A publication of the Northwest Indian Fisheries Commission

Northwest Treaty Tribes

Protecting Natural Resources for Everyone

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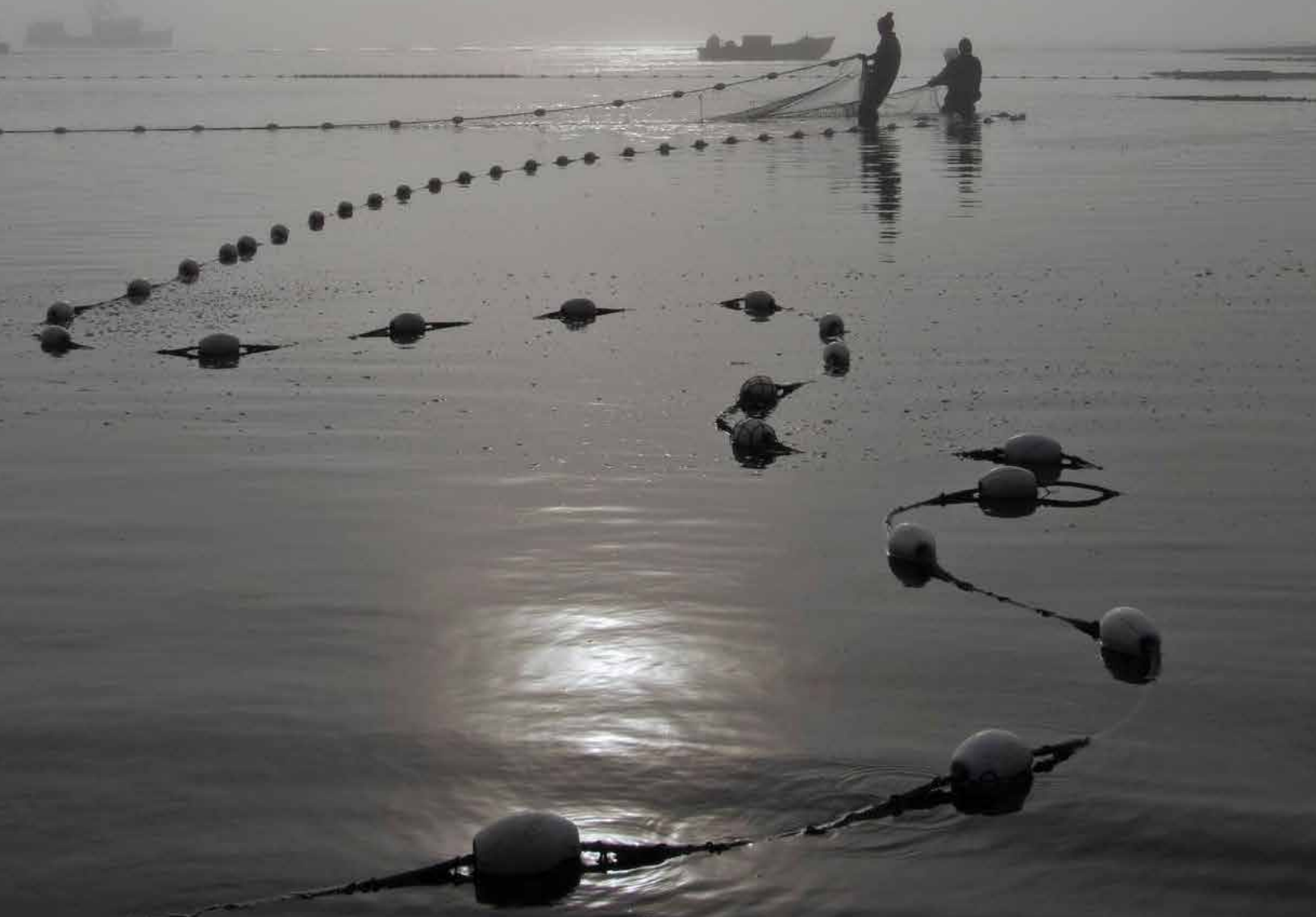
Inside:



Recovering Salmon Takes Leadership, Cooperation

by Lorraine Loomis
NWIFC Chair

Treaty Indian tribes in western Washington are greatly encouraged by Gov. Jay Inslee's recent commitment to challenge the status quo and take steps needed for salmon recovery.

