

Fish Health Center

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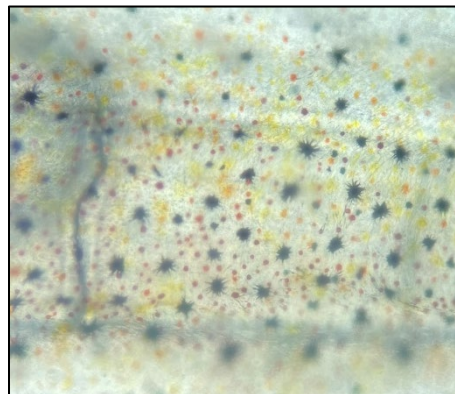
Bozeman Fish Health Center

2024 End of Year Newsletter:

The Bozeman Fish Health Center is wrapping up 2024 in style, officially achieving American Fisheries Society Fish Health Section - Quality Assurance Laboratory Program Tier 2 status. We are the second USFWS FHC to achieve this goal. In addition, we worked closely with hatchery staff to create and implement Hatchery Management Plans at all 13 National Fish Hatcheries in the region.

Services Supporting Federal Recovery, Restoration and Recreation:

- Since the start of FY2025, we have completed the following for federal hatcheries and wild waters in federal jurisdiction: two complete inspections and two virology inspections. This doesn't include the many cases we had to end FY2024.
- Investigated three cases involving morbidity and/or mortality. This requires a clinical work-up including a case history, examination/necropsy, diagnostic assays, treatment protocols, and preventative actions for the future. Both cases have been successfully resolved, with fish back to living their best lives. Solving cases is a full team effort between the Fish Health Center and hatchery staff!
- Completed two cases of triploid testing quality control. Using flow cytometry, the BFHC can determine triploid versus diploid fish by comparing DNA mass.
- The BFHC continues to participate in eDNA surveillance efforts. In collaboration with the Missouri River and Great Plains FWCOs, we are working through four cases of invasive carp eDNA surveillance. Rick and Renee handle the brunt of this.



Top left: Fin clip of a brown trout. Pigment cells are visible, the source of the beautiful coloration of these fish. Photo: USFWS/J. Veilleux.
Top right: Rainbow trout with an ocular injury. Photo: USFWS/J. Veilleux.
Bottom left: *Spironucleus* on an intestinal wet mount. These flagellates can cause disease under the right conditions. Photo: USFWS/J. Veilleux.



Yellowstone cutthroat trout with severe gas bubble disease. This animal was part of the BFTC growth and survival study. Photo: USFWS/J. Veilleux.

Services to Reduce Hatchery and Wild Fish Losses:

- An Aquatic Animal Health Management Plan (HMP) has been created and implemented at all thirteen hatcheries in the region, as directed by the Aquatic Animal Health Policy (713 FW 2). HMPs prioritize robust preventative health practices to prevent, respond to, and manage aquatic animal disease.
- One part of the HMP is the biosecurity walkthrough. Fish health and hatchery staff will walk from water source to effluent, discussing biosecurity concerns and mitigation steps that can be taken to reduce risk. It's a fantastic opportunity for us to learn more about a hatchery program as well!
- Staff participated in numerous calls, email conversations, and site visits with hatcheries and partners regarding fish health diagnostic cases ranging from bacterial infections to nutritional, environmental, and stress-related mortality.
- Collaborated with the Bozeman Fish Technology Center to complete two studies evaluating different rearing factors on the growth and survival of juvenile cutthroat trout.
- Completed transfer examinations and pathogen screening for Wyoming toads being moved from Saratoga NFH to other Recovery Team / SAFE facilities.



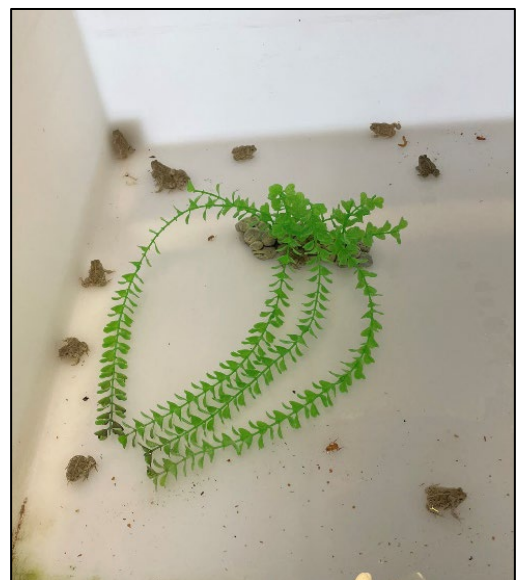
Acid-fast positive, *Cryptosporidium*-like species observed in juvenile Wyoming toad feces. Animals were clinically normal. This suspected organism has long been noted in histopathology of adult toads (Dr. Allan Pessier – WADDL), presenting as a subclinical infection of the ventral ciliated epithelium of the tongue. Photo: USFWS/J. Veilleux.

