



— BUREAU OF —
RECLAMATION

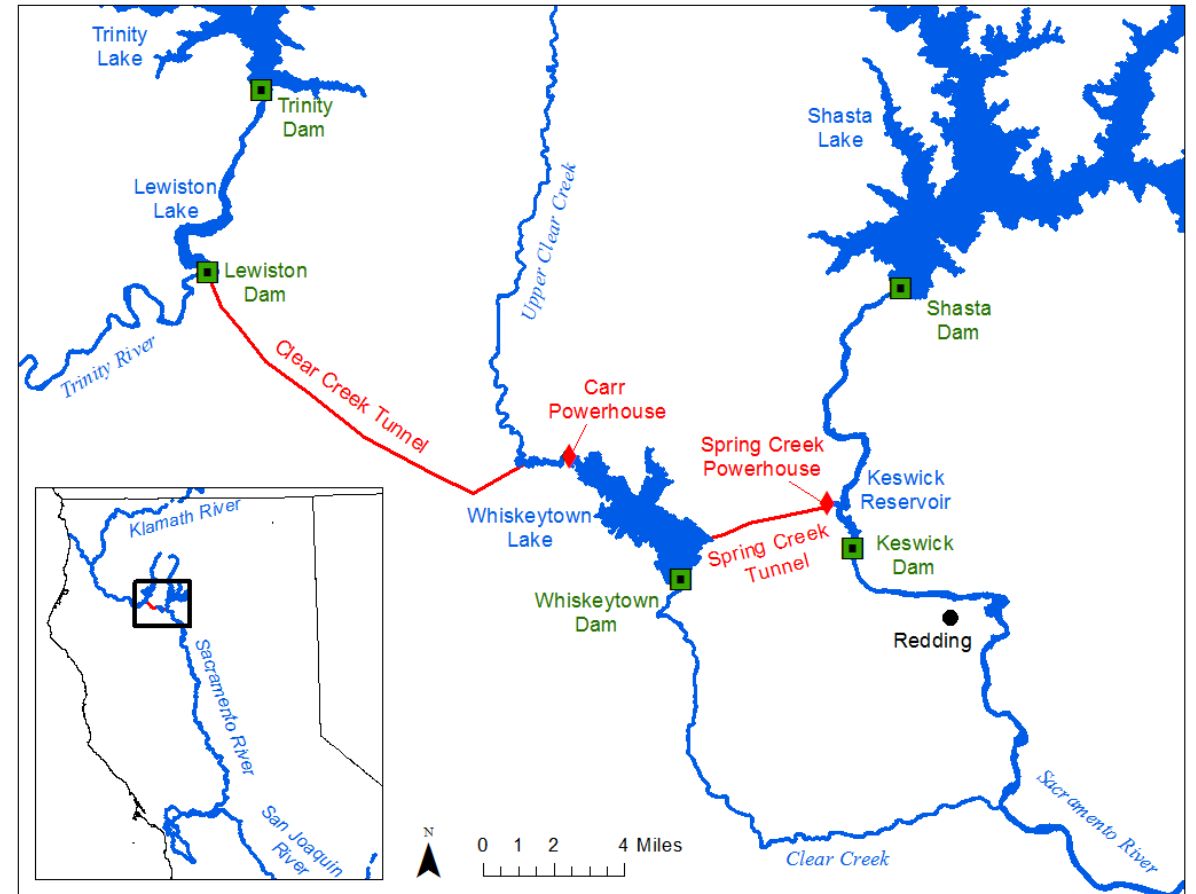
Shasta Reservoir Management for Water Temperatures