It happened in November at the annual Centennial Accord meeting. Created in 1989 to mark the 100th anniversary of statehood, the gathering brings together the tribes and state in a government-to-government forum to address issues of mutual interest such as health care, education and natural resources.

Salmon are declining across western Washington for one main reason: Their habitat is being damaged and lost faster than we can fix it.

The treaty Indian tribes in western Washington have been leading the fight for salmon habitat for decades. We know that to recover salmon we must hold ourselves accountable and do what is necessary to halt and reverse the ongoing loss and damage to their habitat.

Tribes have documented the decline of salmon habitat through the State of Our Watersheds report, which details habitat conditions and limiting factors for recovery throughout western Washington. We have developed solutions through *gʷəd̓ᶻadad*, our strategy for restoring salmon habitat that takes its name from the Lushootseed word that means "Teachings of our Ancestors."

This work recommends that we:

- Protect streamside habitat through a consistent science-based approach across the region. That means creating and protecting healthy streamside buffers with plenty of mature trees that keep water temperatures low, stabilize riverbanks and contribute to diverse instream habitat for salmon.
- Revise the state's Growth Management Act and other resource protection guidelines from one of No Net Loss to one of Net Gain – working to better protect and enhance the ecosystems that salmon, orcas and we all depend on.
- Develop a statewide permit tracking system to create transparency, accountability and efficiency in understanding the cumulative effects of our collective land-use decisions.
- Reduce toxic contamination of water and salmon through improved water quality standards, source control and stormwater management requirements.

At the Centennial Accord meeting, Gov. Inslee acknowledged the importance of healthy streamside areas as critical to both our region's salmon recovery efforts and our resiliency in the face of global climate change. In a strong move, he directed his state environmental and natural resources agencies to develop a proposal for a consistent approach by the end of the year.

Washington Department of Fish and Wildlife Director Kelly Susewind echoed Gov. Inslee's support. He and I have committed to working cooperatively as co-managers through the annual North of Falcon salmon season setting process to embrace the actions outlined in the *gʷəd̓ᶻadad* habitat restoration strategy and include the issues of habitat protection in our management discussions.

To its credit, the state of Washington was the first state to establish a government-to-government relationship with tribes through a formal agreement like the Centennial Accord.

Right now, we are witnessing leadership, cooperation and commitment on a scale we have not seen in a long time. This is how we will recover salmon.

More information about the State of Our Watersheds and *gʷəd̓ᶻadad* habitat strategy are available at: *geo.nwifc.org/sow* and *nwtreatytribes.org/habitatstrategy*.

Northwest Treaty Tribes
Protecting Natural Resources For Everyone

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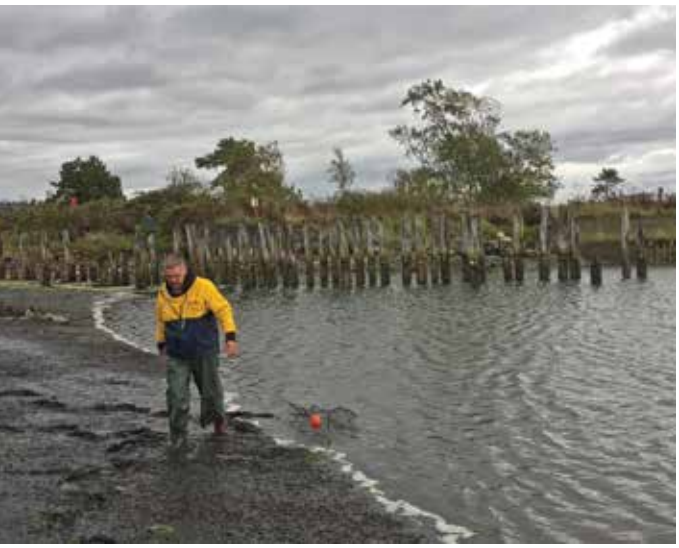
On the cover:
Skokomish tribal members Ian Bowcott and Pat Johns pull in a seine during a brief fishery targeting fall hatchery chum produced by WDFW's Hoodsport and George Adams hatcheries, and the Skokomish Tribe's Enatai Hatchery. Chum returns were so low that later fisheries were closed. See related story, page 4. *D. Preston*



Karl Mueller, Lummi Natural Resources

Megan Hintz, Lummi Natural Resources

Above: Northwest Indian College intern and Lummi fisherman Daniel Washington sets a trap for European green crab on reservation tidelands. Right: A male European green crab was captured on a Lummi beach Oct. 8.

