Bay-Delta Fish & Wildlife Facing a Catastrophe in 2021

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Overview

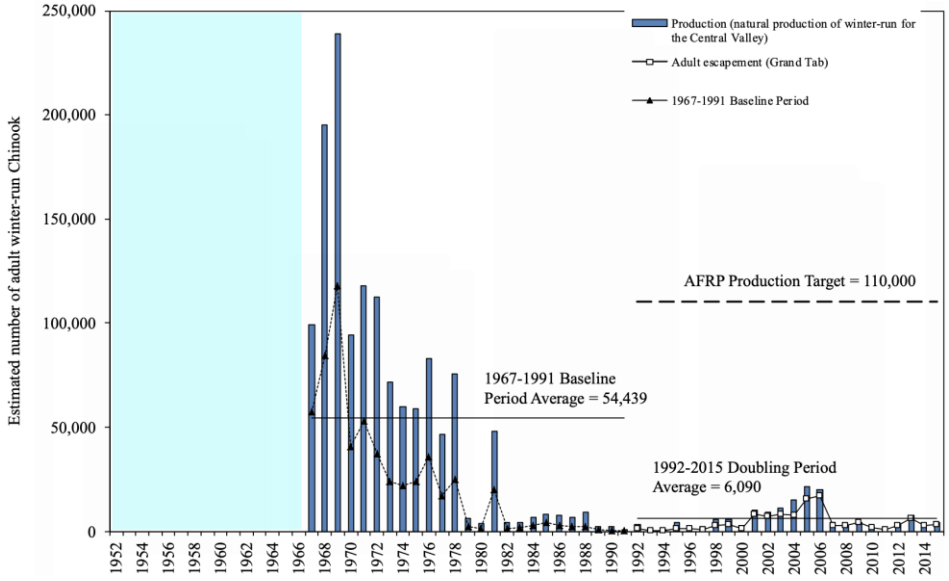
- CV Salmon populations are in deep trouble
- High water temperatures threaten to devastate winter, spring, and fall-run Chinook Salmon again this year
- Reducing water deliveries now can reduce river temperatures and salmon mortality this summer and fall to levels that are less catastrophic

CV Chinook Salmon in Deep Trouble

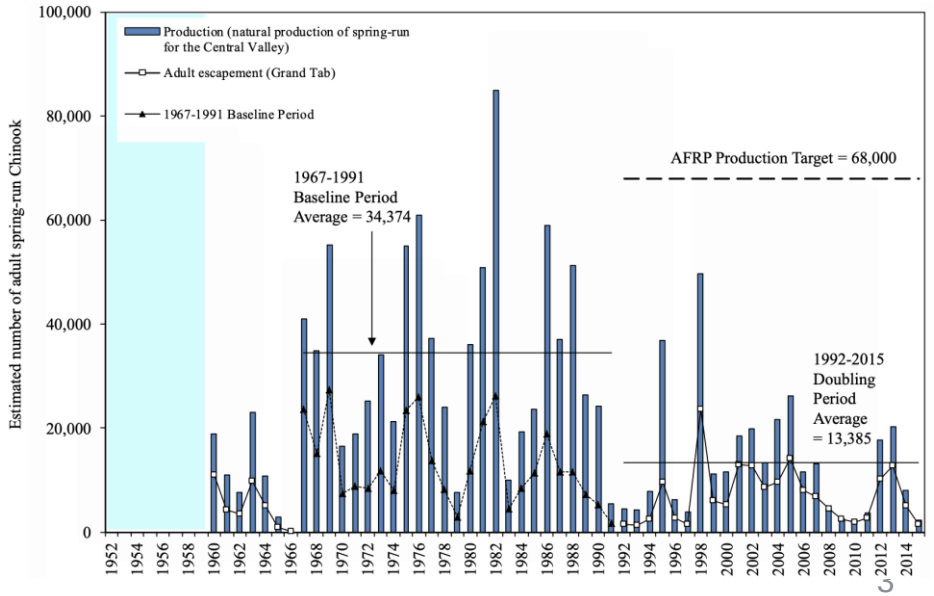
	Natural Production Annual Average Baseline (1967–1991) Period	Natural Production Annual Average for 1992–2015 Period	Change in Average Natural Production between 1967–1991 and 1992–2015
Sacramento winter-run	54,439	6,090	-89%
Sacramento spring-run	34,374	13,385	-61%
Sacramento late-fall-run	33,941	16,175	-52%
Sacramento fall-run (main stem)	115,371	65,791	-43%
San Joaquin fall-run[1]	38,388	17,453	-55%

