Spring-run Chinook Salmon Emergency Egg Incubation Action- Clear Creek 2024

- Conducted by CDFW, with cooperation from USFWS, BLM, and BOR.

Presented by Mike Memeo, CDFW Region 1.

Reason for Action- 2023-24 CVSR cohort collapse

"Core 1" CVSR Spawner Estimates			
Year	Mill Creek	Deer Creek	Butte Creek
2023	34	16	95
2024	18*	33*	44*

- Extremely low numbers represent a cohort collapse requiring immediate emergency actions
  1. Propagation of a captive broodstock program at UC Davis (CABA)
  2. Egg incubation box implementation on Clear Creek.

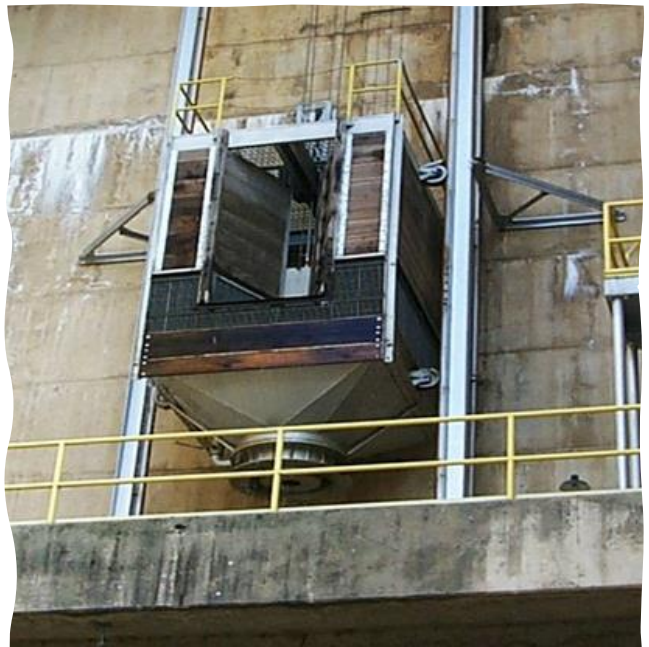
  * Unpublished data (Grandtab).
- CDFW submitted NOE SCH # 2024100296 on 10/8/2024 for the egg incubation action. https://ceqanet.opr.ca.gov/2024100296

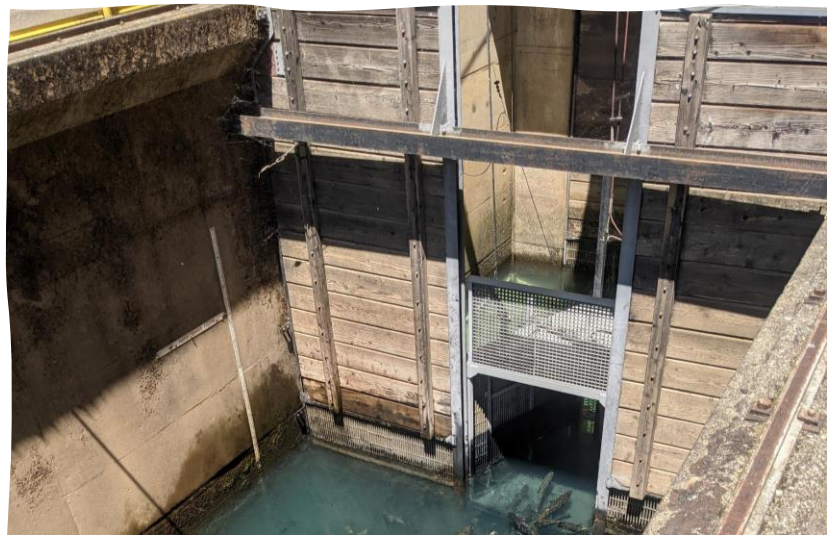
Photo credit: Chris Nonel

Livingston Stone National Fish Hatchery (LSNFH)

- Conservation hatchery built specifically to enhance winter-run Chinook salmon (CVWR) populations.
- Produce 200,000 to 800,000 CVWR juveniles annually.
- Adult CVWR brood stock collected using a fish trap at the base of Keswick Dam operated February-July by LSNFH personnel. Adult CVSR are incidentally captured at trap. Usually, CVSR are returned to the river with a Floy tag. In 2022 CVSR adults were taken to Clear Creek to spawn as part of a drought emergency action. Limited spawning success observed. Beginning in 2024 the Department requested up to 40 trapped CVSR to be retained and spawned at LSNFH.

