Using Passive Integrated Transponder (PIT) Tags for Aquatic Conservation

PIT tags are a small coil of wire wrapped around a small integrated circuit (a “microchip”) enclosed in glass. Each tag contains a unique identification number, which allows it to be tracked and identified, as if it were a license plate or Social Security number. The tags can be implanted into animals, like your pet, to allow tracking of the individual. When a PIT tag is within range of a reader, the reader’s oscillating magnetic field provides the power that the PIT tag needs to transmit its identification number.

When it comes to tracking fish, PIT tags have many advantages over some other methods used to mark or track fish. Acoustic tags and radio tags have batteries and transmit a signal at regular intervals; since PIT tags are “passive”, they don’t require a battery, which is one of the advantages of PIT tags. This allows the tags to be much smaller so they can be used on smaller animals, and, unlike batteries which typically have a lifetime, PIT tags will last the life of the animal and beyond. A PIT tag from a fish tagged in Washington was found as far as a sea bird’s nest in Japan!
Using Passive Integrated Transponders (PIT) Tags for Aquatic Conservation  (continued)

A commonly used tag for Pacific salmon is the coded wire tag: a piece of wire 3/16 inch long with a micro-engraved number on it that is embedded in the fish’s nose. Coded wire tags provide only two data points for the fish: where it was tagged, and where the tag was removed. Unlike coded wire tags, PIT tags can track the fish throughout its life. There are more than 300 PIT tag reader sites throughout the Columbia River basin: on the dams, in all the fish ladders, and in spawning streams and habitats. This allows a tagged fish to be tracked from the time of its release from a hatchery to when it returns to spawn in its originating creek. Fun fact: If you find a PIT tag when you are gutting a fish, send it to PTAGIS.org, you can learn your fish’s life history.

PIT tags are by far the least expensive method of tagging a fish to track its behavior. Valuable data from PIT tags allows us to understand a fish’s life history and helps make management decisions. Kurt, the electronics engineer at Abernathy FTC has been hard at work creating tools to help biologists utilize PIT tag technology for tracking aquatic organisms. He has created a document which provides procedures for the construction and installation of antennas that detect and decode PIT tags for the identification of individual aquatic organisms. The technical details focus on PIT systems driven by two models of transceivers. Kurt has also created a PIT antenna inductance and tuning tool to determine optimal antenna shape. With a few simple inputs such as antenna dimensions, the spreadsheet calculates the number of loops of wire that will be needed to construct an antenna of a given shape that will tune properly with a reader. If you are interested to see these tools, please visit: https://www.fws.gov/aftc/ProgramQET.cfm#PITtags.
Program Highlights

Conservation Genetics

Our monthly highlights typically focus on specific projects we are working on here at Abernathy FTC. For the present issue, however, we wished to focus on another service commonly provided by the Program; interpreting genetics research conducted by external partners, for use internally. Staff at FAC and Ecological Services offices routinely need to evaluate genetic information generated by our partners, and to incorporate that information into management plans, recovery, or listing actions. In some cases our internal offices fund genetics research in partner laboratories and require assistance in interpreting the results. In other cases our staff will simply come across new information in published reports or articles.

Requests range from simple questions that can be asked over the phone about a study or report, to written reviews or synthesis essays, to having Abernathy FTC staff serve on expert panels or review committees. In November and December last year, we addressed requests from ES offices in California, Nevada, and Arizona, and a FAC office in Washington. We wrote one study plan and two reviews, and participated on one expert panel and one review committee. Because these products are often being used for ongoing management, recovery, or listing actions, they are generally not described in our newsletter. FWS staff looking for assistance in interpreting genetic data typically either contact us directly, or via the FWS Genetics Community of Practice web site (https://www.fws.gov/ConservationGeneticscOP/).

Brice returned to Abernathy FTC after completing a 90-day detail as the acting project leader at the Mariana Islands Refuges and Monument Complex. While there he supervised staff at Guam NWR and reviewed permit applications for activities in the Mariana Trench Marine National Monument.

Program Highlights

Conservation Genetics

Matthew and Brice shared results of genetic analysis of Wallowa River bull trout with our partners at PacifiCorp. This work is part of a multi-year collaboration between the FWS and PacifiCorp to understand the status of bull trout and bull trout x brook trout hybrids in the Wallowa Lake and River watershed.

