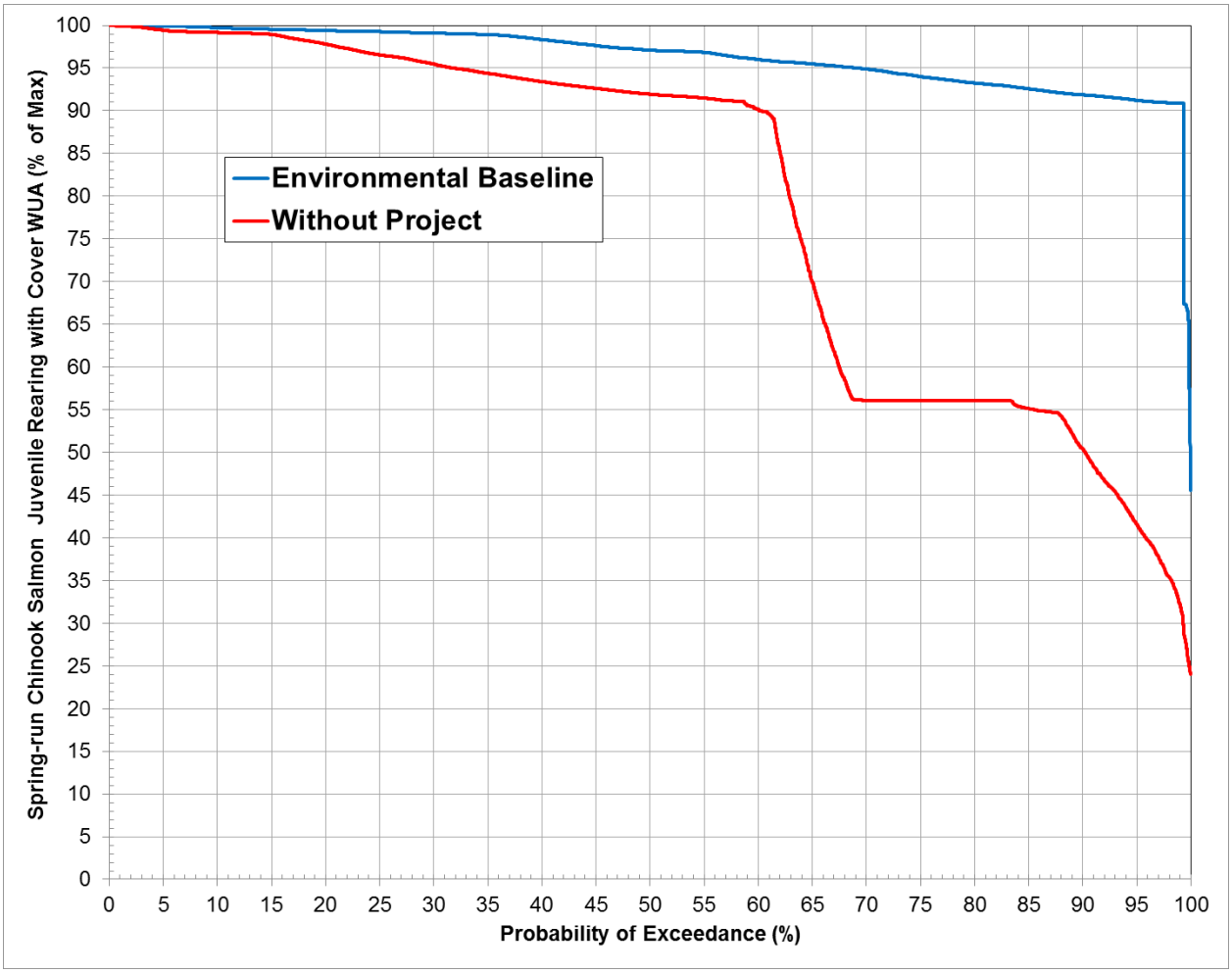
scenario provides an average of ~~75.8~~71.9 to ~~81.6~~76.2 percent of maximum juvenile rearing WUA over all WYTs.

Table 6.5-13. Long-term and WYT average spring-run Chinook salmon juvenile rearing in-channel WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Environmental Baseline~~	~~96.3~~	~~95.5~~	~~95.7~~	~~96.4~~	~~97.5~~	~~97.1~~
Without Project	79.6	81.6	79.7	80.7	80.1	75.8
Difference	16.7	13.9	16.0	15.7	17.4	21.3
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Environmental Baseline	90.5	89.7	90.0	90.5	91.6	91.3
Without Project	74.8	76.2	75.8	75.8	74.6	71.9
Difference	15.7	13.5	14.2	14.7	17.0	19.4

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat duration for spring-run Chinook salmon juvenile in-channel rearing under the Environmental Baseline and Without-Project scenarios is presented in Figure 6.5-19. The Environmental Baseline provides higher amounts of juvenile rearing habitat availability over the entire exceedance distribution, and provides substantially more habitat over about the lower 40 percent of the distribution. The Environmental Baseline scenario achieves over 90 percent of maximum spawning WUA with about a ~~99~~62 percent probability, while the Without-Project scenario achieves over 90 percent of maximum juvenile rearing WUA with about a ~~60~~29 percent probability (and 80 percent or more of maximum WUA with about a 6~~2~~3 percent probability).



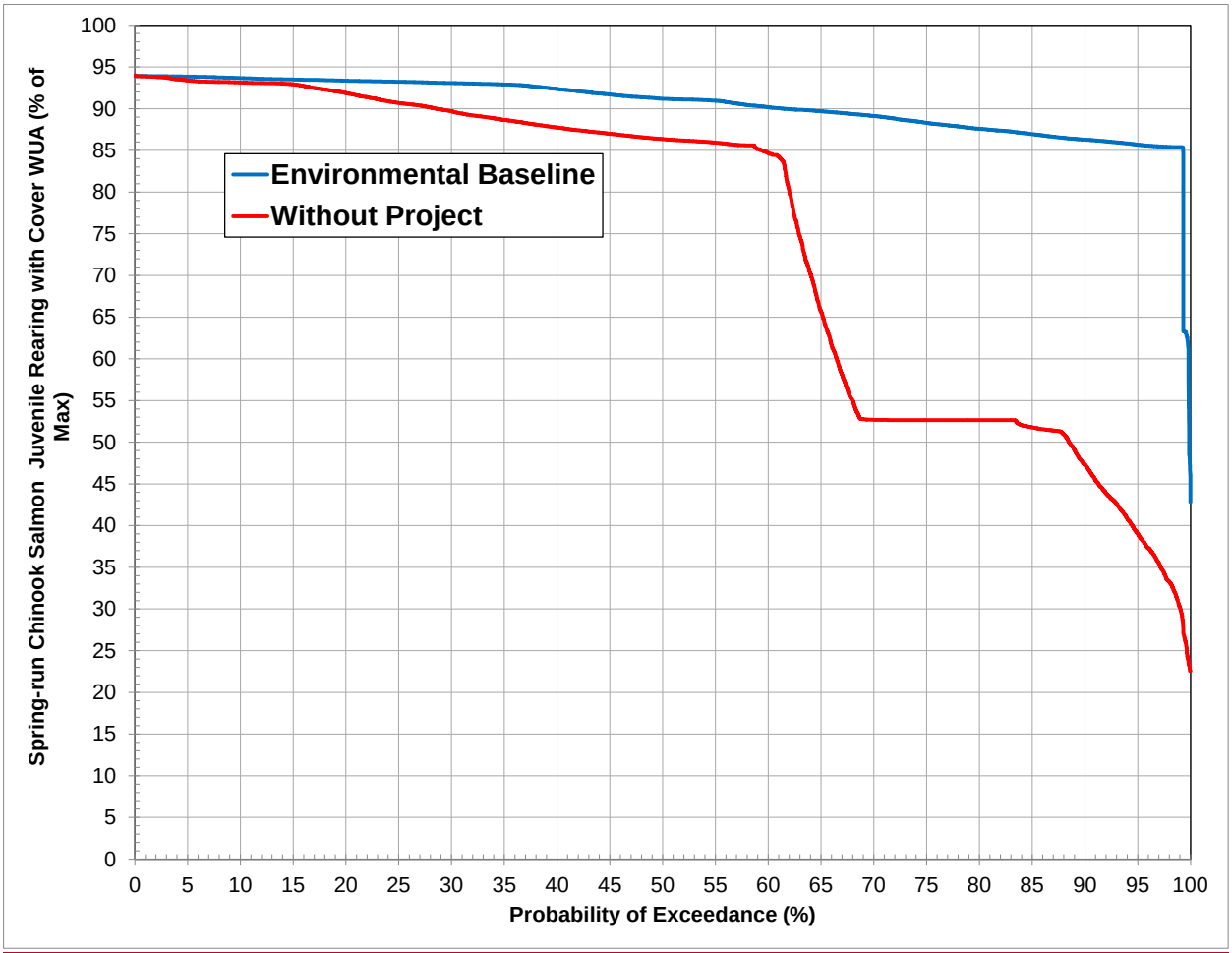


Figure 6.5-19. Spring-run Chinook salmon juvenile rearing in-channel habitat duration over the 41-year hydrologic period for the Environmental Baseline and Without-Project scenarios.

Pages BA6-121 to BA6-123

6.5.3.2.3 Spring-run Chinook Salmon Fry Rearing Full-Flow Habitat

Table 6.5-14 displays the full-flow analysis of the average amounts (ac) of spring-run Chinook salmon fry WUA without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by water year type.

For the entire simulation period, slightly less amounts of average fry rearing habitat (WUA) are available under the Environmental Baseline compared to the Without-Project scenario. The Environmental Baseline results in 2.9~~8~~, ~~3.1~~2.8, 4.1, 4.3~~2~~, and 5.2~~4~~ percent less average fry rearing habitat during wet, above normal, and below normal, dry, and critical WYs, respectively.

Table 6.5-14. Long-term average WUA (ac) over the 41-year period of evaluation and WYT-specific relative contribution to the long-term average WUA of spring-run Chinook salmon fry rearing habitat, under the Environmental Baseline and the Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**3,772**	**1,380**	**552**	**644**	**460**	**736**
Days ≤ 5,000 cfs	3,317	979	506	639	458	735
Days > 5,000 cfs	455	401	46	5	2	1
Avg. WUA	**154.3**	**58.0**	**22.3**	**25.3**	**18.3**	**30.3**
WUA ≤ 5,000 cfs	131.8	38.1	20.1	25.1	18.2	30.2
WUA > 5,000 cfs	22.5	19.9	2.3	0.2	0.1	0.0
Without-Project						
Total Days in Analysis	**3,772**	**1,380**	**552**	**644**	**460**	**736**
Days ≤ 5,000 cfs	3,173	920	453	630	442	728
Days > 5,000 cfs	599	460	99	14	18	8
Avg. WUA	**160.3**	**59.7**	**23.0**	**26.4**	**19.1**	**32.0**
WUA ≤ 5,000 cfs	129.9	36.1	18.1	25.7	18.3	31.6
WUA > 5,000 cfs	30.4	23.6	4.9	0.7	0.8	0.4
Differences						
Avg. WUA	**-6.0**	**-1.7**	**-0.7**	**-1.1**	**-0.8**	**-1.7**
% change	**-3.7%**	**-2.8%**	**-3.1%**	**-4.1%**	**-4.2%**	**-5.4%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**3,772**	**1,472**	**460**	**644**	**368**	**828**
Days ≤ 5,000 cfs	3,317	1,061	424	639	366	827
Days > 5,000 cfs	455	411	36	5	2	1
Avg. WUA	**154.3**	**61.9**	**18.5**	**25.3**	**14.6**	**34.0**
WUA ≤ 5,000 cfs	131.8	41.5	16.7	25.1	14.6	33.9
WUA > 5,000 cfs	22.5	20.4	1.8	0.2	0.1	0.0
Without-Project						
Total Days in Analysis	**3,772**	**1,472**	**460**	**644**	**368**	**828**
Days ≤ 5,000 cfs	3,173	982	391	630	352	818
Days > 5,000 cfs	599	490	69	14	16	10
Avg. WUA	**160.3**	**63.7**	**19.0**	**26.4**	**15.3**	**35.8**
WUA ≤ 5,000 cfs	129.9	38.6	15.7	25.7	14.6	35.4
WUA > 5,000 cfs	30.4	25.1	3.4	0.7	0.7	0.4
Differences						
Avg. WUA	**-6.0**	**-1.8**	**-0.5**	**-1.1**	**-0.7**	**-1.9**
% change	**-3.7%**	**-2.9%**	**-2.8%**	**-4.1%**	**-4.3%**	**-5.2%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 6.5-20 displays the full-flow analysis of the average amounts (ac) of spring-run Chinook salmon fry WUA without cover under the Environmental Baseline and the Without-Project scenarios. For both scenarios, the highest average spring-run Chinook salmon fry habitat occurred during wet WYs, followed by critical WYs and with lesser amounts during above normal, below normal, and dry WYTs. For both the Environmental Baseline and Without-Project scenarios, relatively little to no additional fry rearing habitat is provided by those days when flows were > 5,000 cfs for below normal, dry and critical WYTs.

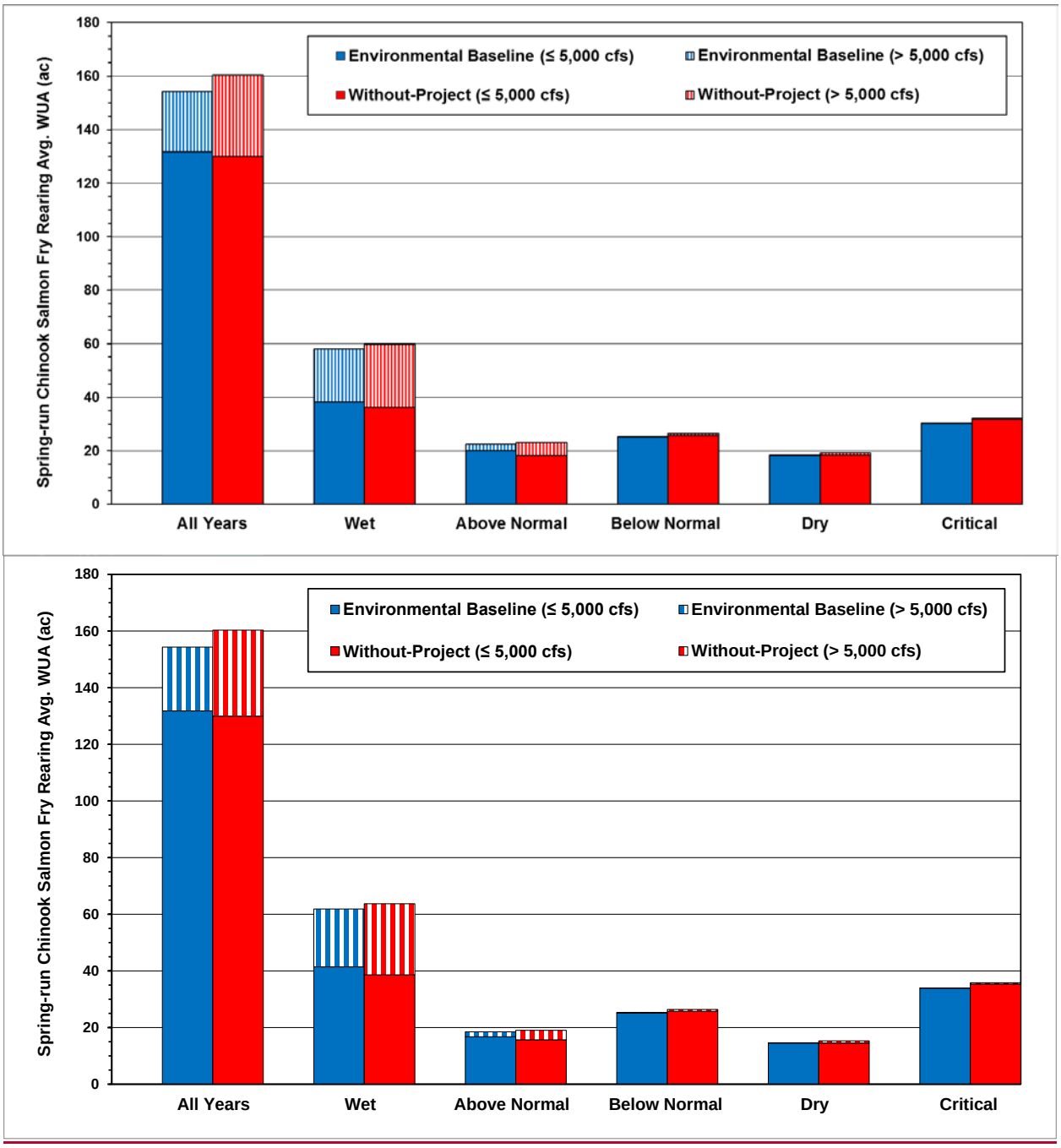


Figure 6.5-20. Comparison of the average amount (ac) of spring-run Chinook salmon fry weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. Shown are the average amounts over the long-term full simulation period (all years) and by water year type of habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

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6.5.3.2.4 Spring-run Chinook Salmon Juvenile Rearing Full-Flow Habitat

Table 6.5-15 displays the full-flow analysis of the average amounts (ac) of spring-run Chinook salmon juvenile WUA without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. For the entire simulation period, substantially higher (15.3 percent) amounts of average juvenile rearing habitat (WUA) are available under the Environmental Baseline compared to the Without-Project scenario. Relative to the Without-Project scenario, the Environmental Baseline results in increasing percentages of juvenile rearing habitat as WYTs progress from wet to critical. The Environmental Baseline provides 8.~~1~~5, 12.4~~8~~, 16.1, 22.9~~2~~, and 2~~6~~7.8 percent higher average juvenile rearing habitat during wet, above normal, below normal, dry, and critical WYs, respectively.

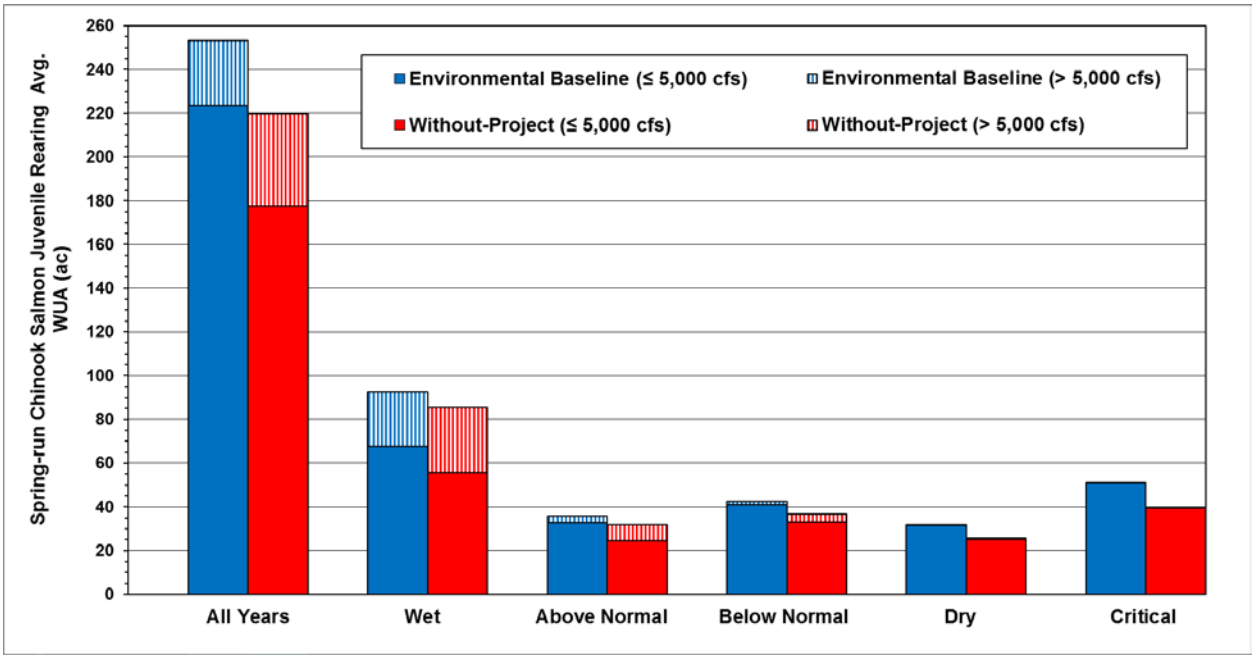
Table 6.5-15. Long-term average WUA (ac) over the 41-year period of evaluation and WYT-specific relative contribution to the long-term average WUA of spring-run Chinook salmon juvenile rearing habitat, under the Environmental Baseline and the Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**14,974**	**5,477**	**2,191**	**2,557**	**1,826**	**2,923**
Days ≤ 5,000 cfs	13,411	4,198	2,003	2,468	1,823	2,919
Days > 5,000 cfs	1,563	1,279	188	89	3	4
Avg. WUA	**253.3**	**92.4**	**35.9**	**42.6**	**31.4**	**50.9**
WUA ≤ 5,000 cfs	223.7	67.8	32.6	41.1	31.4	50.8
WUA > 5,000 cfs	29.6	24.6	3.3	1.5	0.0	0.1
Without-Project						
Total Days in Analysis	**14,974**	**5,477**	**2,191**	**2,557**	**1,826**	**2,923**
Days ≤ 5,000 cfs	12,756	3,945	1,772	2,349	1,791	2,899
Days > 5,000 cfs	2,218	1,532	419	208	35	24
Avg. WUA	**219.6**	**85.4**	**31.8**	**36.7**	**25.7**	**39.8**
WUA ≤ 5,000 cfs	177.6	55.6	24.4	33.0	25.1	39.4
WUA > 5,000 cfs	42.0	29.8	7.4	3.7	0.6	0.4
Differences						
Avg. WUA	**33.7**	**7.0**	**4.1**	**5.9**	**5.7**	**11.1**
% change	**15.3%**	**8.1%**	**12.8%**	**16.1%**	**22.2%**	**27.8%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**14,974**	**5,842**	**1,826**	**2,557**	**1,461**	**3,288**
Days ≤ 5,000 cfs	13,411	4,540	1,661	2,468	1,458	3,284
Days > 5,000 cfs	1,563	1,302	165	89	3	4
Avg. WUA	**253.3**	**98.3**	**29.9**	**42.6**	**25.1**	**57.2**
WUA ≤ 5,000 cfs	223.7	73.3	27.1	41.1	25.1	57.2
WUA > 5,000 cfs	29.6	25.0	2.9	1.5	0.0	0.1
Without-Project						
Total Days in Analysis	**14,974**	**5,842**	**1,826**	**2,557**	**1,461**	**3,288**
Days ≤ 5,000 cfs	12,756	4,211	1,506	2,349	1,432	3,258
Days > 5,000 cfs	2,218	1,631	320	208	29	30
Avg. WUA	**219.6**	**90.6**	**26.6**	**36.7**	**20.4**	**45.1**
WUA ≤ 5,000 cfs	177.6	59.0	21.0	33.0	19.9	44.6
WUA > 5,000 cfs	42.0	31.6	5.7	3.7	0.5	0.5
Differences						
Avg. WUA	**33.7**	**7.7**	**3.3**	**5.9**	**4.7**	**12.1**
% change	**15.3%**	**8.5%**	**12.4%**	**16.1%**	**22.9%**	**26.8%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 6.5-21 displays the full-flow analysis of the average amounts (ac) of spring-run Chinook salmon juvenile WUA without cover under the Environmental Baseline and the Without-Project scenarios. For both scenarios, the highest average spring-run Chinook salmon fry habitat occurred during wet WYs, followed by critical WYs and with lesser amounts during above normal, below normal, and dry WYTs. For both the Environmental Baseline and Without-Project scenarios, relatively little or no additional juvenile rearing habitat is provided by those days when flows were > 5,000 cfs for dry and critical WYTs.



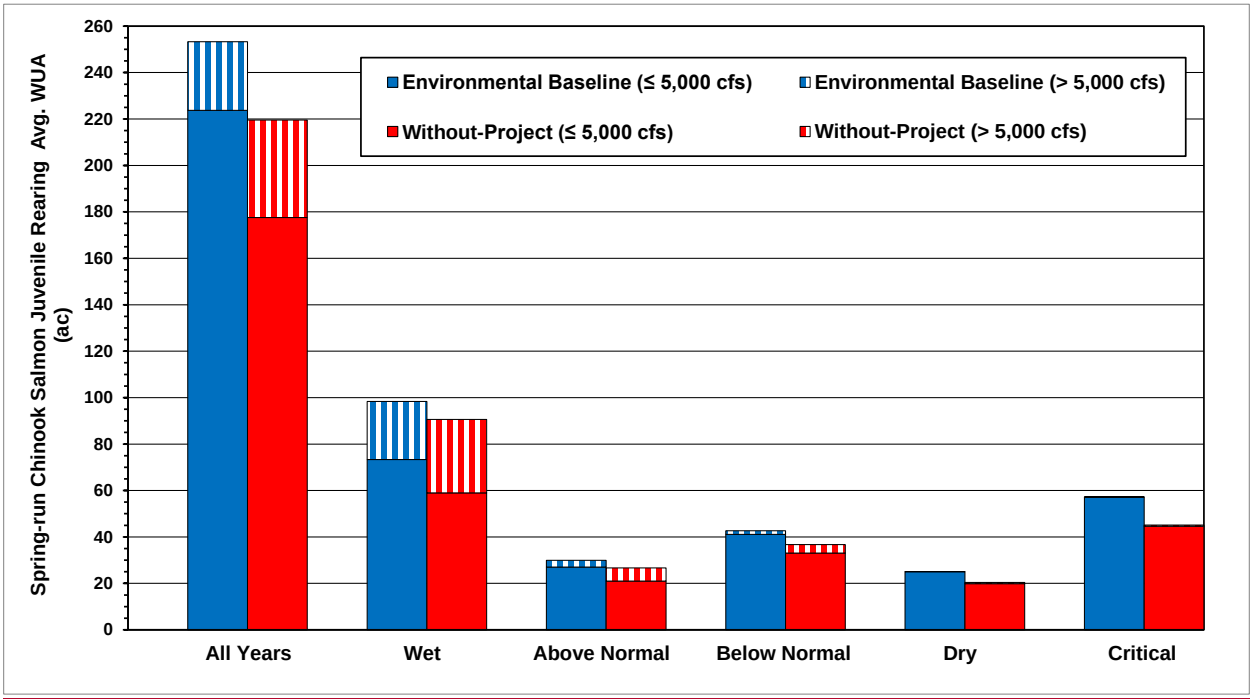


Figure 6.5-21. Comparison of the average amount (ac) of spring-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages BA6-125 to BA6-127

6.5.3.2.5 Steelhead Fry Rearing In-channel Habitat

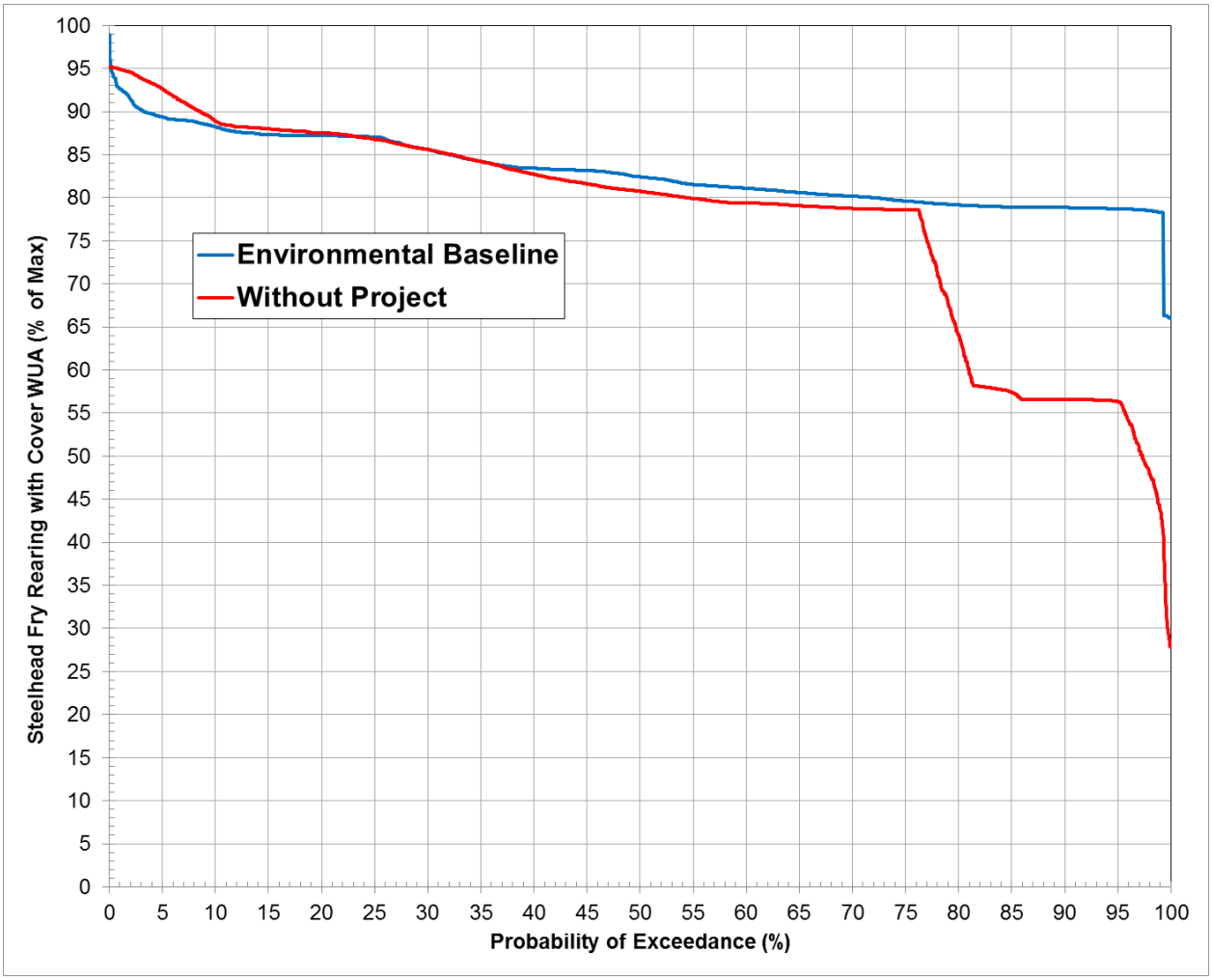
Table 6.5-16 displays the long-term average and average by WYT steelhead fry rearing in-channel habitat (percent of maximum WUA) under the Environmental Baseline and Without-Project scenarios. Over the entire 41-year simulation period, long-term average steelhead fry rearing in-channel WUA in the lower Yuba River is somewhat higher under the Environmental Baseline relative to the Without-Project scenario (long-term average of ~~83.0~~80.0 percent versus ~~77.8~~74.9 percent of maximum WUA, respectively). The Environmental Baseline results in 0.5 percent more maximum fry rearing habitat during wet WYs, 1.0~~1~~ percent more during above normal WYs, 4.1~~2~~ percent more during below normal WYs, 7.2~~4~~ percent more during dry WYs, and ~~13.1~~12.0 percent more during critical WYs. The Environmental Baseline scenario provides an average of 80 percent or more of maximum WUA during ~~all~~ dry and critical WYTs, whereas the Without-Project scenario does not provide an average of 80 percent or more of maximum fry rearing WUA during ~~below normal, dry or critical~~any WYTs.

Table 6.5-16. Long-term and WYT average steelhead fry rearing in-channel WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Environmental Baseline~~	~~83.0~~	~~81.8~~	~~82.1~~	~~81.5~~	~~84.0~~	~~86.0~~
Without Project	77.8	81.3	81.0	77.3	76.6	72.9
Difference	5.2	0.5	1.1	4.2	7.4	13.1
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Environmental Baseline	80.0	78.9	78.8	78.6	80.9	82.7
Without Project	74.9	78.4	77.8	74.5	73.7	70.7
Difference	5.1	0.5	1.0	4.1	7.2	12.0

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat duration for steelhead fry in-channel rearing under the Environmental Baseline and Without-Project scenarios is presented in Figure 6.5-22. The Environmental Baseline provides slightly lesser or similar amounts of fry rearing habitat availability over the upper 40 percent of the exceedance distribution, but provides more over the remainder of the distribution, and substantially more over the lower nearly 25 percent ~~–~~of the distribution, when habitat is most limiting. The Environmental Baseline and Without-Project scenarios achieve over 80 percent or more of maximum steelhead fry rearing in-channel WUA with about a ~~75~~47 and ~~55~~39 percent probability, respectively.


Steelhead Fry Rearing with Cover WUA (% of Max)
Probability of Exceedance (%)
Environmental Baseline
Without Project
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100

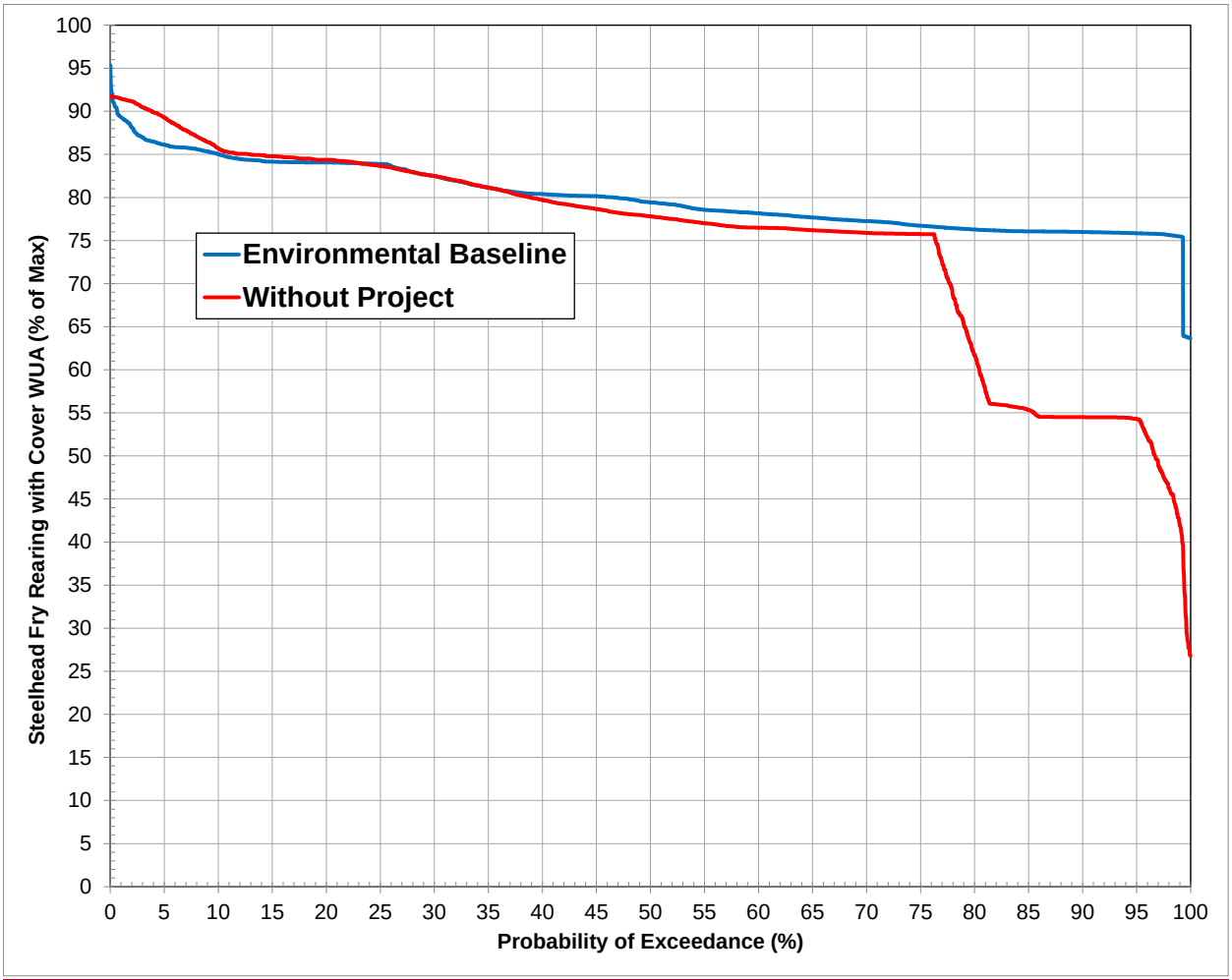


Figure 6.5-22. Steelhead fry rearing in-channel habitat duration over the 41-year hydrologic period for the Environmental Baseline and Without-Project scenarios.

Pages BA6-127 to BA6-129

6.5.3.2.6 Steelhead Juvenile Rearing In-channel Habitat

Table 6.5-17 displays the long-term average and average by WYT steelhead juvenile rearing in-channel WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios. Over the entire 41-year simulation period, long-term average juvenile rearing WUA in the lower Yuba River is substantially higher under the Environmental Baseline relative to the Without-Project scenario (long-term average of ~~96.6~~91.6 percent versus ~~79.1~~75.0 percent of maximum WUA). The Environmental Baseline also results in substantially more maximum juvenile rearing habitat during all WYTs, ranging from 14.2~~5~~ percent more during wet WYs to ~~22.2~~20.4 percent more during critical WYs. The Environmental Baseline scenario provides an average of over 80 percent (and even over ~~95~~90 percent) of juvenile rearing maximum WUA during all WYTs, whereas the Without-Project scenario does not provide~~s~~ an average of 80 percent or more of maximum WUA ~~only~~ during ~~wet and below normal~~any WYTs~~.~~

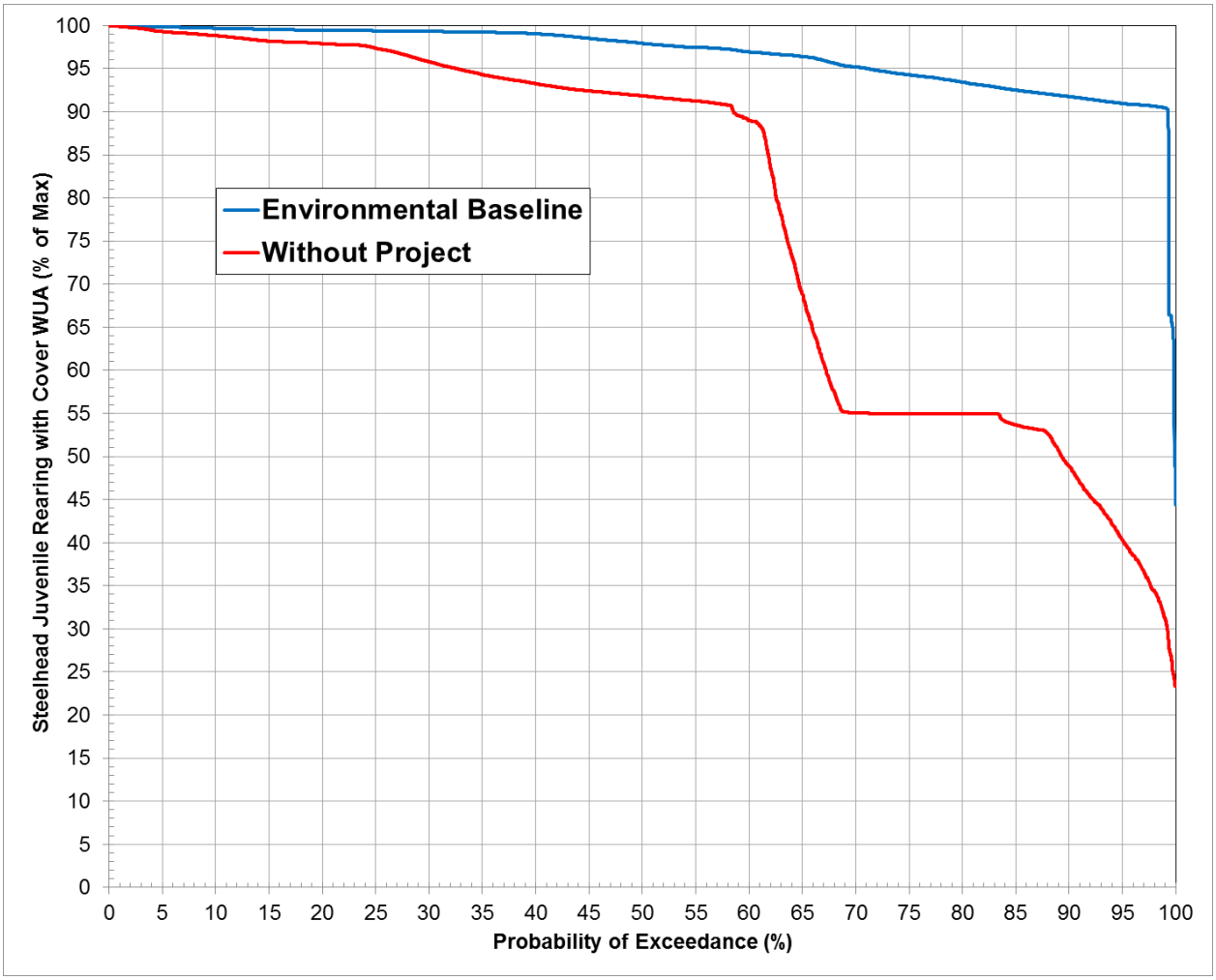
Table 6.5-17. Long-term and WYT average steelhead juvenile rearing in-channel WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Environmental Baseline~~	~~96.6~~	~~95.6~~	~~95.8~~	~~96.8~~	~~98.1~~	~~97.4~~
Without Project	79.1	81.1	79.1	80.2	79.7	75.2
Difference	17.5	14.5	16.7	16.6	18.4	22.2

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline	91.6	90.6	90.9	91.8	92.9	92.4
Without Project	75.0	76.4	75.9	76.0	74.9	72.0
Difference	16.6	14.2	15.0	15.8	18.0	20.4

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat duration for steelhead juvenile in-channel rearing under the Environmental Baseline and Without-Project scenarios is presented in Figure 6.5-23. The Environmental Baseline provides more amounts of juvenile rearing habitat availability over the entire exceedance distribution, and provides substantially more habitat over about the lower 40 percent of the distribution. The Environmental Baseline scenario achieves 80 percent (and even 90 percent) or more of juvenile rearing maximum WUA with about a 99 percent probability, while the Without-Project scenario achieves 80 percent or more of maximum WUA with about a 62~~3~~ percent probability.



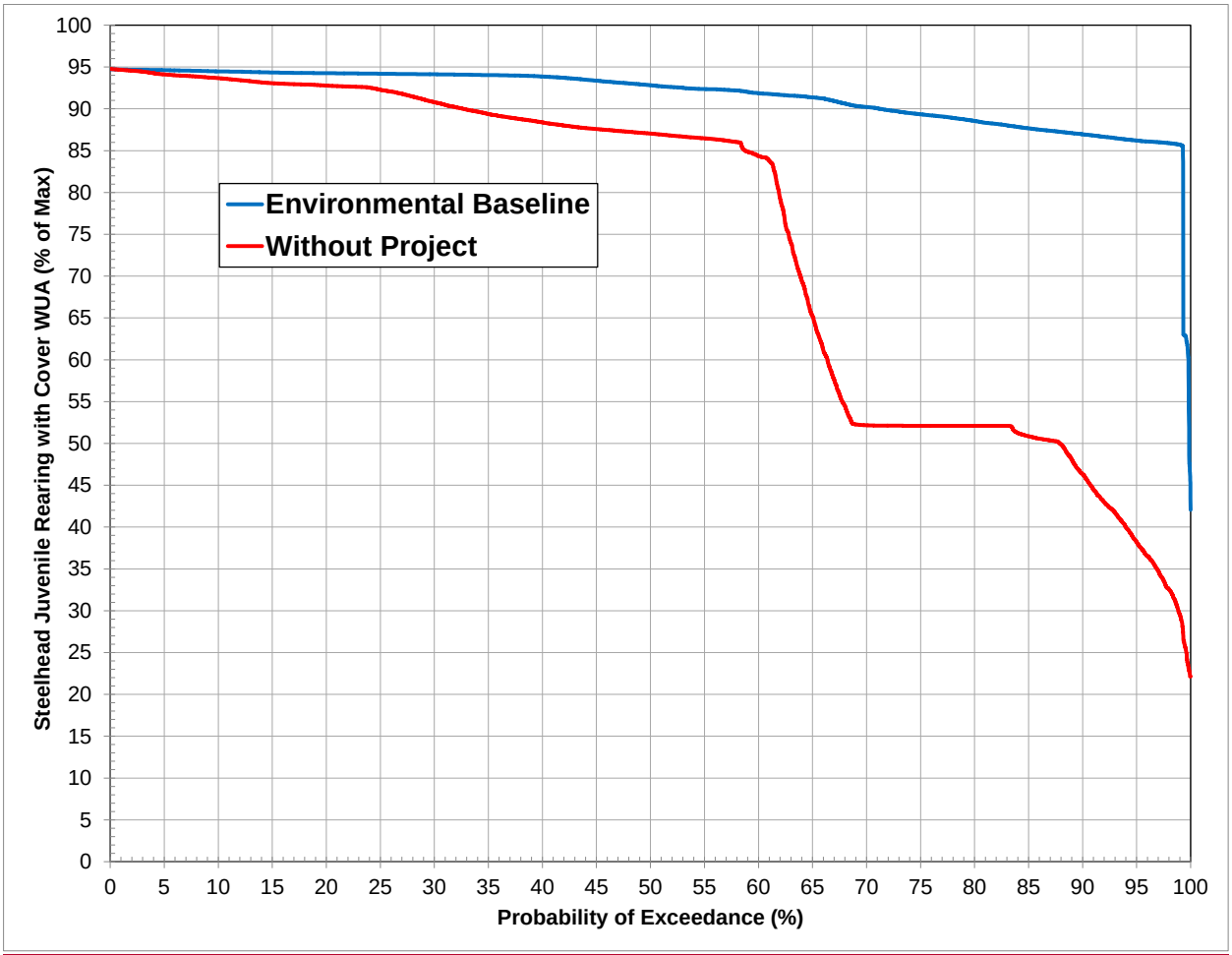


Figure 6.5-23. Steelhead juvenile rearing in-channel habitat duration over the 41-year hydrologic period for the Environmental Baseline and Without-Project scenarios.

Pages BA6-129 to BA6-131

6.5.3.2.7 Steelhead Fry Rearing Full-Flow Habitat

Table 6.5-18 displays the full-flow analysis of the average amounts (ac) of steelhead fry WUA without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by WYT.

For the entire simulation period, similar amounts of average fry rearing habitat (WUA) are available under the Environmental Baseline compared to the Without-Project scenario. The Environmental Baseline results in an average of 4.53 and 5.03 percent less fry rearing habitat during wet and above normal WYs, but 0.5, 8.79 and 17.116.2 percent more habitat during below normal, dry and critical WYs. The greatest difference in amounts of fry rearing habitat

occurs during critical WYs, when the Environmental Baseline provides an average of ~~17.1~~16.2 percent more habitat than the Without-Project scenario.

Table 6.5-18. Long-term average WUA (ac) over the 41-year period of evaluation and WYT-specific relative contribution to the long-term average WUA of steelhead fry rearing habitat, under the Environmental Baseline and the Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**5,002**	**1,830**	**732**	**854**	**610**	**976**
Days ≤ 5,000 cfs	4,400	1,341	664	809	610	976
Days > 5,000 cfs	602	489	68	45	0	0
Avg. WUA	**169.1**	**62.7**	**23.6**	**27.4**	**20.7**	**34.7**
WUA ≤ 5,000 cfs	144.4	42.3	21.0	25.8	20.7	34.7
WUA > 5,000 cfs	24.7	20.5	2.6	1.7	0.0	0.0
Without-Project						
Total Days in Analysis	**5,002**	**1,830**	**732**	**854**	**610**	**976**
Days ≤ 5,000 cfs	4,007	1,156	522	747	608	974
Days > 5,000 cfs	995	674	210	107	2	2
Avg. WUA	**166.4**	**65.6**	**24.9**	**27.3**	**19.0**	**29.6**
WUA ≤ 5,000 cfs	126.1	37.5	17.0	23.2	18.9	29.5
WUA > 5,000 cfs	40.3	28.1	7.9	4.1	0.1	0.1
Differences						
Avg. WUA	**2.7**	**-2.8**	**-1.3**	**0.1**	**1.7**	**5.1**
% change	**1.6%**	**-4.3%**	**-5.3%**	**0.5%**	**8.9%**	**17.1%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**5,002**	**1,952**	**610**	**854**	**488**	**1,098**
Days ≤ 5,000 cfs	4,400	1,459	546	809	488	1,098
Days > 5,000 cfs	602	493	64	45	0	0
Avg. WUA	**169.1**	**66.7**	**19.6**	**27.4**	**16.5**	**38.8**
WUA ≤ 5,000 cfs	144.4	46.1	17.2	25.8	16.5	38.8
WUA > 5,000 cfs	24.7	20.6	2.4	1.7	0.0	0.0
Without-Project						
Total Days in Analysis	**5,002**	**1,952**	**610**	**854**	**488**	**1,098**
Days ≤ 5,000 cfs	4,007	1,230	448	747	488	1,094
Days > 5,000 cfs	995	722	162	107	0	4
Avg. WUA	**166.4**	**69.8**	**20.7**	**27.3**	**15.2**	**33.4**
WUA ≤ 5,000 cfs	126.1	39.9	14.5	23.2	15.2	33.3
WUA > 5,000 cfs	40.3	29.9	6.1	4.1	0.0	0.2
Differences						
Avg. WUA	**2.7**	**-3.1**	**-1.0**	**0.1**	**1.3**	**5.4**
% change	**1.6%**	**-4.5%**	**-5.0%**	**0.5%**	**8.7%**	**16.2%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 6.5-24 displays the full-flow analysis of the average amounts (ac) of steelhead fry weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios. For both scenarios, the highest average ~~spring-run Chinook salmon~~steelhead fry habitat occurred during wet WYs, followed by critical WYs and with lesser amounts during above normal, below normal, and dry WYTs. For both the Environmental Baseline and Without-Project scenarios, relatively little or no additional fry rearing habitat is provided by those days when flows were > 5,000 cfs for dry and critical WYTs.

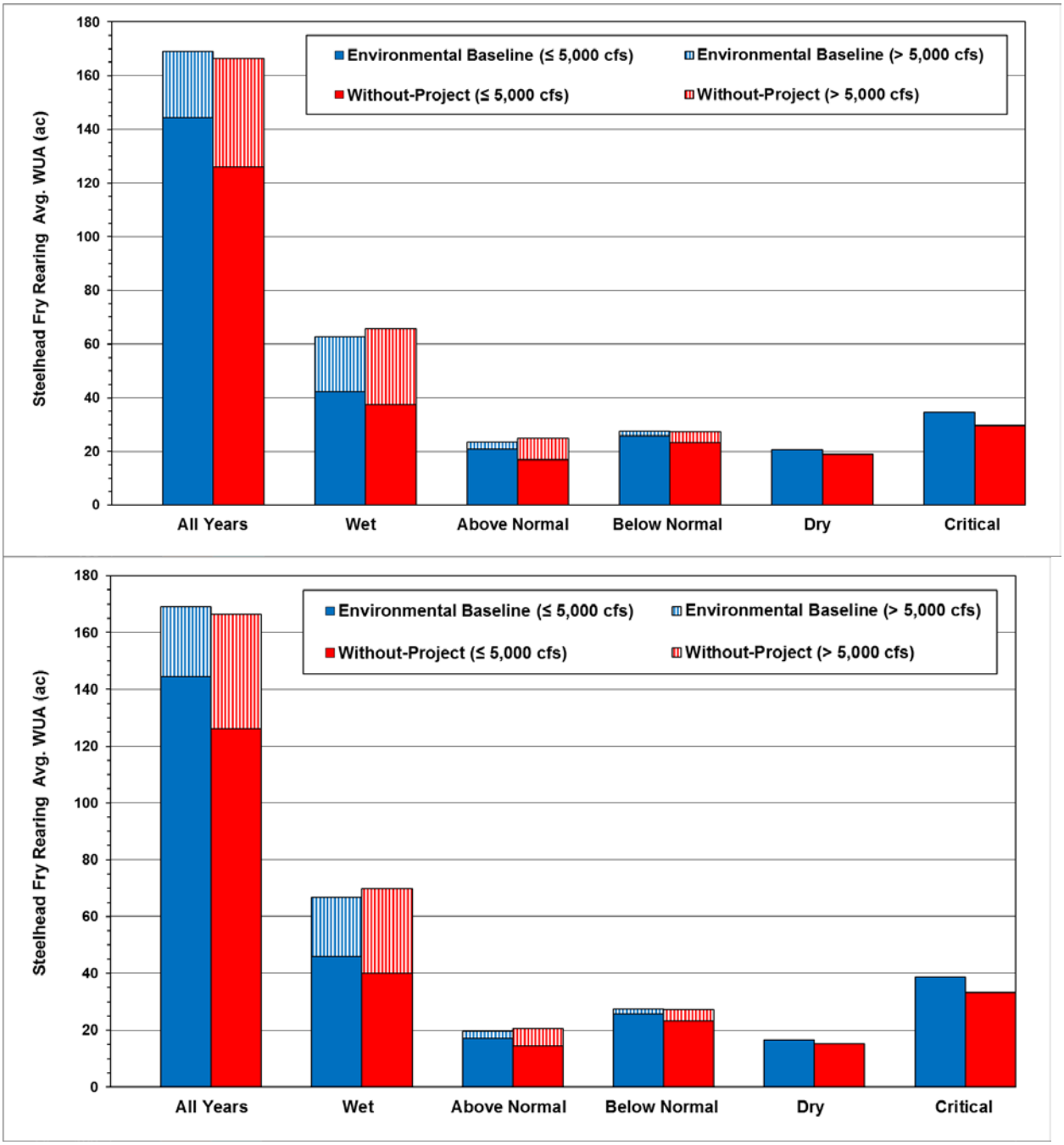


Figure 6.5-24. Comparison of the average amount (ac) of steelhead fry weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

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6.5.3.2.8 Steelhead Juvenile Rearing Full-Flow Habitat

Table 6.5-19 displays the full-flow analysis of the average amounts (ac) of steelhead juvenile WUA without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. For the entire simulation period, substantially higher (16.6 percent) amounts of average juvenile rearing habitat (WUA) are available under the Environmental Baseline compared to the Without-Project scenario. Relative to the Without-Project scenario, the Environmental Baseline results in increasing percentages of juvenile rearing habitat as WYTs progress from wet to critical. The Environmental Baseline provides ~~8.9~~9.3, ~~14.0~~13.6, 17.7, 24.~~80~~, and ~~29.5~~28.5 percent more juvenile rearing habitat during wet, above normal, below normal, dry, and critical WYs, respectively.

Table 6.5-19. Long-term average WUA (ac) over the 41-year period of evaluation and WYT-specific relative contribution to the long-term average WUA of steelhead juvenile rearing habitat, under the Environmental Baseline and the Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**14,974**	**5,477**	**2,191**	**2,557**	**1,826**	**2,923**
Days ≤ 5,000 cfs	13,411	4,198	2,003	2,468	1,823	2,919
Days > 5,000 cfs	1,563	1,279	188	89	3	4
Avg. WUA	**259.7**	**94.4**	**36.7**	**43.9**	**32.4**	**52.3**
WUA ≤ 5,000 cfs	229.7	69.4	33.4	42.3	32.4	52.2
WUA > 5,000 cfs	30.0	25.0	3.3	1.5	0.0	0.1
Without-Project						
Total Days in Analysis	**14,974**	**5,477**	**2,191**	**2,557**	**1,826**	**2,923**
Days ≤ 5,000 cfs	12,756	3,945	1,772	2,349	1,791	2,899
Days > 5,000 cfs	2,218	1,532	419	208	35	24
Avg. WUA	**222.7**	**86.7**	**32.2**	**37.3**	**26.1**	**40.4**
WUA ≤ 5,000 cfs	180.0	56.3	24.7	33.5	25.5	39.9
WUA > 5,000 cfs	42.7	30.4	7.5	3.7	0.6	0.4
Differences						
Avg. WUA	**37.0**	**7.7**	**4.5**	**6.6**	**6.3**	**11.9**
% change	**16.6%**	**8.9%**	**14.0%**	**17.7%**	**24.0%**	**29.5%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**14,974**	**5,842**	**1,826**	**2,557**	**1,461**	**3,288**
Days ≤ 5,000 cfs	13,411	4,540	1,661	2,468	1,458	3,284
Days > 5,000 cfs	1,563	1,302	165	89	3	4
Avg. WUA	**259.7**	**100.5**	**30.6**	**43.9**	**25.9**	**58.8**
WUA ≤ 5,000 cfs	229.7	75.0	27.7	42.3	25.8	58.7
WUA > 5,000 cfs	30.0	25.5	2.9	1.5	0.0	0.1
Without-Project						
Total Days in Analysis	**14,974**	**5,842**	**1,826**	**2,557**	**1,461**	**3,288**
Days ≤ 5,000 cfs	12,756	4,211	1,506	2,349	1,432	3,258
Days > 5,000 cfs	2,218	1,631	320	208	29	30
Avg. WUA	**222.7**	**92.0**	**27.0**	**37.3**	**20.7**	**45.8**
WUA ≤ 5,000 cfs	180.0	59.8	21.2	33.5	20.2	45.2
WUA > 5,000 cfs	42.7	32.2	5.7	3.7	0.5	0.5
Differences						
Avg. WUA	**37.0**	**8.5**	**3.7**	**6.6**	**5.1**	**13.0**
% change	**16.6%**	**9.3%**	**13.6%**	**17.7%**	**24.8%**	**28.5%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 6.5-25 displays the full-flow analysis of the average amounts (ac) of steelhead juvenile WUA without cover under the Environmental Baseline and the Without-Project scenarios. For both scenarios, the highest average spring-run Chinook salmon fry habitat occurred during wet WYs, followed by critical WYs and with lesser amounts during above normal, below normal, and dry WYTs. For both the Environmental Baseline and Without-Project scenarios, relatively little to no additional juvenile rearing habitat is provided by those days when flows were > 5,000 cfs for dry and critical WYTs.

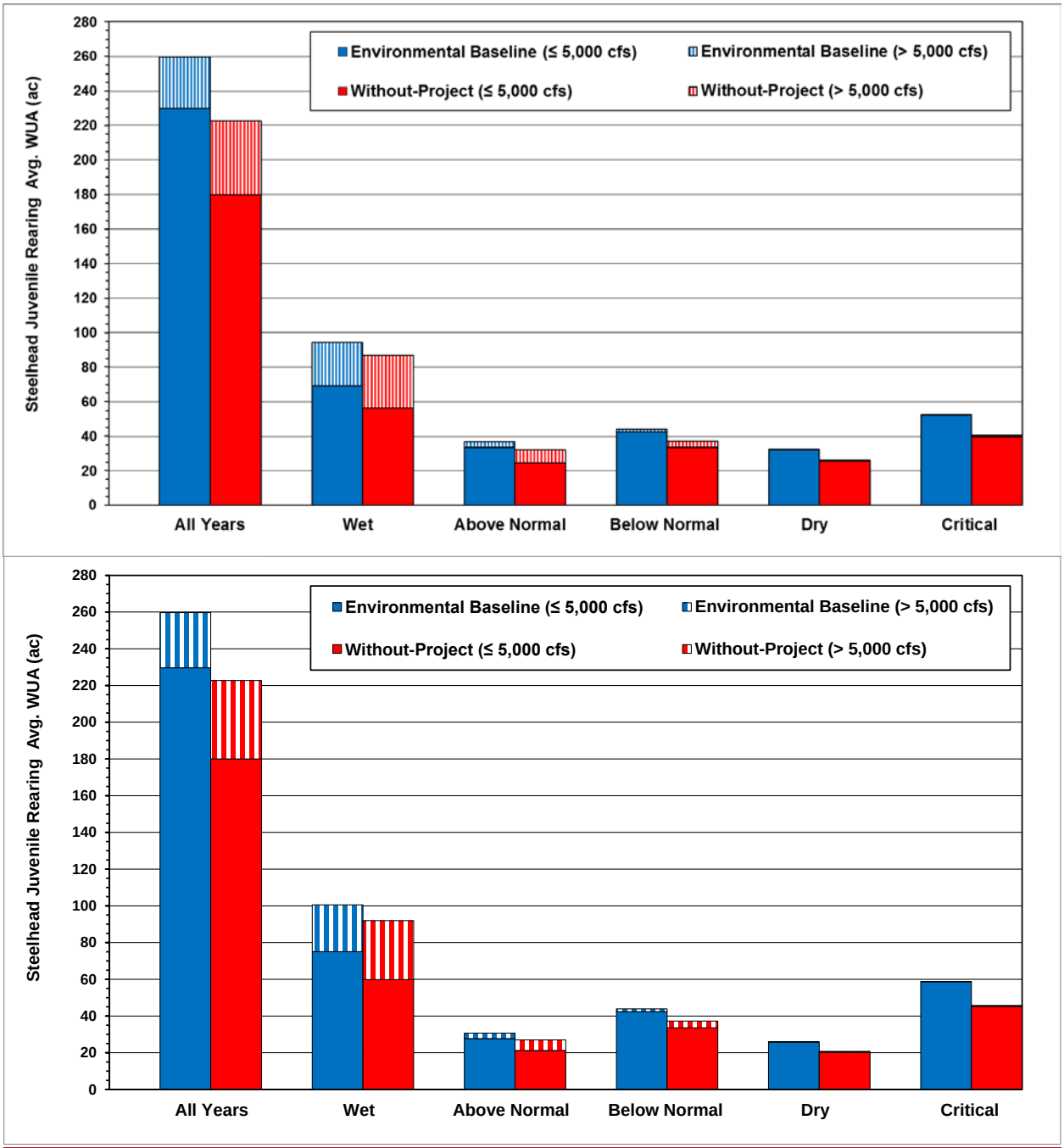


Figure 6.5-25. Comparison of the average amount (ac) of steelhead juvenile weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

SECTION 8

Pages BA8-6 to BA8-7

8.3.1.1.1 Flow-Dependent Habitat Conditions

Spawning Habitat Availability

Spawning WUA for spring-run Chinook salmon was evaluated for simulated flows up to 5,000 cfs, which generally represents the bankfull flow in the lower Yuba River. Because flows do not exceed 5,000 cfs over the 41-year simulation period during the September through mid-October spring-run Chinook salmon spawning period, no simulated daily flows were excluded from the spring-run Chinook salmon spawning WUA analysis. Table 8.3-1 displays the long-term average and average by water year type (WYT) spring-run Chinook salmon spawning habitat (percent of maximum WUA) under the Proposed Action and Environmental Baseline.

Table 8.3-1. Long-term and water year type average spring-run Chinook salmon spawning WUA (percent of maximum) under the Proposed Action and Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Proposed Action~~	~~99.3~~	~~99.3~~	~~99.3~~	~~99.6~~	~~99.6~~	~~98.9~~
Environmental Baseline	98.8	99.3	99.4	99.6	99.6	96.1
Difference	0.5	0.0	-0.1	0.0	0.0	2.8
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Proposed Action	98.3	98.2	98.6	98.6	98.5	98.0
Environmental Baseline	97.8	98.2	98.6	98.6	98.6	95.5
Difference	0.5	0.0	0.0	0.0	-0.1	2.5

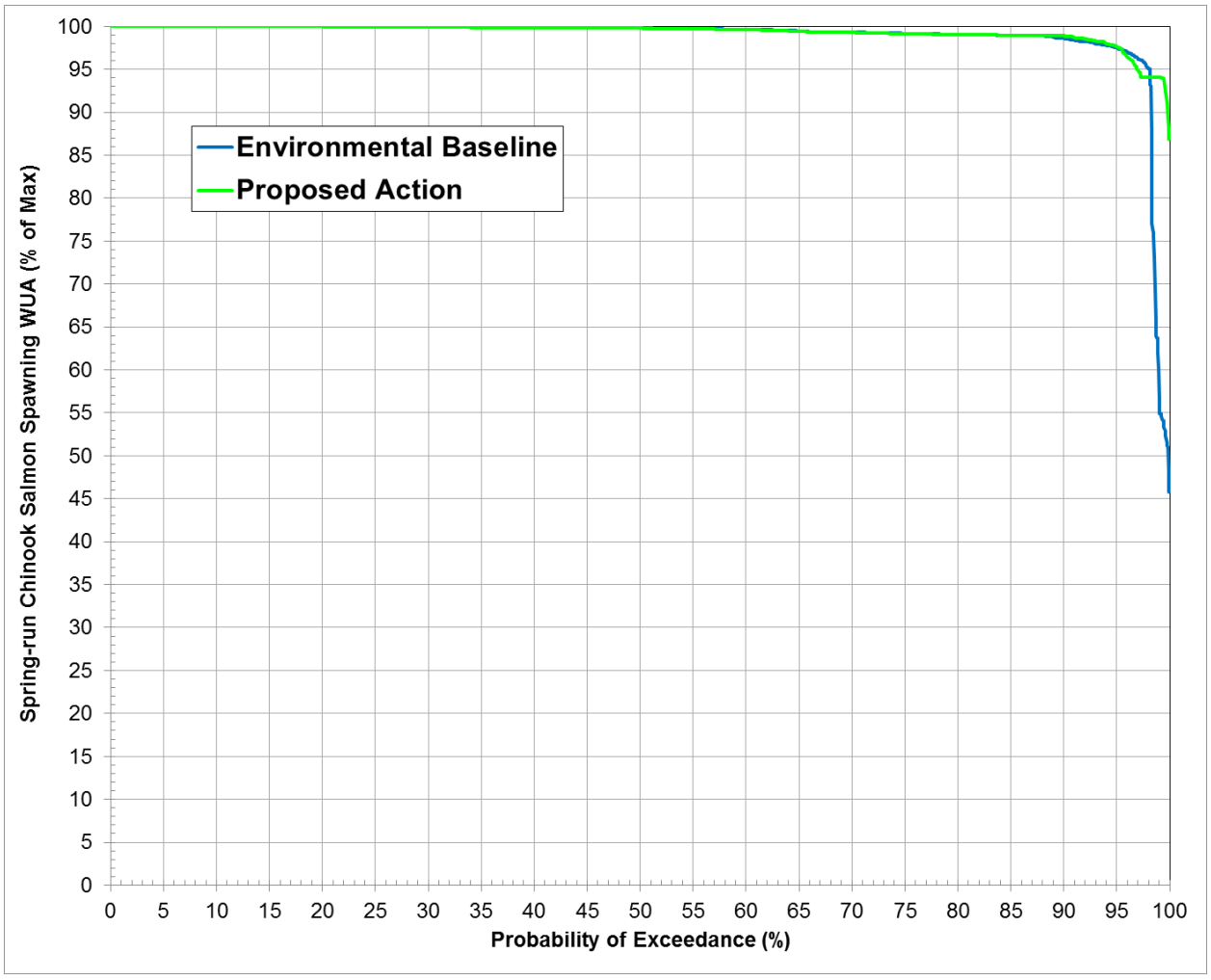
[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Over the entire 41-year simulation period, long-term average spring-run Chinook salmon spawning habitat availability (percent of maximum WUA) in the lower Yuba River is similar under the Proposed Action relative to the Environmental Baseline (long-term average of ~~99.3~~98.3 percent versus ~~98.8~~97.8 percent of the maximum WUA, respectively). The Proposed Action provides very similar amounts of spawning habitat during wet, above normal, below normal and dry WYs, and provides 2.5~~8~~ percent more habitat during critical WYs. As with the

Environmental Baseline, the Proposed Action provides, on the average, over 80 percent (and even 95 percent) or more of maximum spawning WUA during all WYTs.

Habitat duration for spring-run Chinook salmon spawning under the Proposed Action and Environmental Baseline scenarios are presented in Figure 8.3-1.

The Proposed Action scenario provides similar amounts of spawning habitat availability overall, but provides more spawning habitat availability over about the lowest about 2 percent of the exceedance probability distribution, relative to the Environmental Baseline scenario. The Proposed Action provides 80 percent (and even 90 percent) or more of maximum spawning WUA 100 percent of the time, while the Environmental Baseline scenario provides 80 percent (and even 90 percent) or more of maximum WUA about 98 percent of the time.



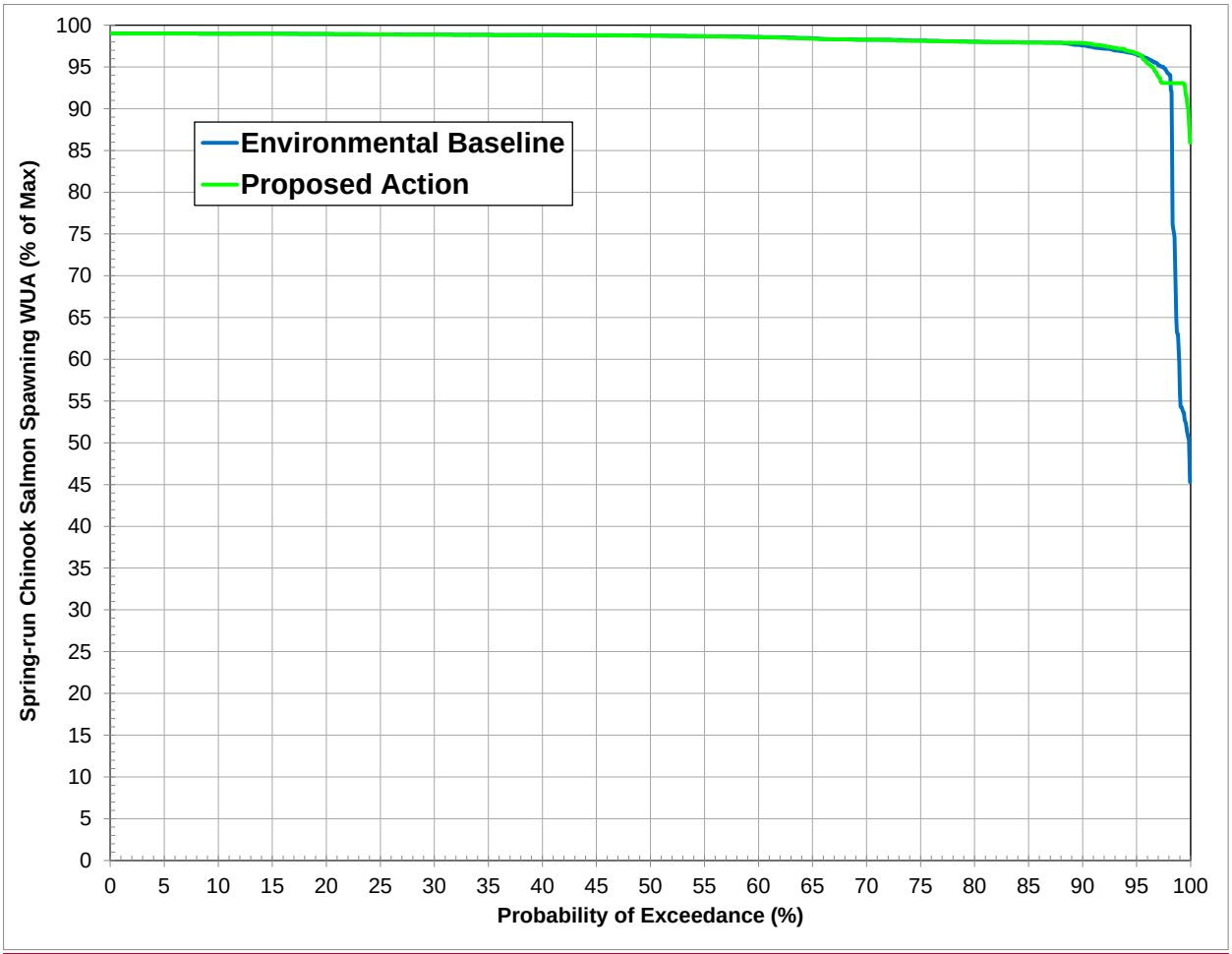


Figure 8.3-1. Spring-run Chinook salmon spawning habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline scenarios.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), for analytical purposes the corresponding spring-run Chinook salmon spawning period extends from September 1 – October 15 of 1977. During that spawning season, 934 percent of spring-run Chinook salmon maximum spawning WUA was provided under the Proposed Action, compared to 712 percent provided under the Environmental Baseline.

Spring-run Chinook salmon spawning habitat availability under the Proposed Action is generally similar to the Environmental Baseline overall, provides more habitat during the conference WY, and represents a low stressor under the Proposed Action.

