

PRELIMINARY DATA: Redd Dewatering Estimates for Keswick Fall Flow Scenarios

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This script constructs real-time winter-run redd dewatering estimates based on most recent data available from CDFW (2024-10-31) for winter-run data and dewatering estimates from USFWS (2006; see citation). Data are also available in 2024 Winter-run Data file.xls online at calfish.org.

This document is also now available on SacPAS. However, data on the SacPAS webpage may not immediately reflect data in the document as updates to the webpage with newest flow and redd data may be pending.

Please note that all data are preliminary until data collection is finalized. Likewise, there are uncertainties with forecasts which may lead to changes in proposed operations.

Current Winter-run Chinook Salmon Redd Count

As of September 10, 2024, the unexpanded redd count is **152** Winter-run redds. It is important to note that until data collection is completed for the year these are the **minimum** number of possible redds. The Winter-run number will always expand upon final analysis but gives an in-season guard rail of the minimum number of redds this year.

Given that the number of Winter-run redds is always larger than the early season carcass counts, an expansion number based on historic data is multiplied by the carcass count to estimate the total number of redds for the season before the end of the season's final estimate is developed and the final redd count is known. Average 2005-2022 expansion was 1.98 * the total redd count, and thus we focus on an expansion factor of 2 to represent expected final redd count and support decision-making.

Table 1: Estimated total number of Winter-run redds and resulting number of redds that represent 1% of the population. Estimated total redds are based on current count and expansion number representing average 2005-2022 expansion.

Name	Expansion Number	Total Redds	1%
Current Count	1	152	1.52
Anticipated Expansion	2	304	3.04

Chinook Salmon Dewatered Redd Estimates

As of October 31, 2024, **12** Winter-run redds have **emerged** and **0** have been **dewatered**. This leaves **5** shallow water redds of concern.

There is no real time data on fall-run redd counts. Estimates are predicted based on estimated dewatering percentages from USFWS (2006) and spring-run and fall-run spawn timing based on fresh female carcasses encountered by week from 2003 through 2023. Emergence timing were predicted from water temperatures below Keswick in 2018 which most closely aligns with 2024 operations targeting 53.5 F at Clear Creek.

Fall-run dewatered redd estimates range from **10.5** to **13.5%**. Note that fall-run dewatering estimates are likely overestimated using the dewatering percentages from USFWS (2006), and likely do not reflect actual dewatering percentages and should only be used for comparative purposes between scenarios. A comparative analysis between field and modeled dewatering percentages by Gosselin and Beer (2024) can be found here: https://www.cbr.washington.edu/sacramento/fishmodel/Note_on_Redd_Dewatering_Observed_v_Predicted.pdf.

Carryover Effects to Next Year Winter-run Brood

An analysis on the relationship between winter-run chinook salmon temperature dependent mortality relationship and Shasta Reservoir end-of-year storage suggests a threshold of 2,200 TAF end of September Shasta Storage to assess the impacts of TDM impacts on next year’s cohort. Next year’s cohort is expected to experience minimal TDM impacts when end of September Shasta Storage is greater than this threshold, while values lower than 2,200 TAF are correlated with potentially more negative TDM impacts. As of August, End of September Shasta Storage is expected to be **2717** TAF. All proposed scenarios are anticipated to have EOS storage greater than the 2200 TAF threshold and therefore would not be expected to contribute to TDM impacts to winter-run chinook salmon in the subsequent year (see Table 2).

Preliminary Predicted Results

Table 2: Summary of water volume and winter-run and fall-run dewatering estimates related to flow scenarios. Each scenario uses actual flow-to-date as of most current report and proposed flows for the remainder of the incubation period. Percentage of the population lost is based on the September 10, 2024 count of 152 Winter-run redds. See Scenario Descriptions file for additional information on each scenario.

Metric	aug90wradjdec	aug90wrfr6000	aug90wrfr6500	aug90wrshape2dec	aug90wrshapedec	spgoct3
Avg Sept Flow (cfs)	8358	8358	8358	8358	8358	8358
Avg Oct Flow (cfs)	6879	6879	6879	6879	6879	6879
Sept-Feb Total Volume (TAF)	1974	2001	1991	1933	1933	1933
Aug-Sept Total Volume (TAF)	1213	1213	1213	1213	1213	1213
Anticipated EOS Storage (TAF)	2717	2717	2717	2717	2717	2717
Winter-run Redds Dewatered	1	2	1	2	2	2
Winter-run Percent Lost (current count)	0.66	1.32	0.66	1.32	1.32	1.32
Winter-run Percent Lost (mean expansion of 2)	0.33	0.66	0.33	0.66	0.66	0.66
Winter-run Redds Dewatered (250 cfs buffer)	1	2	1	2	2	2
Winter-run Percent Lost (250 cfs buffer)	0.66	1.32	0.66	1.32	1.32	1.32
Fall-run dewatered (%)	13.3	12.7	13.5	10.5	10.5	10.5

Table 3: Description of scenarios being considered and compared by the Upper Sacramento Scheduling Team. Scenario name includes the shorthand notion in parentheses for cross-referencing with graph and tables.

Scenario	Description
Aug 90% WR shape dec (aug90wrshapedec)	Developed on 9/6/2024. Based on the 90% forecast exceedance. Follows ramping rates. Shifts 500cfs diversion from late Oct to early Oct.

Aug 90% WR shape2 dec (aug90wrshape2dec) SPG Oct 3 (spgoct3)	Developed on 9/11/2024. Based on the 90% forecast exceedance. Follows ramping rates. Shifts 500cfs diversion from late Oct to early Oct. Removes end of Sept 4-day flow reduction at Keswick Scenario developed on 10/7/2024 based on Shasta Planning Group advice transmitted to USST on October 3. Reduce flows to 6,750 cfs (rounded to 6,800 cfs) after heat wave (Oct 12), then try to reduce releases after winter-run redd (ID 4152-24-W) emerges Oct 24. This scenario is similar to Aug 90% WR shape2 dec. Assumes unable to reduce end of Oct but begins rampdown Nov 1.
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References

- Gard, Mark. 2006. Relationships between flow fluctuations and redd dewatering and juvenile stranding for Chinook Salmon and Steelhead in the Sacramento River between Keswick Dam and Battle Creek. 94 pages.
- Gosselin, J.L. and W.N. Beer. 2024. Sacramento River Winter-run Chinook Salmon Redd Dewatering: a Note on Comparing Observed and Predicted. Central Valley Prediction and Assessment of Salmon (SacPas; <https://www.cbr.washington.edu/sacramento/>). Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington.