Invasive Green Crab Found on Lummi Beaches

After invasive European green crab were found last fall near Blaine, the Lummi Nation acted quickly to determine whether the non-native species had reached tribal beaches.

Days after 17 European green crab were found in Drayton Harbor by the Washington Department of Fish and Wildlife and the Washington Sea Grant (WSG) Crab Team, Lummi Natural Resources Department staff set 30 traps on reservation tidelands over two nights. They captured 36 European green crab in two locations in Lummi Bay.

The high catch rate on Lummi Reservation tidelands is a concern to natural resources managers.

"European green crab are pernicious burrowers," said Karl Mueller, Lummi shellfish biologist. "There is a very real concern about them colonizing here, because of the potential for habitat destruction and competition with or predation on small native crab species such as juvenile Dungeness."

In addition, European green crab can uproot eelgrass beds in estuaries, degrading important rearing habitat for juvenile salmon.

The Crab Team has coordinated a regionwide early detection effort since 2015. In partnership with the state, several tribes and volunteers, the Crab Team is monitoring more than 50 sites in hopes of preventing invasive European green crab from establishing populations here.

Before now, European green crab had only been found a few at a time in traps in North Puget Sound. However, more than 200 have been trapped on Dungeness Spit in the Strait of Juan de Fuca. The Makah Tribe has trapped more than 1,000 European green crab near its reservation each year for the past two years.

"Managing aquatic invasive species like the European green crab is similar to preventing wildfires," said Emily Grason, marine ecologist and WSG Crab Team program manager. "We keep a sharp lookout and respond quickly to small populations before they get too big to control. When even a single green crab is found, the first step is to quickly do more trapping to figure out the size and geographic extent of a potential population. Then we have more information to determine the best way to manage them."

The Lummi Natural Resources Department sent the trapped European green crab to the Crab Team for genetic analysis in hopes of determining the source population of the invasive species.

"We will continue sampling European green crab on reservation tidelands to improve our understanding of the geographic distribution of the crab and the age or size structure of the population," Mueller said. "In addition, over the winter months, Lummi Natural Resources will formalize a response plan, which may include partnering with regional experts like the WSG Crab Team, implementing a widespread trapping program, assessing possible impacts to local species and habitats, recruiting volunteers, and availing outreach and education materials to the Lummi community."

Members of the public are encouraged to keep an eye out for European green crab, but should not attempt to remove or kill them. Despite the name, European green crab can be other colors. Likewise, native shore crabs can have similar markings or colors as the invasive species.

Invasive European green crab are most easily identified by five distinct spines on the shell beside the eyes. They can grow up to about three inches across – bigger than most native shore crabs, but not as big as Dungeness crabs. – *K. Neumeyer*

If you think you've found a green crab, record the date and time of the finding and take a photo.

On the Lummi Reservation, send the photo to Karl Mueller (*KarlM@lummi-nsn.gov*) or Nick Jefferson (*NicholasJ@lummi-nsn.gov*).

Off reservation, send the photo to the WSG Crab Team at *crabteam@uw.edu*.

For more information:
wsg.washington.edu/crabteam

What Happened to All the Chum?

South Sound Fisheries Canceled

Chum salmon returns this year have been dismal in much of Puget Sound.

"This season may be going down as the worst harvest of chum on record for Squaxin," said Joe Peters, Squaxin Island tribal natural resources policy representative.

Chum sport and tribal fishing were shut down in South Sound after test fisheries found far fewer fish than forecast.

The state and tribal co-managers conduct an annual chum test fishery at Apple Cove Point near Kingston. It's a real-time check of the size of the run, used to adjust harvest quotas for chum throughout South Puget Sound.

The preliminary forecast for chum was 555,000, but the test fishery results were so poor, the forecast was revised to 243,000.

"These returns are the worst in 20 years, and we don't have a real culprit identified," said Bill Patton, Northwest Indian Fisheries Commission South Sound biologist. "Returns were supposed to be decent."

The Squaxin Island Tribe's surveys showed that Totten Inlet, where Kennedy Creek is a major chum stream, will make escapement – the number of fish needed to sustain the run – but Eld Inlet is still between 40 to 60 percent of what it needs.

"It's been beyond depressing," said Mike Huff, Suquamish Tribe's hatchery manager.

The tribe's Grovers Creek Hatchery had a total of 720 chum adults return, with an egg take of 419,000.

