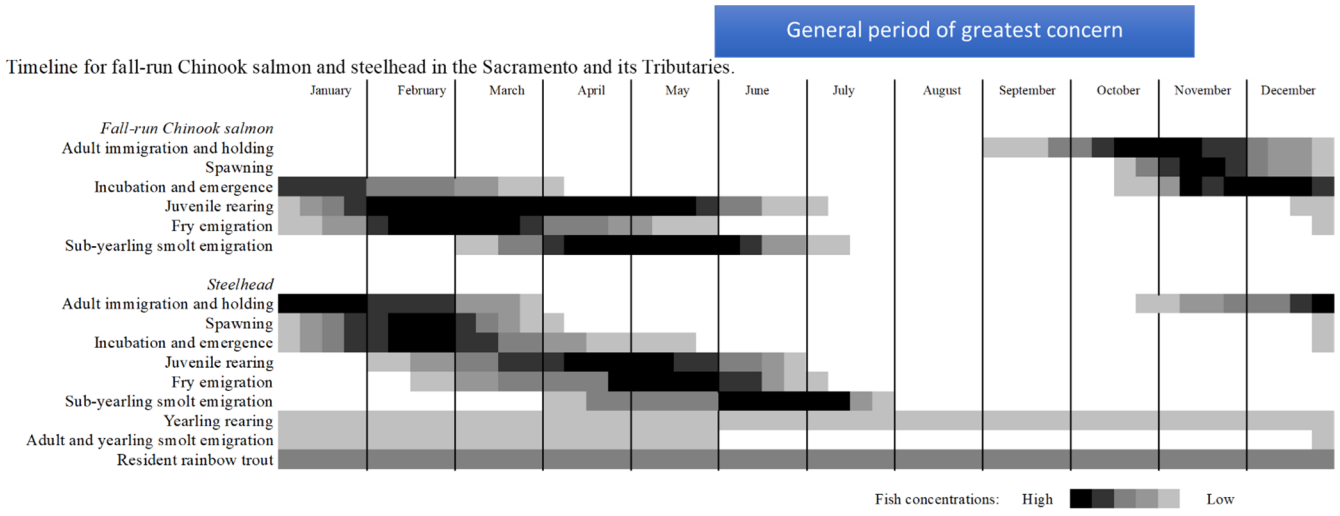
Fisheries and Health of the Lower American River: A Lookback at Summer 2021
Frequently Asked Questions

Introduction

This summer, the lower American River (LAR) and the fish that depend on it faced dire conditions due to warm water, low flows, and limited habitat. The Water Forum's coequal goals are concerned with preserving many aspects of the river, including fisheries, wildlife, recreational, and aesthetics; and we use fishery conditions as a proxy for overall river health. The Water Forum does not operate any facilities but by providing analysis, monitoring, and coordination, we support our agency partners, including Reclamation, CDFW, USFWS, NMFS, and many others wherever possible. As we move into the winter season, we wanted to provide a "lookback" at summer and early fall conditions for our LAR target species (steelhead trout (*Oncorhynchus mykiss*) and fall-run Chinook salmon (*O. tshawytscha*).

1) Was it too warm for steelhead trout (*O. mykiss*) and fall-run Chinook salmon (*O. tshawytscha*) this year?

Managing for appropriate water temperatures within our highly altered system is a complex exercise and requires an understanding of operational needs, and salmon and steelhead life stages. During summer, Folsom Dam is managed to meet water supply demands and is operated in coordination with other dams to help manage Delta salinity, along with other State and Federal water quality requirements.



1 NMFS - Species of Concern, CDFW - Species of Special Concern

2 Federal ESA: Threatened

As illustrated in the figure above, throughout the year, we have multiple life stages of steelhead trout and fall-run Chinook salmon in the river concurrently. Water temperature needs vary for these life stages. Summer and early fall months (June to October) are a general period of greatest concern because high water temperatures can cause juvenile steelhead trout to become diseased or die before they can emigrate. High water temperatures may also act as a barrier to adult Chinook immigrating into the LAR to spawn or they may die in the river before they have a chance to spawn (known as pre-spawn mortality). Under the American River Temperature Management Plan, to maintain operational flexibility at Folsom Dam, this year, Reclamation committed to managing river temperatures to not exceed 71° F for more than seven consecutive days at the Hazel Avenue compliance point. Note: The water temperature compliance

point is typically at Watt Avenue, but the compliance point was moved upstream this year due to the reduced cold water pool in Folsom Reservoir.

