RIPPLES IN THE GRANDE RONDE

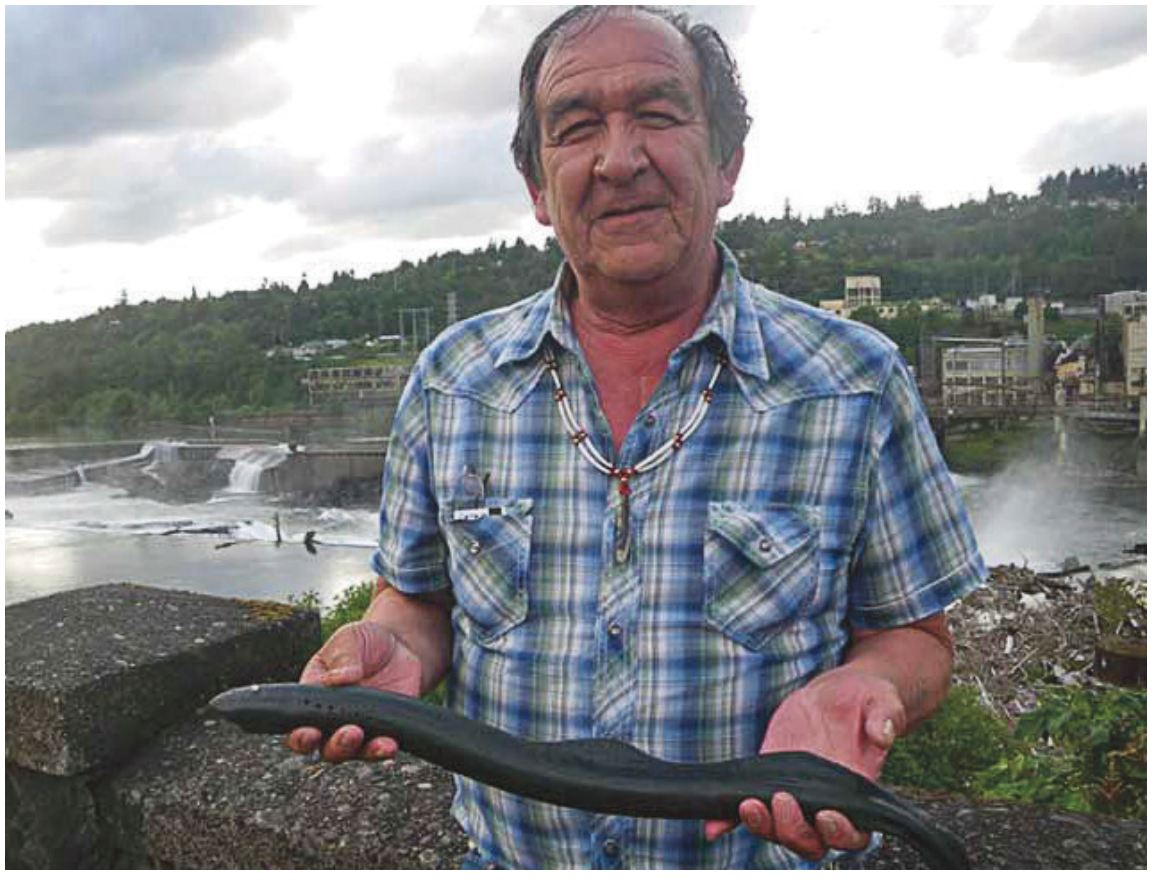
SUMMER-FALL 2022

RIVERS UNITING NEIGHBORS·NEWS FROM THE GRANDE RONDE MODEL WATERSHED

The Story of the Pacific Lamprey | "Heesu" in the Life of the Columbia River Basin