"Normally we have about 2,000 chum salmon to spawn and get 2.5 million eggs into our hatchery, but this is the lowest we've ever had," he said.

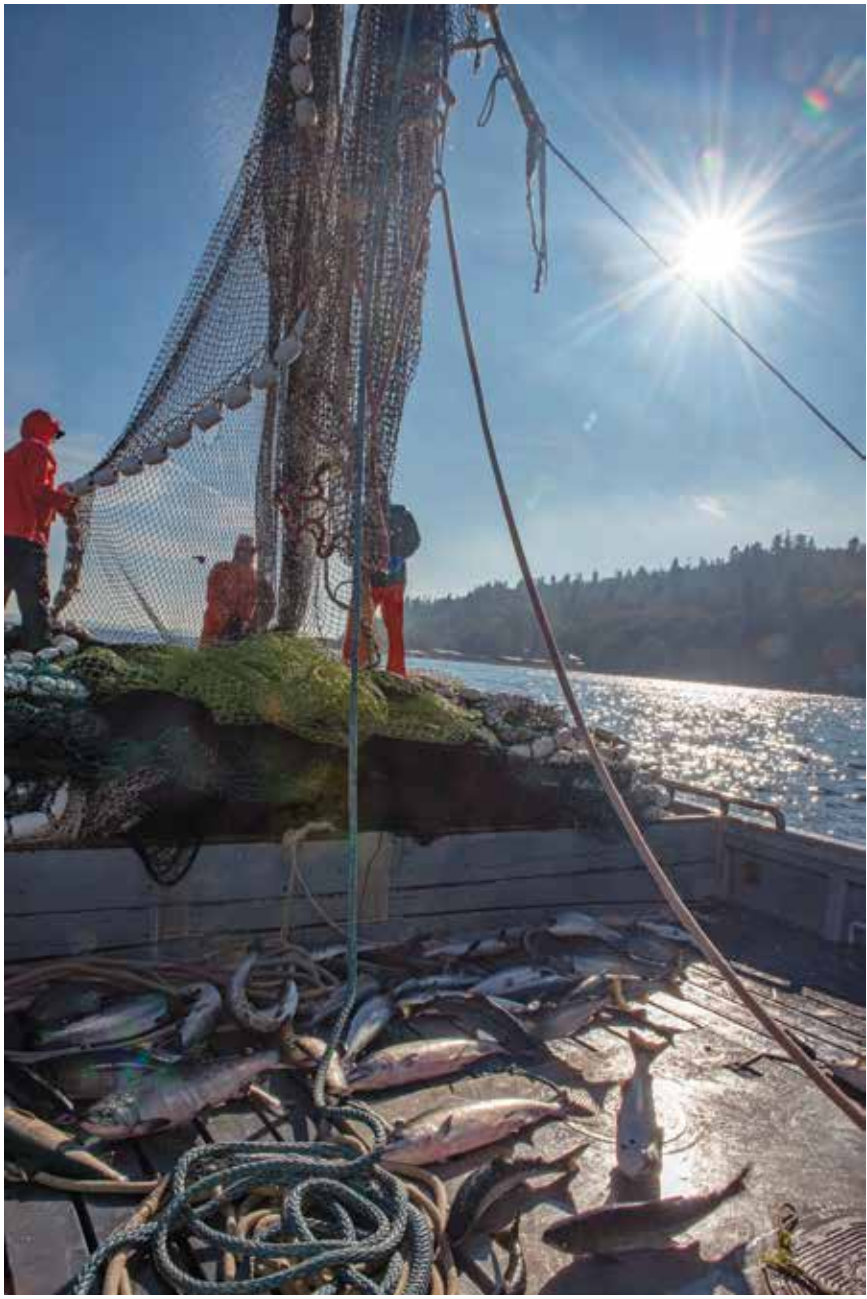
Hood Canal's preseason forecast was reduced by 23 percent over the commercial fishing season, said Abigail Welch, Port Gamble S'Klallam Tribe's fisheries biologist.

Welch suspects the 2015 warm ocean conditions are in part to blame. The tribe released nearly 1.3 million fry in 2015 – the largest number in seven years – hoping for a fruitful return in 2019, she said. Only 500 chum returned to the tribe's Point Julia Hatchery in Port Gamble Bay. On average, more than 4,000 fish return to the bay.

The tribe's fishermen had minimal fishing effort due to the low returns. In October, 344 chum were harvested. Nobody fished the bay in November.