Services Supporting Partner Recovery, Restoration and Recreation:

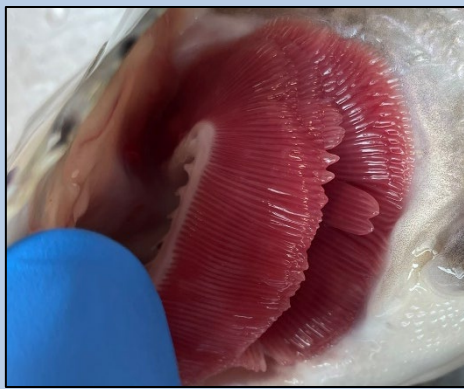
- Montana Fish, Wildlife and Parks (MTFWP): from tissue samples submitted to the lab, staff conducted eleven complete inspections, six virology cases, and one flow cytometry case. These cases are a mix of hatchery and wild fish. Molly works closely with our MTFWP partners to coordinate these sampling efforts, making sure our lab doesn't get inundated all at once!
- Completed a PCR confirmation case for Wyoming Game and Fish Department.
- Conducted a complete inspection for Utah Department of Agriculture and Food.



Bonytail chub missing both eyes. Appeared to be a congenital deformity. Fish was otherwise in good health and body condition. Photo: USFWS/J. Veilleux.



Left: Juvenile lake sturgeon at Valley City National Fish Hatchery, including one fish with naturally occurring, super cool-looking leucism: USFWS/J. Veilleux.
Right: Healthy Wyoming toadlets cleared for transfer. By moving toads between facilities, the genetic pool can be maximized. USFWS/J. Veilleux.



Normal gills? A closer inspection shows they're inflamed (glossy and swollen). The microscope reveals an even more interesting story (see page 5). Photo: USFWS/J. Veilleux.

Outreach and Education:

- Renee continues to be an All-Star Collateral Duty Safety Officer, leading sessions on fire drill preparation, earthquake response, mold safety, and more.
- With freezing weather and snow, our pollinator garden has entered dormancy until at least May 2025. It was another extremely successful year thanks to our team's hard work, especially Tammy. We'll miss seeing all the different flower colors and visiting critters.
- Tammy recently updated our website, with more changes to come. Check out <https://www.fws.gov/office/bozeman-fish-health-center> to learn more about what we do! All our newsletters get posted there as well.
- Jake presented at the American Association of Fish Veterinarians Conference.
- Staff gave numerous tours of the Bozeman Fish Health Center to USFWS colleagues, other governmental agency employees, and public visitors.

Partnerships, Employee Development & Other News:

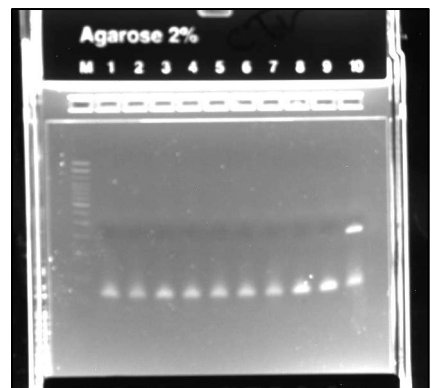
- After lots of hard work by Rick, Tammy, and the rest of the team, the AFS-FHS QA/QC committee approved our Quality Assurance Laboratory Program Tier 2 status. We're proud of the improvements we've made and continue to make at our lab.
- Staff held several individual fish health training sessions for partner agencies. Topics included fish health basics, diagnostic sampling techniques, bacteriology, and molecular assay preparation.
- Lacey, Renee, and Jake joined the fall Wyoming Toad Recovery Team meeting.
- Along with her many Virology laboratory duties, Molly holds the prestigious honor of being our BFHC purchase card holder. She kept us calm and organized down the final stretch as purchasing was finalized and FY2024 ended.