Proposed Action for the Coordinated Long-Term Operation of the CVP and SWP

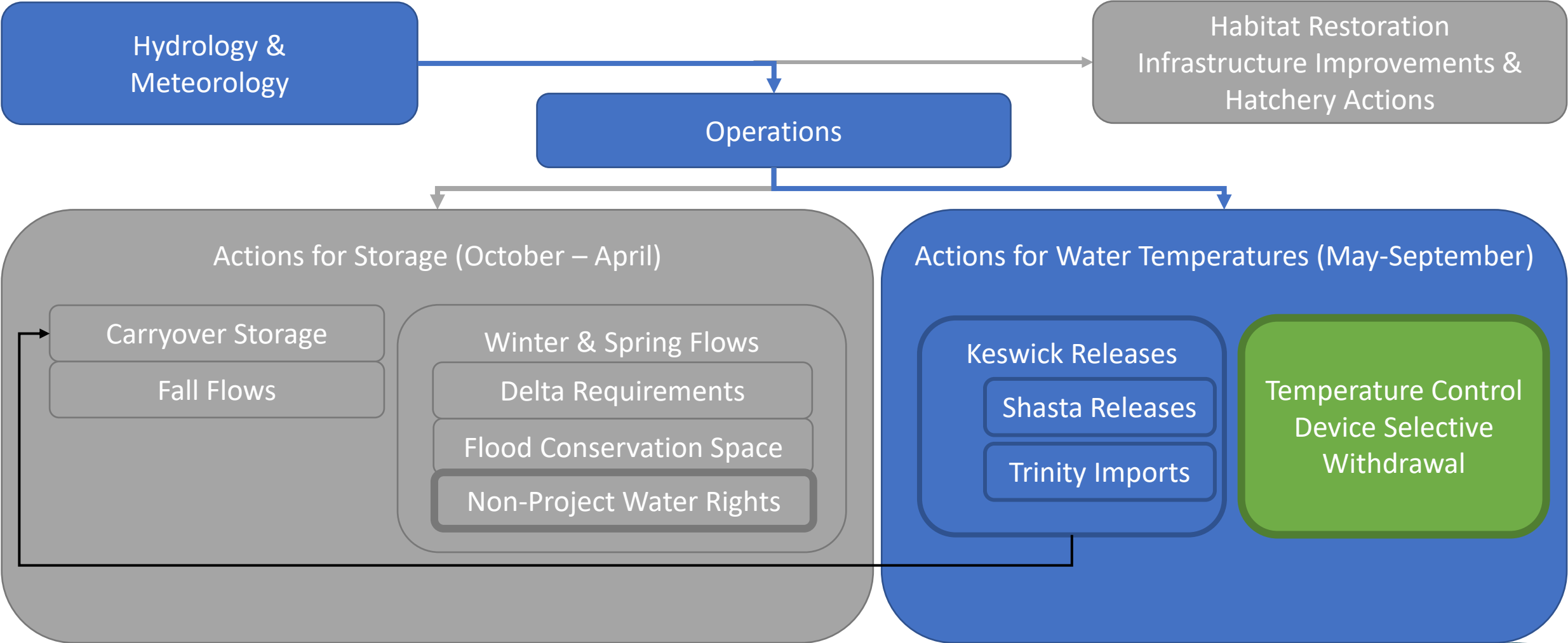
April 21, 2021

Shasta and Trinity Divisions

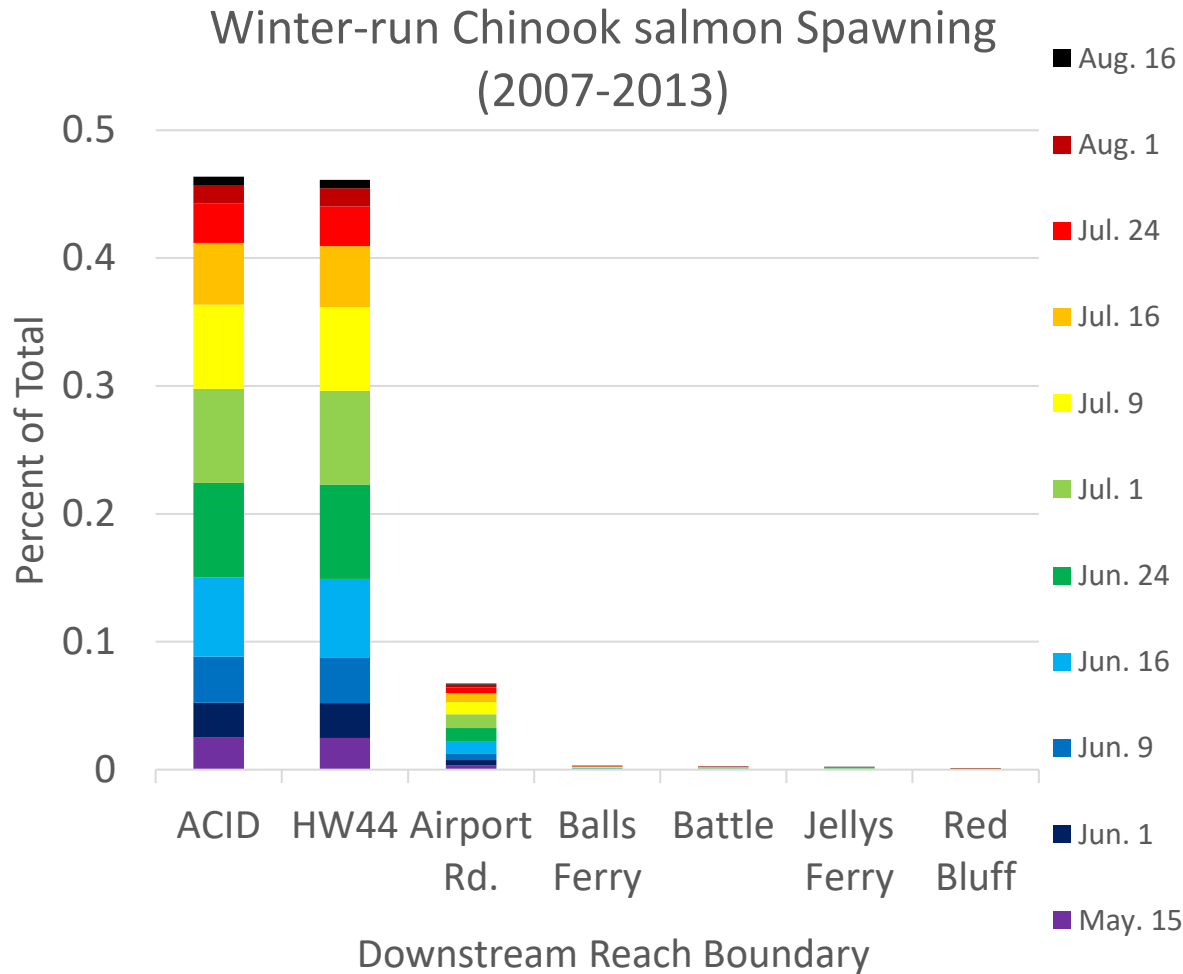
- Facilities
 - Shasta and Keswick Dams and Reservoirs
 - Trinity and Lewiston Dams and Reservoirs
 - Carr and Spring Creek
 - Whiskeytown Dam and Reservoir
- Proposed Action Components
 - Seasonal Operations
 - Status and Trend Monitoring
 - Habitat and Facility Improvements
 - Hatchery Intervention
 - Special Studies



Shasta Cold Water Pool Management Framework



Winter-Run Chinook Salmon



- Spawning, incubation, and emergence generally occurs May through November.
- Most winter-run spawn upstream of the Clear Creek confluence.
- Temperature-dependent mortality is believed negligible at water temperatures colder than 53.5°F*.
- Hydrology and meteorology does not provide enough cold water for 53.5°F below Keswick Dam in all years.
- The biology of egg incubation provides a strategy that can incorporate uncertainty in meteorology and hydrology.

