APPENDIX D. WORK GROUP ADAPTATION MEETING NOTES, AUGUST 25, 2021

Leavenworth National Fish Hatchery Climate Change Vulnerability Assessment: Meeting to discuss projected impacts and adaptation strategies

I. Overview of meeting.

A. Work group participants, U.S Fish and Wildlife Service:

Andy Goodwin (CCVA Team), Bill Gale (CCVA Team), Chris Pasley (CCVA Team), Chris Griffith (Asst. Hatchery Manager), Christine Parker-Graham (Fish Health Veterinarian), Dan Nehler (RO Supervisor), Don Campton (CCVA Team), Doug Peterson (CCVA Team), Haley Muir (Fish Biologist), Jim Craig (Complex Manager), Kyle Hanson (CCVA Team), Matt Cooper (Fish Biologist), Matthew Maxey (Hatchery Manager), Patty Crandell (CCVA Team), Tanya Sommer (Acting RO Supervisor), Tim Bundy (Fish Health Biologist), Tom Sinclair (RO Supervisor).

B. Work group participants, U.S. Bureau of Reclamation:

David Child (Natural Resources Project Manager)

C. Purpose of meeting:

Identify the adaptive capacity and potential strategies of Leavenworth NFH to adapt or mitigate for climate change impacts projected in the 2040s for the Icicle Creek watershed and the Spring Chinook Salmon program.

D. Adaptive Capacity: definition and concept:

Adaptive capacity is the existing ability or capacity of a system or species to adjust or adapt to the impact of an environmental disturbance such as climate change.

In the context of assessing the vulnerability of human communities (e.g., NFHs), *adaptive capacity* often refers to the potential to implement planned adaptation measures to cope with change, including consideration of future strategies or potential changes that would *increase* the adaptive capacity of a system or species.

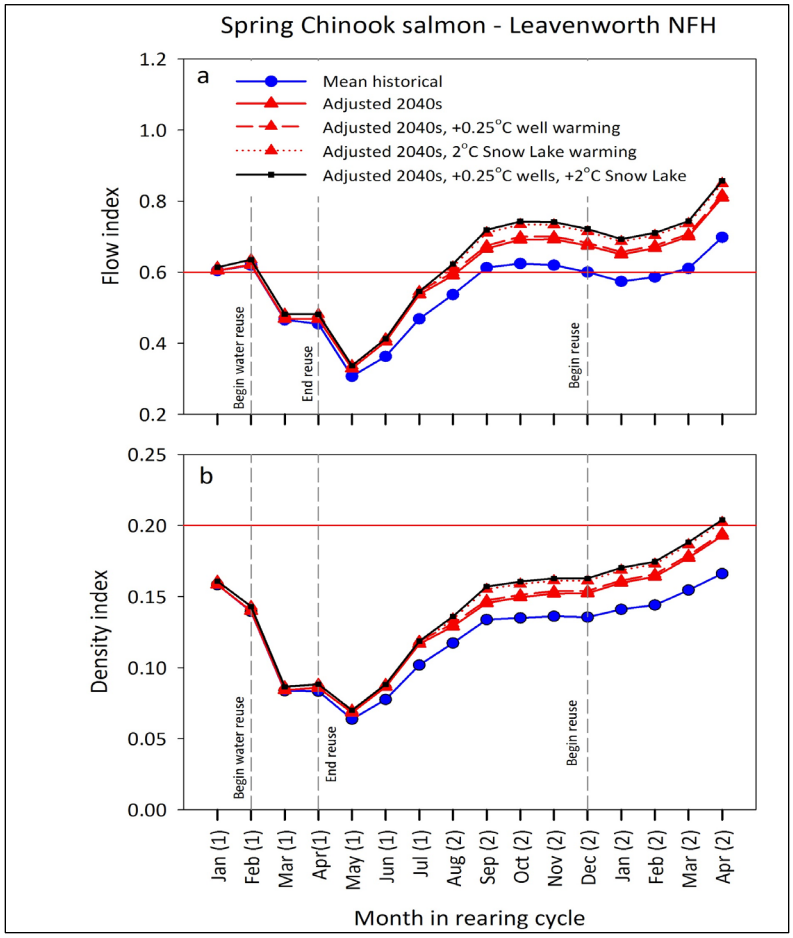
Note: In the following sections, impacts identified by CCVA Team are preceded by capital letters (A, B, etc.), and responses by the Work Group are listed as bullets.