Source: SWRCB 2017

Winter-run

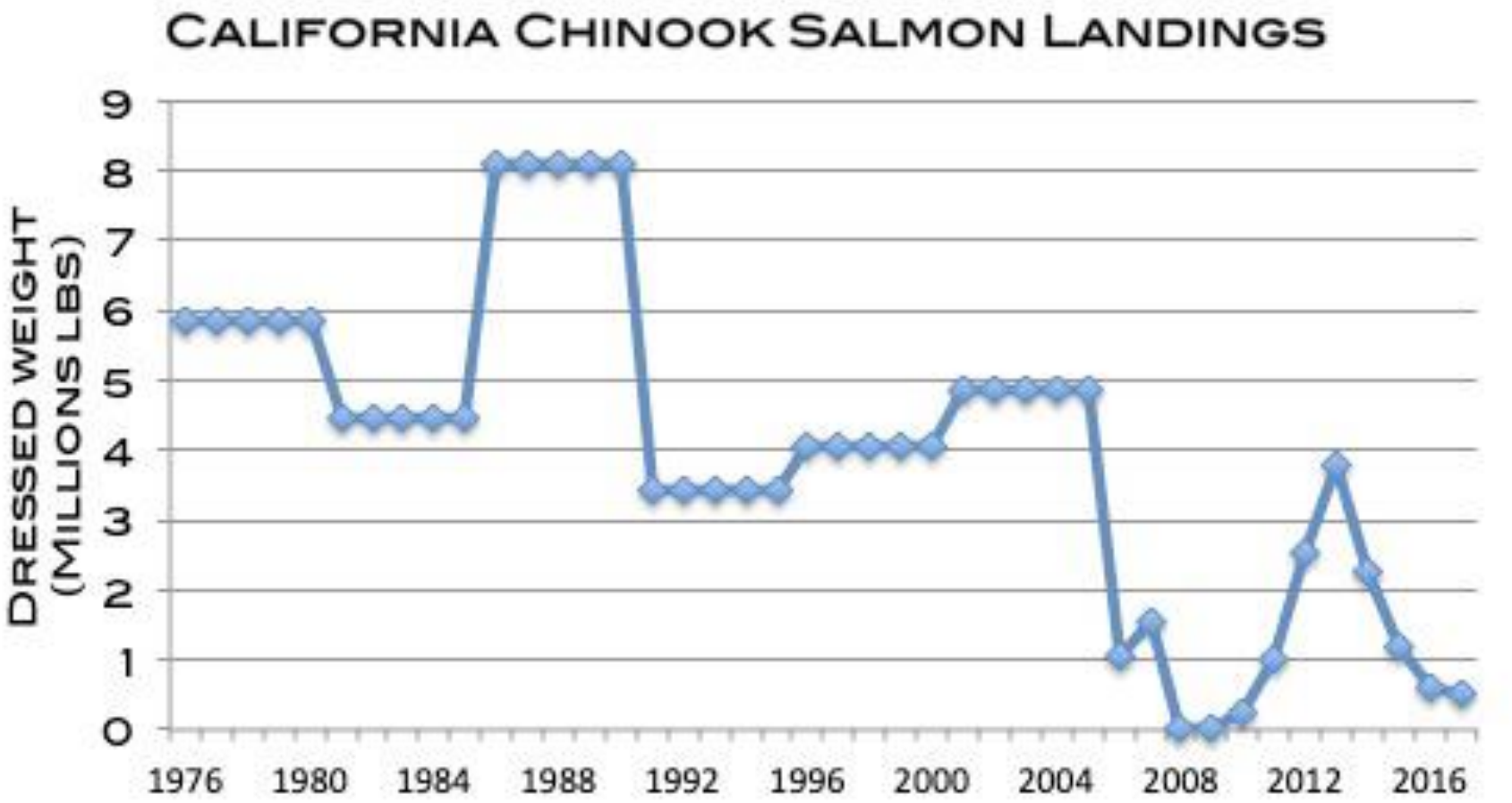


Spring-run



Source: AFRP 2021

California Chinook Salmon Fishery



Data from: PFMC 2018

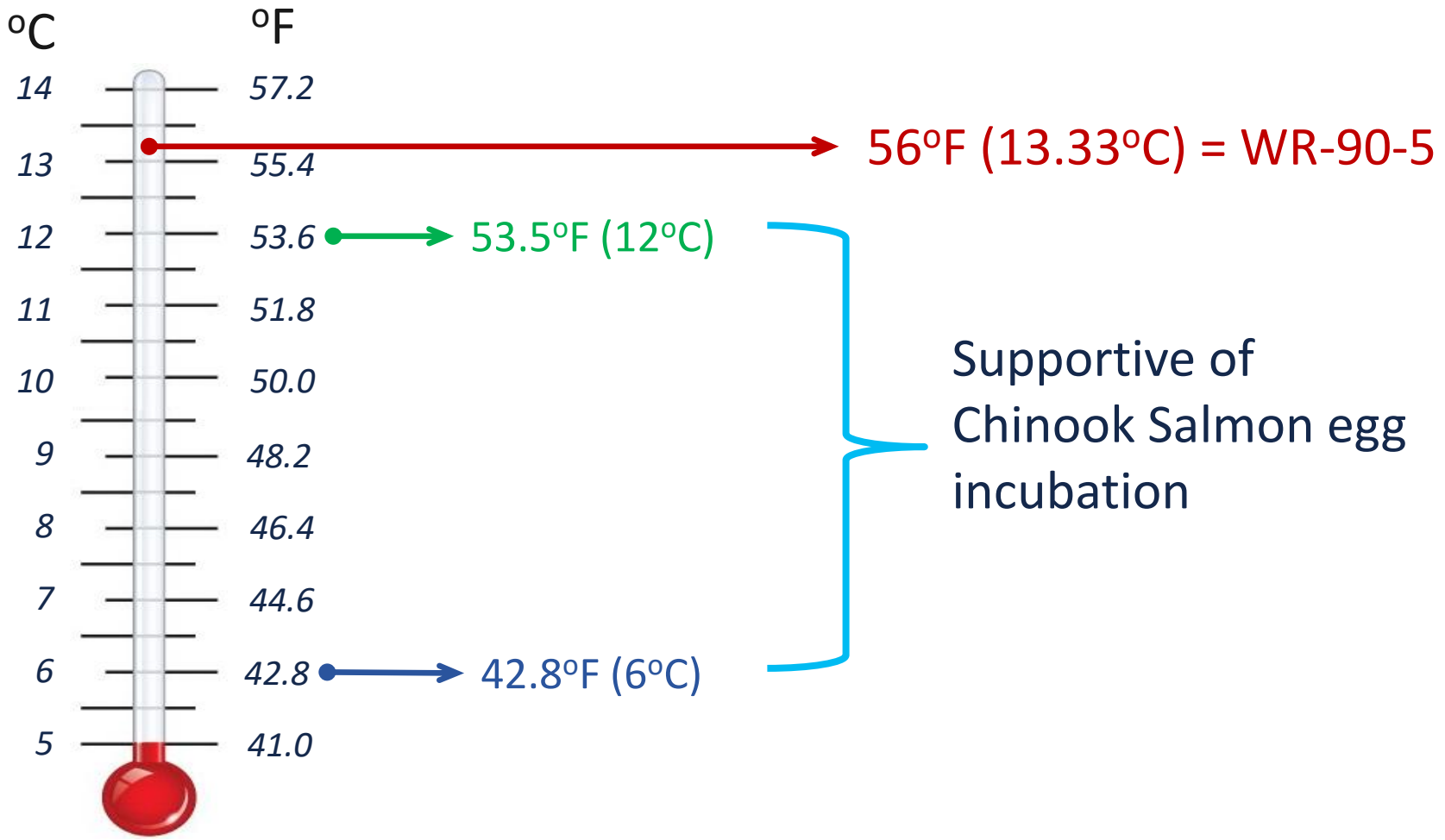
CV Chinook Salmon Life History

High water temperatures are detrimental to the fishery year-round

	Adult Migration period	Adult Peak Migration	Adult Spawning Period	Adult Peak Spawning Period	Juvenile Emergence Period	Juvenile Stream Residency (Months)
Sacramento Basin						
Winter-run	Dec–Jul	Mar	Late Apr–mid Aug	May–Jun	July–Oct	5–10
Spring-run	Feb–Sept	May–Jun	Late Aug–Nov	Oct–Nov	Dec–Mar	12–16
Late-fall-run	Oct–Apr	Dec–Jan	Early Jan–Apr	Feb–Mar	Apr–Jun	7–13
Fall-run	Jun–Dec	Oct	Late Sep–Jan	Oct	Dec–Apr	1–5
San Joaquin Basin						
Fall-run	Sept–Dec	Nov	Nov–Jan	Nov–Dec	Dec–Mar	2–5
Steelhead (both basins)	July–Mar	Sep–Oct	Nov–Apr	Dec–Apr	Jan–May	12–36

Source: Modified from Yoshiyama et al. (1998) and NMFS (2014a).

Central Valley Temperature Criterion



Central Valley Temperature Thresholds

Species	Temperature	Metric	Citation	Geography
Chinook Salmon	42.6 to 53.6°F	Daily Average	SEP 2019	Central Valley
	<54.5°F	7DADM		
	<54.5°F	Daily Average	Martin et al. 2016	Central Valley (winter-run)
	39.2 to 53.6°F	Daily Average	Myrick and Cech 2001, 2004	Central Valley
	55.4°F	7DADM	Richter and Kolmes 2005	Rangewide
	55.4°F	7DADM	USEPA 2003	Rangewide
Steelhead	44.6 to 50°F <50.9°F	Daily Average 7DADM	SEP 2019	Central Valley
	44.6 to 50°F	Daily Average	Myrick and Cech 2001, 2004	Central Valley
	50°F	Weekly Mean	Richter and Kolmes 2005	Rangewide