Photo credit: Kaitlin Dunham/USFWS





Background

- A total of 11 adult CVSR were captured between June and July 2024 and held at LSNFH. Genetic analysis showed that all adults were of Feather River Hatchery origin.
- On September 26, 2024 three un-marked female CVSR were spawned with three un-marked male CVSR. Eggs were incubated until the eyed stage at LSNFH.
- **Objective(s):** To enhance Clear Creek CVSR population and to analyze feasibility of Hatch Partner Boxes (HPB) for future salmonid population enhancement efforts.

Photo credit: Brian Krempasky CDFW

Hatch Partner Boxes

- CDFW Region 2 personnel were made aware of new egg incubation technology being implemented in Idaho. They found the patent, reached out to the inventors, and were put in touch with the Shoshone-Bannock Tribe who had implemented the boxes on the Salmon River to enhance Chinook populations. Began a collaborative effort to implement and share data.
- Twenty Hatch Partner Boxes Patented by Partner Steel Co. Inc. were purchased by CDFW Region 2 for the North Yuba River spring-run reintroduction program. Region 2 was unable to use the boxes, due to funding constraints. Region 2 presented on the North Yuba Reintroduction Project and the boxes, which led to Region 1 borrowing 4 boxes to be used on Clear Creek.

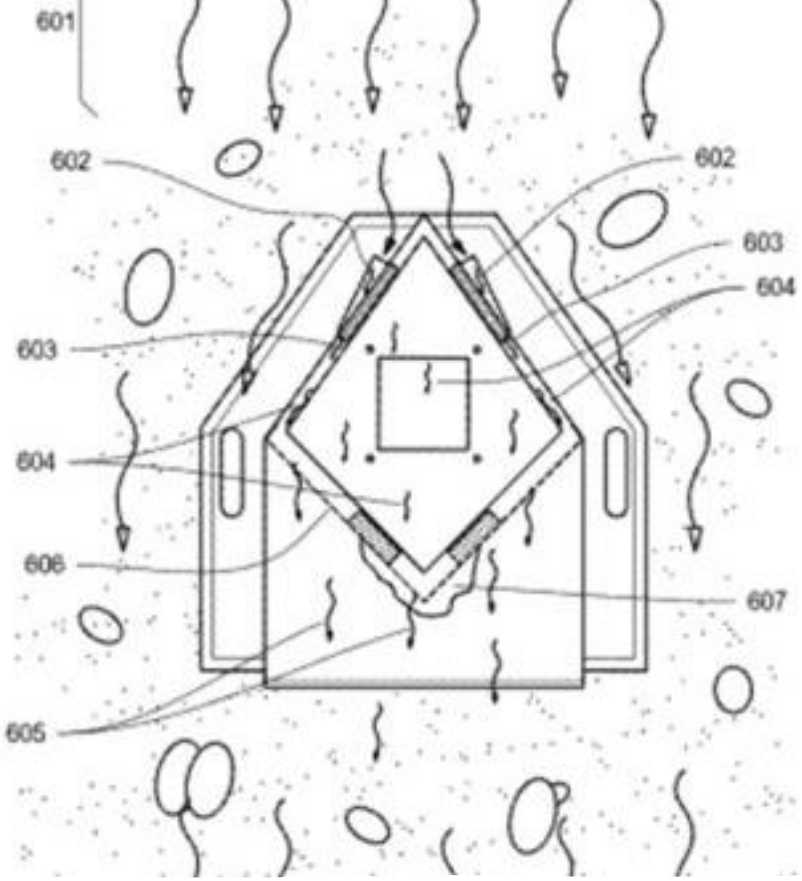
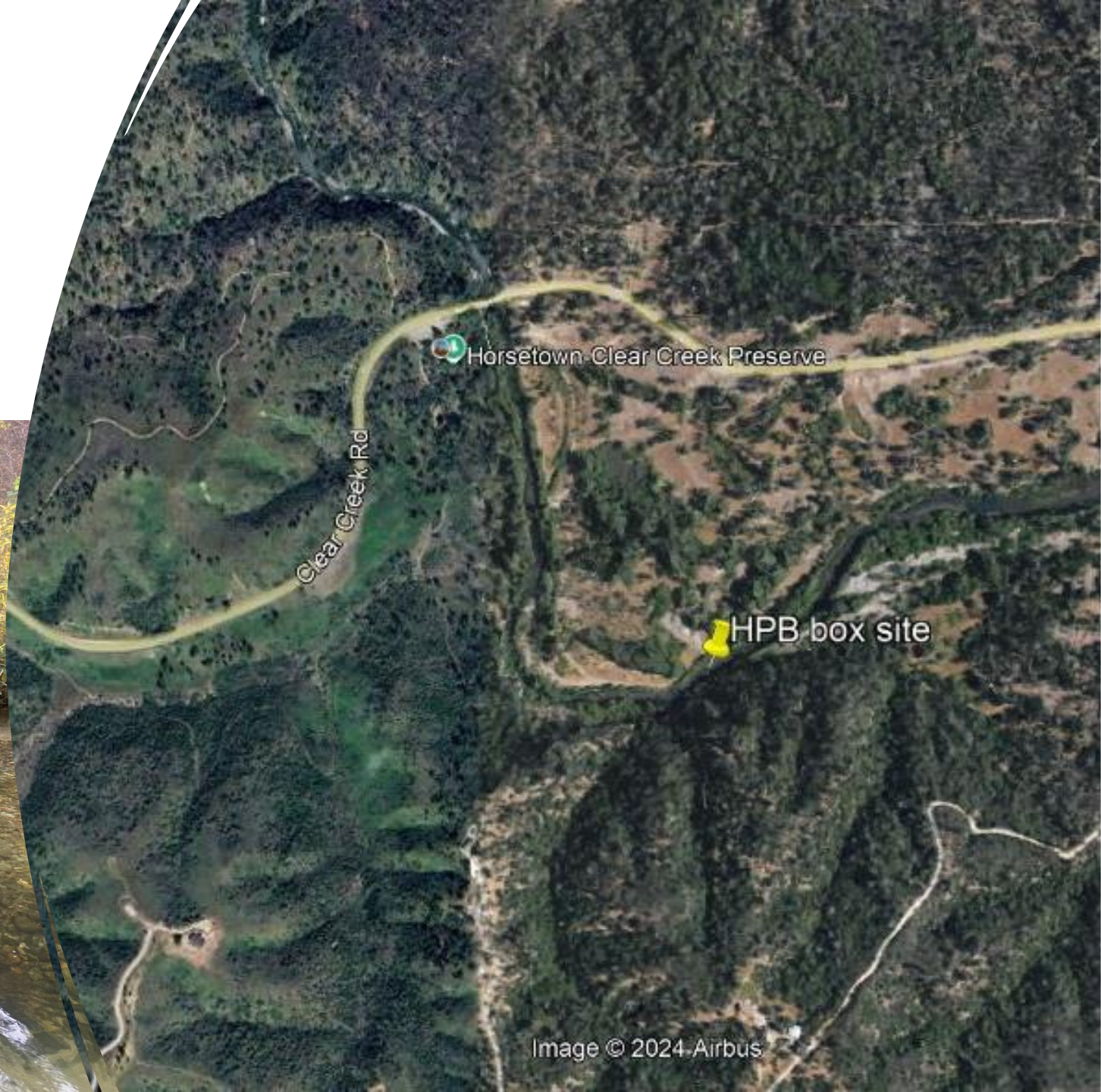


Photo credit: Hatch Partner Steel/Shoshone-Bannock Tribe

Implementation

- Three HPBs were installed in Clear Creek downstream of the Horsetown Preserve on October 29, 2024. Boxes were anchored to the substrate using a combination of 1 to 2-foot steel spikes driven through box handles, and cobble piled along the metal apron which runs along the external box exterior.
- 11,909 eggs were split into the boxes as follows: box S1756 received 4,900 eggs, box S1752 received 4,380 eggs, and box S1764 received 2,629 eggs.
- The number of eggs in each box corresponded with the number that was counted at LSNFH for each of the three females spawned (lots). This allowed for an accurate starting egg count.

Project site location



Methods

- Following Installation, all boxes were checked three times a week (when possible). When possible, dead eggs and/or alevins were removed from the internal egg boxes.
- Water quality metrics collected included pH, temperature, dissolved oxygen, specific conductivity, and turbidity.
- Water depths and velocities directly adjacent to the hatch partner boxes were also collected at least weekly.