Pages BA8-7 to BA8-9

Potential Redd Dewatering

Since the development of the existing flow fluctuation criteria, additional data and information

have been collected and models have been developed to better analyze the potential for spring-run Chinook salmon redd dewatering in the Yuba River (see Section 6.0 of this Applicant-Prepared Draft BA). Proposed new flow fluctuation criteria were developed for the Proposed Action (see Proposed Condition AR9, *Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam* in Appendix E2 of the Amended FLA).

For every day of the annual embryo incubation period over 41 years, the long-term annual averages of the percentages of spring-run Chinook salmon redds potentially dewatered under the Proposed Action and Environmental Baseline scenarios both are very low, only 0.02 percent and 0.01 percent, respectively. Applying the 41-year average of estimated redd dewatering, it is estimated that essentially no spring-run Chinook salmon redd would be expected to have been dewatered under either the Proposed Action or the Environmental Baseline scenario during 2009 and 2010[4].

The average percentage of redds potentially dewatered would be very small, and would be very similar under the Proposed Action, relative to the Environmental Baseline during all WYTs (Table 8.3-2).

Table 8.3-2. Estimated spring-run Chinook salmon redd and egg pocket potential dewatering under the Proposed Action relative to the Environmental Baseline.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Proposed Action	Environmental Baseline	Difference	Proposed Action	Environmental Baseline	Difference
Long-term (All WYs)	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%
Wet	0.03%	0.02%	0.01%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Critical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
WYT Categories	**Redd Dewatering Index (%)**			**Egg Pocket Dewatering Index (%)**		
	Proposed Action	**Environmental Baseline**	**Difference**	**Proposed Action**	**Environmental Baseline**	**Difference**
Long-term (All WYs)	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%
Wet	0.03%	0.02%	0.01%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Critical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

[4] All phenotypic spring-run Chinook salmon redds identified in the lower Yuba River during the weekly near-census 2009 and 2010 Chinook salmon redd surveys were combined into one dataset. As described in Section 6.0, an estimated 1,148 and 1,465 spring-run Chinook salmon redds were constructed in the lower Yuba River during 2009 and 2010, respectively. See Section 6.5 for the detailed description of the redd dewatering methodology.

The long-term and WYT averages of the percentage of egg pockets dewatered indicate that no egg pockets would be dewatered under the Proposed Action scenario or the Environmental Baseline scenario during any WYT. During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), no redds or egg pockets would potentially be expected to be dewatered under the Proposed Action scenario or under the Environmental Baseline scenario.

Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam, was developed in part to minimize the potential for spring-run Chinook salmon redd dewatering during the period from September 2 through December 31 (corresponding to the spring-run Chinook salmon spawning and incubation period). Under this proposed condition, Licensee shall not reduce the flow downstream of Englebright Dam to less than the larger of: 1) the applicable minimum streamflow requirement specified in YCWA's Proposed Condition AR3; or 2) the flow that would result from applying the maximum flow reduction amount specified in Table 1 of this condition corresponding to the base flow range determined using the maximum 5-day average flow that occurred on days when this condition was in effect during that September 2 through December 31 period. During the period of September 2 through 5, the base flow range for this proposed condition shall be determined by the average daily flow on September 1.

Proposed Condition AR9 would not necessarily apply to every day each year of the embryo incubation period. It would not apply: (a) to Project operations during emergencies, (b) to releases required by USACE's flood control criteria, (c) to releases required to maintain a flood control buffer or for other flood control purposes, (d) to bypasses of uncontrolled flows into Englebright Reservoir, (e) during times when Englebright Dam is spilling, or (f) when releases are governed by the limits of Table 3 of this condition. When this condition would apply, Licensee shall make reasonable efforts to operate New Bullards Bar Reservoir and Project facilities downstream of Englebright Dam and coordinate with the operator of the Narrows Project (FERC Project No. 1403) to avoid fluctuations in the flow of the Yuba River downstream of Englebright Dam and daily changes in Project operations affecting releases or bypasses of flow downstream of Englebright Dam shall be continuously measured at USGS Smartsville Streamflow Gage 11418000.

During the days over the 41-year period of evaluation when this proposed condition would apply, it would provide the intended protection for spring-run Chinook salmon redd dewatering (Table 8.3-3).

Table 8.3-3. Estimated spring-run Chinook salmon redd and egg pocket potential dewatering under the Proposed Action relative to the Environmental Baseline for those days in the 41-year period of record during which the flow reduction criteria specified in Proposed Condition AR9 would apply.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Proposed Action	Environmental Baseline	Difference	Proposed Action	Environmental Baseline	Difference
Long-term (All WYs)	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%
Wet	0.03%	0.02%	0.01%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Critical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Proposed Action	Environmental Baseline	Difference	Proposed Action	Environmental Baseline	Difference
Long-term (All WYs)	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%
Wet	0.03%	0.02%	0.01%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Critical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Spring-run Chinook salmon redd dewatering under the Proposed Action scenario is estimated to be very low and similar to that under the Environmental Baseline. Redd dewatering under the Proposed Action represents a low stressor to spring-run Chinook salmon.

Pages BA8-10 to BA8-11

Fry and Juvenile Rearing Habitat Availability

Spring-run Chinook Salmon Fry Rearing In-Channel Habitat

Table 8.3-4 displays the long-term average and average by WYT spring-run Chinook salmon fry rearing in-channel habitat (percent of maximum WUA) under the Proposed Action and Environmental Baseline scenarios.

Table 8.3-4. Long-term and WYT average spring-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Proposed Action~~	~~88.6~~	~~88.6~~	~~89.0~~	~~87.6~~	~~88.0~~	~~89.7~~
Environmental Baseline	88.6	88.6	88.9	87.6	88.2	89.7
Difference	0.0	0.0	0.1	0.0	-0.2	0.0

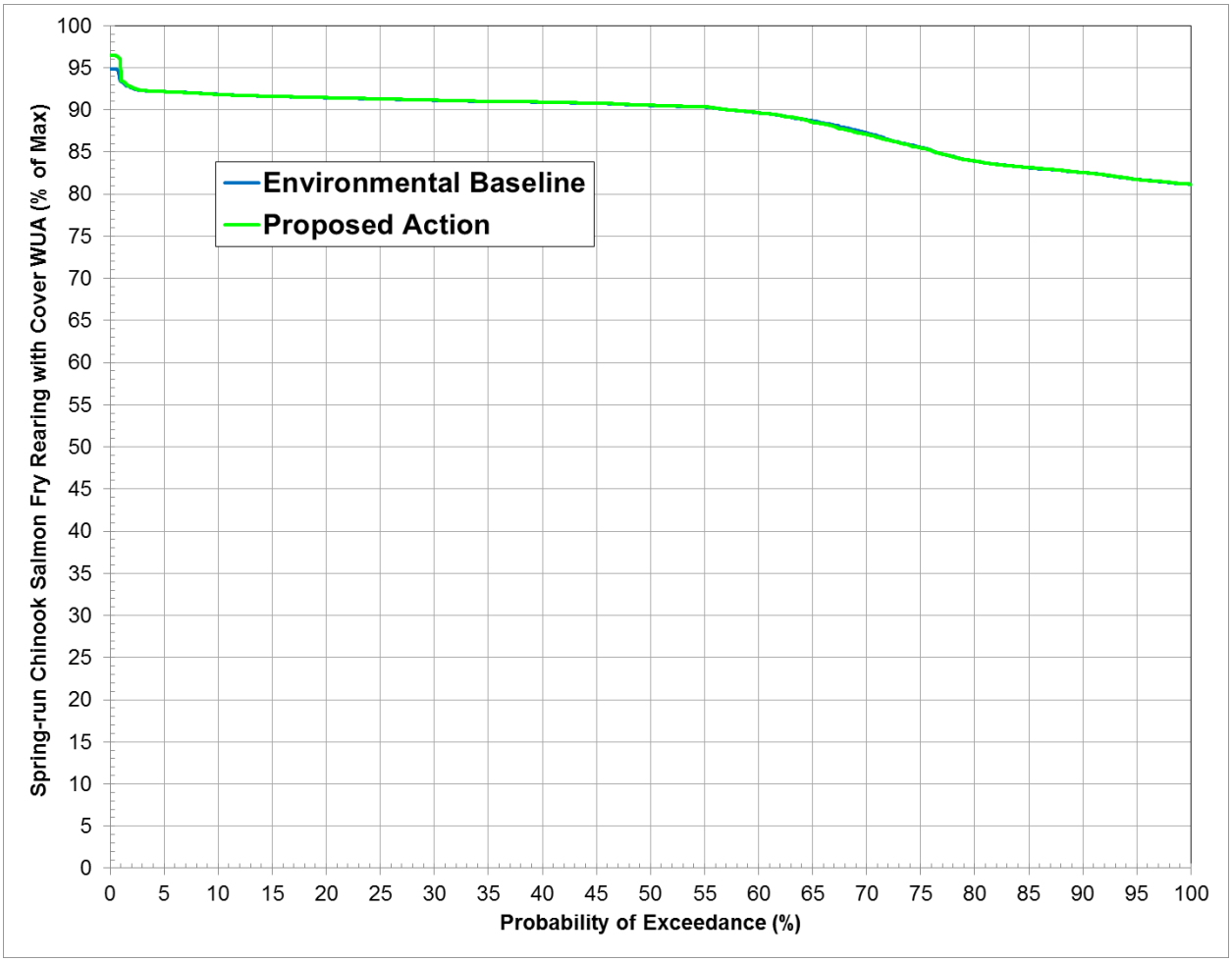
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action	84.2	84.3	84.3	83.2	83.5	85.1
Environmental Baseline	84.2	84.3	84.3	83.2	83.7	85.1
Difference	0.0	0.0	0.0	0.0	-0.2	0.0

1 As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
2 Based on the WY 1970-2010 simulation period.

During the mid-November through mid-February spring-run Chinook salmon fry rearing period, flows exceed 5,000 cfs during about 13 percent of the days over the 41-year simulation period for the Proposed Action, and during about 12 percent of the days under the Environmental Baseline. These days were excluded from the spring-run Chinook salmon fry in-channel rearing WUA analysis.

Over the entire 41-year simulation period, long-term average fry rearing in-channel habitat availability (percent of maximum WUA) in the lower Yuba River is the same under the Proposed Action and Environmental Baseline scenarios (long-term average of ~~88.6~~84.2 percent of the maximum WUA). The Proposed Action and Environmental Baseline scenarios result in very similar amounts of WUA by WYT. Both the Proposed Action and Environmental Baseline scenario provide an average of over 80 percent of fry rearing maximum WUA during all WYTs.

Habitat durations for spring-run Chinook salmon fry rearing under the Proposed Action and Environmental Baseline scenarios are presented in Figure 8.3-2. The Proposed Action and Environmental Baseline scenarios provide very similar amounts of habitat over the entire distribution. Both the Proposed Action and Environmental Baseline scenarios provide over 80 percent fry rearing maximum WUA over about 79 percent of the ~~entire~~ exceedance distributions.



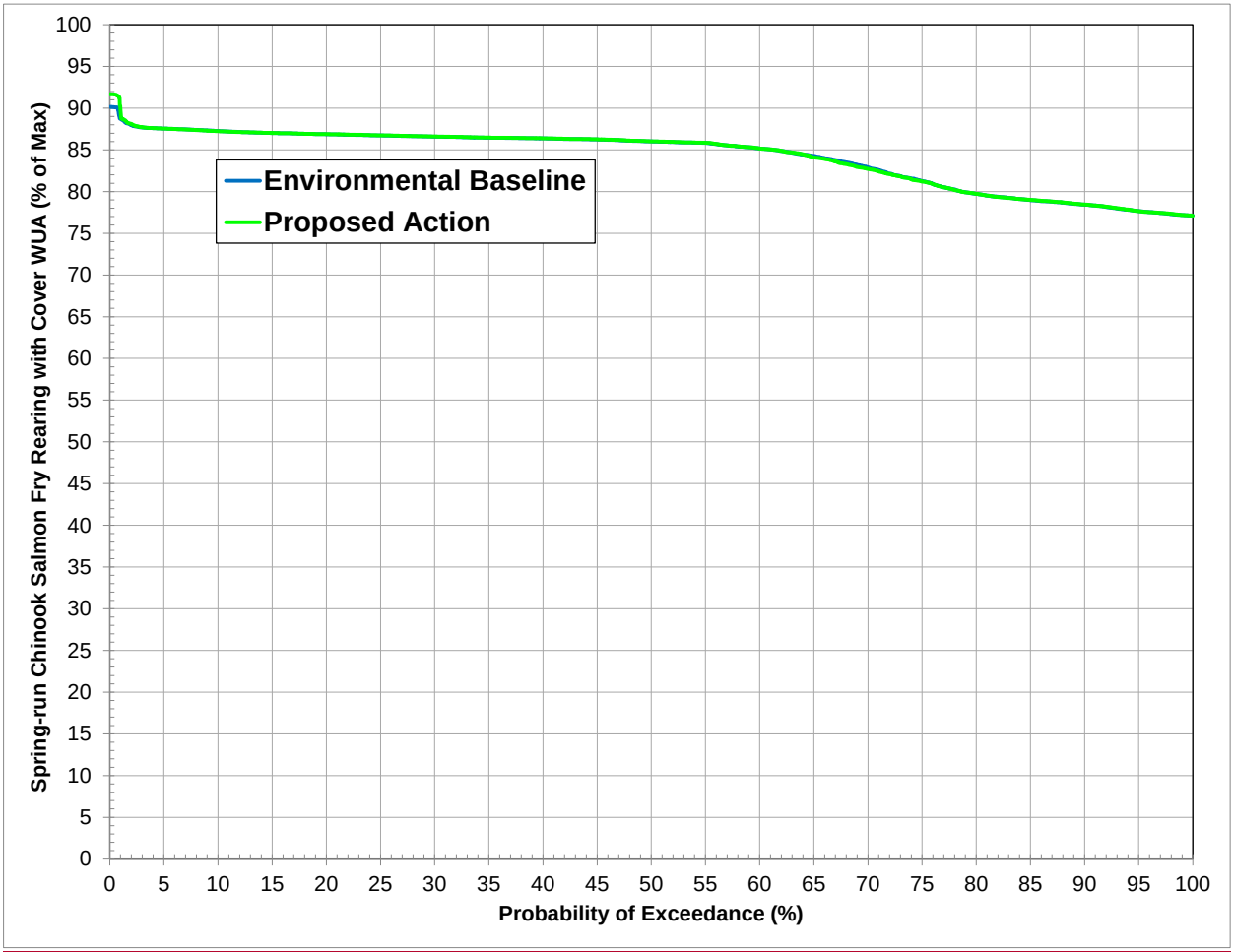


Figure 8.3-2. Spring-run Chinook salmon fry in-channel rearing habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline scenarios.

During the fry rearing season of the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), ~~91.2~~86.6 percent of spring-run Chinook salmon fry rearing maximum WUA was provided under both the Proposed Action scenario and the Environmental Baseline scenario.

Pages BA8-11 to BA8-13

Spring-run Chinook Salmon Fry Rearing Full-Flow Habitat

Table 8.3-5 displays the full-flow analysis of the amounts (ac) of spring-run Chinook salmon fry WUA without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by WYT.

For the entire simulation period, very similar amounts of fry rearing habitat (average WUA) are available under the Proposed Action compared to the Environmental Baseline as well as for each of the WYTs.

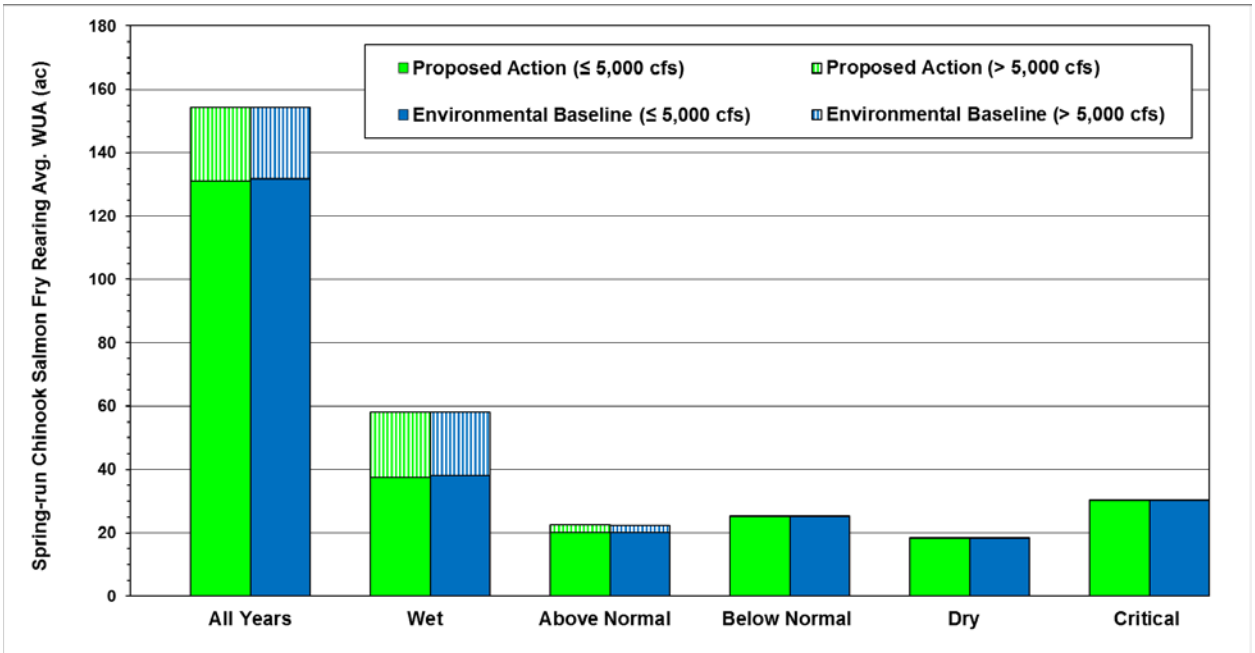
Table 8.3-5. Long-term average WUA (ac) over the 41-year period of evaluation and WYT-specific relative contribution to the long-term average WUA of spring-run Chinook salmon fry rearing habitat, under the Proposed Action and the Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**3,772**	**1,380**	**552**	**644**	**460**	**736**
Days ≤ 5,000 cfs	3,298	959	507	639	458	735
Days > 5,000 cfs	474	421	45	5	2	1
Avg. WUA	**154.4**	**58.1**	**22.4**	**25.3**	**18.3**	**30.3**
WUA ≤ 5,000 cfs	131.1	37.4	20.2	25.1	18.2	30.2
WUA > 5,000 cfs	23.3	20.7	2.2	0.2	0.1	0.0
Environmental Baseline						
Total Days in Analysis	**3,772**	**1,380**	**552**	**644**	**460**	**736**
Days ≤ 5,000 cfs	3,317	979	506	639	458	735
Days > 5,000 cfs	455	401	46	5	2	1
Avg. WUA	**154.3**	**58.0**	**22.3**	**25.3**	**18.3**	**30.3**
WUA ≤ 5,000 cfs	131.8	38.1	20.1	25.1	18.2	30.2
WUA > 5,000 cfs	22.5	19.9	2.3	0.2	0.1	0.0
Differences						
Avg. WUA	**0.1**	**0.1**	**0.1**	**0.0**	**-0.1**	**0.0**
% change	**0.1%**	**0.2%**	**0.3%**	**0.0%**	**-0.4%**	**0.0%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**3,772**	**1,472**	**460**	**644**	**368**	**828**
Days ≤ 5,000 cfs	3,298	1,042	424	639	366	827
Days > 5,000 cfs	474	430	36	5	2	1
Avg. WUA	**154.4**	**62.0**	**18.5**	**25.3**	**14.6**	**34.0**
WUA ≤ 5,000 cfs	131.1	40.8	16.8	25.1	14.5	33.9
WUA > 5,000 cfs	23.3	21.2	1.8	0.2	0.1	0.0
Environmental Baseline						
Total Days in Analysis	**3,772**	**1,472**	**460**	**644**	**368**	**828**
Days ≤ 5,000 cfs	3,317	1,061	424	639	366	827
Days > 5,000 cfs	455	411	36	5	2	1
Avg. WUA	**154.3**	**61.9**	**18.5**	**25.3**	**14.6**	**34.0**
WUA ≤ 5,000 cfs	131.8	41.5	16.7	25.1	14.6	33.9
WUA > 5,000 cfs	22.5	20.4	1.8	0.2	0.1	0.0
Differences						
Avg. WUA	**0.1**	**0.2**	**0.0**	**0.0**	**-0.1**	**0.0**
% change	**0.1%**	**0.2%**	**0.1%**	**0.0%**	**-0.6%**	**0.1%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 8.3-3 displays the full-flow analysis of the average amounts (ac) of spring-run Chinook salmon fry WUA without cover under the Proposed Action and the Environmental Baseline. For both scenarios, the highest average spring-run Chinook salmon fry habitat (WUA) occurred during wet WYs, followed by critical WYs and with lesser amounts during above normal, below normal, and dry WYTs. For both the Proposed Action and Environmental Baseline scenarios, relatively little or no additional fry rearing habitat is provided by days when flows were > 5,000 cfs for below normal, dry, and critical WYTs.



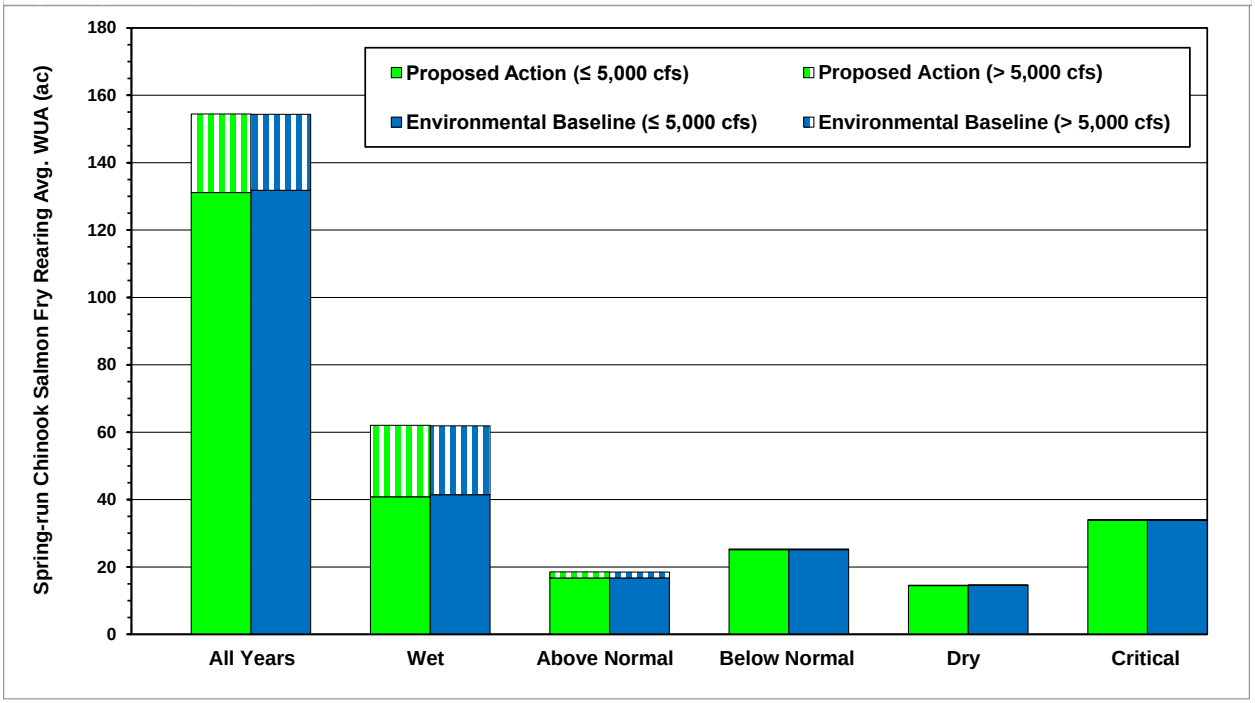


Figure 8.3-3. Comparison of the average amount (ac) of spring-run Chinook salmon fry weighted usable area (WUA) without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Shown are the average amounts over the long-term full simulation period (all years) and by water year type of habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages BA8-13 to BA8-15

Spring-run Chinook Salmon Juvenile Rearing In-Channel Habitat

Table 8.3-6 displays the long-term average and average by WYT spring-run Chinook salmon juvenile rearing in-channel habitat (percent of maximum WUA) under the Proposed Action and Environmental Baseline scenarios.

During the year-round spring-run Chinook salmon juvenile rearing period, flows exceed 5,000 cfs during about 11 percent of the days over the 41-year simulation period for the Proposed Action, and about 10 percent of the days under the Environmental Baseline scenarios. These days were excluded from the spring-run Chinook salmon juvenile in-channel rearing WUA analysis.

Over the entire 41-year simulation period, long-term average juvenile in-channel rearing habitat availability in the lower Yuba River is similar under the Proposed Action and Environmental Baseline scenarios (long-term average of ~~96.5~~90.6 percent and ~~96.3~~90.5 percent of maximum WUA, respectively). The Proposed Action and Environmental Baseline scenarios also result in very similar amounts of WUA by WYT, although the Proposed Action provides slightly more habitat (0.5~~7~~ percent) during critical WYs. Both the Proposed Action and Environmental Baseline scenarios provide over 80 percent (and even up to about ~~95~~90 percent) of juvenile in-channel rearing maximum WUA during all WYTs.

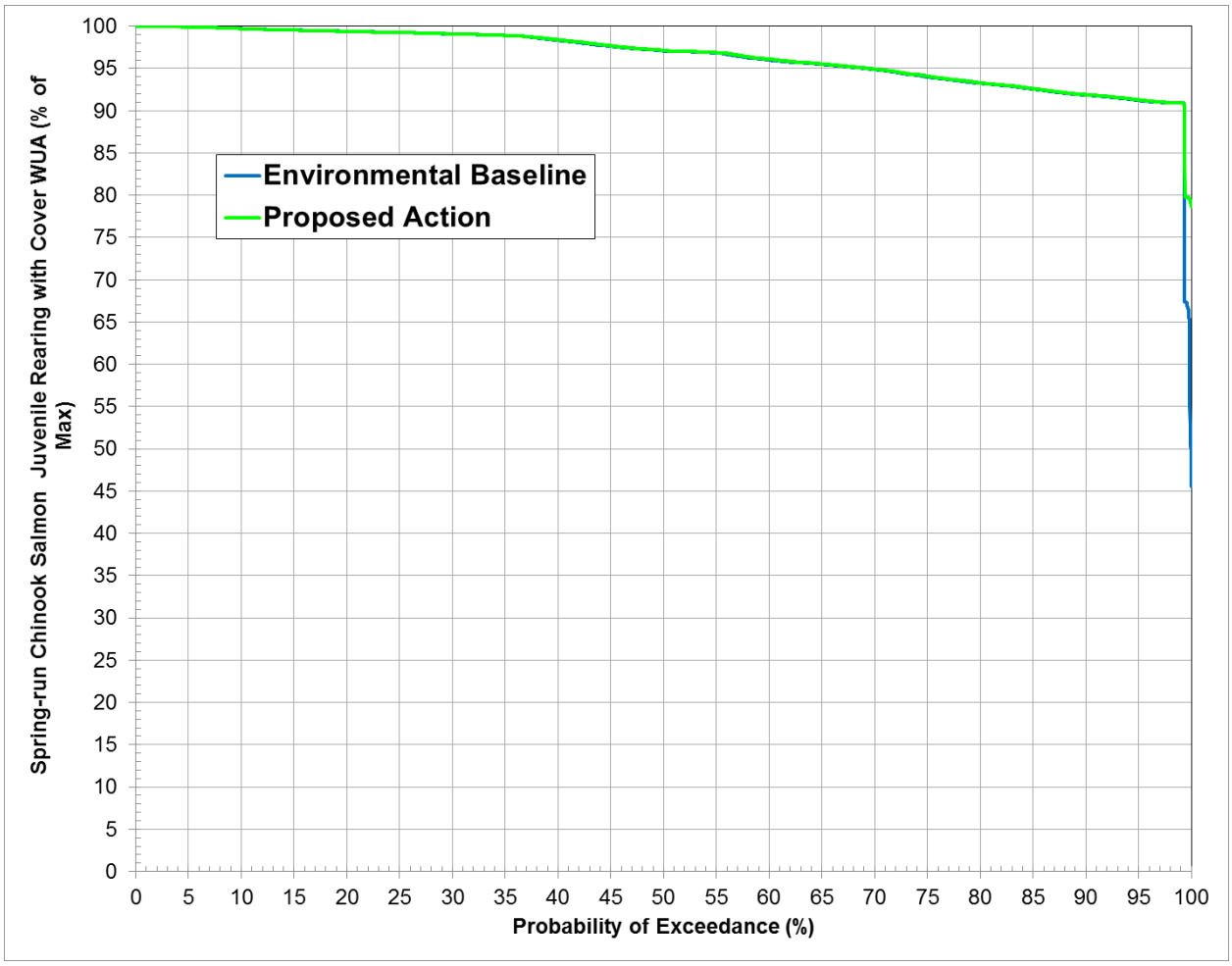
Table 8.3-6. Long-term and WYT average spring-run Chinook salmon juvenile rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Proposed Action~~	~~96.5~~	~~95.6~~	~~95.7~~	~~96.4~~	~~97.5~~	~~97.8~~
Environmental Baseline	96.3	95.5	95.7	96.4	97.5	97.1
Difference	0.2	0.1	0.0	0.0	0.0	0.7

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action	90.6	89.8	90.0	90.5	91.5	91.8
Environmental Baseline	90.5	89.7	90.0	90.5	91.6	91.3
Difference	0.1	0.1	0.0	0.0	-0.1	0.5

1 As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
2 Based on the WY 1970-2010 simulation period.

Habitat duration for spring-run Chinook salmon juvenile in-channel rearing under the Proposed Action and Environmental Baseline scenarios is presented in Figure 8.3-4. The Proposed Action and Environmental Baseline scenarios provide very similar amounts of habitat over nearly the entire distribution. Both the Proposed Action and Environmental Baseline scenarios achieve over 80 percent ~~(and even 90 percent)~~ of juvenile in-channel rearing maximum WUA with about a 99 percent probability.



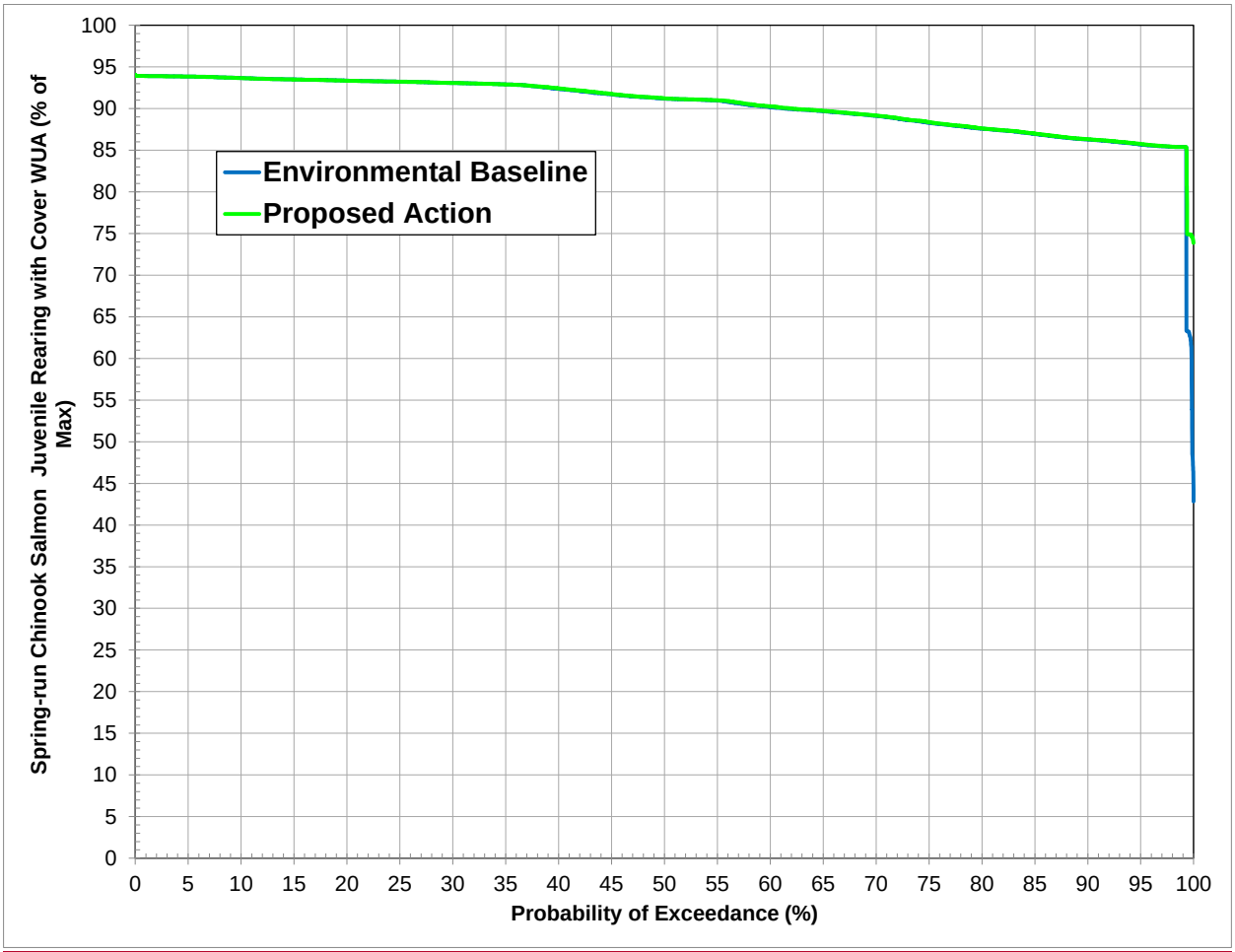


Figure 8.3-4. Spring-run Chinook salmon juvenile in-channel rearing habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline scenarios.

During the juvenile rearing season of the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), ~~93.9~~88.2 percent of spring-run Chinook salmon maximum juvenile in-channel rearing WUA was provided under the Proposed Action compared to ~~89.0~~83.6 percent under the Environmental Baseline scenario.

Pages BA8-15 to BA8-17

Spring-run Chinook Salmon Juvenile Rearing Full-Flow Habitat

Table 8.3-7 displays the full-flow analysis of the average amounts (ac) of spring-run Chinook salmon juvenile WUA without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. For the entire simulation period, very similar amounts of juvenile rearing habitat (average WUA) are available under the Proposed Action and the Environmental Baseline. Relative to the Environmental Baseline, the Proposed Action results in very similar amounts of juvenile rearing habitat for all WYTs, with the exception of critical WYs when 0.8 percent more habitat is provided under the Proposed Action.

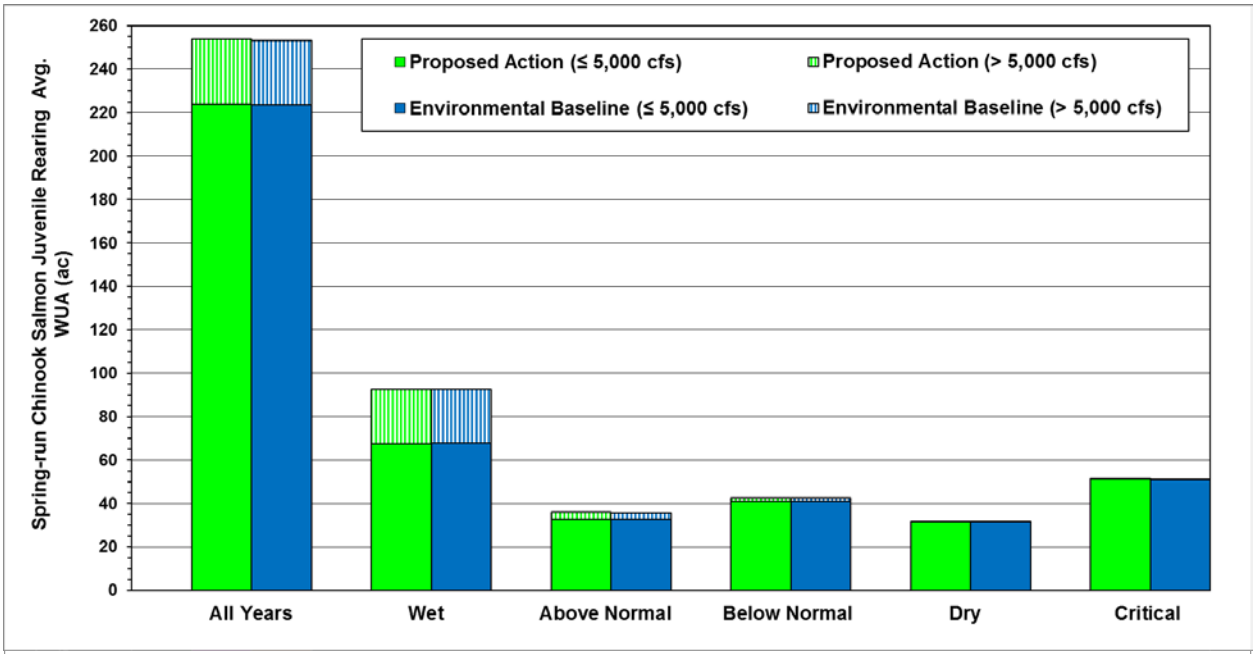
Table 8.3-7. Long-term average WUA (ac) over the 41-year period of evaluation and WYT-specific relative contribution to the long-term average WUA of spring-run Chinook salmon juvenile rearing habitat, under the Proposed Action and the Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**14,974**	**5,477**	**2,191**	**2,557**	**1,826**	**2,923**
Days ≤ 5,000 cfs	13,387	4,175	2,002	2,468	1,823	2,919
Days > 5,000 cfs	1,587	1,302	189	89	3	4
Avg. WUA	**253.8**	**92.5**	**35.9**	**42.7**	**31.4**	**51.3**
WUA ≤ 5,000 cfs	223.8	67.5	32.6	41.1	31.4	51.3
WUA > 5,000 cfs	30.0	25.0	3.3	1.5	0.0	0.1
Environmental Baseline						
Total Days in Analysis	**14,974**	**5,477**	**2,191**	**2,557**	**1,826**	**2,923**
Days ≤ 5,000 cfs	13,411	4,198	2,003	2,468	1,823	2,919
Days > 5,000 cfs	1,563	1,279	188	89	3	4
Avg. WUA	**253.3**	**92.4**	**35.9**	**42.6**	**31.4**	**50.9**
WUA ≤ 5,000 cfs	223.7	67.8	32.6	41.1	31.4	50.8
WUA > 5,000 cfs	29.6	24.6	3.3	1.5	0.0	0.1
Differences						
Avg. WUA	**0.5**	**0.1**	**0.0**	**0.0**	**0.0**	**0.4**
% change	**0.2%**	**0.1%**	**0.0%**	**0.0%**	**-0.1%**	**0.8%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**14,974**	**5,842**	**1,826**	**2,557**	**1,461**	**3,288**
Days ≤ 5,000 cfs	13,387	4,518	1,659	2,468	1,458	3,284
Days > 5,000 cfs	1,587	1,324	167	89	3	4
Avg. WUA	**253.8**	**98.5**	**30.0**	**42.7**	**25.1**	**57.7**
WUA ≤ 5,000 cfs	223.8	73.1	27.0	41.1	25.0	57.6
WUA > 5,000 cfs	30.0	25.4	2.9	1.5	0.0	0.1
Environmental Baseline						
Total Days in Analysis	**14,974**	**5,842**	**1,826**	**2,557**	**1,461**	**3,288**
Days ≤ 5,000 cfs	13,411	4,540	1,661	2,468	1,458	3,284
Days > 5,000 cfs	1,563	1,302	165	89	3	4
Avg. WUA	**253.3**	**98.3**	**29.9**	**42.6**	**25.1**	**57.2**
WUA ≤ 5,000 cfs	223.7	73.3	27.1	41.1	25.1	57.2
WUA > 5,000 cfs	29.6	25.0	2.9	1.5	0.0	0.1
Differences						
Avg. WUA	**0.5**	**0.1**	**0.0**	**0.0**	**0.0**	**0.4**
% change	**0.2%**	**0.1%**	**0.0%**	**0.0%**	**-0.2%**	**0.8%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 8.3-5 displays the full-flow analysis of the average amounts (ac) of spring-run Chinook salmon juvenile WUA without cover under the Proposed Action and the Environmental Baseline scenarios. For both scenarios, the highest average spring-run Chinook salmon ~~fry~~ juvenile rearing habitat occurred during wet WYs, followed by critical WYs and with lesser amounts during above normal, below normal, and dry WYTs. For both the Proposed Action and Environmental Baseline, relatively little to no additional juvenile rearing habitat is provided by days when flows were > 5,000 cfs for below normal, dry and critical WYTs.



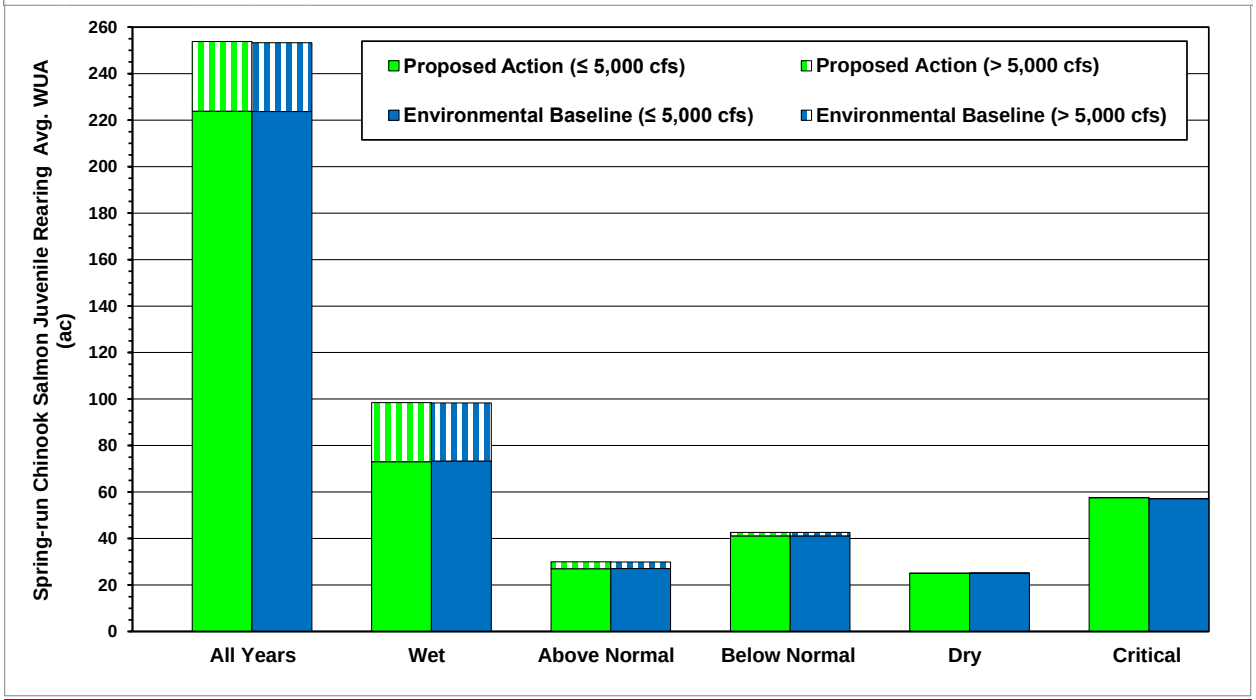


Figure 8.3-5. Comparison of the average amount (ac) of spring-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages BA8-26 to BA8-27

8.3.1.2.1 Flow-Dependent Habitat Conditions

Spawning Habitat

Spawning WUA for steelhead was evaluated for simulated flows up to 5,000 cfs, which generally represents the bankfull flow in the lower Yuba River. During the January through April steelhead spawning period, flows exceed 5,000 cfs during about 21 percent of the days over the 41-year simulation period for both the Proposed Action and the Environmental Baseline, which were excluded from the steelhead spawning WUA analysis. Table 8.3-11 displays the long-term average and average by WYT of steelhead spawning WUA (percent of maximum) under the Proposed Action and Environmental Baseline scenarios.

Table 8.3-11. Long-term and water year type average steelhead spawning WUA (percent of maximum) under the Proposed Action and Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Proposed Action~~	~~92.4~~	~~97.5~~	~~96.4~~	~~93.9~~	~~91.6~~	~~84.0~~
Environmental Baseline	92.4	97.6	96.4	94.0	91.2	83.9
Difference	0.0	-0.1	0.0	-0.1	0.4	0.1
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Proposed Action	91.4	96.4	95.4	93.0	91.1	83.8
Environmental Baseline	91.4	96.5	95.4	93.1	90.4	83.8
Difference	0.0	-0.1	0.0	-0.1	0.7	0.0

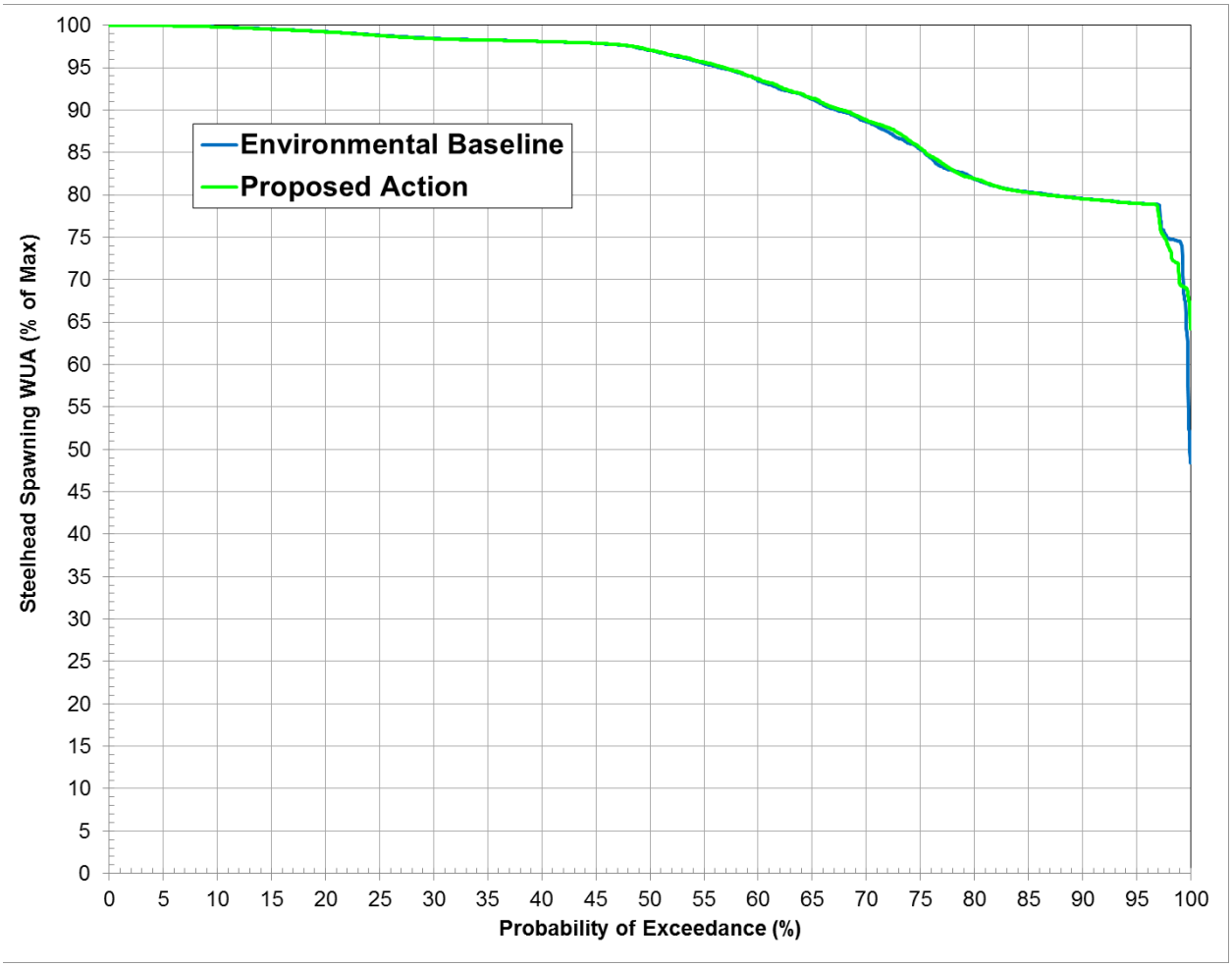
1 As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
2 Based on the WY 1970-2010 simulation period.

Over the entire 41-year simulation period, the long-term average steelhead spawning habitat availability (WUA) in the lower Yuba River is the same under the Proposed Action relative to

the Environmental Baseline (~~92.4~~91.4 percent of maximum WUA). The Proposed Action scenario results in a similar amounts of spawning WUA by WYT as the Environmental Baseline scenario. As with the Environmental Baseline scenario, the Proposed Action scenario provides an average of over 80 percent of maximum spawning WUA during all WYTs.

Habitat durations for steelhead spawning under the Proposed Action and Environmental Baseline scenarios are presented in Figure 8.3-8.

The Proposed Action scenario provides similar amounts of spawning habitat availability compared to the Environmental Baseline scenario over nearly the entire exceedance distribution. Both the Proposed Action and Environmental Baseline provide more than 80 percent of maximum WUA with about an ~~85~~83 percent probability.



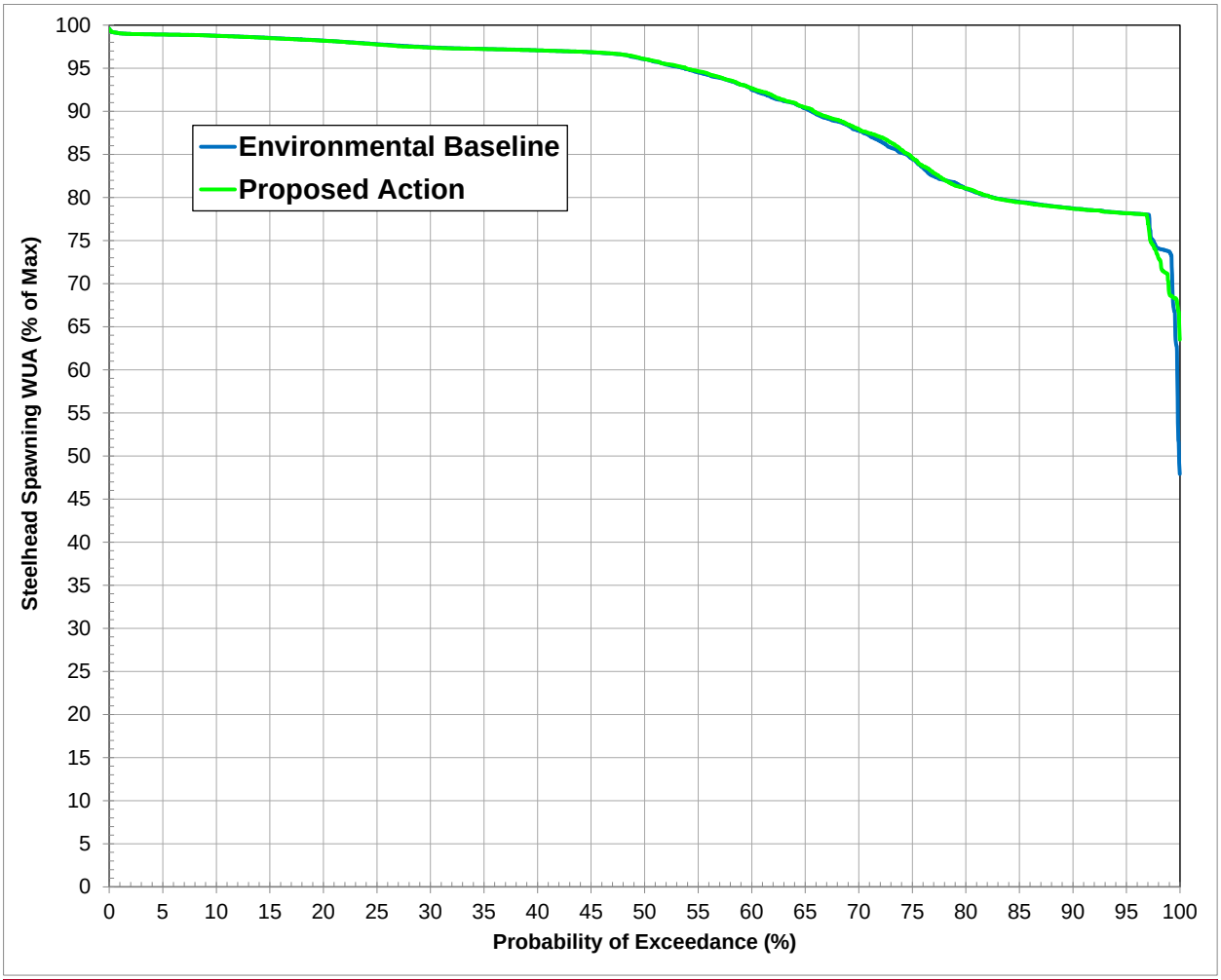


Figure 8.3-8. Steelhead spawning habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline scenarios.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), the Proposed Action and the Environmental Baseline provide similar amounts of steelhead spawning habitat (73.1~~8~~ percent and ~~73.6~~72.8 percent of maximum WUA, respectively).

Flow-dependent spawning habitat availability under the Proposed Action scenario is estimated to be very similar to that under the Environmental Baseline. Flow-dependent spawning habitat availability under the Proposed Action represents a low stressor to steelhead.

Pages BA8-27 to BA8-29

Potential Redd Dewatering

Since the development of the existing flow fluctuation criteria, additional data and information have been collected and models have been developed to better analyze the potential for steelhead redd dewatering in the Yuba River (see Section 6.0 of this Applicant-Prepared Draft BA). Proposed new flow fluctuation criteria were developed for the Proposed Action (see Proposed Condition AR9, *Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam*, in Amended Appendix E2 of the Amended FLA).

The long-term annual average and the average by WYT of steelhead redds potentially dewatered under the Proposed Action is very similar to that under the Environmental Baseline (Table 8.3-12).

Table 8.3-12. Estimated steelhead redd and egg pocket potential dewatering under the Proposed Action relative to the Environmental Baseline.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Proposed Action	Environmental Baseline	Difference	Proposed Action	Environmental Baseline	Difference
Long-term (All WYs)	19.28%	19.17%	0.11%	9.69%	9.54%	0.15%
Wet	36.56%	35.91%	0.65%	20.32%	20.04%	0.28%
Above Normal	16.63%	17.16%	-0.53%	6.80%	6.82%	-0.02%
Below Normal	15.10%	14.87%	0.23%	6.17%	5.89%	0.28%
Dry	3.76%	4.42%	-0.66%	0.72%	0.75%	-0.03%
Critical	2.20%	2.26%	-0.06%	0.62%	0.58%	0.04%
WYT Categories	**Redd Dewatering Index (%)**			**Egg Pocket Dewatering Index (%)**		
	Proposed Action	**Environmental Baseline**	**Difference**	**Proposed Action**	**Environmental Baseline**	**Difference**
Long-term (All WYs)	19.28%	19.17%	0.11%	9.69%	9.54%	0.15%
Wet	34.62%	34.00%	0.62%	19.23%	18.97%	0.26%
Above Normal	18.87%	19.53%	-0.66%	7.58%	7.60%	-0.02%
Below Normal	15.10%	14.87%	0.23%	6.17%	5.89%	0.28%
Dry	4.51%	5.39%	-0.88%	0.86%	0.92%	-0.06%
Critical	2.04%	2.06%	-0.02%	0.57%	0.52%	0.05%

The long-term average and the average by WYT of potential egg pocket dewatering is similar under the Proposed Action and the Environmental Baseline scenarios.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), no steelhead redds would potentially be dewatered under the Proposed Action, compared to an estimated 1.25 percent of redds under the Environmental Baseline. During this conference year, no egg pockets would be dewatered under either the Proposed Action or Environmental Baseline.

The potential redd dewatering for steelhead is primarily due to high flow events (storm flows), which exceed the combined total flow capacity at Narrows 1 and Narrows 2 (4,130 cfs) that occur during the steelhead spawning and incubation period (i.e., January through May), and due

to redd dewatering during those days when the conditions associated with Proposed Condition AR9 would not apply. Consequently, potential steelhead redd dewatering under the Proposed Action is estimated to be similar to that under the Environmental Baseline, and would not be exacerbated by the Proposed Action.

Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam, was developed in part to minimize the potential for steelhead redd dewatering, during the period from January 1 through May 31 (corresponding to the steelhead spawning and incubation period). Under this proposed condition, Licensee shall not reduce the flow downstream of Englebright Dam to less than the larger of: 1) the applicable minimum streamflow requirement specified in YCWA's Proposed Condition AR3; or 2) the flow that would result from applying the maximum flow reduction amount specified in Table 2 of this condition corresponding to the base flow range determined using the maximum 5-day average flow that occurred on days when this condition was in effect during that January 1 through May 31 period. During the period of January 1 through 5, the base flow range under this proposed condition shall be determined by the average daily flow on December 31. If this proposed condition is not in effect on December 31, then the base flow range shall be the minimum flow authorized under the preceding paragraph on the latest date on which this condition was in effect. During the period from April 1 through May 31 when Flow Schedules 3 through 6 or Conference Years specified in YCWA's Proposed Condition WR3 are in effect, the proposed condition would allow Licensee to reduce the flow downstream of Englebright Dam to the applicable minimum streamflow requirement specified in YCWA's Proposed Condition AR3.

During the days over the 41-year period of evaluation when this proposed condition would apply, it would provide the intended protection for steelhead redd dewatering (Table 8.3-13).

Table 8.3-13. Estimated steelhead redd and egg pocket potential dewatering under the Proposed Action relative to the Environmental Baseline, for those days in the 41-year period of record during which the flow reduction criteria specified in Proposed Condition AR9 would apply.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Proposed Action	Environmental Baseline	Difference	Proposed Action	Environmental Baseline	Difference
Long-term (All WYs)	0.43%	0.43%	0.00%	0.06%	0.05%	0.01%
Wet	0.26%	0.19%	0.07%	0.01%	0.01%	0.00%
Above Normal	0.38%	0.45%	-0.07%	0.07%	0.08%	-0.01%
Below Normal	0.12%	0.14%	-0.02%	0.01%	0.01%	0.00%
Dry	0.41%	0.39%	0.02%	0.06%	0.04%	0.02%
Critical	1.07%	1.14%	-0.07%	0.18%	0.17%	0.01%

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Proposed Action	Environmental Baseline	Difference	Proposed Action	Environmental Baseline	Difference
Long-term (All WYs)	0.43%	0.43%	0.00%	0.06%	0.05%	0.01%
Wet	0.25%	0.19%	0.06%	0.02%	0.01%	0.01%
Above Normal	0.42%	0.51%	-0.09%	0.08%	0.08%	0.00%
Below Normal	0.12%	0.14%	-0.02%	0.01%	0.01%	0.00%
Dry	0.34%	0.38%	-0.04%	0.03%	0.03%	0.00%
Critical	1.03%	1.06%	-0.03%	0.18%	0.15%	0.03%

Pages BA8-29 to BA8-31

Steelhead Fry Rearing In-Channel Habitat

Table 8.3-14 displays the long-term average and average by WYT of steelhead fry in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline scenarios.

Table 8.3-14. Long-term and WYT average steelhead fry in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Proposed Action~~	~~83.1~~	~~81.8~~	~~82.0~~	~~81.5~~	~~83.9~~	~~86.7~~
Environmental Baseline	83.0	81.8	82.1	81.5	84.0	86.0
Difference	0.1	0.0	-0.1	0.0	-0.1	0.7
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Proposed Action	80.1	79.0	78.7	78.5	80.7	83.3
Environmental Baseline	80.0	78.9	78.8	78.6	80.9	82.7
Difference	0.1	0.1	-0.1	-0.1	-0.2	0.6

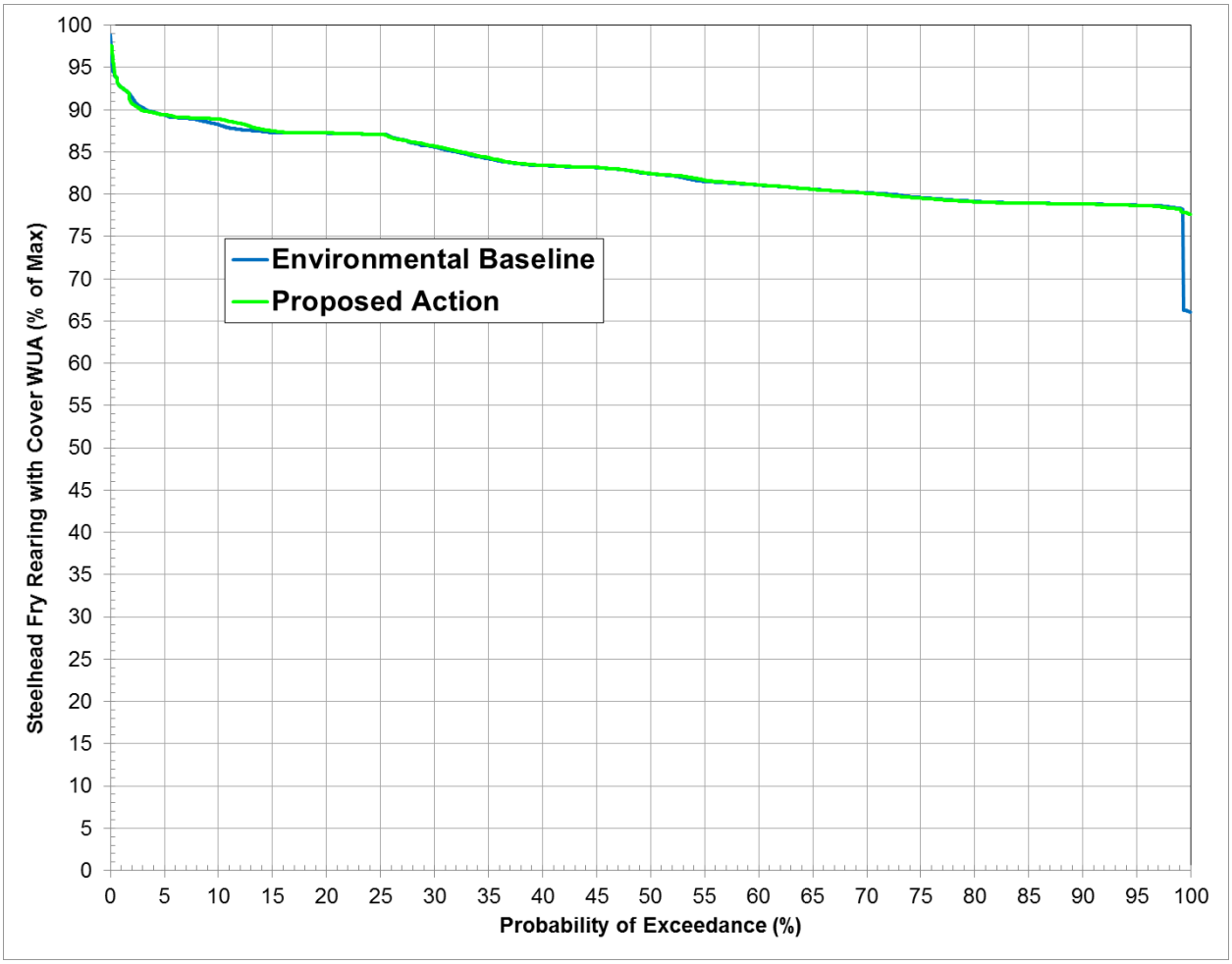
1 As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
2 Based on the WY 1970-2010 simulation period.

During the April through July steelhead fry rearing period, flows exceed 5,000 cfs during about 12 percent of the days over the 41-year simulation period for the Proposed Action and

Environmental Baseline scenarios. These days were excluded from the steelhead fry in-channel rearing WUA analysis.

Over the entire 41-year simulation period, long-term average fry in-channel rearing WUA in the lower Yuba River is very similar under the Proposed Action and Environmental Baseline scenarios (long-term average of ~~83.1~~80.1 percent and ~~83.0~~80.0 percent of maximum WUA, respectively). The Proposed Action scenario results in very similar amounts of fry in-channel rearing habitat (maximum WUA) during all WYs, with the exception of critical WYs, when the Proposed Action provides 0.6~~7~~ percent more habitat than the Environmental Baseline. Neither the Proposed Action scenario or Environmental Baseline scenario provides over 90 percent of maximum fry in-channel rearing WUA during any WYT, although both scenarios provide over 80 percent of maximum in-channel rearing WUA during ~~all~~dry and critical WYTs.

Habitat duration for steelhead fry rearing under the Proposed Action and Environmental Baseline scenarios is presented in Figure 8.3-9. The Proposed Action and Environmental Baseline scenarios provide mostly similar or higher amounts of fry in-channel rearing habitat availability over nearly the entire exceedance distribution. The Proposed Action and Environmental Baseline scenarios achieve 80 percent or more of maximum fry in-channel rearing WUA with about a ~~72~~47 percent probability.



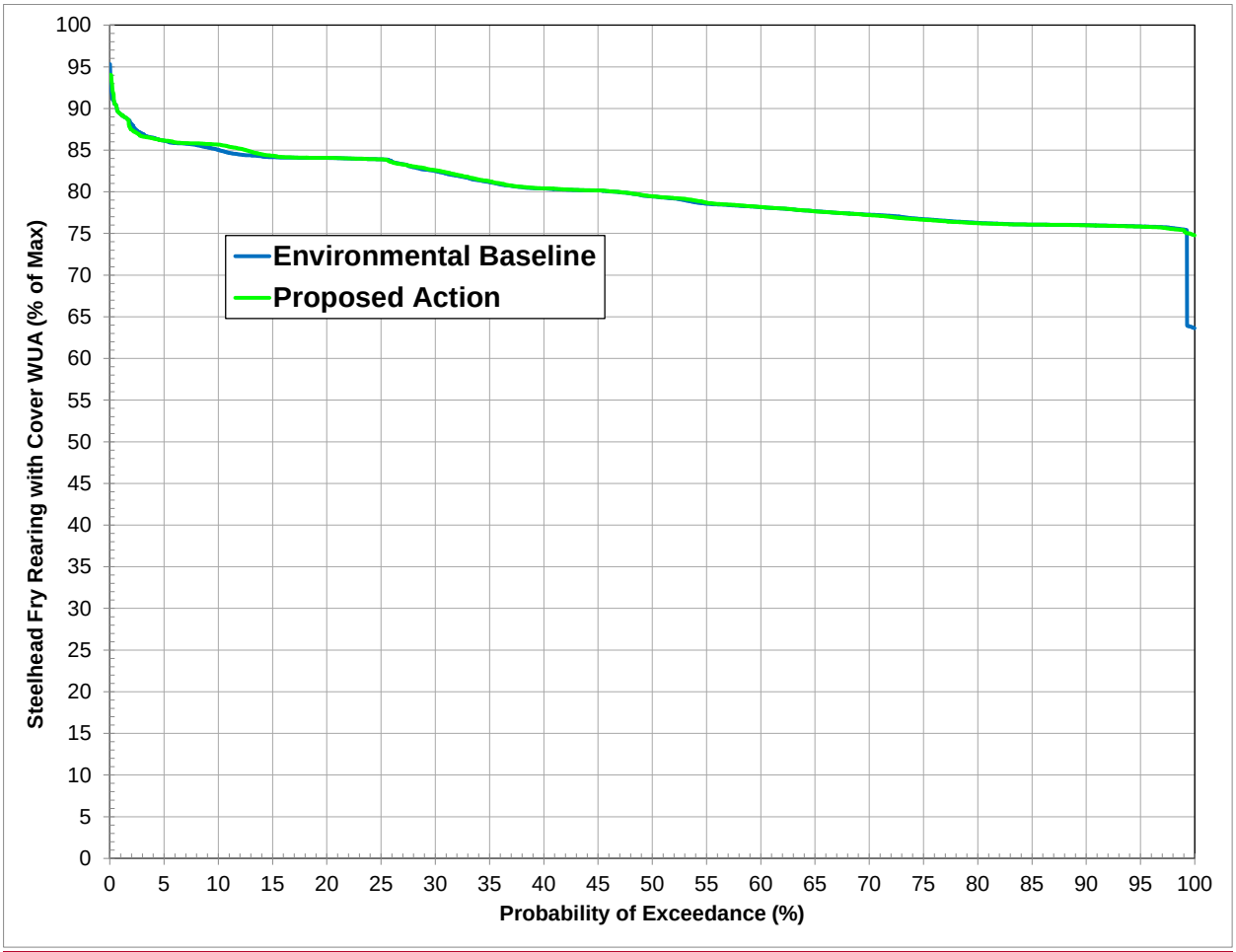


Figure 8.3-9. Steelhead fry in-channel rearing habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline scenarios.

There is one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010). The corresponding steelhead fry rearing period extends from April through July of 1977. ~~Duirng~~During that fry rearing season, ~~87.6~~84.4 percent of steelhead maximum fry in-channel rearing WUA was provided under the Proposed Action scenario compared to ~~86.2~~83.1 percent provided under the Environmental Baseline scenario.

Pages BA8-31 to BA8-33

Steelhead Fry Rearing Full Flow Habitat

Table 8.3-15 displays the full-flow analysis of the average amounts (ac) of steelhead fry WUA without cover under the Proposed Action and the Environmental Baseline scenarios over the 41-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by WYT.

Table 8.3-15. Long-term average WUA (ac) over the 41-year period of evaluation and WYT-specific relative contribution to the long-term average WUA of steelhead fry rearing habitat, under the Proposed Action and the Environmental Baseline.

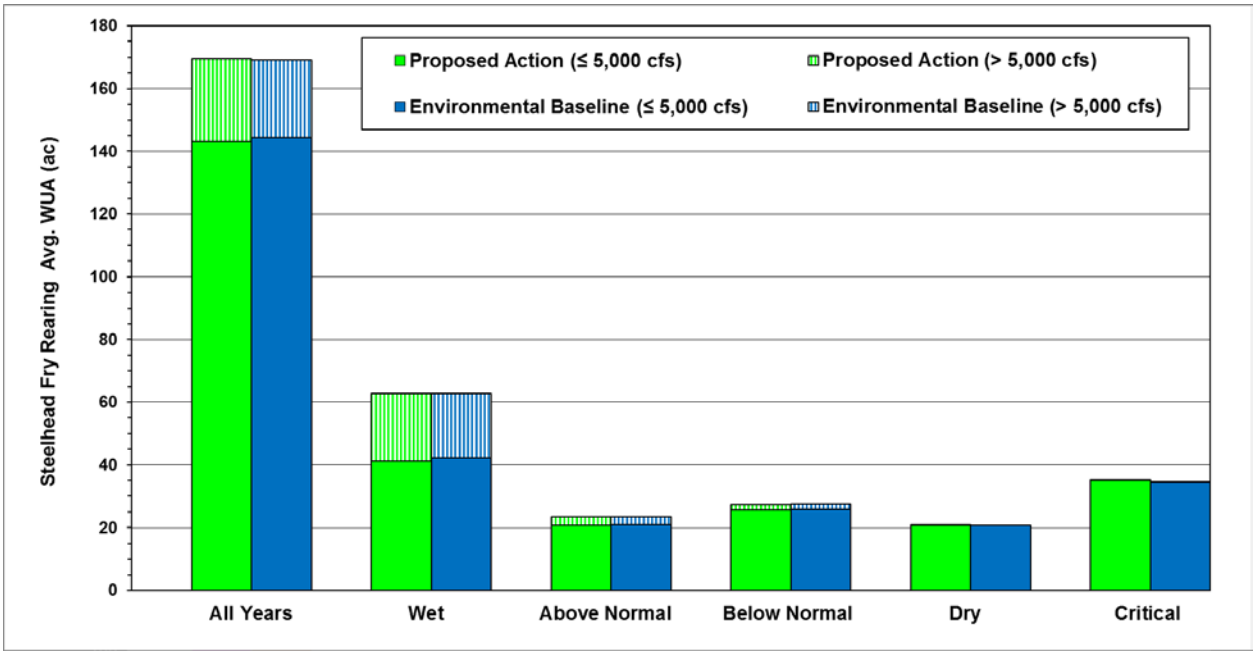
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**5,002**	**1,830**	**732**	**854**	**610**	**976**
Days ≤ 5,000 cfs	4,348	1,308	653	805	609	973
Days > 5,000 cfs	654	522	79	49	1	3
Avg. WUA	**169.5**	**62.8**	**23.5**	**27.4**	**20.6**	**35.0**
WUA ≤ 5,000 cfs	143.0	41.2	20.6	25.6	20.6	34.9
WUA > 5,000 cfs	26.5	21.6	2.9	1.8	0.0	0.1
Environmental Baseline						
Total Days in Analysis	**5,002**	**1,830**	**732**	**854**	**610**	**976**
Days ≤ 5,000 cfs	4,400	1,341	664	809	610	976
Days > 5,000 cfs	602	489	68	45	0	0
Avg. WUA	**169.1**	**62.7**	**23.6**	**27.4**	**20.7**	**34.7**
WUA ≤ 5,000 cfs	144.4	42.3	21.0	25.8	20.7	34.7
WUA > 5,000 cfs	24.7	20.5	2.6	1.7	0.0	0.0
Differences						
Avg. WUA	**0.4**	**0.1**	**0.0**	**0.0**	**0.0**	**0.4**
% change	**0.2%**	**0.1%**	**-0.1%**	**-0.1%**	**-0.2%**	**1.1%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**5,002**	**1,952**	**610**	**854**	**488**	**1,098**
Days ≤ 5,000 cfs	4,348	1,423	538	805	487	1,095
Days > 5,000 cfs	654	529	72	49	1	3
Avg. WUA	**169.5**	**66.8**	**19.6**	**27.4**	**16.4**	**39.2**
WUA ≤ 5,000 cfs	143.0	44.9	16.9	25.6	16.4	39.1
WUA > 5,000 cfs	26.5	21.9	2.7	1.8	0.0	0.1
Environmental Baseline						
Total Days in Analysis	**5,002**	**1,952**	**610**	**854**	**488**	**1,098**
Days ≤ 5,000 cfs	4,400	1,459	546	809	488	1,098
Days > 5,000 cfs	602	493	64	45	0	0
Avg. WUA	**169.1**	**66.7**	**19.6**	**27.4**	**16.5**	**38.8**
WUA ≤ 5,000 cfs	144.4	46.1	17.2	25.8	16.5	38.8
WUA > 5,000 cfs	24.7	20.6	2.4	1.7	0.0	0.0
Differences						
Avg. WUA	**0.4**	**0.1**	**0.0**	**0.0**	**-0.1**	**0.4**
% change	**0.2%**	**0.1%**	**-0.1%**	**-0.1%**	**-0.4%**	**1.0%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

For the entire simulation period, generally similar amounts of fry rearing habitat (average WUA) are available under the Proposed Action compared to the Environmental Baseline. The Proposed Action results in very similar amounts of fry rearing habitat during all WYs, except during critical WYs when the Proposed Action provides 1.0~~1~~ percent more habitat than under the Environmental Baseline.