High Egg Survival Rates are Crucial

Temperature Dependent Egg Mortality

Egg-Fry Survival

- Typical population = 38% survival (Quinn 2005)

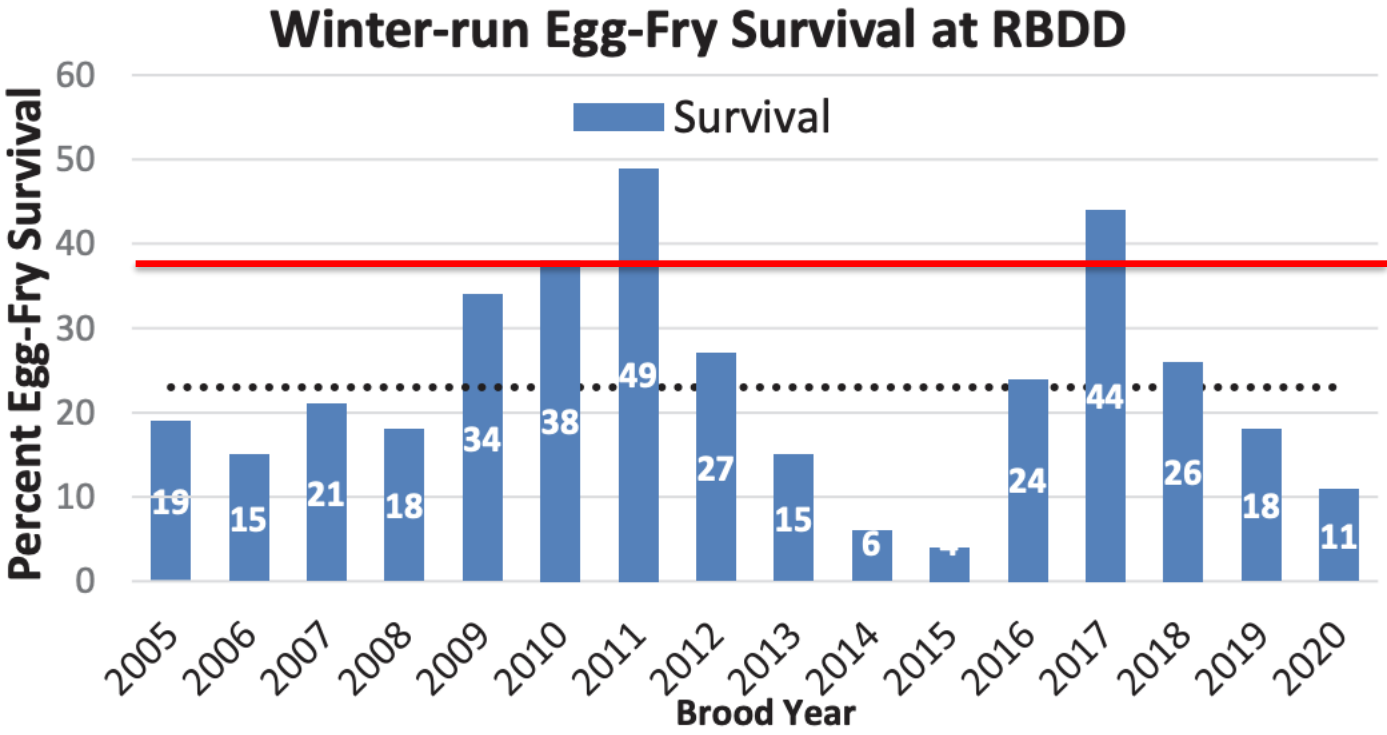
Total Freshwater Survival

- Typical population = 10% survival (Quinn 2005)

Poor Egg-Fry Survival Below Shasta

Rangewide average egg-to-fry survival ~38% (Quinn 2005)