Hatch day

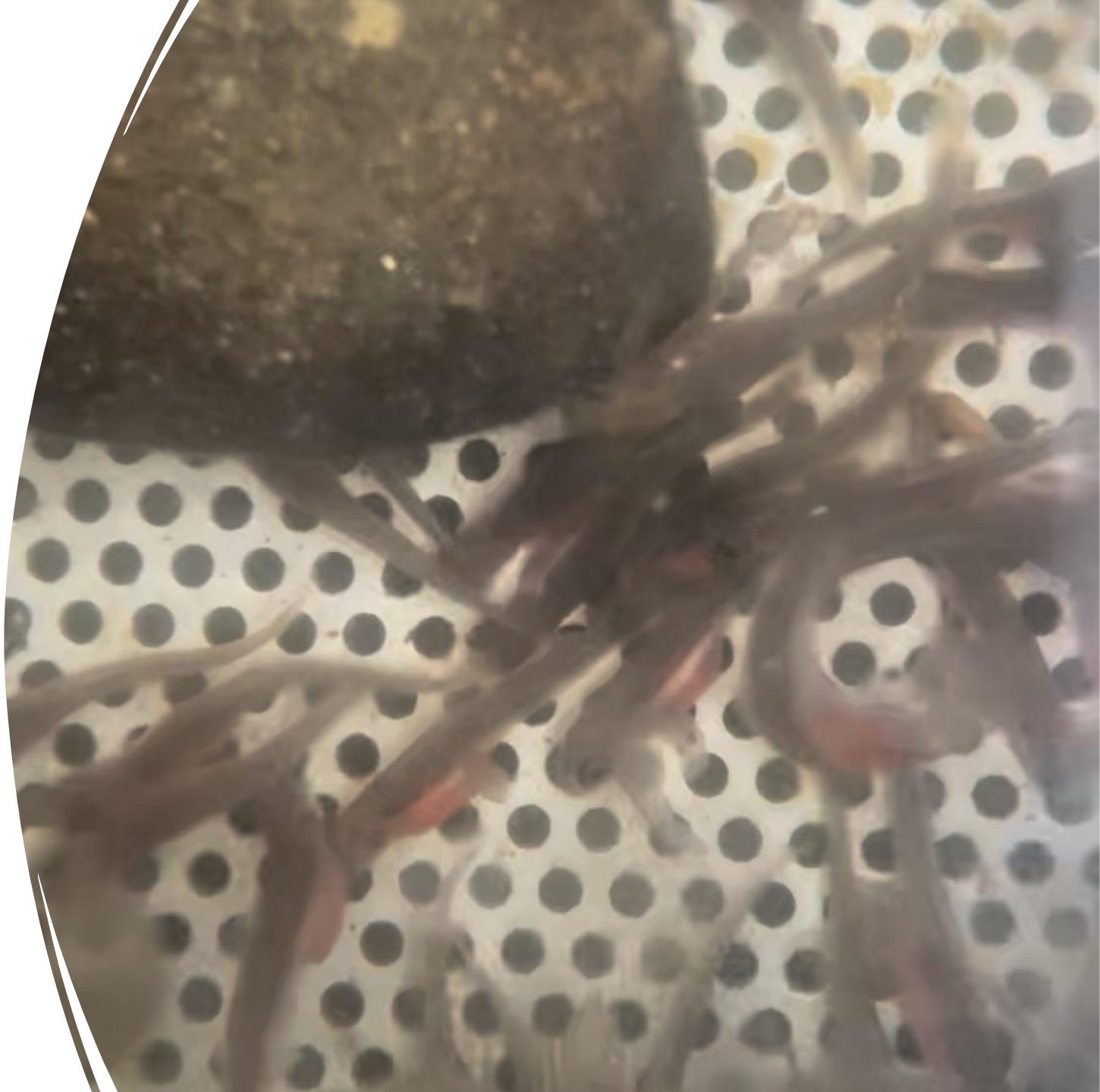
- 11/9/24: Alevins observed within all three boxes for the first time…eggs beginning to hatch.
- 11/12/24: Appeared that most eggs had hatched within the three boxes. Video recorded on 11/12/24.