II. Adaptive measures: Impacts to Spring Chinook Salmon at Leavenworth NFH.

A. Impact: Spring Chinook Salmon will grow faster due to higher mean water temperatures resulting in greater density and flow index values.

Juvenile Chinook Salmon reared at Leavenworth NFH will be exposed to warmer rearing conditions in all months in the 2040s with projected temperature increases of 0.1 – 2.1 °C across the rearing period. Projected mean monthly water temperatures during the juvenile growth phase in the 2040s do not exceed the upper optimum for Chinook Salmon (15.9 °C) except during July (16.4 °C), assuming water is not released from Snow Lake prior to

August 1.[1] Thus, higher water temperatures alone in the 2040s are not expected to preclude the ability of Leavenworth NFH to propagate Spring Chinook Salmon. However, mean weight and length of Chinook Salmon smolts at release are projected to be 24.8% and 7.8% greater in the 2040s than historically (i.e., under Scenario A with no increase in well water or Snow Creek temperatures). As a result, flow index values in the 2040s are projected to exceed the fish health upper guideline value of 0.6 during the last eight months of the rearing cycle.

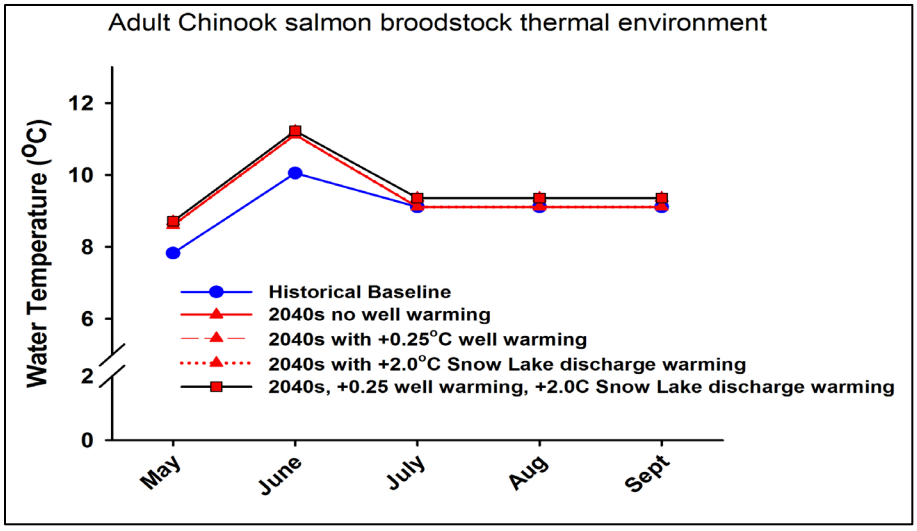


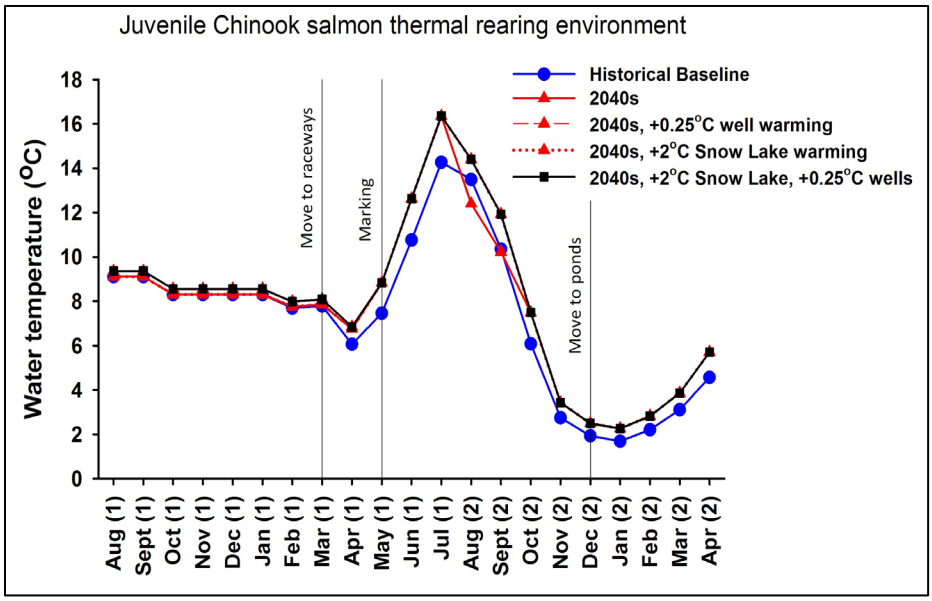
- This higher total biomass in the conventional raceways is a big concern. Densities near 0.2 will increase Ich and BKD risks. Pathogen transmission will be a lot faster at higher densities versus lower densities with an expected increase in the speed of morbidity and mortality.
- Warmer water temperatures is one motivation for the partial reuse aquaculture system (PRAS) pilot project currently being studied. We need to investigate the potential use of a PRAS more thoroughly. The hatchery will need to conduct studies with the engineering firm to include chillers in the PRAS in response to higher temperatures.

