PRELIMINARY DATA: Redd Dewatering Estimates for Keswick Fall Flow Scenarios

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Background

This script constructs real-time winter-run redd dewatering estimates based on most recent data available from CDFW (as of August 14, 2025) for winter-run data and using a redd dewatering estimate tool from USFWS (2006; see citation). Data are also available in the 2025 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.

Winter-run Redd Counts

As of August 13, 2025, the unexpanded redd count is **2206** 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 2.04 * the total redd count, but we illustrate several different expansion scenarios in the table below.

Table 1: Estimated total number of Winter-run redds with varying expansion factors and resulting number of redds that represent 1 percent of the population. An expansion factor of 1 approximates the lowest expansion factor of 1.25 observed in 2010, an expansion of 3.5 approximates the highest expansion factor of 3.36 in 2017, and an expansion of 2.0 approximates the average expansion factor of 2.04 over a 20 year period

Expansion Factor	Total Redds	Dewatering Threshold (1%)
1.0	2206	22

Expansion Factor	Total Redds	Dewatering Threshold (1%)
1.5	3309	33
2.0	4412	44
2.5	5515	55
3.0	6618	66
3.5	7721	77

Redd dewatering estimates

A total of **208** redds are or have been monitored this season. As of August 14, 2025, **0** Winter-run redds have **emerged** and **6** have been **dewatered**. This leaves **202** 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 from 2014 through 2023. Emergence timing were predicted from water temperatures below Keswick individually for each year and dewatering was estimated for each scenario for each year to capture annual variance in spawn timing. Fall-run dewatering estimates range from **6.4** to **25.6%** (see detailed data in table below). 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.

Table 2: Estimated fall-run redd dewatering for each scenario by spawning year to reflect variation in spawn timing

Scenario	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
A3	14.7	13.8	8.8	8.4	12.7	11.9	12.7	15.8	14.0	8.1
B3	10.4	10.1	6.7	6.6	9.4	9.1	9.4	11.7	11.4	6.4
C1	22.1	20.3	13.4	14.8	21.3	18.8	18.2	24.6	21.7	14.0
C2	22.4	21.0	14.8	16.8	22.9	19.5	18.7	25.6	23.4	15.9

Carryover Effects to Next Year Winter-run Brood

Carryover effects as it relates to temperature-dependent mortality will be evaluated when additional scenarios have been developed.

Preliminary Predicted Results

Below are summarized results of scenarios as they relate to total volume, winter-run redd dewatering, and fall-run redd dewatering by scenario. Note that winter-run redd dewatering is predicted and based on estimated flow in which a redd may be dewatered prior to emergence. Fall-run redd dewatering is averaged over multiple years of spawning data.

Table 3: Summary of water volume for each scenario. After August 1 in each year each scenario uses actual flow-to-date as of most current report and proposed flows for the remainder of the incubation period. See scenarios description table for further detailed explanation of scenarios.

Volume Measures	A3	B3	C1	C2
Avg Sept Flow (cfs)	8500	8500	9500	8750
Avg Oct Flow (cfs)	7500	6500	9500	8750
Sept-Feb Total Volume (TAF)	1978	1917	2176	2094
Aug-Sept Total Volume (TAF)	1186	1186	1242	1198

Table 4: Estimated number of dewatered winter-run redds with and without a 250 cfs buffer. Winter-run redd dewatering predictions include any confirmed dewatered redds in the count to actively reflect both observed and predicted dewatering. After August 1 in each year each scenario uses actual flow-to-date as of most current report and proposed flows for the remainder of the incubation period. See scenarios description table for further detailed explanation of scenarios.

Dewatering Count Measures	A3	B3	C1	C2
Winter-run Redds Dewatered	68	84	15	43
Winter-run Redds Dewatered (250 cfs buffer)	77	110	22	43

Table 5: Predicted percentage of winter-run and fall-run redds expected to be dewatered across scenarios, expansion factors, and flow buffers. Percentage of the population lost is based on most recent unexapanded count of Winter-run redds. Fall-run dewatering percentage is average dewatering across years in table 2 for each scenario. After August 1 in each year each scenario uses actual flow-to-date as of most current report and proposed flows for the remainder of the incubation period. See scenarios description table for further detailed explanation of scenarios.

