

Fish Health Center

Lacey Hopper, Project
Leader/Supervisory Fish Biologist

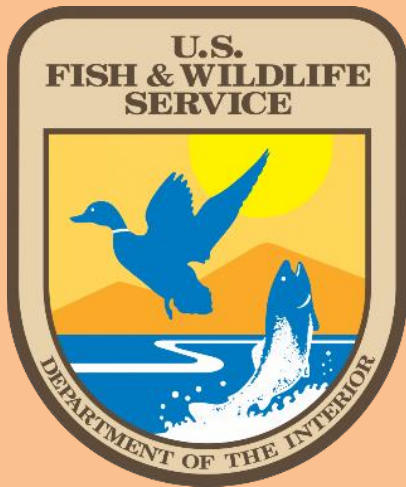
Molly Bensley, Fish Biologist

Tammy Weiss, Fish Biologist

Renee Yamamoto, Fish Biologist

Rick Cordes, Fish Biologist

Jake Veilleux, Veterinary Medical
Officer



Bozeman Fish Health Center
1805 S. 22nd Ave, Suite 1
Bozeman, MT 59718
(406) 582-8656

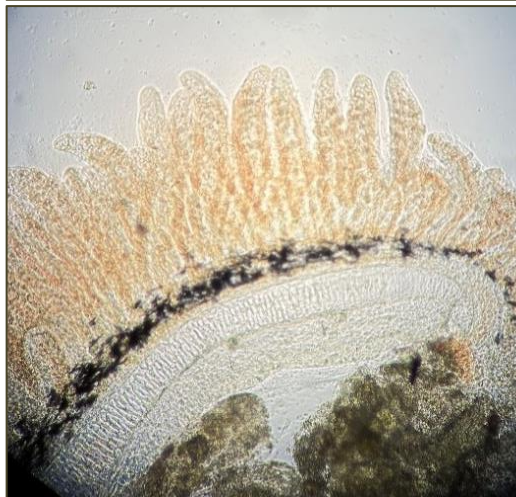
Bozeman Fish Health Center

Fall 2023 Highlights:

This Fall, the Bozeman FHC had a plate full of inspections, diagnostic cases, eDNA work, and more! We completed our application for the AFS-FHS Quality Assurance Tier 2 program and made great progress in developing Health Management Plans for the Region 6 hatcheries.

Laboratory Services Supporting Federal Recovery, Restoration and Recreation:

- Since the end of September, we have completed the following for federal hatcheries and wild waters in federal jurisdiction: two complete inspections, three virology inspections, and three histology processing cases. There were six troubleshooting cases that required a full clinical work-up and sample collection for lab diagnostics.
- We ran three cases of triploid testing quality control. Using flow cytometry, the BFHC can quantitate what percent of a fish lot was successfully converted to triploid fish. Renee and Tammy spearhead this effort. They continue to fine tune the test protocols to make sampling is as efficient as possible.
- Processed and analyzed 100 eDNA water samples for silver and bighead carp detection. These samples were collected from waterways in South Dakota by the Great Plains FWCO.



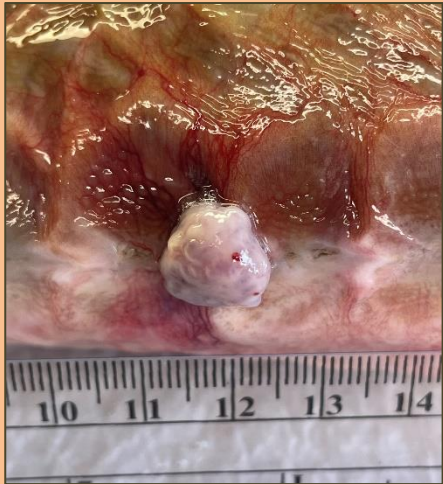
Top left: Molly and Renee's workstation as they begin the fish health inspection at Creston National Fish Hatchery. Pictured are rainbow trout of varying sizes. Photo: USFWS/R. Yamamoto.

Top right: A wild pallid sturgeon that was found dead on the Powder River. Photo: USFWS/R. Yamamoto.

Bottom left: Gill clip of a cutthroat trout under light microscopy. This juvenile fish had some loss of lamellar structure (the gas exchanging units of the gill). Photo: USFWS/J. Veilleux.