[1] Outputs from modeled projections were reported as mean monthly values. However, *daily* water temperatures exceeded 16.4 °C during the summer of 2021. Christine Parker-Graham, USFWS Fish Health Veterinarian, personal communication

- Proactive disease preventive medicine will continue to be emphasized in the future rather than relying solely on reactive treatment approaches.
- Precocious maturation of males will most likely not be an issue because of cold-water temperatures in winter. Nevertheless, it will be important to continue monitoring efforts.

B. Impact: Higher water temperatures projected for the 2040s during the summer months will likely increase disease risks, particularly for Ich.





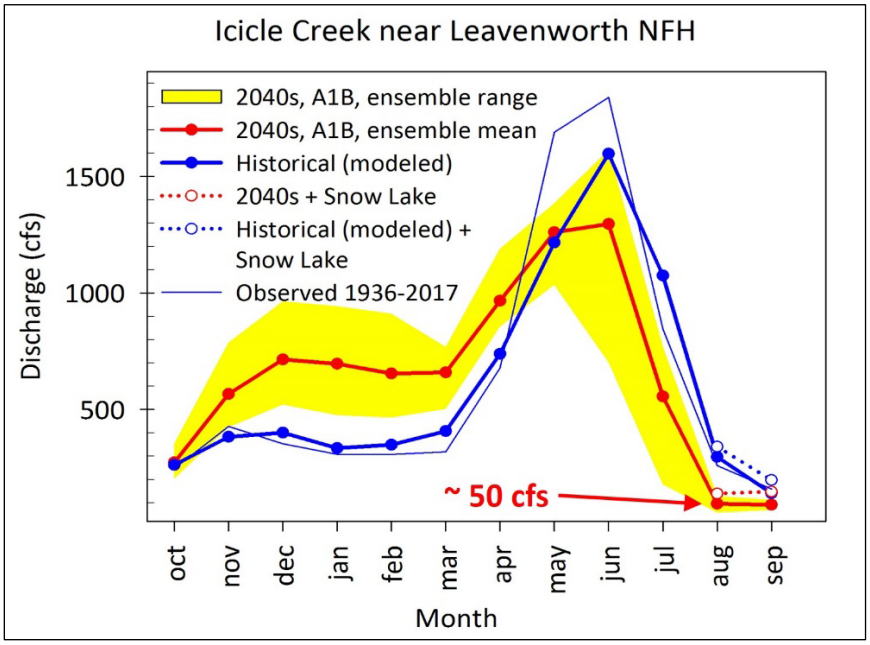
- **<u>Adults</u>**:
  - Improved infrastructure is needed for maintaining adult broodstock prior to spawning. Adult returns usually exceed broodstock needs, and more space is needed for holding adults, especially in years with large returns.
  - Improved infrastructure for holding adult broodstock should include options for increasing water quality in the adult holding pond. The only way currently to supply surface water to the adult holding pond is with serial discharge water (3

raceways) from one of the 8x80-ft. raceway banks. A direct water line from the intake pipe to the adult holding pond is desired.
    - In addition to projected higher water temperatures of Icicle Creek, improved fish passage in Icicle Creek is expected to increase disease risks because of higher numbers of adults upstream of the water intake for the hatchery.

- **Juveniles:**
    - Conduct fish culture activities in the morning when water temperatures are lower to reduce stress.
    - Hatchery staff will need to keep Fish Health staff abreast of any issues/observations. For many of these disease concerns, early intervention during higher water temperatures will yield better treatment outcomes.
    - Refine and hone preventive medicine activities, and reduce antibiotics as much as possible via preventive activities.
    - The proposed PRAS will address both temperature and disease issues with filters, UV sterilizers, and chillers. The current pilot system will help determine the size and number of chillers and UV sterilizers needed.