Figure 8.3-10 displays the full-flow analysis of the average amounts (ac) of steelhead fry weighted usable area (WUA) without cover under the Proposed Action and the Environmental Baseline. For both scenarios, the highest average spring-run Chinook salmon fry habitat occurred during wet WYs, followed by critical WYs and with lesser amounts during above normal, below normal, and dry WYTs. For both the Proposed Action and Environmental Baseline, relatively little to no additional fry rearing habitat is provided by days when flows were > 5,000 cfs for dry and critical WYTs.



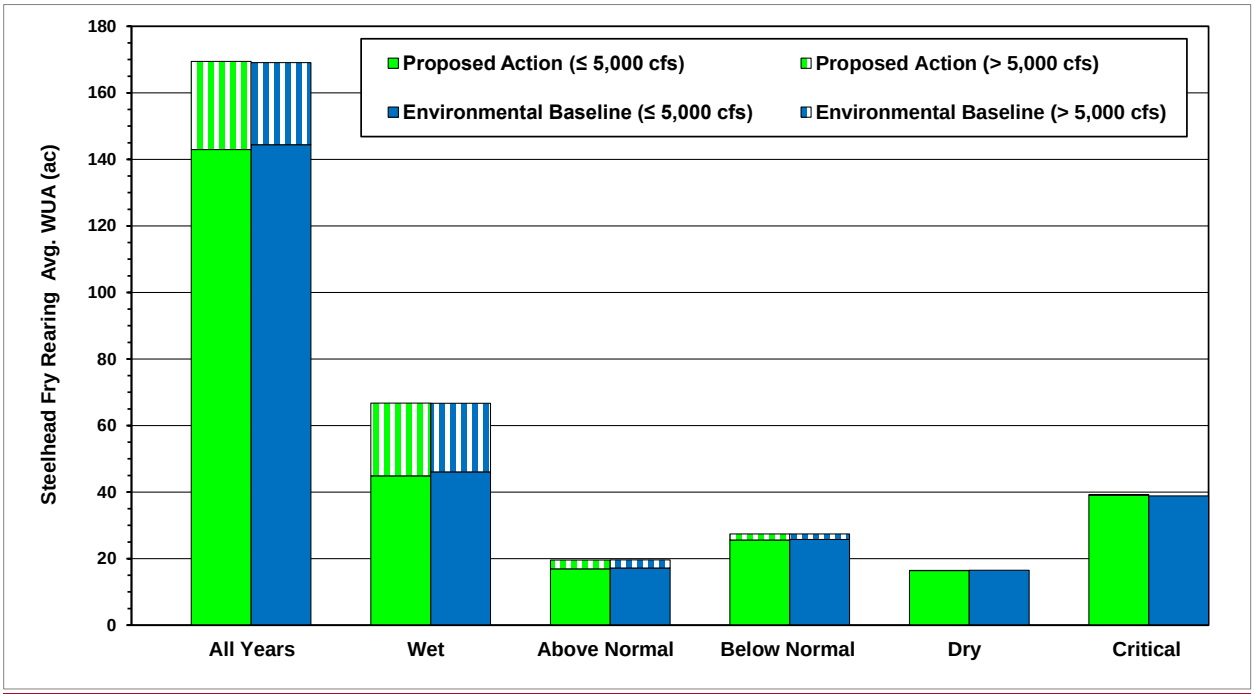


Figure 8.3-10. Comparison of the average amount (ac) of steelhead fry weighted usable area (WUA) without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages BA8-33 to BA8-35

Steelhead Juvenile Rearing In-Channel Habitat

During the year-round steelhead juvenile rearing period, flows exceed 5,000 cfs during about 11 percent of the days over the 41-year simulation period for the Proposed Action, and during about 10 percent of the days under the Environmental Baseline. These days were excluded from the steelhead juvenile in-channel rearing WUA analysis. Table 8.3-16 displays the long-term average and average by WYT of steelhead juvenile in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline scenarios.

Table 8.3-16. Long-term and WYT average steelhead juvenile in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline scenarios.

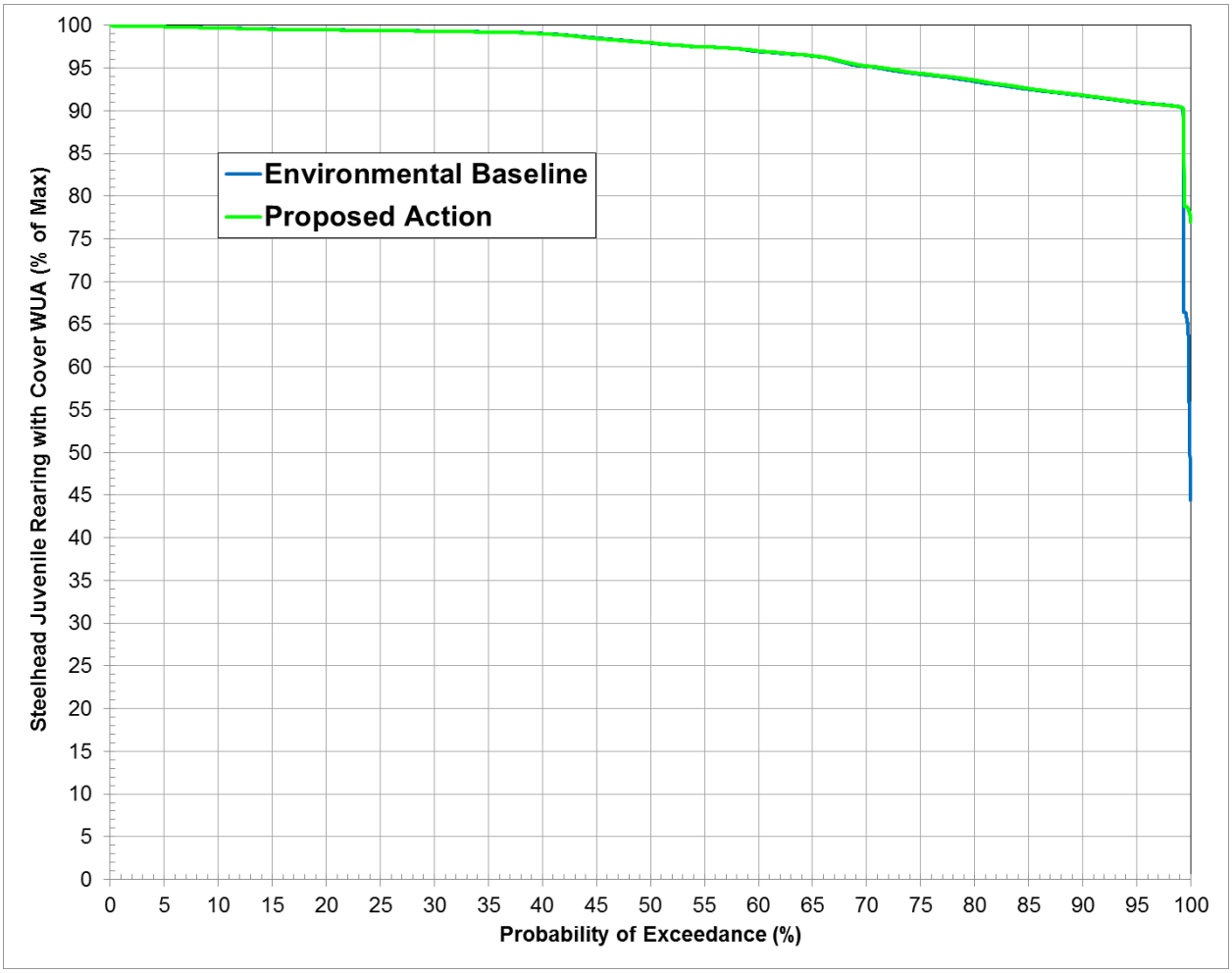
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Proposed Action~~	~~96.7~~	~~95.7~~	~~95.8~~	~~96.8~~	~~98.1~~	~~98.0~~
Environmental Baseline	96.6	95.6	95.8	96.8	98.1	97.4
Difference	0.1	0.1	0.0	0.0	0.0	0.6

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action	91.7	90.7	90.9	91.8	92.9	92.9
Environmental Baseline	91.6	90.6	90.9	91.8	92.9	92.4
Difference	0.1	0.1	0.0	0.0	0.0	0.5

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Over the entire 41-year simulation period, long-term average juvenile in-channel rearing WUA in the lower Yuba River is very similar under the Proposed Action and Environmental Baseline scenarios (long-term average of ~~96.7~~91.7 percent versus ~~96.6~~91.6 percent of maximum WUA). The Proposed Action scenario also results in very similar maximum fry rearing habitat during all WYTs, with the exception of critical WYs, when the Proposed Action scenario provides 0.5~~6~~ percent more fry rearing habitat relative to the Environmental Baseline scenario. Both the Proposed Action and Environmental Baseline scenarios provide an average of 80 percent (and even over ~~95~~90 percent) or more of juvenile in-channel rearing maximum WUA during all WYTs.

Habitat duration for steelhead juvenile in-channel rearing under the Proposed Action and Environmental scenarios is presented in Figure 8.3-11. The Proposed Action and Environmental Baseline scenarios provide very similar amounts of juvenile rearing habitat availability over the entire exceedance distribution. The Proposed Action and Environmental Baseline scenarios both achieve 80 percent ~~(and even 90 percent)~~ or more of juvenile in-channel rearing maximum WUA with about a 99 percent probability.



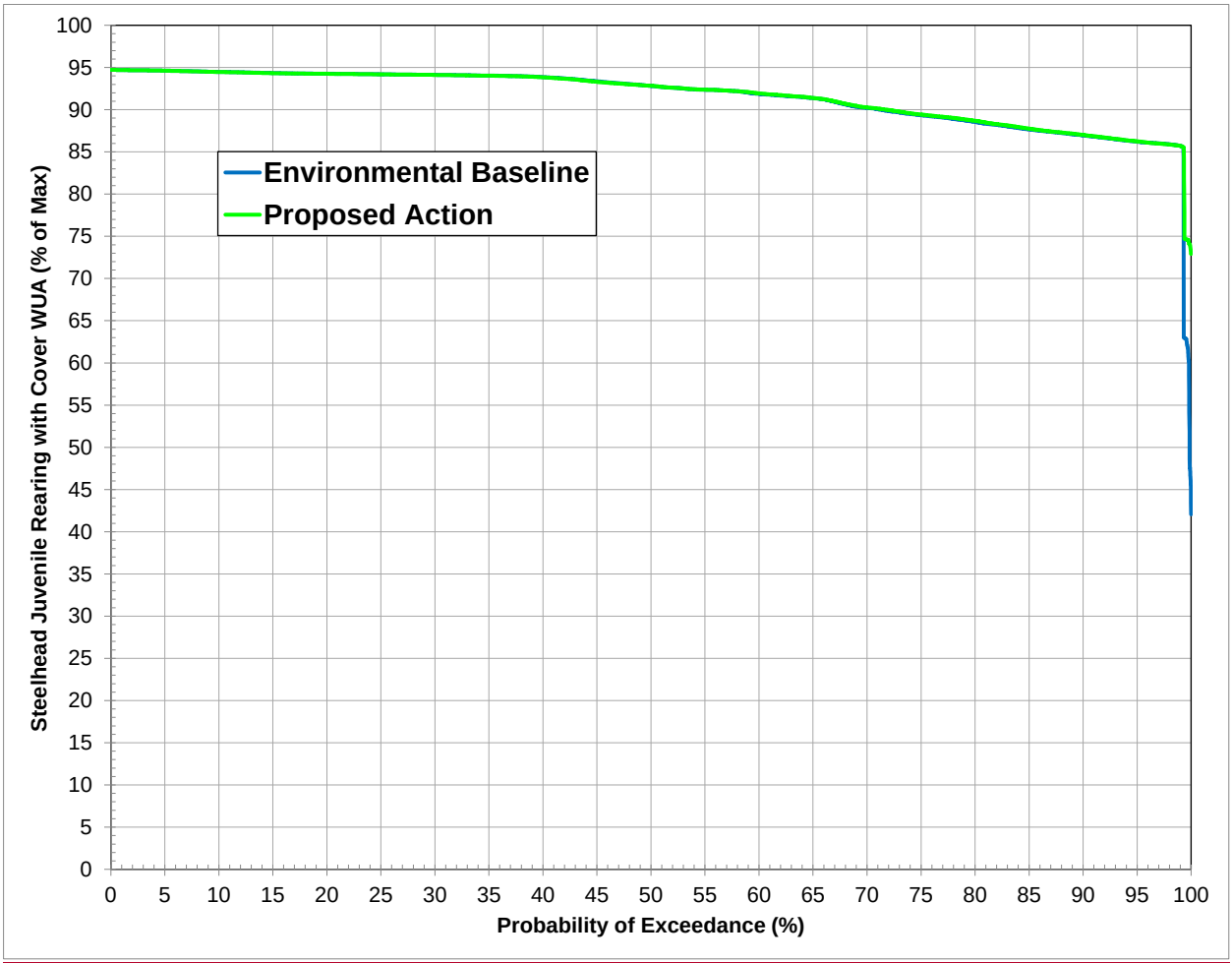


Figure 8.3-11. Steelhead juvenile in-channel rearing habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline scenarios.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), ~~93.1~~88.3 percent of steelhead juvenile in-channel rearing maximum WUA was provided under the Proposed Action compared to ~~88.3~~83.7 percent provided under the Environmental Baseline.

Pages BA8-35 to BA8-36

Steelhead Juvenile Rearing Full-Flow Habitat

Table 8.3-17 displays the full-flow analysis of the average amounts (ac) of steelhead juvenile WUA without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Very similar amounts of juvenile rearing habitat (ave~~a~~rage WUA) are provided under the Proposed Action and the Environmental Baseline for the entire ~~simuation~~simulation period and all WYTs, with the exception of critical WYs when 0.7~~8~~ percent more habitat was provided under the Proposed Action.

Table 8.3-17. Long-term average WUA (ac) over the 41-year period of evaluation and WYT-specific relative contribution to the long-term average WUA of steelhead juvenile rearing habitat, under the Proposed Action and the Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**14,974**	**5,477**	**2,191**	**2,557**	**1,826**	**2,923**
Days ≤ 5,000 cfs	13,387	4,175	2,002	2,468	1,823	2,919
Days > 5,000 cfs	1,587	1,302	189	89	3	4
Avg. WUA	**260.2**	**94.5**	**36.7**	**43.9**	**32.4**	**52.7**
WUA ≤ 5,000 cfs	229.8	69.1	33.4	42.3	32.3	52.6
WUA > 5,000 cfs	30.5	25.4	3.4	1.6	0.1	0.1
Environmental Baseline						
Total Days in Analysis	**14,974**	**5,477**	**2,191**	**2,557**	**1,826**	**2,923**
Days ≤ 5,000 cfs	13,411	4,198	2,003	2,468	1,823	2,919
Days > 5,000 cfs	1,563	1,279	188	89	3	4
Avg. WUA	**259.7**	**94.4**	**36.7**	**43.9**	**32.4**	**52.3**
WUA ≤ 5,000 cfs	229.7	69.4	33.4	42.3	32.4	52.2
WUA > 5,000 cfs	30.0	25.0	3.3	1.5	0.0	0.1
Differences						
Avg. WUA	**0.5**	**0.1**	**0.0**	**0.0**	**0.0**	**0.4**
% change	**0.2%**	**0.1%**	**0.0%**	**0.0%**	**-0.1%**	**0.8%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**14,974**	**5,842**	**1,826**	**2,557**	**1,461**	**3,288**
Days ≤ 5,000 cfs	13,387	4,518	1,659	2,468	1,458	3,284
Days > 5,000 cfs	1,587	1,324	167	89	3	4
Avg. WUA	**260.2**	**100.6**	**30.7**	**43.9**	**25.8**	**59.2**
WUA ≤ 5,000 cfs	229.8	74.8	27.7	42.3	25.8	59.1
WUA > 5,000 cfs	30.5	25.8	3.0	1.6	0.1	0.1
Environmental Baseline						
Total Days in Analysis	**14,974**	**5,842**	**1,826**	**2,557**	**1,461**	**3,288**
Days ≤ 5,000 cfs	13,411	4,540	1,661	2,468	1,458	3,284
Days > 5,000 cfs	1,563	1,302	165	89	3	4
Avg. WUA	**259.7**	**100.5**	**30.6**	**43.9**	**25.9**	**58.8**
WUA ≤ 5,000 cfs	229.7	75.0	27.7	42.3	25.8	58.7
WUA > 5,000 cfs	30.0	25.5	2.9	1.5	0.0	0.1
Differences						
Avg. WUA	**0.5**	**0.1**	**0.0**	**0.0**	**0.0**	**0.4**
% change	**0.2%**	**0.1%**	**0.0%**	**0.0%**	**-0.2%**	**0.7%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 8.3-12 displays the full-flow analysis of the average amounts (ac) of steelhead juvenile WUA without cover under the Proposed Action and the Environmental Baseline. For both scenarios, the highest average spring-run Chinook salmon fry habitat occurred during wet WYs, followed by critical WYs and with lesser amounts during above normal, below normal, and dry WYTs. For both the Proposed Action and the Environmental Baseline, relatively little to no additional juvenile rearing habitat is provided by days when flows were > 5,000 cfs for dry and critical WYTs.

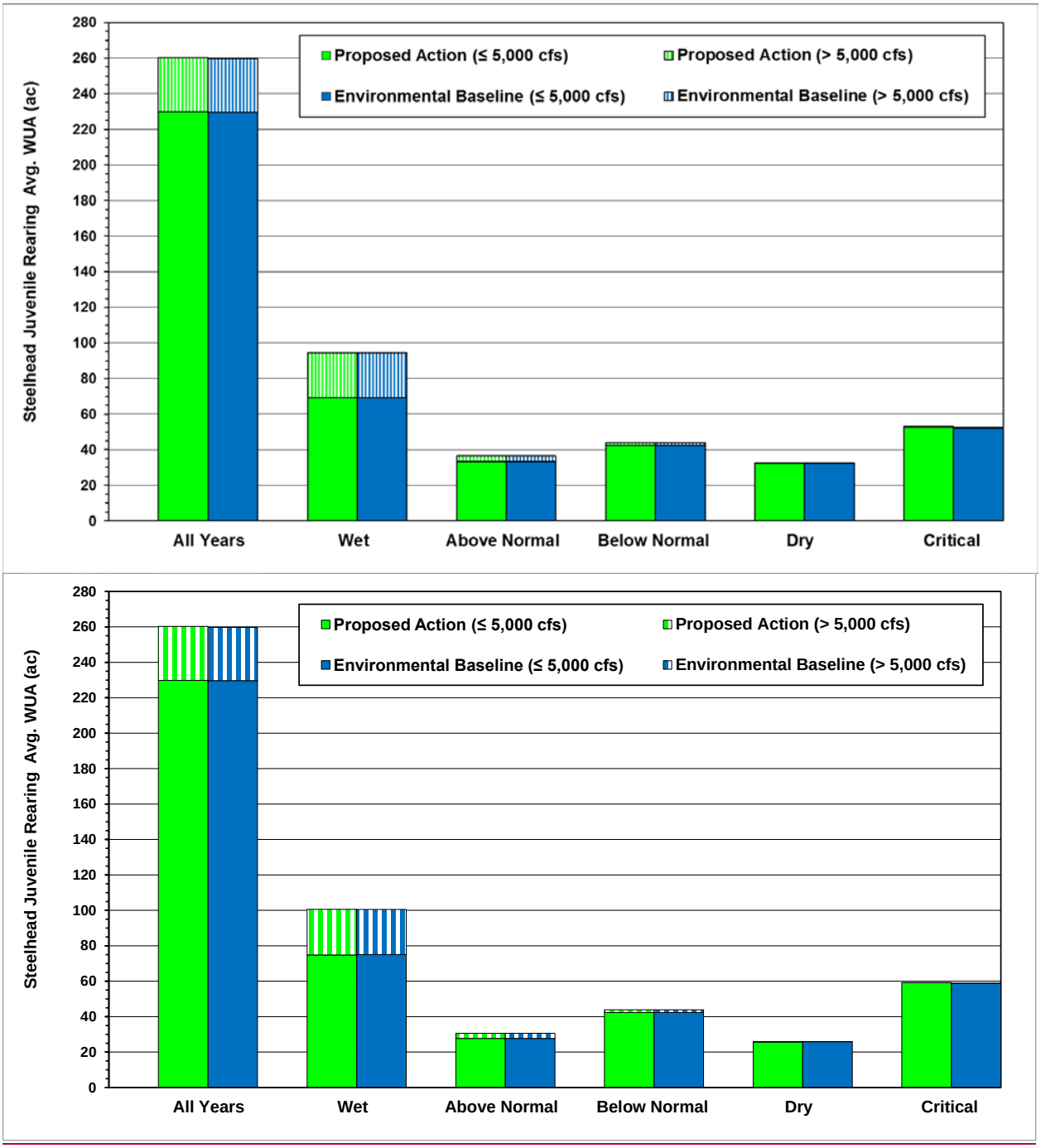


Figure 8.3-12. Comparison of the average amount (ac) of steelhead juvenile weighted usable area (WUA) without cover under the Proposed Action and the ~~-~~Environmental Baseline over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by WYT of habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages BA8-47 to BA8-49

8.4.1.1.1 Spawning Habitat Availability

Because flows do not exceed 5,000 cfs during the September through mid-October spring-run Chinook salmon spawning period under the Cumulative Condition and Environmental Baseline scenarios, no daily flows were excluded from the spring-run Chinook salmon spawning WUA analysis. Table 8.4-1 displays the long-term average and average by WYT spring-run Chinook salmon spawning WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

Table 8.4-1. Long-term and water year type average spring-run Chinook salmon spawning WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Cumulative Condition~~	~~99.2~~	~~99.0~~	~~99.1~~	~~99.6~~	~~99.7~~	~~99.0~~
Environmental Baseline	98.6	99.3	99.4	99.6	99.6	95.9
Difference	0.6	-0.3	-0.3	0.0	0.1	3.1

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition	98.2	97.9	98.5	98.6	98.7	98.1
Environmental Baseline	97.6	98.2	98.7	98.6	98.6	95.4
Difference	0.6	-0.3	-0.2	0.0	0.1	2.7

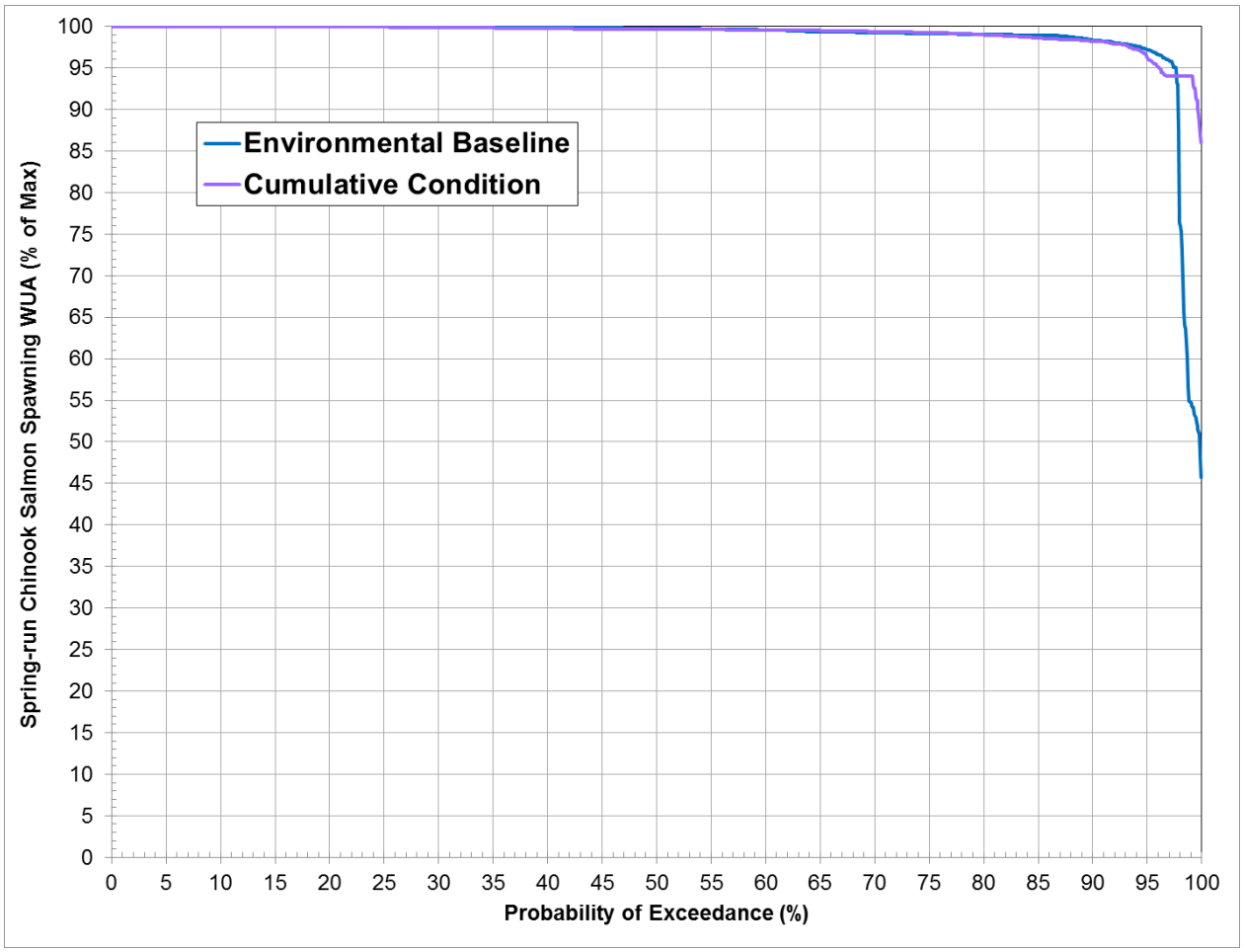
[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average spring-run Chinook salmon in-channel spawning habitat availability (WUA) in the lower Yuba River is similar, but slightly higher, under the Cumulative Condition scenario relative to the Environmental Baseline scenario (long-term average of ~~99.2~~98.2 percent versus ~~98.6~~97.6 percent of the maximum WUA). The Cumulative Condition scenario provides similar spawning habitat availability (percent of maximum WUA) during all WYTs, with the exception of critical WYs, when the Cumulative Condition scenario provides ~~3.1~~2.7 percent more spawning habitat. As with the Environmental

Baseline scenario, the Cumulative Condition scenario provides, on the average, 80 percent (and even 90 percent) or more of maximum spawning WUA during all WYTs.

Habitat durations for spring-run Chinook salmon spawning under the Cumulative Condition and Environmental Baseline scenarios are presented in Figure 8.4-1.

The Cumulative Condition scenario provides similar amounts of in-channel spawning habitat availability over nearly the entire exceedance probability distribution, relative to the Environmental Baseline scenario. Also, the Cumulative Condition achieves over 80 percent (and even 90 percent) of spawning maximum WUA with about a 100 percent probability, while the Environmental Baseline scenario achieves 80 percent (and even 95 percent) or more of spawning maximum WUA with about a~~n~~ 97-98 percent probability.



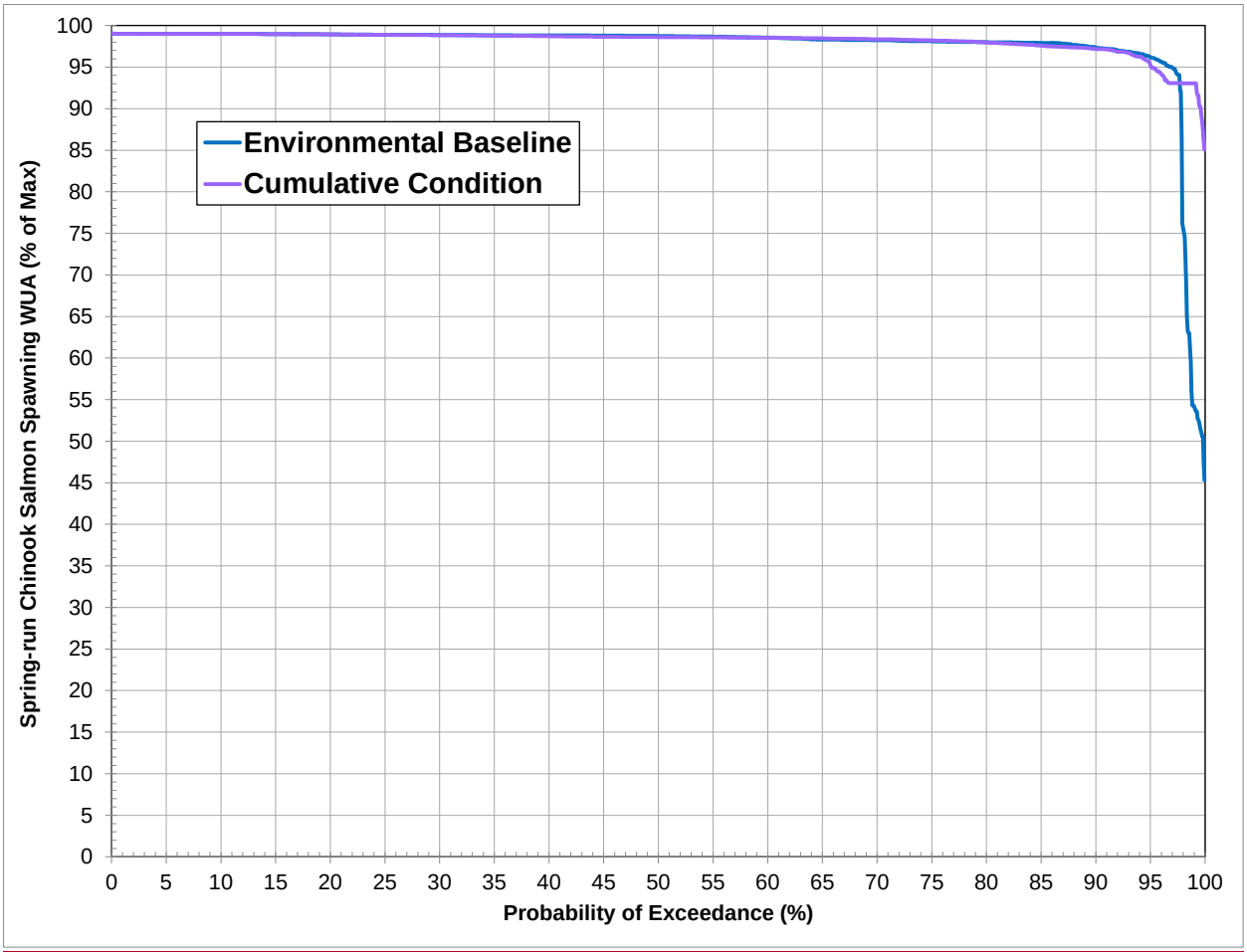


Figure 8.4-1. Spring-run Chinook salmon spawning habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline scenarios.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), for analytical purposes the corresponding spring-run Chinook salmon spawning period extends from September 1 – October 15 of 1977. During that spawning season, ~~94.3~~94.8 percent of spring-run Chinook salmon maximum spawning WUA was provided under the Cumulative Condition scenario, compared to ~~71.5~~71.8 percent provided under the Environmental Baseline scenario.

Flow-dependent spawning habitat availability under the Cumulative Condition is similar to, or slightly greater than that under the Environmental Baseline. Flow-dependent spawning habitat availability remains characterized as a low stressor under the Cumulative Condition.

Pages BA8-49 to BA8-50

8.4.1.1.2 Potential Redd Dewatering

For every day of the annual embryo incubation period, the long-term annual average of the

percentage of spring-run Chinook salmon redds potentially dewatered under the Cumulative Condition scenario is very low, and similar to that under the Environmental Baseline scenario. The average percentage of redds potentially dewatered by WYTs under the Cumulative Condition would be very low and similar to that under the Environmental Baseline scenario (Table 8.4-2).

Table 8.4-2. Estimated spring-run Chinook salmon redd and egg pocket potential dewatering under the Cumulative Condition relative to the Environmental Baseline.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	0.03%	0.01%	0.02%	0.00%	0.00%	0.00%
Wet	0.06%	0.02%	0.04%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Critical	0.01%	0.00%	0.01%	0.00%	0.00%	0.00%
WYT Categories	**Redd Dewatering Index (%)**			**Egg Pocket Dewatering Index (%)**		
	Cumulative Condition	**Environmental Baseline**	**Difference**	**Cumulative Condition**	**Environmental Baseline**	**Difference**
Long-term (All WYs)	0.03%	0.01%	0.02%	0.00%	0.00%	0.00%
Wet	0.06%	0.02%	0.04%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Critical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

The long-term and WYT averages of the percentage of egg pockets dewatered indicates that no egg pockets would be dewatered under the Cumulative Condition scenario or the Environmental Baseline scenario.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), no spring-run Chinook salmon redds or egg pockets would potentially be dewatered under the Cumulative Condition scenario or under the Environmental Baseline scenario.

As previously discussed, Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam, was developed in part to minimize the potential for spring-run Chinook salmon redd dewatering during the period from September 2 through December 31 (corresponding to the spring-run Chinook salmon spawning and incubation period).

Proposed Condition AR9 would not necessarily apply to every day each year of the embryo incubation period. During the days over the 33-year period of evaluation when this proposed condition would apply, it would provide the intended protection for spring-run Chinook salmon

redd dewatering (Table 8.4-3). The estimated spring-run Chinook salmon potential dewatering under the Cumulative Condition would be very similar as under the Proposed Action, because during the embryo incubation period flows are almost always controlled.

Table 8.4-3. Estimated spring-run Chinook salmon redd and egg pocket potential dewatering under the Cumulative ~~Conditon~~Condition relative to the Environmental Baseline for those days in th~~-~~e 33-year period of record during which the flow reduction criteria specified in Proposed Condition AR9 would apply.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	0.03%	0.01%	0.02%	0.00%	0.00%	0.00%
Wet	0.06%	0.01%	0.05%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Critical	0.01%	0.00%	0.01%	0.00%	0.00%	0.00%

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	0.03%	0.01%	0.02%	0.00%	0.00%	0.00%
Wet	0.06%	0.02%	0.04%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Critical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Spring-run Chinook salmon redd dewatering under the Cumulative Condition is estimated to be very low and similar to that under the Environmental Baseline. Potential redd dewatering would be a low stressor to spring-run Chinook salmon under the Cumulative Condition.

Pages BA8-50 to BA8-52

8.4.1.1.3 Fry and Juvenile Rearing Habitat Availability

Spring-run Chinook Salmon Fry Rearing In-Channel Habitat

During the mid-November through mid-February spring-run Chinook salmon fry rearing period, flows exceed 5,000 cfs during about 12 percent of the days over the 33-year simulation period for the Cumulative Condition and the Environmental Baseline. These days were excluded from the spring-run Chinook salmon fry in-channel rearing WUA analysis. Table 8.4-4 displays the long-term average and average by WYT spring-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline scenarios.

Table 8.4-4. Long-term and WYT average spring-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline scenarios.

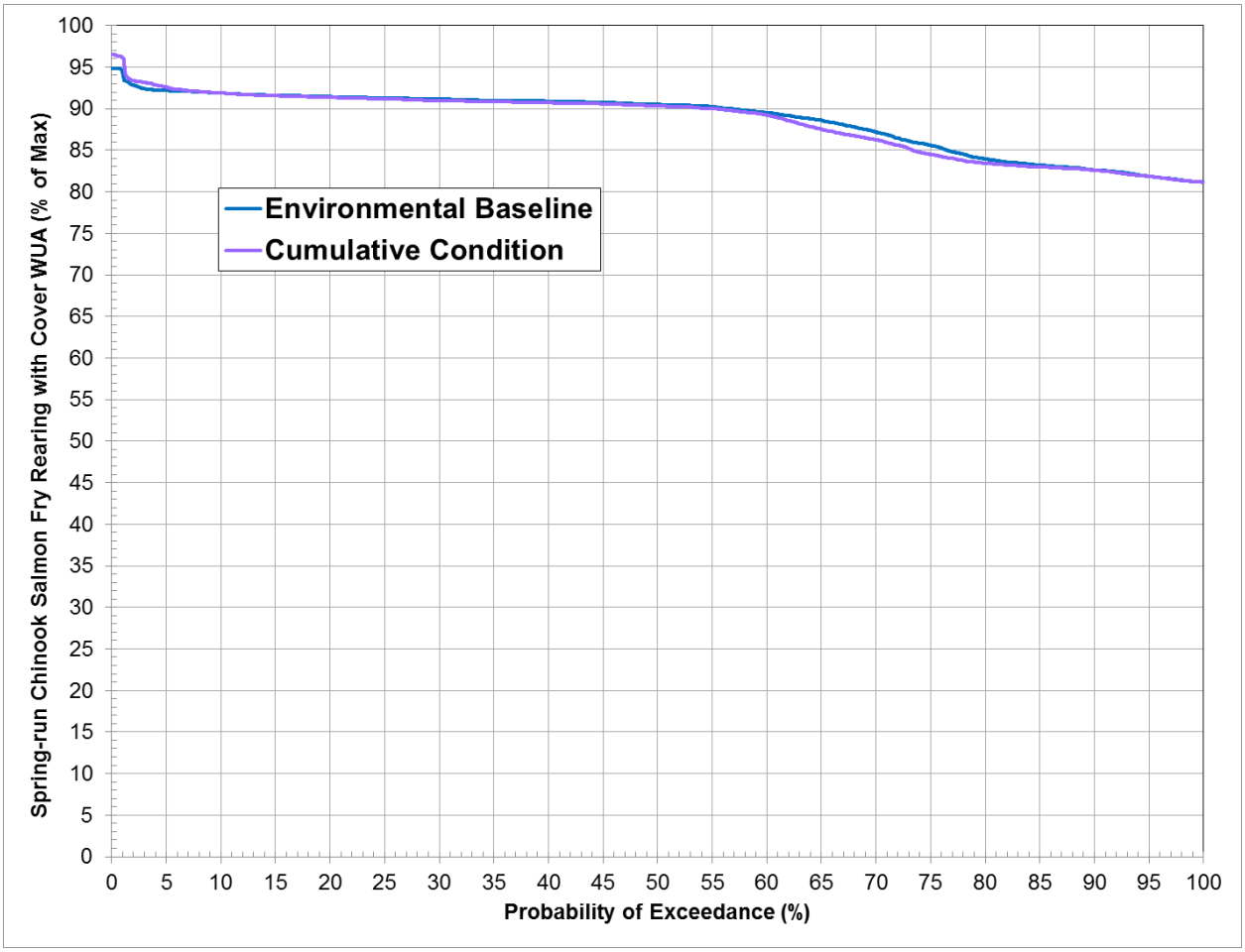
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Cumulative Condition~~	~~88.4~~	~~88.4~~	~~88.9~~	~~86.7~~	~~87.5~~	~~89.6~~
Environmental Baseline	88.6	88.6	88.8	87.0	88.2	89.7
Difference	-0.2	-0.2	0.1	-0.3	-0.7	-0.1

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition	84.0	84.2	84.1	82.4	83.1	84.9
Environmental Baseline	84.2	84.3	84.2	82.6	83.7	85.1
Difference	-0.2	-0.1	-0.1	-0.2	-0.6	-0.2

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average fry rearing habitat availability (WUA) in the lower Yuba River is very similar under the Cumulative Condition and Environmental Baseline scenarios (long-term average of ~~88.4~~84.0 percent and ~~88.6~~84.2 percent of the maximum WUA). The Cumulative Condition and Environmental Baseline scenarios also result in similar amounts of WUA by WYT. Both the Cumulative Condition and Environmental Baseline scenarios provide an average of 80 percent or more fry in-channel rearing maximum WUA during all WYTs.

Habitat duration for spring-run Chinook salmon fry in-channel rearing under the Cumulative Condition and Environmental Baseline scenarios is presented in Figure 8.4-2. The Cumulative Condition and Environmental Baseline scenarios provide similar amounts of habitat over the entire distribution, but the Cumulative Condition provides slightly more habitat over about the lower 5 percent of the distribution, and provides slightly less habitat over about 20 percent of the distribution. The Cumulative Condition and Environmental Baseline scenarios both achieve 80 percent or more of fry in-channel rearing maximum WUA with about a 76 and a 79 ~~100~~ percent probability, respectively.



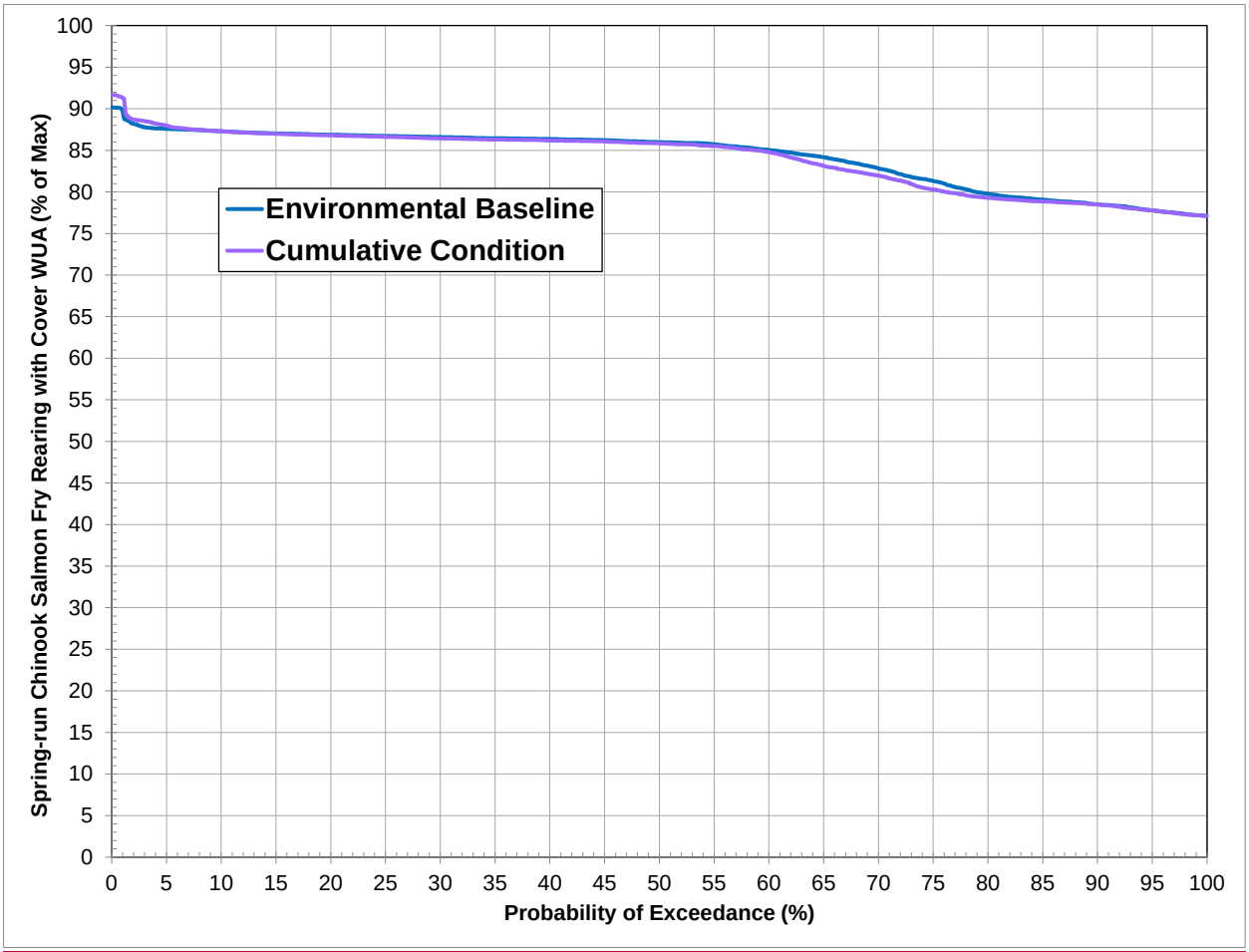


Figure 8.4-2. Spring-run Chinook salmon fry in-channel rearing habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline scenarios.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), ~~92.5~~87.9 percent of spring-run Chinook salmon fry in-channel rearing maximum WUA was provided under the Cumulative Condition scenario compared to ~~91.2~~86.6 percent provided under the Environmental Baseline scenario.

Pages BA8-52 to BA8-54

Spring-run Chinook Salmon Fry Rearing Full-Flow Habitat

Table 8.4-5 displays the full-flow analysis of the average amounts (ac) of spring-run Chinook salmon fry WUA without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by WYT.

For the entire simulation period, very similar amounts of fry rearing habitat (average WUA) are available under the Cumulative Condition compared to the Environmental Baseline, as well as for each of the WYTs.

Table 8.4-5. Long-term average WUA (ac) over the 33-year period of evaluation and WYT-specific relative contribution to the long-term average WUA of spring-run Chinook salmon fry rearing habitat, under the Cumulative Condition and the Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**3,036**	**1,012**	**460**	**368**	**460**	**736**
Days ≤ 5,000 cfs	2,656	665	436	363	457	735
Days > 5,000 cfs	380	347	24	5	3	1
Avg. WUA	**153.8**	**53.2**	**23.0**	**17.7**	**22.5**	**37.5**
WUA ≤ 5,000 cfs	130.8	32.1	21.5	17.4	22.3	37.5
WUA > 5,000 cfs	23.1	21.1	1.5	0.3	0.2	0.1
Environmental Baseline						
Total Days in Analysis	**3,036**	**1,012**	**460**	**368**	**460**	**736**
Days ≤ 5,000 cfs	2,677	682	438	364	458	735
Days > 5,000 cfs	359	330	22	4	2	1
Avg. WUA	**154.4**	**53.3**	**23.0**	**17.8**	**22.8**	**37.6**
WUA ≤ 5,000 cfs	132.4	33.0	21.6	17.6	22.7	37.6
WUA > 5,000 cfs	22.0	20.3	1.4	0.2	0.1	0.1
Differences						
Avg. WUA	**-0.6**	**-0.1**	**0.0**	**-0.1**	**-0.3**	**-0.1**
% change	**-0.4%**	**-0.1%**	**0.0%**	**-0.6%**	**-1.4%**	**-0.3%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**3,036**	**1,104**	**368**	**368**	**368**	**828**
Days ≤ 5,000 cfs	2,656	746	355	363	365	827
Days > 5,000 cfs	380	358	13	5	3	1
Avg. WUA	**153.8**	**58.0**	**18.2**	**17.7**	**17.9**	**42.0**
WUA ≤ 5,000 cfs	130.8	36.2	17.4	17.4	17.8	42.0
WUA > 5,000 cfs	23.1	21.8	0.8	0.3	0.2	0.1
Environmental Baseline						
Total Days in Analysis	**3,036**	**1,104**	**368**	**368**	**368**	**828**
Days ≤ 5,000 cfs	2,677	764	356	364	366	827
Days > 5,000 cfs	359	340	12	4	2	1
Avg. WUA	**154.4**	**58.0**	**18.2**	**17.8**	**18.2**	**42.2**
WUA ≤ 5,000 cfs	132.4	37.1	17.5	17.6	18.1	42.1
WUA > 5,000 cfs	22.0	20.9	0.8	0.2	0.1	0.1
Differences						
Avg. WUA	**-0.6**	**0.0**	**-0.1**	**-0.1**	**-0.3**	**-0.1**
% change	**-0.4%**	**0.0%**	**-0.4%**	**-0.6%**	**-1.5%**	**-0.4%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 8.4-3 displays the full-flow analysis of the average amounts (ac) of spring-run Chinook salmon fry WUA without cover under the Cumulative Condition and the Environmental Baseline. For both scenarios, a trend was observed of the most spring-run Chinook salmon fry habitat occurring during wet WYs with decreasing amounts from wet to ~~below~~above normal WYTs, remaining about the same during below normal and dry years, and then fry habitat increasing for ~~dry and~~ critical WYs. For both the Cumulative Condition and Environmental Baseline scenarios, relatively little to no additional fry rearing habitat is provided by days when flows were > 5,000 cfs for below normal, dry, and critical WYTs.

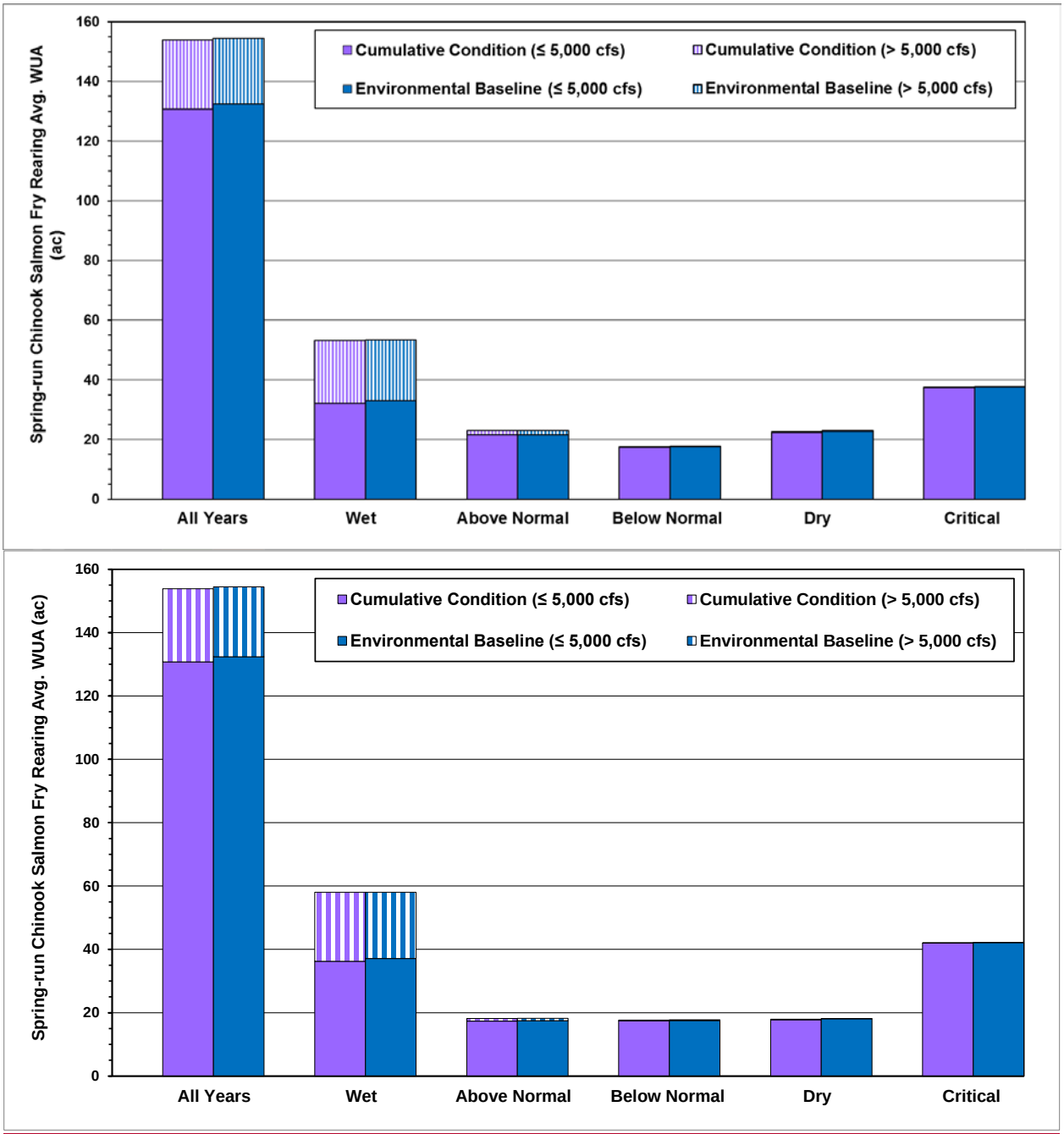


Figure 8.4-3. Comparison of the average amount (ac) of spring-run Chinook salmon fry weighted usable area (WUA) without cover under the Cumulative Condition and the Environmental Baseline scenarios over the 33-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

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Spring-run Chinook Salmon Juvenile Rearing In-Channel Habitat

During the year-round spring-run Chinook salmon juvenile rearing period, flows exceed 5,000 cfs during about 11 percent of the days over the 33-year simulation period for the Cumulative Condition and Environmental Baseline scenarios. These days were excluded from the spring-run Chinook salmon juvenile in-channel rearing WUA analysis. Table 8.4-6 displays the long-term average and average by WYT spring-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline scenarios.

Table 8.4-6. Long-term and WYT average spring-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline scenarios.

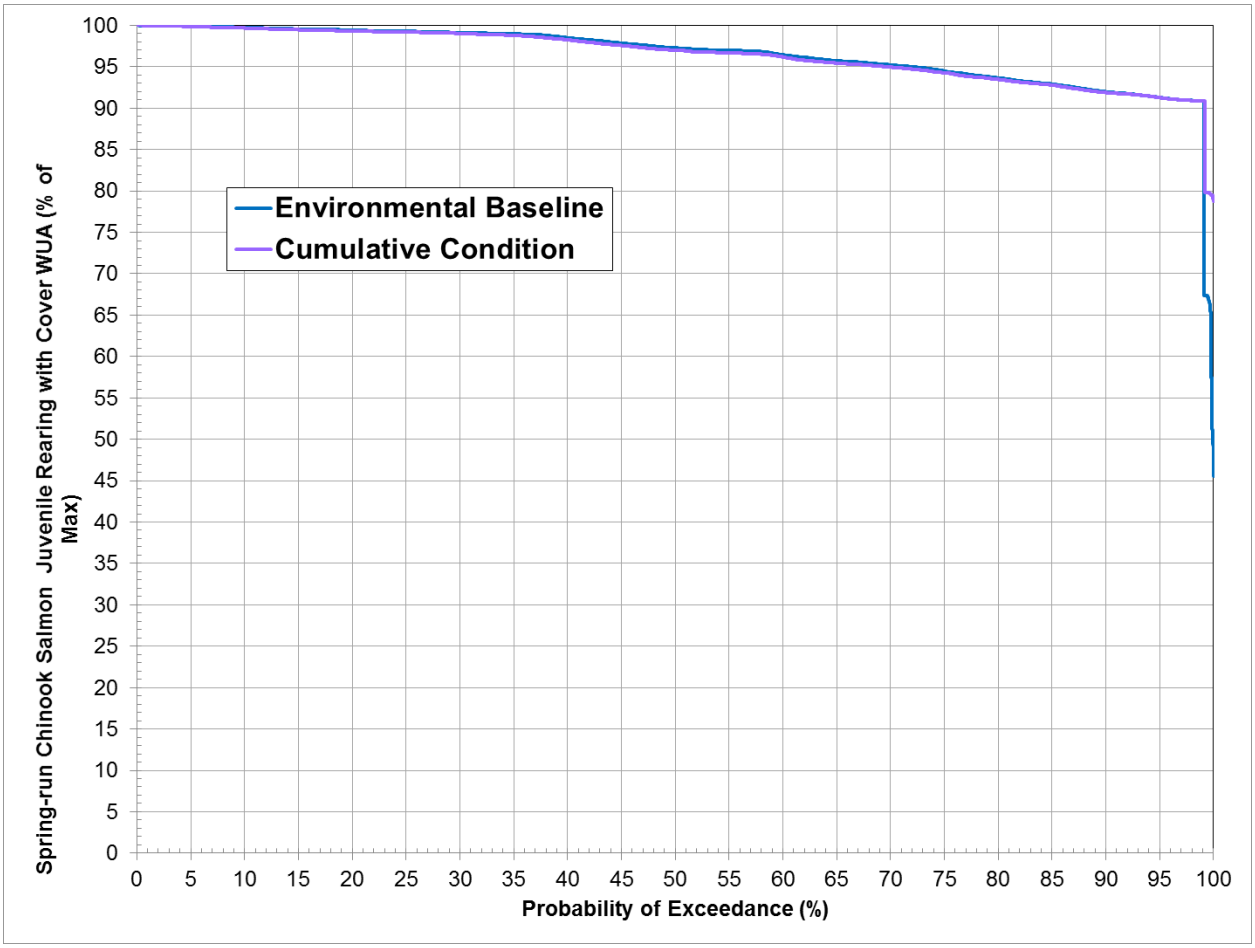
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Cumulative Condition~~	~~96.4~~	~~95.4~~	~~95.6~~	~~96.2~~	~~97.2~~	~~97.5~~
Environmental Baseline	96.5	95.5	95.8	96.4	97.5	97.1
Difference	-0.1	-0.1	-0.2	-0.2	-0.3	0.4

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition	90.6	89.7	89.8	90.4	91.3	91.6
Environmental Baseline	90.6	89.8	90.0	90.6	91.6	91.3
Difference	0.0	-0.1	-0.2	-0.2	-0.3	0.3

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average juvenile in-channel rearing habitat availability (WUA) in the lower Yuba River is very similar under the Cumulative Condition and Environmental Baseline scenarios (long-term average of ~~96.4~~90.6 percent ~~and 96.5 percent~~ of the maximum WUA~~, respectively~~). The Cumulative Condition and Environmental Baseline scenarios also result in similar amounts of WUA by WYT. Both the Cumulative Condition and Environmental Baseline scenarios provide an average of 80 percent (and even up to and over ~~95~~90 percent) or more of maximum juvenile rearing WUA during all WYTs.

Habitat durations for spring-run Chinook salmon juvenile rearing under the Cumulative Condition and Environmental Baseline scenarios are presented in Figure 8.4-4. The Cumulative Condition and Environmental Baseline scenarios provide similar amounts of habitat over the entire distribution, but the Cumulative Condition scenario does provide more habitat over about the lower 1 percent of the distribution when juvenile rearing is most limited. The Cumulative Condition and Environmental Baseline scenarios both achieve 80 percent (and even ~~90~~85 percent) or more of juvenile in-channel rearing maximum WUA with about a 99 percent probability.



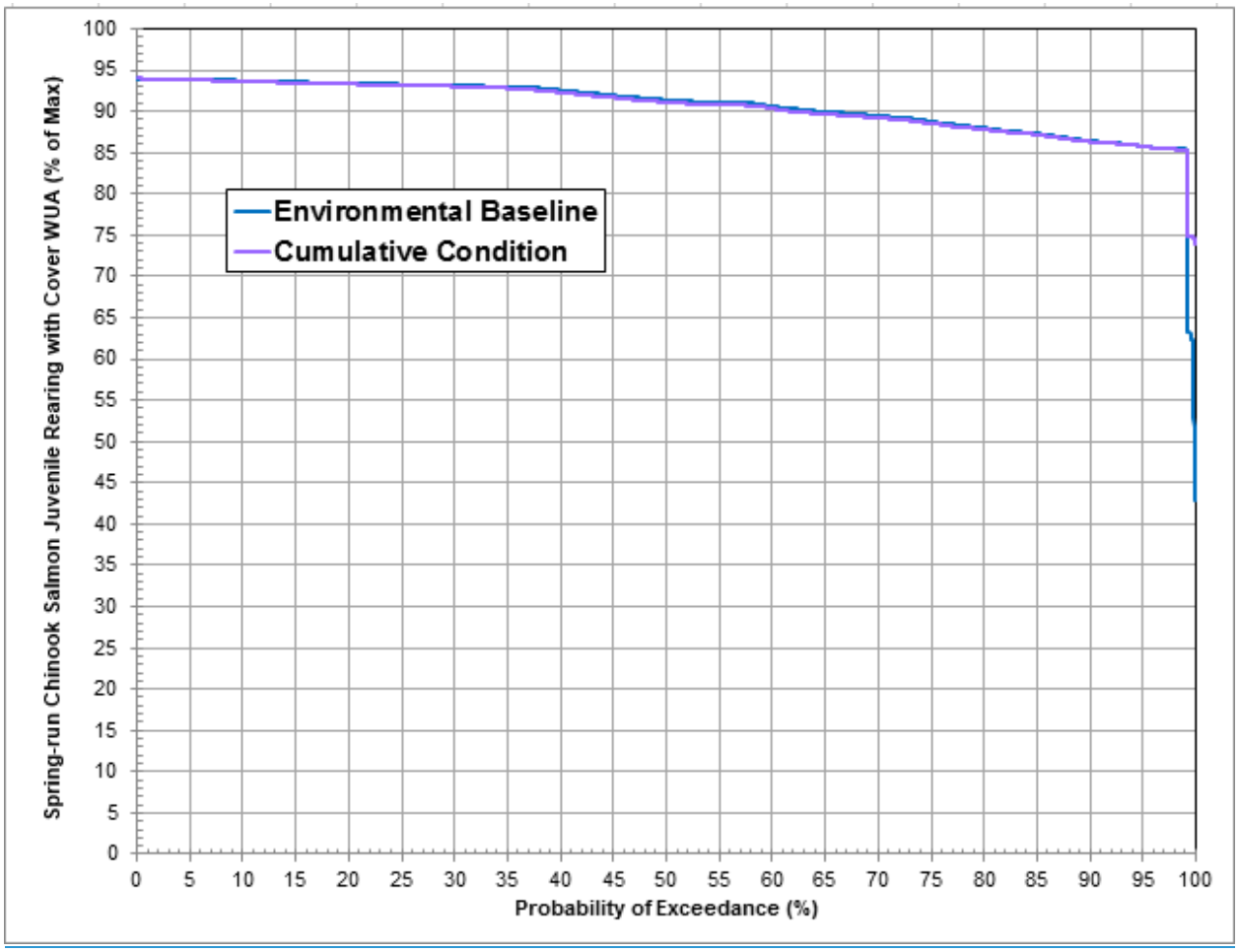


Figure 8.4-4. Spring-run Chinook salmon juvenile in-channel rearing habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline scenarios.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), ~~93.7~~88.0 percent of spring-run Chinook salmon maximum juvenile in-channel rearing WUA was provided under the Cumulative Condition scenario compared to ~~89.0~~83.6 percent provided under the Environmental Baseline scenario.

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Spring-run Chinook Salmon Juvenile Rearing Full-Flow Habitat

Table 8.4-7 displays the full-flow analysis of the average amounts (ac) of spring-run Chinook salmon juvenile WUA without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. For the entire simulation period and by WYT, very similar amounts of juvenile rearing habitat (average WUA) are available under the Cumulative Condition and the Environmental Baseline.

Table 8.4-7. Long-term average WUA (ac) over the 33-year period of evaluation and WYT-specific relative contribution to the long-term average WUA of spring-run Chinook salmon juvenile rearing habitat, under the Cumulative Condition and the Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**12,053**	**4,017**	**1,826**	**1,461**	**1,826**	**2,923**
Days ≤ 5,000 cfs	10,766	2,936	1,687	1,403	1,821	2,919
Days > 5,000 cfs	1,287	1,081	139	58	5	4
Avg. WUA	**254.3**	**84.7**	**37.1**	**30.2**	**38.8**	**63.4**
WUA ≤ 5,000 cfs	223.9	58.9	34.0	29.0	38.7	63.4
WUA > 5,000 cfs	30.4	25.8	3.1	1.3	0.1	0.1
Environmental Baseline						
Total Days in Analysis	**12,053**	**4,017**	**1,826**	**1,461**	**1,826**	**2,923**
Days ≤ 5,000 cfs	10,776	2,952	1,679	1,403	1,823	2,919
Days > 5,000 cfs	1,277	1,065	147	58	3	4
Avg. WUA	**254.8**	**85.0**	**37.2**	**30.4**	**39.1**	**63.2**
WUA ≤ 5,000 cfs	224.5	59.3	34.0	29.1	39.0	63.1
WUA > 5,000 cfs	30.3	25.6	3.2	1.3	0.1	0.1
Differences						
Avg. WUA	**-0.6**	**-0.2**	**-0.1**	**-0.1**	**-0.3**	**0.2**
% change	**-0.2%**	**-0.3%**	**-0.3%**	**-0.4%**	**-0.7%**	**0.3%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**12,053**	**4,382**	**1,461**	**1,461**	**1,461**	**3,288**
Days ≤ 5,000 cfs	10,766	3,277	1,346	1,403	1,456	3,284
Days > 5,000 cfs	1,287	1,105	115	58	5	4
Avg. WUA	**254.3**	**92.1**	**29.7**	**30.2**	**31.0**	**71.2**
WUA ≤ 5,000 cfs	223.9	65.7	27.2	29.0	30.9	71.2
WUA > 5,000 cfs	30.4	26.4	2.5	1.3	0.1	0.1
Environmental Baseline						
Total Days in Analysis	**12,053**	**4,382**	**1,461**	**1,461**	**1,461**	**3,288**
Days ≤ 5,000 cfs	10,776	3,294	1,337	1,403	1,458	3,284
Days > 5,000 cfs	1,277	1,088	124	58	3	4
Avg. WUA	**254.8**	**92.4**	**29.8**	**30.4**	**31.2**	**71.1**
WUA ≤ 5,000 cfs	224.5	66.2	27.1	29.1	31.1	71.0
WUA > 5,000 cfs	30.3	26.2	2.7	1.3	0.1	0.1
Differences						
Avg. WUA	**-0.6**	**-0.3**	**-0.1**	**-0.1**	**-0.2**	**0.1**
% change	**-0.2%**	**-0.3%**	**-0.4%**	**-0.4%**	**-0.7%**	**0.2%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 8.4-5 displays the full-flow analysis of the average amounts (ac) of spring-run Chinook salmon juvenile WUA without cover under the Cumulative Condition and the Environmental Baseline scenarios. For both scenarios, decreasing amounts of total habitat were provided from wet to above~~below~~ normal WYTs, similar amounts from above normal to dry WYTs, then increasing amounts were provided for ~~dry and~~ critical WYTs. For both the Cumulative Condition and Environmental Baseline, relatively little to no additional juvenile rearing habitat is provided by days when flows were > 5,000 cfs for below normal, dry and critical WYTs.

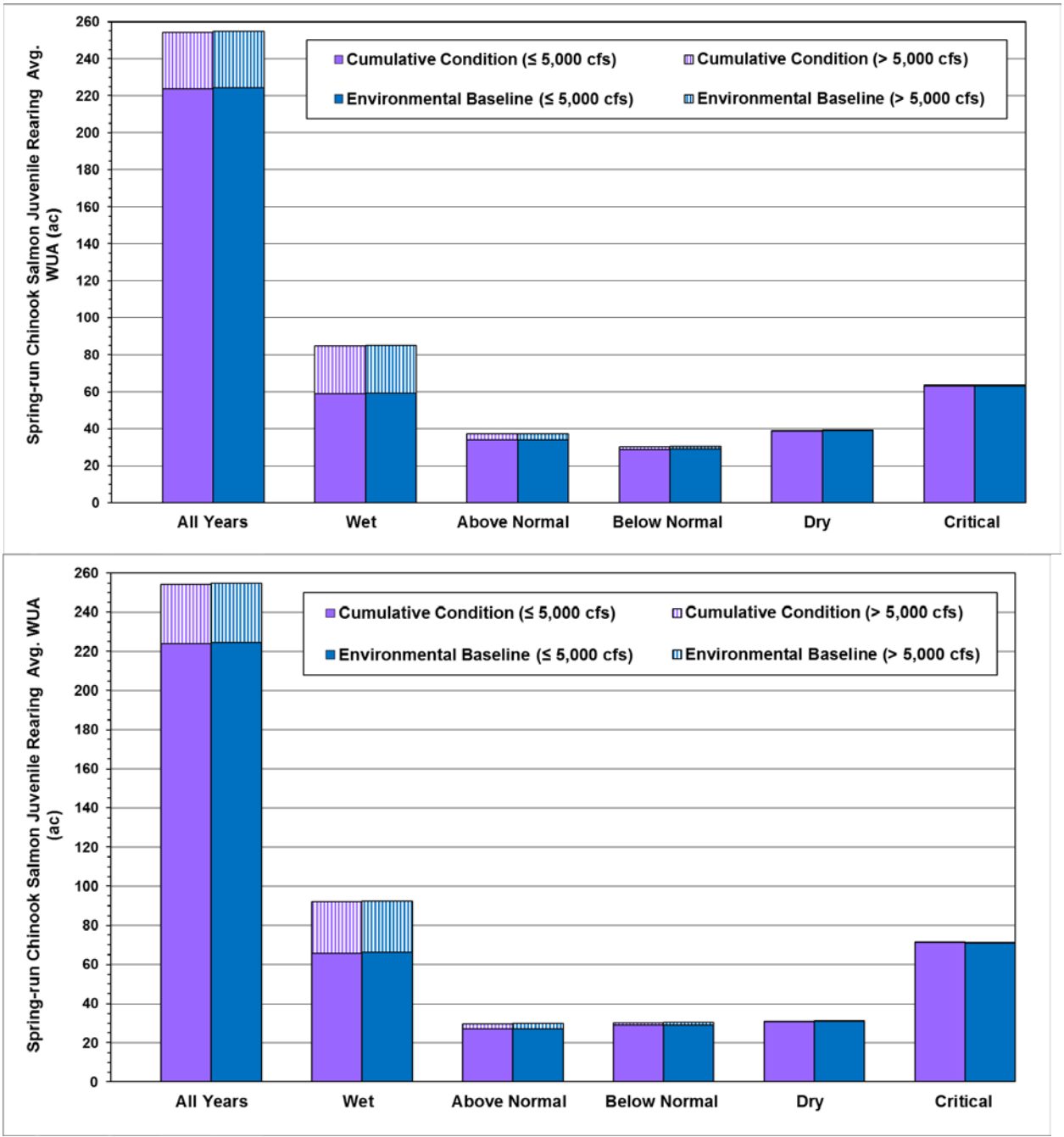


Figure 8.4-5. Comparison of the average amount (ac) of spring-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Cumulative Condition and the

Environmental Baseline over the 33-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages BA8-64 to BA8-66

8.4.2 Steelhead

8.4.2.1 Flow-Dependent Habitat Conditions

8.4.2.1.1 Spawning Habitat

Spawning WUA for steelhead was evaluated for simulated flows up to 5,000 cfs, which generally represents the bankfull flow in the lower Yuba River. During the January through April steelhead spawning period, flows exceed 5,000 cfs during about 22 and 21 percent of the days over the 33-year simulation period for the Cumulative Condition and the comparative Environmental Baseline scenario, respectively. Table 8.4-10 displays the long-term average and average by WYT of steelhead spawning WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline scenarios.