Razorback sucker with a yellow-tinged skin lesion consistent with columnaris disease. PCR confirmed the presence of the bacteria *F. columnare*. Photo: USFWS/Z. Olsen.



Papilloma-like lesion on an adult pallid sturgeon. A full suite of diagnostics has been completed for this case, with advanced molecular testing still pending. Photo: USFWS/J. Veilleux.



Wild brown trout from the Big Hole River with an ulcerating lesion on the dorsal rostrum of the fish. Commonly described in the media as “cheese-grater head.” Photo: USFWS/J. Veilleux.

Laboratory Diagnostic Support to Reduce Hatchery and Wild Fish Losses:

- Progress has been made on drafting and implementing Health Management Plans (HMPs) for each hatchery in the region, as directed by the Aquatic Animal Health Policy (713 FW 2). Three hatcheries have completed final drafts, with two more close behind. The process will begin for the rest of the Region 6 hatcheries in the coming months. See more about HMPs in our Fish Health 101 section!
- Staff participated in numerous calls, email conversations, and site visits with hatchery managers and partners regarding fish health issues such as:
 - Nutritional concerns: amphibian vitamin supplementation, feeding recommendations for early life stage cutthroat trout.
 - Environmental problems: increased rearing densities, water quality fluctuations, weather (heat wave, flooding), and AIS preparation.
 - Disease: Columnaris disease, atypical bacterial gill disease, and more.
- Provided support to the Wyoming Toad colony at Saratoga NFH. This included surgical removal of a soft tissue sarcoma, investigating chronic skin health issues potentially associated with ammonia gas exposure, and conducting numerous PCR screenings for pathogens of concern (all negative).

Laboratory Services Supporting Partner Recovery, Restoration and Recreation:

- Montana Fish, Wildlife and Parks (MTFWP): from tissue samples submitted to the lab, staff conducted eight complete inspections (hatchery and wild fish), one virology case, and one troubleshooting case. Jake participated in salmonid disease sampling efforts with FWP partners on the Big Hole River.
- Led by Lacey, staff has been participating in the planning stages of the Lower Clark River Pathogen Survey. This is a wild fish health survey undertaken with MTFWP, Idaho Fish and Game, Avista Corp., and Northwestern Energy every 5 years.
- Lacey, Rick, and Renee continue to work on an eDNA project to validate a qPCR for detecting Alligator Snapping Turtles. This is a collaborative effort between the USFWS Whitney Genetics Lab, USGS-NOROCK, and Air Force partners.
- Molly and Renee completed 11 virology cases this fall, with most coming from MTFWP and federal hatcheries. Each case takes at least 28 days to finish! Carefully processed tissue samples are plated onto lab-grown cell lines. Then our dynamic virology duo watches these cells under the microscope for a several week period. A detectable virus will cause cytopathic effect which is structural change to a cell. Sometimes this can be very dramatic, and other times quite subtle. Once observed, further diagnostics like PCR can be used to confirm a specific virus.
- Tammy processed a plethora of slides this fall in collaboration with various federal, state, and tribal partners. Several of these cases were done with the Bozeman Fish Technology Center, including a dead adult pallid sturgeon recovered from the Powder River (see its picture on page 1). Interestingly, the gonads of this individual were in relatively good shape compared to the rest of the fish, which was beginning to decompose. The histology slides came out beautiful!



Rick proudly pictured with the BFHC Quality Manual, which includes the Biosafety Manual. Go Rick! Photo: USFWS/J. Veilleux.



Juvenile cutthroat trout in poor body condition (1/5 body condition score). Photo: USFWS/J. Veilleux.



Preparing for lake trout spawning at Saratoga National Fish Hatchery... featuring Lee Bender! Photo: USFWS/J. Veilleux.

Outreach and Education:

- The Bozeman FHC pollinator garden has entered “hibernation” for the long Montana winter but was active well into October. Thanks to careful planning by Tammy, many of our mixed native and nonnative plants are perennials. She is also an expert at banking seeds and propagating plants for the future!
- Lacey led several visitor tours of the BFHC this fall, showcasing all that we do to members of the USFWS, other federal agencies, and the public. Among others, USFWS Deputy Director Siva Sundaresan and Region 6 - Acting Assistant Regional Director of Fisheries and Aquatic Conservation Aaron Mize visited our lab!