by Tod Sween and Raymond Ellenwood, *Nez Perce Tribe*

Pacific Lamprey are a culturally important species to the Nez Perce Tribe (called "Heesu" in Nimiipuutimpt, the Nez Perce language, or "eel," by tribal members) and an integral link in the Snake River ecosystem, which includes the Grande Ronde River Watershed. These fish, like steelhead and salmon, are anadromous, spawning and rearing in freshwater streams (for up to 10 years) and then migrating to the ocean to grow and live out the adult phase of their life history (up to five years), returning to freshwater to spawn and then die, their decomposing bodies releasing crucial marine-derived nutrients back into the streams. Heesu has been many things to the Nez Perce People. He has been a source of nutrients. Heesu has been harvested historically from the Columbia River and tributaries, such as 15 Mile Creek at present-day The Dalles Dam up to the Snake River tributaries like Asotin Creek. Heesu also was a character in stories for the Nez Perce People. One Tribal story tells of Heesu getting greedy and careless and betting away more than he should have. Each listener of the story took his own lesson away from the story. The people of the Tribe viewed all things, breathing or not, as important. Everything has a place and purpose, and all played a role in the ecosystem. Heesu continues to be an important character in Tribal lives. To lose Heesu would be losing part of our history and our future.



Elmer Crow holds Heesu, an adult Pacific Lamprey, in front of the Willamette Falls in Oregon City, Oregon. Photo courtesy of the Nez Perce Tribe.

Columbia River Basin Dam System Challenges and Population Protection Solutions

Since construction of the hydropower dam system in the Columbia River Basin, population declines resulted in extirpation (loss of local or regional populations) of Heesu in Snake River tributaries. This prompted Elmer Crow and other Tribal elders to advocate for action, resulting in the Tribe's Pacific Lamprey Translocation Initiative, which utilizes translocation as a stop-gap measure against further declines until passage issues are identified and addressed. Until recently, the primary focus has been on adult passage as they migrate from the ocean upstream (a distance of almost 500 miles from the mouth of the Columbia River to Idaho and Oregon) to spawn in freshwater tributaries, including those streams of the Snake River Basin. Done on empty

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stomachs (Heesu does not feed after returning to freshwater), this migration uses energy reserves stored up while feeding in the ocean (on fish, sharks, and whales) and requires Heesu to make its way past eight dams to successfully spawn. The problem is that as the migration encounters each dam, only about half the fish are successful in getting past. This dilemma is repeated eight times as Heesu makes its way upriver, with four dams on the Columbia River and four more on the lower Snake River, compounding passage problems so that the math is not in "eel's" favor, with fewer than one in 200 that arrived at the first dam, Bonneville Dam, getting past it and the others and then on to the last dam, Lower Granite Dam, to spawn in the tributaries of the Snake River.

Releasing Heesu into a targeted stream during the spring season after over-wintering in a holding tank. Photo courtesy of the Nez Perce Tribe.

In a collaborative effort with the Columbia River Inter-Tribal Fish Commission (CRITFC) and other member tribes (Umatilla, Yakama, and Warm Springs), adults are collected at three lower mainstem Columbia River dams (Bonneville, The Dalles, and John Day) and transported upstream to the Nez Perce Homelands of the Snake River Basin, where half are taken to the Nez Perce Tribal Hatchery (near Lenore, Idaho) for over-wintering in holding tanks and later spring-time releases into targeted streams. The other half are directly released back into the Clearwater River to continue their volitional migration. Fins are snipped for tissue samples and taken from each adult fish prior to release (and from larval fish electrofish sampled in the fall) and are sent to the CRITFC lab for genetic Parental Based Tagging (PBT) analysis. Recent studies find that this translocation effort boosted abundance of all life stages and has added to the understanding of the life history of this unique and cool (very cool!) fish.

Collecting adult Heesu for transportation from the lower mainstem Columbia River. Photo courtesy of the Nez Perce Tribe.

Helping Juvenile Heesu Survive and Thrive

In Spring 2022, researchers began looking at the other half of the passage problem, for juveniles ("macrophthalmia"), when they begin their journey to the ocean after living in the sediments of freshwater

streams (up to 10 years for the earthworm-like larvae "ammocoetes"). Once again, they must pass the eight dams on their downstream migration. This part of the life history has been largely ignored until now, but what is known is that there are several locations where juvenile mortality rates are high, including at juvenile bypass and turbine cooling screens at dams.

Another factor potentially limiting downstream juvenile migration is predation because the slow current of the reservoirs between dams allows predators, including many introduced species, such as smallmouth bass and walleye, that readily feed on the migrating young fish. In fact, most predators preferentially eat Heesu because it is up to five times richer in fats than even salmon (it is sometimes referred to as a "swimming sausage"). Another ecological benefit that Heesu brings to a healthy and fully functional ecosystem is as a "prey buffer," allowing more salmon smolts to escape predation. High fecundity (up to 250,000 eggs per female) and spawning success resulted in abundance that has been historically reflected in stream and creek names such as Asotin Creek (derived from Heesu) in southeast Washington and Eel Creek in the Lochsa drainage of north central Idaho.