Table 8.4-10. Long-term and water year type average steelhead spawning WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Cumulative Condition~~	~~92.1~~	~~97.9~~	~~96.5~~	~~94.5~~	~~92.8~~	~~84.4~~
Environmental Baseline	91.5	97.9	96.0	94.1	91.2	83.9
Difference	0.6	0.0	0.5	0.4	1.6	0.5

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition	91.1	96.8	95.4	93.5	91.9	84.4
Environmental Baseline	90.6	96.7	94.9	93.1	90.4	83.8
Difference	0.5	0.1	0.5	0.4	1.5	0.6

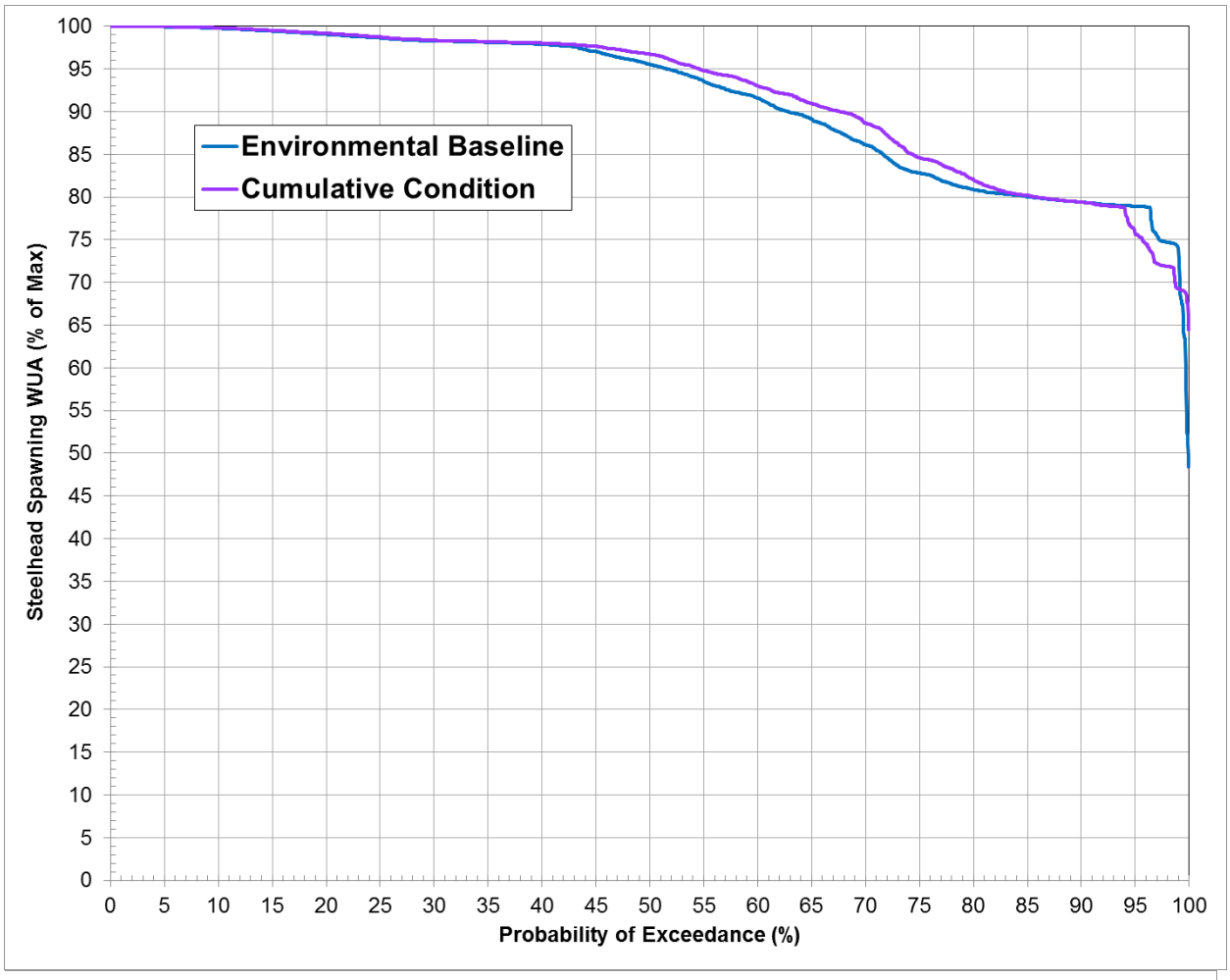
[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, there is very little difference between the long-term average steelhead spawning habitat availability (percent of maximum WUA) in the lower Yuba River under the Cumulative Condition scenario (~~92.1~~91.1 percent maximum WUA) relative to the Environmental Baseline scenario (~~91.5~~90.6 percent maximum WUA). The Cumulative Condition also results in similar percentages of maximum WUA by WYT as the Environmental Baseline scenario, but does result in an increase in maximum WUA of ~~1.6~~1.5 percent during dry WYs. Both the Cumulative Condition and the Environmental Baseline scenario provide 80 percent or more of maximum spawning WUA during all WYTs.

Habitat durations for steelhead in-channel spawning under the Cumulative Condition and Environmental Baseline scenarios are presented in Figure 8.4-8.

The Cumulative Condition scenario provides similar or higher amounts of spawning habitat availability as the Environmental Baseline scenario over most of the exceedance distribution, provides less habitat over about 5 percent of the lower end of the distribution, and provides substantially more habitat over the lowest <1 percent of the distribution when habitat is most limiting. Both the Cumulative Condition and Environmental Baseline scenarios achieve 80 percent or more of spawning maximum WUA about 85 percent of the time.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), an average of ~~72.0~~71.2 percent of steelhead maximum spawning WUA was provided under the Cumulative Condition scenario, compared to ~~73.6~~72.8 percent provided under the Environmental Baseline scenario.


Environmental Baseline
Cumulative Condition
Steelhead Spawning WUA (% of Max)
Probability of Exceedance (%)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100

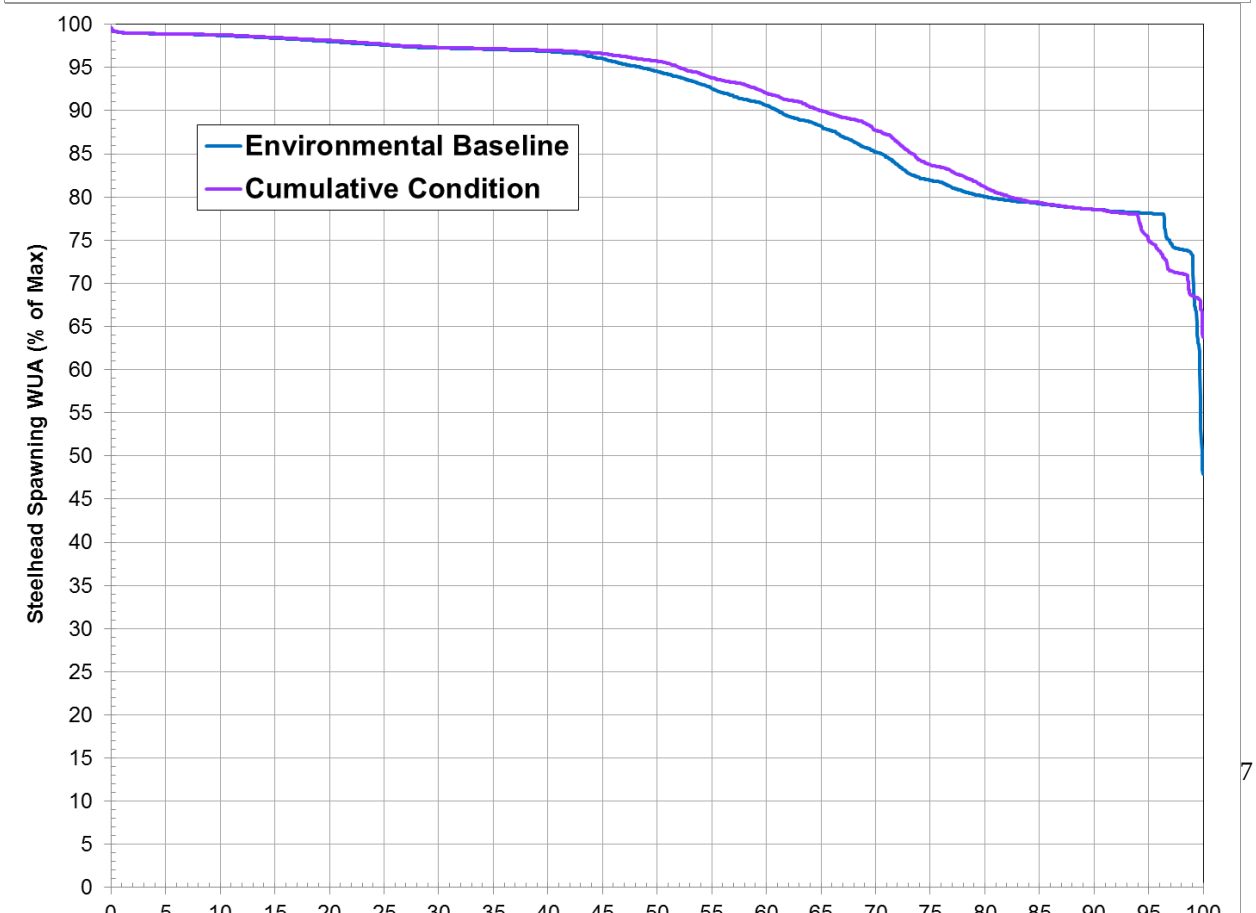

Environmental Baseline
Cumulative Condition
Steelhead Spawning WUA (% of Max)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100

Figure 8.4-8. Steelhead spawning habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline scenarios.

As discussed in Section 6.0, flow-dependent spawning habitat availability under the Environmental Baseline is a low stressor to Yuba River steelhead. Because of the general similarity or improvement in spawning habitat availability under the Cumulative Condition relative to the Environmental Baseline, this stressor would remain characterized as a low stressor under the Cumulative Condition.

Pages BA8-66 to BA8-68

8.4.2.1.2 Potential Redd Dewatering

For every day of the annual embryo incubation period, the long-term annual average of the percentage of steelhead redds potentially dewatered under the Cumulative Condition is slightly (0.30 percent) lower than the average under the Environmental Baseline. Applying the WY 1976-2008 average to the estimated 227 steelhead redds observed during surveys in the lower Yuba River during 2010, it is estimated that about 39 steelhead redds would potentially have been dewatered under the Cumulative Condition compared to an estimated 40 redds dewatered under the Environmental Baseline.

The highest estimated percentage of redds potentially dewatered occurs during wet WYTs for both the Cumulative Condition scenario (~~33.45~~31.26 percent) and the Environmental Baseline scenario (~~34.80~~32.34 percent) (Table 8.4-11). Under both the Cumulative Condition and the Environmental Baseline scenarios, the percentage of redds potentially dewatered generally decreases as the WYTs become drier from wet to critical. Small differences in steelhead redd dewatering would occur between the Cumulative Condition and the Environmental Baseline scenarios. The largest difference occurs during the wet WYs, when the average percentage of steelhead redds potentially dewatered under the Cumulative Condition would be ~~1.35~~1.08 percent lower, relative to the Environmental Baseline.

Table 8.4-11. Estimated steelhead redd and egg pocket potential dewatering under the Cumulative Condition relative to the Environmental Baseline.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	17.22%	17.52%	-0.30%	8.79%	8.98%	-0.19%
Wet	33.45%	34.80%	-1.35%	18.49%	19.68%	-1.19%
Above Normal	17.80%	16.97%	0.83%	8.27%	7.38%	0.89%
Below Normal	17.66%	17.62%	0.04%	8.94%	8.65%	0.29%
Dry	3.85%	4.42%	-0.57%	0.72%	0.75%	-0.03%
Critical	2.66%	2.26%	0.40%	0.75%	0.58%	0.17%

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	17.22%	17.52%	-0.30%	8.79%	8.98%	-0.19%
Wet	31.26%	32.34%	-1.08%	17.25%	18.28%	-1.03%
Above Normal	20.46%	19.88%	0.58%	9.46%	8.50%	0.96%
Below Normal	17.66%	17.62%	0.04%	8.94%	8.65%	0.29%
Dry	4.63%	5.39%	-0.76%	0.87%	0.92%	-0.05%
Critical	2.45%	2.06%	0.39%	0.68%	0.52%	0.16%

The long-term average percentage of egg pocket dewatering is very similar under the Cumulative Condition and Environmental Baseline scenarios (8.79 and 8.98 percent, respectively). The highest estimated percentage of egg pockets potentially dewatered occurs during wet WYTs for both the Cumulative Condition scenario (~~18.49~~17.25 percent) and the Environmental Baseline scenario (~~19.68~~18.28 percent). Potential egg pocket dewatering by WYT is similar, but slightly lower (up to ~~1.2~~1.0 percent in wet WYs), under the Cumulative Condition relative to the Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), no steelhead redds would potentially be dewatered under the Cumulative Condition, and an estimated 1.25 percent of steelhead redds would potentially be dewatered the Environmental Baseline. During this conference year, no egg pockets would potentially be dewatered under either the Cumulative Condition or the Environmental Baseline.The potential redd dewatering for steelhead is primarily due to high flow events (storm flows), which exceed the combined total flow capacity at Narrows 1 and Narrows 2 (4,130 cfs) that occur during the steelhead spawning and incubation period (i.e., January through May), and due to redd dewatering during those days when the conditions associated with Proposed Condition AR9 would not apply. Consequently, potential steelhead redd dewatering under the Cumulative Condition is estimated to be similar to that under the Environmental Baseline, and would not be exacerbated by the Cumulative Condition.

As discussed for spring-run Chinook salmon, Proposed Condition AR9 would not necessarily apply to every day each year of the embryo incubation period. During the days over the 33-year period of evaluation when this proposed condition would apply, it would provide the intended protection for steelhead redd dewatering (Table 8.4-12).

Table 8.4-12. Estimated steelhead redd and egg pocket potential dewatering under the Cumulative Conditon relative to the Environmental Baseline, for those days in the 33-year period of record during which the flow reduction criteria specified in Proposed Condition AR9 would apply.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	0.38%	0.48%	-0.10%	0.05%	0.06%	-0.01%
Wet	0.16%	0.11%	0.05%	0.00%	0.00%	0.00%
Above Normal	0.31%	0.54%	-0.23%	0.06%	0.09%	-0.03%
Below Normal	0.13%	0.22%	-0.09%	0.00%	0.02%	-0.02%
Dry	0.38%	0.39%	-0.01%	0.05%	0.04%	0.01%
Critical	0.84%	1.14%	-0.30%	0.14%	0.17%	-0.03%

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	0.38%	0.48%	-0.10%	0.05%	0.06%	-0.01%
Wet	0.16%	0.12%	0.04%	0.00%	0.01%	-0.01%
Above Normal	0.36%	0.63%	-0.27%	0.07%	0.10%	-0.03%
Below Normal	0.13%	0.22%	-0.09%	0.00%	0.02%	-0.02%
Dry	0.32%	0.38%	-0.06%	0.04%	0.03%	0.01%
Critical	0.82%	1.06%	-0.24%	0.14%	0.15%	-0.01%

Pages BA8-68 to BA8-70

8.4.2.1.3 Fry and Juvenile Rearing Habitat Availability

Steelhead Fry Rearing In-Channel Habitat

During the April through July steelhead fry rearing period, flows exceed 5,000 cfs during about 12 percent of the days over the 33-year simulation period for the Cumulative Condition and Environmental Baseline scenarios. These days were excluded from the steelhead fry in-channel rearing WUA analysis. Table 8.4-13 displays the long-term average and average by WYT steelhead fry in-channel rearing habitat (percent of maximum WUA) under the Cumulative Condition and Environmental Baseline scenarios.

Table 8.4-13. Long-term and WYT average steelhead fry in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline scenarios.

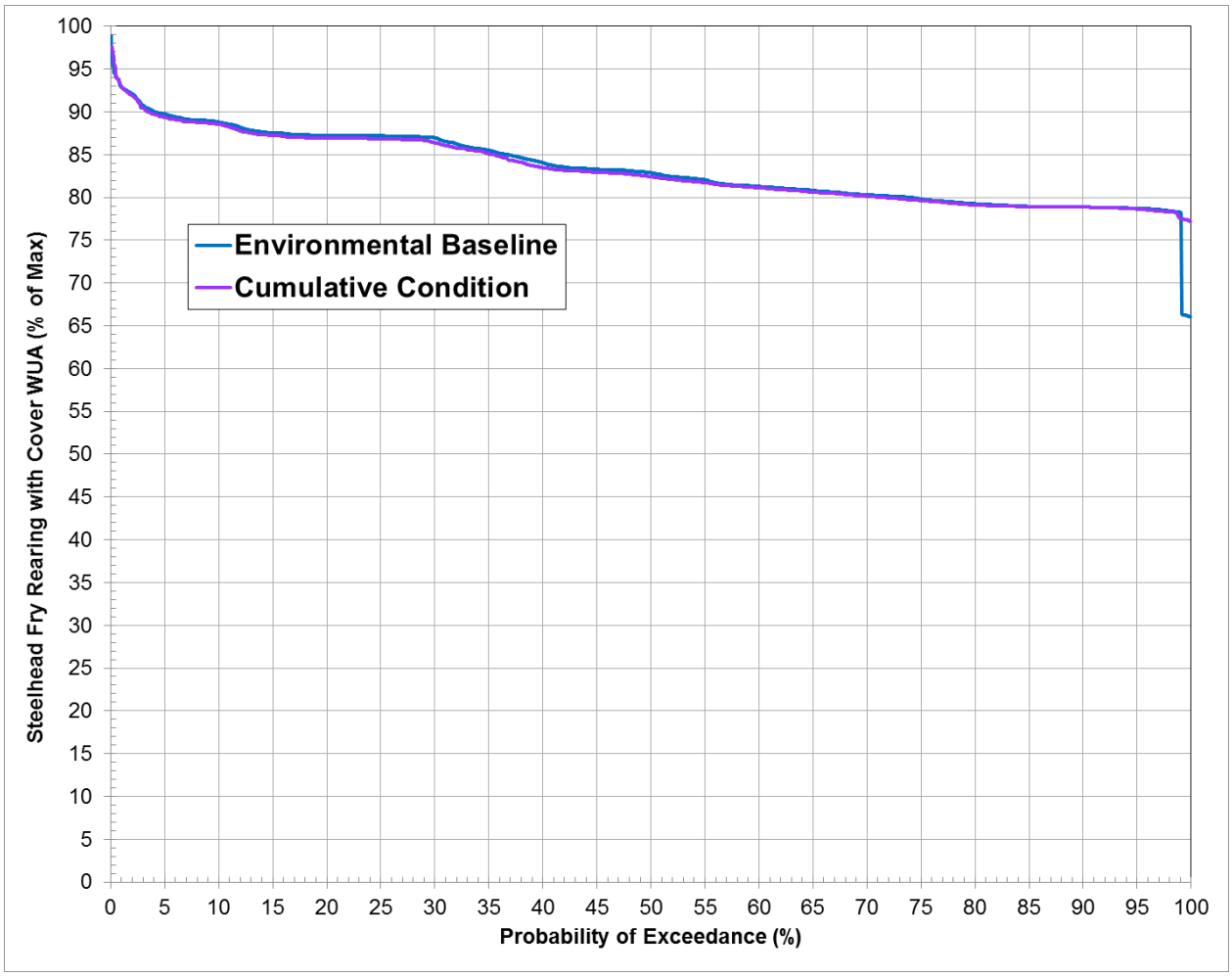
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Cumulative Condition~~	~~83.2~~	~~81.6~~	~~82.0~~	~~81.2~~	~~83.6~~	~~86.1~~
Environmental Baseline	83.3	81.6	82.3	81.5	84.0	86.0
Difference	-0.1	0.0	-0.3	-0.3	-0.4	0.1

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition	80.2	78.8	78.7	78.3	80.4	82.7
Environmental Baseline	80.3	78.8	79.0	78.5	80.9	82.7
Difference	-0.1	0.0	-0.3	-0.2	-0.5	0.0

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average fry in-channel rearing WUA in the lower Yuba River is very similar under the Cumulative Condition and Environmental Baseline. The Cumulative Condition scenario also results in similar fry in-channel rearing ~~–~~maximum WUA by WYT. Both the Cumulative Condition scenario and Environmental Baseline provide 80 percent or more of fry in-channel rearing maximum WUA during ~~all~~dry and critical WYTs.

Habitat durations for steelhead fry in-channel rearing under the Cumulative Condition and Environmental Baseline scenarios are presented in Figure 8.4-9. The Cumulative Condition and Environmental Baseline scenarios provide similar amounts of fry in-channel rearing habitat availability over most of the exceedance distribution, although the Cumulative Condition scenario provides more habitat over the lowest 1 percent of the distribution, relative to the Environmental Baseline scenario. Both the Cumulative Condition and Environmental Baseline scenarios achieve 80 percent or more of in-channel fry rearing maximum WUA with nearly a ~~75~~45 and 49 percent probability, respectively.



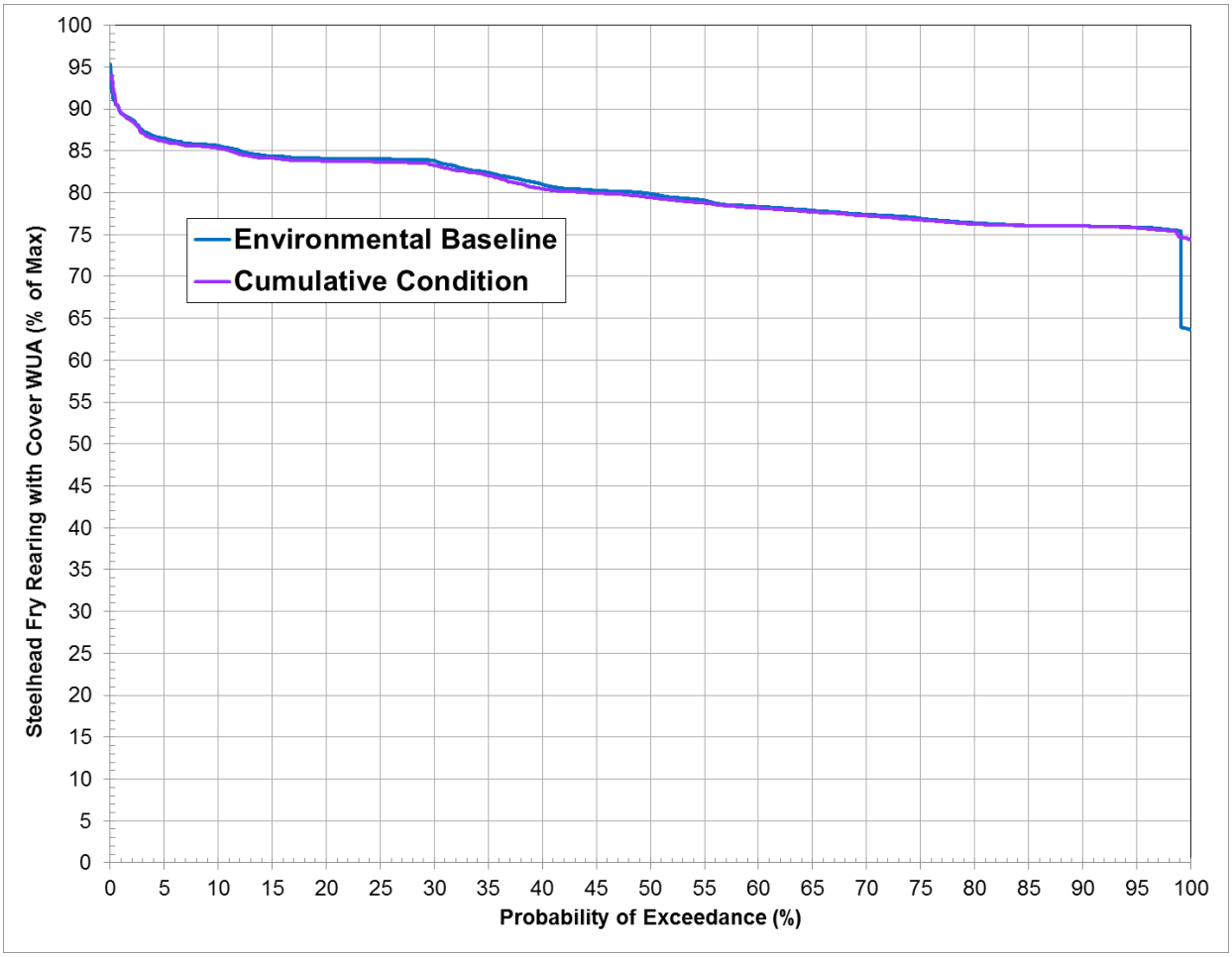


Figure 8.4-9. Steelhead fry in-channel rearing habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline scenarios.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), ~~87.3~~84.2 percent of steelhead fry in-channel rearing maximum WUA was provided under the Cumulative Condition, compared to ~~86.2~~83.1 percent provided under the Environmental Baseline.

Pages BA8-70 to BA8-71

Steelhead Fry Rearing Full-Flow Habitat

Table 8.4-14 displays the full-flow analysis of the average amounts (ac) of steelhead fry WUA without cover under the Cumulative Condition and the Environmental Baseline scenarios over the 33-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by WYT.

Table 8.4-14. Long-term average WUA (ac) over the 33-year period of evaluation and WYT-specific relative contribution to the long-term average WUA of steelhead fry rearing habitat, under the Cumulative Condition and the Environmental Baseline.

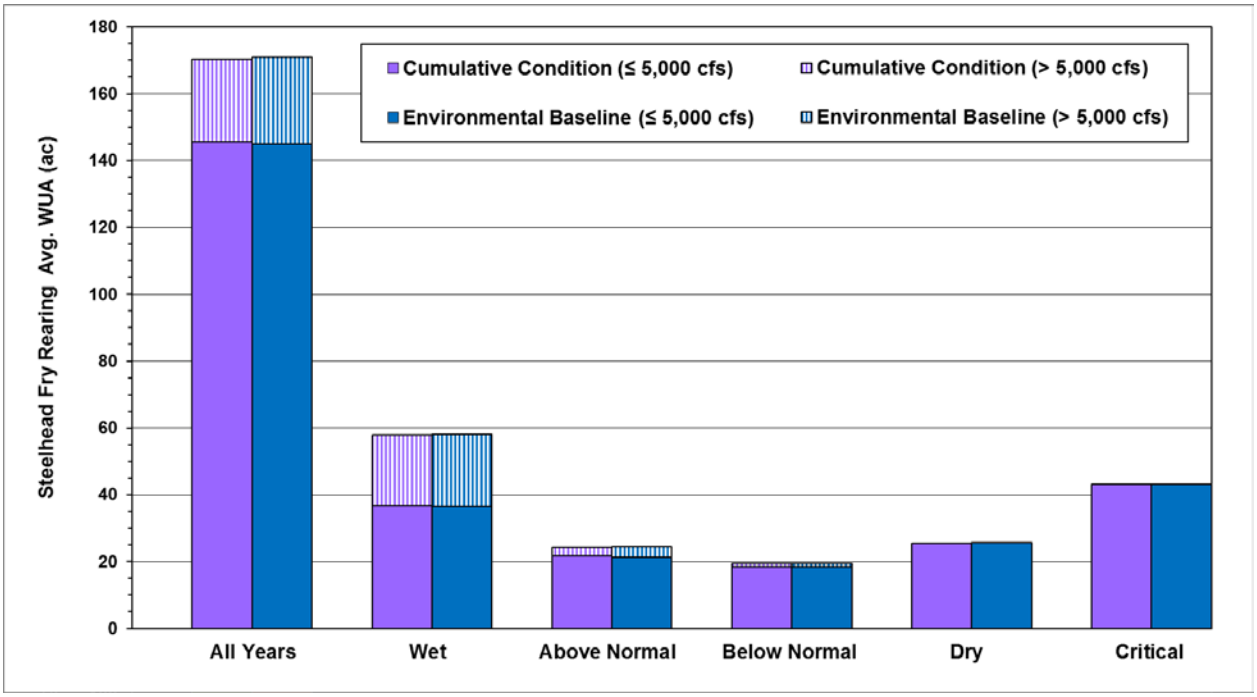
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**4,026**	**1,342**	**610**	**488**	**610**	**976**
Days ≤ 5,000 cfs	3,551	940	557	468	610	976
Days > 5,000 cfs	475	402	53	20	0	0
Avg. WUA	**170.2**	**58.0**	**24.3**	**19.4**	**25.5**	**43.1**
WUA ≤ 5,000 cfs	145.6	36.7	21.8	18.5	25.5	43.1
WUA > 5,000 cfs	24.6	21.2	2.5	0.9	0.0	0.0
Environmental Baseline						
Total Days in Analysis	**4,026**	**1,342**	**610**	**488**	**610**	**976**
Days ≤ 5,000 cfs	3,527	933	542	466	610	976
Days > 5,000 cfs	499	409	68	22	0	0
Avg. WUA	**170.8**	**58.1**	**24.5**	**19.5**	**25.7**	**43.1**
WUA ≤ 5,000 cfs	145.0	36.5	21.3	18.5	25.7	43.1
WUA > 5,000 cfs	25.8	21.6	3.2	1.0	0.0	0.0
Differences						
Avg. WUA	**-0.6**	**-0.1**	**-0.2**	**-0.1**	**-0.2**	**0.0**
% change	**-0.4%**	**-0.2%**	**-0.9%**	**-0.6%**	**-0.8%**	**0.0%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**4,026**	**1,464**	**488**	**488**	**488**	**1,098**
Days ≤ 5,000 cfs	3,551	1,059	438	468	488	1,098
Days > 5,000 cfs	475	405	50	20	0	0
Avg. WUA	**170.2**	**62.8**	**19.4**	**19.4**	**20.4**	**48.2**
WUA ≤ 5,000 cfs	145.6	41.5	17.1	18.5	20.4	48.2
WUA > 5,000 cfs	24.6	21.4	2.4	0.9	0.0	0.0
Environmental Baseline						
Total Days in Analysis	**4,026**	**1,464**	**488**	**488**	**488**	**1,098**
Days ≤ 5,000 cfs	3,527	1,051	424	466	488	1,098
Days > 5,000 cfs	499	413	64	22	0	0
Avg. WUA	**170.8**	**63.0**	**19.6**	**19.5**	**20.5**	**48.3**
WUA ≤ 5,000 cfs	145.0	41.2	16.6	18.5	20.5	48.3
WUA > 5,000 cfs	25.8	21.8	3.0	1.0	0.0	0.0
Differences						
Avg. WUA	**-0.6**	**-0.1**	**-0.2**	**-0.1**	**-0.2**	**-0.1**
% change	**-0.4%**	**-0.2%**	**-0.9%**	**-0.6%**	**-0.7%**	**-0.1%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

For the entire simulation period, slightly lower amounts (0.4 percent) of fry rearing habitat (average WUA) are available under the Cumulative Condition compared to the Environmental Baseline. The Cumulative Condition results in similar but slightly lower (<1 percent) amounts of fry rearing habitat during all WYTs.

Figure 8.4-10 displays the full-flow analysis of the average amounts (ac) of steelhead fry weighted usable area (WUA) without cover under the Cumulative Condition and the Environmental Baseline. For both scenarios, a trend was observed of the most steelhead fry habitat occurring during wet WYs with decreasing amounts from wet to below normal WYTs, then fry habitat increasing for dry and critical WYs. For both the Cumulative Condition and Environmental Baseline, relatively little to no additional fry rearing habitat is provided by days when flows were > 5,000 cfs for below normal, dry, and critical WYTs.



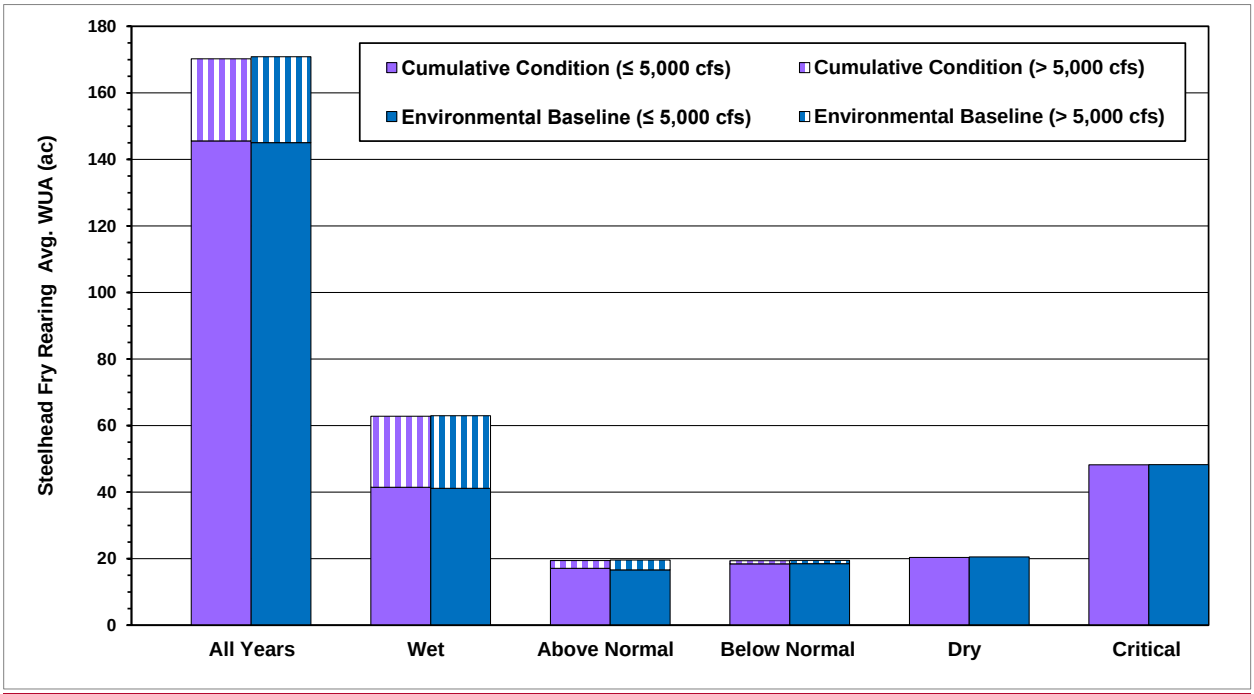


Figure 8.4-10. Comparison of the average amount (ac) of steelhead fry weighted usable area (WUA) without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by WYT of habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages BA8-71 to BA8-73

Steelhead Juvenile Rearing In-Channel Habitat

During the year-round steelhead juvenile rearing period, flows exceed 5,000 cfs during about 11 percent of the days over the 33-year simulation period for the Cumulative Condition and Environmental Baseline scenarios. These days were excluded from the steelhead juvenile in-channel rearing WUA analysis. Table 8.4-15 displays the long-term average and average by WYT steelhead juvenile in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline scenarios.

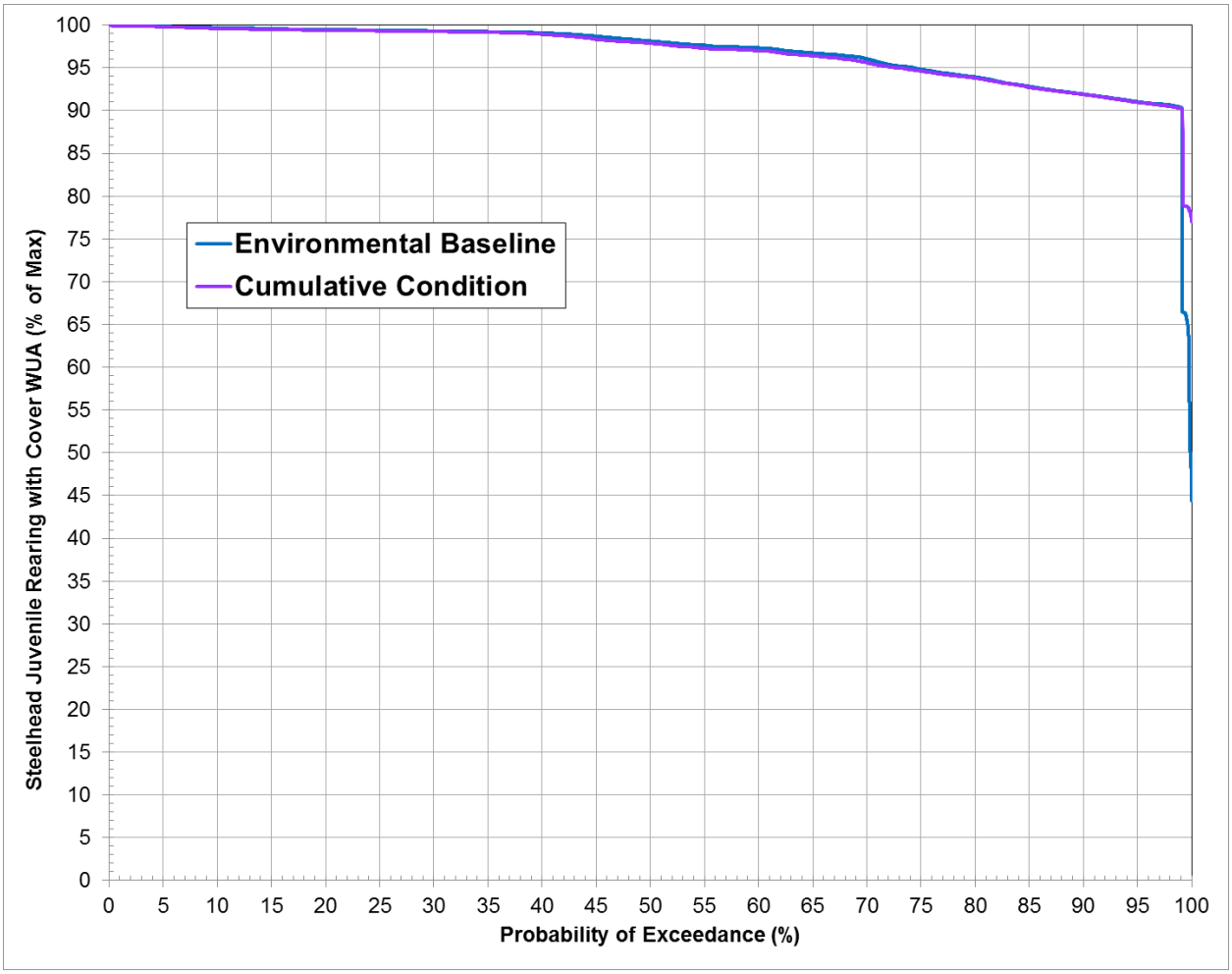
Over the entire 33-year simulation period, long-term average juvenile rearing WUA in the lower Yuba River is the same under the Cumulative Condition and Environmental Baseline scenarios (long-term average of ~~96.7~~91.7 percent of maximum WUA). The Cumulative Condition scenario also results in very similar amounts of (percent of maximum) juvenile rearing habitat during all WYTs relative to the Environmental Baseline scenario. Both the Cumulative Condition and Environmental Baseline scenarios provide, on average, 80 percent (and even ~~95~~90 percent) or more of maximum juvenile rearing WUA during all WYTs.

Table 8.4-15. Long-term and WYT average steelhead juvenile in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Cumulative Condition~~	~~96.7~~	~~95.6~~	~~95.6~~	~~96.7~~	~~97.9~~	~~97.8~~
Environmental Baseline	96.7	95.7	95.9	96.9	98.1	97.4
Difference	0.0	-0.1	-0.3	-0.2	-0.2	0.4
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Cumulative Condition	91.7	90.6	90.8	91.7	92.7	92.7
Environmental Baseline	91.7	90.7	91.0	91.9	92.9	92.4
Difference	0.0	-0.1	-0.2	-0.2	-0.2	0.3

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Habitat duration for steelhead juvenile rearing under the Cumulative Condition and Environmental scenarios is presented in Figure 8.4-11. The Cumulative Condition and Environmental Baseline scenarios provide very similar amounts of juvenile rearing habitat availability over nearly the entire exceedance distribution. The Cumulative Condition and Environmental Baseline scenarios both achieve 80 percent ~~(and even 90 percent)~~ or more of juvenile in-channel rearing maximum WUA with about a 99 percent probability.



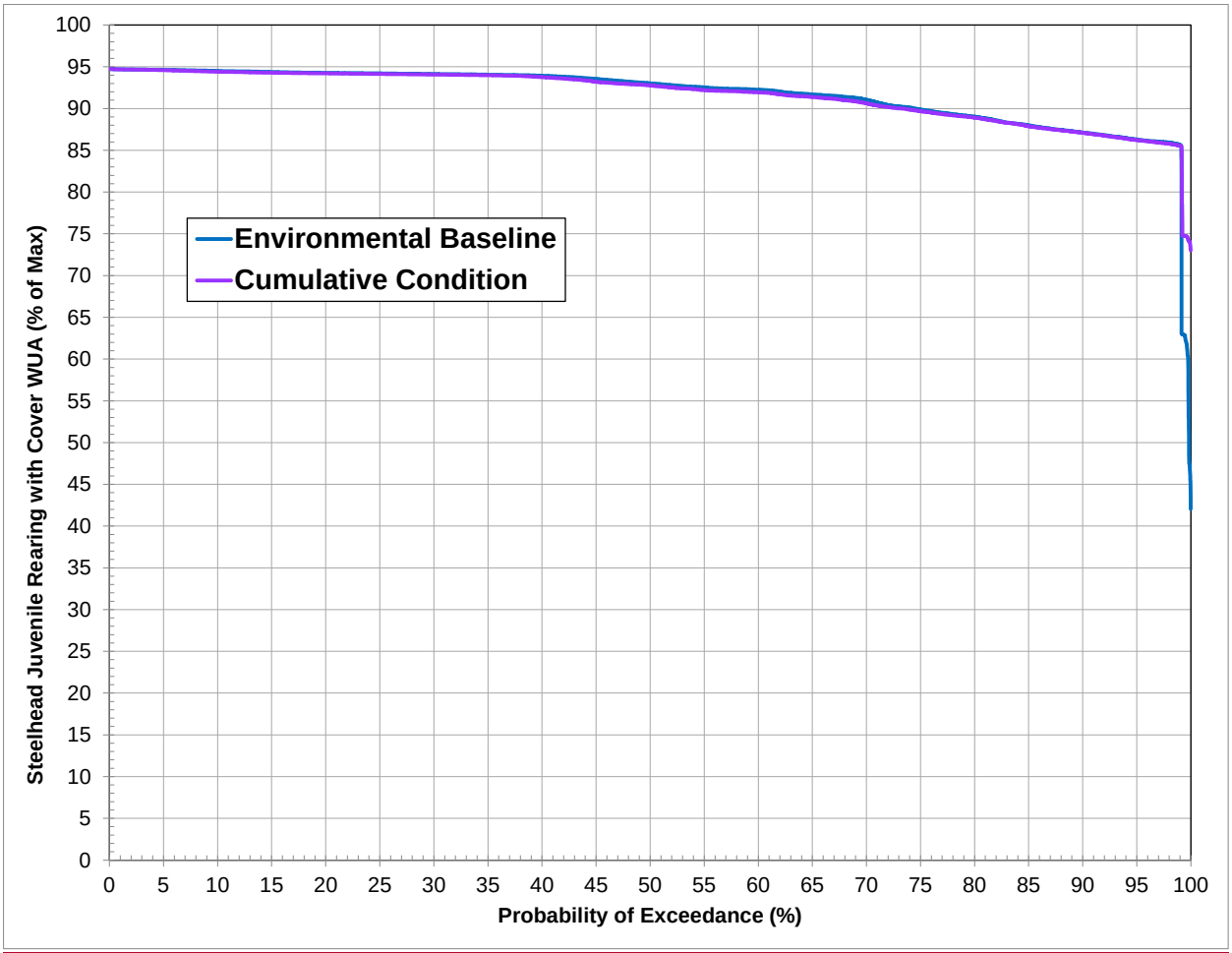


Figure 8.4-11. Steelhead juvenile in-channel rearing habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline scenarios.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), ~~92.9~~88.1 percent of steelhead maximum juvenile in-channel rearing WUA was provided under the Cumulative Condition, compared to ~~88.3~~83.7 percent provided under the Environmental Baseline.

Pages BA8-73 to BA8-75

Steelhead Juvenile Rearing Full Flow Habitat

Table 8.4-16 displays the full-flow analysis of the average amounts (ac) of steelhead juvenile WUA without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Similar amounts of juvenile rearing habitat (average WUA) are provided under the Cumulative Condition and the Environmental Baseline for the entire ~~simuation~~simulation period and all WYTs.

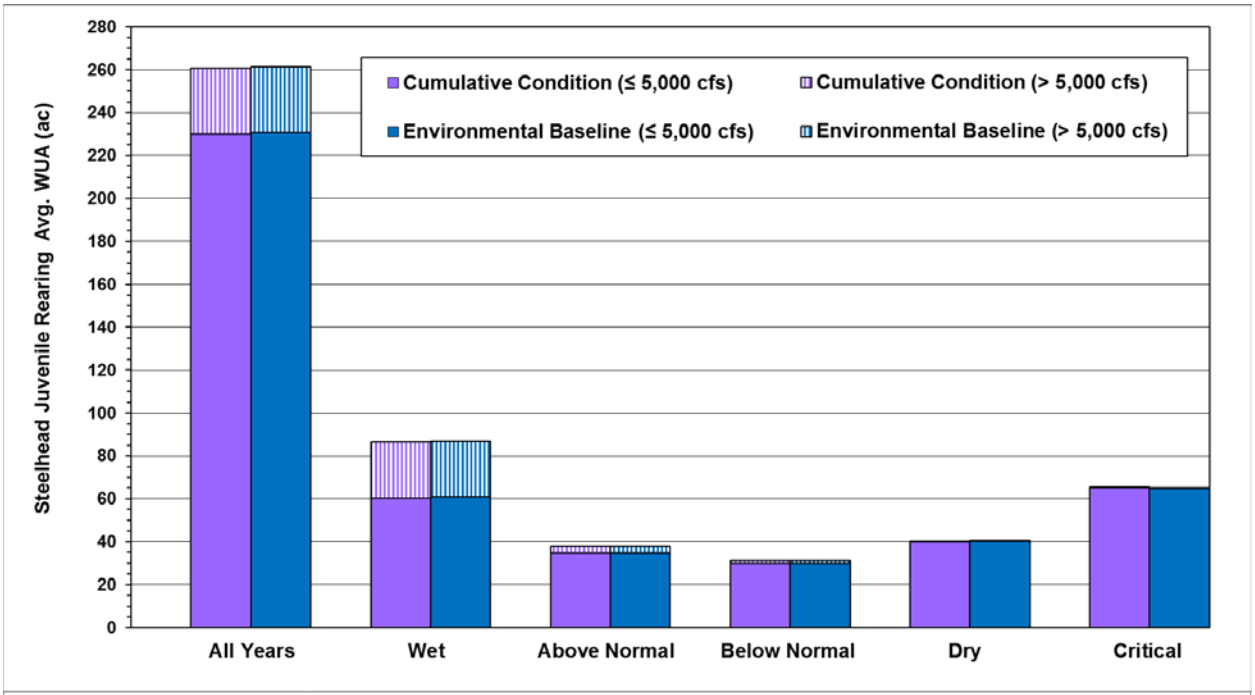
Table 8.4-16. Long-term average WUA (ac) over the 33-year period of evaluation and WYT-specific relative contribution to the long-term average WUA of steelhead juvenile rearing habitat, under the Cumulative Condition and the Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**12,053**	**4,017**	**1,826**	**1,461**	**1,826**	**2,923**
Days ≤ 5,000 cfs	10,766	2,936	1,687	1,403	1,821	2,919
Days > 5,000 cfs	1,287	1,081	139	58	5	4
Avg. WUA	**260.8**	**86.6**	**37.9**	**31.1**	**40.0**	**65.2**
WUA ≤ 5,000 cfs	230.0	60.3	34.8	29.8	39.9	65.1
WUA > 5,000 cfs	30.9	26.3	3.1	1.3	0.1	0.1
Environmental Baseline						
Total Days in Analysis	**12,053**	**4,017**	**1,826**	**1,461**	**1,826**	**2,923**
Days ≤ 5,000 cfs	10,776	2,952	1,679	1,403	1,823	2,919
Days > 5,000 cfs	1,277	1,065	147	58	3	4
Avg. WUA	**261.4**	**86.9**	**38.0**	**31.3**	**40.3**	**65.0**
WUA ≤ 5,000 cfs	230.6	60.8	34.8	30.0	40.2	64.9
WUA > 5,000 cfs	30.8	26.1	3.2	1.3	0.1	0.1
Differences						
Avg. WUA	**-0.5**	**-0.3**	**-0.1**	**-0.1**	**-0.3**	**0.2**
% change	**-0.2%**	**-0.3%**	**-0.3%**	**-0.4%**	**-0.6%**	**0.3%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**12,053**	**4,382**	**1,461**	**1,461**	**1,461**	**3,288**
Days ≤ 5,000 cfs	10,766	3,277	1,346	1,403	1,456	3,284
Days > 5,000 cfs	1,287	1,105	115	58	5	4
Avg. WUA	**260.8**	**94.1**	**30.4**	**31.1**	**32.0**	**73.2**
WUA ≤ 5,000 cfs	230.0	67.3	27.8	29.8	31.9	73.1
WUA > 5,000 cfs	30.9	26.8	2.5	1.3	0.1	0.1
Environmental Baseline						
Total Days in Analysis	**12,053**	**4,382**	**1,461**	**1,461**	**1,461**	**3,288**
Days ≤ 5,000 cfs	10,776	3,294	1,337	1,403	1,458	3,284
Days > 5,000 cfs	1,277	1,088	124	58	3	4
Avg. WUA	**261.4**	**94.4**	**30.5**	**31.3**	**32.2**	**73.1**
WUA ≤ 5,000 cfs	230.6	67.8	27.8	30.0	32.1	73.0
WUA > 5,000 cfs	30.8	26.6	2.7	1.3	0.1	0.1
Differences						
Avg. WUA	**-0.5**	**-0.3**	**-0.1**	**-0.1**	**-0.2**	**0.2**
% change	**-0.2%**	**-0.3%**	**-0.4%**	**-0.4%**	**-0.6%**	**0.2%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Figure 8.4-12 displays the full-flow analysis of the average amounts (ac) of steelhead juvenile WUA without cover under the Cumulative Condition and the Environmental Baseline. For both scenarios, decreasing amounts of total habitat were provided from wet to below normal WYTs, then increasing amounts were provided for dry and critical WYTs. For both the Cumulative Condition and the Environmental Baseline, relatively little to no additional juvenile rearing habitat is provided by days when flows were > 5,000 cfs for below normal, dry and critical WYTs.



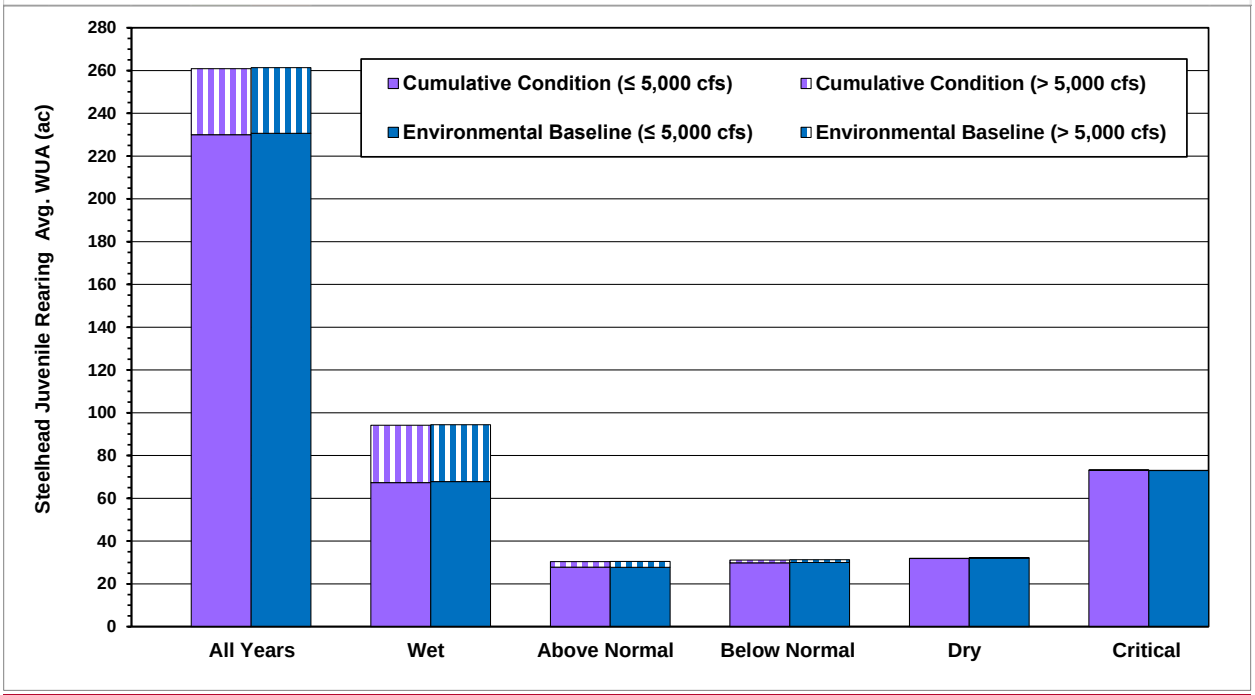


Figure 8.4-12. Comparison of the average amount (ac) of steelhead juvenile weighted usable area (WUA) without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

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SECTION 7

Pages EFH7-54 to EFH7-56

7.4.2.1.2 Modeled Spring-run Chinook Salmon Spawning Habitat Availability

YCWA (2013) calculated spring-run and fall-run Chinook salmon spawning habitat availability using WUA-discharge relationships developed by the Relicensing Participants. The Relicensing Participants' WUA-discharge relationships were developed based on reaching consensus among the Relicensing Participants on the use of depth, velocity, and substrate habitat suitability criteria (HSCs). The HSCs were subjectively modified from other relationships. The resulting WUA-discharge relationships were intended to represent a more broad measure of spawning habitat, including potential spawning habitat that is not currently utilized in the lower Yuba River. Spawning WUA-discharge relationships were developed for four HZs – Daguerre Point Dam HZ, Deer Creek HZ, Dry Creek HZ, and Englebright Dam HZ. The spring-run Chinook salmon spawning habitat evaluation was conducted only upstream of Daguerre Point Dam. The Englebright Dam HZ WUA-discharge relationship was only developed for flows at and above 700 cfs, and at and above 300 cfs for the Deer Creek and Dry Creek HZs. For flows lower than these lowest modeled flows, linear extrapolation was applied from those values to the origin of the distributions.

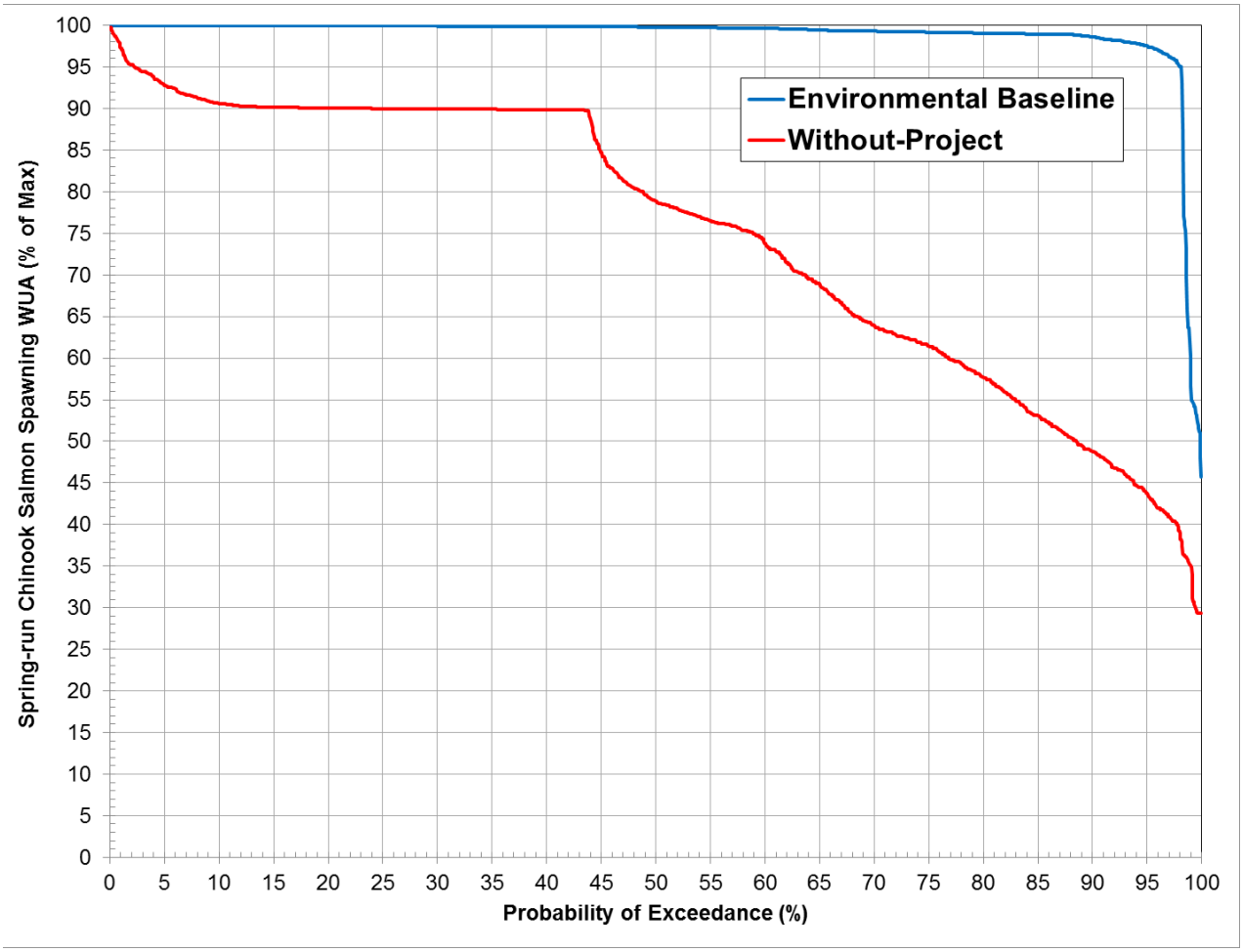
Table 7.4-3 displays the long-term average and average by WYT spring-run Chinook salmon spawning WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios. Over the entire 41-year simulation period, long-term average spring-run Chinook salmon spawning habitat availability (WUA) in the lower Yuba River is substantially higher under the Environmental Baseline scenario relative to the Without-Project scenario (long-term average of ~~98.8%~~97.8% versus ~~75.1%~~74.3% of the maximum WUA). The Environmental Baseline (i.e., "With Project" scenario) results in ~~12.7~~13.4 percent more maximum spawning habitat during wet WYs, ~~19.9~~18.5 percent more during above normal WYs, ~~25.3~~25.0 percent more during below normal WYs, 32.9 percent more during dry WYs, and ~~39.8~~38.5 percent more during critical WYs. The Environmental Baseline scenario provides an average of over 80 percent (and even over ~~90~~95%) of maximum spawning WUA during all WYTs, whereas the Without-Project scenario provides an average of only about ~~56~~57 to ~~87~~85 percent of maximum spawning WUA during any WYT.

Table 7.4-3. Long-term and WYT average spring-run Chinook salmon spawning WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Environmental Baseline~~	~~98.8~~	~~99.3~~	~~99.4~~	~~99.6~~	~~99.6~~	~~96.1~~
Without-Project	75.1	86.6	79.5	74.3	66.7	56.3
Difference	23.7	12.7	19.9	25.3	32.9	39.8
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Environmental Baseline	97.8	98.2	98.6	98.6	98.6	95.5
Without Project	74.3	84.8	80.1	73.6	65.7	57.0
Difference	23.5	13.4	18.5	25.0	32.9	38.5

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat duration for spring-run Chinook salmon spawning under the Environmental Baseline and Without-Project scenarios are presented in Figure 7.4-6. The Environmental Baseline scenario provides substantially greater amounts of spawning habitat availability over the entire exceedance probability distribution. Also, the Environmental Baseline scenario achieves over 80 percent (and even about ~~95~~94%) of maximum spawning WUA with about a 98 percent probability, by contrast to the Without-Project scenario which achieves 80 percent or more of maximum spawning WUA with about a 48 percent probability.



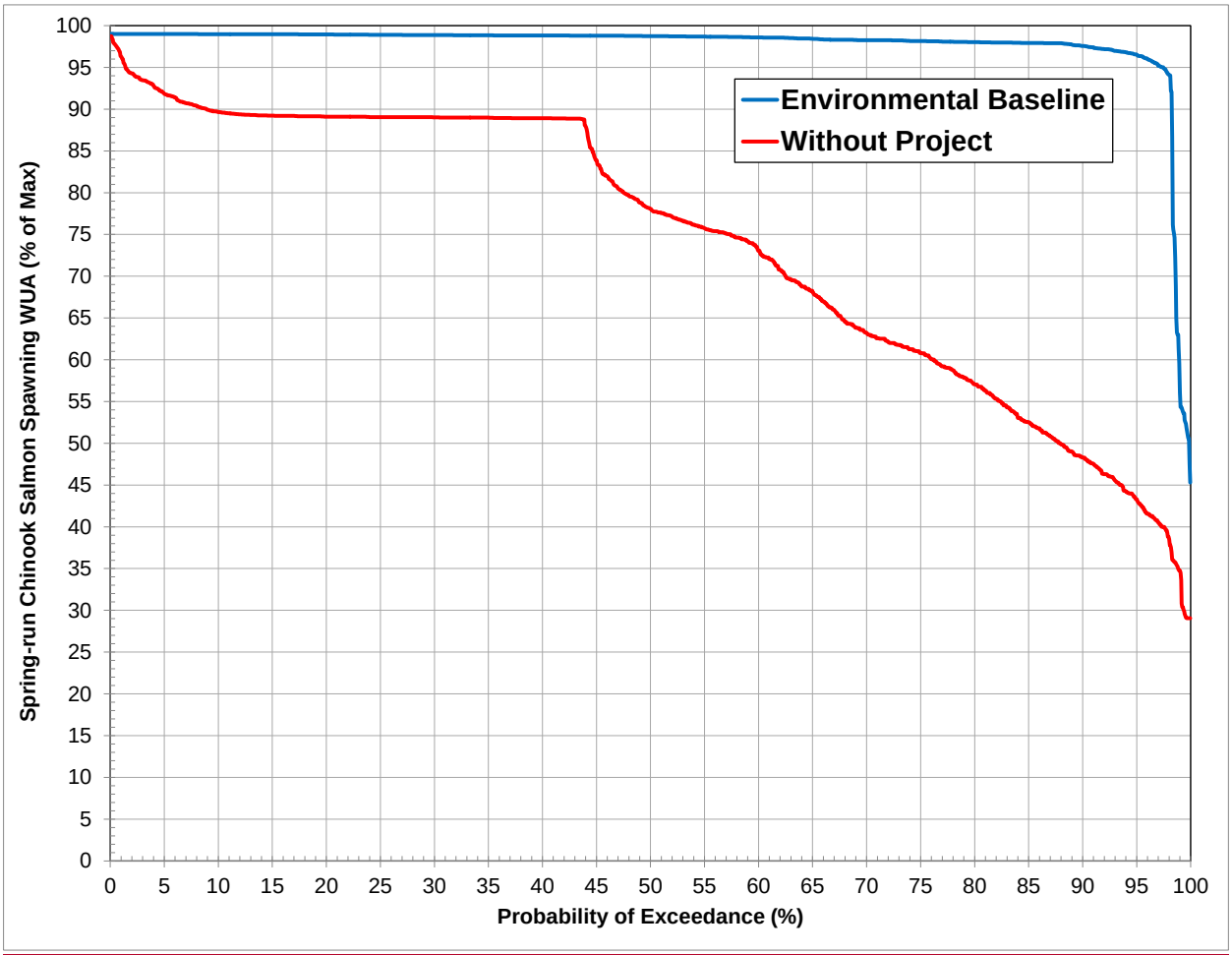


Figure 7.4-6. Spring-run Chinook salmon spawning habitat duration over the 41-year hydrologic period for the Environmental Baseline and Without-Project scenarios.

Pages EFH7-56 to EFH7-58

7.4.2.1.3 Modeled Fall-run Chinook Salmon Spawning Habitat Availability

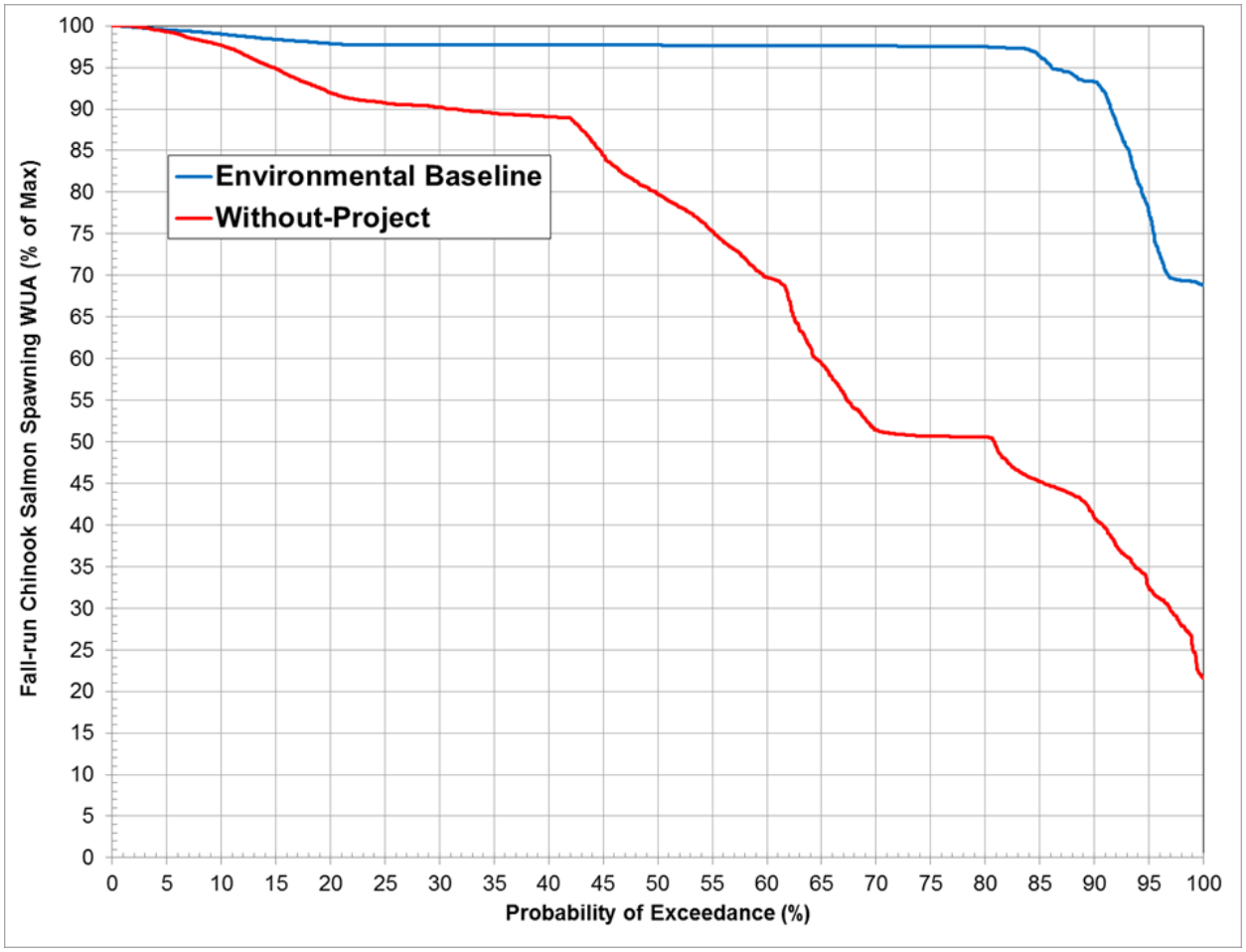
Table 7.4-4 displays the long-term average and average by WYT of fall-run Chinook salmon spawning WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios. Over the entire 41-year simulation period, long-term average fall-run Chinook salmon spawning habitat availability (WUA) in the lower Yuba River is substantially higher under the Environmental Baseline relative to the Without-Project scenario (long-term average of ~~95.8~~95.2% versus ~~72.3~~71.8% of the maximum WUA). The Environmental Baseline results in substantially more maximum spawning habitat during all WYTs, ranging from ~~19.8~~20.9 percent more during wet WYs, to ~~28.7~~27.0 percent more during critical WYs. The Environmental Baseline scenario provides over 80 percent (and even over 90%) of maximum spawning WUA during all WYTs, whereas the Without-Project scenario provides an average of only about ~~69~~70 to ~~74~~73 percent of maximum spawning WUA during any WYT.

Table 7.4-4. Long-term and WYT average fall-run Chinook salmon spawning WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Environmental Baseline~~	~~95.8~~	~~93.8~~	~~95.6~~	~~96.6~~	~~97.6~~	~~97.8~~
Without-Project	72.3	74.0	70.2	73.5	73.8	69.1
Difference	23.5	19.8	25.4	23.1	23.8	28.7
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Environmental Baseline	95.2	93.1	95.4	95.9	96.9	97.1
Without Project	71.8	72.2	72.9	73.0	71.2	70.1
Difference	23.4	20.9	22.5	22.9	25.7	27.0

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat duration for fall-run Chinook salmon spawning under the Environmental Baseline and Without-Project scenarios are presented in Figure 7.4-7. The Environmental Baseline scenario provides substantially greater amounts of spawning habitat availability over most of the exceedance probability distribution. Also, the Environmental Baseline achieves over 80 percent of maximum spawning WUA with about a 94 percent probability, by contrast to the Without-Project scenario which achieves over 80 percent or more of maximum spawning WUA with about a ~~50~~49 percent probability.



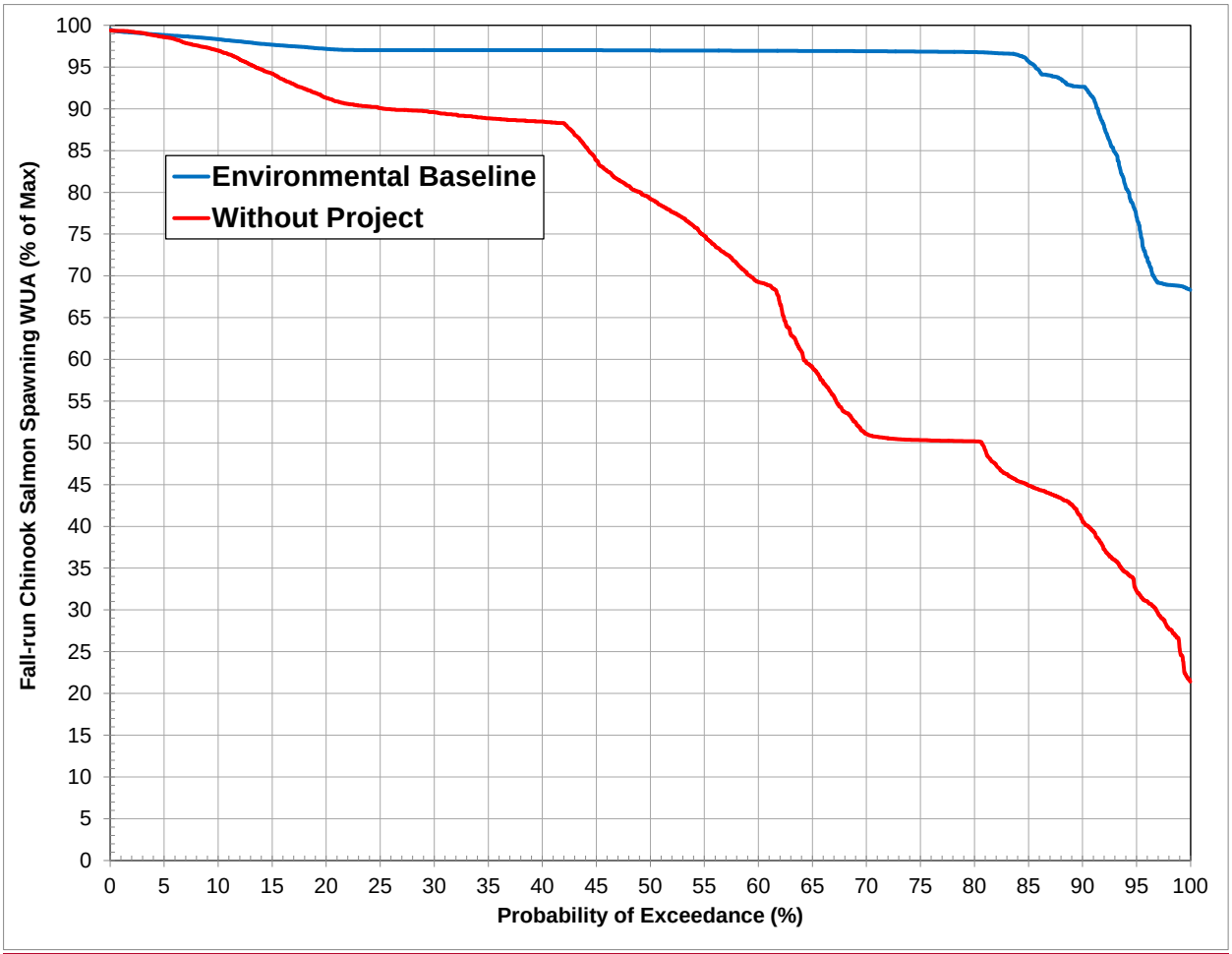


Figure 7.4-7. Fall-run Chinook salmon spawning habitat duration over the 41-year hydrologic period for the Environmental Baseline and Without-Project scenarios.