Partnerships, Employee Development & Other News:

- Thanks to the hard work of Rick, we submitted our application for the AFS-FHS Quality Assurance Tier 2 program in September. This is part of a multi-tiered program for quality assurance and quality control in aquatic animal laboratories. As part of the process, Rick developed a lab-specific, comprehensive biosafety manual. It’s been a full team effort working together to make incremental improvements to our biosafety and quality assurance protocols.
- Renee and Rick were trained on using our new digital PCR machine. We are very excited about the many applications we can use this technology for!
- Rick completed entering all fiscal year 2023 cases histories into the Laboratory Information Management System (LIMS) date base.
- Lacey, Renee, and Jake were active participants in the Fall 2023 Wyoming Toad Recovery Team call.
- Molly completed the USFWS NCTC *Working with Emotional Intelligence* course.



Top left: Sampling the Big Hole River with Montana Fish, Wildlife, and Parks. Photo: USFWS/J. Veilleux.

Top right: An active bee house that was brought inside for the winter. Photo: USFWS/T. Weiss.

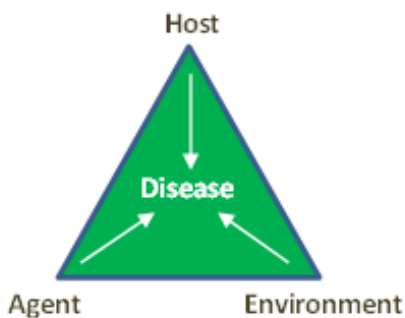
Bottom left: Honeybee on a *Verbena* plant. USFWS/T. Weiss.

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 about the new Aquatic Health Management Plans required by Aquatic Animal Health Policy (713 FW 2). If you have further questions or would like to request a topic, email Jacob_Veilleux@fws.gov.

EPIDEMIOLOGIC TRIANGLE



Featured in a previous edition of Fish Health 101, the epidemiologic triangle returns! This concept looms large over the HMP, especially the disease management and biosecurity plan aspects. When thinking about infectious diseases, it's important not to hyperfocus on the agent (pathogen). For example, many agents can be found in "clean" water. Does this mean a fish will get sick as soon as it's exposed? No. Both the environment (such as water quality and rearing densities) and the host (fish's immunocompetence) play a major role. Understanding this, we can develop a biosecurity plan that lowers the risk of disease, while also still being achievable. Image by USFWS/J. Veilleux.

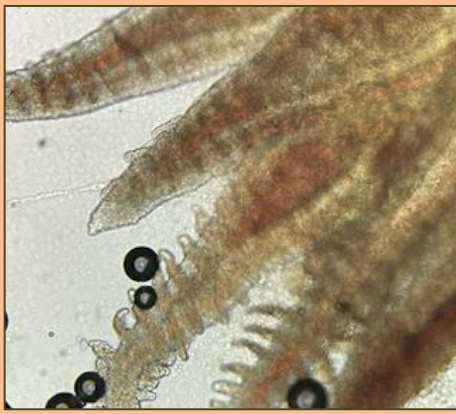
What are Health Management Plans?

Per 713 FW 2:

- A. Fish Health Program (FHP) supervisor must prepare an Aquatic Animal Health Management Plan (Plan) to provide an annual overview of aquatic animal health activities for all aquatic animals held, translocated, and propagated by a Service-managed facility or involving a Service-managed wild population. No component of a Plan can compel a veterinarian to violate any aspect of U.S. Food and Drug Administration (FDA) rules or the Veterinary Practice Act of the pertinent State.
- B. The FHP supervisor prepares or oversees preparation of such a Plan for each facility or managed wild population. The Plan must include the following components (refer to the handbook for additional information):
 1. Annual facility inspection plan,
 2. Lot-specific disease management plan, and
 3. Biosecurity plan to minimize the transmission of pathogens onto and within a facility or site.
- C. The FHP supervisor must review Plans annually or more often when the need arises.

How will these Health Management Plans (HMPs) help hatcheries?