Native species of concern live a life of luxury at Valley City NFH. This picture shows a tank with hide structures and spawning substrate. Photo: USFWS/J. Veilleux.



The Wyoming toad that had a soft tissue sarcoma (tumor) surgically removed is still with us. 16-months post diagnosis and she's going strong. What a champ! The arrow points to the healed excision site. Photo: USFWS/R. Frabasilio (the toad expert).



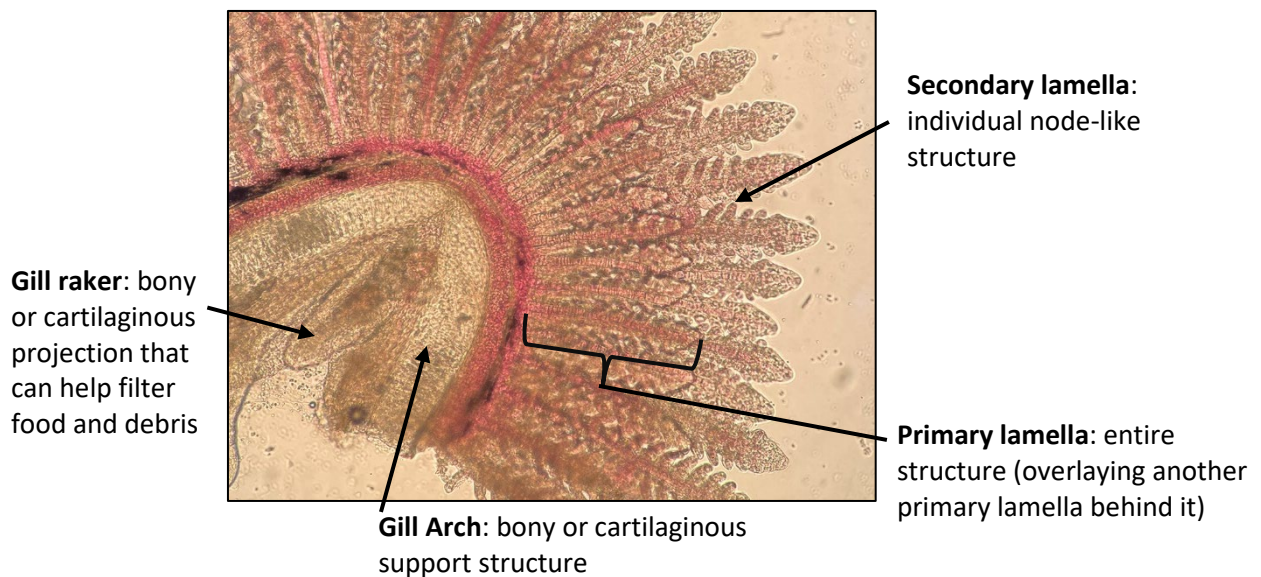
Top left: Freshwater drum at Garrison Dam NFH. An underappreciated, but important Missouri River native species! Photo: USFWS/M. Bensley.
Top right: Conventional PCR with E-gel showing a positive band for *Y. ruckeri*. Photo: USFWS/ R. Yamamoto.
Bottom left: Rainbow trout with dysplasia of the supratemporal canal - a sensory canal (red arrow). Photo: USFWS/J. Veilleux.

Test your skills looking at gills!

Importance of gill health can't be understated!

- Gills are a critical organ for our finned-friends!
 - Gas exchange
 - Nitrogenous waste excretion
 - Osmoregulation (i.e., ion uptake)
 - Acid-base regulation... and more!
- Protected from physical trauma by operculum but are otherwise exposed to the environment and susceptible to damage from infectious agents and environmental factors like poor water quality.
- Fish with poor gill health can defy odds and survive a surprisingly long time. However, they'll fail to thrive and be susceptible mortality from even minor stressors.

Gill Anatomy



Example Cases



Both images are of trout gills. On the left is an example of healthy gill tissue. The **blue arrow** points to a secondary gill lamella. These are the primary gas-exchanging units of the gill. Note the symmetry and structural definition as they line the primary lamella (sometimes called the gill filament).