Pages EFH7-76 to EFH7-78

7.4.2.1.6 Redd Dewatering Results

Spring-run Chinook Salmon

Estimation of potential spring-run Chinook salmon redd dewatering indicates that the long-term average of the percentage of redds built within a given year that would have the potential to be dewatered with slightly less frequency under the Environmental Baseline relative to the Without-Project. Under both scenarios, the potential for redd dewatering is very low, averaging only about 0.01 percent and 0.10 percent annually, respectively. To put this into context, an estimated 1,148 and 1,465 spring-run Chinook salmon redds were constructed in the lower Yuba River during 2009 and 2010, respectively. Correspondingly, applying the 41-year average, it is estimated that essentially no spring-run Chinook salmon redd would be expected to be dewatered

under the Environmental Baseline, and only about 1 spring-run Chinook salmon redd would be expected to be dewatered under the Without-Project scenario during each of these 2 years.

The percentage of redds potentially dewatered would be very small, and similar under the Environmental Baseline and Without-Project scenarios during all WYTs (Table 7.4-11). The largest difference between the Environmental Baseline and Without-Project scenarios potential spring-run Chinook salmon redd dewatering occurs during dry WYs, when the probability of redd dewatering is less under the Environmental Baseline, relative to the Without-Project scenario.

Table 7.4-11. Estimated spring-run Chinook salmon redd and egg pocket potential dewatering under the Environmental Baseline scenario relative to the Without-Project scenario.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Environmental Baseline	Without Project	Difference	Environmental Baseline	Without Project	Difference
Long-term (All WYs)	0.01%	0.10%	-0.09%	0.00%	0.00%	0.00%
Wet	0.02%	0.14%	-0.12%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.05%	-0.04%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.01%	-0.01%	0.00%	0.00%	0.00%
Dry	0.00%	0.20%	-0.20%	0.00%	0.00%	0.00%
Critical	0.00%	0.04%	-0.04%	0.00%	0.00%	0.00%
WYT Categories	**Redd Dewatering Index (%)**			**Egg Pocket Dewatering Index (%)**		
	Environmental Baseline	**Without Project**	**Difference**	**Environmental Baseline**	**Without Project**	**Difference**
Long-term (All WYs)	0.01%	0.10%	-0.09%	0.00%	0.00%	0.00%
Wet	0.02%	0.14%	-0.12%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.03%	-0.02%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.01%	-0.01%	0.00%	0.00%	0.00%
Dry	0.00%	0.25%	-0.25%	0.00%	0.00%	0.00%
Critical	0.00%	0.04%	-0.04%	0.00%	0.00%	0.00%

The long-term and WYT averages of the percentage of egg pockets dewatered indicates that no egg pockets would be expected to be dewatered under the Environmental Baseline scenario or the Without-Project scenario.

Fall-run Chinook Salmon

Estimation of potential fall-run Chinook salmon redd dewatering indicates that the long-term average of the percentage of redds built within a given year would be dewatered less frequently under the Environmental Baseline scenario, relative to the Without-Project scenario (Table 7.4-12). Under the Environmental Baseline scenario, the estimated percent of expected redds dewatered is relatively low, averaging only about 1.32 percent annually. To put this into context, an estimated 2,079 and 1,559 fall-run Chinook salmon redds were constructed in the lower Yuba River during 2009 and 2010, respectively. Correspondingly, applying the 41-year average, it is estimated that only about 27 and 21 fall-run Chinook salmon redds would be

expected to be dewatered under the Environmental Baseline scenario during 2009 and 2010, respectively. Under the Without-Project scenario, approximately 99 and 74 redds would be expected to be dewatered during 2009 and 2010, respectively.

The highest estimated percentage of redds potentially dewatered occurs during wet WYs under both the Environmental Baseline scenario (~~2.88~~2.72%) and the Without-Project scenario (~~8.25~~7.80% ~~percent~~). Under the Environmental Baseline scenario, the percentage of redds potentially dewatered generally decreases as the WYTs become drier from wet to critical. The largest differences between the Environmental Baseline scenario and the Without-Project scenario occur during the wetter WYTs, with less estimated fall-run Chinook salmon redd dewatering occurring under the Environmental Baseline scenario.

Table 7.4-12. Estimated fall-run Chinook salmon redd and egg pocket potential dewatering under the Environmental Baseline scenario relative to the Without-Project scenario.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Environmental Baseline	Without Project	Difference	Environmental Baseline	Without Project	Difference
Long-term (All WYs)	1.32%	4.74%	-3.42%	0.76%	2.73%	-1.97%
Wet	2.88%	8.25%	-5.37%	1.79%	5.45%	-3.66%
Above Normal	0.55%	3.45%	-2.90%	0.23%	1.54%	-1.31%
Below Normal	0.84%	2.57%	-1.73%	0.37%	1.29%	-0.92%
Dry	0.20%	2.93%	-2.73%	0.04%	1.26%	-1.22%
Critical	0.09%	2.16%	-2.07%	0.01%	0.72%	-0.71%
WYT Categories	**Redd Dewatering Index (%)**			**Egg Pocket Dewatering Index (%)**		
	Environmental Baseline	**Without Project**	**Difference**	**Environmental Baseline**	**Without Project**	**Difference**
Long-term (All WYs)	1.32%	4.74%	-3.42%	0.76%	2.73%	-1.97%
Wet	2.72%	7.80%	-5.08%	1.69%	5.14%	-3.45%
Above Normal	0.59%	3.93%	-3.34%	0.24%	1.75%	-1.51%
Below Normal	0.84%	2.57%	-1.73%	0.37%	1.29%	-0.92%
Dry	0.16%	2.01%	-1.85%	0.03%	0.73%	-0.70%
Critical	0.12%	2.65%	-2.53%	0.02%	1.01%	-0.99%

The highest estimated percentage of egg pockets potentially dewatered occurs during wet WYTs for both the Environmental Baseline scenario (~~1.79~~1.69%) and the Without-Project scenario (~~5.45~~5.14%). Under the Environmental Baseline, the percentage of egg pockets potentially dewatered generally decreases as WYTs become drier from wet to critical. Potential egg pocket dewatering is lower under the Environmental Baseline scenario than under the Without-Project for all WYTs.

Estimations of fall-run Chinook salmon redd and egg pocket dewatering under the Environmental Baseline and Without-Project scenarios are higher for fall-run Chinook salmon than for spring-run Chinook salmon. The increased potential redd dewatering for fall-run Chinook salmon is due to the high flow events (storm flows) that occur during the latter portion of their incubation period (i.e., January through March). Flows during these events exceed the combined flow capacity at the Narrows 1 and Narrows 2 facilities (4,130 cfs). The fact that uncontrolled storm flows are causing the relatively higher redd dewatering percentages for fall-run Chinook salmon is evidenced by the higher redd dewatering index under the Without-Project scenario, which represents the Environmental Baseline without Project operations.

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Spring-run Chinook Salmon Fry In-Channel Rearing Habitat

Table 7.5-3 displays the long-term average and average by WYT spring-run Chinook salmon fry in-channel rearing habitat (percent of maximum WUA) under the Environmental Baseline and Without-Project scenarios. Over the entire 41-year simulation period, long-term average fry

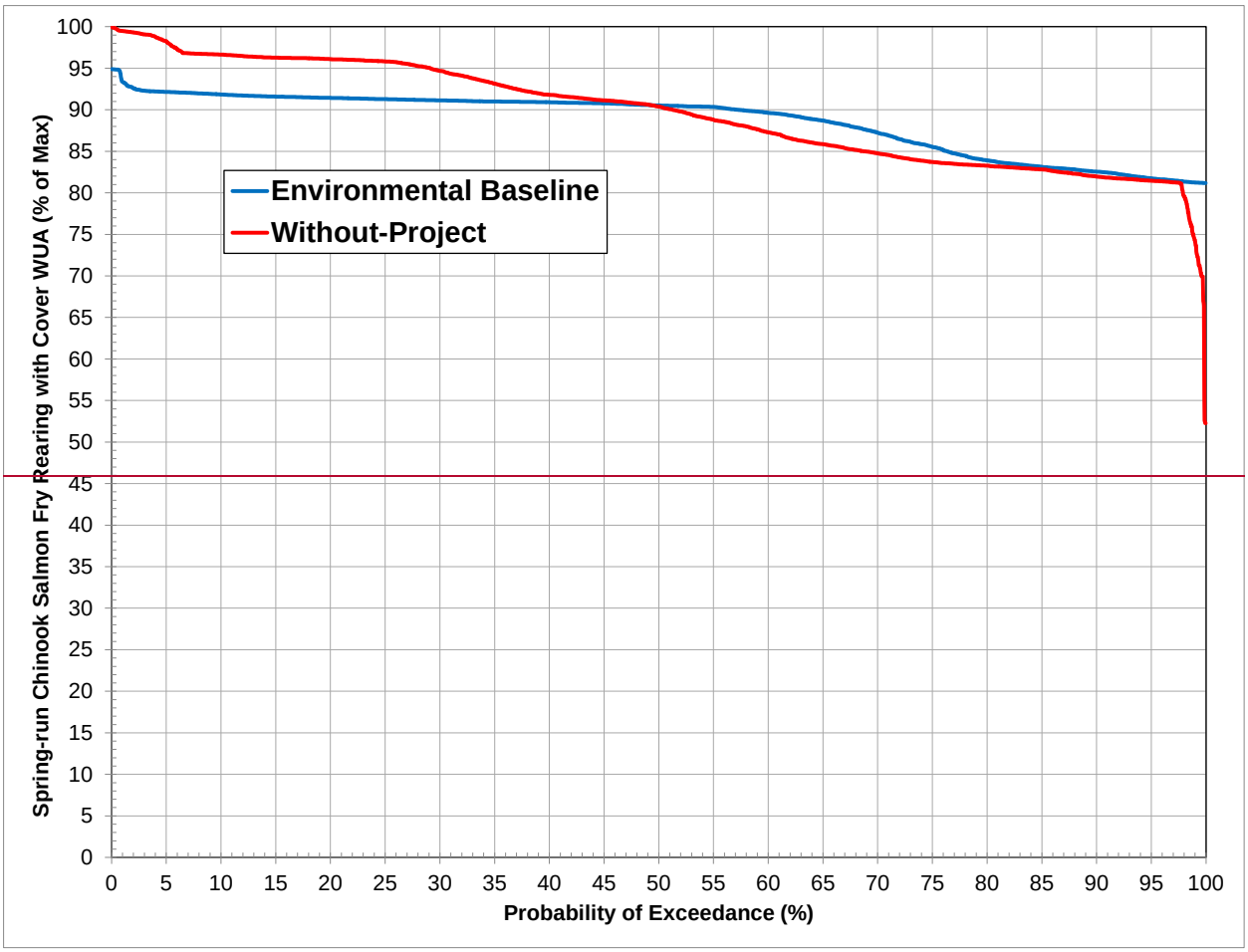
rearing habitat availability (WUA) in the lower Yuba River is similar under the Environmental Baseline and Without-Project scenarios (long-term average of ~~88.6~~84.2% and ~~89.5~~85.1% of the maximum WUA, respectively). The Environmental Baseline scenario results in 0.3 percent more ~~an essentially equivalent amount of~~ maximum fry rearing habitat during wet WYs, ~~0.3~~0.1 percent ~~more~~less during above normal WYs, ~~1.9~~1.8 percent less during below normal WYs, ~~2.0~~1.9 percent less during dry WYs, and 1.3 percent less during critical WYs. Neither the Environmental Baseline scenario nor the Without-Project scenario provide an average of over 90 percent of maximum fry rearing WUA during any WYT, ~~except for during dry and critical WYTs under the Without-Project scenario,~~ although both scenarios provide an average of 80 percent or more of maximum fry rearing in-channel WUA during all WYTs.

Table 7.5-3. Long-term and WYT average spring-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Environmental Baseline~~	~~88.6~~	~~88.6~~	~~88.9~~	~~87.6~~	~~88.2~~	~~89.7~~
Without-Project	89.5	88.6	88.6	89.5	90.2	91.0
Difference	-0.9	0.0	0.3	-1.9	-2.0	-1.3
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Environmental Baseline	84.2	84.3	84.3	83.2	83.7	85.1
Without Project	85.1	84.0	84.4	85.0	85.6	86.4
Difference	-0.9	0.3	-0.1	-1.8	-1.9	-1.3

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat durations for spring-run Chinook salmon fry in-channel rearing under the Environmental Baseline and Without-Project scenarios are presented in Figure 7.5-2. The Environmental Baseline scenario provides slightly less (about 5% of maximum WUA) amounts of fry rearing habitat availability over the upper about 40 percent of the exceedance distribution, although remaining over ~~90~~85 percent maximum WUA. The Environmental Baseline scenario achieves ~~over~~less than 80 percent of maximum fry rearing WUA over ~~the entire~~ about ~~78~~22 percent of the exceedance distribution, whereas the Without-Project scenario provides less than 80 percent maximum WUA ~~for the lowermost (about 3%)~~ over about the lower 30 percent of the distribution, particularly for the lowermost 3 percent.


Spring-run Chinook Salmon Fry Rearing with Cover WUA (% of Max)
Probability of Exceedance (%)
Environmental Baseline
Without-Project
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100

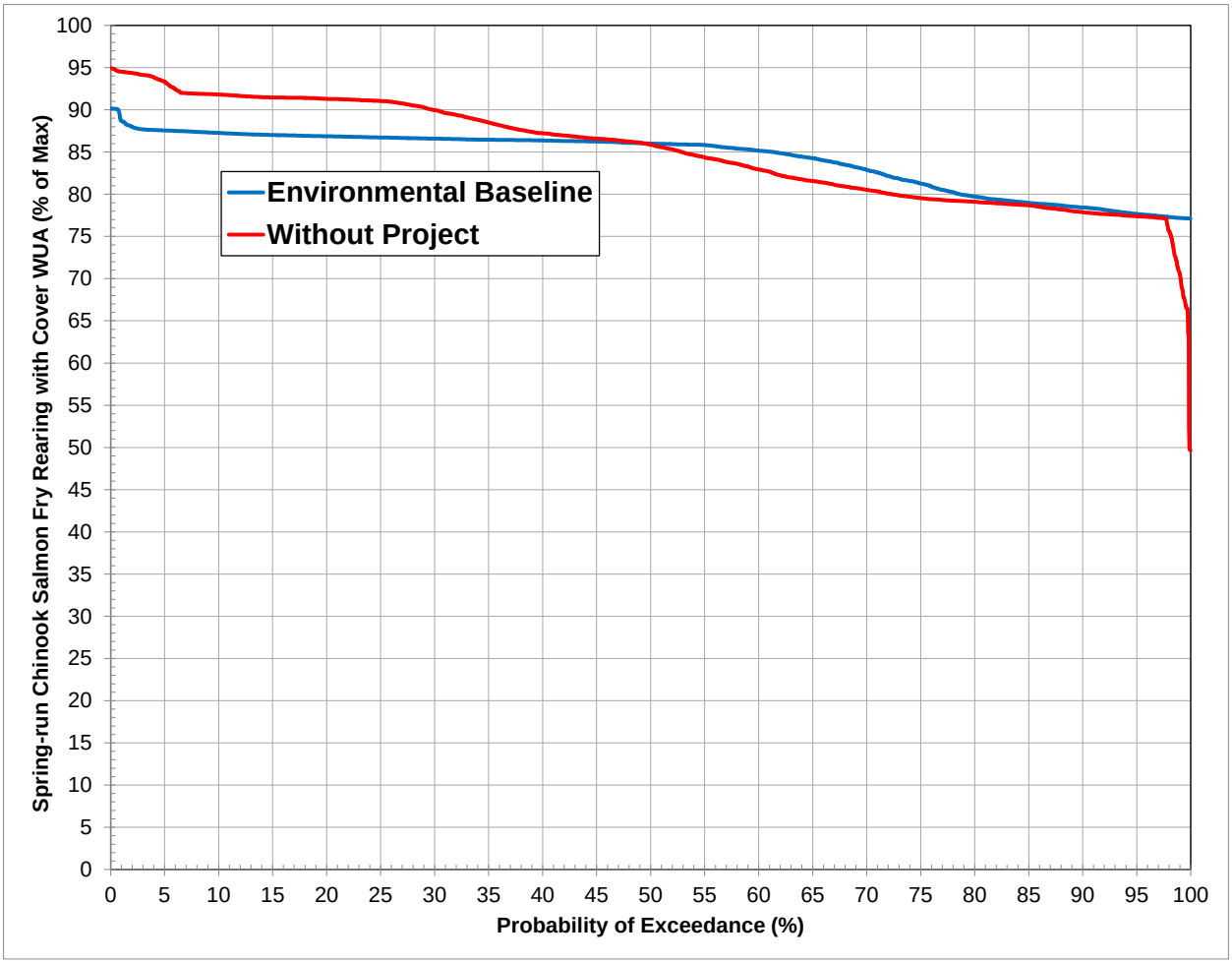


Figure 7.5-2. Spring-run Chinook salmon fry in-channel rearing habitat duration over the 41-year hydrologic period for the Environmental Baseline and Without-Project scenarios.

Pages EFH7-94 to EFH7-96

Spring-run Chinook Salmon Juvenile In-Channel Rearing Habitat

Table 7.5-4 displays the long-term average and average by WYT spring-run Chinook salmon juvenile in-channel rearing habitat (percent of maximum WUA) under the Environmental Baseline and Without-Project scenarios. Over the entire 41-year simulation period, long-term average juvenile rearing WUA in the lower Yuba River is substantially higher under the Environmental Baseline scenario relative to the Without-Project scenario (long-term average of ~~96.3~~90.5% versus ~~79.6~~74.8% of maximum WUA). The Environmental Baseline scenario also results in substantially more juvenile rearing habitat during all WYTs, ranging from ~~13.9~~13.5 percent more during wet WYs to ~~21.3~~19.4 percent more during critical WYs. The Environmental Baseline scenario provides an average of over ~~90~~80 percent (and even up to or over 90 percent) of maximum juvenile in-channel rearing WUA during all WYTs, whereas the Without-Project scenario ~~does not provide an average of over 90 percent of maximum juvenile~~

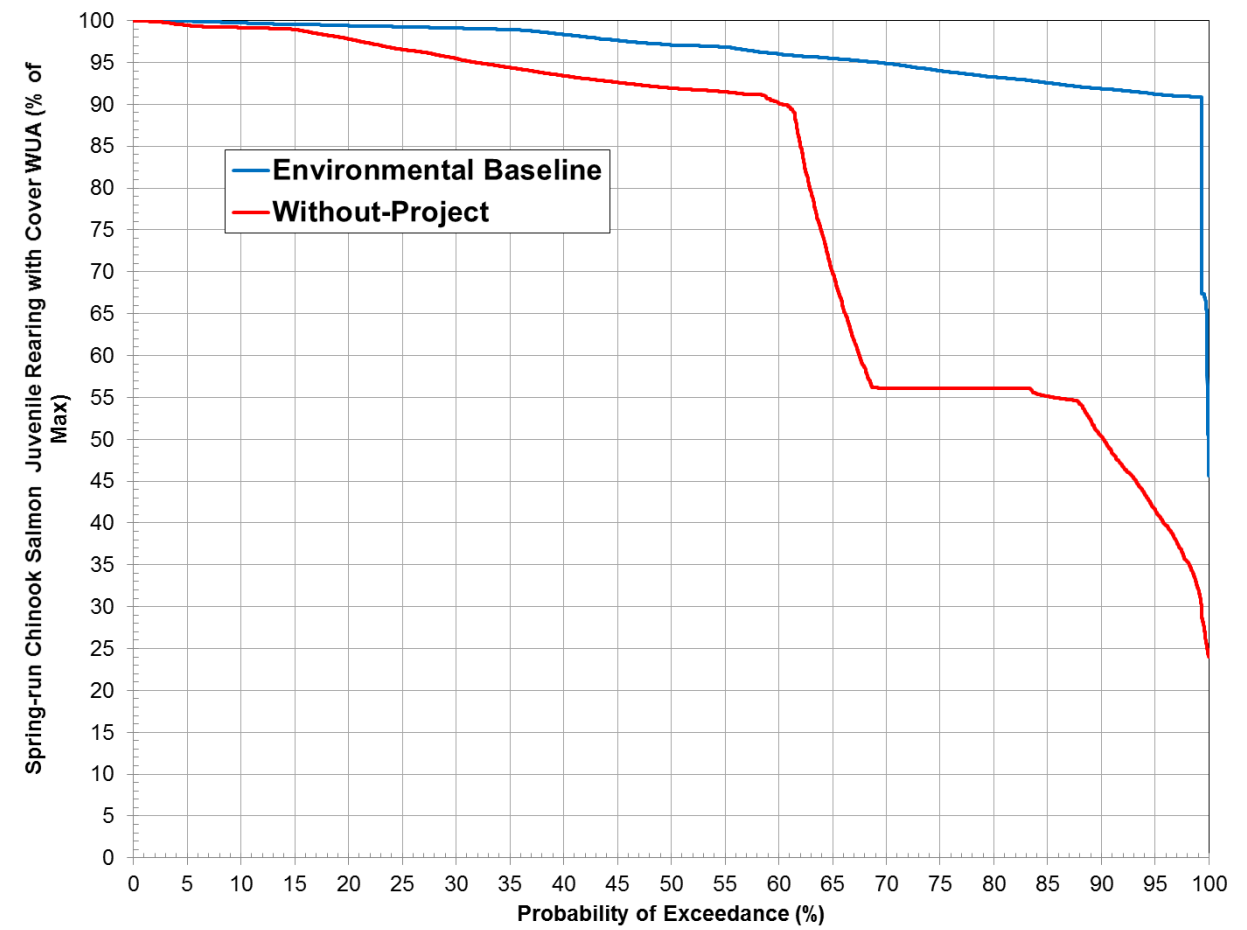
~~rearing WUA during any WYT, and only~~ provides an average of 71.9 to 76.2~~80~~ percent ~~during wet, below normal and dry WYTs~~ of maximum juvenile rearing WUA over all WYTs.

Table 7.5-4. Long-term and WYT average spring-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Environmental Baseline~~	~~96.3~~	~~95.5~~	~~95.7~~	~~96.4~~	~~97.5~~	~~97.1~~
Without-Project	79.6	81.6	79.7	80.7	80.1	75.8
Difference	16.7	13.9	16.0	15.7	17.4	21.3
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Environmental Baseline	90.5	89.7	90.0	90.5	91.6	91.3
Without Project	74.8	76.2	75.8	75.8	74.6	71.9
Difference	15.7	13.5	14.2	14.7	17.0	19.4

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat duration for spring-run Chinook salmon juvenile in-channel rearing under the Environmental Baseline and Without-Project scenarios is presented in Figure 7.5-3. The Environmental Baseline scenario provides higher amounts of juvenile rearing habitat availability over the entire exceedance distribution, and provides substantially more habitat over about the lower 40 percent of the distribution. The Environmental Baseline scenario achieves over 90 percent of maximum spawning WUA with about a ~~99~~62 percent probability, while the Without-Project scenario achieves over 90 percent of maximum juvenile rearing WUA with about a 29~~60~~ percent probability (and over 80% of maximum WUA with about a ~~63~~62% probability).


Spring-run Chinook Salmon Juvenile Rearing with Cover WUA (% of Max)
Environmental Baseline
Without-Project
Probability of Exceedance (%)

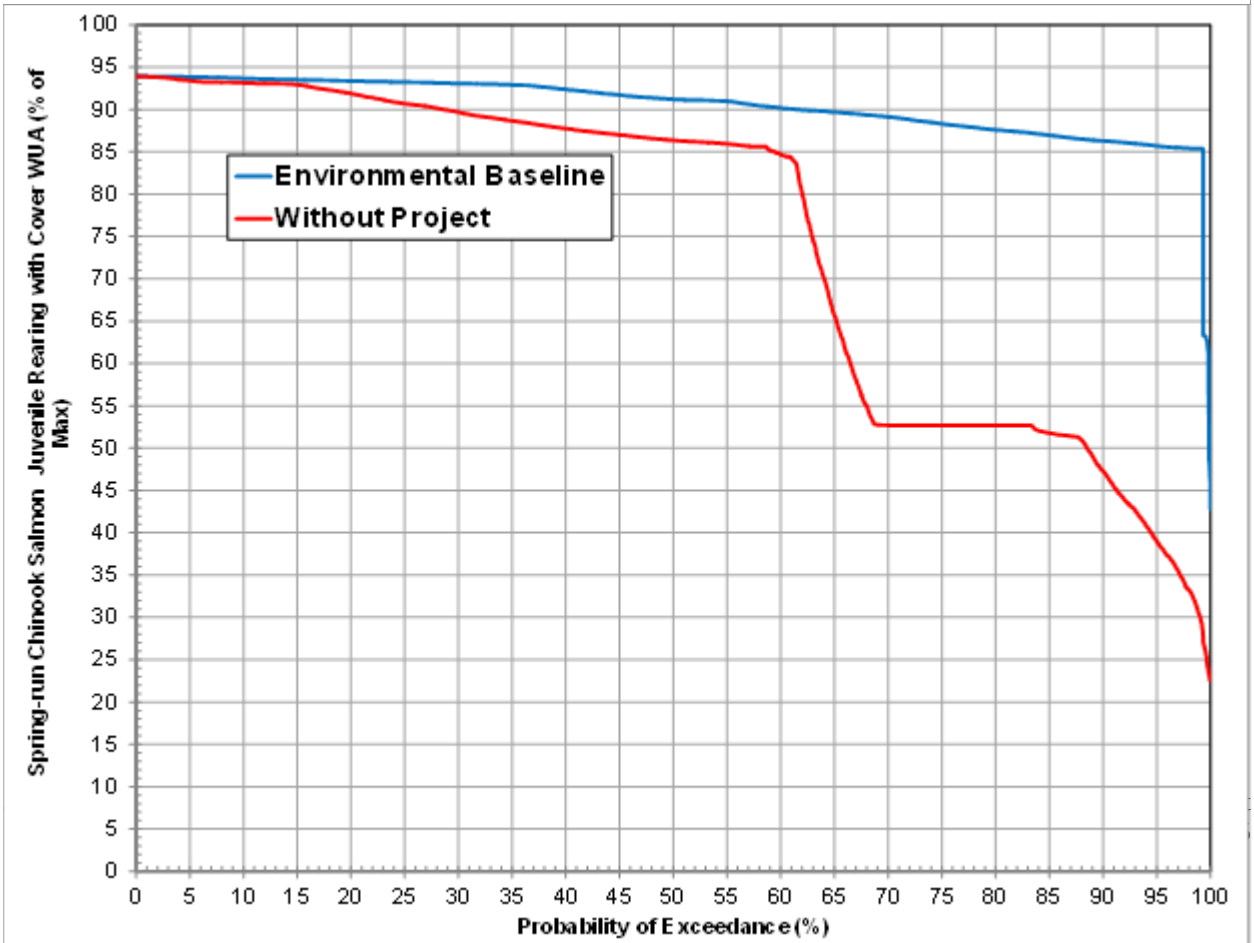

Spring-run Chinook Salmon Juvenile Rearing with Cover WUA (% of Max)
Environmental Baseline
Without Project
Probability of Exceedance (%)

Figure 7.5-3. Spring-run Chinook salmon juvenile in-channel rearing habitat duration over the 41-year hydrologic period for the Environmental Baseline and Without-Project scenarios.

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Fall-run Chinook Salmon Fry In-Channel Rearing Habitat

Table 7.5-5 displays the long-term average and average by WYT fall-run Chinook salmon fry in-channel rearing habitat (percent of maximum WUA) under the Environmental Baseline and Without-Project scenarios. Over the entire 41-year simulation period, long-term average fry rearing habitat availability (WUA) in the lower Yuba River is similar under the Environmental Baseline and Without-Project scenarios (long-term average of ~~87.2~~82.9% and ~~86.6~~82.3% of the maximum WUA, respectively). The Environmental Baseline scenario results in ~~1.3~~1.2 percent more maximum fry rearing habitat during wet WYs, ~~0.1~~0.2 percent ~~more~~less during above normal WYs, ~~1.2~~1.1 percent less during below normal WYs, 0.1 percent more during dry WYs, and ~~1.8~~1.6 percent more of WUA during critical WYs. Neither the Environmental Baseline scenario nor the Without-Project scenario provides over 90 percent of maximum fry rearing WUA during any WYT, although both scenarios provide 80% or more of maximum fry rearing WUA during all WYTs.

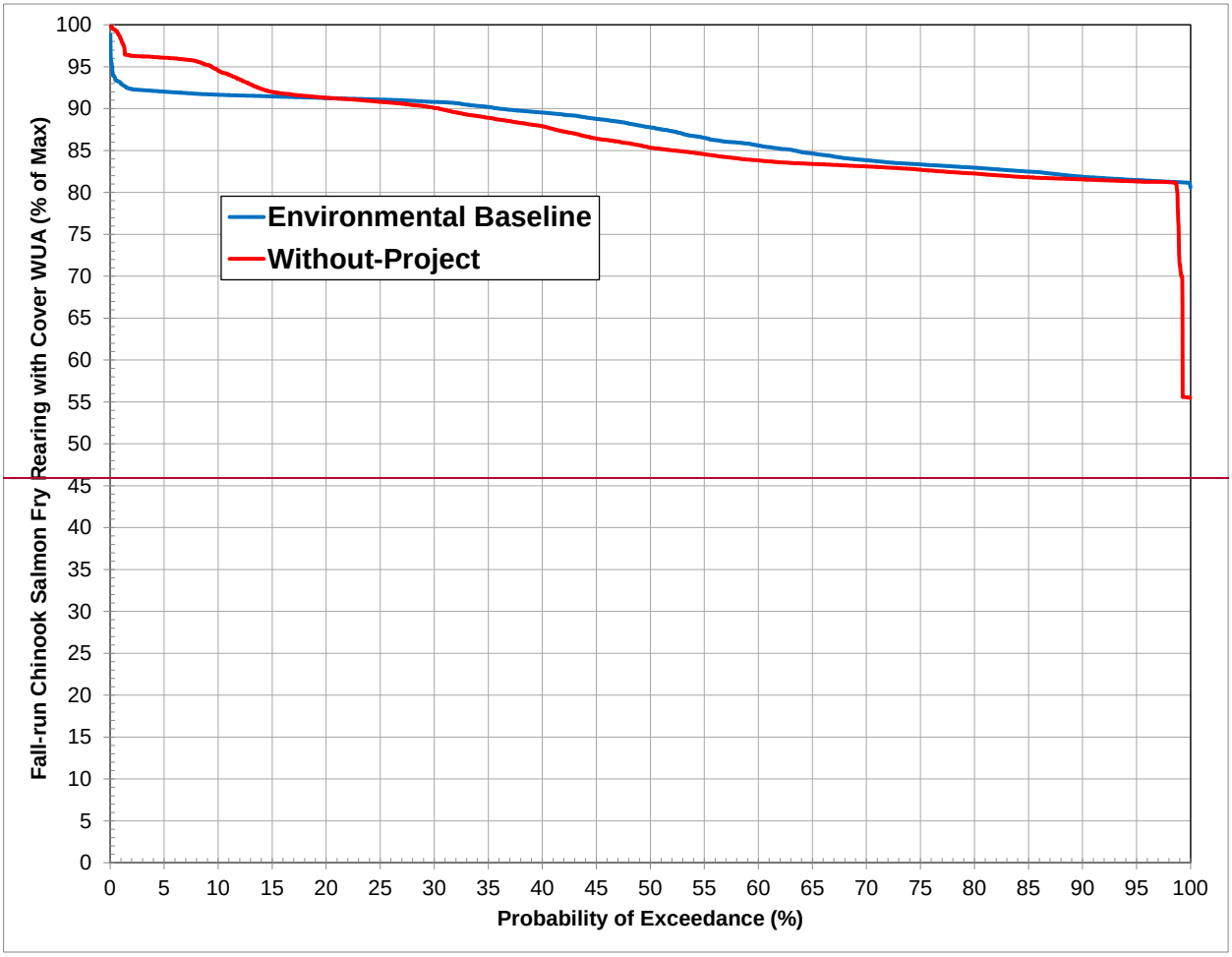
Table 7.5-5. Long-term and WYT average fall-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline	87.2	88.2	87.3	85.4	85.7	88.6
Without-Project	86.6	86.9	87.2	86.6	85.6	86.8
Difference	0.6	1.3	0.1	-1.2	0.1	1.8
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Environmental Baseline	82.9	83.8	82.7	81.1	81.4	83.9
Without Project	82.3	82.6	82.9	82.2	81.3	82.3
Difference	0.6	1.2	-0.2	-1.1	0.1	1.6

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat duration for fall-run Chinook salmon fry in-channel rearing under the Environmental Baseline and Without-Project scenarios is presented in Figure 7.5-4. The Environmental Baseline scenario provides slightly less (about 4% of maximum WUA) amounts of fry rearing

habitat availability over about the upper 15 percent of the exceedance distribution, but provides slightly more (about 2-3% of maximum WUA) over the lower 80 percent of the distribution. The Environmental Baseline scenario provides substantially more habitat over about the lowest 2 percent of the distribution. The Environmental Baseline scenario achieves over ~~90~~80 percent of maximum fry rearing WUA with about a ~~33~~68 percent probability, while the Without-Project scenario achieves over ~~90~~80 percent of maximum fry rearing WUA with about a ~~27~~57 percent probability. ~~Both scenarios provide 80 percent or more of maximum fry rearing habitat WUA over nearly the entire exceedance distributions.~~



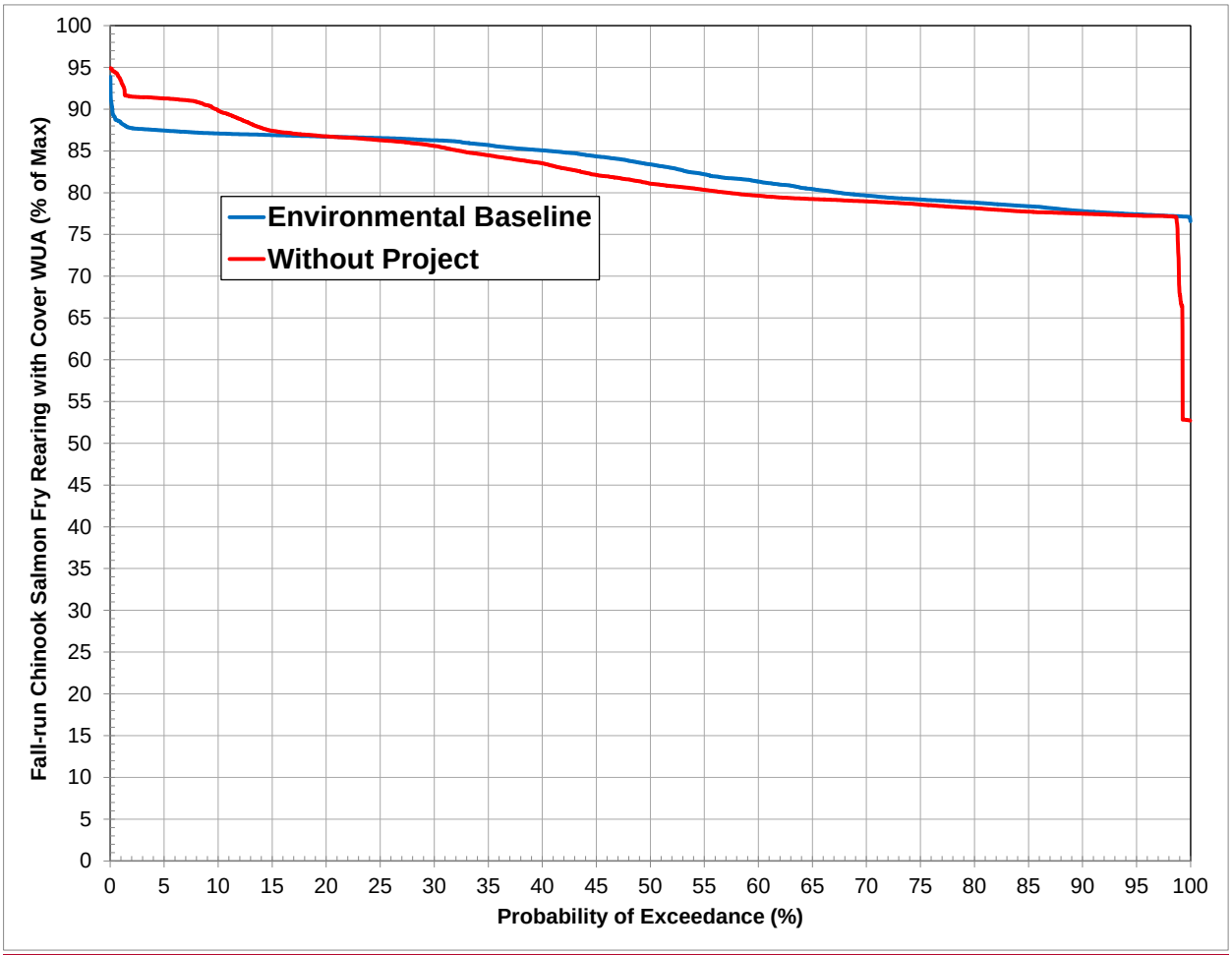


Figure 7.5-4. Fall-run Chinook salmon fry in-channel rearing habitat duration over the 41-year hydrologic period for the Environmental Baseline and Without-Project scenarios.

Pages EFH7-98 to EFH7-100

Fall-run Chinook Salmon Juvenile In-Channel Rearing Habitat

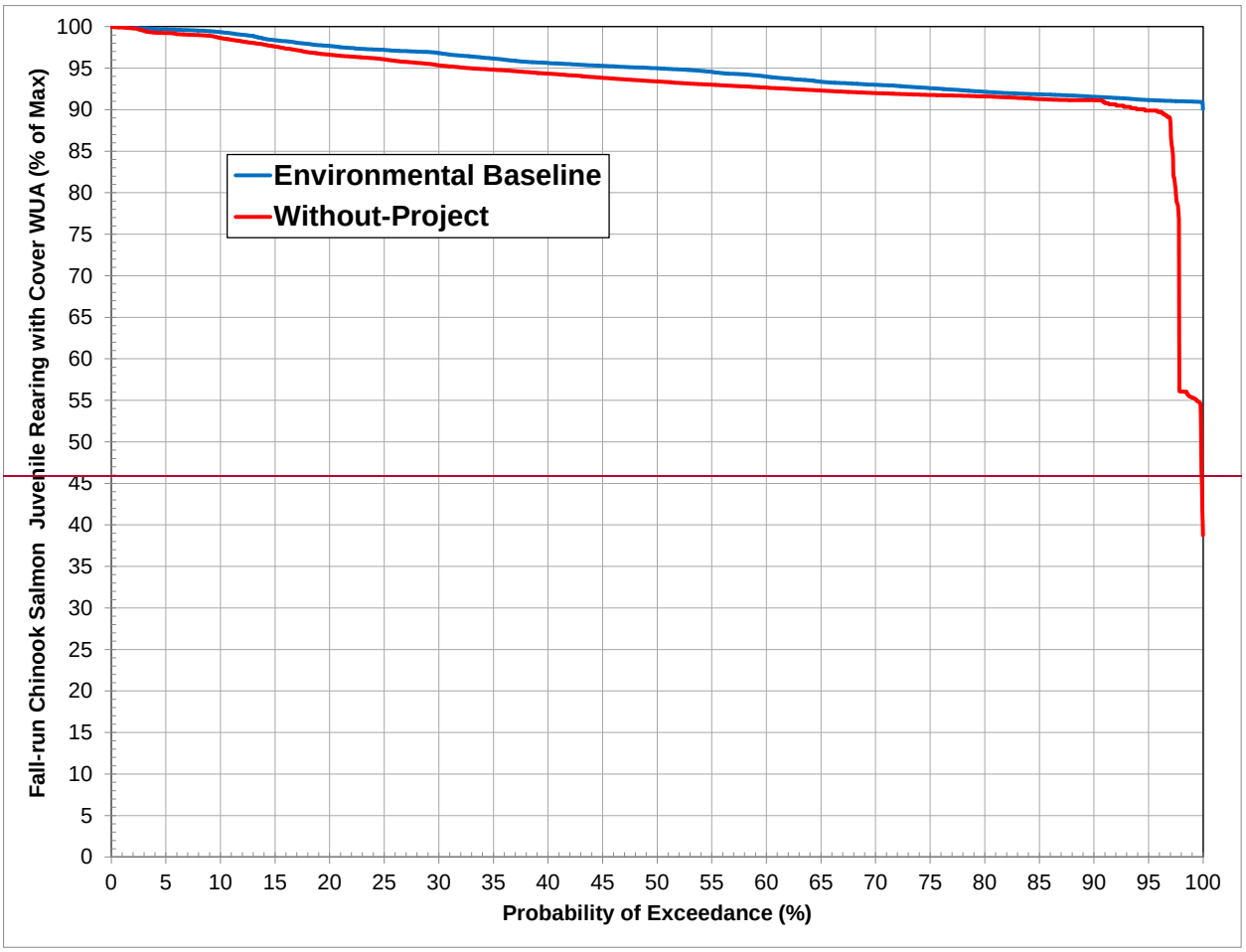
Table 7.5-6 displays the long-term average and average by WYT fall-run Chinook salmon juvenile in-channel rearing habitat (percent of maximum WUA) under the Environmental Baseline and Without-Project scenarios. Over the entire 41-year simulation period, long-term average juvenile rearing WUA in the lower Yuba River is similar, but slightly higher under the Environmental Baseline scenario relative to the Without-Project scenario (long-term average of ~~95.0~~89.3% versus ~~93.2~~87.5% of maximum WUA). The Environmental Baseline scenario also results in similar maximum juvenile rearing habitat during all WYTs, with the exception of critical WYs, when the Environmental Baseline scenario provides about ~~6.2~~5.4 percent more maximum WUA than the Without-Project scenario. Both the Environmental Baseline and Without-Project scenarios provide over ~~90~~80 percent of maximum juvenile rearing WUA during all WYTs.

Table 7.5-6. Long-term and WYT average fall-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Environmental Baseline and Without-Project scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Environmental Baseline~~	~~95.0~~	~~93.5~~	~~93.5~~	~~94.2~~	~~96.3~~	~~97.5~~
Without-Project	93.2	93.5	93.5	94.2	94.2	91.3
Difference	1.8	0.0	0.0	0.0	2.1	6.2
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Environmental Baseline	89.3	87.9	87.7	88.5	90.3	91.5
Without Project	87.5	87.8	87.9	88.5	88.4	86.1
Difference	1.8	0.1	-0.2	0.0	1.9	5.4

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat duration for fall-run Chinook salmon juvenile in-channel rearing under the Environmental Baseline and Without-Project scenarios is presented in Figure 7.5-5. The Environmental Baseline scenario provides slightly higher amounts of juvenile rearing habitat availability over the entire exceedance distribution. The Environmental Baseline scenario achieves over ~~90~~80 percent of maximum spawning WUA with a 100 percent probability, while the Without-Project scenario achieves over ~~90~~80 percent of maximum juvenile rearing WUA with about a ~~93~~97 percent probability.


Environmental Baseline
Without-Project
Fall-run Chinook Salmon Juvenile Rearing with Cover WUA (% of Max)
Probability of Exceedance (%)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100

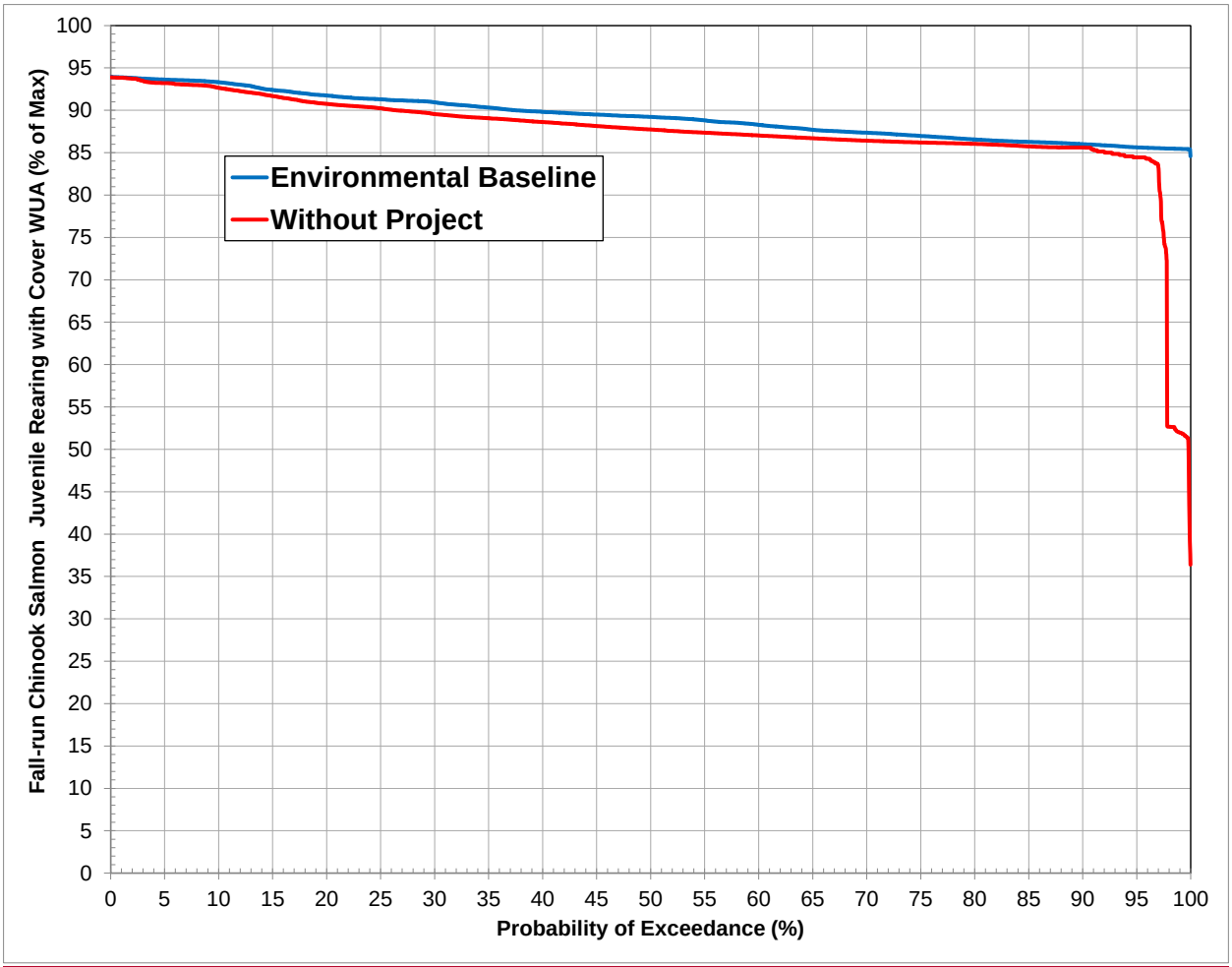


Figure 7.5-5. Fall-run Chinook salmon juvenile in-channel rearing habitat duration over the 41-year hydrologic period for the Environmental Baseline and Without-Project scenarios.

Pages EFH7-100 to EFH7-102

Spring-run Chinook Salmon Fry Full-flow Rearing Habitat

Table 7.5-7 displays the full-flow analysis of the amounts (ac) of spring-run Chinook salmon fry WUA without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. Results are shown for all days - for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the 2 scenarios over the long-term full simulation period (all years) and by water year type.

For the entire simulation period, slightly less amounts of fry rearing habitat (total WUA) are available under the Environmental Baseline compared to the Without-Project scenario. The Environmental Baseline results in ~~2.8~~2.9, ~~3.1~~2.8, 4.1, ~~4.2~~4.3, and ~~5.4~~5.2 percent less fry rearing habitat during wet, above normal, below normal, dry, and critical WYs, respectively.

Table 7.5-7. Acres of spring-run Chinook salmon fry weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**3,772**	**1,380**	**552**	**644**	**460**	**736**
Days ≤ 5,000 cfs	3,317	979	506	639	458	735
Days > 5,000 cfs	455	401	46	5	2	1
Avg. WUA	**154.3**	**58.0**	**22.3**	**25.3**	**18.3**	**30.3**
WUA ≤ 5,000 cfs	131.8	38.1	20.1	25.1	18.2	30.2
WUA > 5,000 cfs	22.5	19.9	2.3	0.2	0.1	0.0
Without-Project						
Total Days in Analysis	**3,772**	**1,380**	**552**	**644**	**460**	**736**
Days ≤ 5,000 cfs	3,173	920	453	630	442	728
Days > 5,000 cfs	599	460	99	14	18	8
Avg. WUA	**160.3**	**59.7**	**23.0**	**26.4**	**19.1**	**32.0**
WUA ≤ 5,000 cfs	129.9	36.1	18.1	25.7	18.3	31.6
WUA > 5,000 cfs	30.4	23.6	4.9	0.7	0.8	0.4
Differences						
Avg. WUA	**-6.0**	**-1.7**	**-0.7**	**-1.1**	**-0.8**	**-1.7**
% change	**-3.7%**	**-2.8%**	**-3.1%**	**-4.1%**	**-4.2%**	**-5.4%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**3,772**	**1,472**	**460**	**644**	**368**	**828**
Days ≤ 5,000 cfs	3,317	1,061	424	639	366	827
Days > 5,000 cfs	455	411	36	5	2	1
Avg. WUA	**154.3**	**61.9**	**18.5**	**25.3**	**14.6**	**34.0**
WUA ≤ 5,000 cfs	131.8	41.5	16.7	25.1	14.6	33.9
WUA > 5,000 cfs	22.5	20.4	1.8	0.2	0.1	0.0
Without-Project						
Total Days in Analysis	**3,772**	**1,472**	**460**	**644**	**368**	**828**
Days ≤ 5,000 cfs	3,173	982	391	630	352	818
Days > 5,000 cfs	599	490	69	14	16	10
Avg. WUA	**160.3**	**63.7**	**19.0**	**26.4**	**15.3**	**35.8**
WUA ≤ 5,000 cfs	129.9	38.6	15.7	25.7	14.6	35.4
WUA > 5,000 cfs	30.4	25.1	3.4	0.7	0.7	0.4
Differences						
Avg. WUA	**-6.0**	**-1.8**	**-0.5**	**-1.1**	**-0.7**	**-1.9**
% change	**-3.7%**	**-2.9%**	**-2.8%**	**-4.1%**	**-4.3%**	**-5.2%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 7.5-6 displays the full-flow analysis of the amounts (ac) of spring-run Chinook salmon fry WUA without cover under the Environmental Baseline and the Without-Project scenarios. For both scenarios, a trend was observed of the most spring-run Chinook salmon fry rearing habitat occurring during wet WYs with decreasing amounts from wet to above normal WYs, then fry habitat increasing in below normal WYs, decreasing in dry WYs, and increasing in critical WYs. For both the Environmental Baseline and Without-Project scenarios, relatively little additional fry rearing habitat is provided by days when flows were > 5,000 cfs during below normal, dry and critical WYTs.

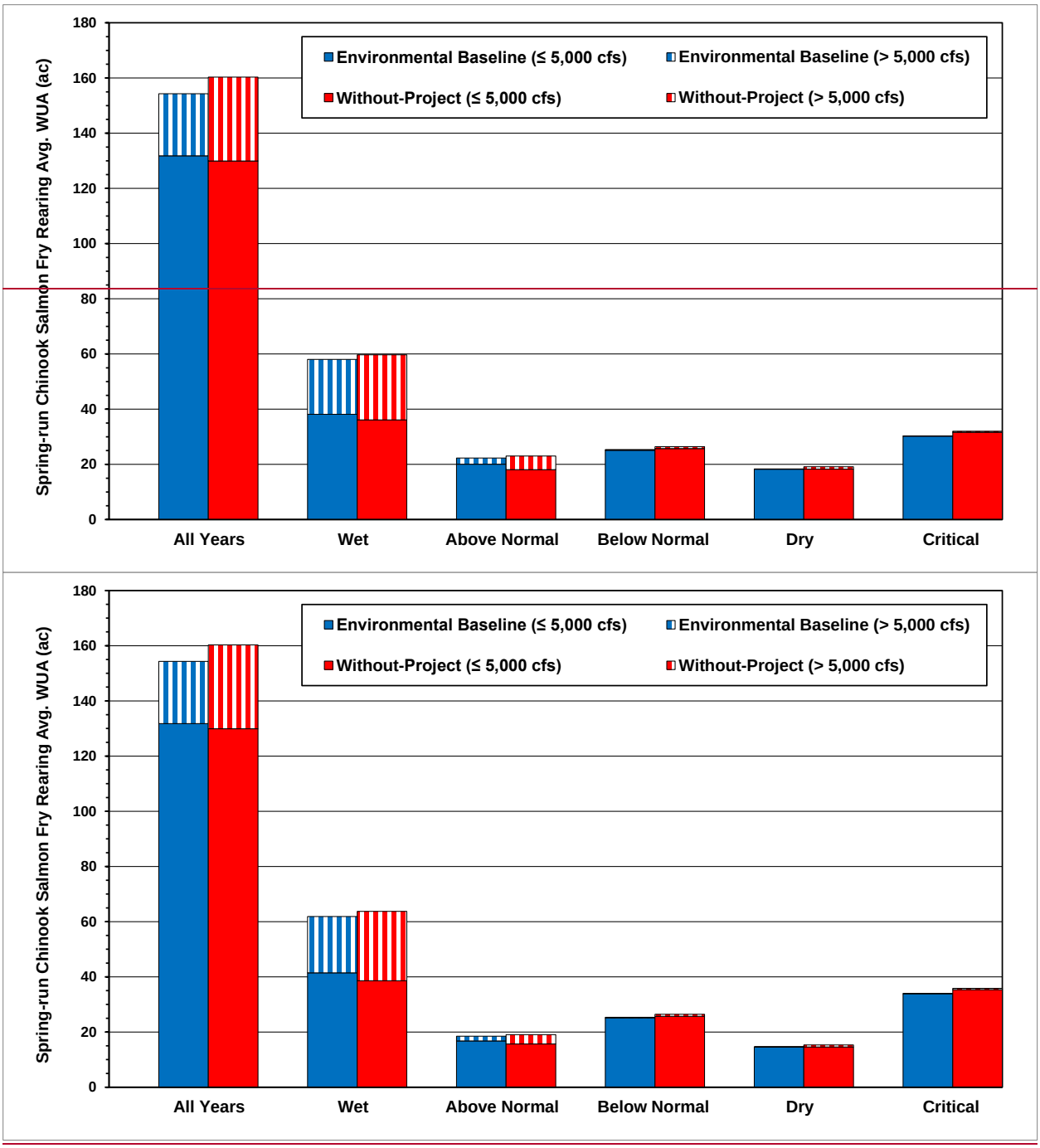


Figure 7.5-6. Comparison of the amount (acres) of spring-run Chinook salmon fry weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages EFH7-102 to EFH7-104

Spring-run Chinook Salmon Juvenile Full-flow Rearing Habitat

Table 7.5-8 displays the full-flow analysis of the amounts (ac) of spring-run Chinook salmon juvenile WUA without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. For the entire simulation period, substantially more (15.3%) amounts of juvenile rearing habitat (total WUA) are available under the Environmental Baseline compared to the Without-Project scenario. Relative to the Without-Project scenario, the Environmental Baseline results in increasing percentages of juvenile rearing habitat as WYTs progress from wet to critical. The Environmental Baseline provides ~~8.1~~8.5, ~~12.8~~12.4, 16.1, ~~22.2~~22.9, and ~~27.8~~26.8 percent more juvenile rearing habitat during wet, above normal, below normal, dry and critical WYs, respectively.

Table 7.5-8. Acres of spring-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**14,974**	**5,477**	**2,191**	**2,557**	**1,826**	**2,923**
Days ≤ 5,000 cfs	13,411	4,198	2,003	2,468	1,823	2,919
Days > 5,000 cfs	1,563	1,279	188	89	3	4
Avg. WUA	**253.3**	**92.4**	**35.9**	**42.6**	**31.4**	**50.9**
WUA ≤ 5,000 cfs	223.7	67.8	32.6	41.1	31.4	50.8
WUA > 5,000 cfs	29.6	24.6	3.3	1.5	0.0	0.1
Without-Project						
Total Days in Analysis	**14,974**	**5,477**	**2,191**	**2,557**	**1,826**	**2,923**
Days ≤ 5,000 cfs	12,756	3,945	1,772	2,349	1,791	2,899
Days > 5,000 cfs	2,218	1,532	419	208	35	24
Avg. WUA	**219.6**	**85.4**	**31.8**	**36.7**	**25.7**	**39.8**
WUA ≤ 5,000 cfs	177.6	55.6	24.4	33.0	25.1	39.4
WUA > 5,000 cfs	42.0	29.8	7.4	3.7	0.6	0.4
Differences						
Avg. WUA	**33.7**	**7.0**	**4.1**	**5.9**	**5.7**	**11.1**
% change	**15.3%**	**8.1%**	**12.8%**	**16.1%**	**22.2%**	**27.8%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**14,974**	**5,842**	**1,826**	**2,557**	**1,461**	**3,288**
Days ≤ 5,000 cfs	13,411	4,540	1,661	2,468	1,458	3,284
Days > 5,000 cfs	1,563	1,302	165	89	3	4
Avg. WUA	**253.3**	**98.3**	**29.9**	**42.6**	**25.1**	**57.2**
WUA ≤ 5,000 cfs	223.7	73.3	27.1	41.1	25.1	57.2
WUA > 5,000 cfs	29.6	25.0	2.9	1.5	0.0	0.1
Without-Project						
Total Days in Analysis	**14,974**	**5,842**	**1,826**	**2,557**	**1,461**	**3,288**
Days ≤ 5,000 cfs	12,756	4,211	1,506	2,349	1,432	3,258
Days > 5,000 cfs	2,218	1,631	320	208	29	30
Avg. WUA	**219.6**	**90.6**	**26.6**	**36.7**	**20.4**	**45.1**
WUA ≤ 5,000 cfs	177.6	59.0	21.0	33.0	19.9	44.6
WUA > 5,000 cfs	42.0	31.6	5.7	3.7	0.5	0.5
Differences						
Avg. WUA	**33.7**	**7.7**	**3.3**	**5.9**	**4.7**	**12.1**
% change	**15.3%**	**8.5%**	**12.4%**	**16.1%**	**22.9%**	**26.8%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 7.5-7 displays the full-flow analysis of the amounts (ac) of spring-run Chinook salmon juvenile WUA without cover under the Environmental Baseline and the Without-Project scenarios. For both scenarios, decreasing amounts of total habitat were provided from wet to above normal WYs and dry WYs, and increasing amounts were provided for below normal and critical WYs. For both the Environmental Baseline and Without-Project scenarios, relatively little additional juvenile rearing habitat is provided by days when flows were > 5,000 cfs for below normal, dry and critical WYTs.

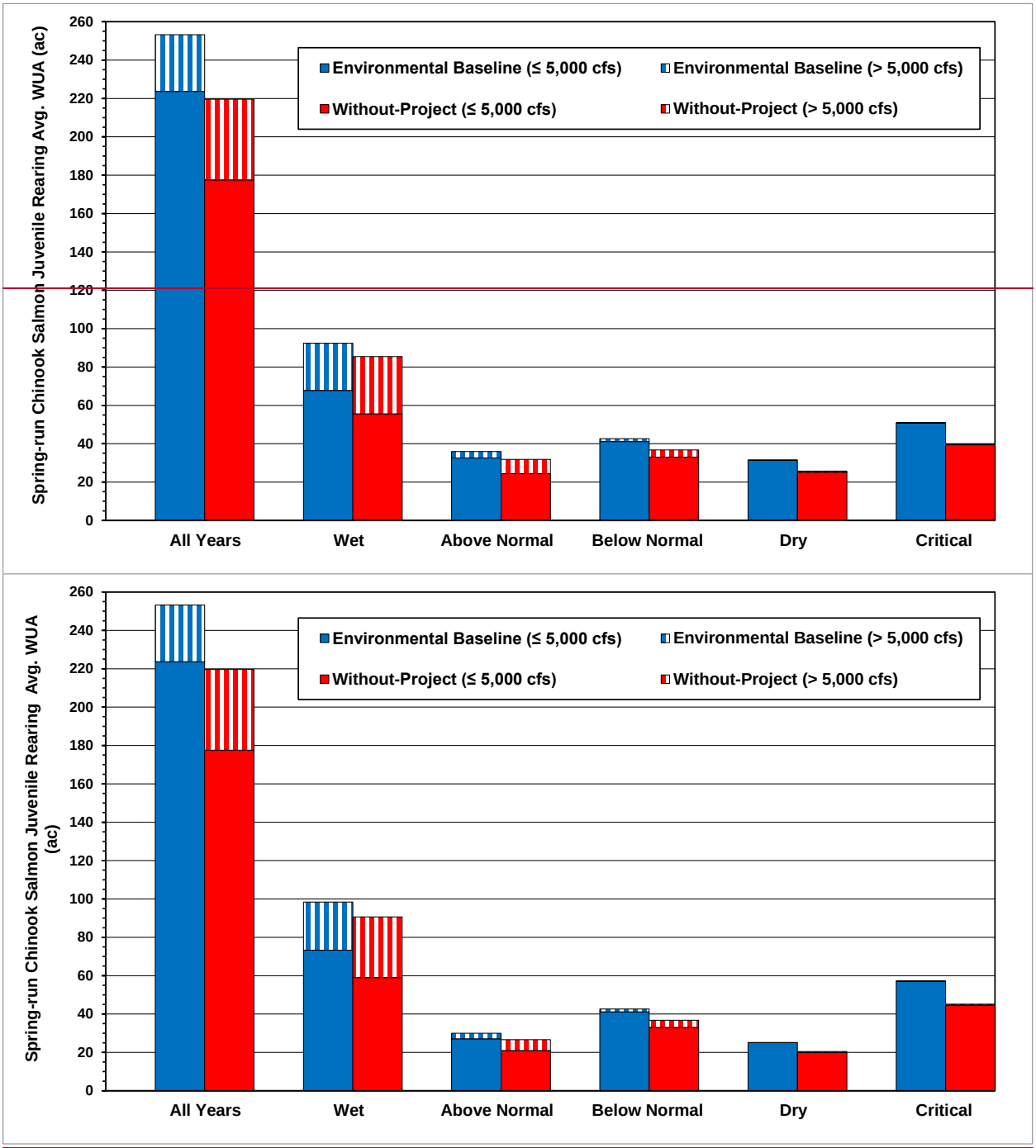


Figure 7.5-7. Comparison of the amount (acres) of spring-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

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Fall-run Chinook Salmon Fry Full-flow Rearing Habitat

Table 7.5-9 displays the full-flow analysis of the amounts (ac) of fall-run Chinook salmon fry WUA without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. Results are shown for all days; for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by water year type.

For the entire simulation period, slightly less amounts of fry rearing habitat (total WUA) are available under the Environmental Baseline compared to the Without-Project scenario. The Environmental Baseline results in ~~1.1~~1.5, ~~3.8~~3.1, and 3.2 percent less fry rearing habitat during wet, above normal and below normal WYs, and ~~0.6~~0.4 and 1.7 percent more fry rearing habitat during dry and critical WYs, respectively.

Table 7.5-9. Acres of fall-run Chinook salmon fry weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**5,586**	**2,043**	**817**	**954**	**681**	**1,091**
Days ≤ 5,000 cfs	4,493	1,154	686	888	678	1,087
Days > 5,000 cfs	1,093	889	131	66	3	4
Avg. WUA	**152.0**	**59.1**	**21.5**	**24.3**	**17.4**	**29.7**
WUA ≤ 5,000 cfs	116.1	29.5	17.4	22.3	17.3	29.6
WUA > 5,000 cfs	35.9	29.6	4.1	2.0	0.1	0.1
Without-Project						
Total Days in Analysis	**5,586**	**2,043**	**817**	**954**	**681**	**1,091**
Days ≤ 5,000 cfs	4,128	1,052	546	813	649	1,068
Days > 5,000 cfs	1,458	991	271	141	32	23
Avg. WUA	**153.7**	**59.8**	**22.4**	**25.1**	**17.3**	**29.2**
WUA ≤ 5,000 cfs	105.7	26.4	13.8	20.7	16.3	28.5
WUA > 5,000 cfs	48.0	33.3	8.6	4.4	1.0	0.7
Differences						
Avg. WUA	**-1.7**	**-0.6**	**-0.9**	**-0.8**	**0.1**	**0.5**
% change	**-1.1%**	**-1.1%**	**-3.8%**	**-3.2%**	**0.6%**	**1.7%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**5,586**	**2,179**	**681**	**954**	**545**	**1,227**
Days ≤ 5,000 cfs	4,493	1,267	573	888	542	1,223
Days > 5,000 cfs	1,093	912	108	66	3	4
Avg. WUA	**152.0**	**62.8**	**17.9**	**24.3**	**13.9**	**33.2**
WUA ≤ 5,000 cfs	116.1	32.5	14.5	22.3	13.8	33.1
WUA > 5,000 cfs	35.9	30.3	3.4	2.0	0.1	0.1
Without-Project						
Total Days in Analysis	**5,586**	**2,179**	**681**	**954**	**545**	**1,227**
Days ≤ 5,000 cfs	4,128	1,112	486	813	517	1,200
Days > 5,000 cfs	1,458	1,067	195	141	28	27
Avg. WUA	**153.7**	**63.7**	**18.4**	**25.1**	**13.8**	**32.6**
WUA ≤ 5,000 cfs	105.7	27.9	12.3	20.7	13.0	31.8
WUA > 5,000 cfs	48.0	35.7	6.1	4.4	0.9	0.8
Differences						
Avg. WUA	**-1.7**	**-0.9**	**-0.6**	**-0.8**	**0.1**	**0.6**
% change	**-1.1%**	**-1.5%**	**-3.1%**	**-3.2%**	**0.4%**	**1.7%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 7.5-8 displays the full-flow analysis of the amounts (ac) of fall-run Chinook salmon fry WUA without cover under the Environmental Baseline and the Without-Project scenarios. For both scenarios, a trend was observed of the most fall-run Chinook salmon fry habitat occurring during wet WYs, with decreasing amounts from wet to above normal WYs, generally similar amounts during below normal WYs, then fry habitat decreasing for dry WYs and increasing for critical WYs. For both the Environmental Baseline and Without-Project scenarios, relatively little additional fry rearing habitat is provided by days when flows were > 5,000 cfs for dry and critical WYTs.

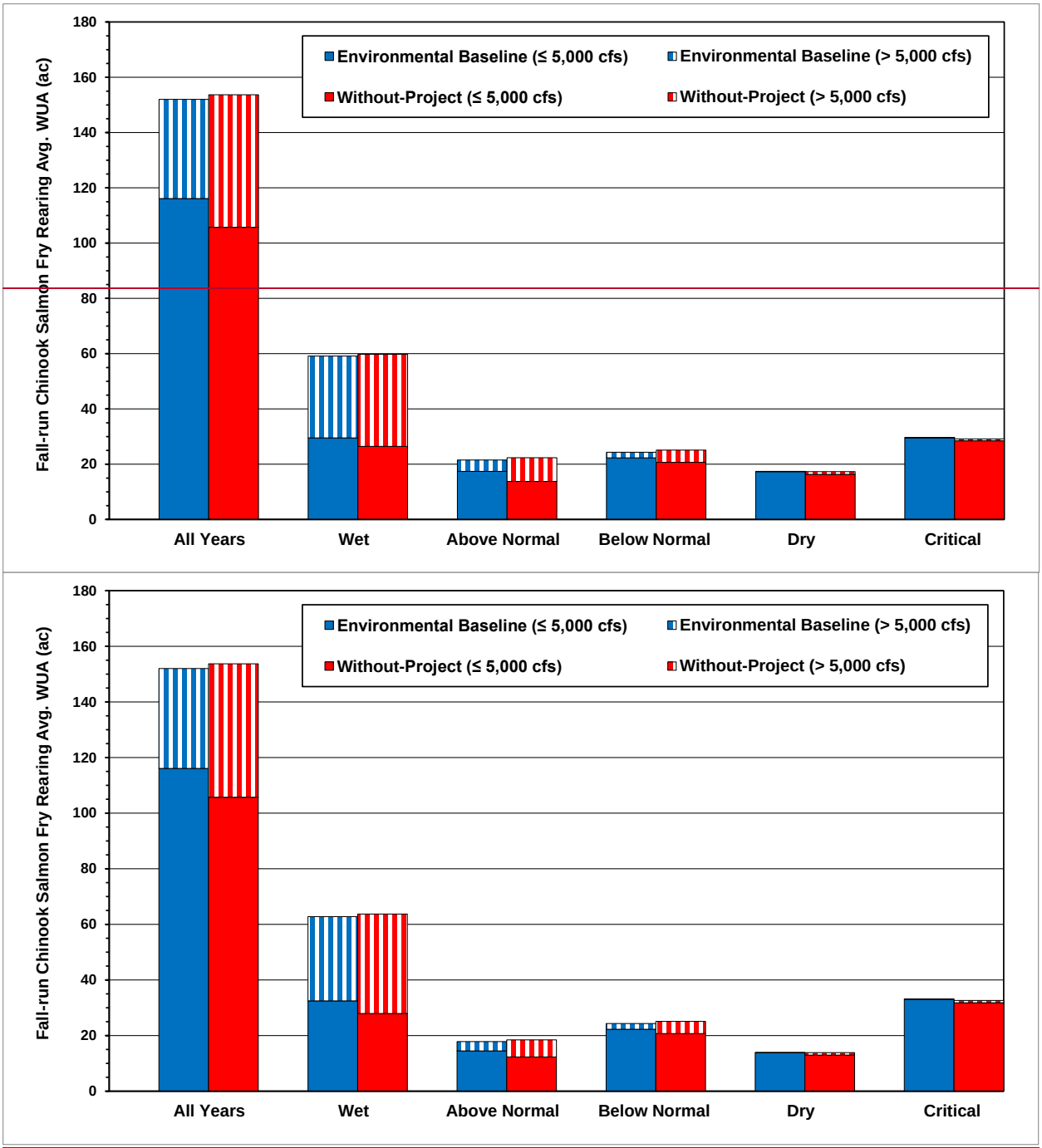


Figure 7.5-8. Comparison of the amount (acres) of fall-run Chinook salmon fry weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages EFH7-106 to EFH7-108

Fall-run Chinook Salmon Juvenile Full-flow Rearing Habitat

Table 7.5-10 displays the full-flow analysis of the amounts (ac) of fall-run Chinook salmon juvenile WUA without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. For the entire simulation period, slightly more (0.2%) amounts of juvenile rearing habitat (total WUA) are available under the Environmental Baseline compared to the Without-Project scenario. Relative to the Without-Project scenario, the Environmental Baseline results in decreasing percentages of juvenile rearing habitat during wet, above normal and below normal WYs. The Environmental Baseline provides ~~4.1~~3.8 and ~~8.1~~7.8 percent more juvenile rearing habitat during dry and critical WYs, respectively.