Sacramento winter-run Chinook average egg-to-fry survival ~23%



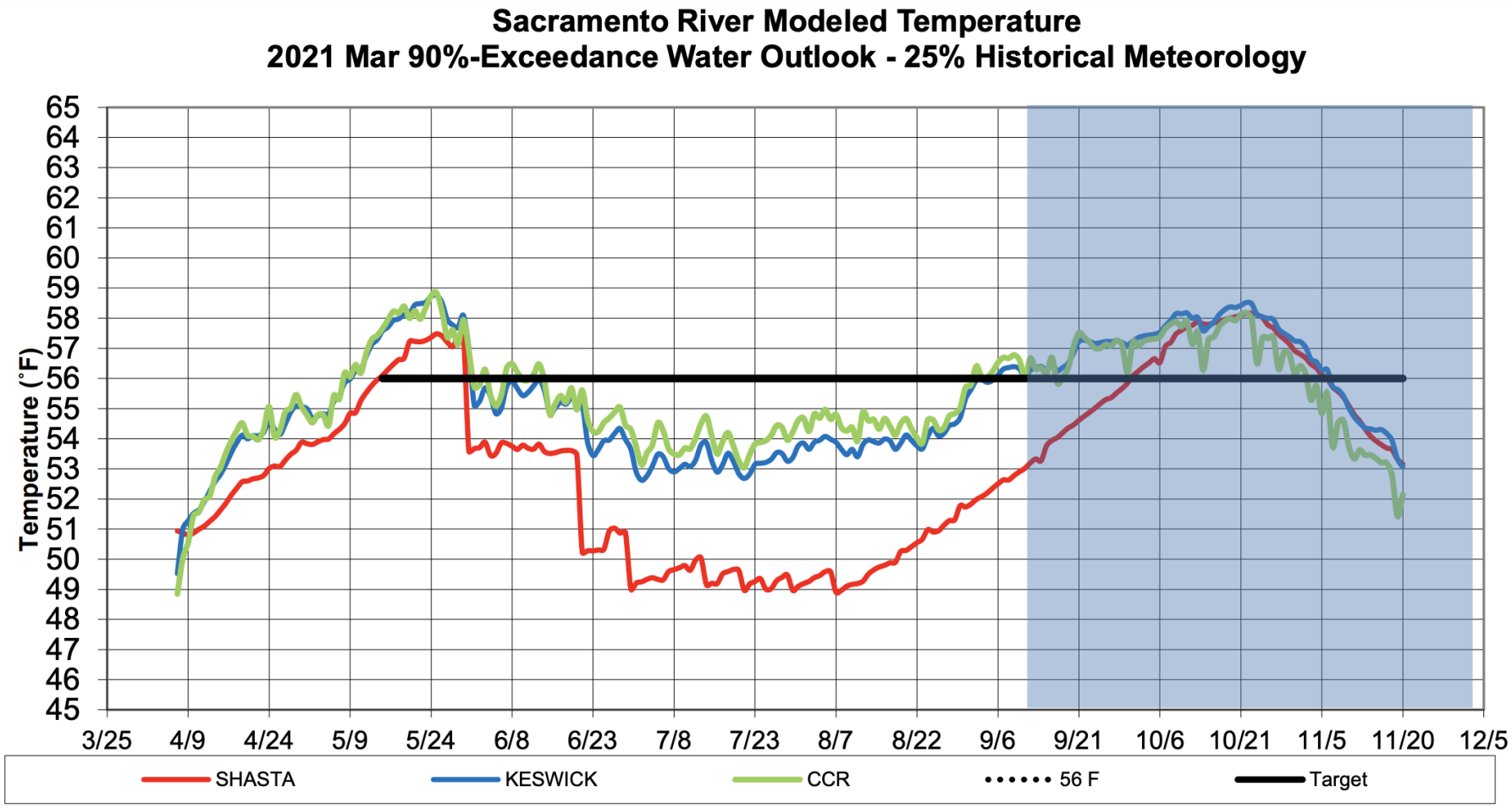
Source: NMFS (Cathy Marcinkevage) letter to Reclamation (Kristin White) January 25, 2021

Low “temperature-dependent egg mortality” is required in order to achieve high egg-fry survival

Maximum Temperature Dependent Mortality

	NMFS' Jan. 19, 2017 Draft RPA Amendment	NMFS' July 1, 2019 Jeopardy Biop	2021 Projections
"Tier 4" Years / Critically Dry Years	Maximum temperature dependent mortality = 30%	• Minimum egg to fry survival = 15% • End of September Shasta Storage of 1.9 MAF • Only 1 in 10 years can be "Tier 4"	• Temperature dependent mortality = 89% (worse than 2014 or 2015) • End of September Storage = 1.29 MAF