C. Impact: Projected decreases in surface water availability during the summer in the 2040s raise questions regarding the future ability of Leavenworth NFH to maintain fish on station during August and September.

After accounting for irrigation withdrawals upstream of the hatchery and the proposed goal to maintain a minimum instream flow of 60 cfs in Icicle Creek, virtually no surface water would be available for fish culture during August and September based on projections for the 2040s.



- Install a radio-controlled outlet valve switch for upper Snow Lake. This project is already on the new projects list for Leavenworth NFH. An automated valve would be much more responsive to water needs and would allow the hatchery to conserve storage water in Upper Snow Lake during the summer. The current system requires

a person to physically hike to Upper Snow Lake, approximately a 5,000-foot elevation gain, to adjust the valve manually when needed.

- At the present time, the release of water from four IPID reservoirs in the Icicle Creek watershed upstream from the hatchery is not efficient; outlet valves must be manually adjusted in a manner similar to the outlet valve for upper Snow Lake. Evaluations by the Icicle Work Group suggest that both the needs of the hatchery and the proposed 60 cfs instream flow goal can be achieved if water releases from the four IPID reservoirs and Upper Snow Lake are controlled remotely in accordance with availability and demand, thus allowing water to be conserved significantly.
  - Continue to support development of radio-controlled automation of water releases from the four IPID reservoirs in the upper Icicle Creek watershed.
  - Work through the Icicle Work Group to develop a Decision Support Tool for water management of Icicle Creek.
- Continue testing and developing a PRAS at Leavenworth NFH. A full build-out of the PRAS is predicted to reduce water needs of the hatchery by approximately 50% during the summer, from ~ 45 cfs to 20-25 cfs.
- Investigate groundwater options and infrastructure upgrades to increase the quantity of groundwater available during the summer.
- Continue well-rehabilitation and maintenance activities.
- Three projects are moving forward or proposed that are expected to increase instream flows in Icicle Creek:[2]

  1. The Cascade Orchards Irrigation Company, which currently withdraws approximately 7 cfs of water at the intake for the hatchery, is planning to construct a new water intake in lower Icicle Creek downstream of the hatchery. The water intake for the hatchery will also be reconstructed: the current open ditch will be replaced by a pressurized pipe which should yield several more cfs savings to instream flows. Both projects are scheduled for construction in 2023.
  2. The Leavenworth NFH PRAS pilot project will also reduce the amount of surface water that the hatchery withdraws from Icicle Creek. If the pilot project proves successful and the system is expanded to full build-out, then the hatchery will be able to reduce water withdrawals from Icicle Creek by up to 20 cfs.
  3. Reconstruction of the outlet structures of the four IPID storage lakes with radio-controlled valves is expected to reduce water withdrawals by 10 – 15 cfs.

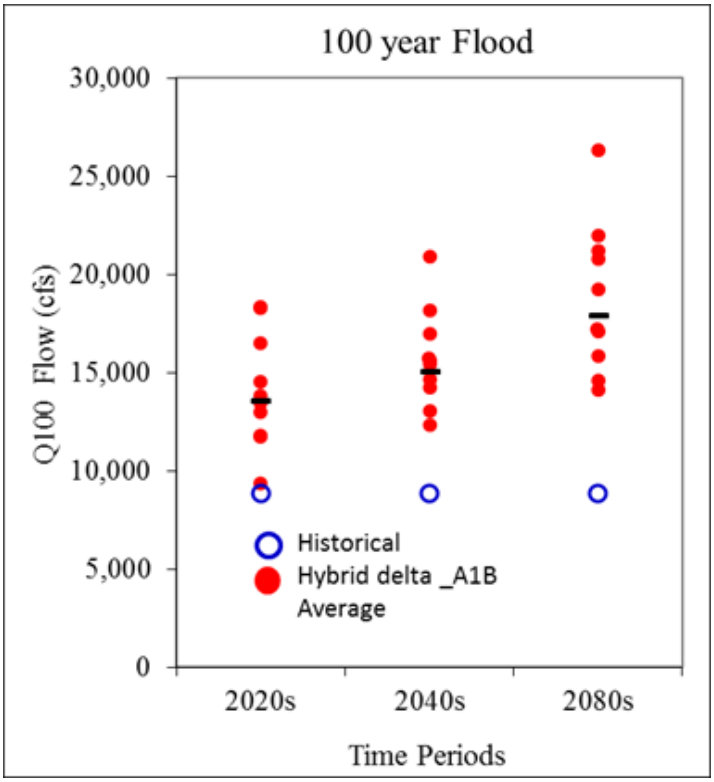
- The IPID has a pump option from the Wenatchee River on the table, but whether that option will move forward is unknown. The IPID is screening their intake.
- Continue to support the Icicle Creek Work Group. They have a lot of work proposed that will indirectly help the hatchery.