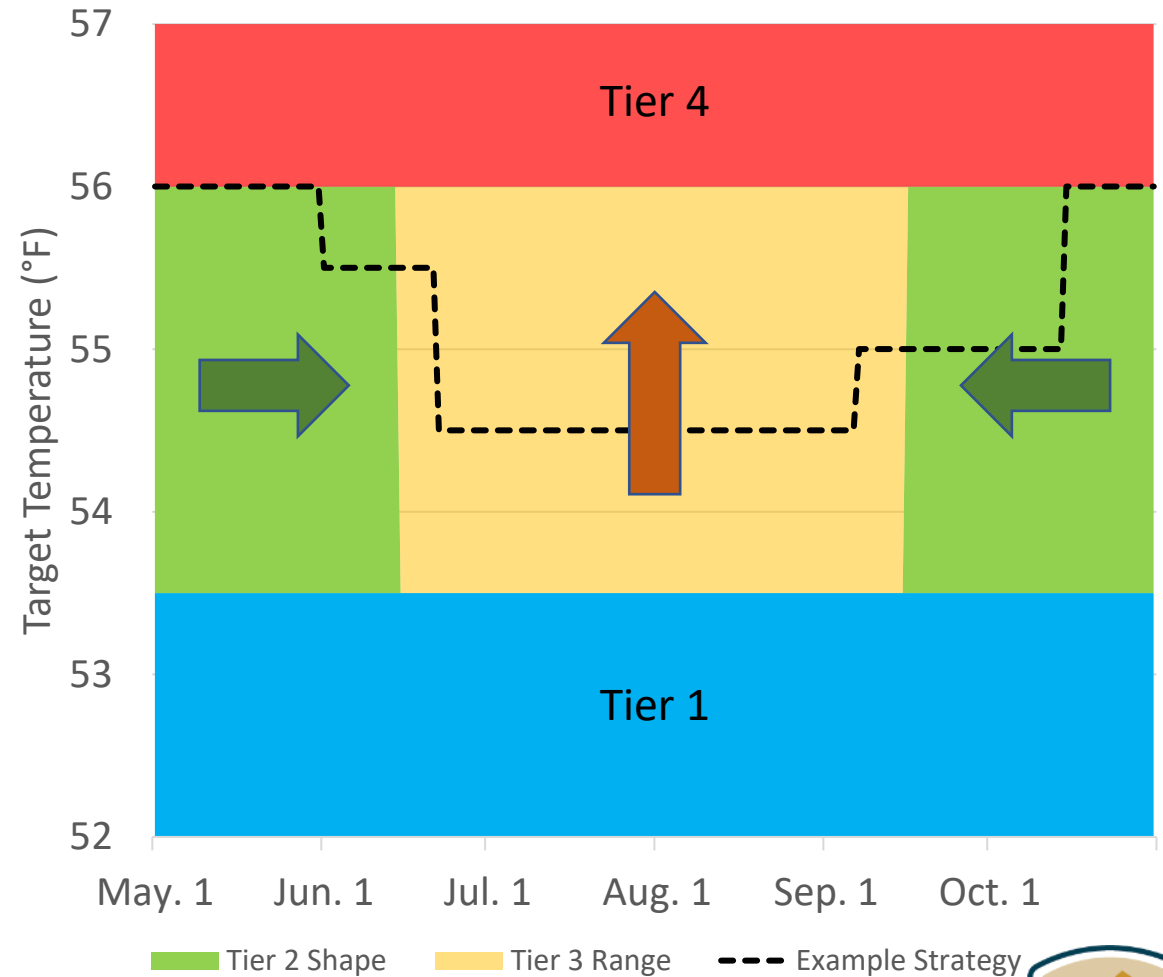
*The 53.5°F DAT (daily average temperature) is the operational and modelled parameter to achieve the 57 °F 7DADM (7-day average daily maximum) for the Sacramento River.



Shasta Cold Water Pool Temperature Tiers

- The tier depends on feasibility after the May 1 reservoir profile identifies the available cold water pool (CWP).
- Description of Tiers-Based Strategy:
 - Tier 1: CCR ≤ 53.5 °F (CWP > ~2.8 MAF*)
 - Tier 2: CCR 53.5 °F to 56 °F (CWP < ~2.8 MAF*)
 - Tier 3: CCR > 53.5 °F but ≤ 56 °F (CWP > ~2.3 MAF*)
 - Tier 4: CCR > 56°F (Total Storage < ~2.5 MAF)
- The Sacramento River Temperature Task Group develops the schedule of target temperatures.

* The reservoir storage believed necessary to achieve downstream water temperatures is based on historical conditions. The tier in any particular year will depend upon measured conditions.



Performance Measures

Temperature Dependent Mortality

	Frequency	Average	Range	Measure
Tier 1	68%	6%	0.4 - 39%	<15%
Tier 2	17%	15%	1 - 46%	<31%
Tier 3	7%	34%	6 - 77%	<65%
Tier 4	7%	n/a	n/a	n/a

Egg to Fry Survival

	Frequency	Average	Range	Measure
Tier 1	68%	29%	15 - 49%	32%
Tier 2/3	24%	21%	15 - 34%	27%
Tier 4	7%	n/a	n/a	n/a

If necessary, an independent panel will evaluate the conditions experienced during the years under review, the success of the implementation of the tiered strategy, the effect of the implementation on the species, and, if needed, develop recommendations to improve implementation and performance.



Tier 4 and Drought Actions at Shasta Reservoir

- Ahead of Time
 - Storage in Shasta Reservoir
 - Directors Meeting
 - Drought and Dry Year Toolkit
- During
 - Year-Specific Performance Measures
 - Sacramento River Settlement Contractors Meet and Confer
 - Sacramento River Temperature Task Group
- Long-Term
 - Monitoring and Analysis Tools
 - Habitat and Facility Improvements
 - Independent Panel Recommendations



The Livingston Stone National Fish Hatchery, located at the foot of Shasta Dam near Redding, CA, raises winter-run Chinook salmon to supplement wild populations with measure that preserve genetic diversity.



Shasta Cold Water Pool Temperature Tiers



■ Tier 1
 ■ Tier 2 Shape
 ■ Tier 3 Range
 ■ Tier 4
 • Example Strategy