Devastating River Temperatures for Winter, Spring, and Fall-run in 2021

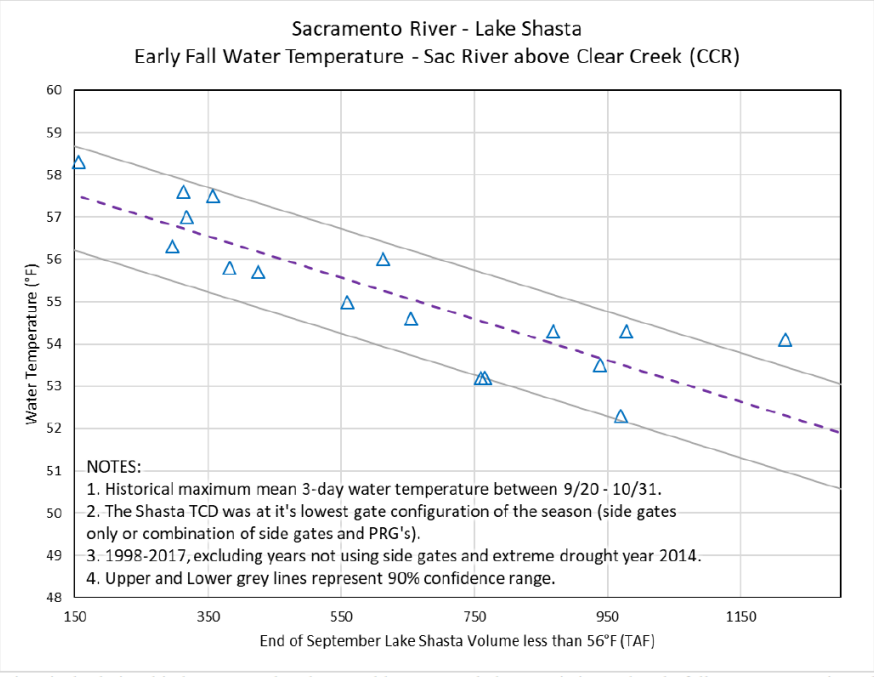


Source: USBR 2021

River Temperatures Can Be Managed

- Maintain adequate reservoir storage
  - Reduce reservoir releases
  - Delay reservoir releases
- Release colder water
  - Temperature Control Device
  - Powerplant bypasses

Historical relationship between Lake Shasta cold-water pool and Sacramento River temperature above Clear Creek



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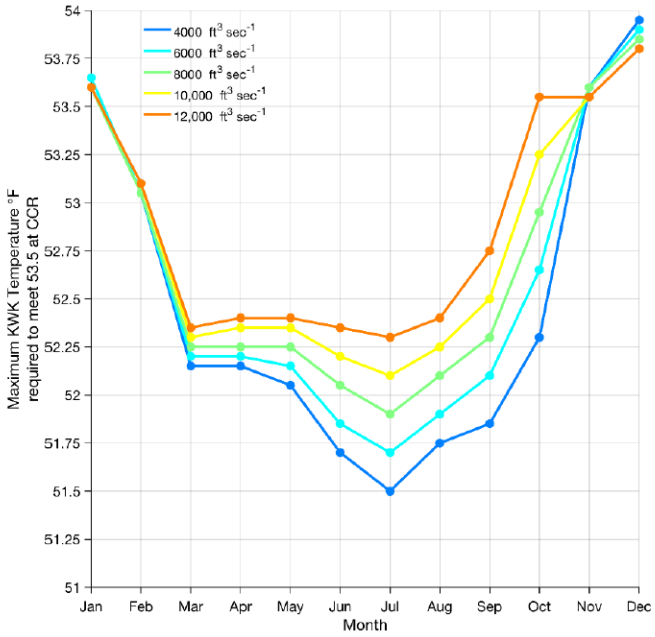


Figure 41. Estimated Keswick Dam discharge temperature required to obtain a water temperature less than or equal to 53.5°F at Clear Creek gauge for five discharge levels.

"… drivers that had the greatest influence on temperature dynamics were [Shasta] dam discharge temperature, air temperature, and solar radiation. The primary controlling factors were dam discharge temperature in the most upstream reaches and air temperature in the most downstream reaches."

Daniels and Danner 2020

Water Rights Order 90-5

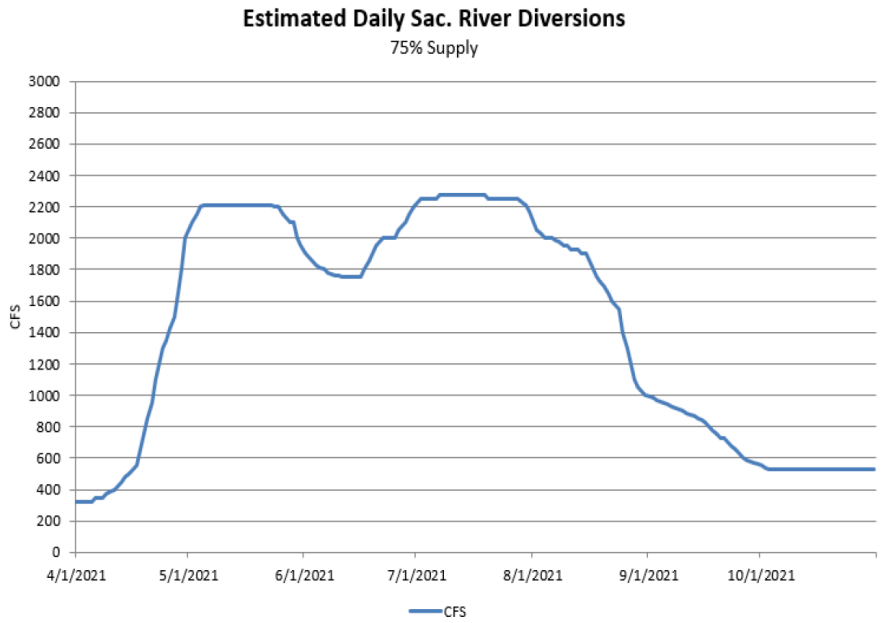
Reclamation "… shall operate Keswick Dam, Shasta Dam, and the Spring Creek Power Plant to meet a daily average water temperature of 56°F in the Sacramento River at Red Bluff Diversion Dam during periods when higher temperatures will be detrimental to the fishery."