Bomb Cyclone/Atmospheric River

- 11/18/24-11/20/24: Egg boxes leashed and protected from high flow event (predicted to reach 900+ cfs), with large rocks taken from riffle nearby (left photo).
- One internal box checked (S1764) quickly and observed very few mortalities (less than 10). Leashed all boxes together using coated cable, d-rings, and cable clamps. Leashed the boxes to an exposed Alder Root.
- 11-22-24: Observed boxes at around 9:30 am (right photo). Flows at Igo were 1,402cfs. Turbidity was about 35 FNU.
- Flows peaked at 1,970cfs according to CDEC.

The Boxes survived!

- 11/25/24: Crews cleaned out some decomposed granite, but the boxes and alevins survived the high flow event (photo taken after clean-out).

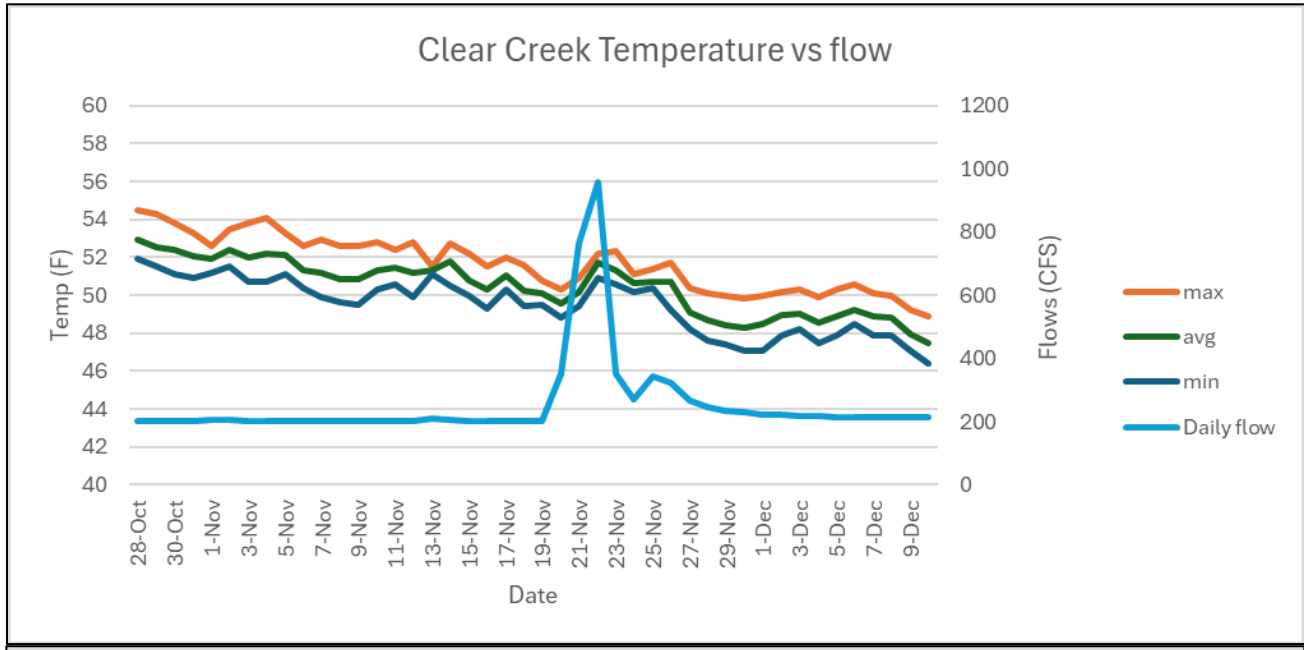


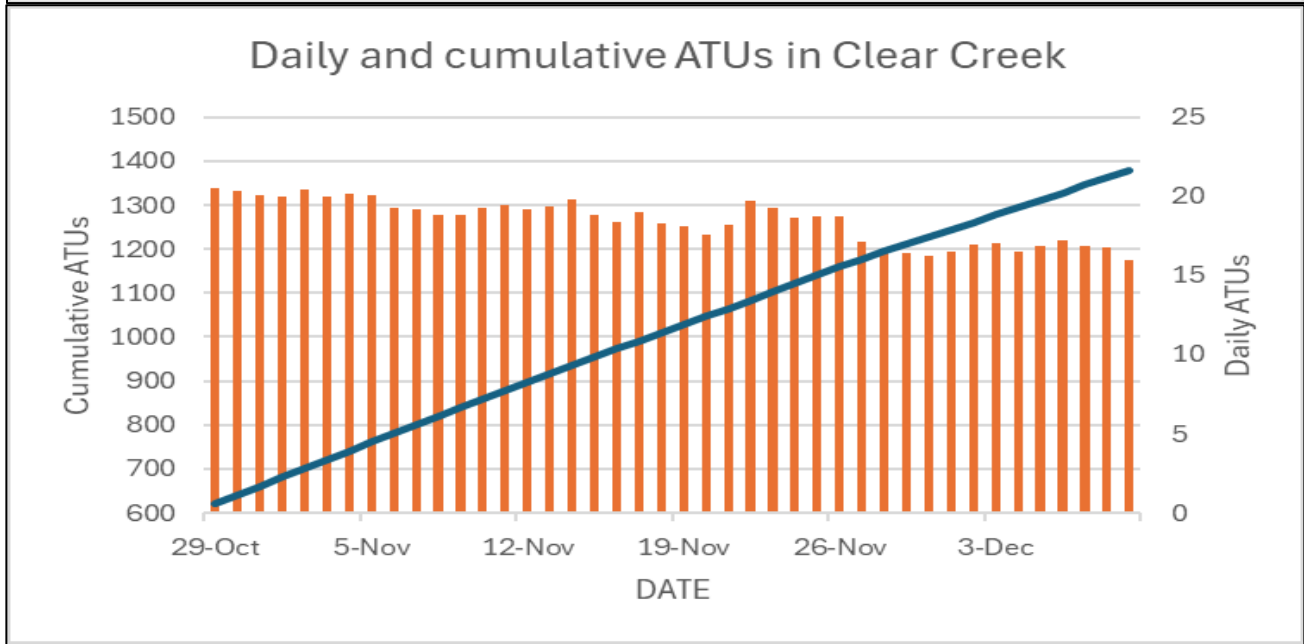
Release Day!

- Two boxes (S1764 & S1756) of swim-up fry were released on 12/6/24. Fry from the third box (S1752)were released on 12/9/24.
- Due to inconsistent ability to count mortalities, all released fry were counted by hand to attain an egg to fry survival rate.
- Box S1764: 2,629 eggs resulted in 2,393 fry (survival=91.02%)
- Box S1756: 4,900 eggs resulted in 4,735 fry (survival=96.63%)
- Box S1752: 4,380 eggs resulted in 4,052 fry (survival=92.51%)
- **Overall survival was 11,170 fry from 11,909 eggs or 93.79%.**