Transfering adult lamprey to an over-wintering holding tank. Photo courtesy of the Nez Perce Tribe.

Working on translocation efforts on the lower Snake River. Photo courtesy of the Nez Perce Tribe.

Translocation work in northeastern Oregon began with releases of adult lamprey into the Wallowa River in Spring 2012, with the addition of the Minam River in 2015 and Chesnimnus Creek in the Joseph Creek drainage the following year. Nez Perce translocation efforts, along with those of the Umatilla program, have released more than 13,000 Heesu into the Snake River Basin. This number represents almost 1.5 times more fish than those that volitionally made it up to this watershed on their own, and there is evidence that the translocated fish are more successful spawning and producing larvae upon release. This finding is not surprising because a tremendous amount of energy is expended by the volitional fish during the journey swimming (and climbing!) from the ocean, which the translocated fish can instead put into eggs and reproduction.

With current trends indicating increasing larval and juvenile populations in targeted translocation tributaries, this effort appears successful in the short-term, but until passage issues are identified and remedied for both upstream adult and downstream juvenile migrations, translocation remains just a band-aid to the passage problem and full restoration and recovery, which entail healthy and harvestable populations.■

TOWARD UNCOVERING THE HIDDEN DIVERSITY OF OREGON'S FRESHWATER SCULPINS

by Brian L. Sidlauskas, *Oregon State University, Department of Fisheries, Wildlife and Conservation Biology*

Though Oregon's majestic waterways rightly hold fame for harboring the great Pacific salmons and trouts, they also provide homes to many other native species. Any trout stream will surely contain small bottom-dwelling fishes called sculpins, which feed upon invertebrates amongst the cobble and in turn become food for the larger fishes. Each stream reach can shelter hundreds or thousands of individuals, and that abundance places sculpins among the most ubiquitous of Oregon's fishes.

Despite their commonality, we know surprisingly little about sculpin diversity and biology, perhaps because they are small and cryptic and have never commanded public attention in the way that large game fishes have. Most of the taxonomic work on sculpins dates back decades and predates the molecular age, meaning that the species were identified and diagnosed using measurements, color patterns, counts of fin rays, patterns of dentition, and other anatomical characteristics. Unfortunately, many of these characteristics vary among closely related individuals and among populations, and many nominal species were described from a relatively few specimens. Because of that variation and the small sample sizes, the historical anatomical descriptions often match only some of individuals belonging to the same independently evolving lineage, or species. In some cases, two or more names have probably been applied to the same species, while other populations may belong to unrecognized and undescribed species. All this ambiguity and variation has led to identification keys that are maddeningly difficult to use and sometimes erroneous.

Recently, a few molecular studies have begun to identify the genetic divisions among freshwater sculpins and map the distribution of lineages across the waterways of the Pacific Northwest. This genetic perspective provides a major advance, but so far these studies have not included an anatomical component, nor have they examined specimens from all of Oregon's regions. As such, they help to locate the genetic and geographic boundaries among species and populations, but they do not provide the tools needed to create new identification keys that can allow users to identify sculpins reliably without resorting to DNA sequencing. To truly understand how many species of sculpin occur in Oregon, discover the boundaries among distinct populations within species, and create new identification guides, we need to collect anatomical and genetic information from the same specimens, and we need to sample individuals from more of Oregon's rivers.

The need to fill that gap brought me and my graduate student, Hakan Aydoğan, out to Enterprise in July, in hopes of collecting

A specimen of *Cottus bairdii* (Mottled Sculpin, above) and probably one of *Cottus confusus* (Shorthead Sculpin, below) from the Wallowa River at the Grande Ronde Model Watershed. These individuals were photographed in an immersion tank immediately after euthanization. Photos and editing by B. Sidlauskas.

specimens of the aptly named *Cottus confusus* (Shorthead Sculpin), an enigmatic species that was described from a tributary of the Snake River in Idaho, but that also has been suggested to occur in two disjunct regions of Oregon. Some inhabit the slopes of the Cascades, while others occur in the northeastern corner of our state. Are these two populations of the same species? Two different species? What was the history that led to their geographic separation?