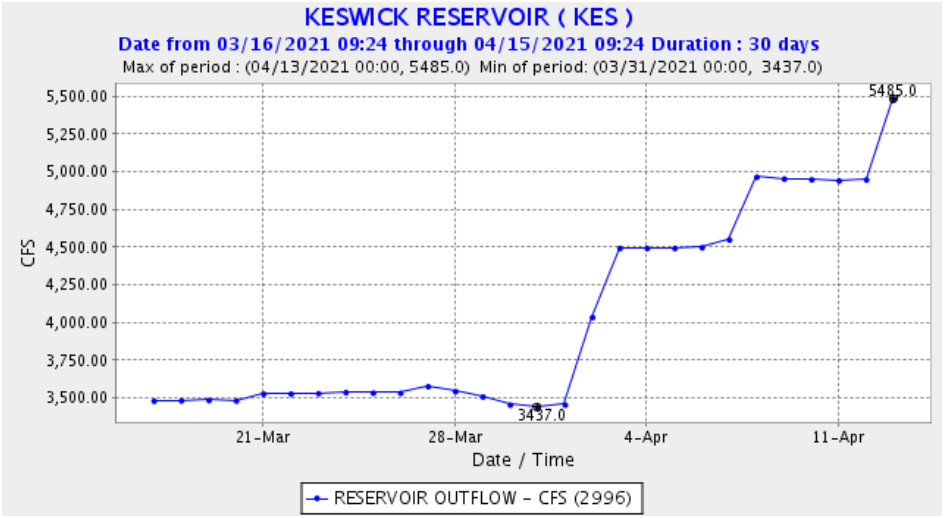
CVP Water Allocations in 2021

Service Area	Maximum per Contract or Agreement (acre-feet)	M&I Historical Use (1) (acre-feet)	Agricultural Use (2) (acre-feet)	2020 Allocation by %	2021 Allocation by acre-feet (9)
North of the Delta					
American River M&I	313,750	184,357		55%	101,397
Sacramento River					
Water Service	468,990				
Agriculture			441,784	5%	22,089
M&I		27,206		55%	14,963
Water Rights (3)	2,115,620			75%	1,586,715
Refuge - Level 2 (4)	151,250			75%	113,438
South of the Delta					
Water Service	2,112,898				
Agriculture			1,974,766	5%	98,738
M&I		138,132		55%	75,973
Water Rights	875,623			75%	656,717
Refuge - Level 2 (4)	271,001			75%	203,251
Contra Costa In Delta	195,000	170,000		55%	107,250
New Melones East Side (5)	155,000			100%	155,000
East-Side Water Rights (6)	600,000				600,000
Friant					
Class 1	800,000			20%	160,000
Class 2	1,401,475			0%	0
Buchanan Unit	24,000				24,000
Hidden Unit	24,000				24,000
Total Water (7) (8)	**9,508,607**				**3,943,531**

Keswick Releases Are High Now

Keswick Releases Increasing Now for Sacramento River Settlement Contractor Deliveries





Source: GCID 2021

Limiting Reservoir Releases Is Important

Limiting Spring and Summer Releases is Critical to Maintaining Temperature Control

Scenario Differences

	6 b (1) Reclamation	6 b (2) Salmonid Plan	6 b (3) "Temp Optimal" (SWCB Scenario)	6 b (4) 53 deg target at Shasta Reclamation	Request #1 - Same as 6b (2) Cut SC to keep Folsom whole
	Keswick (cfs)	Keswick (cfs)	Keswick (cfs)	Keswick (cfs)	Keswick (cfs)
April	5600	3250	3250	5600	3250
May	7589	5000	6000	7589	5000
June	8549	8000	8500	8549	8000
July	9234	8000	9000	9234	8000
August	7593	8000	8500	7593	8000
September	5000	6000	6000	5000	6000
October	4061	5500	5500	4061	5500
November	3389	5000	3389	3389 *	5000
December	3250	5000	3250	3250	5000
January	3250	3250	3250	3250	3250
February	3250	3250	3250	3250	3250
EO Sep Storage	1204	1558	1377	1204	1558
EOS vol below 56	199	399	256	305	399
1st side gate ops	July 26	Aug 18	Aug 10	Aug 23	Aug 18
Side gate ops	Sep 11	Oct 22	Sep 17	Oct 20	Oct 22

Source: SWRCB 2015

"the extreme drought in 2014 through 2016 and associated modelling scenarios demonstrated that the volume and stability of cold water throughout the temperature management season can be adversely affected not only by April and May deliveries but also by deliveries in June and early July."