In South Hood Canal, only 246 fish returned to the Skokomish Tribe's Enatai Hatchery, with 637,000 eggs taken for spawning, said Robert Blankenship, the tribe's hatchery manager. The tribe normally spawns 2,500 fish for 3.5 million eggs, based on average fecundity of 2,800 eggs per female.

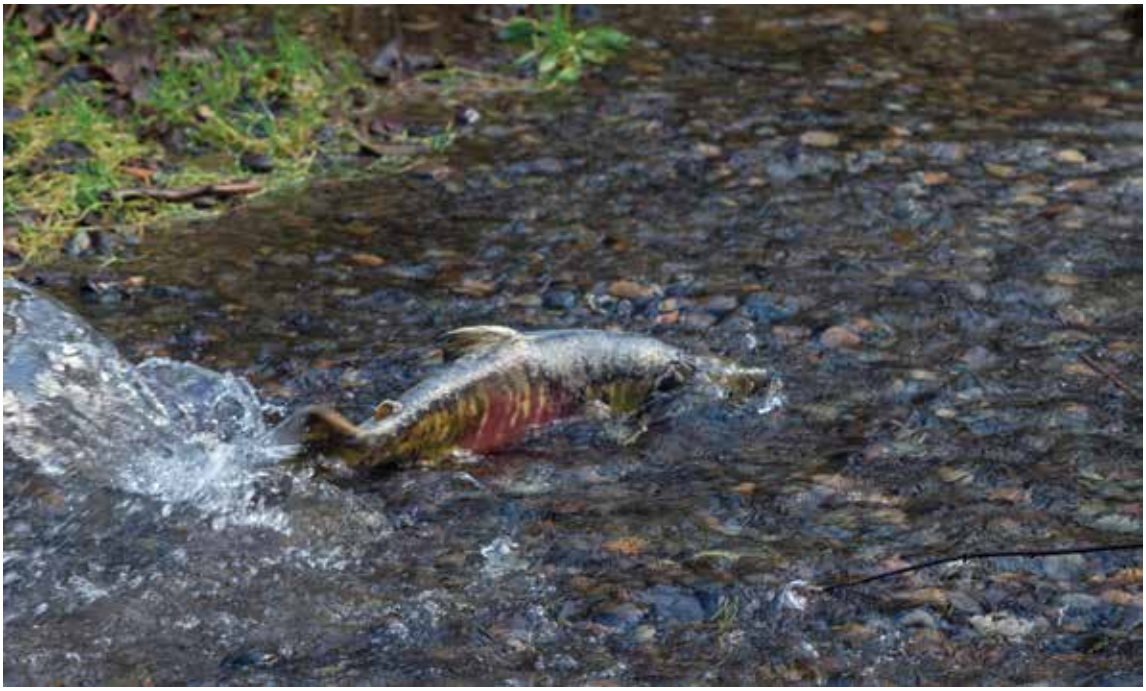
Tulalip Tribes' salmon enhancement biologist Mike Crewson says that climate change is having an impact on fish in both marine and fresh water. Tulalip's Bernie "Kai Kai" Gobin hatchery had its lowest egg take ever.



D. Preston

Tribal and state biologists sample and count chum during a test fishery at Apple Cove Point near Kingston to monitor returns and adjust harvest quotas for South Puget Sound.

"This year's hatchery chum run and egg take is about 90 percent below average and 95 percent below what we've seen in a good year," he said. "The run is close to 80 percent males, which further limits the number of eggs we can produce." – *D. Preston, T. Royal and K. Neumeyer*



D. Preston

A male chum skitters down McLane Creek, part of the Squaxin Island Tribe's traditional territory, where returns were unusually low. Tribal natural resources staff survey redds (egg nests) each year to help forecast upcoming returns.

Skagit River Chum Haven't Been Fished for a Decade

Skagit River fisheries managers have been alarmed by small chum returns for a decade.

"We've been scratching our heads about why the chum aren't coming back," said Scott Schuyler, Upper Skagit Tribe's natural resources director. "When we tried to broodstock for our hatchery program during the week that should have been the peak return, we caught two fish. In the nineties, we had a quarter of a million fish return."

Chum used to be one of the staples for the Upper Skagit Tribe, Schuyler added.