- Through the creation of a three-pronged health management strategy specific to each individual hatchery:
 - **Annual facility inspection plan = disease surveillance**
 - Identifies all fish on-station and the testing requirements for each lot.
 - **Lot-specific disease management plan = disease response**
 - Identifies historical and current disease issues at a facility, including non-infectious health issues. This section essentially serves as a centralized medical record that parties can refer to if a health issue arises, with previous management and treatment strategies described.
 - Beyond the annual inspection, your FHC is here to help you raise healthy fish as efficiently as possible. As with any other species of farmed animal, health is bigger than just mortality intervention. By talking routinely to your FHC about preventative health and early intervention when morbidity occurs, you're setting your fish up for success.
 - **Biosecurity plan = disease prevention**
 - A biosecurity plan is crucial to a hatchery's success. Worst case, the introduction or spread of a pathogen or AIS from a hatchery can result in culling of the entire population. No one wants to see that! In writing an HMP, hatchery and BFHC staff will work together to identify risks, highlight transmission pathways, and develop mitigation techniques. This allows for a tailored biosecurity plan.
 - Having a written plan staff can refer to makes it easier to follow biosecurity protocols. Learning these procedures (and their importance) should be part of onboarding training to ensure maximum effectiveness.
 - Ultimately, with any outdoor animal rearing, having a zero-pathogen facility is unrealistic. It's all about lowering the risks through realistic, achievable measures.



Light microscopy is a powerful tool in preventative health and early detection of disease. A skin scrape or gill clip can be collected non-lethally and reveal an entire story. One application of these diagnostics is as a screening test during fish movement. For example, you may detect a parasite that wasn't causing fish trouble in the 1-acre pond but would flourish after moving to a higher-density tank. By screening, you catch it early and can work with your FHC to decide if treatment is appropriate. Photo: USFWS/J. Veilleux.

In a future edition, we'll talk more about light microscopy basics, but if you're interested in learning more now, feel free to reach out!



Your friendly neighborhood Fish Health Center team wishes you a happy holiday season! Photo: USFWS/R. Cordes.

Don't we already do this?

- Yes and no. All hatcheries in our region have an annual fish health inspection and BFHC staff have records for historical disease problems at a hatchery. Hatcheries also have biosecurity practices, though there may not be a written biosecurity plan. Developing a facility specific HMP allows us to go in much more depth and fosters an open dialogue between the hatchery and FHC.
- Having all of this written in one place with a policy-required annual review helps improve communication and accountability on all sides. This means healthier fish and a lower risk for headaches caused by regulated pathogens or AIS.

Why do you keep harping on preventative health and early intervention?

- The best way to fight disease is to prevent it from occurring in the first place. Whether you're human, dog, or beef cow, that means getting regular health check-ups. Along with examination and lab work, understanding lifestyle (diet, exercise, health history, etc.) is just as important. This applies to fish too!
- The following are a few aspects of preventative health in aquaculture:
 - Annual fish health inspections
 - Routine monitoring of fish by hatchery staff, which includes daily mortality logs
 - Strong fish culture and husbandry practices → appropriate rearing densities, high quality feed, and low-stress handling and transport procedures
 - Routine water quality monitoring
 - Strong biosecurity protocols and utilization of quarantine when applicable
- The BFHC is here to work in collaboration with our hatcheries and their expertise in fish culture. Together, we can identify risk factors to fish health and implement facility-specific mitigation techniques.
- A key benefit of a robust preventative health program is the early detection of disease. Early intervention can result in a simpler, more successful treatment with less loss and cost. Even if morbidity is mild, we strongly recommend reaching out for the following reasons:
 - The sooner we know about the issue, the faster we can help!
 - Administering a treatment prior to a health work-up can result in increased losses and make diagnostics more complicated moving forward.
 - I.e., A parasite is suspected, so fish are treated with formalin. Instead, the fish have gill disease, and the formalin causes a mortality event.
 - Along with combing through the clinical history and presentation, there are several non-lethal methods of testing we can attempt prior to culling fish. If a small number of fish do need to be culled for diagnostics, it will still likely save a much larger number of fish in the long run.
 - Reduces the risk of disease transmission and losses across the entire hatchery.
 - Obviously, discovering a reportable disease is not ideal. But whether it's found early or late, it still gets reported. The only difference is that with early intervention, many reportable diseases are treatable, and more fish can be saved!
- **Moral of the story: Involve the BFHC whenever you have a fish health question. Very few animal culturists can say they have access to year-round free health care!**