Table 7.5-10. Acres of fall-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**6,816**	**2,493**	**997**	**1,164**	**831**	**1,331**
Days ≤ 5,000 cfs	5,474	1,420	821	1,078	828	1,327
Days > 5,000 cfs	1,342	1,073	176	86	3	4
Avg. WUA	**246.4**	**91.5**	**33.8**	**40.2**	**30.3**	**50.7**
WUA ≤ 5,000 cfs	191.2	46.5	27.0	36.9	30.2	50.5
WUA > 5,000 cfs	55.2	45.0	6.8	3.3	0.1	0.2
Without-Project						
Total Days in Analysis	**6,816**	**2,493**	**997**	**1,164**	**831**	**1,331**
Days ≤ 5,000 cfs	4,925	1,230	618	963	805	1,309
Days > 5,000 cfs	1,891	1,263	379	201	26	22
Avg. WUA	**246.0**	**94.1**	**35.1**	**40.9**	**29.1**	**46.8**
WUA ≤ 5,000 cfs	168.4	40.7	20.4	33.1	28.1	46.0
WUA > 5,000 cfs	77.7	53.3	14.6	7.8	1.0	0.9
Differences						
Avg. WUA	**0.4**	**-2.6**	**-1.3**	**-0.7**	**1.2**	**3.8**
% change	**0.2%**	**-2.8%**	**-3.6%**	**-1.8%**	**4.1%**	**8.1%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Environmental Baseline						
Total Days in Analysis	**6,816**	**2,659**	**831**	**1,164**	**665**	**1,497**
Days ≤ 5,000 cfs	5,474	1,567	674	1,078	662	1,493
Days > 5,000 cfs	1,342	1,092	157	86	3	4
Avg. WUA	**246.4**	**97.1**	**28.2**	**40.2**	**24.2**	**56.8**
WUA ≤ 5,000 cfs	191.2	51.4	22.2	36.9	24.1	56.6
WUA > 5,000 cfs	55.2	45.7	6.0	3.3	0.1	0.2
Without-Project						
Total Days in Analysis	**6,816**	**2,659**	**831**	**1,164**	**665**	**1,497**
Days ≤ 5,000 cfs	4,925	1,310	538	963	643	1,471
Days > 5,000 cfs	1,891	1,349	293	201	22	26
Avg. WUA	**246.0**	**100.0**	**29.1**	**40.9**	**23.3**	**52.7**
WUA ≤ 5,000 cfs	168.4	43.3	17.8	33.1	22.4	51.6
WUA > 5,000 cfs	77.7	56.7	11.3	7.8	0.9	1.0
Differences						
Avg. WUA	**0.4**	**-2.9**	**-0.9**	**-0.7**	**0.9**	**4.1**
% change	**0.2%**	**-2.9%**	**-3.2%**	**-1.8%**	**3.8%**	**7.8%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Figure 7.5-9 displays the full-flow analysis of the amounts (ac) of fall-run Chinook salmon juvenile WUA without cover under the Environmental Baseline and the Without-Project scenarios. For both scenarios, decreasing amounts of total habitat were provided from wet to above normal WYs, following by slightly increasing amounts during below normal WYs, decreasing amounts during dry WYs, then increasing amounts were provided for critical WYs. For both the Environmental Baseline and Without-Project scenarios, relatively little additional juvenile rearing habitat is provided by days when flows were > 5,000 cfs for dry and critical WYTs.

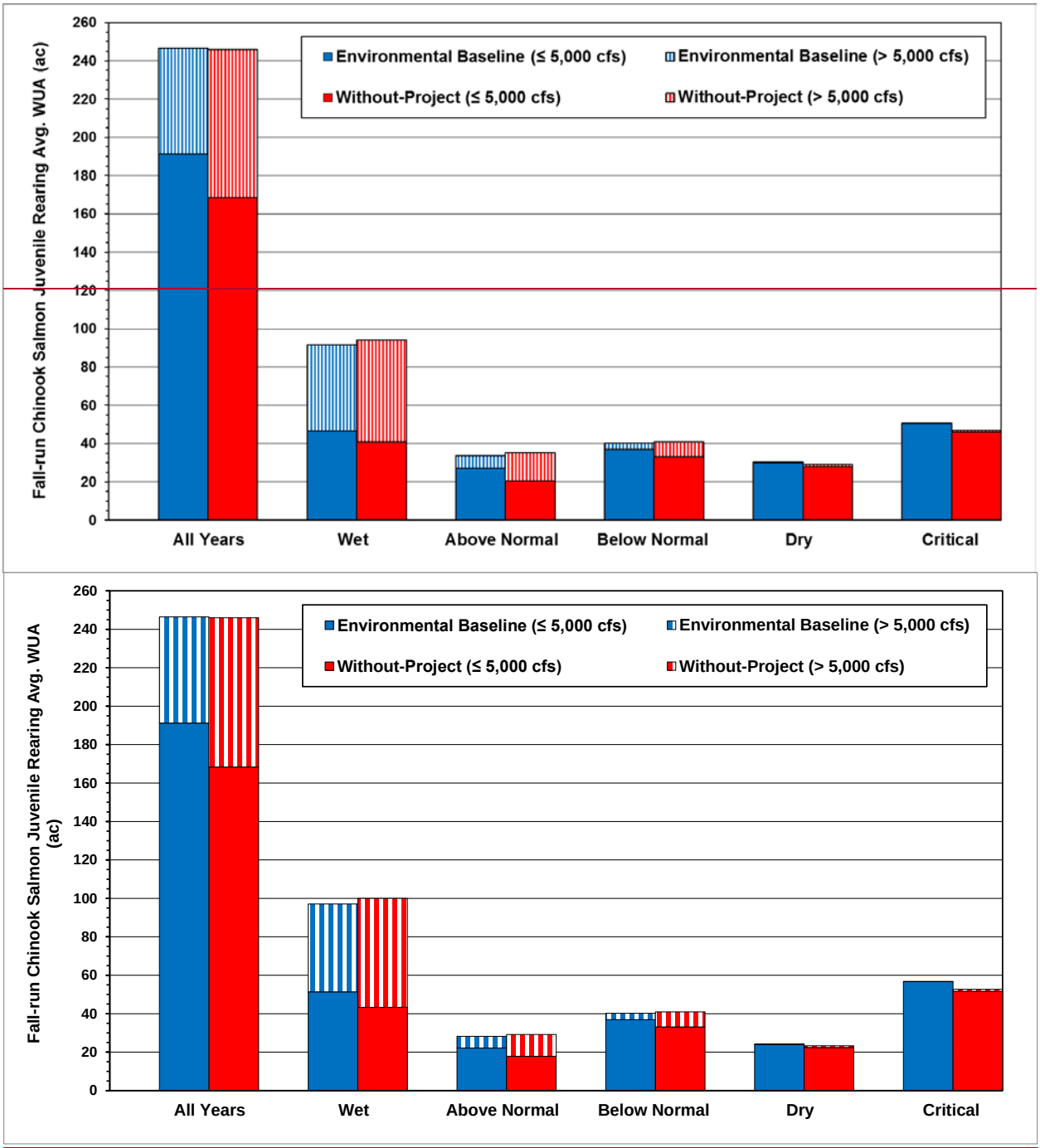


Figure 7.5-9. Comparison of the amount (acres) of fall-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Environmental Baseline and the Without-Project scenarios over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

SECTION 8

Pages EFH8-21 to EFH8-22

8.2.2.1.1 Spawning Habitat

Habitat duration analyses for spring-run Chinook salmon spawning indicate that the Environmental Baseline achieves over ~~95~~94 percent of maximum spawning WUA with about a 98 percent probability. The Environmental Baseline provides 80 percent or more of maximum spawning WUA about 98 percent of the time. Habitat duration analyses for fall-run Chinook salmon indicate that over 80 percent of maximum spawning WUA is achieved with about a 94 percent probability. There have been no definitive determinations of how much reduction in WUA would represent a stressor to specific species/lifestages. However, the use of 80 percent of maximum spawning WUA as a benchmark is based upon testimony as part of the SWRCB Mono Lake Decision 1631 process. Dr. Tom Hardy (a fisheries biologist retained by the Los Angeles Department of Water and Power (LADWP) testified that …"*no objective criteria has been validated to guide investigators on what percentage reduction in optimal habitat represents a significant impact, or at what exceedance value associated with either optimal or median habitat represents adequate protection for the aquatic resources*." However, Dr. Hardy testified that several instream flow studies that he had participated in targeted a range of 80 to 85 percent of the maximum WUA as optimal habitat conditions. Using 80 percent of maximum WUA[1] as a benchmark, the Environmental Baseline provides optimal spring-run Chinook salmon spawning habitat conditions and optimal fall-run Chinook salmon spawning habitat conditions most of the time.

Also, the Environmental Baseline provides substantially more spring-run Chinook salmon and fall-run Chinook salmon spawning habitat than does the Without-Project. The Environmental Baseline achieves over 80 percent (and even about ~~95~~94%) of spring-run Chinook salmon maximum spawning WUA with about a 98 percent probability, by contrast to the Without-Project which achieves over 80 percent of maximum spawning WUA with about a 48 percent probability. For fall-run Chinook salmon, the Environmental Baseline provides over 80 percent of maximum spawning WUA with about a 94 percent probability, while the Without-Project provides over 80 percent or more of maximum spawning WUA with only about a ~~50~~49 percent probability.

For these reasons, flow-dependent spawning habitat availability under the Environmental Baseline is a low stressor to Yuba River Chinook salmon.

[1] In the NMFS and USFWS Biological Opinions on Klamath Project Operations (2013), NMFS reports that available instream habitat of 80 percent of maximum (WUA) has been used as a guideline to develop minimum flow needs for the conservation of anadromous salmonids, and that: (1) NMFS assumes that at least 80 percent of maximum available habitat provides a wide range of conditions and habitat abundance in which populations can grow and recover; (2) where habitat availability is 80 percent of maximum or greater, habitat is not expected to limit individual fitness or population productivity or distribution, nor adversely affect the function of essential features of (coho) salmon critical habitat.

Pages EFH8-22 to EFH8-23

8.2.2.1.2 Potential Redd Dewatering

Estimation of potential spring-run Chinook salmon redd dewatering indicates that the long-term annual averages of the percentage of redds built within a given year that would have the potential to be dewatered for every day of the annual embryo incubation period with slightly less frequency under the Environmental Baseline, relative to the Without-Project. Under both scenarios, the potential for redd dewatering is very low, averaging only about 0.01 and 0.10 percent annually, respectively. To put this into context, an estimated 1,148 and 1,465 spring-run Chinook salmon redds were constructed in the lower Yuba River during 2009 and 2010, respectively. Correspondingly, applying the 41-year average, it is estimated that essentially no spring-run Chinook salmon redd would be expected to be dewatered under the Environmental Baseline, and only about 1 spring-run Chinook salmon redd would be expected to be dewatered under the Without-Project during each of these two years.

Estimation of potential fall-run Chinook salmon redd dewatering indicates that the long-term average of the percentage of redds built within a given year would be dewatered less frequently under the Environmental Baseline, relative to the Without-Project. Under the Environmental Baseline, the estimated percent of expected redds dewatered is relatively low, averaging only about 1.32 percent annually. To put this into context, an estimated 2,079 and 1,559 fall-run Chinook salmon redds were constructed in the lower Yuba River during 2009 and 2010, respectively. Correspondingly, applying the 41-year average, it is estimated that only about 27 and 21 fall-run Chinook salmon redds would be expected to be dewatered under the Environmental Baseline during 2009 and 2010, respectively. Under the Without-Project, approximately 99 and 74 redds would be expected to be dewatered during 2009 and 2010, respectively. The relatively higher percentage of redd dewatering for fall-run Chinook salmon is likely due to more frequent uncontrolled high flow events during the fall-run Chinook salmon spawning and embryo incubation period than during the spring-run Chinook salmon spawning and embryo incubation period. This is demonstrated with the higher percentages of potential fall-run Chinook salmon redds dewatered under the Without-Project, in which high flow events in winter and spring are more extreme and varied than under the existing conditions (Environmental Baseline).

Examination of potential egg pocket dewatering indicates that no spring-run Chinook salmon egg pockets would be expected to be dewatered under the Environmental Baseline or the Without-Project. The estimated average annual percentage of expected fall-run Chinook salmon egg pockets potentially dewatered is relatively low, averaging 0.76 percent under the Environmental Baseline, compared to 2.73 percent under the Without-Project.

For these reasons, potential redd dewatering is a low stressor to spring-run Chinook salmon in the lower Yuba River, and a low/moderate stressor to fall-run Chinook salmon.

Page EFH8-23

8.2.2.1.3 Chinook Salmon Fry and Juvenile Rearing Habitat

Habitat duration analyses for both spring-run and fall-run Chinook salmon fry in-channel rearing habitat availability in the lower Yuba River is similar under the Environmental Baseline and the Without-Project. However, compared to the Without-Project, the Environmental Baseline provides more habitat (over most of the distribution for fall-run Chinook salmon and over about the lower 40 percent of the distribution for spring-run Chinook salmon, when habitat is most limiting). Chinook salmon fry full-flow rearing habitat availability (WUA) in the lower Yuba River is slightly lower under the Environmental Baseline relative to the Without-Project.

Habitat duration analyses for both spring-run and fall-run Chinook salmon juvenile in-channel rearing under the Environmental Baseline indicate that over 80 percent ~~(and even up to 90%)~~ of maximum juvenile rearing WUA is achieved with nearly a 100 percent probability over the evaluated 41-year hydrologic period. Overall, the long-term average and average by WYT simulated juvenile spring-run and fall-run Chinook salmon rearing habitat availability is higher under the Environmental Baseline, relative to the Without-Project. Chinook salmon juvenile full-flow rearing habitat availability (WUA) in the lower Yuba River is substantially higher (15.3%) for spring-run Chinook salmon and similar for fall-run Chinook salmon under the Environmental Baseline, relative to the Without-Project. Based on model simulations of WUA-discharge relationships, flow-dependent fry and juvenile rearing habitat availability is a low stressor to Yuba River Chinook salmon.

Page EFH8-56

8.3.2.1 Flow-Dependent Habitat Conditions

Flow-dependent analyses described in this Applicant-Prepared Draft EFH Assessment used modeled flows and water temperatures to quantify spawning habitat availability, potential redd dewatering, fry and juvenile rearing habitat availability, potential fry and juvenile isolation, and lifestage-specific water temperature suitabilities for spring-run and fall-run Chinook salmon. Methods to conduct the flow-dependent analyses are the same as those described in Section 6.0 of the Applicant-Prepared Draft BA. Each of these considerations are evaluated in this Section 8.0 under the Proposed Action, relative to the Environmental Baseline, and their relative magnitudes as stressors to spring-run and fall-run Chinook salmon in the lower Yuba River are presented. Note that for the lower Yuba River, results by WYT classifications are in accordance with the Yuba River Index (YRI). ~~Water year types based on the YRI are as defined in SWRCB Decision 1644. WYT designation uses DWR published Full Natural Flow for the Yuba River at Smartsville for water years 1970 to 1999, and for water years 2000 to 2010 uses the final determination for each year based on DWR Bulletin 120 and updates of Yuba River Unimpaired flow at Smartsville.~~ Water year types are based on the Yuba River Index as defined in SWRCB Decision 1644 using DWR published Full Natural Flow for the Yuba River at Smartsville for water years 1970 to 2010, DWR Bulletin 120 forecasts of Yuba River Unimpaired flow at Smartsville for 1970 through 2010, and available final DWR Bulletin 120 Updates of Yuba River Unimpaired flow at Smartsville for water years 1998 through 2010. Although WY 1977 is

considered to be a conference year in YCWA's proposed conditions in Amended Appendix E2 of the Amended FLA, it is included in the water year type summary tables as a critical year, but discussed separately under the Proposed Action and Cumulative Condition analyses.

Pages EFH8-56 to EFH8-58

8.3.2.1.1 Spring-run Chinook Salmon Spawning Habitat Availability

Spawning WUA for spring-run Chinook salmon was evaluated for simulated flows up to 5,000 cfs, which generally represents the bankfull flow in the lower Yuba River. Because flows do not exceed 5,000 cfs over the 41-year simulation period during the September through mid-October spring-run Chinook salmon spawning period, this limitation does not exclude any simulated daily flows from the spring-run Chinook salmon spawning WUA analysis. Tables 8.3-13 displays the long-term average and average by WYT spring-run Chinook salmon spawning habitat (percent of maximum WUA) under the Proposed Action and the Environmental Baseline.

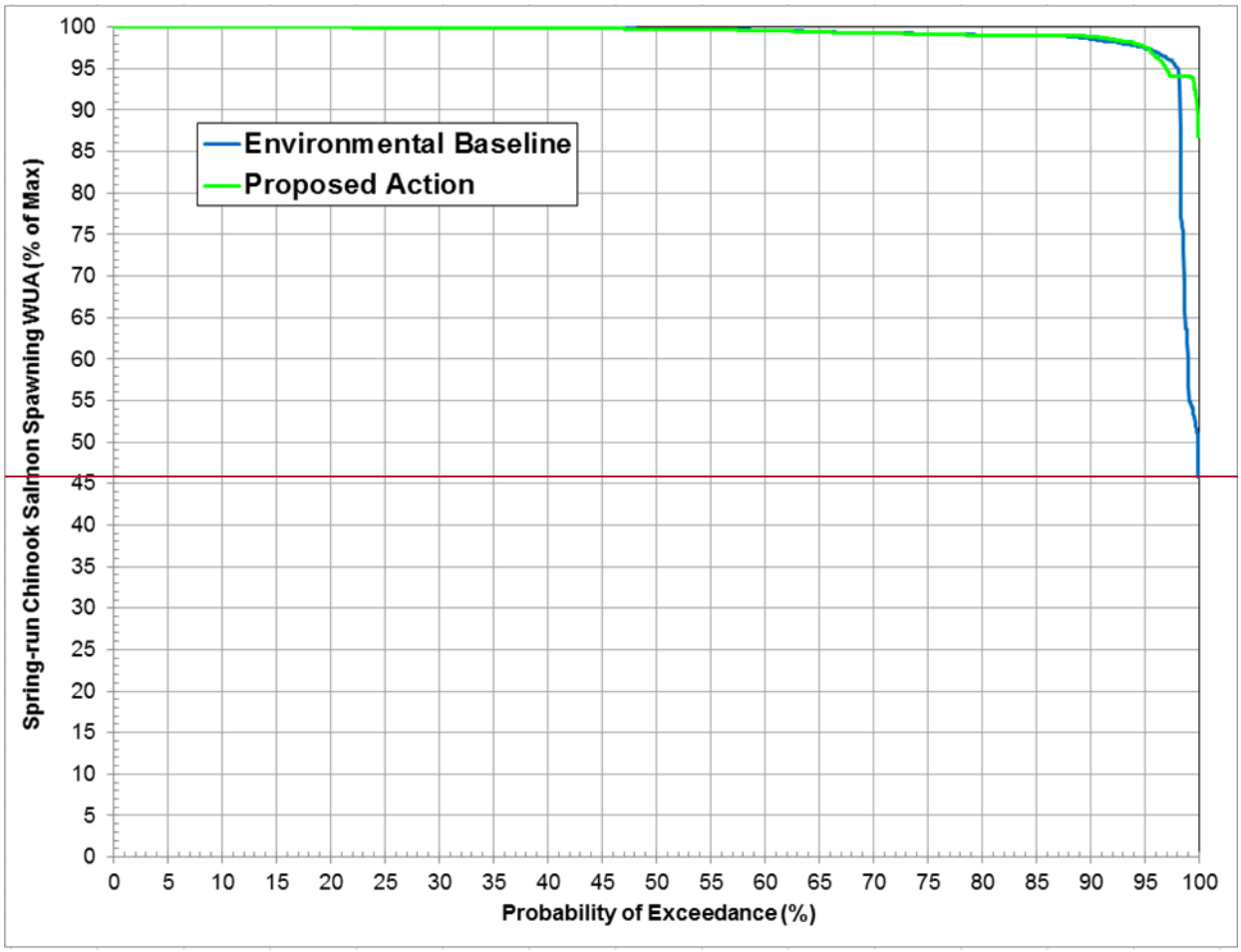
Over the entire 41-year simulation period, long-term average spring-run Chinook salmon spawning habitat availability (percent of maximum WUA) in the lower Yuba River is similar under the Proposed Action relative to the Environmental Baseline (long-term average of ~~99.3~~98.3% versus ~~98.8~~97.8% of the maximum WUA, respectively). The Proposed Action provides very similar amounts of spawning habitat during wet, above normal, below normal and dry WYs, and provides ~~2.8~~2.5 percent more habitat during critical WYs. As with the Environmental Baseline, the Proposed Action provides, on the average, over 80 percent (and even 90%) or more of maximum spawning WUA during all WYTs.

Table 8.3-13. Long-term and water year type average spring-run Chinook salmon spawning WUA (percent of maximum) under the Proposed Action and Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Proposed Action~~	~~99.3~~	~~99.3~~	~~99.3~~	~~99.6~~	~~99.6~~	~~98.9~~
Environmental Baseline	98.8	99.3	99.4	99.6	99.6	96.1
Difference	0.5	0.0	-0.1	0.0	0.0	2.8
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Proposed Action	98.3	98.2	98.6	98.6	98.5	98.0
Environmental Baseline	97.8	98.2	98.6	98.6	98.6	95.5
Difference	0.5	0.0	0.0	0.0	-0.1	2.5

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat durations for spring-run Chinook salmon spawning under the Proposed Action and Environmental Baseline s are presented in Figure 8.3-1. The Proposed Action provides similar amounts of spawning habitat availability overall, but provides more spawning habitat availability over about the lowest 2 percent of the lower portion of the exceedance probability distribution. Also, the Proposed Action provides 80 percent (and even 90%) or more of maximum spawning WUA about 100 percent of the time, while the Environmental Baseline provides 80 percent (and even 90%) or more of maximum spawning WUA about 98 percent of the time.



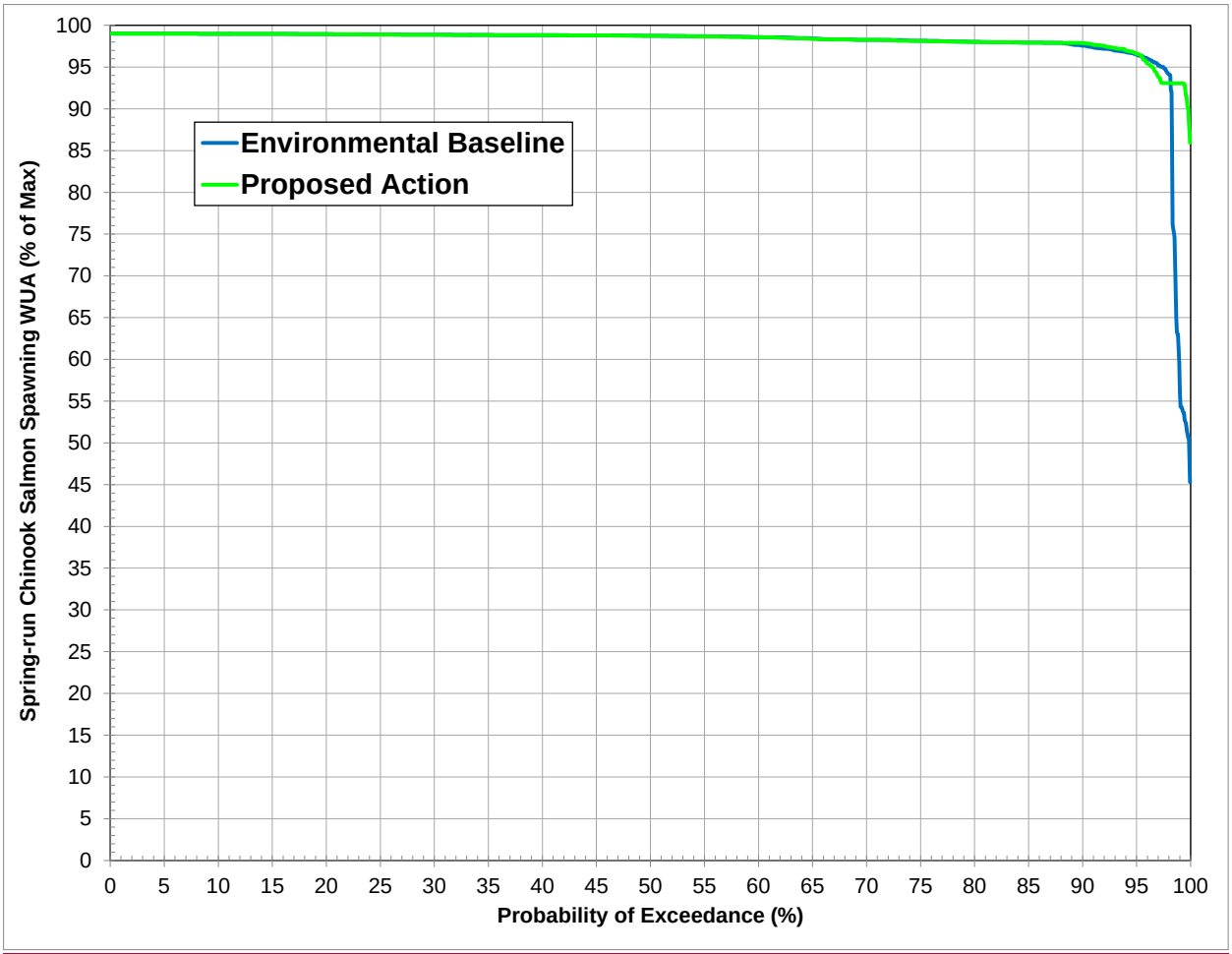


Figure 8.3-1. Spring-run Chinook salmon spawning habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), for analytical purposes the corresponding spring-run Chinook salmon spawning period extends from September 1 – October 15 of 1977. During that spawning season, 9~~3~~4 percent of spring-run Chinook salmon maximum spawning WUA was provided under the Proposed Action, compared to 7~~1~~2 percent provided under the Environmental Baseline.

Spring-run Chinook salmon spawning habitat availability under the Proposed Action is generally similar to the Environmental Baseline overall, provides more habitat during the conference WY, and represents a low stressor under the Proposed Action.

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8.3.2.1.2 Fall-run Chinook Salmon Spawning Habitat

Spawning WUA for fall-run Chinook salmon was evaluated for simulated flows up to 5,000 cfs, which generally represents the bankfull flow in the lower Yuba River. During the October through December fall-run Chinook salmon spawning period, flows exceed 5,000 cfs during about 3.3 percent of the days over the 41-year simulation period for the Proposed Action, and about 2.9 percent of the days under the Environmental Baseline, which were excluded from the fall-run Chinook salmon spawning WUA analysis. Tables 8.3-14 displays the long-term average and average by WYT of fall-run Chinook salmon spawning WUA (percent of maximum) under the Proposed Action and Environmental Baseline.

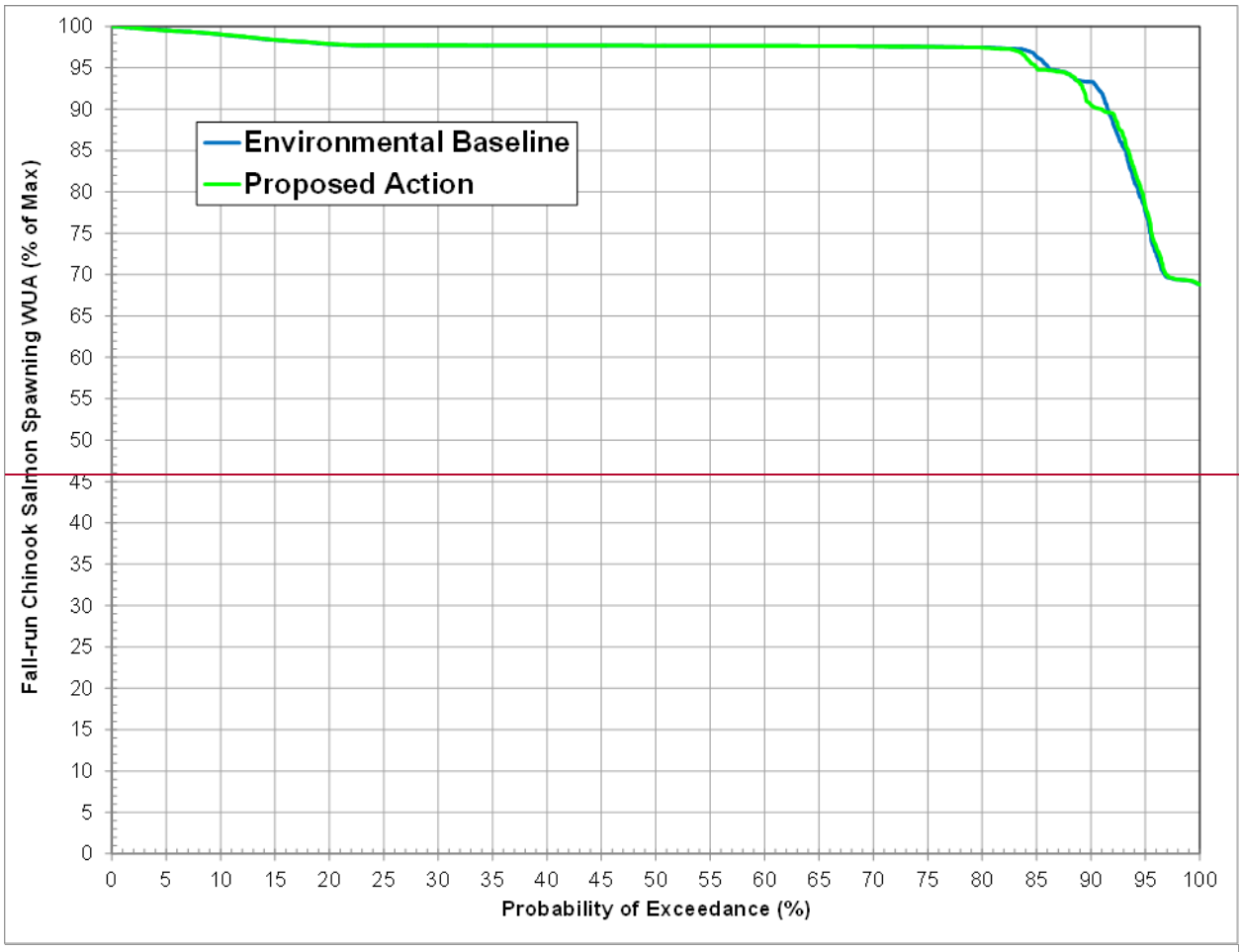
Table 8.3-14. Long-term and water year type average fall-run Chinook salmon spawning WUA (percent of maximum) under the Proposed Action and Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Proposed Action~~	~~95.8~~	~~94.1~~	~~95.0~~	~~96.6~~	~~97.3~~	~~97.6~~
Environmental Baseline	95.8	93.8	95.6	96.6	97.6	97.8
Difference	0.0	0.3	-0.6	0.0	-0.3	-0.2
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Proposed Action	95.1	93.2	95.3	95.9	96.6	96.9
Environmental Baseline	95.2	93.1	95.4	95.9	96.9	97.1
Difference	-0.1	0.1	-0.1	0.0	-0.3	-0.2

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Over the entire 41-year simulation period, long-term average spring-run Chinook salmon spawning habitat availability (percent of maximum WUA) in the lower Yuba River is the same under the Proposed Action, relative to the Environmental Baseline (long-term average of ~~95.8~~95.1~~ ~~% versus ~~95.8 ~~95.2% of maximum WUA, respectively). The Proposed Action also provides similar amounts of spawning habitat by WYT. Both the Environmental Baseline and the Proposed Action provide over 90 percent of maximum spawning WUA during any WYT.

Habitat durations for fall-run Chinook salmon spawning under the Proposed Action and Environmental Baseline are presented in Figure 8.3-2. The Proposed Action provides similar amounts of spawning habitat availability overall, but provides slightly less spawning habitat availability over about the 83-86 and 88-92 percent of the exceedance probability distribution. The Proposed Action and Environmental Baseline both provide over 80 percent of maximum spawning WUA with about a 94 percent probability. Additionally, the Proposed Action and the Environmental Baseline provide 90 percent or more of maximum spawning WUA about ~~90~~89 and ~~92~~91 percent of the time, respectively.


Environmental Baseline
Proposed Action
Fall-run Chinook Salmon Spawning WUA (% of Max)
Probability of Exceedance (%)
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

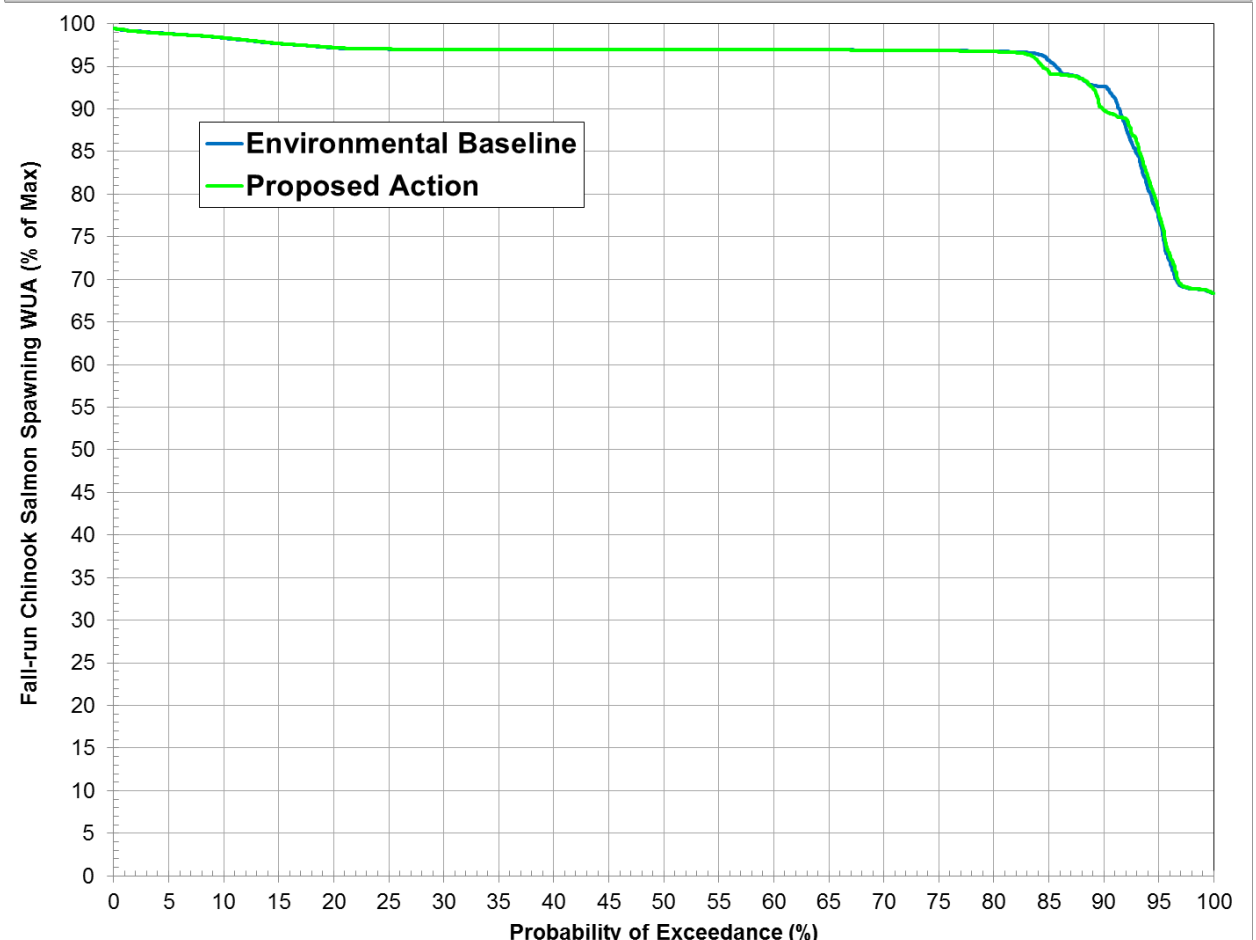

Environmental Baseline
Proposed Action
Fall-run Chinook Salmon Spawning WUA (% of Max)
Probability of Exceedance (%)
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Figure 8.3-2. Fall-run Chinook salmon spawning habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), for analytical purposes the corresponding fall-run Chinook salmon spawning period extends from October 1 – December 31 of 1977. During that spawning season, ~~90.3~~96.0 percent of fall-run Chinook salmon maximum spawning WUA was provided under the Proposed Action and ~~93.1 percent was provided~~ under the Environmental Baseline.

Flow-dependent spawning habitat availability under the Environmental Baseline is a low stressor to Yuba River fall-run Chinook salmon. Because of the similarity in spawning habitat availability under the Proposed Action relative to the Environmental Baseline, this stressor remains characterized as low under the Proposed Action.

Moreover, the Proposed Action overall provides substantially more fall-run Chinook salmon spawning habitat over most of the exceedance distributions relative to the Without-Project ~~under both the RMT and Relicensing Participants' WUA-discharge relationships~~.

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8.3.2.1.3 Potential Redd Dewatering

Since the development of the existing flow fluctuation criteria, additional data and information have been collected and models developed to better analyze the potential for Chinook salmon redd dewatering in the Yuba River (see Section 6.0 of the Applicant-Prepared Draft BA). Proposed new flow fluctuation criteria were developed for the Proposed Action (see Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam in Appendix E2 of the Amended FLA).

Fall-run Chinook Salmon

For every day of the annual embryo incubation period over the 41 years, the long-term annual average of the percentages of fall-run Chinook salmon redds that potentially would have been dewatered under the Proposed Action and Environmental Baseline both are low, averaging 1.59 percent and 1.32 percent annually, respectively. Applying these long-term averages to the number of fall-run Chinook redds observed during 2009 and 2010 (2,079 and 1,559 redds, respectively), it is estimated that between about 33 and 21 fall-run Chinook salmon redds would have been dewatered under the Proposed Action and Environmental Baseline.

The average percentage of redds potentially dewatered under the Proposed Action would also be small and slightly higher than the average percentage under the Environmental Baseline during all WYs (Table 8.3-17).

Table 8.3-17. Estimated fall-run Chinook salmon redd and egg pocket potential dewatering under

the Proposed Action relative to the Environmental Baseline.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Proposed Action	Environmental Baseline	Difference	Proposed Action	Environmental Baseline	Difference
Long-term (All WYs)	1.59%	1.32%	0.27%	0.92%	0.76%	0.16%
Wet	3.40%	2.88%	0.52%	2.14%	1.79%	0.35%
Above Normal	0.73%	0.55%	0.18%	0.30%	0.23%	0.07%
Below Normal	0.99%	0.84%	0.15%	0.45%	0.37%	0.08%
Dry	0.30%	0.20%	0.10%	0.08%	0.04%	0.04%
Critical	0.16%	0.09%	0.07%	0.02%	0.01%	0.01%

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Proposed Action	Environmental Baseline	Difference	Proposed Action	Environmental Baseline	Difference
Long-term (All WYs)	1.59%	1.32%	0.27%	0.92%	0.76%	0.16%
Wet	3.21%	2.72%	0.49%	2.02%	1.69%	0.33%
Above Normal	0.80%	0.59%	0.21%	0.32%	0.24%	0.08%
Below Normal	0.99%	0.84%	0.15%	0.45%	0.37%	0.08%
Dry	0.25%	0.16%	0.09%	0.07%	0.03%	0.04%
Critical	0.20%	0.12%	0.08%	0.03%	0.02%	0.01%

WYT defined by the Yuba River Index (YRI) WY Hydrologic Classification.
Percentage estimates based on the WY 1970-2010 simulation period.

The long-term and water year type averages of the percentages of egg pockets dewatered under the Proposed Action are very low, about half or less of the percentages of dewatered redds, and these percentages are very similar to the corresponding averages under the Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), an estimated 0.02 percent of fall-run Chinook salmon redds and 0.0 percent of egg pockets would potentially be dewatered under the Proposed Action, nearly the same as the percentages expected under the Environmental Baseline (0.01% and 0.0%, respectively).

As previously discussed, Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam, was developed in part to minimize the potential for Chinook salmon redd dewatering during the period from September 2 through December 31 (corresponding to the spring-run Chinook salmon spawning and incubation period).

Proposed Condition AR9 would not necessarily apply to every day each year of the embryo incubation period. During the days over the 41-year period of evaluation when this proposed condition would apply, it would provide the intended protection for fall-run Chinook salmon redd dewatering (Table 8.3-18).

Table 8.3-18. Estimated fall-run Chinook salmon redd and egg pocket potential dewatering under the Proposed Action relative to the Environmental Baseline for those days in the 41-year period of record during which the flow reduction criteria specified in Proposed Condition AR9 would apply.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Proposed Action	Environmental Baseline	Difference	Proposed Action	Environmental Baseline	Difference
Long-term (All WYs)	0.39%	0.30%	0.09%	0.15%	0.10%	0.05%
Wet	0.65%	0.57%	0.08%	0.31%	0.20%	0.11%
Above Normal	0.44%	0.28%	0.16%	0.14%	0.09%	0.05%
Below Normal	0.17%	0.07%	0.10%	0.03%	0.00%	0.03%
Dry	0.28%	0.18%	0.10%	0.08%	0.04%	0.04%
Critical	0.12%	0.07%	0.05%	0.02%	0.01%	0.01%

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Proposed Action	Environmental Baseline	Difference	Proposed Action	Environmental Baseline	Difference
Long-term (All WYs)	0.39%	0.30%	0.09%	0.15%	0.10%	0.05%
Wet	0.63%	0.56%	0.07%	0.30%	0.20%	0.10%
Above Normal	0.45%	0.27%	0.18%	0.13%	0.08%	0.05%
Below Normal	0.17%	0.07%	0.10%	0.03%	0.00%	0.03%
Dry	0.23%	0.15%	0.08%	0.07%	0.03%	0.04%
Critical	0.16%	0.10%	0.06%	0.03%	0.02%	0.01%

WYT defined by the Yuba River Index (YRI) WY Hydrologic Classification.
Percentage estimates based on the WY 1970-2010 simulation period.

Fall-run Chinook salmon redd dewatering under the Proposed Action is estimated to be very low and similar to that under the Environmental Baseline. Redd dewatering under the Proposed Action represents a low/moderate stressor to fall-run Chinook salmon.

Pages EFH8-65 to EFH8-67

8.3.2.1.4 Fry and Juvenile Rearing Habitat Availability

Spring-run Chinook Salmon Fry In-channel Rearing Habitat

Table 8.3-19 displays the long-term average and average by WYT spring-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline. During the mid-November through mid-February spring-run Chinook salmon fry rearing period, flows exceed 5,000 cfs during about 13 percent of the days over the 41-year simulation period for the Proposed Action, and during about 12 percent of the days under the Environmental Baseline. These days were excluded from the spring-run Chinook salmon fry in-channel rearing WUA analysis.

Table 8.3-19. Long-term and WYT average spring-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline.

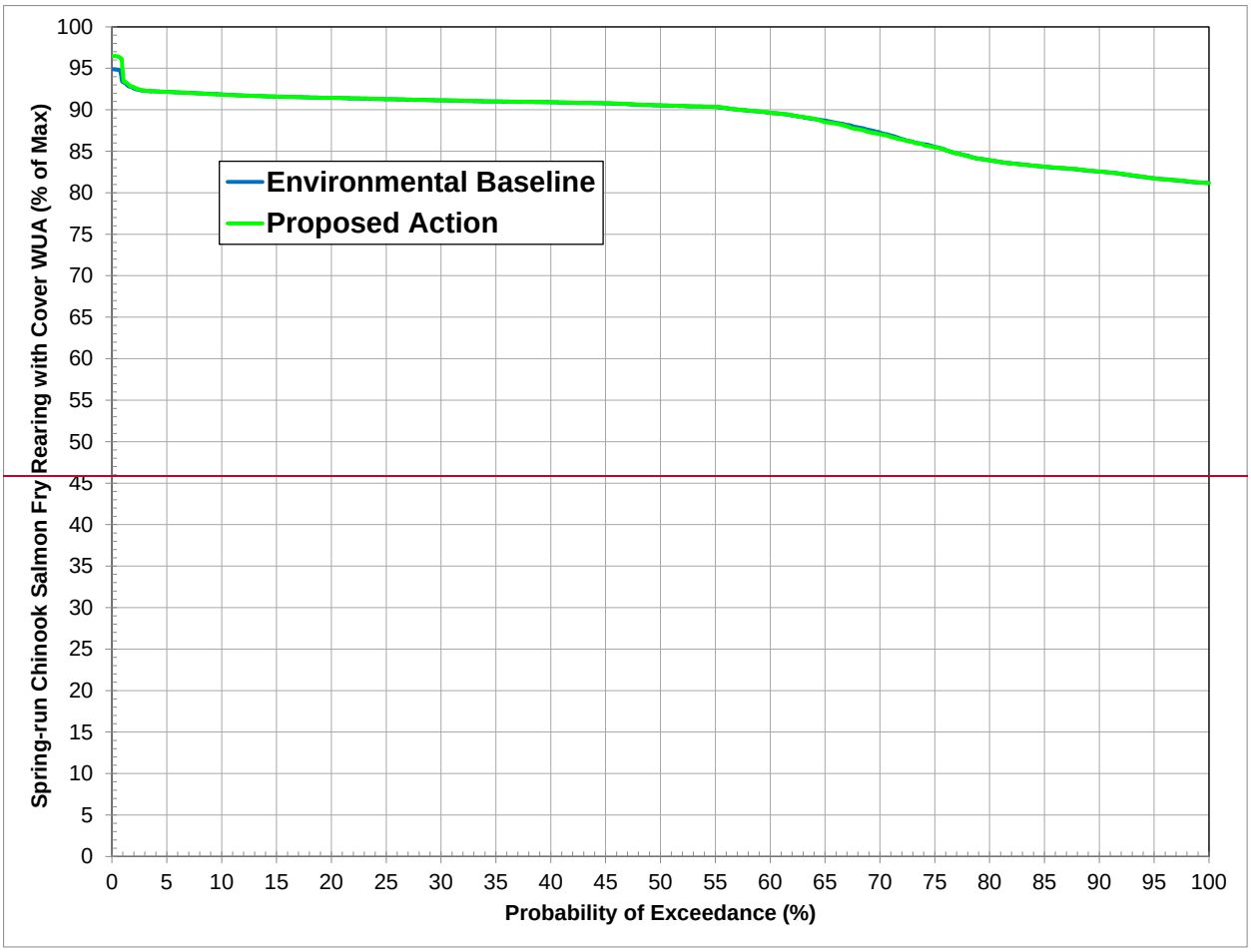
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Proposed Action~~	~~88.6~~	~~88.6~~	~~89.0~~	~~87.6~~	~~88.0~~	~~89.7~~
Environmental Baseline	88.6	88.6	88.9	87.6	88.2	89.7
Difference	0.0	0.0	0.1	0.0	-0.2	0.0

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action	84.2	84.3	84.3	83.2	83.5	85.1
Environmental Baseline	84.2	84.3	84.3	83.2	83.7	85.1
Difference	0.0	0.0	0.0	0.0	-0.2	0.0

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Over the entire 41-year simulation period, long-term average fry in-channel rearing habitat availability (percent of maximum WUA) in the lower Yuba River is the same under the Proposed Action and Environmental Baseline (long-term average of ~~88.6~~84.2% of the maximum WUA). The Proposed Action and Environmental Baseline also result in very similar amounts of WUA by WYT. Both the Proposed Action and the Environmental Baseline provide an average of over 80 percent of fry rearing maximum WUA during all WYTs.

Habitat durations for spring-run Chinook salmon fry rearing under the Proposed Action and Environmental Baseline is presented in Figure 8.3-3. The Proposed Action and Environmental Baseline provide very similar amounts of habitat over the entire distribution. Both the Proposed Action and Environmental Baseline provide over 80 percent fry rearing maximum WUA over about 79 percent of the ~~entire~~ exceedance probability distributions.


Spring-run Chinook Salmon Fry Rearing with Cover WUA (% of Max)
Probability of Exceedance (%)
Environmental Baseline
Proposed Action
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

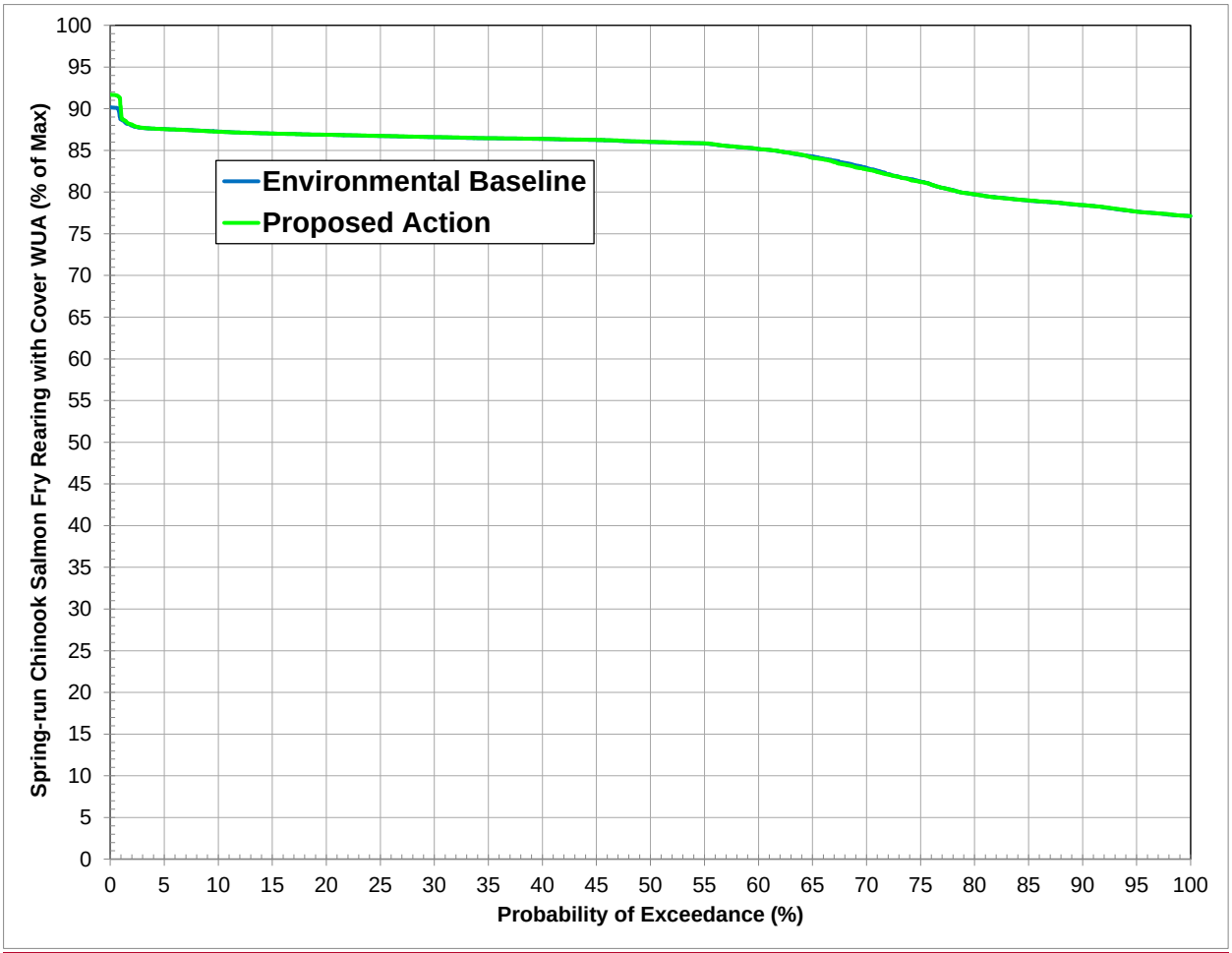


Figure 8.3-3. Spring-run Chinook salmon fry in-channel rearing habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.

During the fry rearing season of the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), ~~91.2~~86.6 percent of spring-run Chinook salmon fry rearing maximum WUA was provided under both the Proposed Action ~~compared to 91.2 percent provided under~~ and the Environmental Baseline.

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Fall-run Chinook Salmon Fry In-channel Rearing Habitat

Table 8.3-20 displays the long-term average and average by WYT fall-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline. During the mid-December through April fall-run Chinook salmon fry rearing period, flows exceed 5,000 cfs during about 19.6 percent of the days over the 41-year simulation period

for both the Proposed Action and the Environmental Baseline. These days were excluded from the fall-run Chinook salmon fry in-channel rearing WUA analysis.

Table 8.3-20. Long-term and WYT average fall-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline.

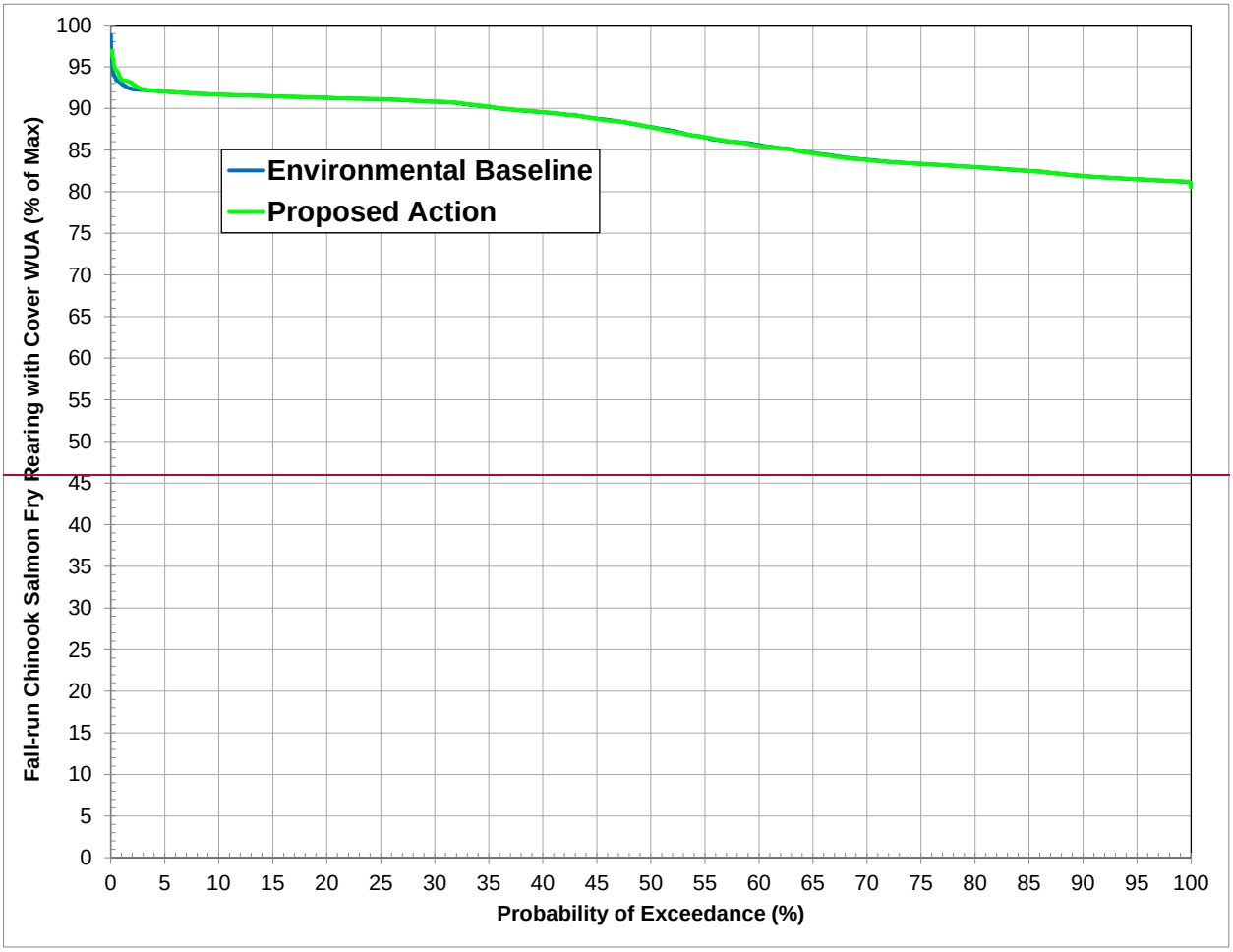
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Proposed Action~~	~~87.2~~	~~88.3~~	~~87.2~~	~~85.4~~	~~85.6~~	~~88.7~~
Environmental Baseline	87.2	88.2	87.3	85.4	85.7	88.6
Difference	0.0	0.1	-0.1	0.0	-0.1	0.1

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action	82.9	83.9	82.6	81.1	81.2	84.0
Environmental Baseline	82.9	83.8	82.7	81.1	81.4	83.9
Difference	0.0	0.1	-0.1	0.0	-0.2	0.1

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Over the entire 41-year simulation period, long-term average fry rearing habitat availability (WUA) in the lower Yuba River is the same under the Proposed Action and Environmental Baseline (long-term average of ~~87.2~~82.9%). The Proposed Action and Environmental Baseline also result in similar amounts of WUA by WYT. Neither the Proposed Action nor the Environmental Baseline provides over 90 percent of fry rearing maximum WUA during any WYT, although both scenarios provide an average of over 80 percent of fry rearing maximum WUA during all WYTs.

Habitat durations for fall-run Chinook salmon fry in-channel rearing under the Proposed Action and Environmental Baseline is presented in Figure 8.3-4. The Proposed Action and Environmental Baseline provide very similar amounts of habitat over the entire distribution. Both the Proposed Action and Environmental Baseline provide over 80 percent of fry rearing maximum WUA with about a ~~100~~67 percent probability.



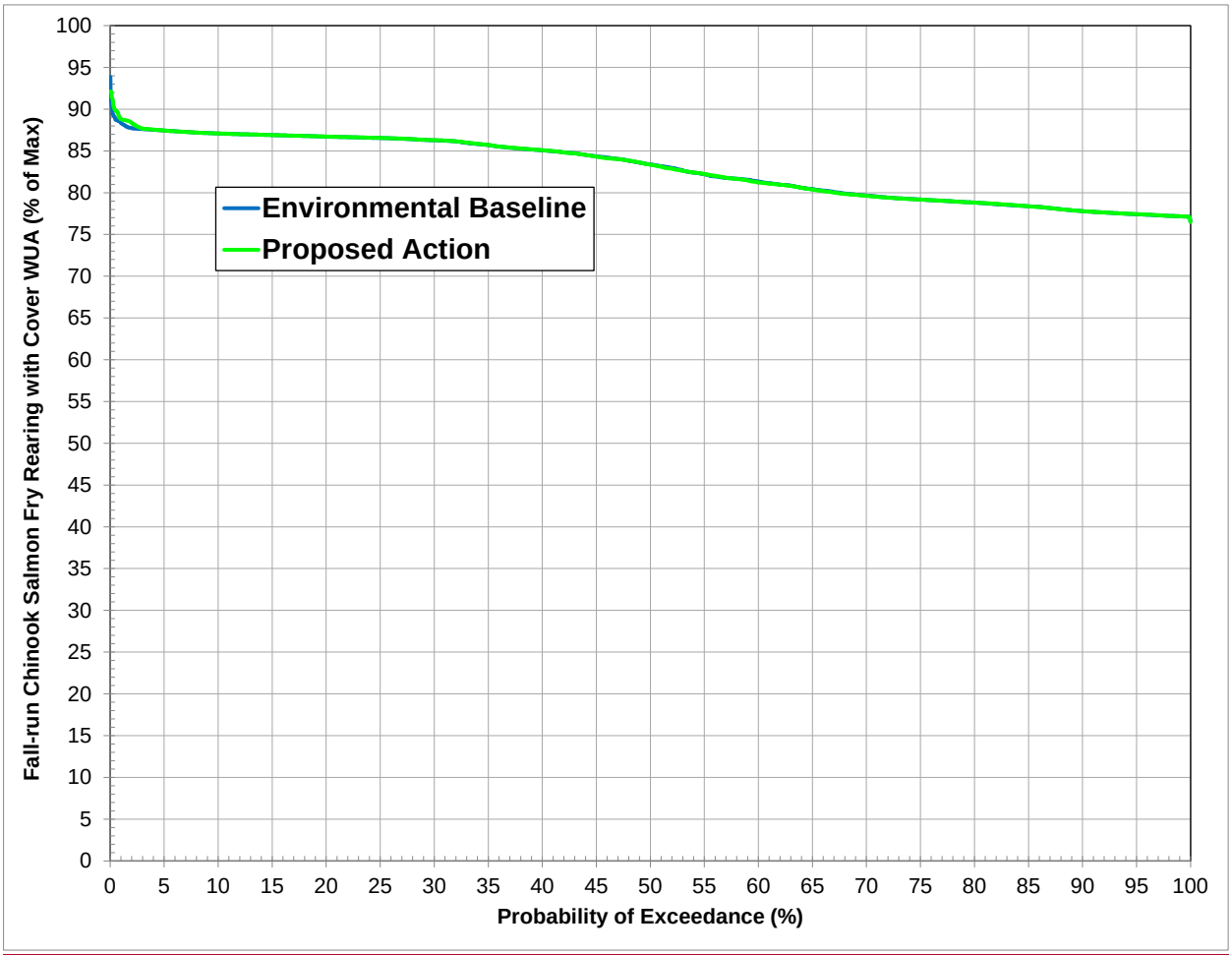


Figure 8.3-4. Fall-run Chinook salmon fry in-channel rearing habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.

During the fry rearing season of the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), ~~92.6~~88.0 percent of fall-run Chinook salmon fry rearing maximum WUA was provided under the Proposed Action compared to ~~90.4~~87.5 percent provided under the Environmental Baseline.

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Spring-run Chinook Salmon Juvenile In-channel Rearing Habitat

Table 8.3-21 displays the long-term average and average by WYT spring-run Chinook salmon juvenile in-channel rearing habitat (percent of maximum WUA) under the Proposed Action and Environmental Baseline. During the year-round spring-run Chinook salmon juvenile rearing period, flows exceed 5,000 cfs during about 11 percent of the days over the 41-year simulation period for the Proposed Action, and about 10 percent of the days under the Environmental

Baseline. These days were excluded from the spring-run Chinook salmon juvenile in-channel rearing WUA analysis.

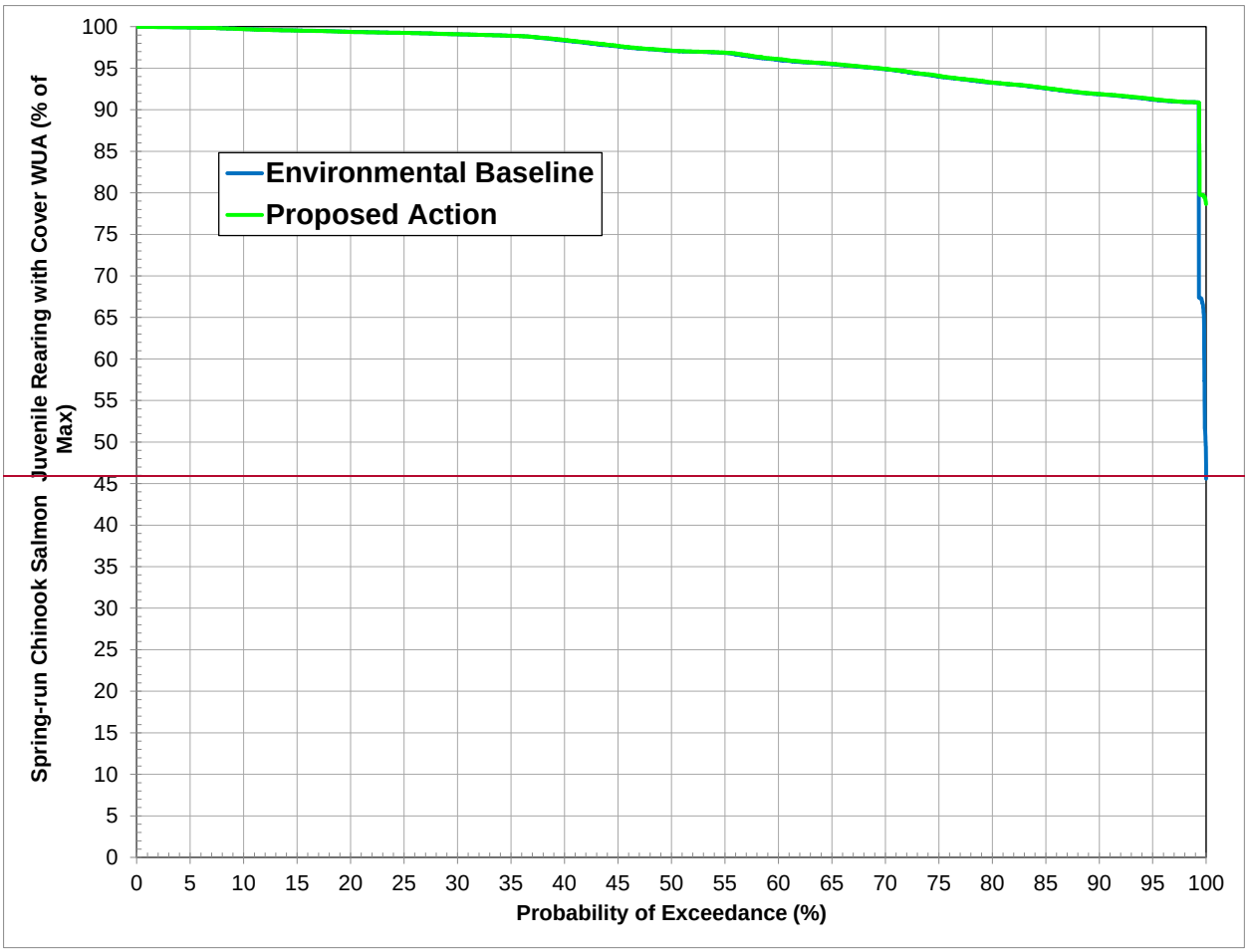
Table 8.3-21. Long-term and WYT average spring-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Proposed Action~~	~~96.5~~	~~95.6~~	~~95.7~~	~~96.4~~	~~97.5~~	~~97.8~~
Environmental Baseline	96.3	95.5	95.7	96.4	97.5	97.1
Difference	0.2	0.1	0.0	0.0	0.0	0.7
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Proposed Action	90.6	89.8	90.0	90.5	91.5	91.8
Environmental Baseline	90.5	89.7	90.0	90.5	91.6	91.3
Difference	0.1	0.1	0.0	0.0	-0.1	0.5

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Over the entire 41-year simulation period, long-term average juvenile in-channel rearing habitat availability in the lower Yuba River is similar under the Proposed Action and Environmental Baseline (long-term average of ~~96.5~~90.6% and ~~96.3~~90.5% of the maximum WUA, respectively). The Proposed Action and Environmental Baseline also result in similar amounts of WUA by WYT, but the Proposed Action provides slightly more habitat (0.5~~7~~%) during critical WYs. Both the Proposed Action and Environmental Baseline provide over 80 percent (and even up to about 90%) of juvenile in-channel rearing maximum WUA during all WYTs.

Habitat durations for spring-run Chinook salmon juvenile in-channel rearing under the Proposed Action and Environmental Baseline is presented in Figure 8.3-5. The Proposed Action and Environmental Baseline provide very similar amounts of habitat over nearly the entire distribution. The Proposed Action and Environmental Baseline achieve over 80 percent ~~(and even 90%)~~ of juvenile in-channel rearing maximum WUA with about a 99 percent probability.



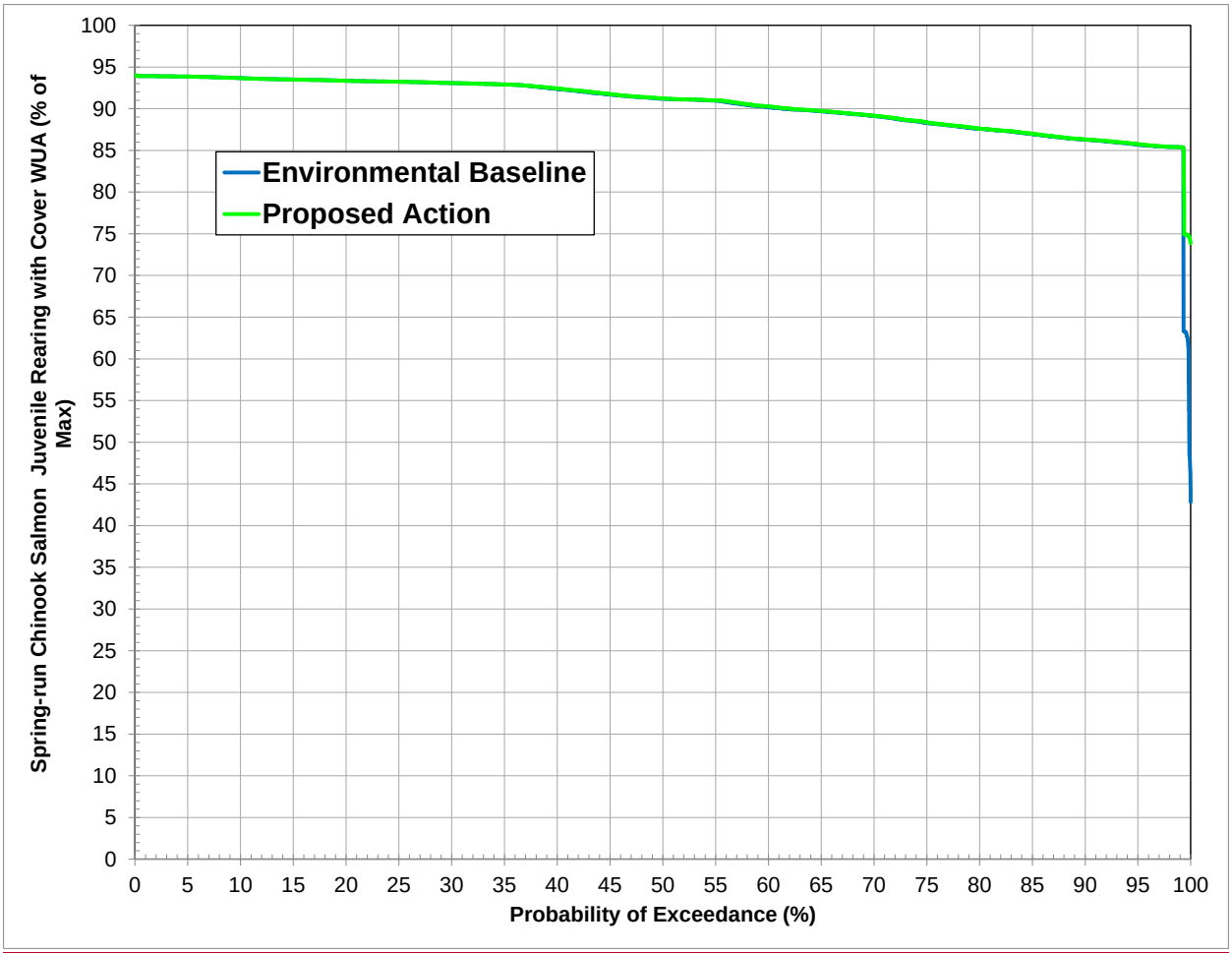


Figure 8.3-5. Spring-run Chinook salmon juvenile in-channel rearing habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.

During the juvenile rearing season of the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), ~~94.9~~88.2 percent of spring-run Chinook salmon maximum juvenile rearing WUA was provided under the Proposed Action compared to ~~89.0~~83.6 percent provided under the Environmental Baseline.

Pages EFH8-70 to EFH8-72

Fall-run Chinook Salmon Juvenile In-channel Rearing Habitat

Table 8.3-22 displays the long-term average and average by WYT fall-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline. During the mid-January through June fall-run Chinook salmon juvenile rearing period, flows exceed 5,000 cfs during about 20 percent of the days over the 41-year

simulation period for both the Proposed Action and the Environmental Baseline. These days were excluded from the fall-run Chinook salmon juvenile in-channel rearing WUA analysis.