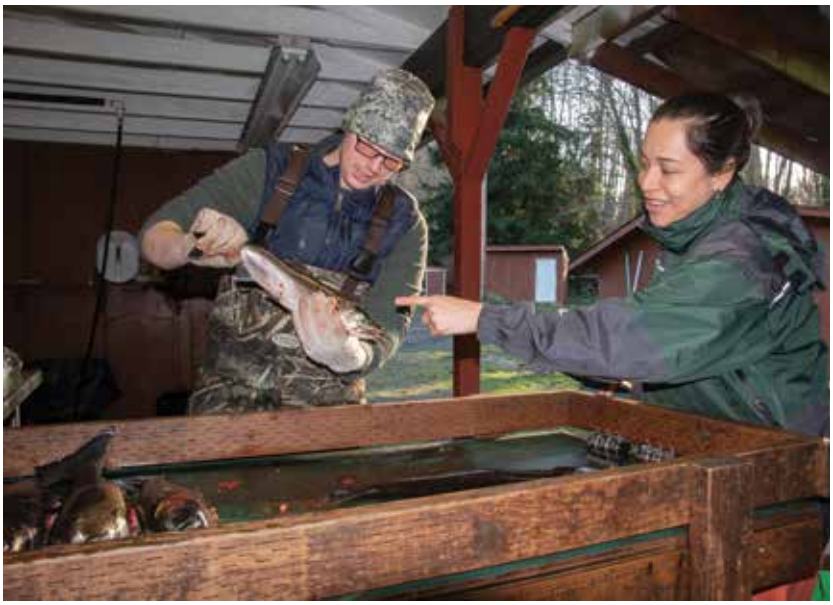
"It's how we survived through the winter. We haven't had a chum fishery since 2007 and that was a bust."

The Sauk-Suiattle Tribe has been developing a hatchery chum supplementation program on the Sauk River, a tributary to the Skagit, for the past few years. In 2017, the tribe's natural resources department released 20,000 fry, which should return as adults in fall 2020.

While the goal is to collect 50 male and 50 female adults to spawn, Sauk-Suiattle hatchery staff collected 14 of each, providing 34,000 eggs. The eggs will be incubated to eyed stage at the Marblemount Hatchery on the Skagit River and then raised in remote site incubators on a tributary to the Sauk.

"In 2008, returns in the Skagit dropped to the worst level historically," said Grant Kirby, Sauk-Suiattle fisheries biologist. "The Sauk population is the smallest of the sub-populations in the Skagit River system." – *K. Neumeyer*

Coho Numbers Also Low, with Smaller Fish



T. Royal

Scott Hammersberg, Suquamish Tribe hatchery culturist, examines a small coho with tribal hatchery technician Bryna Lawrence at the tribe's Grovers Creek Hatchery.

Coho returns have not been faring much better than chum. Fish are returning smaller and in fewer numbers. The smaller coho also tend to have lower fecundity, which leaves hatchery managers unable to meet their egg take goals.

T. Royal

Suquamish Tribe shellfish technician Rick Alexander harvests a sample of cockles at Kiana Beach.

Native Cockles Decline on Reservation Beaches

Suquamish tribal elders have noticed a diminishing native cockle population on reservation beaches the past 20 years, prompting scientists to take a closer look at potential causes.

The tribe is partnering with the Puget Sound Restoration Fund (PSRF) and National Oceanic and Atmospheric Administration to estimate Puget Sound's cockle population, study its genetics in different watersheds and explore impacts from climate change.

The study stems from recent hatchery work done by the tribe and PSRF to better understand the life cycle of cockles, including how they spawn.

While not as economically profitable as manila and littleneck clams, the native species of cockle is a culturally important shellfish to Coast Salish tribes, both in diet and ceremony.

However, the Suquamish Tribe recently closed its cockle harvest because of their scarcity on reservation beaches.

"Our survey focus has largely been on the commercial bivalve species such as manila clams and subtidal geoduck to ensure continuous, sustainable harvests," said Viviane Barry, the tribe's shellfish program manager. "Our program has grown over the last decade and we are now capable of studying species that are important culturally but less so commercially."

Populations are being surveyed at Doe-Keg-Wats, Kiana Beach, George Lane, Indianola, Port Madison and Liberty Bay. Samples will be taken for genetic and disease testing from a dozen locations around Puget Sound, plus Canada, Oregon and Alaska.

The partners want to test the population's genes to determine whether Puget Sound cockles are similar to those on Suquamish beaches. This will inform management strategies, including potentially seeding beaches, said Elizabeth Unsell, a Suquamish Tribe shellfish biologist.