On the right, is a fish with severe branchitis, or inflammation of the gill. The **red arrow** points to where the secondary lamella should be but are no longer visible. There is loss of secondary lamellar structure where epithelial tissue has completely fused together due to excessive proliferation of cells. Branchitis occurs when a noxious stimuli causes damage to the gill tissue, and in response, the body quickly tries to heal. Some causes include infectious agents, environmental stressors, or nutritional deficiencies, though it's often a combination!

What's this?

Each newsletter will have an installment of **Fish Health 101**. It will briefly cover a topic of fish health you may find of interest.

In this edition, we'll talk gill health. Imagine having lungs on the outside of your body that also do a whole bunch of other important stuff! If you have further questions or would like to request a topic, email Jacob_Veilleux@fws.gov.

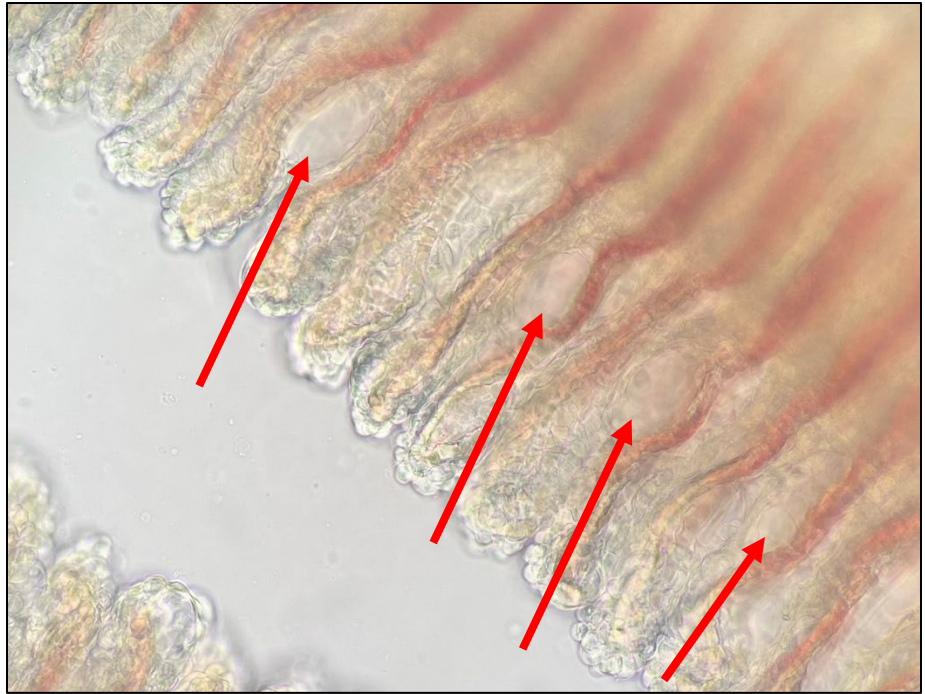


You may be sick of hearing about it, but us Bozeman Fish Health Center employees sure do love our microscopes! Using light microscopy and wet mounts, we can visualize a whole new world of fish health. We can determine normal versus abnormal gill tissue, visualize specific pathology, and even identify potential causes for disease.

In many cases, these wet mounts (gill clips, skin scrapes, and fin clips) can be done non-lethally. Photo: USFWS/J. Veilleux.



Beautiful, healthy gills from a trout. Look how symmetrical and defined those lamellae are. This should be the goal for all fish! Photo: USFWS/J. Veilleux.



Gill clip from an adult trout (see macroscopic image of gills on page 3). This animal also has proliferative branchitis, though not as severe as the fish in the previous image. Note that the primary lamellae appear crowded, and it is difficult to appreciate individual secondary lamella. There appears to be some lamellar fusion occurring.

These gills also have additional pathology. The most visible is epitheliocystis, indicated by the **red arrows**. This disease is caused by an intracellular bacterial infection which forms large, cyst-like inclusions in epithelial cells. This doesn't necessarily result in mortality on its own but can significantly reduce gill functional ability. When combined with other disease(s) and stressors, mortality becomes more likely.



This image comes from the same fish, just a different field of view on the wet mount. **Circled in red** are numerous *Chilodonella*, an external protozoan parasite. Under normal conditions, a healthy adult trout should probably be able to handle *Chilodonella* no problem. However, when combined with other stressors (low DO, tankmate aggression, etc.) and/or disease (epitheliocystis), infection can take off.

Fish Health 101 Section images: USFWS/J. Veilleux.