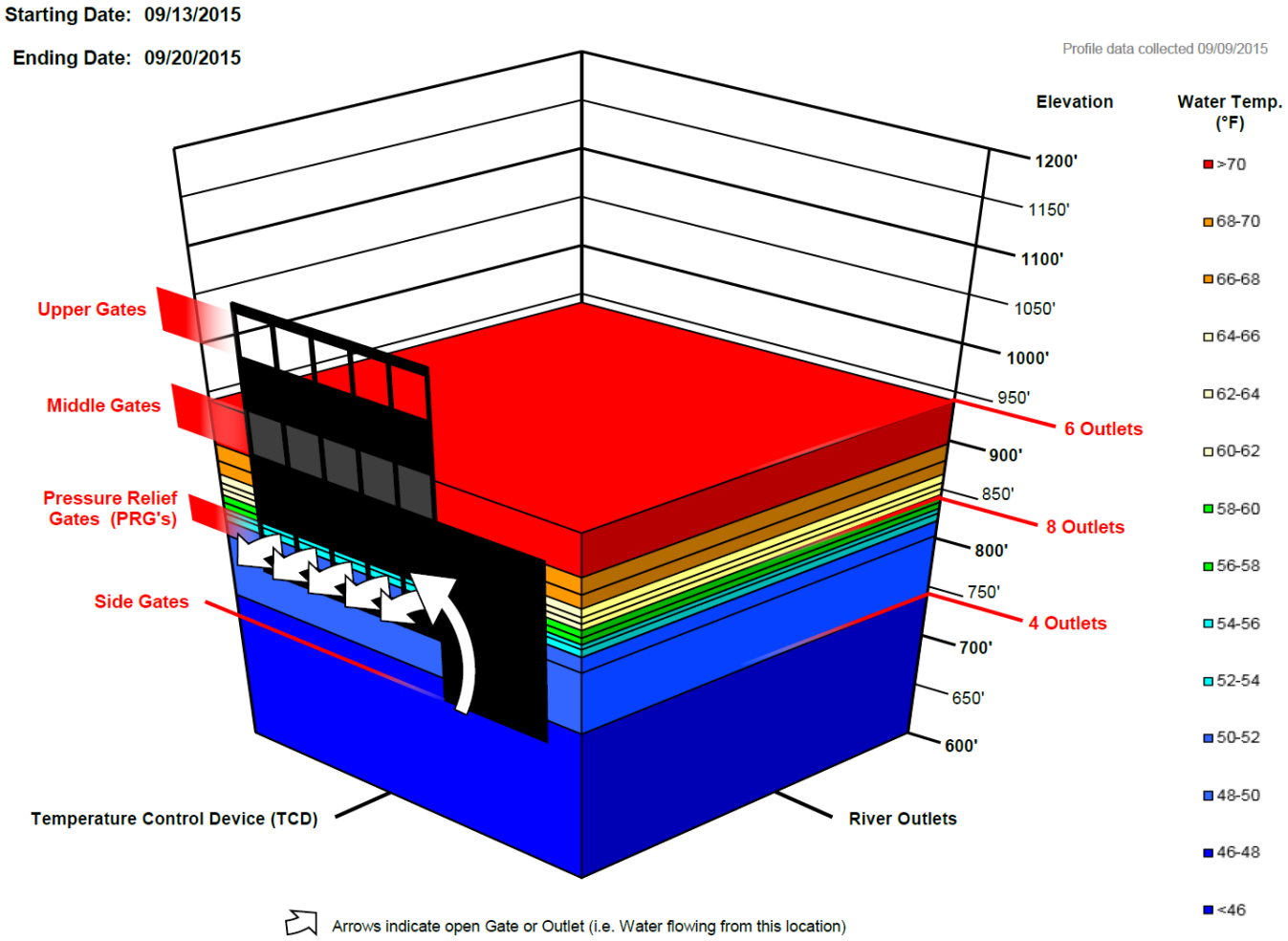
- NMFS 2019

Keswick Releases Can Be Reduced

Keswick Releases Exceed Water Temperature Requirements Today – And All summer

	2021 Planned Keswick Releases	NMFS' Proposed Maximum Keswick Releases (Jan. 2017 RPA Amendment)
April (90% forecast)	6,000 cfs	4,000 cfs
May (90% forecast)	7,738 cfs	6,000 cfs
June (90% forecast)	8,817 cfs	6,000 cfs
July (90% forecast)	9,029 cfs	6,000 cfs

Shasta Temperature Control Device



Water Temps to Protect Fish & Wildlife

- Order 90-5 requires Reclamation to protect winter-run “and other runs of Chinook salmon and other native species.”
- Under 90-5, factors under “Reclamation’s control include deliveries of water diverted under Reclamation’s water rights, including deliveries to settlement and exchange contractors.”
- Reducing water deliveries can better protect salmon
- Winter-run temperature mortality should be less than 30%
- The plan does not protect fall-run salmon and other fish

Thank you

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