III. Adaptive measures: Impacts to hatchery infrastructure.

A. Impact: Transition of the Icicle Creek watershed from primarily a snow-driven watershed historically to a mixed rain-and-snow-driven watershed in the 2040s is expected to increase flood risks in the late fall and winter.

[2] Information provided by Jim Craig, USFWS Leavenworth Complex Manager, personal communication. 22-Sep-2021.

The magnitude of 100-year peak water flows (Q100 statistics) is projected to increase from approximately 9,500 cfs historically to 15,000 cfs in the 2040s. The highest recorded flow of Icicle Creek in the past occurred on November 29, 1995 when flows peaked at 19,800 cfs following a rain-on-snow event. A similar event occurred on November 6, 2006 when flows peaked at 14,700 cfs. The likelihood, frequency, and magnitude of such events are expected to increase through the 2040s and beyond.



- Leavenworth NFH appears to be fairly well buffered from the direct impact of floods. The hatchery building, raceways, and most of the hatchery infrastructure are above the flood plain.
- However, the current water intake structure, the adult holding ponds and ladder, and the pollution abatement pond are susceptible to high water events and floods of Icicle Creek. These structures were impacted significantly by the high water events in 1995 and 2006.
- A new water intake structure is scheduled for construction in 2023, and the engineering design of the structure took into account the 1995 flow of 19,800 cfs.
- High water events increase disease risks to fish on station because of high sediment loads and fine debris in the water intake. This could be the biggest threat of high flows.
- As currently configured, the adult ponds and ladder are vulnerable to very high flows of Icicle Creek. However, adult Chinook Salmon would not be in the pond or ascending the ladder when very high flows are most likely (late fall through winter).
- Construction of a berm around the adult holding ponds is not feasible. Reconstruction of the adult ponds is desired to reduce to safely accommodate more fish and reduce disease risks in years with high numbers of returning adults. Any

reconfiguration of the adult ponds and ladder should consider high flow events and flood risks when peak flows of Icicle could potentially exceed 20,000 cfs.

B. Impact: Higher mean air temperatures during the spring and summer, coupled with slight decreases in mean monthly precipitation, are expected to increase fire risks to the Icicle Creek watershed and Leavenworth NFH through the 2040s.

- Fire at the hatchery is not as big of a concern as mud, ash and debris washing into Icicle Creek from the upper watershed where major fires have occurred in the past. Leavenworth NFH has had several inches of mud and debris in raceways that washed down from the upper watershed following fires. The settling basin will help reduce sediment in the intake water .
- The buildings and infrastructure at the hatchery are well buffered against potential fires with cleared vegetation and back-up generators
- Several staff at Leavenworth NFH are former fire crew members, and they keep the hatchery manager informed about fire risks and the measures necessary to minimize fire risks and potentially mitigate for their impacts.
- Leavenworth NFH is adjacent to National Forest lands. There are lots of partnerships dealing with fire management in the watershed. The hatchery staff will continue to work with the Fire Management Officer to develop a land management and burn plan for timber and slash piles to reduce fire risks.
- Update the Station Safety Plan.

IV. Other issues, thoughts?

- If winter flows of Icicle Creek increase, that could help groundwater situation, especially with recharging shallow wells, because the bypass channel would be watered more frequently.
- Question: Will continued growth and development in Leavenworth increase groundwater demands for homes and domestic use? "Yes, but the city may have a moratorium on new well hookups."
- Putting a hydrologist on staff at the hatchery would be an asset for water use monitoring so that the hatchery can respond more quickly to changes in availability and demand.
- Develop an Adaptive Management Plan that would be reviewed and updated every five years.

V. Next steps in the CCVA process for Leavenworth NFH.

1. Complete the Adaptation and Vulnerability sections of the CCVA draft report for Leavenworth NFH.
2. Review of the draft report by the Hatchery Evaluation Team.
3. Review of the revised CCVA draft report by USFWS managers in the Regional Office.
4. Finalization and posting of the CCVA report for Leavenworth NFH on the USFWS website.