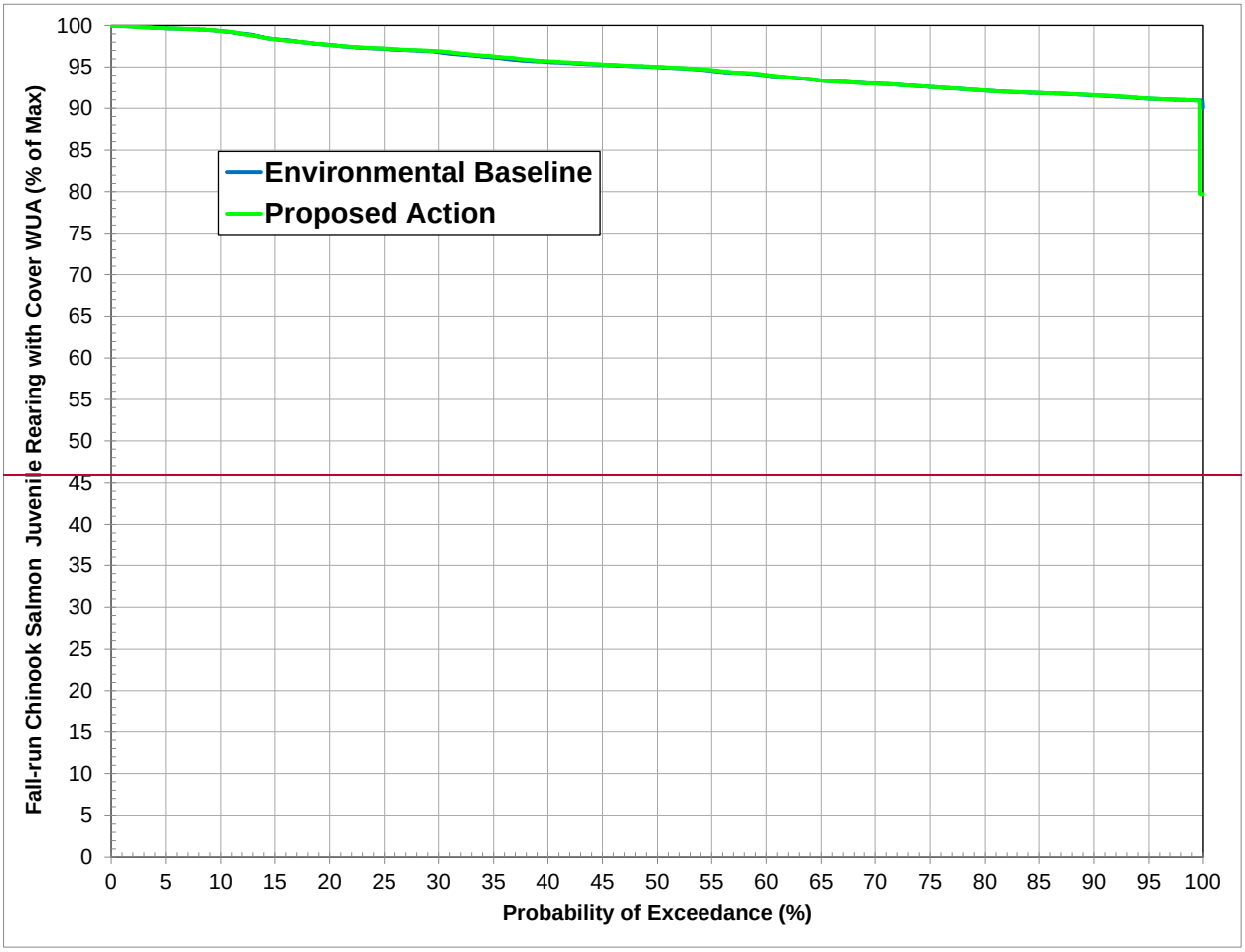
Over the entire 41-year simulation period, long-term average juvenile rearing habitat availability (WUA) in the lower Yuba River is the same under the Proposed Action and Environmental Baseline (long-term average of ~~95.0~~89.3 percent of the maximum WUA). The Proposed Action and Environmental Baseline also result in similar amounts of WUA by WYT. Both the Proposed Action and Environmental Baseline provide over 80 percent (and even over 90% in dry and critical years~~t~~) of fall-run Chinook salmon juvenile in-channel rearing maximum WUA during all WYTs.

Table 8.3-22. Long-term and WYT average fall-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Proposed Action~~	~~95.0~~	~~93.5~~	~~93.5~~	~~94.2~~	~~96.2~~	~~97.5~~
Environmental Baseline	95.0	93.5	93.5	94.2	96.3	97.5
Difference	0.0	0.0	0.0	0.0	-0.1	0.0
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Proposed Action	89.3	87.9	87.7	88.5	90.2	91.5
Environmental Baseline	89.3	87.9	87.7	88.5	90.3	91.5
Difference	0.0	0.0	0.0	0.0	-0.1	0.0

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat durations for fall-run Chinook salmon juvenile in-channel rearing under the Proposed Action and Environmental Baseline is presented in Figure 8.3-6. The Proposed Action and Environmental Baseline provide very similar amounts of habitat over the entire distribution. The Proposed Action and Environmental Baseline achieve over 80 percent ~~(and even 90%)~~ of juvenile in-channel rearing maximum WUA with about a 99 percent probability.



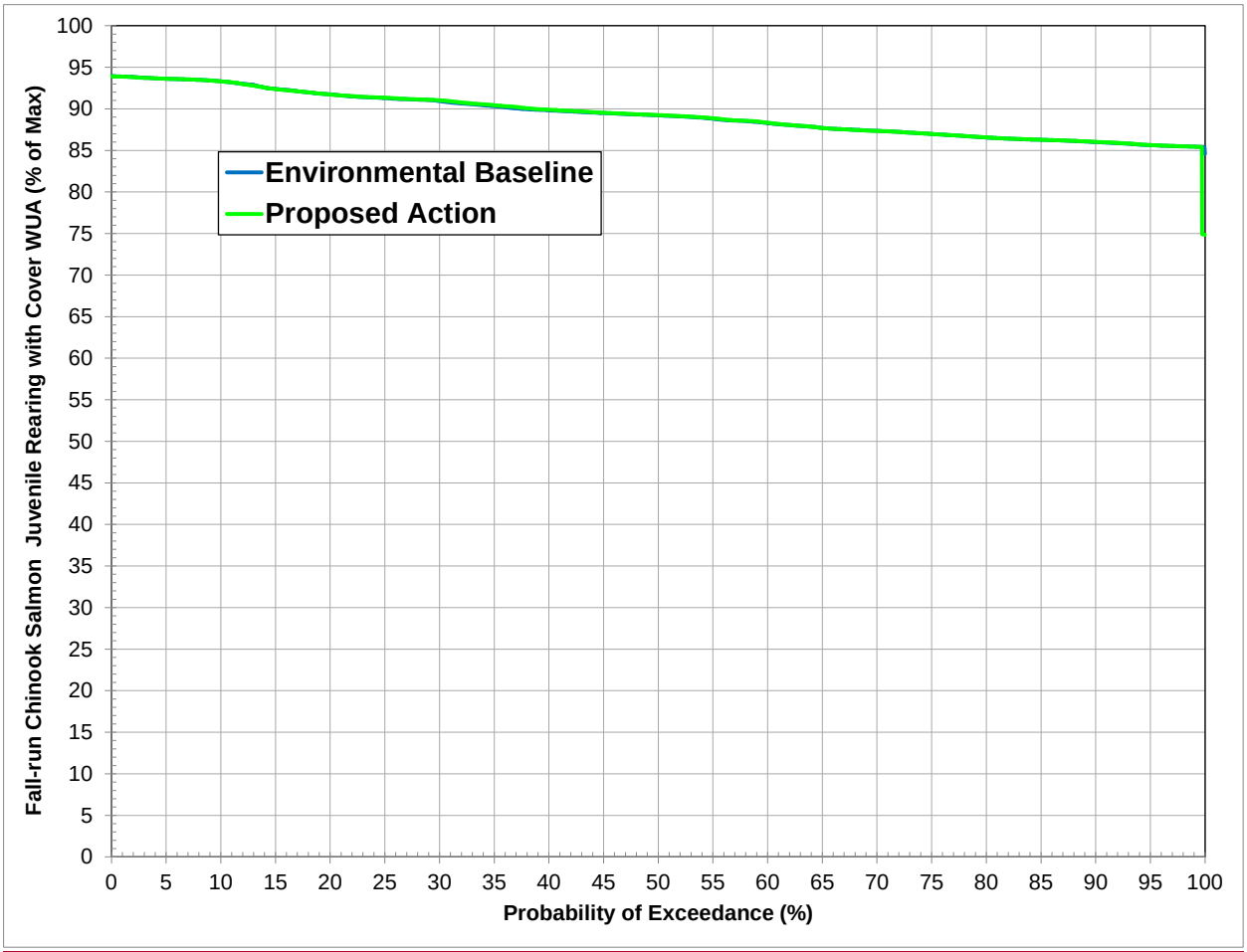


Figure 8.3-6. Fall-run Chinook salmon juvenile in-channel rearing habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.

During the juvenile rearing season of the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), ~~95.9~~90.1 percent of fall-run Chinook salmon juvenile rearing maximum WUA was provided under the Proposed Action compared to ~~96.7~~90.8 percent provided under the Environmental Baseline.

Pages EFH8-72 to EFH8-74

Spring-run Chinook Salmon Fry Full-Flow Rearing Habitat

Table 8.3-23 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon fry WUA without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by water year type.

Table 8.3-23. Spring-run Chinook salmon fry weighted usable area (WUA) without cover (in acres) under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**3,772**	**1,380**	**552**	**644**	**460**	**736**
Days ≤ 5,000 cfs	3,298	959	507	639	458	735
Days > 5,000 cfs	474	421	45	5	2	1
Avg. WUA	**154.4**	**58.1**	**22.4**	**25.3**	**18.3**	**30.3**
WUA ≤ 5,000 cfs	131.1	37.4	20.2	25.1	18.2	30.2
WUA > 5,000 cfs	23.3	20.7	2.2	0.2	0.1	0.0
Environmental Baseline						
Total Days in Analysis	**3,772**	**1,380**	**552**	**644**	**460**	**736**
Days ≤ 5,000 cfs	3,317	979	506	639	458	735
Days > 5,000 cfs	455	401	46	5	2	1
Avg. WUA	**154.3**	**58.0**	**22.3**	**25.3**	**18.3**	**30.3**
WUA ≤ 5,000 cfs	131.8	38.1	20.1	25.1	18.2	30.2
WUA > 5,000 cfs	22.5	19.9	2.3	0.2	0.1	0.0
Differences						
Avg. WUA	**0.1**	**0.1**	**0.1**	**0.0**	**-0.1**	**0.0**
% change	**0.1%**	**0.2%**	**0.3%**	**0.0%**	**-0.4%**	**0.0%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**3,772**	**1,472**	**460**	**644**	**368**	**828**
Days ≤ 5,000 cfs	3,298	1,042	424	639	366	827
Days > 5,000 cfs	474	430	36	5	2	1
Avg. WUA	**154.4**	**62.0**	**18.5**	**25.3**	**14.6**	**34.0**
WUA ≤ 5,000 cfs	131.1	40.8	16.8	25.1	14.5	33.9
WUA > 5,000 cfs	23.3	21.2	1.8	0.2	0.1	0.0
Environmental Baseline						
Total Days in Analysis	**3,772**	**1,472**	**460**	**644**	**368**	**828**
Days ≤ 5,000 cfs	3,317	1,061	424	639	366	827
Days > 5,000 cfs	455	411	36	5	2	1
Avg. WUA	**154.3**	**61.9**	**18.5**	**25.3**	**14.6**	**34.0**
WUA ≤ 5,000 cfs	131.8	41.5	16.7	25.1	14.6	33.9
WUA > 5,000 cfs	22.5	20.4	1.8	0.2	0.1	0.0
Differences						
Avg. WUA	**0.1**	**0.2**	**0.0**	**0.0**	**-0.1**	**0.0**
% change	**0.1%**	**0.2%**	**0.1%**	**0.0%**	**-0.6%**	**0.1%**

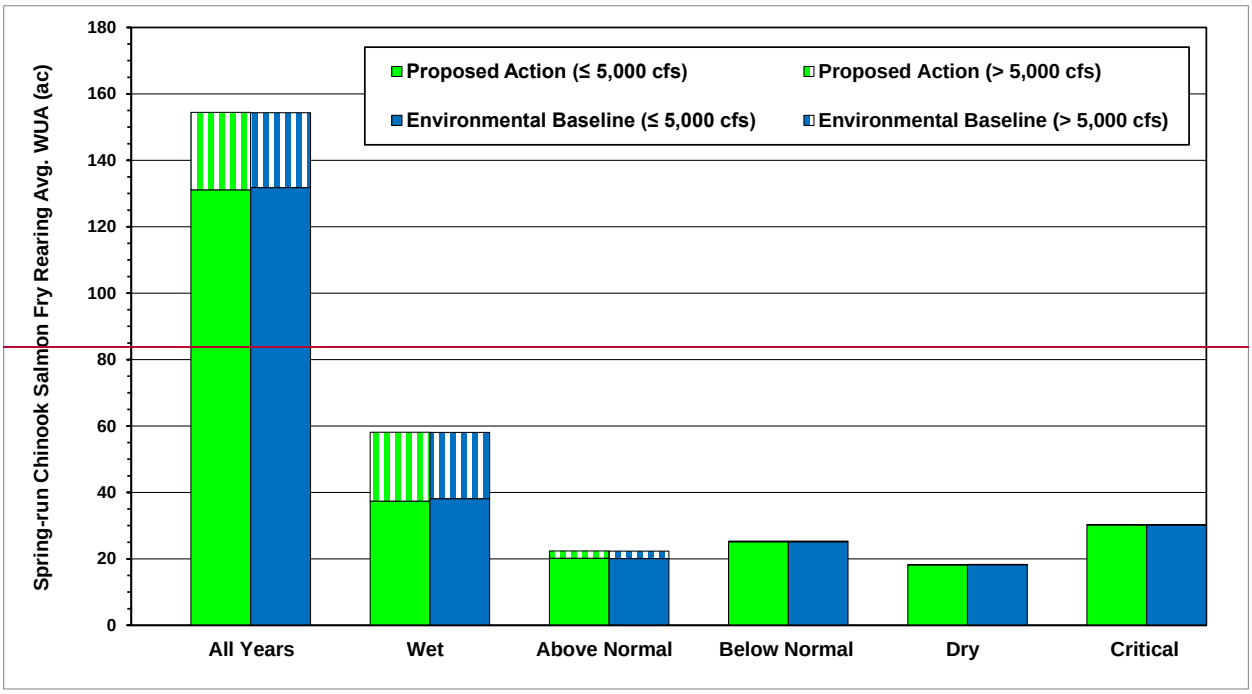
[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification

[2] Based on the WY 1970-2010 simulation period.

For the entire simulation period, very similar amounts of fry rearing habitat (total WUA) are available under the Proposed Action and the Environmental Baseline. Relative to the Environmental Baseline, the Proposed Action results in similar amounts of fry rearing habitat for all WYTs.

Long-term average of fall-run Chinook salmon fry weighted usable area (WUA) without cover, in acres, under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation and relative contribution to the long-term average of days when flows were ≤ 5,000 cfs and days when flows were > 5,000 cfs for the full simulation period and by water year type and the differences between the two scenarios.

Figure 8.3-7 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon fry WUA without cover under the Proposed Action and the Environmental Baseline s. For both scenarios, decreasing amounts of total habitat were provided from wet to above normal and from below normal to dry WYTs, and increasing amounts were provided for below normal and critical WYTs. For both the Proposed Action and Environmental Baseline, relatively little additional fry rearing WUA is provided by days when flows were > 5,000 cfs for below normal, dry and critical WYTs.



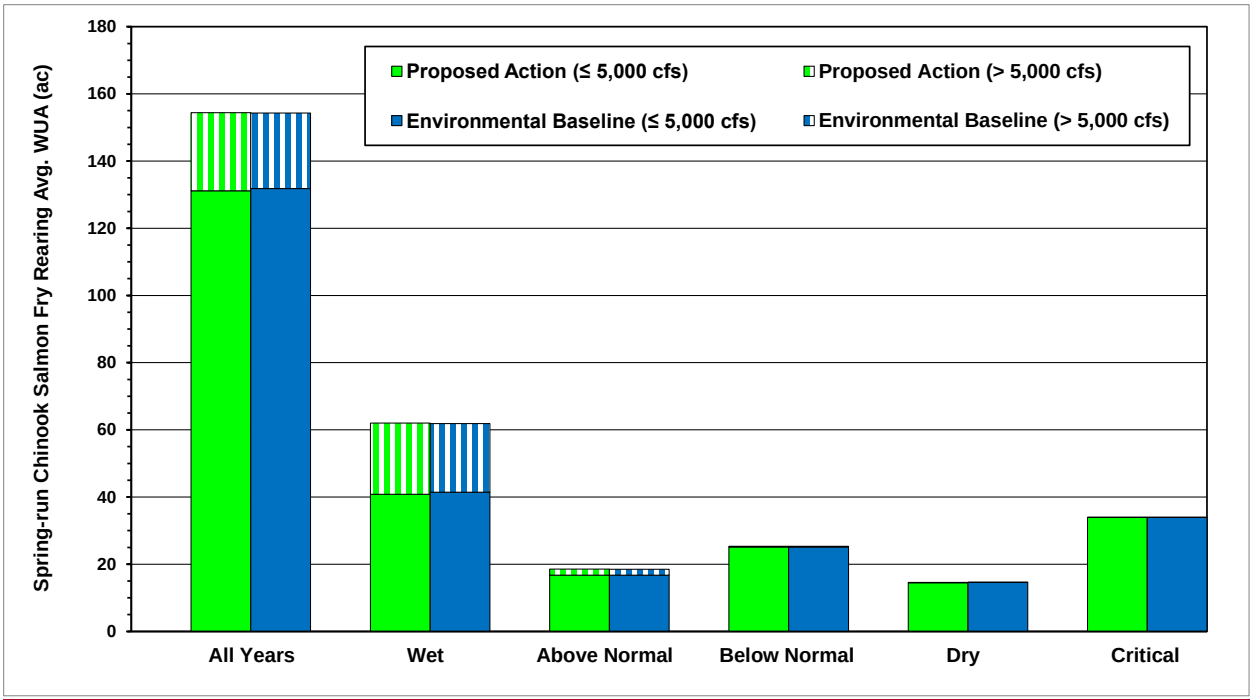


Figure 8.3-7. Comparison of the amounts (in acres) of spring-run Chinook salmon fry weighted usable area (WUA) without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages EFH8-74 to EFH8-76

Fall-run Chinook Salmon Fry Full-Flow Rearing Habitat

Table 8.3-24 displays the full-flow analysis of the amounts (ac) of fall-run Chinook salmon fry WUA without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by water year type.

For the entire simulation period, very similar amounts of fry rearing habitat (total WUA) are available under the Proposed Action and the Environmental Baseline. Relative to the Environmental Baseline, the Proposed Action results in similar amounts of fry rearing habitat for all WYTs.

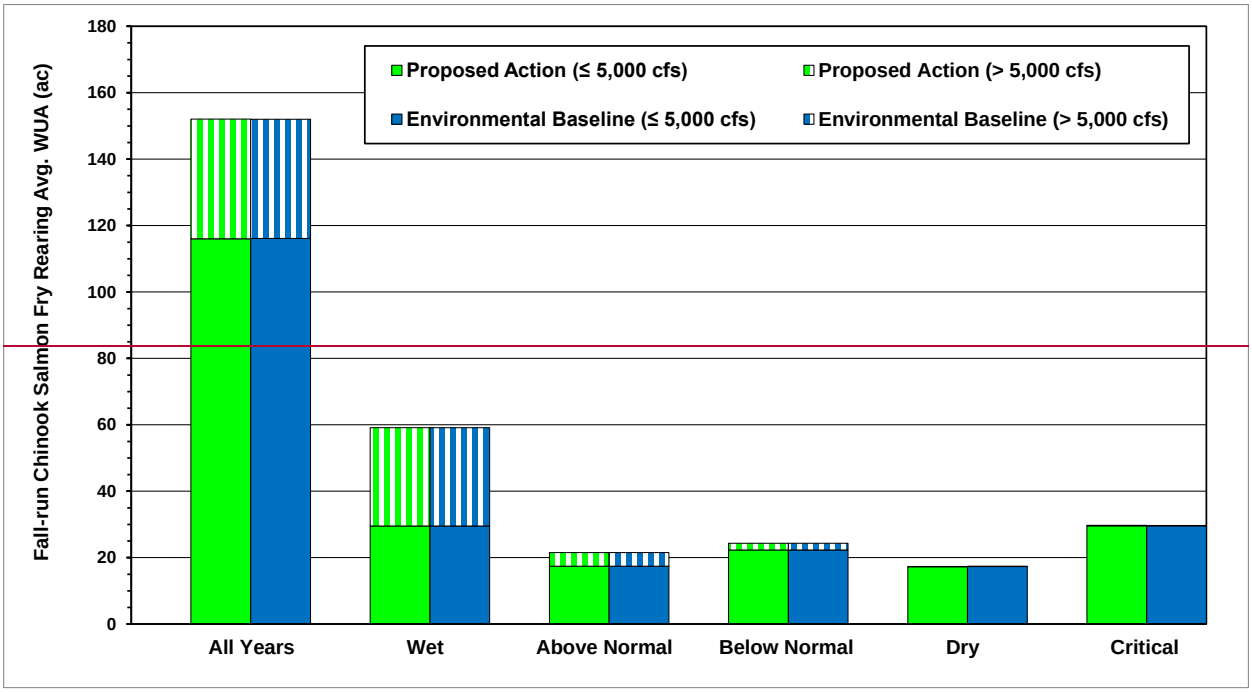
Table 8.3-24. Fall-run Chinook salmon fry weighted usable area (WUA) without cover (in acres) under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**5,586**	**2,043**	**817**	**954**	**681**	**1,091**
Days ≤ 5,000 cfs	4,489	1,151	686	887	678	1,087
Days > 5,000 cfs	1,097	892	131	67	3	4
Avg. WUA	**152.0**	**59.2**	**21.5**	**24.3**	**17.3**	**29.7**
WUA ≤ 5,000 cfs	116.0	29.5	17.4	22.3	17.2	29.6
WUA > 5,000 cfs	36.0	29.6	4.1	2.1	0.1	0.1
Environmental Baseline						
Total Days in Analysis	**5,586**	**2,043**	**817**	**954**	**681**	**1,091**
Days ≤ 5,000 cfs	4,493	1,154	686	888	678	1,087
Days > 5,000 cfs	1,093	889	131	66	3	4
Avg. WUA	**152.0**	**59.1**	**21.5**	**24.3**	**17.4**	**29.7**
WUA ≤ 5,000 cfs	116.1	29.5	17.4	22.3	17.3	29.6
WUA > 5,000 cfs	35.9	29.6	4.1	2.0	0.1	0.1
Differences						
Avg. WUA	**0.0**	**0.0**	**0.0**	**0.0**	**-0.1**	**0.0**
% change	**0.0%**	**0.1%**	**0.0%**	**0.1%**	**-0.4%**	**0.1%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**5,586**	**2,179**	**681**	**954**	**545**	**1,227**
Days ≤ 5,000 cfs	4,489	1,265	572	887	542	1,223
Days > 5,000 cfs	1,097	914	109	67	3	4
Avg. WUA	**152.0**	**62.8**	**17.8**	**24.3**	**13.8**	**33.2**
WUA ≤ 5,000 cfs	116.0	32.5	14.4	22.3	13.7	33.1
WUA > 5,000 cfs	36.0	30.4	3.4	2.1	0.1	0.1
Environmental Baseline						
Total Days in Analysis	**5,586**	**2,179**	**681**	**954**	**545**	**1,227**
Days ≤ 5,000 cfs	4,493	1,267	573	888	542	1,223
Days > 5,000 cfs	1,093	912	108	66	3	4
Avg. WUA	**152.0**	**62.8**	**17.9**	**24.3**	**13.9**	**33.2**
WUA ≤ 5,000 cfs	116.1	32.5	14.5	22.3	13.8	33.1
WUA > 5,000 cfs	35.9	30.3	3.4	2.0	0.1	0.1
Differences						
Avg. WUA	**0.0**	**0.1**	**0.0**	**0.0**	**-0.1**	**0.1**
% change	**0.0%**	**0.1%**	**-0.1%**	**0.1%**	**-0.6%**	**0.2%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification
[2] Based on the WY 1970-2010 simulation period.

Figure 8.3-8 displays the full-flow analysis of the amounts (in acres) of fall-run Chinook salmon fry WUA without cover under the Proposed Action and the Environmental Baseline. For both scenarios, decreasing amounts of total habitat were provided from wet to above normal and from below normal to dry WYTs, and increasing amounts were provided for below normal and critical WYTs. For both the Proposed Action and Environmental Baseline, relatively little additional fry rearing WUA is provided by days when flows were > 5,000 cfs for dry and critical WYTs.



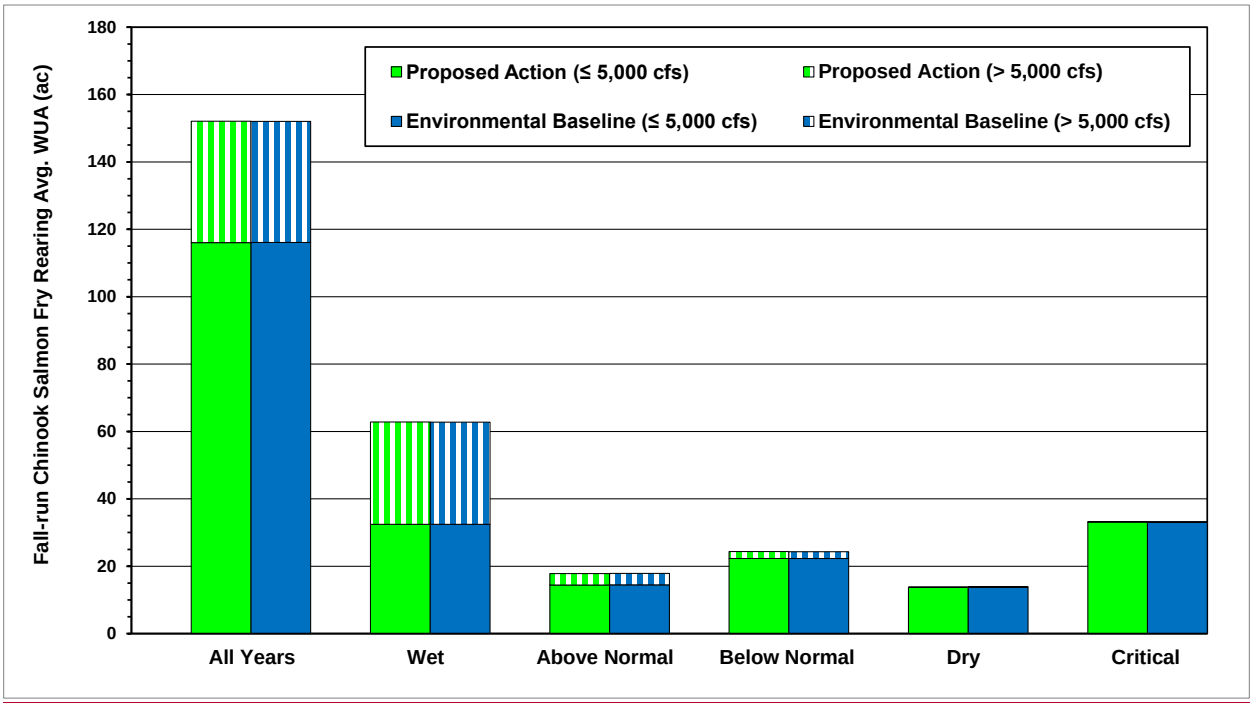


Figure 8.3-8. Comparison of the amounts (in acres) of fall-run Chinook salmon fry weighted usable area (WUA) without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages EFH8-76 to EFH8-78

Spring-run Chinook Salmon Juvenile Full-Flow Rearing Habitat

Table 8.3-25 displays the full-flow analysis of the amounts (ac) of spring-run Chinook salmon juvenile WUA without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. For the entire simulation period, similar amounts of juvenile rearing habitat (total WUA) are available under the Proposed Action and the Environmental Baseline. Relative to the Environmental Baseline, the Proposed Action results in very similar amounts of juvenile rearing habitat for all WYTs, with the exception of critical WYs when 0.8 percent more habitat is provided under the Proposed Action.

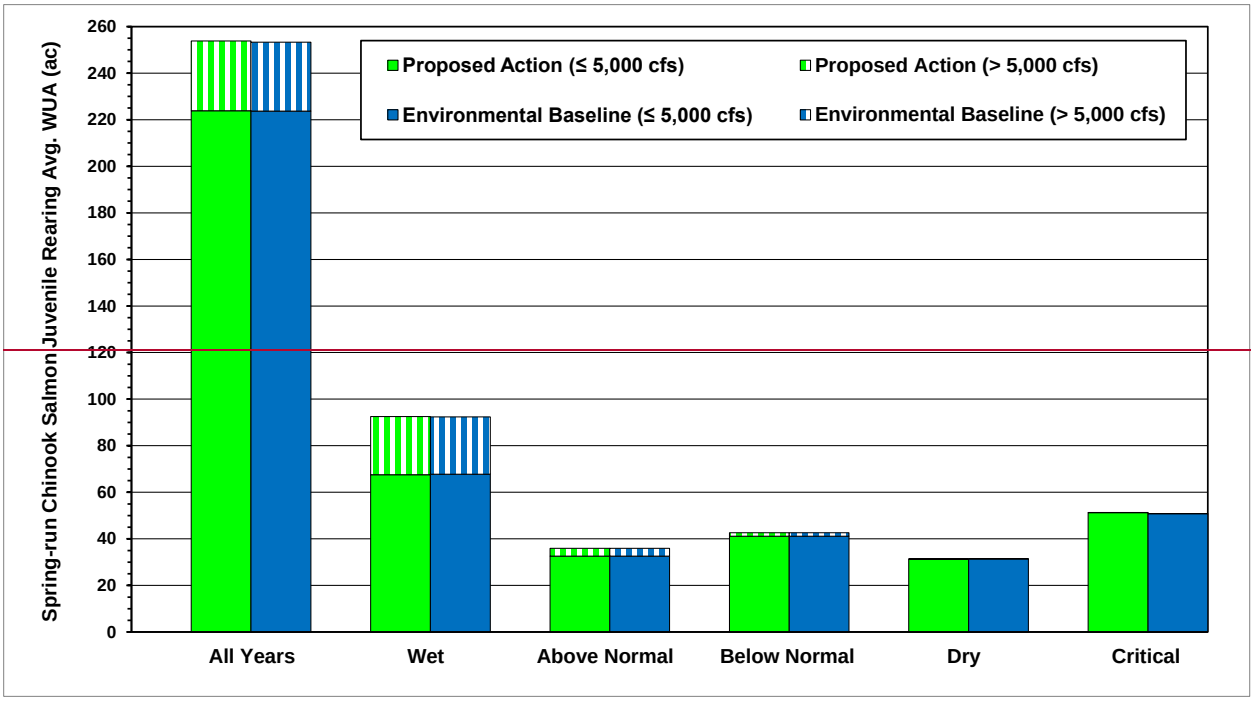
Table 8.3-25. Spring-run Chinook salmon juvenile weighted usable area (WUA) without cover (in acres) under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**14,974**	**5,477**	**2,191**	**2,557**	**1,826**	**2,923**
Days ≤ 5,000 cfs	13,387	4,175	2,002	2,468	1,823	2,919
Days > 5,000 cfs	1,587	1,302	189	89	3	4
Avg. WUA	**253.8**	**92.5**	**35.9**	**42.7**	**31.4**	**51.3**
WUA ≤ 5,000 cfs	223.8	67.5	32.6	41.1	31.4	51.3
WUA > 5,000 cfs	30.0	25.0	3.3	1.5	0.0	0.1
Environmental Baseline						
Total Days in Analysis	**14,974**	**5,477**	**2,191**	**2,557**	**1,826**	**2,923**
Days ≤ 5,000 cfs	13,411	4,198	2,003	2,468	1,823	2,919
Days > 5,000 cfs	1,563	1,279	188	89	3	4
Avg. WUA	**253.3**	**92.4**	**35.9**	**42.6**	**31.4**	**50.9**
WUA ≤ 5,000 cfs	223.7	67.8	32.6	41.1	31.4	50.8
WUA > 5,000 cfs	29.6	24.6	3.3	1.5	0.0	0.1
Differences						
Avg. WUA	**0.5**	**0.1**	**0.0**	**0.0**	**0.0**	**0.4**
% change	**0.2%**	**0.1%**	**0.0%**	**0.0%**	**-0.1%**	**0.8%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**14,974**	**5,842**	**1,826**	**2,557**	**1,461**	**3,288**
Days ≤ 5,000 cfs	13,387	4,518	1,659	2,468	1,458	3,284
Days > 5,000 cfs	1,587	1,324	167	89	3	4
Avg. WUA	**253.8**	**98.5**	**30.0**	**42.7**	**25.1**	**57.7**
WUA ≤ 5,000 cfs	223.8	73.1	27.0	41.1	25.0	57.6
WUA > 5,000 cfs	30.0	25.4	2.9	1.5	0.0	0.1
Environmental Baseline						
Total Days in Analysis	**14,974**	**5,842**	**1,826**	**2,557**	**1,461**	**3,288**
Days ≤ 5,000 cfs	13,411	4,540	1,661	2,468	1,458	3,284
Days > 5,000 cfs	1,563	1,302	165	89	3	4
Avg. WUA	**253.3**	**98.3**	**29.9**	**42.6**	**25.1**	**57.2**
WUA ≤ 5,000 cfs	223.7	73.3	27.1	41.1	25.1	57.2
WUA > 5,000 cfs	29.6	25.0	2.9	1.5	0.0	0.1
Differences						
Avg. WUA	**0.5**	**0.1**	**0.0**	**0.0**	**0.0**	**0.4**
% change	**0.2%**	**0.1%**	**0.0%**	**0.0%**	**-0.2%**	**0.8%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification
[2] Based on the WY 1970-2010 simulation period.

Figure 8.3-9 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon juvenile WUA without cover under the Proposed Action and the Environmental Baseline. For both scenarios, decreasing amounts of total habitat were provided from wet to above normal and from below normal to dry WYTs, and increasing amounts were provided for below normal and critical WYTs. For both the Proposed Action and Environmental Baseline, relatively little additional juvenile rearing WUA is provided by days when flows were > 5,000 cfs for below normal, dry and critical WYTs.



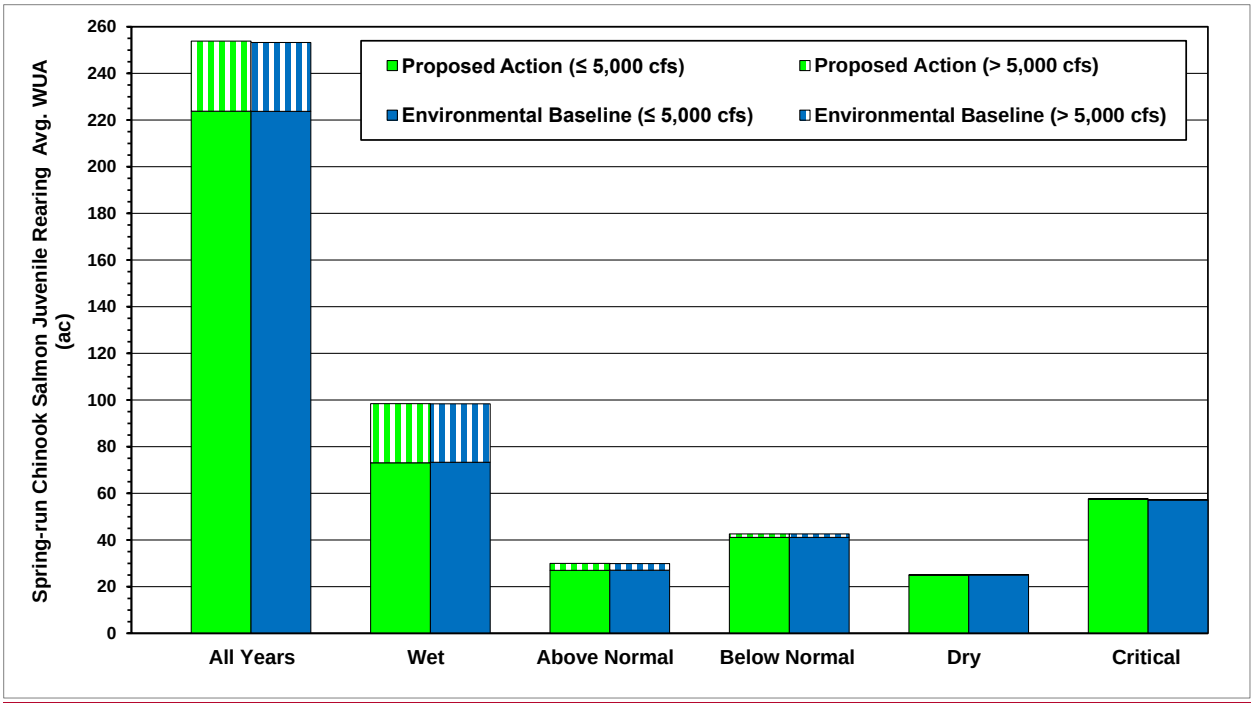


Figure 8.3-9. Comparison of the amounts (in acres) of spring-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages EFH8-78 to EFH8-80

Fall-run Chinook Salmon Juvenile Full-Flow Rearing Habitat

Table 8.3-26 displays the full-flow analysis of the amounts (ac) of fall-run Chinook salmon juvenile WUA without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. For the entire simulation period, similar amounts of juvenile rearing habitat (total WUA) are available under the Proposed Action and the Environmental Baseline. Relative to the Environmental Baseline, the Proposed Action results in similar amounts of juvenile rearing habitat for all WYTs.

Table 8.3-26. Fall-run Chinook salmon juvenile weighted usable area (WUA) without cover (in acres) under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.

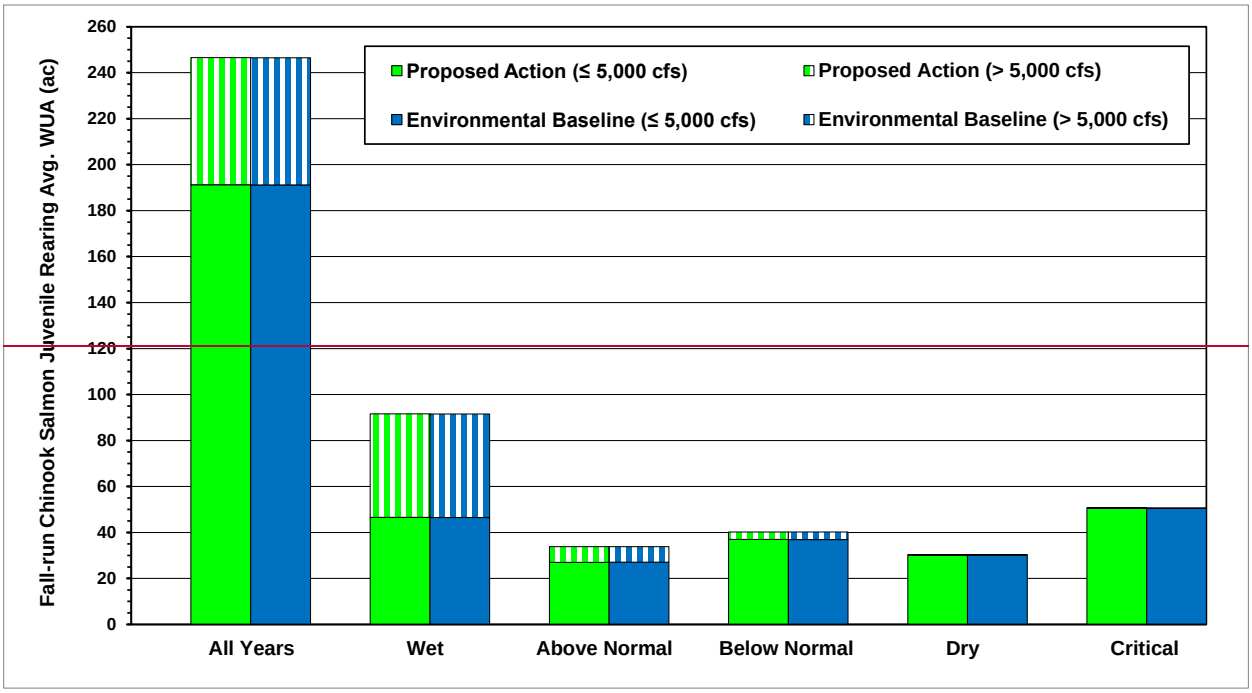
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**6,816**	**2,493**	**997**	**1,164**	**831**	**1,331**
Days ≤ 5,000 cfs	5,475	1,422	820	1,078	828	1,327
Days > 5,000 cfs	1,341	1,071	177	86	3	4
Avg. WUA	**246.6**	**91.6**	**33.8**	**40.2**	**30.3**	**50.7**
WUA ≤ 5,000 cfs	191.3	46.6	27.0	36.9	30.2	50.5
WUA > 5,000 cfs	55.3	45.0	6.8	3.3	0.1	0.2
Environmental Baseline						
Total Days in Analysis	**6,816**	**2,493**	**997**	**1,164**	**831**	**1,331**
Days ≤ 5,000 cfs	5,474	1,420	821	1,078	828	1,327
Days > 5,000 cfs	1,342	1,073	176	86	3	4
Avg. WUA	**246.4**	**91.5**	**33.8**	**40.2**	**30.3**	**50.7**
WUA ≤ 5,000 cfs	191.2	46.5	27.0	36.9	30.2	50.5
WUA > 5,000 cfs	55.2	45.0	6.8	3.3	0.1	0.2
Differences						
Avg. WUA	**0.1**	**0.1**	**0.0**	**0.0**	**-0.1**	**0.1**
% change	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**-0.2%**	**0.1%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Proposed Action						
Total Days in Analysis	**6,816**	**2,659**	**831**	**1,164**	**665**	**1,497**
Days ≤ 5,000 cfs	5,475	1,570	672	1,078	662	1,493
Days > 5,000 cfs	1,341	1,089	159	86	3	4
Avg. WUA	**246.57**	**97.2**	**28.2**	**40.2**	**24.1**	**56.9**
WUA ≤ 5,000 cfs	191.3	51.5	22.2	36.9	24.0	56.7
WUA > 5,000 cfs	55.3	45.7	6.1	3.3	0.1	0.2
Environmental Baseline						
Total Days in Analysis	**6,816**	**2,659**	**831**	**1,164**	**665**	**1,497**
Days ≤ 5,000 cfs	5,474	1,567	674	1,078	662	1,493
Days > 5,000 cfs	1,342	1,092	157	86	3	4
Avg. WUA	**246.4**	**97.1**	**28.2**	**40.2**	**24.2**	**56.8**
WUA ≤ 5,000 cfs	191.2	51.4	22.2	36.9	24.1	56.6
WUA > 5,000 cfs	55.2	45.7	6.0	3.3	0.1	0.2
Differences						
Avg. WUA	**0.12**	**0.1**	**0.0**	**0.0**	**-0.1**	**0.1**
% change	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**-0.4%**	**0.2%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification

[2] Based on the WY 1970-2010 simulation period.

Figure 8.3-10 displays the full-flow analysis of the amounts (in acres) of fall-run Chinook salmon juvenile WUA without cover under the Proposed Action and the Environmental Baseline. For both scenarios, decreasing amounts of total habitat were provided from wet to above normal and from below normal to dry WYTs, and increasing amounts were provided for below normal and critical WYTs. For both the Proposed Action and Environmental Baseline, relatively little additional juvenile rearing WUA is provided by days when flows were > 5,000 cfs for dry and critical WYTs.



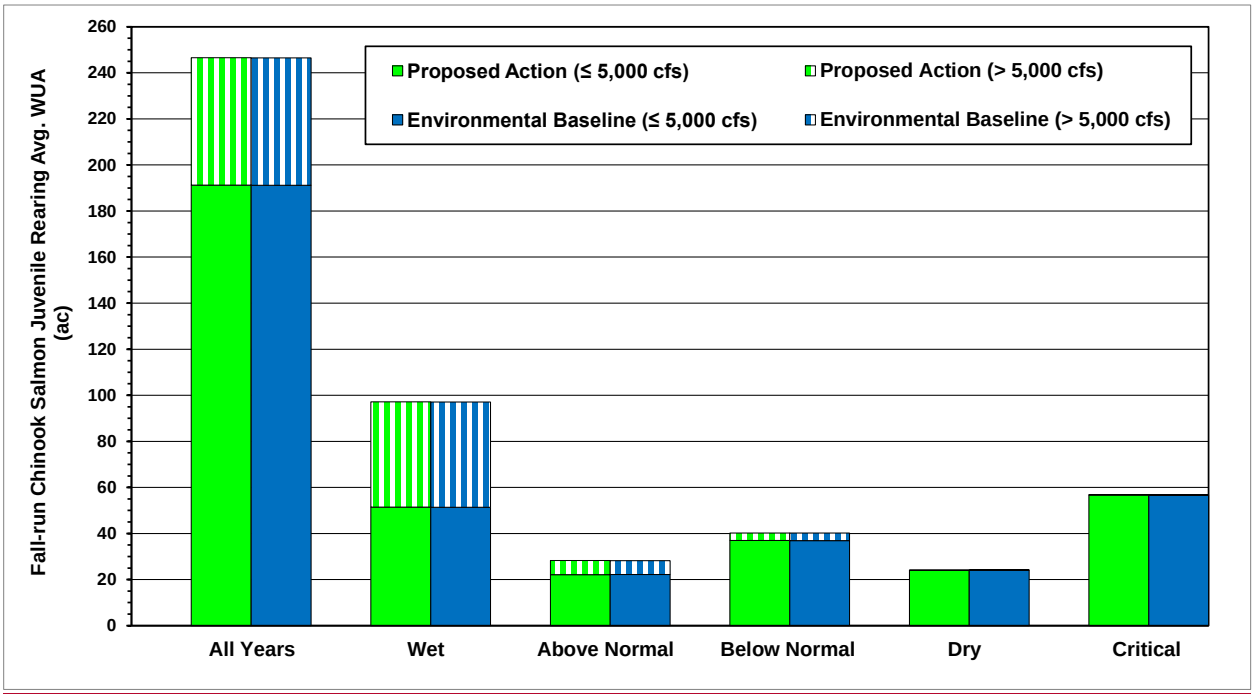


Figure 8.3-10. Comparison of the amounts (in acres) of fall-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

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8.4.4.1.1 Spring-run Chinook Salmon Spawning Habitat Availability

Because flows do not exceed 5,000 cfs during the September through mid-October spring-run Chinook salmon spawning period under the Cumulative Condition and Environmental Baseline, the limitation does not exclude any daily flows from the spring-run Chinook salmon spawning WUA analysis. Tables 8.4-13 displays the long-term average and average by WYT of spring-run Chinook salmon spawning WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

Table 8.4-13. Long-term and water year type average spring-run Chinook salmon spawning WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

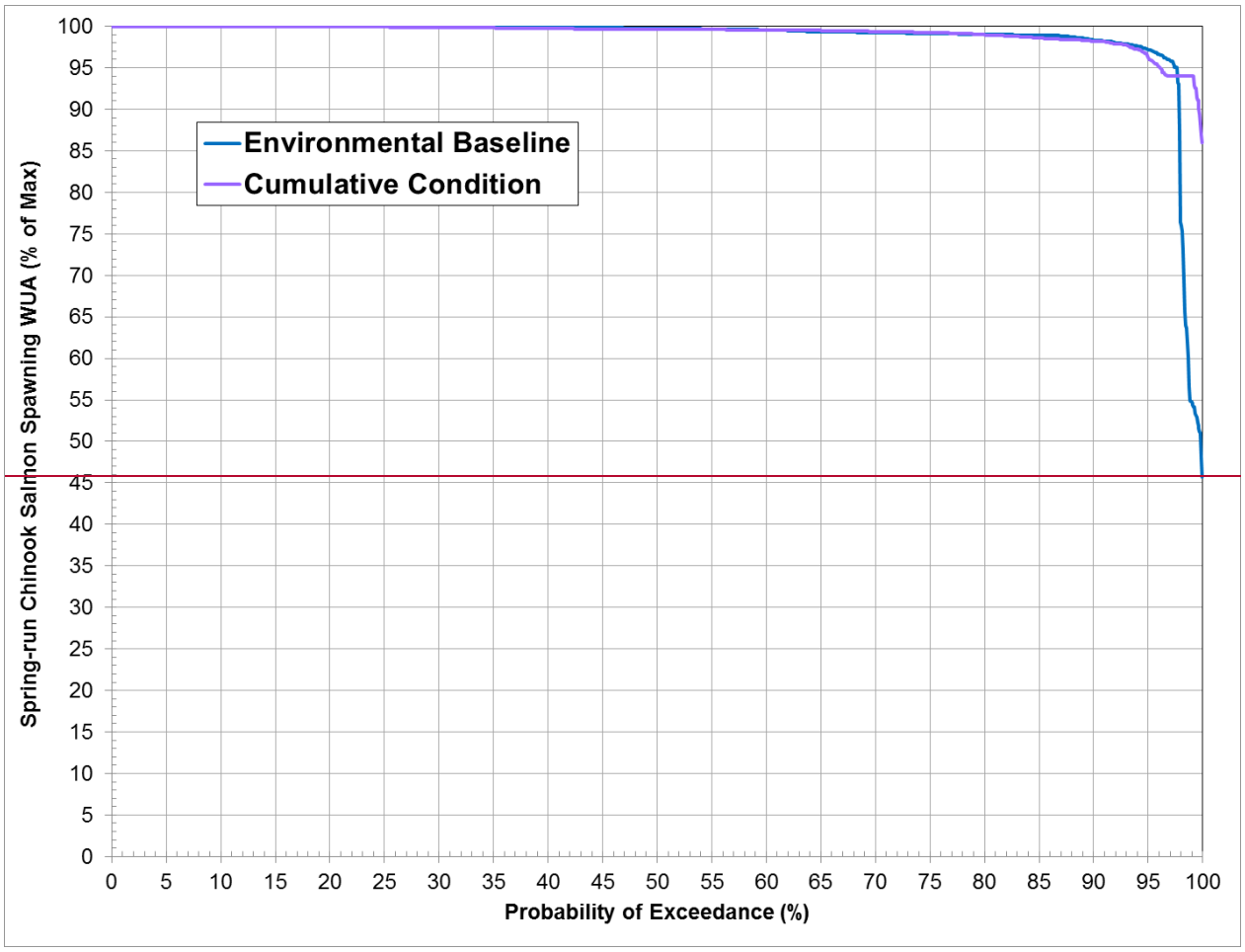
Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Cumulative Condition~~	~~99.2~~	~~99.0~~	~~99.1~~	~~99.6~~	~~99.7~~	~~99.0~~
Environmental Baseline	98.6	99.3	99.4	99.6	99.6	95.9
Difference	0.6	-0.3	-0.3	0.0	0.1	3.1

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition	98.2	97.9	98.5	98.6	98.7	98.1
Environmental Baseline	97.6	98.2	98.7	98.6	98.6	95.4
Difference	0.6	-0.3	-0.2	0.0	0.1	2.7

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average spring-run Chinook salmon in-channel spawning habitat availability (percent of maximum WUA) in the lower Yuba River is similar, but slightly higher under the Cumulative Condition relative to the Environmental Baseline (long-term average of ~~99.2~~98.2% versus ~~98.6~~97.6% of maximum WUA). The Cumulative Condition provides very similar amounts of spawning habitat availability (percent of maximum WUA) during all WYTs, with the exception of critical WYs, when the Cumulative Condition provides ~~3.1~~2.7 percent more spawning habitat. As with the Environmental Baseline, the Cumulative Condition provides, on the average, over 80 percent (and even 90%) of maximum spawning WUA during all WYTs.

Habitat durations for spring-run Chinook salmon spawning under the Cumulative Condition and Environmental Baseline are presented in Figure 8.4-1. The Cumulative Condition provides similar amounts of in-channel spawning habitat availability over nearly the entire exceedance probability distribution, relative to the Environmental Baseline. Also, the Cumulative Condition achieves over 80 percent (and even 90%) of maximum spawning WUA with about a 100 percent probability, while the Environmental Baseline achieves over 80 percent of maximum spawning WUA with about a 98 percent probability.



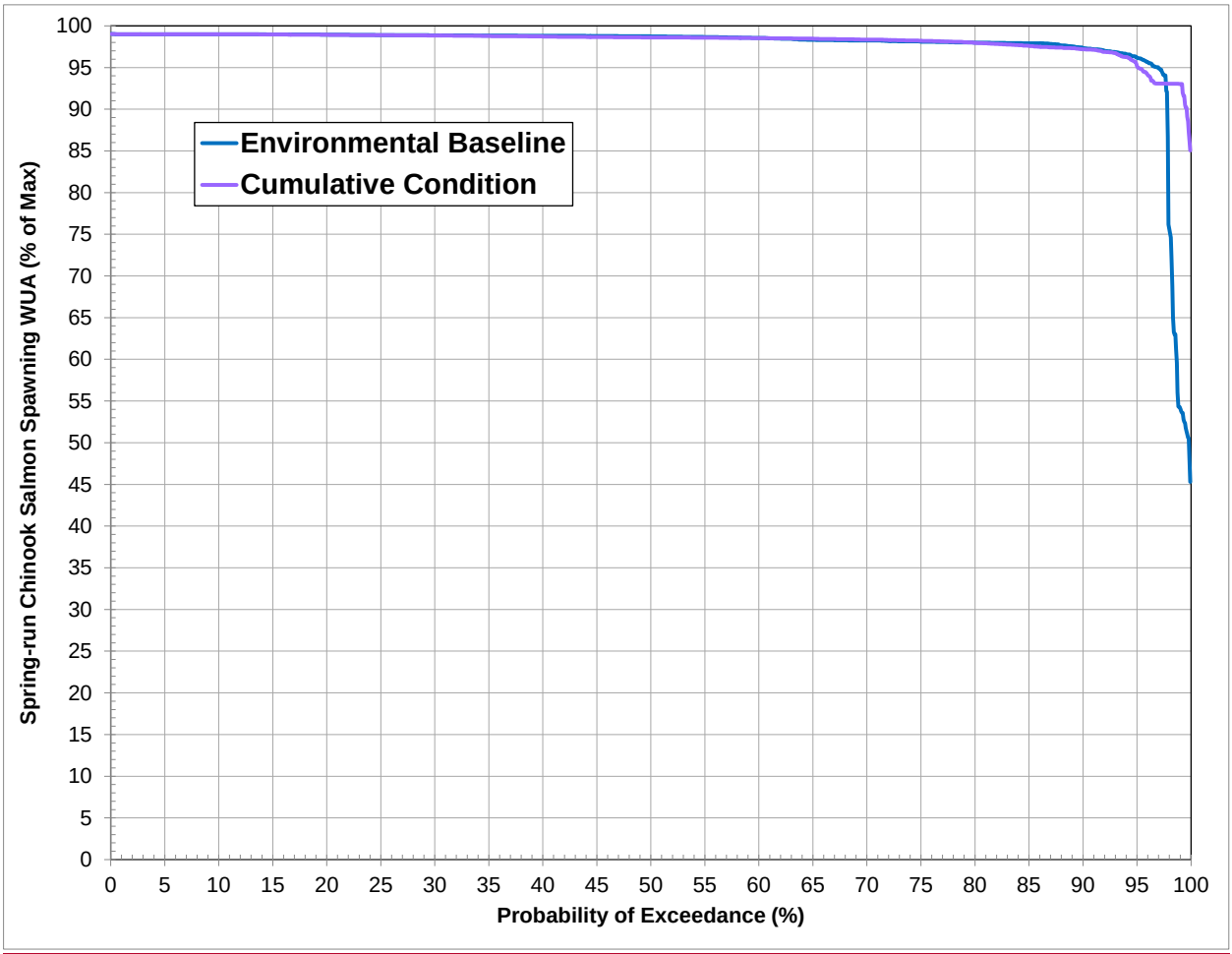


Figure 8.4-1. Spring-run Chinook salmon spawning habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), ~~94.3~~94.8 percent of spring-run Chinook salmon maximum spawning WUA was provided under the Cumulative Condition compared to ~~71.5~~71.8 percent provided under the Environmental Baseline.

Flow-dependent spawning habitat availability under the Cumulative Condition is similar to, or slightly greater than that under the Environmental Baseline. Flow-dependent spawning habitat availability for spring-run Chinook salmon remains characterized as a low stressor under the Cumulative Condition.

Pages EFH8-108 to EFH8-110

8.4.4.1.2 Fall-run Chinook Salmon Spawning Habitat Availability

Because a small proportion (3.3% and 2.8%, respectively) of daily flows exceed 5,000 cfs during the October through December fall-run Chinook salmon spawning period under the Cumulative Condition and Environmental Baseline, these daily flows were excluded from the fall-run Chinook salmon spawning WUA analysis. Tables 8.4-14 displays the long-term average and average by WYT of fall-run Chinook salmon spawning habitat (percent of maximum WUA) under the Cumulative Condition and Environmental Baseline.

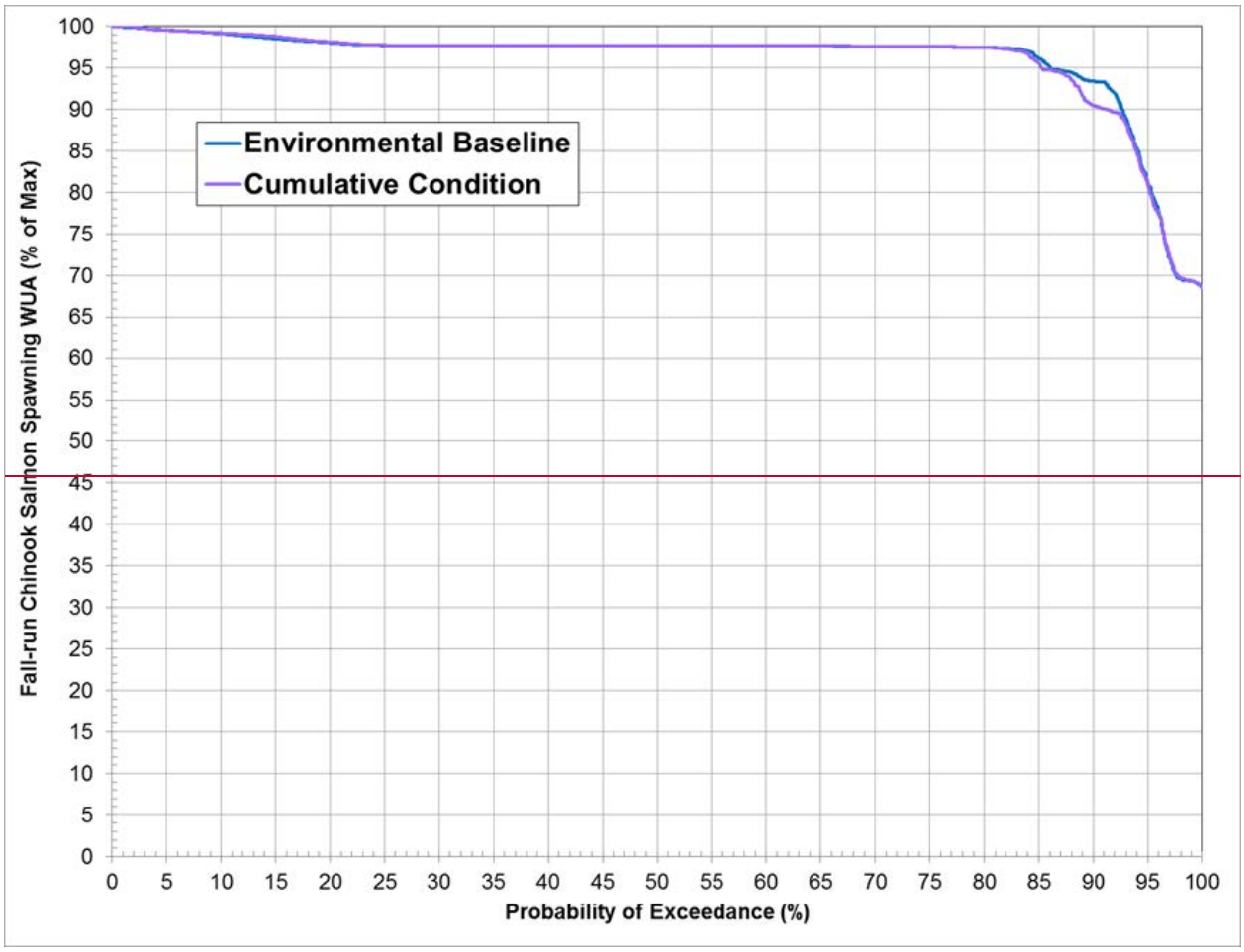
Table 8.4-14. Long-term and water year type average fall-run Chinook salmon spawning WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Cumulative Condition~~	~~96.0~~	~~94.3~~	~~95.4~~	~~95.6~~	~~97.4~~	~~97.7~~
Environmental Baseline	96.1	94.2	96.0	95.8	97.6	97.8
Difference	-0.1	0.1	-0.6	-0.2	-0.2	-0.1
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Cumulative Condition	95.3	93.3	96.0	94.9	96.6	97.0
Environmental Baseline	95.4	93.4	96.1	95.1	96.9	97.1
Difference	-0.1	-0.1	-0.1	-0.2	-0.3	-0.1

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average fall-run Chinook salmon in-channel spawning habitat availability (percent of maximum WUA) in the lower Yuba River is similar under the Cumulative Condition and Environmental Baseline (long-term average of ~~96.0~~95.3 and ~~96.1~~95.4 percent of the maximum WUA, respectively). The Cumulative Condition provides similar amounts of spawning habitat by WYT, ~~but provides~~with 0.1 percent ~~more~~less maximum spawning habitat during wet, above normal and critical~~–~~ WYs, 0.2 percent less during below normal WYs and ~~0.6~~0.3 percent less during ~~above normal~~dry WYs. Both the Environmental Baseline and the Cumulative Condition provide, on the average, over 90 percent of maximum spawning WUA during any WYT.

Habitat durations for fall-run Chinook salmon spawning under the Cumulative Condition and Environmental Baseline are presented in Figure 8.4-2. The Cumulative Condition provides similar amounts of in-channel spawning habitat availability overall, but provides somewhat less spawning habitat availability over about the 87-93 percent of the exceedance probability distribution. Also, the Cumulative Condition and the Environmental Baseline provide over 80 percent of maximum spawning WUA with about a 95 percent probability, and provide over 90 percent of maximum spawning WUA with about a ~~92-93~~90 percent probability.



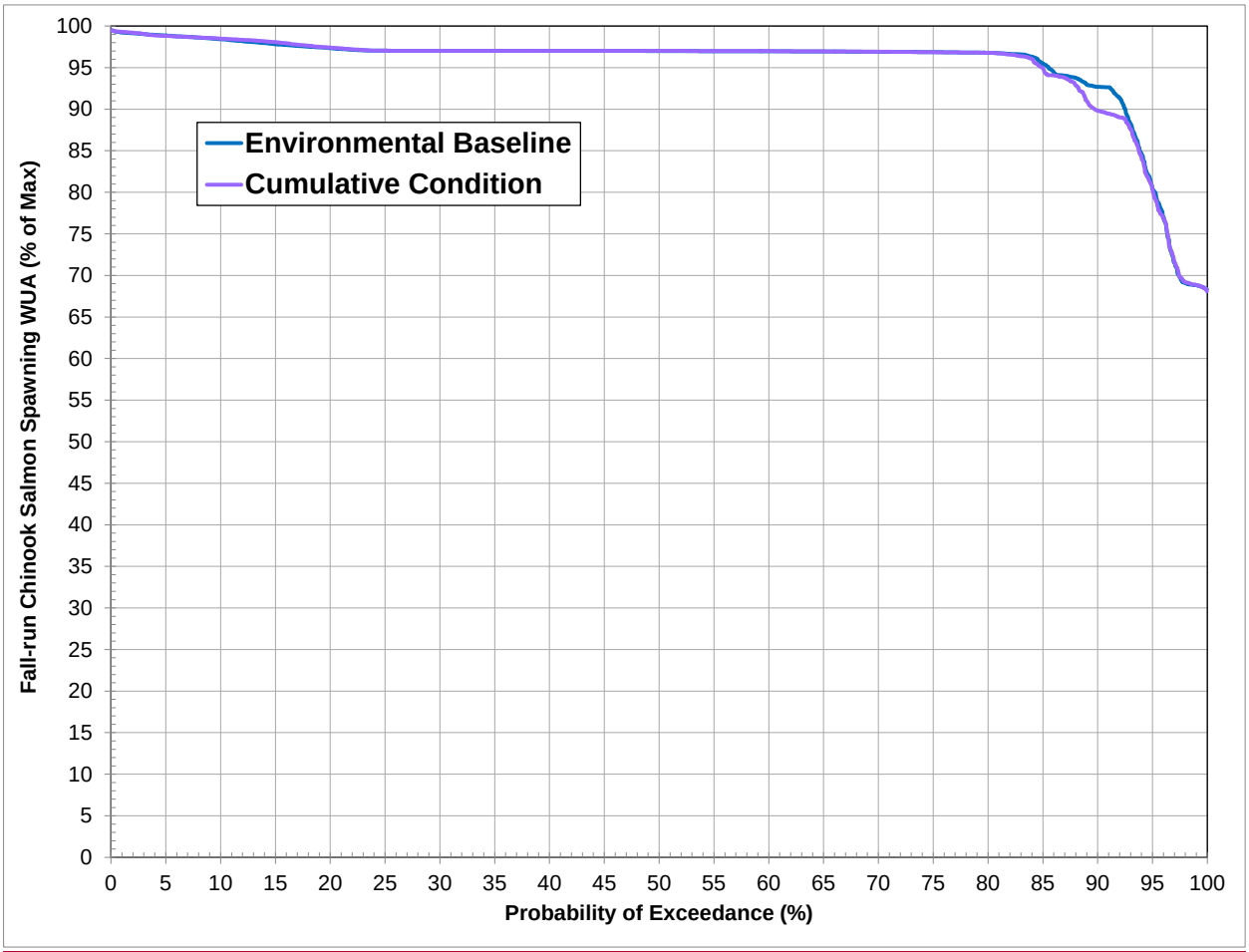


Figure 8.4-2. Fall-run Chinook salmon spawning habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), ~~90.3~~95.8 percent of fall-run Chinook salmon maximum spawning WUA was provided under the Cumulative Condition compared to ~~93.1~~96.0 percent provided under the Environmental Baseline.

Flow-dependent spawning habitat availability under the Cumulative Condition is similar to, or slightly greater than that under the Environmental Baseline. Flow-dependent spawning habitat availability for fall-run Chinook salmon remains characterized as a low stressor under the Cumulative Condition.

Pages EFH8-110 to EFH8-113

8.4.4.2 Potential Redd Dewatering

8.4.4.2.1 Spring-run Chinook Salmon

For every day of the annual embryo incubation period over the 33 years simulated, the long-term annual average of the percentage of spring-run Chinook salmon redds potentially dewatered under the Cumulative Condition is very low, and similar to that under the Environmental Baseline. The average percentage of redds potentially dewatered by WYTs under the Cumulative Condition would be very low, and similar to that under the Environmental Baseline (Table 8.4-15).

Table 8.4-15. Estimated spring-run Chinook salmon redd and egg pocket potential dewatering under the Cumulative Condition relative to the Environmental Baseline.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	0.03%	0.01%	0.02%	0.00%	0.00%	0.00%
Wet	0.06%	0.02%	0.04%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Critical	0.01%	0.00%	0.01%	0.00%	0.00%	0.00%

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	0.03%	0.01%	0.02%	0.00%	0.00%	0.00%
Wet	0.06%	0.02%	0.04%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Critical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

The long-term and WYT averages of the percentage of egg pockets dewatered indicates that no egg pockets would be dewatered under the Cumulative Condition or the Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), no spring-run Chinook salmon redds or egg pockets would potentially be dewatered under the Cumulative Condition or under the Environmental Baseline.

As previously discussed, Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam, was developed in part to minimize the potential for spring-run Chinook salmon redd dewatering during the period from September 2 through December 31 (corresponding to the spring-run Chinook salmon spawning and incubation period).

Proposed Condition AR9 does not necessarily apply to every day each year of the embryo incubation period. During the days over the 33-year period of evaluation when this proposed

condition would apply, it would provide the intended protection for spring-run Chinook salmon redd dewatering (Table 8.4-16).

Table 8.4-16. Estimated spring-run Chinook salmon redd and egg pocket potential dewatering under the Cumulative Condition relative to the Environmental Baseline for those days in the 33-year period of record during which the flow reduction criteria specified in Proposed Condition AR9 would apply.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	0.03%	0.01%	0.02%	0.00%	0.00%	0.00%
Wet	0.06%	0.01%	0.05%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Critical	0.01%	0.00%	0.01%	0.00%	0.00%	0.00%

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	0.03%	0.01%	0.02%	0.00%	0.00%	0.00%
Wet	0.06%	0.02%	0.04%	0.00%	0.00%	0.00%
Above Normal	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Below Normal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Critical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Spring-run Chinook salmon redd dewatering under the Cumulative Condition is estimated to be very low and similar to that under the Environmental Baseline. Potential redd dewatering would be a low stressor to spring-run Chinook salmon under the Cumulative Condition.

8.4.4.2.2 Fall-run Chinook Salmon

For every day of the annual embryo incubation period over the 33 years simulated, the long-term annual average of the percentage of fall-run Chinook salmon redds potentially dewatered under the Cumulative Condition is low, averaging 1.57 percent annually, very similar to the 1.20 percent average under the Environmental Baseline. Applying these long-term averages to the number of fall-run Chinook redds observed during 2009 and 2010 (2,079 and 1,559 redds, respectively), it is estimated that about 32 and 19 fall-run Chinook salmon redds would have been dewatered under the Cumulative Condition and Environmental Baseline, respectively.

The average percentage of redds potentially dewatered would also be small, and generally similar under the Cumulative Condition and Environmental Baseline during all WYTs (Table 8.4-17), with the percentages generally decreasing from "wetter" to "drier" years under both scenarios.

Table 8.4-17. Estimated fall-run Chinook salmon redd and egg pocket potential dewatering under the Cumulative Condition relative to the Environmental Baseline.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	1.57%	1.20%	0.37%	0.85%	0.68%	0.17%
Wet	3.39%	2.73%	0.66%	2.00%	1.68%	0.32%
Above Normal	0.53%	0.43%	0.10%	0.30%	0.24%	0.06%
Below Normal	2.25%	1.44%	0.81%	0.97%	0.65%	0.32%
Dry	0.31%	0.20%	0.11%	0.09%	0.04%	0.05%
Critical	0.15%	0.09%	0.06%	0.02%	0.01%	0.01%
WYT Categories	**Redd Dewatering Index (%)**			**Egg Pocket Dewatering Index (%)**		
	Cumulative Condition	**Environmental Baseline**	**Difference**	**Cumulative Condition**	**Environmental Baseline**	**Difference**
Long-term (All WYs)	1.57%	1.20%	0.37%	0.85%	0.68%	0.17%
Wet	3.14%	2.53%	0.61%	1.85%	1.55%	0.30%
Above Normal	0.56%	0.46%	0.10%	0.32%	0.25%	0.07%
Below Normal	2.25%	1.44%	0.81%	0.97%	0.65%	0.32%
Dry	0.25%	0.16%	0.09%	0.07%	0.03%	0.04%
Critical	0.20%	0.12%	0.08%	0.03%	0.02%	0.01%

The long-term and water year type averages of the percentage of egg pockets dewatered under the Cumulative Condition are very low, about half of the percentages of potentially dewatered redds, and they are very similar to the averages under the Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), an estimated 0.28 percent of fall-run Chinook salmon redds and 0 percent of egg pockets would potentially be dewatered under the Cumulative Condition, compared to 0.01 percent of redds and 0 percent of egg pockets under the Environmental Baseline.

As previously discussed, Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam, was developed in part to minimize the potential for Chinook salmon redd dewatering during the period from September 2 through December 31 (corresponding to the spring-run Chinook salmon spawning and incubation period).

Proposed Condition AR9 would not necessarily apply to every day each year of the embryo incubation period. During the days over the 33-year period of evaluation when this proposed condition would apply, it would provide the intended protection for fall-run Chinook salmon redd dewatering (Table 8.4-18).

Table 8.4-18. Estimated fall-run Chinook salmon redd and egg pocket potential dewatering under the Cumulative Condition relative to the Environmental Baseline for those days corresponding to the specific conditions during which the flow reductions specified in Proposed Condition AR9

apply.