– T. Royal

Burrowing Mud Shrimp Degrade Shellfish Beds

The Skokomish Tribe's shellfish department is trying to improve beach habitat for clams by eradicating the burrowing ghost shrimp that are turning the Skokomish tidelands into a muddy stew.

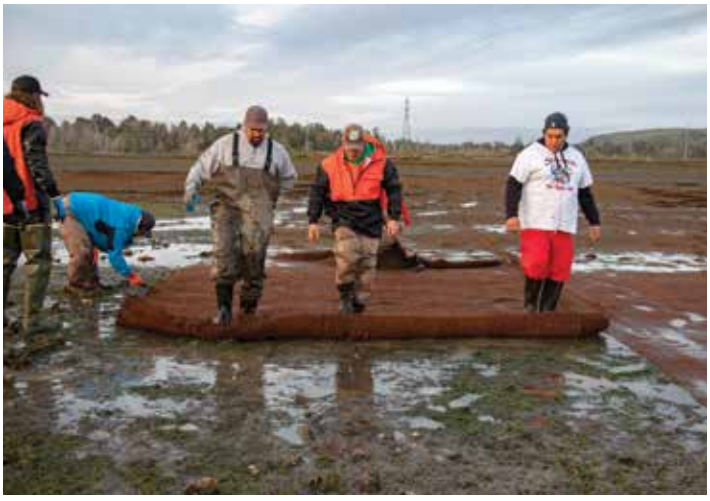
"At one time, the beaches were filled with littlenecks and manila clams, per common knowledge and stories from tribal members," said Blair Paul, the tribe's lead shellfish biologist. "Now they're not. The ghost shrimp have been creating a muddy substrate that clams do not like."

There are two types of burrowing shrimp – mud shrimp and ghost shrimp – that look like tiny lobsters. They burrow in the tidelands an arm's length deep, and suck in water to feed on small animals and algae.

As a result, the tidelands turn into a mucky, pock-marked mudflat, making poor shellfish habitat. Clams need to settle in a harder substrate such as gravel and sand.

Mud and ghost shrimp are native to the area but have become a nuisance over the past few years, Paul said. Their population has increased in part because of a lack of predators in the area, such as sturgeon and gray whales.

Instead of using pesticides, the tribe covered 2.4 acres of the tidelands with large coconut fiber mats to collapse the shrimp's burrows. The mats were topped with a layer of gravel to create a natural substrate for shellfish. Another 3 acres were covered with gravel only. The tribe will sample the areas annually to assess the ecological impacts of the mat and gravel method.