We wanted to make a collection of new specimens from the Wallowa River because historical museum records suggested that our target species occurs there alongside two others: Paiute Sculpin (*Cottus beldingii*) and Mottled Sculpin (*Cottus bairdii*). Kyle Bratcher, the Oregon Department of Fish and Wildlife's district biologist in Enterprise, put us in touch with Ian and Heidi Wilson, whose Grande Ronde Model Watershed project includes a beautiful and easily accessible segment of this river. Ian turned out to be one of my former undergraduate students (small world!) and was kind enough to grant us permission to sample on his family's property. In short order, we had collected numerous sculpins with a backpack electrofisher, which stuns the fish briefly and lets us capture them with nets.

Once the fishes recovered, we separated them into what appeared to be distinct species and retained just enough specimens for us to be able to measure the genetic and anatomical diversity present at the site. For the specimens that we kept, we euthanized them via anaesthetic overdose, and then took photos in an immersion tank to document color pattern, sampled fin and muscle tissue for genetic investigations, and preserved the fishes themselves in formalin as voucher specimens, which will become part of the permanent holdings of the Oregon State University Ichthyology Collection. You can think of this collection as a library that preserves samples of fish diversity dating back nearly 100 years. You can check out the collection's website at https://ichthyology.oregonstate.edu if you'd like to know more about its history and the science that it supports.

The site on the Wallowa River from which the specimens were collected. Photo by B. Sidlauskas.

Dr. Brian Sidlauskas and his graduate student, Hakan Aydoğan, taking genetic samples and specimen photographs in their mobile lab in July 2022 at the Grande Ronde Model Watershed (GRMW). Photo by Ian Wilson, GRMW.

As you can see in the photos accompanying this article, we captured at least two species of sculpins from the Wallowa River. The one with vividly contrasting markings is a member of the Mottled Sculpin (*Cottus bairdii*) species complex. This species occurs to the west and east of the Rockies and probably represents a collection of closely related species, but so far, no taxonomist has been able to solve that problem satisfactorily. The other is likely to be the species that we came to find: Shorthead Sculpin, or *Cottus confusus*. At the very least, it has the slender body, patch of prickles under the pectoral fin, and muted coloration nominally found in

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The Next Generation SPLASHES into River Restoration

by Courtney Zink, *Wallowa Resources*

Wallowa Resources' HAWK internship program spent a day with Grande Ronde Model Watershed (GRMW) at the Wilson Haun river restoration site. Fish salvage was the task for the day, but the experience of partaking in an active restoration project is what made a lasting impression on this group of local high school students.

Water is essential to our lives and our ecosystems — the well-being of our present and our future. Understanding our watersheds, the ecosystems in and around them, and how we manage it all is critical for sustaining healthy water resources for generations to come.

In Wallowa County, we are fortunate to have many wonderful organizations with these values at their hearts. Our community's commitment to water resources management made for a particularly impactful week focused on river restoration, water management, and fish conservation for Wallowa Resources' four HAWK interns this summer. Interns had the opportunity to interact with the recently completed Tamkaliks habitat restoration project with Montana Pagano from the Nez Perce Fisheries; partake in the active river restoration project at the Wilson Haun site with the GRMW team led by Ian Wilson; tour several different types of water monitoring sites with district water masters David Bates and Marcy Osborn; and participate in salmon monitoring at the Imnaha weir with Oregon Department of Fish and Wildlife district fish biologist Kyle Bratcher.

Local high school junior, Madison Estes, on site at the Wilson Haun project. One of Madison's favorite parts of her HAWK internship experience was the exposure to potential career paths involving fish monitoring and conservation. Wallowa High School senior Emma Durning and recent Joseph Charter School graduate Catherine Zeigler work with Montana Pagano from the Nez Perce Fisheries in the background. Photo by Courtney Zink.