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	0.41%	0.30%	0.11%	0.12%	0.10%	0.02%
Wet	0.84%	0.64%	0.20%	0.26%	0.24%	0.02%
Above Normal	0.26%	0.20%	0.06%	0.10%	0.10%	0.00%
Below Normal	0.15%	0.09%	0.06%	0.02%	0.00%	0.02%
Dry	0.28%	0.18%	0.10%	0.08%	0.04%	0.04%
Critical	0.13%	0.07%	0.06%	0.02%	0.01%	0.01%

WYT Categories	Redd Dewatering Index (%)			Egg Pocket Dewatering Index (%)		
	Cumulative Condition	Environmental Baseline	Difference	Cumulative Condition	Environmental Baseline	Difference
Long-term (All WYs)	0.41%	0.30%	0.11%	0.12%	0.10%	0.02%
Wet	0.80%	0.61%	0.19%	0.26%	0.23%	0.03%
Above Normal	0.22%	0.17%	0.05%	0.08%	0.08%	0.00%
Below Normal	0.15%	0.09%	0.06%	0.02%	0.00%	0.02%
Dry	0.22%	0.15%	0.07%	0.07%	0.03%	0.04%
Critical	0.17%	0.10%	0.07%	0.03%	0.02%	0.01%

Fall-run Chinook salmon redd dewatering under the Cumulative Condition is estimated to be very low and similar to that under the Environmental Baseline. Potential redd dewatering would be a low/moderate stressor to fall-run Chinook salmon under the Cumulative Condition.

Pages EFH8-114 to EFH8-115

8.4.4.2.3 Fry and Juvenile Rearing Habitat Availability

Spring-run Chinook Salmon

Fry In-channel Rearing Habitat

During the mid-November through mid-February spring-run Chinook salmon fry rearing period, flows exceed 5,000 cfs during about 13 percent of the days over the 33-year simulation period for the Cumulative Condition, and about 12 percent of the days for the Environmental Baseline These days were excluded from the spring-run Chinook salmon fry in-channel rearing WUA analysis. Table 8.4-19 displays the long-term average and average by WYT of spring-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

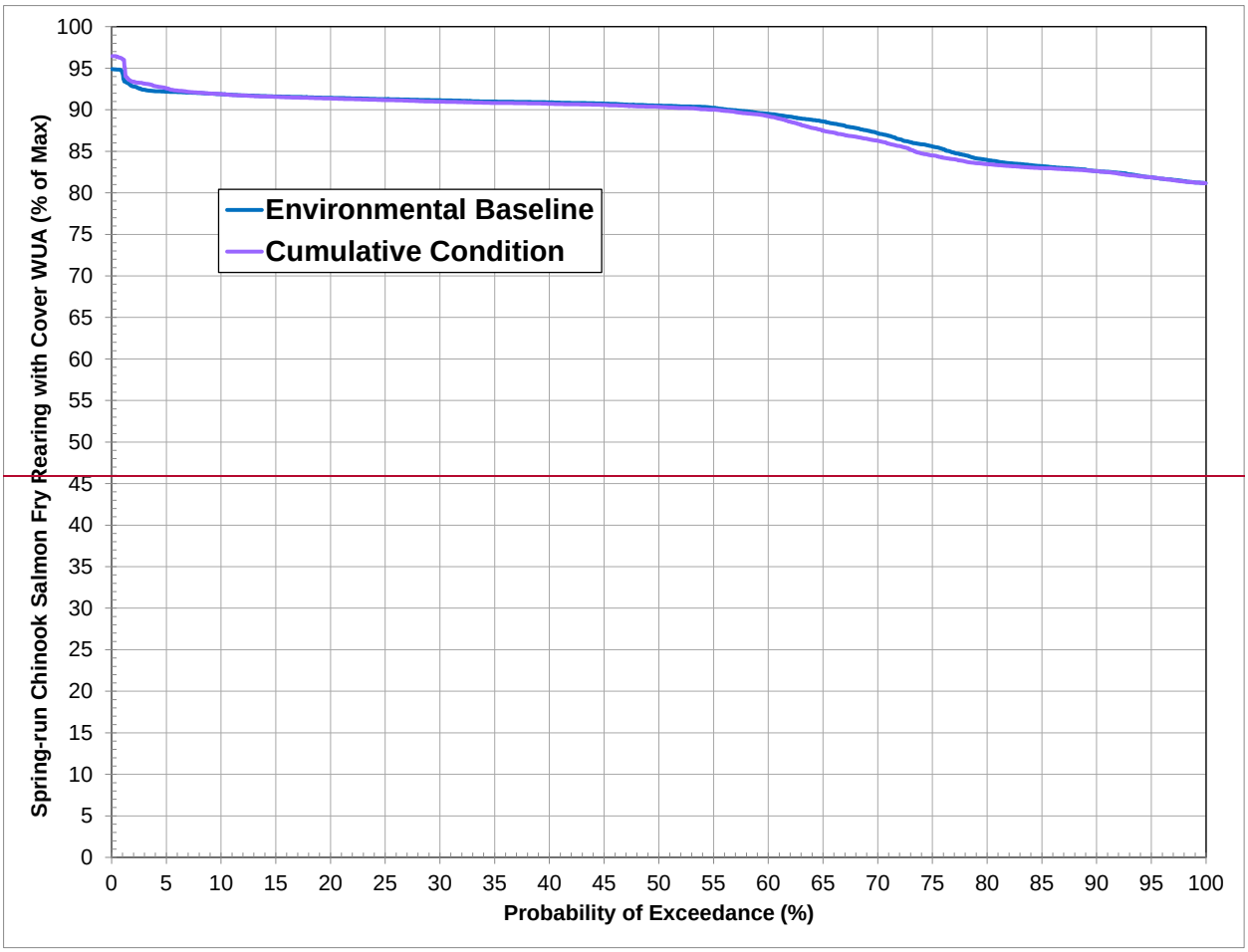
Table 8.4-19. Long-term and WYT average spring-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Cumulative Condition~~	~~88.4~~	~~88.4~~	~~88.9~~	~~86.7~~	~~87.5~~	~~89.6~~
Environmental Baseline	88.6	88.6	88.8	87.0	88.2	89.7
Difference	-0.2	-0.2	0.1	-0.3	-0.7	-0.1
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Cumulative Condition	84.0	84.2	84.1	82.4	83.1	84.9
Environmental Baseline	84.2	84.3	84.2	82.6	83.7	85.1
Difference	-0.2	-0.1	-0.1	-0.2	-0.6	-0.2

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average fry rearing habitat availability (WUA) in the lower Yuba River is very similar under the Cumulative Condition and Environmental Baseline (long-term average of ~~88.4~~84.0% and ~~88.6~~84.2% of the maximum WUA). The Cumulative Condition and Environmental Baseline also result in similar amounts of WUA by WYT. Both the Cumulative Condition and Environmental Baseline provide an average of over 80 percent of fry in-channel rearing maximum WUA during all WYTs.

Habitat durations for spring-run Chinook salmon fry in-channel rearing under the Cumulative Condition and Environmental Baseline are presented in Figure 8.4-3. The Cumulative Condition and Environmental Baseline provide similar amounts of habitat over the entire distribution, but the Cumulative Condition provides slightly more habitat over about the upper 5 percent of the distribution, and provides slightly less habitat over about 20 percent of the distribution. The Cumulative Condition and Environmental Baseline both achieve 80 percent or more of fry in-channel rearing maximum WUA with ~~100~~about a 76 and 79 percent probability, respectively.



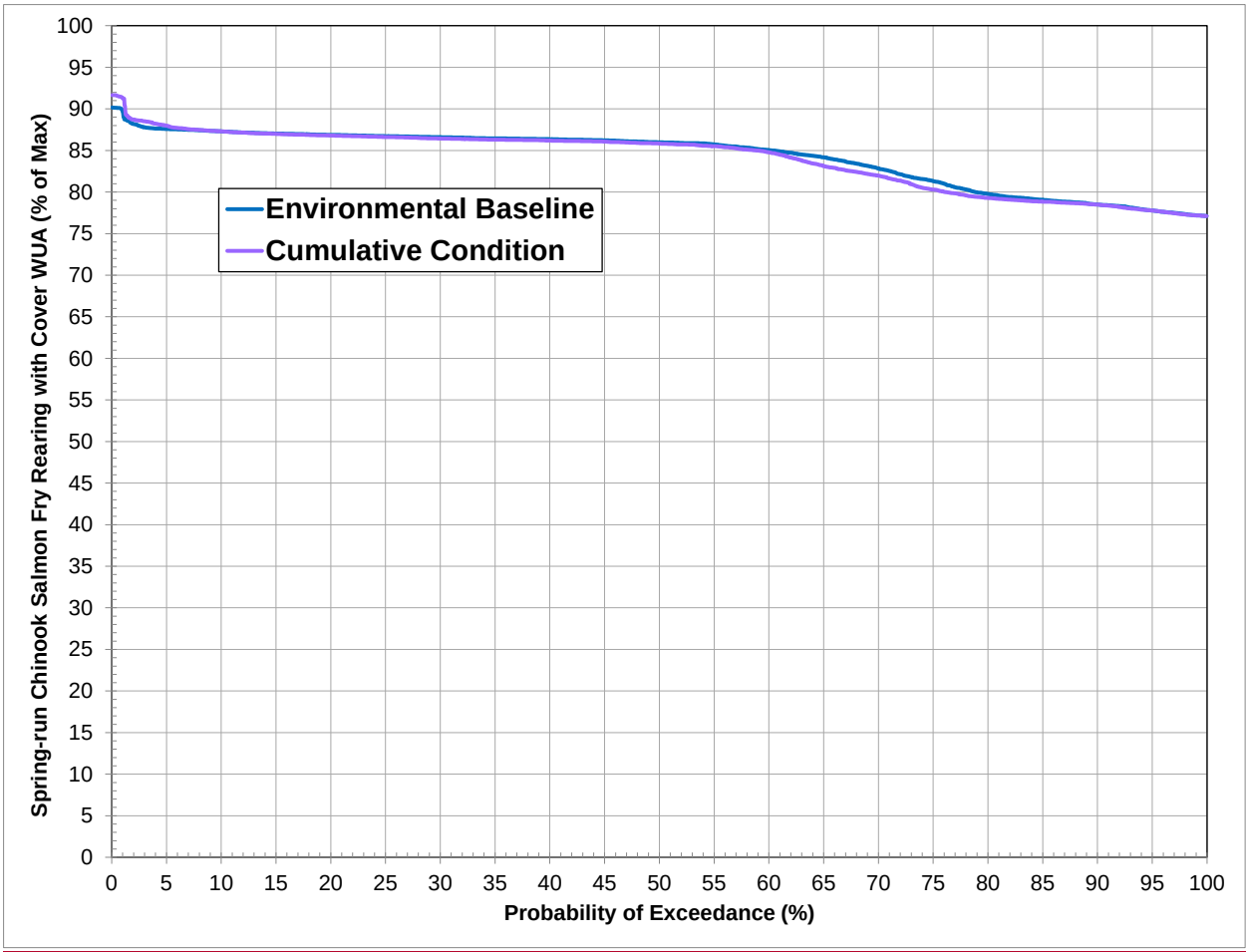


Figure 8.4-3. Spring-run Chinook salmon fry in-channel rearing habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), ~~92.5~~87.9 percent of spring-run Chinook salmon fry in-channel rearing maximum WUA was provided under the Cumulative Condition compared to ~~91.2~~86.6 percent provided under the Environmental Baseline.

Pages EFH8-115 to EFH8-117

Fry Full-Flow Rearing Habitat

Table 8.4-20 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon fry WUA without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by water year type.

Table 8.4-20. Spring-run Chinook salmon fry weighted usable area (WUA) without cover (in acres) under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**3,036**	**1,012**	**460**	**368**	**460**	**736**
Days ≤ 5,000 cfs	2,656	665	436	363	457	735
Days > 5,000 cfs	380	347	24	5	3	1
Avg. WUA	**153.8**	**53.2**	**23.0**	**17.7**	**22.5**	**37.5**
WUA ≤ 5,000 cfs	130.8	32.1	21.5	17.4	22.3	37.5
WUA > 5,000 cfs	23.1	21.1	1.5	0.3	0.2	0.1
Environmental Baseline						
Total Days in Analysis	**3,036**	**1,012**	**460**	**368**	**460**	**736**
Days ≤ 5,000 cfs	2,677	682	438	364	458	735
Days > 5,000 cfs	359	330	22	4	2	1
Avg. WUA	**154.4**	**53.3**	**23.0**	**17.8**	**22.8**	**37.6**
WUA ≤ 5,000 cfs	132.4	33.0	21.6	17.6	22.7	37.6
WUA > 5,000 cfs	22.0	20.3	1.4	0.2	0.1	0.1
Differences						
Avg. WUA	**-0.6**	**-0.1**	**0.0**	**-0.1**	**-0.3**	**-0.1**
% change	**-0.4%**	**-0.1%**	**0.0%**	**-0.6%**	**-1.4%**	**-0.3%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**3,036**	**1,104**	**368**	**368**	**368**	**828**
Days ≤ 5,000 cfs	2,656	746	355	363	365	827
Days > 5,000 cfs	380	358	13	5	3	1
Avg. WUA	**153.8**	**58.0**	**18.2**	**17.7**	**17.9**	**42.0**
WUA ≤ 5,000 cfs	130.8	36.2	17.4	17.4	17.8	42.0
WUA > 5,000 cfs	23.1	21.8	0.8	0.3	0.2	0.1
Environmental Baseline						
Total Days in Analysis	**3,036**	**1,104**	**368**	**368**	**368**	**828**
Days ≤ 5,000 cfs	2,677	764	356	364	366	827
Days > 5,000 cfs	359	340	12	4	2	1
Avg. WUA	**154.4**	**58.0**	**18.2**	**17.8**	**18.2**	**42.2**
WUA ≤ 5,000 cfs	132.4	37.1	17.5	17.6	18.1	42.1
WUA > 5,000 cfs	22.0	20.9	0.8	0.2	0.1	0.1
Differences						
Avg. WUA	**-0.6**	**0.0**	**-0.1**	**-0.1**	**-0.3**	**-0.1**
% change	**-0.4%**	**0.0%**	**-0.4%**	**-0.6%**	**-1.5%**	**-0.4%**

[1] As defined by the Yuba River Index WY (YRI) Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

For the entire simulation period, very similar amounts of fry rearing habitat (total WUA) are available under the Cumulative Condition compared to the Environmental Baseline, as well as for each of the WYTs.

Figure 8.4-4 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon fry WUA without cover under the Cumulative Condition and the Environmental Baseline. For both scenarios, a trend was observed of the most spring-run Chinook salmon fry habitat occurring during wet WYs with decreasing amounts from wet to ~~below~~above normal WYs, remaining about the same during below normal and dry WYs, and then fry habitat increasing for ~~dry and~~ critical WYs. For both the Cumulative Condition and Environmental Baseline, relatively little to no additional fry rearing habitat is provided by days when flows were >5,000 cfs for below normal, dry, and critical WYTs.

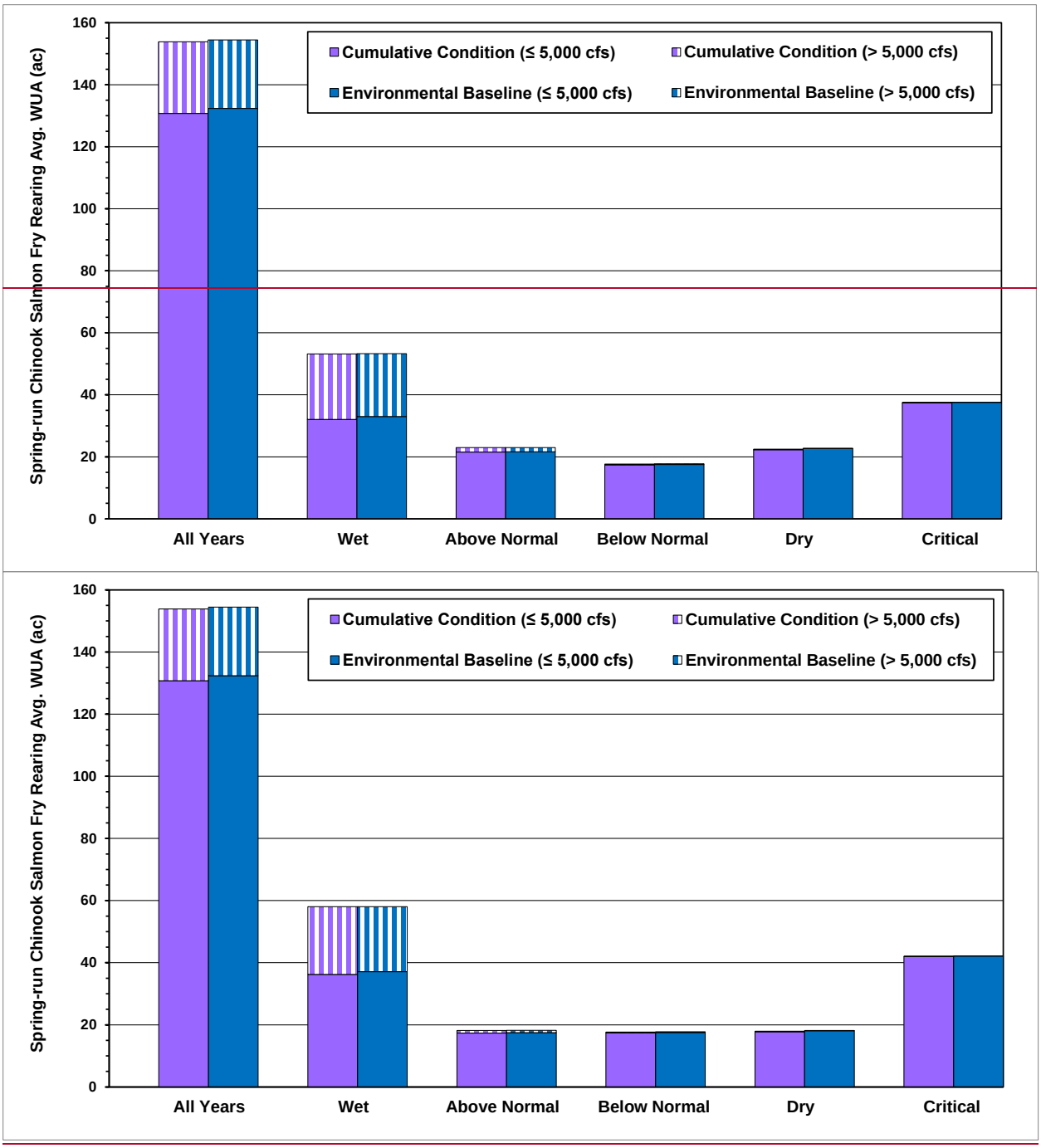


Figure 8.4-4. Comparison of the amount (in acres) of spring-run Chinook salmon fry weighted usable area (WUA) without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤5,000 cfs and for days when flows were >5,000 cfs.

Pages EFH8-117 to EFH8-119

Juvenile In-Channel Rearing Habitat

During the year-round spring-run Chinook salmon juvenile rearing period, flows exceed 5,000 cfs during about 11 percent of the days over the 33-year simulation period for the Cumulative Condition and Environmental Baseline. These days were excluded from the spring-run Chinook salmon juvenile in-channel rearing WUA analysis. Table 8.4-21 displays the long-term average and average by WYT of spring-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

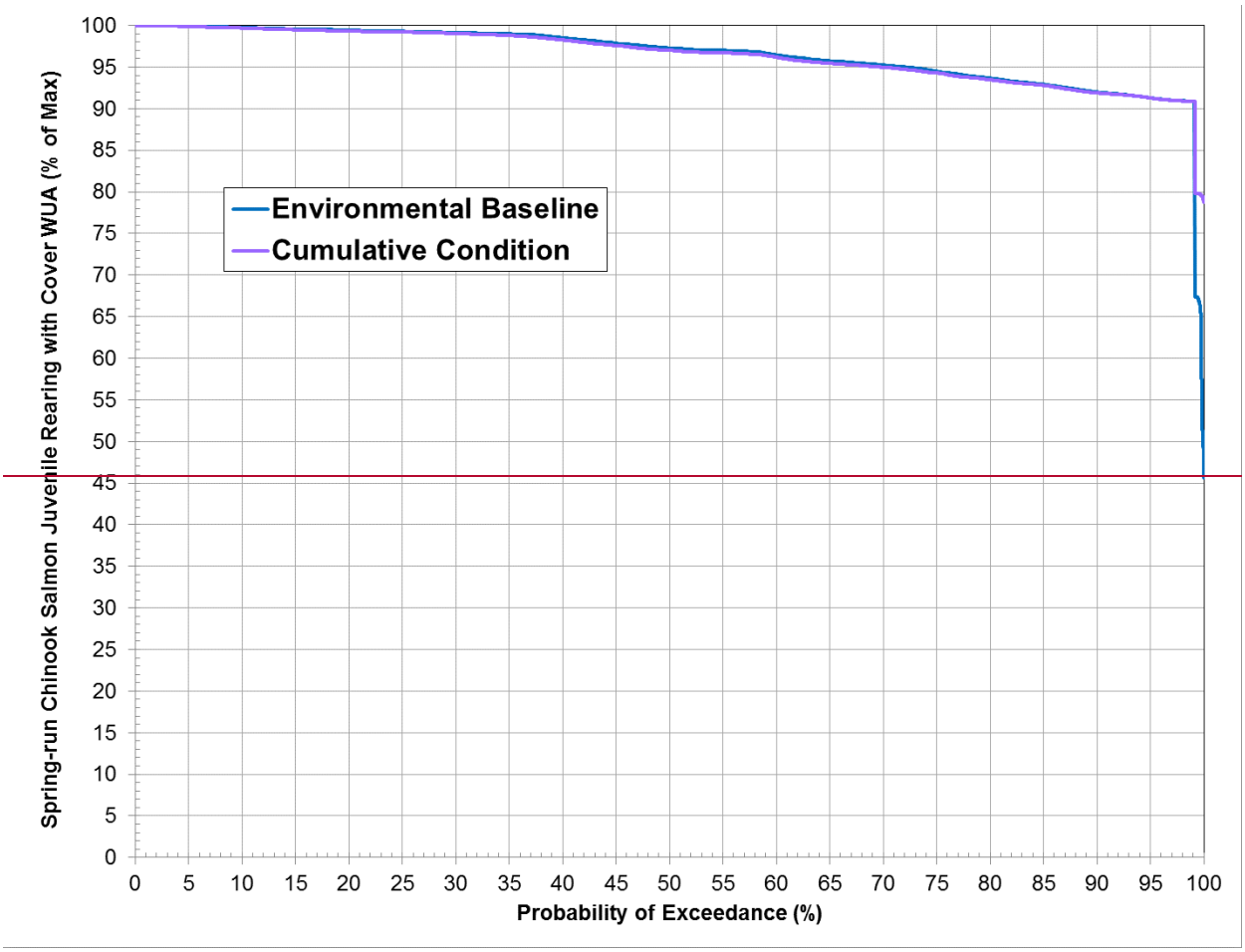
Table 8.4-21. Long-term and WYT average spring-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Cumulative Condition~~	~~96.4~~	~~95.4~~	~~95.6~~	~~96.2~~	~~97.2~~	~~97.5~~
Environmental Baseline	96.5	95.5	95.8	96.4	97.5	97.1
Difference	-0.1	-0.1	-0.2	-0.2	-0.3	0.4
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Cumulative Condition	90.6	89.7	89.8	90.4	91.3	91.6
Environmental Baseline	90.6	89.8	90.0	90.6	91.6	91.3
Difference	0.0	-0.1	-0.2	-0.2	-0.3	0.3

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average juvenile in-channel rearing habitat availability (WUA) in the lower Yuba River is very similar under the Cumulative Condition and Environmental Baseline (long-term average of ~~96.4~~90.6% ~~and 96.5%~~ of the maximum WUA~~, respectively~~). The Cumulative Condition and Environmental Baseline also result in similar amounts of WUA by WYT. Both the Cumulative Condition and Environmental Baseline provide an average of over 80 percent (and even up to and over ~~95~~90%) of juvenile in-channel rearing maximum WUA during all WYTs.

Habitat durations for spring-run Chinook salmon juvenile rearing under the Cumulative Condition and Environmental Baseline are presented in Figure 8.4-5. The Cumulative Condition and Environmental Baseline provide similar amounts of habitat over the entire distribution, but the Cumulative Condition does provide more habitat over about the lower 1 percent of the distribution when juvenile rearing is most limited. The Cumulative Condition and Environmental Baseline both achieve over 80 percent (and even ~~90~~85%) of juvenile in-channel rearing maximum WUA with about a 99 percent probability.


Spring-run Chinook Salmon Juvenile Rearing with Cover WUA (% of Max)
Probability of Exceedance (%)
Environmental Baseline
Cumulative Condition
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100

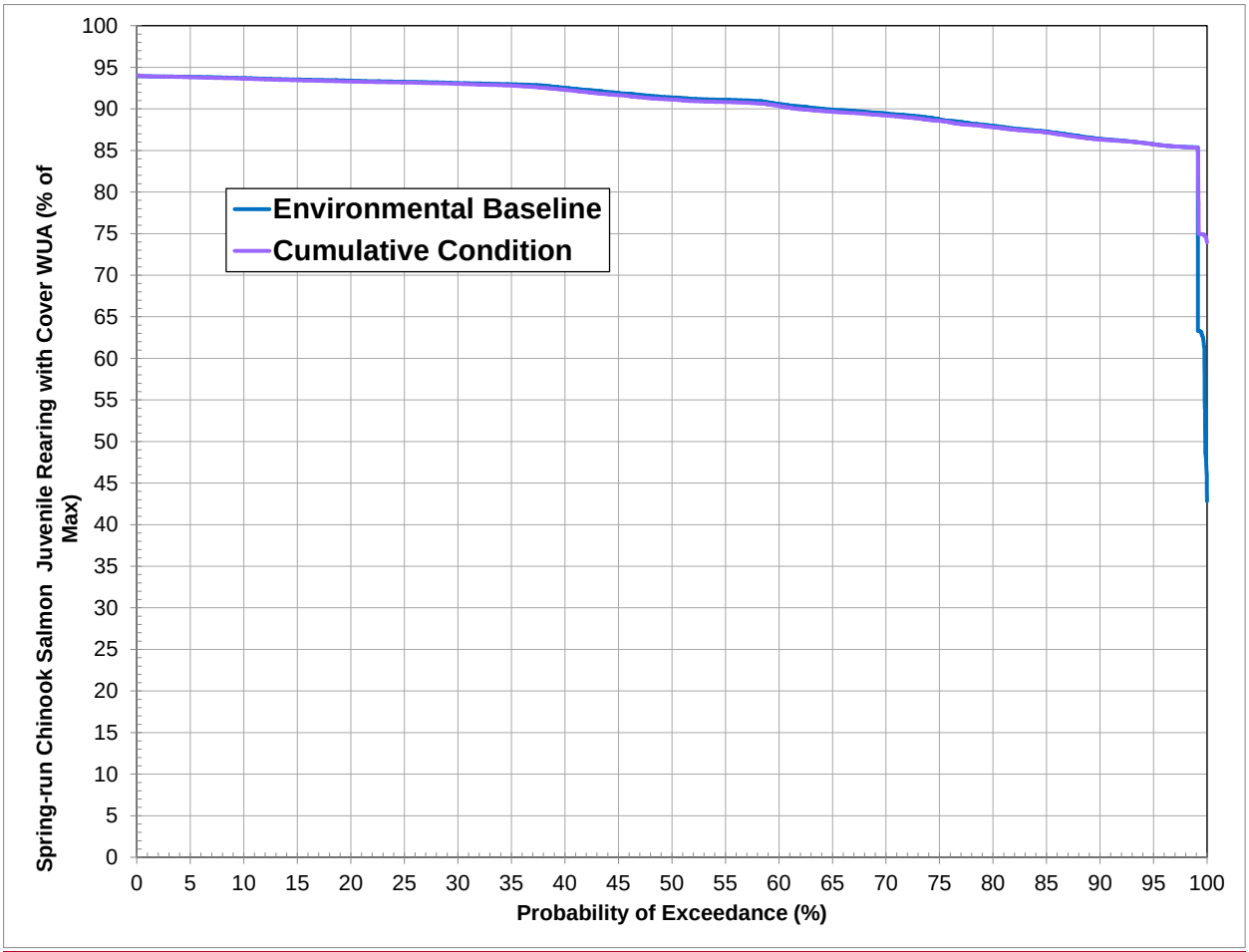


Figure 8.4-5. Spring-run Chinook salmon juvenile in-channel rearing habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), ~~93.7~~88.0 percent of spring-run Chinook salmon juvenile in-channel rearing maximum WUA was provided under the Cumulative Condition compared to ~~89.0~~83.6 percent provided under the Environmental Baseline.

Pages EFH8-119 to EFH8-120

Juvenile Full-Flow Rearing Habitat

Table 8.4-22 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon juvenile WUA without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. For the entire simulation period and by WYT, very similar amounts of juvenile rearing habitat (total WUA) are available under the Cumulative Condition and the Environmental Baseline.

Table 8.4-22. Spring-run Chinook salmon juvenile weighted usable area (WUA) without cover (in

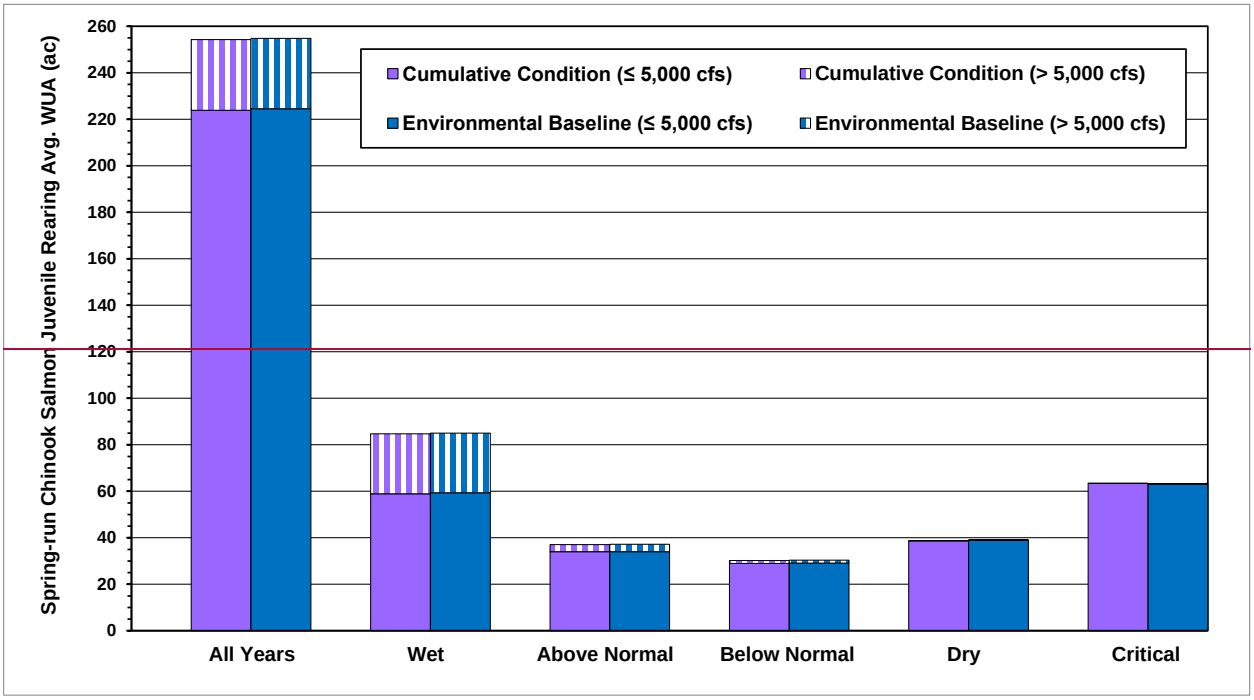
acres) under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation for days when flows were ≤5,000 cfs and for days when flows were >5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**12,053**	**4,017**	**1,826**	**1,461**	**1,826**	**2,923**
Days ≤ 5,000 cfs	10,766	2,936	1,687	1,403	1,821	2,919
Days > 5,000 cfs	1,287	1,081	139	58	5	4
Avg. WUA	**254.3**	**84.7**	**37.1**	**30.2**	**38.8**	**63.4**
WUA ≤ 5,000 cfs	223.9	58.9	34.0	29.0	38.7	63.4
WUA > 5,000 cfs	30.4	25.8	3.1	1.3	0.1	0.1
Environmental Baseline						
Total Days in Analysis	**12,053**	**4,017**	**1,826**	**1,461**	**1,826**	**2,923**
Days ≤ 5,000 cfs	10,776	2,952	1,679	1,403	1,823	2,919
Days > 5,000 cfs	1,277	1,065	147	58	3	4
Avg. WUA	**254.8**	**85.0**	**37.2**	**30.4**	**39.1**	**63.2**
WUA ≤ 5,000 cfs	224.5	59.3	34.0	29.1	39.0	63.1
WUA > 5,000 cfs	30.3	25.6	3.2	1.3	0.1	0.1
Differences						
Avg. WUA	**-0.6**	**-0.2**	**-0.1**	**-0.1**	**-0.3**	**0.2**
% change	**-0.2%**	**-0.3%**	**-0.3%**	**-0.4%**	**-0.7%**	**0.3%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**12,053**	**4,382**	**1,461**	**1,461**	**1,461**	**3,288**
Days ≤ 5,000 cfs	10,766	3,277	1,346	1,403	1,456	3,284
Days > 5,000 cfs	1,287	1,105	115	58	5	4
Avg. WUA	**254.3**	**92.1**	**29.7**	**30.2**	**31.0**	**71.2**
WUA ≤ 5,000 cfs	223.9	65.7	27.2	29.0	30.9	71.2
WUA > 5,000 cfs	30.4	26.4	2.5	1.3	0.1	0.1
Environmental Baseline						
Total Days in Analysis	**12,053**	**4,382**	**1,461**	**1,461**	**1,461**	**3,288**
Days ≤ 5,000 cfs	10,776	3,294	1,337	1,403	1,458	3,284
Days > 5,000 cfs	1,277	1,088	124	58	3	4
Avg. WUA	**254.8**	**92.4**	**29.8**	**30.4**	**31.2**	**71.1**
WUA ≤ 5,000 cfs	224.5	66.2	27.1	29.1	31.1	71.0
WUA > 5,000 cfs	30.3	26.2	2.7	1.3	0.1	0.1
Differences						
Avg. WUA	**-0.6**	**-0.3**	**-0.1**	**-0.1**	**-0.2**	**0.1**
% change	**-0.2%**	**-0.3%**	**-0.4%**	**-0.4%**	**-0.7%**	**0.2%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Figure 8.4-6 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon juvenile WUA without cover under the Cumulative Condition and the Environmental Baseline. For both scenarios, decreasing amounts of total habitat were provided from wet to ~~below~~ above normal WYTs, similar amounts from above normal to dry WYTs, then increasing amounts were provided for ~~dry and~~ critical WYTs. For both the Cumulative Condition and Environmental Baseline, relatively little additional juvenile rearing habitat is provided by days when flows were > 5,000 cfs for below normal, dry and critical WYTs.



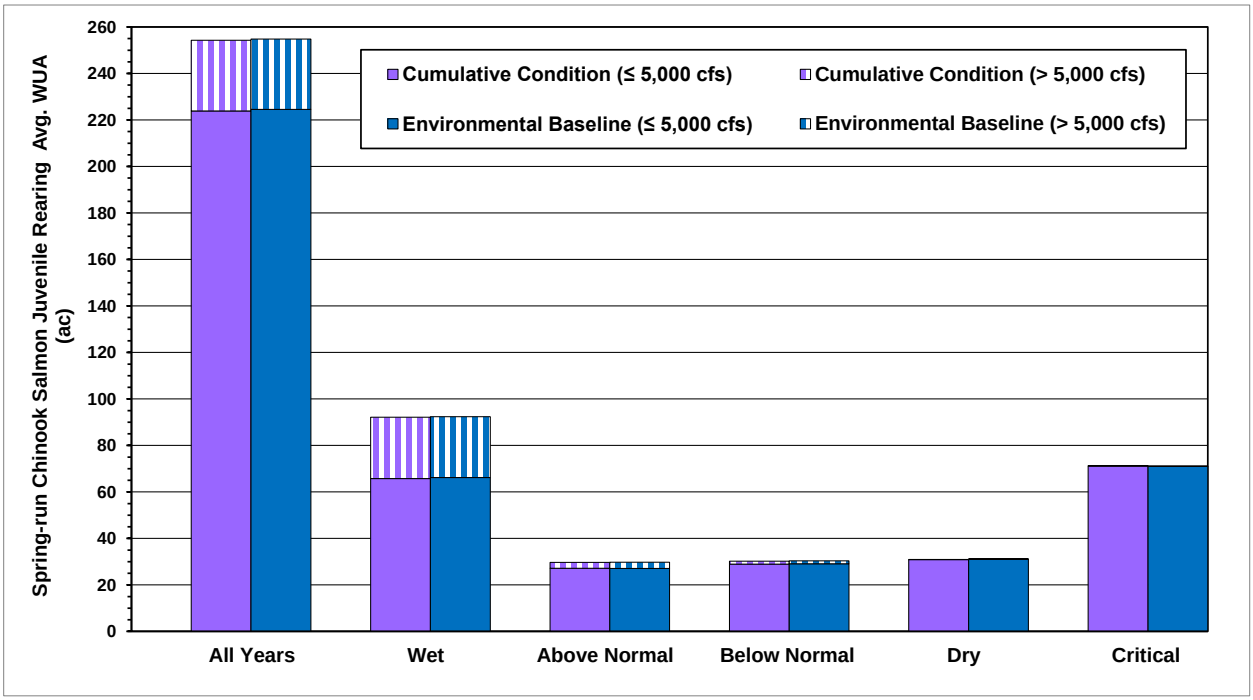


Figure 8.4-6. Comparison of the amounts (in acres) of spring-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages EFH8-120 to EFH8-122

Fall-run Chinook Salmon

Fry In-Channel Rearing Habitat

During the mid-December through April fall-run Chinook salmon fry rearing period, flows exceed 5,000 cfs during about 20 percent of the days over the 33-year simulation period for both the Cumulative Condition and the Environmental Baseline. These days were excluded from the fall-run Chinook salmon fry in-channel rearing WUA analysis. Table 8.4-23 displays the long-term average and average by WYT of fall-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

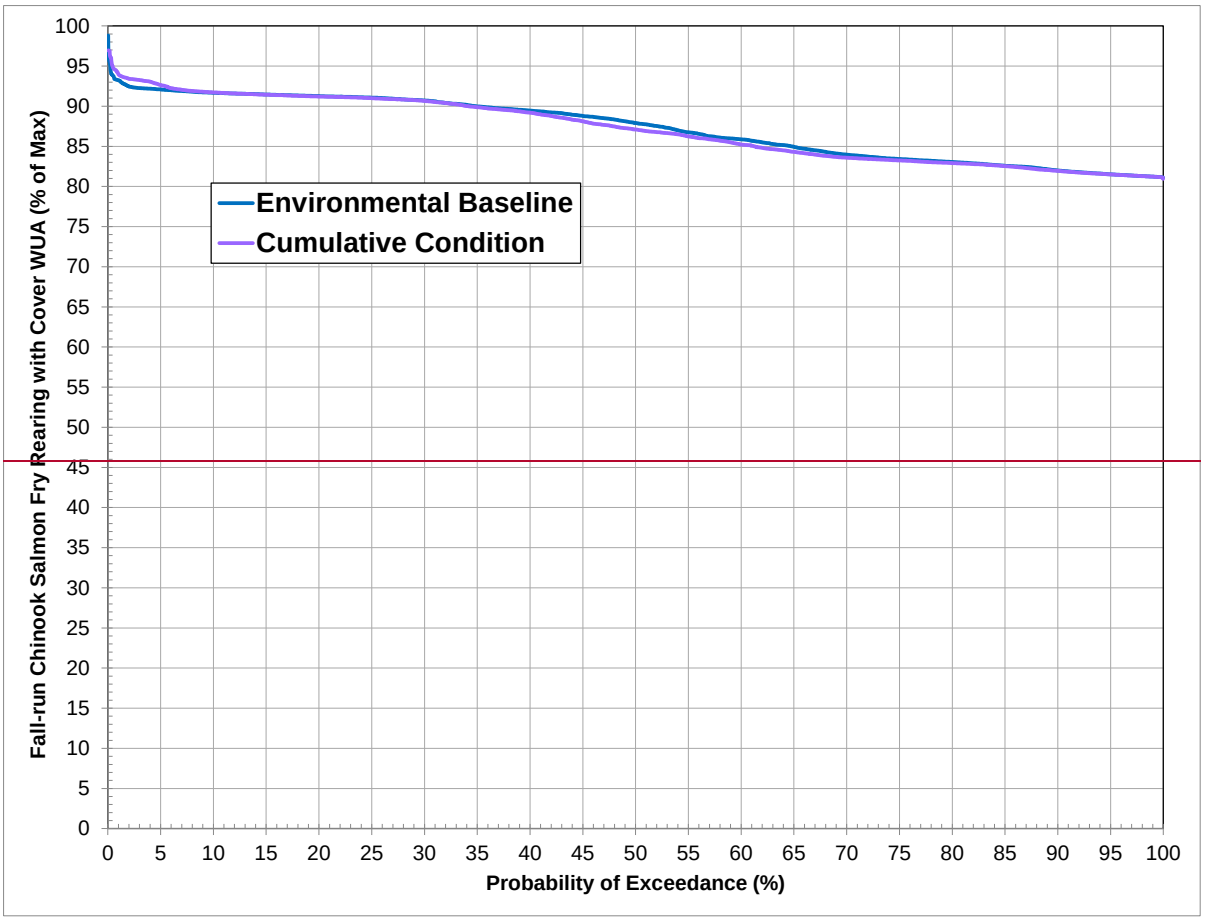
Over the entire 33-year simulation period, long-term average fry rearing habitat availability (WUA) in the lower Yuba River is similar under the Cumulative Condition and Environmental Baseline (long-term average of ~~87.1~~82.8% and ~~87.3~~82.9% of the maximum WUA, respectively). The Cumulative Condition and Environmental Baseline also result in similar amounts of WUA by WYT. Both the Cumulative Condition and the Environmental Baseline provide an average of 80 percent or more of fry in-channel rearing maximum WUA during all WYTs.

Table 8.4-23. Long-term and WYT average fall-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Cumulative Condition~~	~~87.1~~	~~88.3~~	~~86.9~~	~~85.1~~	~~85.2~~	~~88.5~~
Environmental Baseline	87.3	88.3	87.2	85.1	85.7	88.6
Difference	-0.2	0.0	-0.3	0.0	-0.5	-0.1
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Cumulative Condition	82.8	83.9	82.2	80.8	80.8	83.8
Environmental Baseline	82.9	83.9	82.6	80.9	81.4	83.9
Difference	-0.1	0.0	-0.4	-0.1	-0.6	-0.1

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Habitat durations for fall-run Chinook salmon fry in-channel rearing under the Cumulative Condition and Environmental Baseline are presented in Figure 8.4-7. The Cumulative Condition and Environmental Baseline provide similar amounts of habitat over the entire distribution, but the Cumulative Condition provides slightly more habitat over about the upper 3 percent of the distribution. The Cumulative Condition and Environmental Baseline both achieve 80 percent of fry in-channel rearing maximum WUA with about a ~~100~~ 66 to 69 percent probability, respectively.



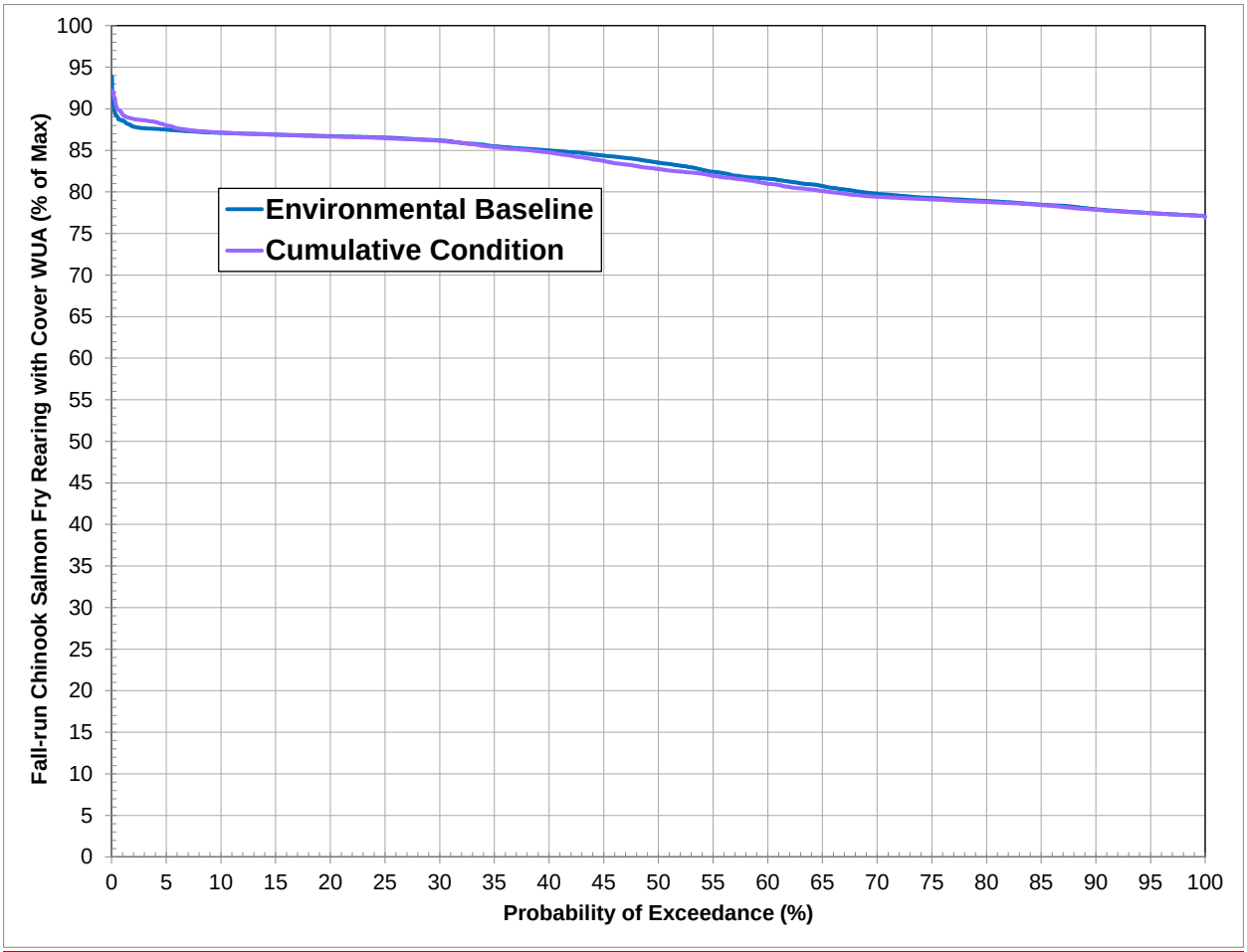


Figure 8.4-7. Fall-run Chinook salmon fry in-channel rearing habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), ~~93.5~~88.9 percent of fall-run Chinook salmon fry in-channel rearing maximum WUA was provided under the Cumulative Condition compared to ~~92.0~~87.5 percent provided under the Environmental Baseline.

Pages EFH8-122 to EFH8-123

Fry Full-Flow Rearing Habitat

Table 8.4-24 displays the full-flow analysis of the amounts (ac) of fall-run Chinook salmon fry WUA without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by water year type.

Table 8.4-24. Fall-run Chinook salmon fry weighted usable area (WUA) without cover (in acres) under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation for days when flows were ≤5,000 cfs and for days when flows were >5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**4,497**	**1,499**	**681**	**545**	**681**	**1,091**
Days ≤ 5,000 cfs	3,583	746	586	488	676	1,087
Days > 5,000 cfs	914	753	95	57	5	4
Avg. WUA	**152.3**	**54.8**	**22.1**	**17.3**	**21.3**	**36.8**
WUA ≤ 5,000 cfs	115.0	23.7	18.4	15.1	21.2	36.6
WUA > 5,000 cfs	37.2	31.0	3.7	2.2	0.2	0.2
Environmental Baseline						
Total Days in Analysis	**4,497**	**1,499**	**681**	**545**	**681**	**1,091**
Days ≤ 5,000 cfs	3,595	751	591	488	678	1,087
Days > 5,000 cfs	902	748	90	57	3	4
Avg. WUA	**152.9**	**54.9**	**22.2**	**17.3**	**21.6**	**36.9**
WUA ≤ 5,000 cfs	115.9	23.9	18.7	15.1	21.5	36.7
WUA > 5,000 cfs	37.0	31.0	3.5	2.2	0.1	0.2
Differences						
Avg. WUA	**-0.6**	**-0.2**	**-0.1**	**0.0**	**-0.3**	**-0.1**
% change	**-0.4%**	**-0.3%**	**-0.3%**	**-0.2%**	**-1.3%**	**-0.2%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**4,497**	**1,635**	**545**	**545**	**545**	**1,227**
Days ≤ 5,000 cfs	3,583	858	474	488	540	1,223
Days > 5,000 cfs	914	777	71	57	5	4
Avg. WUA	**152.3**	**59.3**	**17.6**	**17.3**	**17.0**	**41.1**
WUA ≤ 5,000 cfs	115.0	27.3	14.8	15.1	16.9	40.9
WUA > 5,000 cfs	37.2	32.0	2.8	2.2	0.2	0.2
Environmental Baseline						
Total Days in Analysis	**4,497**	**1,635**	**545**	**545**	**545**	**1,227**
Days ≤ 5,000 cfs	3,595	864	478	488	542	1,223
Days > 5,000 cfs	902	771	67	57	3	4
Avg. WUA	**152.9**	**59.4**	**17.6**	**17.3**	**17.3**	**41.2**
WUA ≤ 5,000 cfs	115.9	27.5	15.0	15.1	17.2	41.1
WUA > 5,000 cfs	37.0	31.9	2.6	2.2	0.1	0.2
Differences						
Avg. WUA	**-0.6**	**-0.2**	**-0.1**	**0.0**	**-0.2**	**-0.1**
% change	**-0.4%**	**-0.3%**	**-0.4%**	**-0.2%**	**-1.3%**	**-0.3%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

For the entire simulation period, similar amounts of fry rearing habitat (total WUA) are available under the Cumulative Condition compared to the Environmental Baseline, as well as for each of the WYTs.

Figure 8.4-8 displays the full-flow analysis of the amounts (in acres) of fall-run Chinook salmon fry WUA without cover under the Cumulative Condition and the Environmental Baseline. For both scenarios, a trend was observed of the most fall-run Chinook salmon fry habitat occurring during wet WYs with decreasing amounts from wet to ~~below~~above normal WYs, similar amounts occurring in below normal and dry WYTs, then fry habitat increasing for ~~dry and~~ critical WYs. For both the Cumulative Condition and Environmental Baseline, relatively little to no additional fry rearing habitat is provided by days when flows were > 5,000 cfs for dry and critical WYTs.

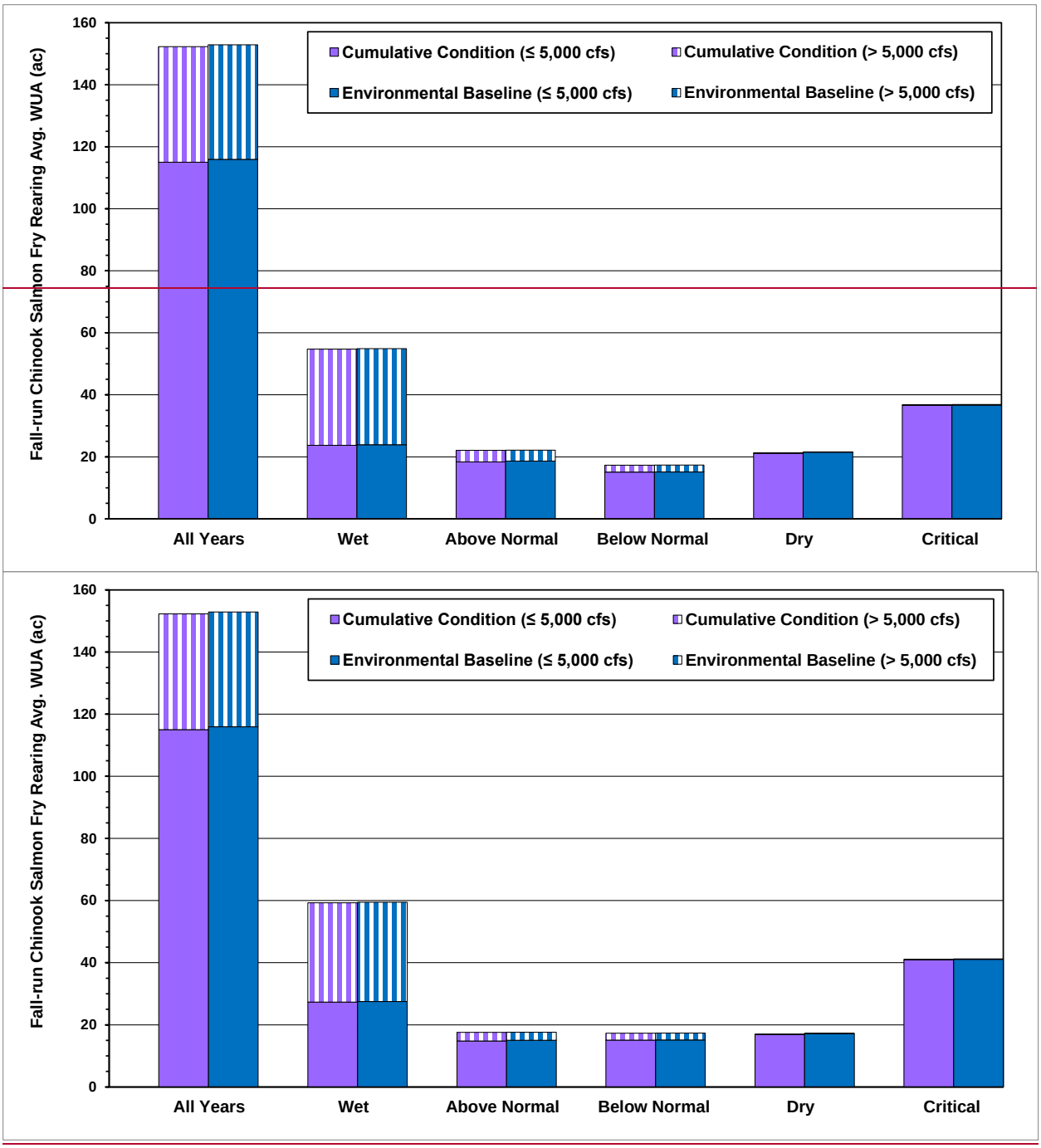


Figure 8.4-8. Comparison of the amounts (in acres) of fall-run Chinook salmon fry weighted usable area (WUA) without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

Pages EFH8-123 to EFH8-125

Juvenile In-Channel Rearing Habitat

During the mid-January through June fall-run Chinook salmon juvenile rearing period, flows exceed 5,000 cfs during about 20 percent of the days over the 33-year simulation period for the Cumulative Condition and Environmental Baseline. These days were excluded from the fall-run Chinook salmon juvenile in-channel rearing WUA analysis. Table 8.4-25 displays the long-term average and average by WYT of fall-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

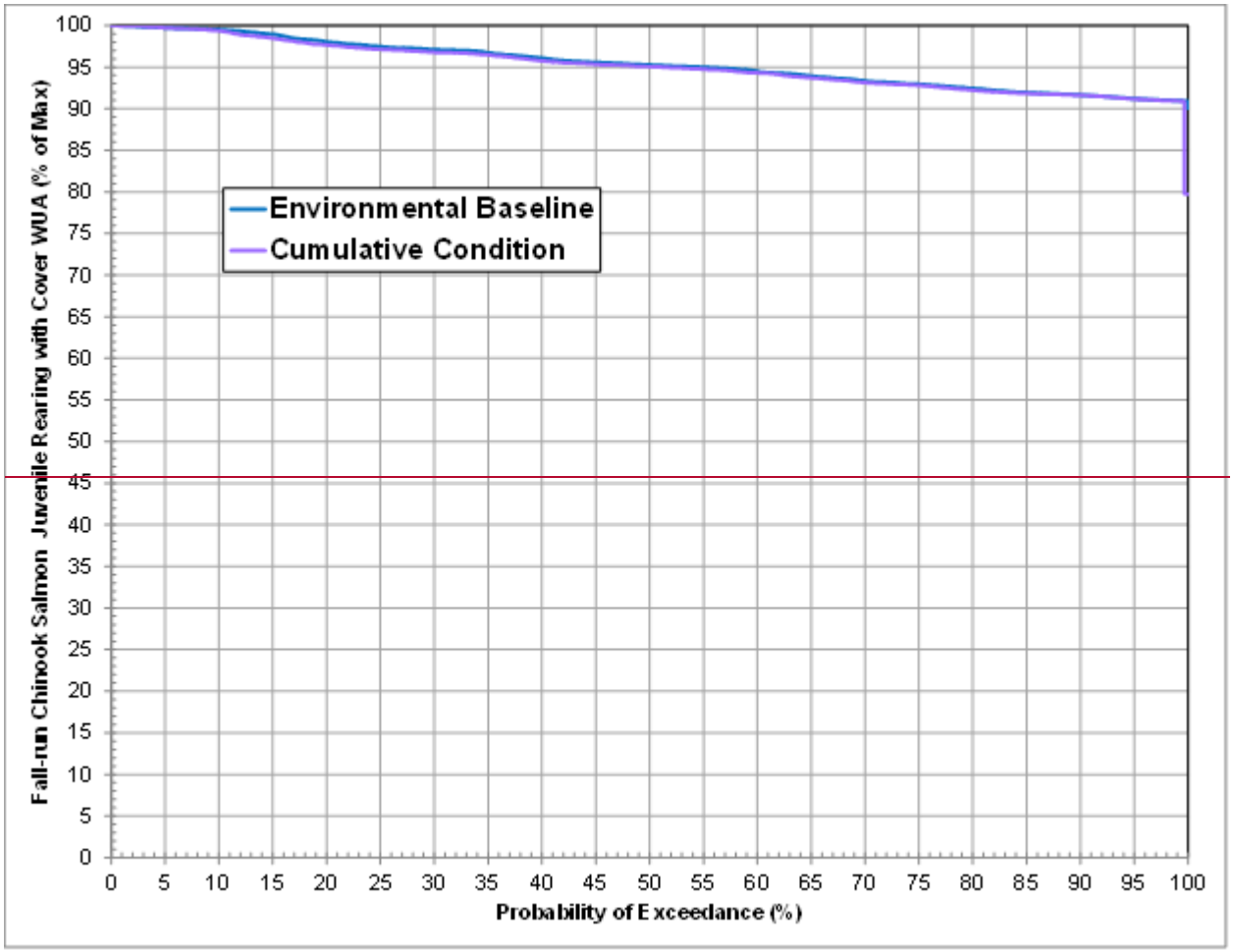
Table 8.4-25. Long-term and WYT average fall-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
~~Cumulative Condition~~	~~95.1~~	~~93.3~~	~~93.3~~	~~94.1~~	~~95.9~~	~~97.3~~
Environmental Baseline	95.3	93.3	93.6	94.3	96.3	97.5
Difference	-0.2	0.0	-0.3	-0.2	-0.4	-0.2
Scenario	**Long-term Full Simulation Period[2]**	**WYTs[1]**				
		Wet	**Above Normal**	**Below Normal**	**Dry**	**Critical**
Cumulative Condition	89.3	87.7	87.6	88.4	90.0	91.2
Environmental Baseline	89.6	87.7	87.9	88.6	90.3	91.5
Difference	-0.3	0.0	-0.3	-0.2	-0.3	-0.3

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average juvenile in-channel rearing habitat availability (WUA) in the lower Yuba River is similar under the Cumulative Condition and Environmental Baseline (long-term average of ~~95.1~~89.3% and ~~95.3~~89.6% of the maximum WUA, respectively). The Cumulative Condition and Environmental Baseline also result in similar amounts of WUA by WYT. Both the Cumulative Condition and Environmental Baseline provide an average of over 80 percent (and even over 90% during dry and critical WYTs) of juvenile in-channel rearing maximum WUA during all WYTs.

Habitat durations for fall-run Chinook salmon juvenile in-channel rearing under the Cumulative Condition and Environmental Baseline are presented in Figure 8.4-9. The Cumulative Condition and Environmental Baseline provide similar amounts of habitat over the entire distribution. The Cumulative Condition and Environmental Baseline both achieve over 80 percent (and even ~~90~~85%) of maximum juvenile in-channel rearing maximum WUA with about a 99 percent probability.



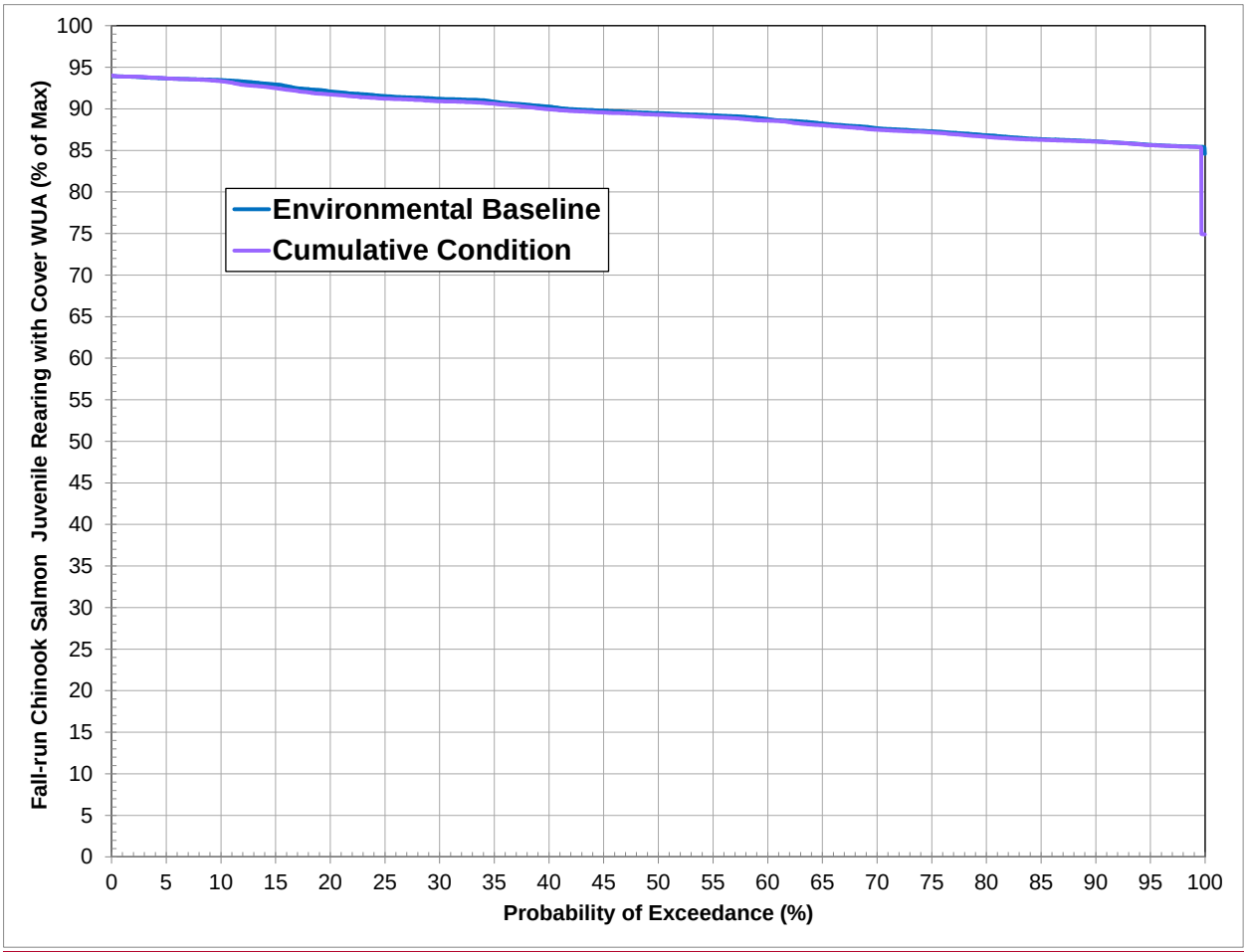


Figure 8.4-9. Fall-run Chinook salmon juvenile in-channel rearing habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), ~~95.9~~90.1 percent of fall-run Chinook salmon juvenile in-channel rearing maximum WUA was provided under the Cumulative Condition compared to ~~96.7~~90.8 percent provided under the Environmental Baseline.

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Juvenile Full-Flow Rearing Habitat

Table 8.4-26 displays the full-flow analysis of the amounts (in acres) of fall-run Chinook salmon juvenile rearing WUA without cover under the Cumulative Condition and the Environmental Baseline. For the entire simulation period and by WYT, similar amounts of juvenile rearing habitat (total WUA) are available under the Cumulative Condition and the Environmental Baseline.

Table 8.4-26. Fall-run Chinook salmon juvenile weighted usable area (WUA) without cover (in acres) under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**5,487**	**1,829**	**831**	**665**	**831**	**1,331**
Days ≤ 5,000 cfs	4,405	943	699	610	826	1,327
Days > 5,000 cfs	1,082	886	132	55	5	4
Avg. WUA	**247.9**	**84.5**	**34.9**	**28.6**	**37.3**	**62.6**
WUA ≤ 5,000 cfs	192.2	38.2	28.5	25.9	37.0	62.4
WUA > 5,000 cfs	55.7	46.3	6.4	2.7	0.2	0.2
Environmental Baseline						
Total Days in Analysis	**5,487**	**1,829**	**831**	**665**	**831**	**1,331**
Days ≤ 5,000 cfs	4,390	934	691	610	828	1,327
Days > 5,000 cfs	1,097	895	140	55	3	4
Avg. WUA	**249.1**	**84.7**	**35.1**	**28.7**	**37.7**	**62.9**
WUA ≤ 5,000 cfs	192.5	37.8	28.4	26.1	37.5	62.7
WUA > 5,000 cfs	56.6	46.9	6.7	2.7	0.1	0.2
Differences						
Avg. WUA	**-1.2**	**-0.3**	**-0.1**	**-0.1**	**-0.4**	**-0.3**
% change	**-0.5%**	**-0.3%**	**-0.4%**	**-0.4%**	**-1.1%**	**-0.5%**

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
Cumulative Condition						
Total Days in Analysis	**5,487**	**1,995**	**665**	**665**	**665**	**1,497**
Days ≤ 5,000 cfs	4,405	1,089	553	610	660	1,493
Days > 5,000 cfs	1,082	906	112	55	5	4
Avg. WUA	**247.9**	**91.4**	**28.0**	**28.6**	**29.8**	**70.1**
WUA ≤ 5,000 cfs	192.2	44.1	22.6	25.9	29.6	69.9
WUA > 5,000 cfs	55.7	47.2	5.4	2.7	0.2	0.2
Environmental Baseline						
Total Days in Analysis	**5,487**	**1,995**	**665**	**665**	**665**	**1,497**
Days ≤ 5,000 cfs	4,390	1,081	544	610	662	1,493
Days > 5,000 cfs	1,097	914	121	55	3	4
Avg. WUA	**249.1**	**91.7**	**28.1**	**28.7**	**30.1**	**70.5**
WUA ≤ 5,000 cfs	192.5	43.8	22.4	26.1	29.9	70.3
WUA > 5,000 cfs	56.6	47.8	5.8	2.7	0.1	0.2
Differences						
Avg. WUA	**-1.2**	**-0.3**	**-0.1**	**-0.1**	**-0.3**	**-0.4**
% change	**-0.5%**	**-0.3%**	**-0.4%**	**-0.4%**	**-1.0%**	**-0.6%**

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Figure 8.4-10 displays the full-flow analysis of the amounts (in acres) of fall-run Chinook salmon juvenile WUA without cover under the Cumulative Condition and the Environmental Baseline. For both scenarios, decreasing amounts of total habitat were provided from wet to ~~below~~above normal WYs, similar amounts occurred during below normal and dry WYs, then increasing amounts were provided for ~~dry and~~ critical WYs. For both the Cumulative Condition and Environmental Baseline, relatively little additional juvenile rearing habitat is provided by days when flows were >5,000 cfs for dry and critical WYs.

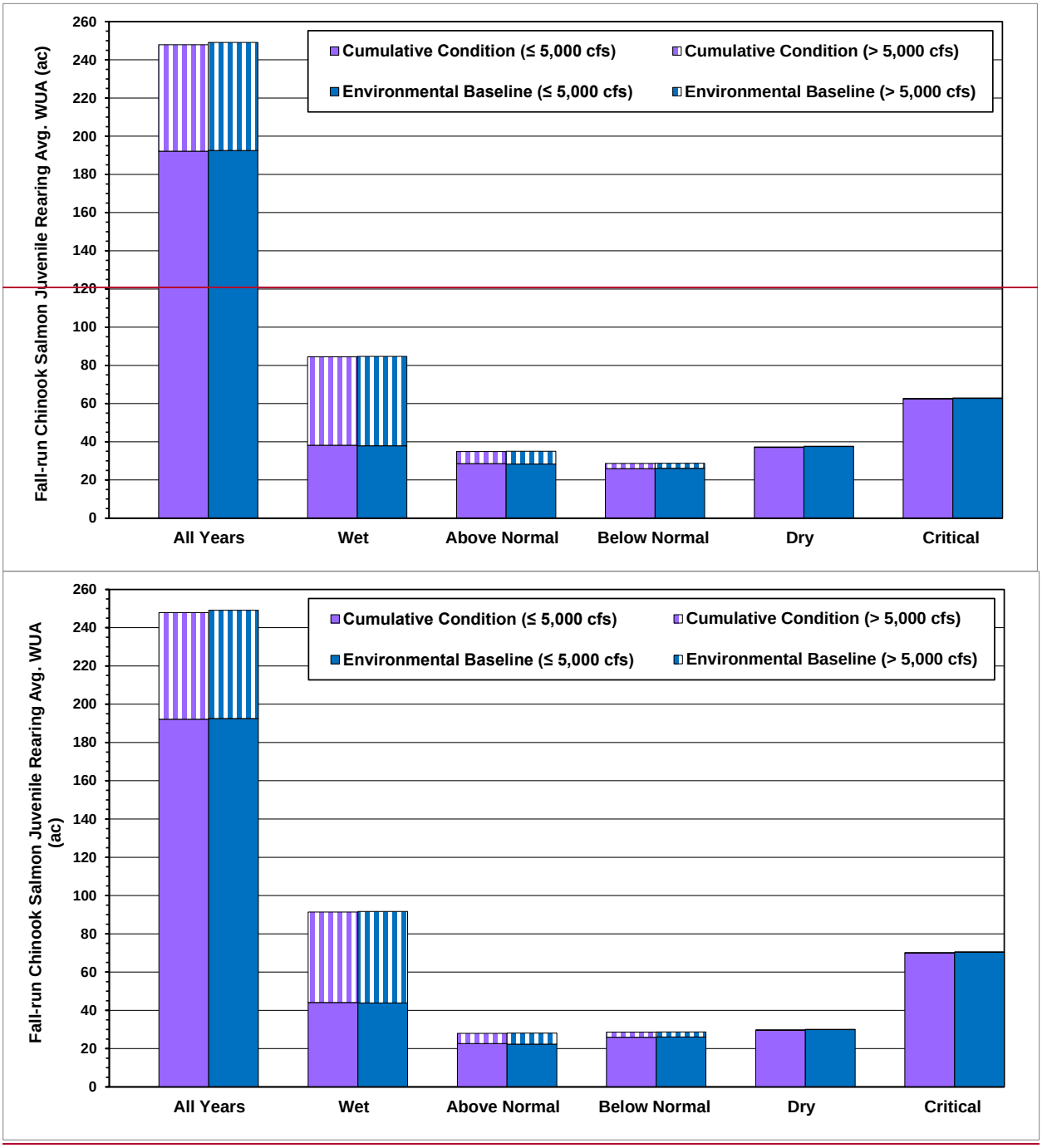

Figure 8.4-10. Comparison of the amounts (in acres) of fall-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.

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