Jennifer assisted biologists with Pacific States Marine Fish Commission in California in developing a genetic sampling strategy to use in 2019. The biologists plan to take genetic samples from juvenile salmonids captured at various sites in the Sacramento River to evaluate habitat use by threatened and endangered species.

Matthew assisted Quinault NFH and Western Washington FWCO staff with spawning and biosampling coho salmon and chum salmon at Quinault NFH. Sharing staff among our facilities has provided our leadership with greater options for getting large tasks completed, and provided staff with a better understanding of, and closer connection with, other offices in our Region.
Program Highlights (continued)

Nutrition & Physiology

Racheal and Ron, along with Kari Dammerman from Columbia River FWCO, collected eggs from 20 coho salmon spawned at Eagle Creek NFH. The eggs will be analyzed for nutrient composition as part of the multiyear coho egg project aimed at examining the relationship between egg nutrient composition and reproductive success at Eagle Creek and Quilcene NFHs and determining whether salmon egg composition is influenced by ocean conditions. This information will increase our understanding of the ways in which changing ocean conditions could affect future NFH production.

The following fish came into the holding ponds in November and December: cutthroat - 7, coho - 138, steelhead - 8. Capture of adult salmonids at Abernathy FTC is one component of the BPA-funded project aimed at examining differences between hatchery and natural-origin steelhead.

Lamprey and mussels held at Abernathy FTC are periodically inventoried. These routine and regular checks enable us to monitor the health and welfare of the organisms. The lamprey data will enable us to inform our partners, the Yakama Nation Fisheries, NOAA and the CTUIR as well as the funding entity, Chelan PUD, of the status of two brood years of fish.

working with others

Ann was contacted by Idaho Department of Fish and Game (IDFG) regarding deliveries of feeds that were 4-5 months old.

Kelli assisted Columbia River FWCO staff with a survey of brook trout in Tyee Springs at Carson NFH. The survey is being undertaken as a preliminary step in evaluating the feasibility of using YY male brook trout to reduce or eliminate the brook trout population there.

Ann was contacted by Phil Branigan, IDFG, for technical assistance related to feed analysis. He is conducting a feeding trial and needed to confirm the accuracy of the feed formulation.

The purpose of the Fish Feed Quality Control (FFQC) program is to ensure that feed that is fresh and meets the dietary requirements of the fish is used at our NFHs. As part of the routine analyses, feeds from hatcheries are checked for rancidity. The Regional Nutritionist (Ann) writes the feed memos, which are sent to the hatchery and the feed mill. A quarterly FFQC report is written and sent out to Tribal, State, and Pacific and Pacific Southwest Region hatchery partners. The report gives analytical data concerning the proximate analysis (protein, lipid, moisture and ash) and rancidity of the sampled feeds.

NUMBER OF FEED SAMPLES RECEIVED BY THE FFQC PROGRAM

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<th>Number of Samples</th>
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<tbody>
<tr>
<td>Jan/Feb 2018</td>
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<tr>
<td>Mar/Apr 2018</td>
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<tr>
<td>May/Jun 2018</td>
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<tr>
<td>Jul/Aug 2018</td>
<td>13</td>
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<tr>
<td>Sep/Oct 2018</td>
<td>2</td>
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<tr>
<td>Nov/Dec 2018</td>
<td>12</td>
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Cheyenne Owens, Natural Resource Specialist of Mountain-Prairie Region, contacted us about joining the Nutrition/Physiology Community of Practice. She had some thoughts on priority species to study using the System-wide Nutrition/Physiology proposals.

James’ poster is being used at the Toutle High School Biology class as an example for student preparation for an event at Washington State University, Vancouver.

Racheal Headley (L) and Kari Dammerman (R) collecting coho egg samples at Eagle Creek NFH. Photo Credit: USFWS.