The HAWK program is an eight-week natural resources stewardship internship for Wallowa County high school students run by Wallowa Resources. It is set up like a college field course, involving a mix of job shadowing/field work, an ongoing monitoring project that participants learn to fully lead and conduct themselves, and reading academic papers and articles about current issues related to their field work, concluding with a professional presentation about their experience to the community. Each week has a different natural resources theme, ranging from forestry and outdoor education to trail maintenance and more, with a variety of career opportunities introduced each week to provide a holistic view. A goal beyond meaningful work experience and introduction to career opportunities is to teach participants to think critically and comprehensively, recognizing that issues and good solutions are often complicated and that there are many different perspectives and angles from which to solve and manage them. The collaboration

Jordan Jennings, a sophomore at Enterprise High School, learns how to measure in-stream flow from David Bates, district water master. Photo by Courtney Zink.

and perspective amongst the various agencies engaged in caring for and managing the water resources in our county serve as a wonderful example of how to effectively provide a holistic view informed by critical and comprehensive thinking.

The time spent on river restoration projects during this year's internship was illuminating. In the group's presentation, Madison Estes spoke in depth about the value of river restoration. She said, "We've found that managing rivers by channelizing them has both hurt our farmlands and our overall ecosystems. During channelization, the natural floodplains were almost eliminated. Floodplains are vital to storing water underground. Now that we've found this out, we are trying to bring back the floodplains (in river restoration) by adding outside channels to the rivers. This allows places for the water to slow and flood over the banks in spring. Slowing the water not only helps us and the land but also helps juvenile fish. A channelized river moves very quickly so small fish have no place to rest or hide from predators. By adding channels and meanders to the river, it gives juvenile fish a place to take a break from swimming upstream."

She went on to discuss in detail her experience with the internship learning about fish and the connection between restoration projects, water management, and the future of fish in the region.

The 2022 HAWK interns and their program leader, Courtney Zink, with their booth at the Woodlands and Watershed Festival. They learned about youth education and community advocacy through leading a pollinator activity for local children. Photo by Lindsay Miller.

All four interns listed the experience at the Wilson Haun project as a highlight from their overall internship experience. With the guidance of Ian Wilson, Montana Pagano, and U.S. Forest Service Hydrologist Dana Nave, they were able to spend the day helping salvage juvenile fish from an area staged for in-stream structures and channel fill. They loved working with the fish and documenting the different species. Several juvenile lamprey were found, and Ian shared that this was the first time lamprey have been documented

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HAWK interns helping capture juvenile fish to move out of the restoration construction zone. Photo by Courtney Zink.

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that species. But we haven't yet sequenced our specimens, and so it is possible that this is actually *Cottus beldingii*, or even an undescribed species.

Although we aren't certain what we will find when we look more closely at the genetics and anatomy of our specimens, the study will get us closer to clarifying the remarkably confused taxonomy of freshwater sculpins. We deeply appreciate landowners like Ian and Heidi Wilson who aid that process by inviting us to discover the diversity at their doorsteps. By collecting high-quality specimens and data from across Oregon, we will reveal our state's full richness of native fish species and better understand the small creatures that interact with the great ones in healthy ecosystems.■

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at the Wilson Haun project site. After much discussion throughout the week around the challenges of fish migration, this finding helped stoke the flame of enthusiasm that members of the group were beginning to feel around the value of river restoration.

Connecting the next generation with experiences of natural resources stewardship is essential to enabling them to make informed decisions about their own futures. The time spent at the Wilson Haun project played a huge role in helping connect concepts around managing water resources with young future advocates that call Wallowa County their home.

The Wallowa Resources Natural Resources Summer Internship/ HAWK is a paid eight-week program for local high school students over 15 years of age. If you or someone you know would be interested in joining next year's crew, please visit our website at https://www.wallowaresources.org/workforcetraining.

Experiences like this are made possible with the collaboration of community partners. If you're interested in partnering for future programs, please contact Courtney Zink at czink@wallowaresources.org.■

Grande Ronde Model Watershed
Upcoming Board Meetings

Tuesday, November 22nd, 2022
5:00 p.m.
Wallowa Community Center
204 E 2nd St.
Wallowa OR 97885

Tuesday, January 24th, 2023
5:00 p.m.
Elgin Community Center
260 N 10th St.
Elgin OR 97827

The public is welcome to attend.

Meeting dates are subject to change.
Please call (541) 663 - 0570 to confirm.
Thank you!

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