A 71° F temperature target was necessary this summer, due to the extremely dry hydrology and low Folsom Reservoir storage which resulted in a very limited cold water pool volume. Although it is understood that 71° F is not an optimal temperature for rearing steelhead or immigrating Chinook, managing to this target during the summer and early fall months was intended to save limited cold water resources to allow for better thermal conditions in the second half of October and November, when steelhead could still be rearing, and larger numbers of Chinook salmon return to the LAR to spawn. Despite hot summer weather, Reclamation met the 71° F management threshold, with only two consecutive days in late July exceeding 71° F (up to 71.2° F, for two days). Late summer recorded stream temperatures were closer to 70° F.

In the fall and winter (October to February) it is important to maintain appropriate flow and temperature so that eggs laid in redds (nests) don't become too warm, dewatered, or suffer poor water quality before hatching. The Water Forum is working with State and Federal agencies to review and synthesize temperature information collected during early fall.

2) How do we know if there were salmon or steelhead in the river this summer?

Good question! We had to look for them. From March through October 2021, CDFW conducted monthly fish surveys at numerous sites throughout the river. Seine (net) surveys to collect fish and estimate population size are the primary method of survey. CDFW crews conduct surveys very early in the morning, to collect data when water temperatures are cooler and as such limit stressing the fish collected in the sienes. However, as temperatures warm, CDFW protocols may switch to snorkeling to avoid touching (and therefore stressing) the fish.

Warm water temperatures affected this year's surveys. In June, CDFW did not observe juvenile steelhead trout in the upper portion of the river, and surveys could not be conducted further downstream because temperatures were too high. During July, August, and September no juvenile steelhead were observed. This doesn't mean salmonids weren't present, it means that more information was needed to answer that question, under these conditions.

To supplement ongoing data collection along the LAR, Water Forum's consultants conducted multiple additional surveys during September including:

- An environmental DNA (eDNA) study, which looks for mitochondrial DNA that sloughs off fish in the river.
- Underwater video transect surveys that supplemented eDNA collection to look for individuals.
- Temperature refugia surveys, to assess how temperatures vary within the river and whether there are pockets or stretches of river that are more suitable because they offer colder water.

Additional water temperature loggers (one per mile between Nimbus Dam and Watt Avenue) have been added to Water Forum's existing network, to supplement ongoing data collection. Once collected, these data will help us determine how far downstream from Nimbus Dam, or what length of river, has provided

tolerable conditions for steelhead and Chinook salmon. These temperature data will also supplement CDFW's ongoing water temperature data collection and help document if the 71° F water temperature management target has allowed for any biological success by supporting any rearing juvenile steelhead trout and immigrating Chinook salmon. Knowing where salmonids hide when it gets hot can help inform future operations and habitat enhancement opportunities.

3) So, did we find any salmonids? If so, how many, and where are they located?

All results indicate that conditions were very poor for salmonids throughout the summer months. In September no *O. mykiss* (steelhead or rainbow trout) and only a few adult Chinook salmon were observed during video surveys. Scientists found a small school of Chinook in Nimbus Basin and a single individual at Gristmill. eDNA surveys detected both Chinook Salmon and *O. mykiss* throughout the LAR, with highest eDNA concentrations for both species observed between Upper Sunrise Park and downstream to San Juan Rapids. Relative eDNA concentrations suggest fall-run Chinook were present in greater abundance than *O. mykiss* throughout the LAR.

For additional information check out the drought monitoring report here: *Cramer Report*

4) Are American River steelhead trout healthy?

Without seine surveys CDFW couldn't reliably monitor juvenile steelhead trout health this summer. When normal conditions allow for seining in the LAR and the fish can be handled without undue stress, basic information recorded by fish crews could estimate the proportion of population with poor health, but this was not possible in 2021.