Rod Engle, Lower Snake River Compensation Plan (LSRCP), and Gregg Anderson, manager of the Hagerman Hatchery contacted Ann about quality of the feed Hagerman is getting for the Partial Reuse Aquaculture System (PRAS).
Program Highlights (continued)

Quantitative Ecology & Technology

Kurt and Kelli collaborated with Will Simpson (Columbia River FWCO) on developing, testing, and deploying a battery switching and power system to operate a PIT antenna array in the Umatilla River basin. The PIT arrays measure movement of juvenile salmon and Pacific lamprey in and around irrigation diversions, and their operation is funded by the US Bureau of Reclamation. The new power system is intended to reduce electromagnetic interference that has been negatively affecting antenna performance. The work needed to be completed before river flows started to rise concurrent with water management in the basin, and before biologists with NOAA and Confederated Tribes of the Umatilla Indian Reservation (CTUIR) began to tag juvenile Pacific lamprey upstream from the antenna sites. Detections of tagged lamprey should also provide a rough estimate of in-river migration rate of macrophthalmia, juvenile lamprey who are making their seaward migration.

A proposal was submitted for a Directorate Fellow (DFP) for summer 2019 to assist with the processing of aerial imagery to be collected by small unmanned aerial systems (sUAS/drones) during the carp biomass study at Malheur NWR. The DFP would process images into geo-referenced GIS layers and help extract data on coverage of submerged aquatic vegetation.

working with others

Administration & Facilities

An important property donation to Abernathy FTC was finalized. The property includes a nice stretch of creek perfect for observing salmon behavior. A plaque will be displayed thanking Roma Bergstrom for her donation.

Abernathy FTC received a 2008 3-yard dump truck in excellent condition that Quilcene NFH no longer needed. The truck will be used as we demolish two large 1960’s-era water tanks.

Patty participated in a small group (Don Campton, RO and Janine Castro, Columbia River FWCO) tasked with coming up with a policy for holding beavers at FAC facilities. The group completed a draft policy document with a checklist and an extensive scientific literature review (thanks Don). All materials were presented to the ARD who will make a determination regarding next steps.

Justin spent the week at NCTC as one of the Pacific Region’s three participants in the Stepping Up to Leadership Program (SUTL 37).

Patty assisted with a fact finding investigation with an Employee Relations Specialist from HR. Draft findings were completed and summarized.

Steve M. modeling Abernathy FTC’s new dump truck. Thanks, Quilcene NFH! Photo Credit: USFWS.
Abernathy FTC staff visited technical experts at the Oregon Zoo, and received a behind the scenes tour of their water conditioning and treatment systems as well as a visit to the nutrition department. The nutritionist talked about feeds and prey items he uses and the challenges he faces while the Life Support Systems expert provided information about recirculating systems.

Patty spoke to the Kelso Lions fraternal organization about the FWS and its mission and how Abernathy FTC fits within that mission.

FAC and EA staff from the Pacific Regional Office visited Abernathy FTC. They learned all about Quantitative Ecology & Technology, rescued lamprey, visited baby brook trout, and interviewed geneticists live on Facebook. They are coming back soon to learn about Nutrition and Physiology (right?). John became Facebook famous for his release of an outmigrating lamprey rescued from Abernathy FTC’s sturgeon raceway. Thanks, Sean Connolly, for immortalizing the event in those marvelous photos. https://www.facebook.com/PacificLamprey/photos/ms.c.efxUEKADEIQ9EbFRM1ztz-zYoVK7fbQmhMD-__APAp622MGrrMlKGp8gTvghGonnBET-__pOaEdQT6if5gUdsAEkyRry.bps.a.202534106878030/2025341194211350/?type=3&theater

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**OUTREACH**

**NOV 29**

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**DEC 3**

Patty spoke to the Kelso Lions fraternal organization about the FWS and its mission and how Abernathy FTC fits within that mission.