Results

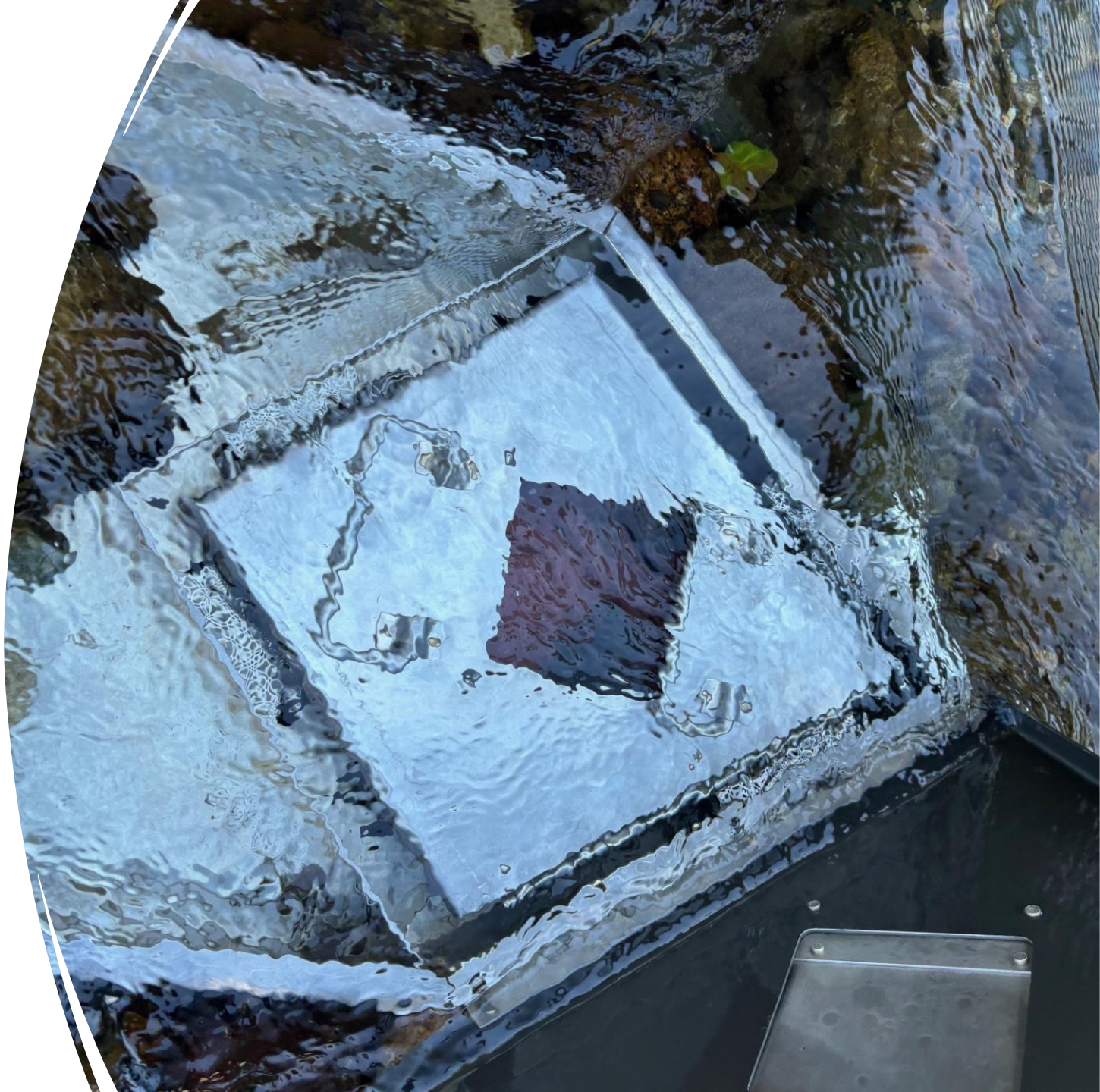
- Total days from spawn to release was 74 days! Development (eyed eggs) to hatch took 10 days.
- Hatch to release took 30 days.
- Water temperature was recorded via Hobo Pendant temperature loggers, but data was lost due to water intrusion into two separate devices.
- Water temperature at the IGO stream gauge (CDEC) located approximately 3 miles upstream was used to calculate accumulated temperature units (ATUs). Total ATUs from spawn to hatch was approximately 857. ATUs at time of release were around 1400.
- Fish were released ahead of another predicted high flow event.





More Results

- Average water velocity taken from just upstream of the boxes ranged from .85 fps to 1.05 fps (excluding the high flow event).
- Average water depth of the boxes ranged from .74 feet to 1.11 feet (excluding the high flow event).
- Average DO was 11.27 mg/L. Average Turbidity was 1.37 FNU. Average pH was 7.95. Average specific conductivity was 94.32 (µS/cm).



Comparisons

- Egg to Fry survival was 93.79% for this study
- Egg to Fry survival for the remote streamside incubation system (RSI) on the McCloud River during the summer of 2023 was 94.5%
- Eyed egg to fry survival at the Feather River Hatchery was 88.5% in 2023 (CDFW 2023).

Lessons Learned

- Difficult to draw any real conclusions due to small sample size of just 3 boxes.
- Egg density may play an important role as survival was inversely related to density.
- Site location may be critical. Future projects should aim at testing a range of velocities and depths to determine optimum levels for egg-to-fry survival. The emergency nature of this project dictated a more conservative approach aimed more towards enhanced survival over experimentation. More experimental studies should seek to test effects like site selection, water velocity, egg density, etc. on survival.
- The boxes are surprisingly resilient to high-flow events, at least in a dam-controlled water body like Clear Creek.

Acknowledgements/ Future work

- Thank you to all the cooperating agencies. Special thanks to the Livingston Stone National Fish Hatchery and CDFW fisheries region 2.
- Due to the positive outcome of this project, plans are moving forward to include hatch partner boxes on a range of projects and locations, including McCloud River winter-run reintroduction, and Klamath river population enhancement.

Video credit: Kristen Harrison CDFW