Conditions were challenging even for hatchery fish this year, as a precaution, and to protect a portion of this year's juvenile steelhead trout hatchery cohort, CDFW preemptively moved fish out of the Nimbus Hatchery over Memorial Day weekend. Most steelhead juveniles were held at the Mokelumne River Hatchery throughout the summer where water temperatures were cooler. These fish were moved back to the Nimbus Hatchery after temperatures began to cool in October.

5) How has Water Forum supported drought decision-making on the LAR this year?

Water Forum has primarily supported drought decision-making through technical support and coordination for the State and Federal agencies by providing the following:

- Water temperature monitoring and modeling,
- Potential redd dewatering estimates,
- Flow magnitude recommendations (including pulse flows),
- Expert advice on species thresholds and stressors,
- Guidance regarding proper application of the Modified Flow Management Standard, and
- Comments on Reclamation's Temperature Management Plan.

6) What is the most important factor in determining whether environmental conditions will support healthy fish populations?

In extremely dry years like this one it's important for water managers to carefully monitor and control temperatures in the river. A combination of factors go into a decision of how much water should be released during which months to protect cold water storage in Folsom Reservoir.

The Water Forum's consultants provided temperature modeling to support State and Federal agency temperature management decisions. In late spring, Water Forum provided temperature modeling support and technical advice to inform the agencies decision on effective temperature thresholds for the summer.

Based on Water Forum's monitoring we confirmed that water quality conditions, including temperature and dissolved oxygen, were generally poor throughout the survey area (from Nimbus Basin to Gristmill). The only exceptions were at the mouths of Cordova and Buffalo Creeks (LAR tributaries) which were over 3 °F cooler than adjacent river conditions and had normal dissolved oxygen levels. The results of this study provide insight to conditions experienced by salmonids, but additional information is needed (fall and winter surveys) before we can make any conclusions about the effectiveness of the management actions taken this year.

7) When will we know if the power bypass helped protect salmon and steelhead this year?

In critically dry years Reclamation often implements a power bypass to lower water temperatures in the fall to support spawning for fall-run Chinook. Because a limited cold water pool exists for use during a power bypass, the Water Forum conducted water temperature modeling to help agencies assess power bypass timing (e.g., how early to start?) and duration (e.g., how long will the limited cold water last?) to support Chinook spawning and hopefully reduce pre-spawn mortality during fall 2021. Additional modeling showed the power bypass could improve egg to fry survival for fall-run Chinook during incubation.

Beginning October 11, Reclamation increased cold water releases to provide up to 150 cfs of cold water that bypassed the Folsom Dam power generation units until daily average water temperatures reached 62° F at Hazel Avenue. On or around October 25, Reclamation increased the power bypass amount, not to exceed 350 cfs to further reduce water temperature, to target a daily average water temperature of 56° F measured at Hazel Avenue. The power bypass is ongoing and is planned to continue until a target daily average temperature of 56° F at Hazel Avenue can be maintained without a power bypass.

The power bypass resulted in lower water temperatures earlier in the fall-run Chinook spawning season than would have otherwise occurred due to this year's drought conditions. Temperature modeling indicated that without the power bypass, LAR temperatures would have exceeded 60° F throughout the month of October, and potentially into November. Based on preliminary monitoring results, we know that temperatures were reduced to 60° F at Fair Oaks during the 3rd week in October due to the power bypass, and continue to trend down, as expected.

Power bypass flows, coupled with lower ambient air temperatures that generally occur during the fall months, are intended to provide more suitable river conditions for fall run Chinook. The full biological benefit of the power bypass won't be known until early 2022, once surveys documenting Chinook salmon spawning activity have been completed.

Learn more: 2021 Critical Drought Conditions Temperature Management Planning Memo

8) What interim conclusions can be drawn from this year and what are the Water Forum's next steps?

In general, conditions along the river were difficult for Chinook salmon and steelhead this year. Monitoring to establish baseline conditions and gain more insight into the river's health during drought years, is essential for adaptive management. The Water Forum will continue to support data collection and coordination on the LAR, and we look forward to sharing additional information from fall and winter monitoring activities.

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