Dewatering % Measures	A3	B3	C1	C2
Winter-run % Lost (expansion factor = 1)	3.1	3.8	0.7	1.9
Winter-run % Lost (expansion factor = 2.04)	1.5	1.9	0.3	1.0

Dewatering % Measures	A3	B3	C1	C2
Winter-run % Lost (250 cfs buffer)	3.5	5.0	1.0	1.9
Fall-run % Redds Dewatered	12.1	9.1	18.9	20.1

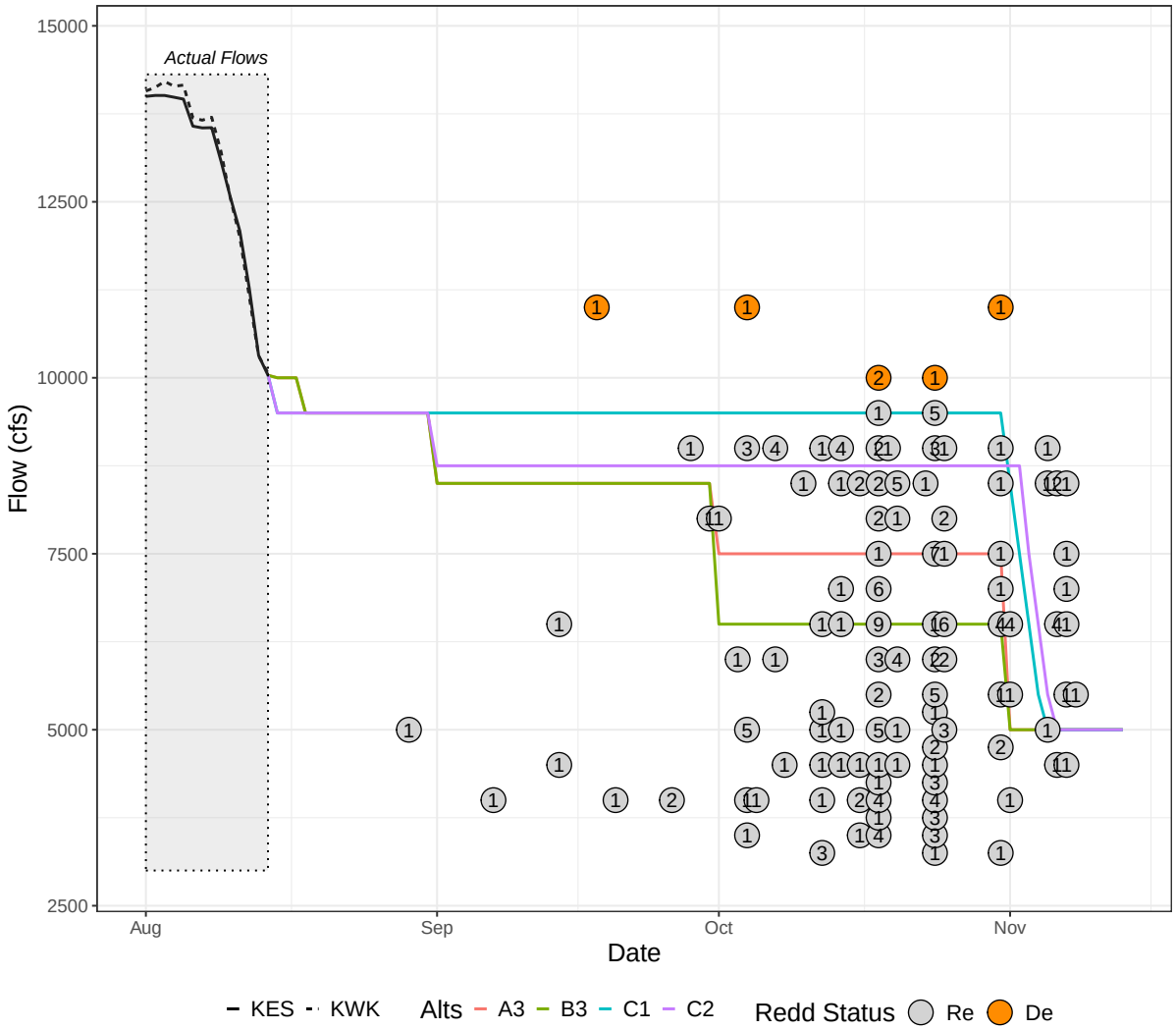

Figure 1: Actual or estimated emergence dates of SRWC redds and actual or estimated dewatering flow for the September-October estimated redd emergence dates as compared to Keswick flow (in cfs) of proposed management alternatives. Points represent dewatered (De), emerged (Em), or remaining (Re) redds. Numbers inside of points indicate how many redds share that estimated emergence date and actual/estimated dewatering flow. Points that fall above/to the right of a flow alternative line are expected to be dewatered given that management alternative is followed. Points that fall below/to the left of/on a flow alternative line are not expected to be dewatered, given that management alternative is followed

Table 6: Description of scenarios being considered and compared by the Upper Sacramento Scheduling Team

Scenario	Description
A3	Scenario using August 90% exceedance forecast developed on August 11, 2025. Does not follow ramping rate criteria.
B3	Scenario using August 50% Exceedance Forecast developed on August 11, 2025.Does not use ramping rate criteria.
C1	Scenario focused on reducing winter-run redd dewatering developed on August 12, 2025.
C2	Scenario focused on reducing winter-run redd dewatering developed on August 14, 2025.

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.