**DEC 12**

FAC and EA staff from the Pacific Regional Office visited Abernathy FTC. They learned all about Quantitative Ecology & Technology, rescued lamprey, visited baby brook trout, and interviewed geneticists live on Facebook. They are coming back soon to learn about Nutrition and Physiology (right?). John became Facebook famous for his release of an outmigrating lamprey rescued from Abernathy FTC’s sturgeon raceway. Thanks, Sean Connolly, for immortalizing the event in those marvelous photos. https://www.facebook.com/PacificLamprey/photos/ms.c.efxUEKADEIQ9EbFRM1ztz-zYoVK7fbQmhMD-__APAp622MGrrMlKGp8gTvghGonnBET-__pOaEdQT6if5gUdsAEkyRry.bps.a.202534106878030/2025341194211350/?type=3&theater

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**PUBLICATIONS AND REPORTS**


### MEETINGS, CONFERENCES & TRAININGS

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<tr>
<th>Date</th>
<th>Event Description</th>
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<tr>
<td>Nov 1</td>
<td>Doug, Ron and Patty participated in a conference call with Rod Engle (LSRCP) and staff from IDFG to make introductions, brief IDFG staff on the Service's PRAS evaluation study at Hagerman Hatchery, and begin coordinating data collection for 2019. IDFG recently took over operations at Hagerman Hatchery.</td>
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<td>Nov 1</td>
<td>James, Ann and Racheal had a conference call with Alexa Maine, CTUIR, to talk about mussel culture. Information was shared and the possible development of projects was discussed.</td>
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<td>Nov 2</td>
<td>Matt and Christian met with representatives from Portland General Electric and Oregon Department of Fish and Wildlife to discuss interpretation of genetic data for redband trout and steelhead in the Deschutes River.</td>
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<td>Nov 5-9</td>
<td>Ben attended DOI’s remote pilot training course for small unmanned aerial systems (sUAS or drones), and became Abernathy FTC’s second DOI-certified sUAS pilot.</td>
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<td>Nov 7</td>
<td>James, Racheal and Ann called in to the Rocky Reach Fish Forum-Chelan PUD monthly meeting to be available for questions as they reviewed our Phase II lamprey study proposal.</td>
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<td>Nov 8</td>
<td>Doug had a conference call with Rod Engle (LSRCP) and Chris Sullivan (IDFG) to discuss one element of the PRAS evaluation work at Hagerman NFH, concerning whether loose or shed PIT tags ingested by juvenile steelhead are “cycled” within raceways and tanks by repeated cases of ingestion and excretion.</td>
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<td>Nov 13</td>
<td>Mona Derby, intern, gave a presentation about her experiences and ideas at Abernathy FTC titled, Conversion of a Production Fish Hatchery to a Modern Fisheries Research Center: Lessons Learned from Six Decades of Experience.</td>
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<td>Nov 20</td>
<td>Ron gave a presentation on Abernathy FTC’s history, mission and research activities as the speaker at the monthly Wakhiahum Outdoors program in Cathlamet, WA. The request for a speaker from Abernathy FTC was to inform the community about work done at the technology center and to explain how Abernathy FTC fits into the broad salmonid picture.</td>
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<td>Nov 28</td>
<td>Ben represented Abernathy FTC at the Army Corps of Engineers (COE) 2018 Anadromous Fish Evaluation Program annual review meeting, in Portland, OR. The meeting is a forum for biologists to present results of research and monitoring funded by COE, and included sessions on juvenile and adult salmon passage, estuary habitat, avian predation, and Pacific lamprey passage.</td>
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<td>Nov 29</td>
<td>Doug participated via conference call in the Harney Basin Wetland Initiative all partner meeting to discuss ongoing conservation, monitoring, and research projects in the Malheur basin (mostly carp-related), and to discuss new proposals to be submitted for funding to the Oregon Watershed Enhancement Board’s Focused Investment Partnership (FIP) program. FIP funds support Abernathy’s carp biomass study in at Malheur NWR.</td>
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<td>Dec 7</td>
<td>Ann attended a Pacific Northwest Native Freshwater Mussel Workgroup quarterly conference call. Items discussed were the upcoming Freshwater Mollusk Conservation Society symposium this workgroup will host it in 2021; developing and sharing a mussel die off documentation form for the group since numbers of reports are increasing and Willamette Riverkeeper shared findings from a 2018 Willamette River mussel study.</td>
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<td>Dec 10</td>
<td>Matthew attended the 2018 Olympic Mudminnow Symposium at Evergreen State College. This meeting provided staff and our partners an opportunity to communicate recent research, discuss conservation needs, and demonstrate monitoring approaches related to Washington State’s only endemic fish species.</td>
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