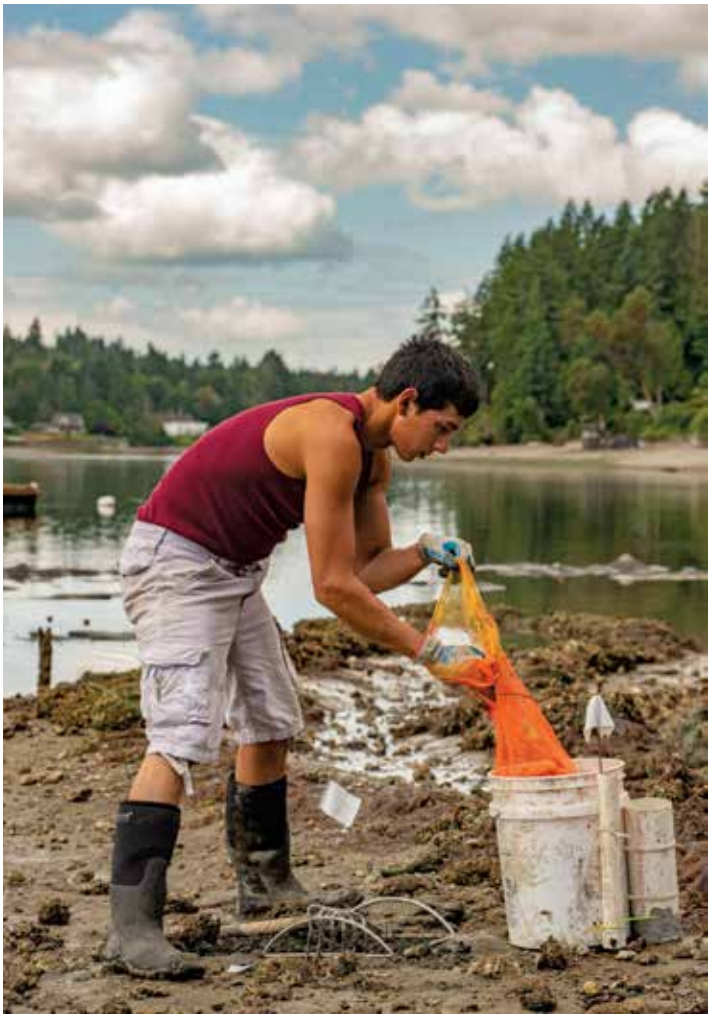
T. Royal

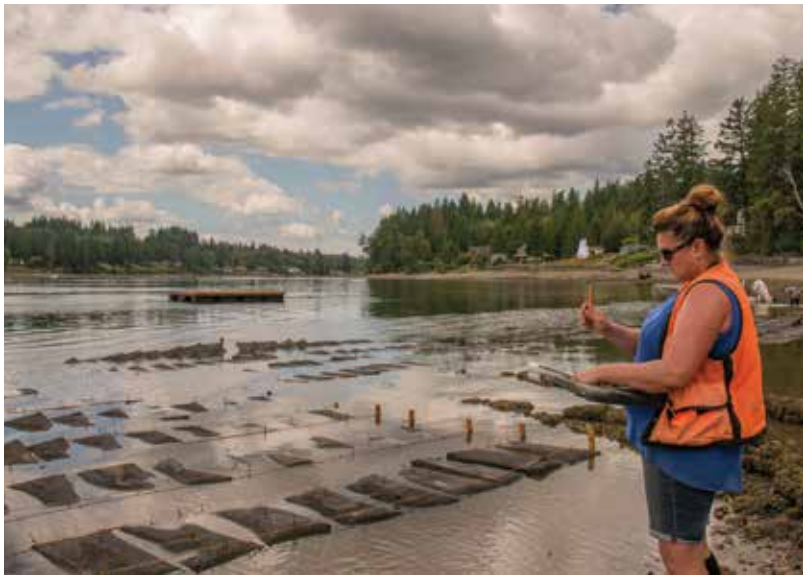
Skokomish shellfish staff roll out coconut fiber mats on the Skokomish estuary where mud and ghost shrimp are creating poor shellfish habitat conditions.

"It's a novel technique for killing the burrowing shrimp, and we're trying to set an example," Paul said.

The tribe should see results of its work in about four years, after the tidelands are seeded next spring and the first crops in the matted and graveled areas are ready for harvest in 2023.

– T. Royal





D. Preston (2)

Above: Rana Brown, Squaxin Island Tribe shellfish biologist lays out a shellfish survey area to estimate the clam population prior to harvest. This beach was reopened after a three-year closure following cooperative research and outreach to the community to assist in improving water quality.

Left: Keenon Vigil-Snook, Squaxin Island tribal natural resources technician, bags shellfish from a survey plot near Church Point, where water quality was improved thanks to the efforts of the tribe, Mason County and the state.

Outreach, Monitoring Lead to Shellfish Harvest

The Squaxin Island Tribe worked cooperatively with neighbors and government partners to improve water quality to open shellfish harvest near Church Point outside Shelton after a three-year closure.

Shellfish are an integral part of both the tribe's cultural identity and economy. Clean water is necessary for harvest, and it can be increasingly difficult to maintain water quality as rural populations expand rapidly.

The Washington State Department of Health (DOH) detected high fecal coliform bacterial counts in shoreline freshwater surveys in 2016. A group effort narrowed down the suspected causes, said Erica Marbet, water resources biologist for the Squaxin Island Tribe.

The tribe, DOH and Mason County Public Health each increased the frequency and number of locations where they sampled water quality in the Church Point neighborhood.

"Mason County did dye tests for septic tanks in the area to search for failing systems, and also to rule out septic systems that were working fine," Marbet said. "Freshwater samples in the neighborhood had sporadic high readings of contamination that didn't have a clear source."

Many things can cause water quality to degrade, such as leaking septic systems, and waste from wild and domestic animals, including Canada geese, livestock and pets.

"When you have an increase in population in a rural area like Mason County, you get a lot of 5-acre lots that tend to push and consolidate wildlife in the remaining open areas that can then consolidate their waste," Marbet said.

Frequently, there also are small, personal farms with a few livestock, so these various waste sources in upland areas wash into streams when it rains.

"Neighbor awareness was another important step," Marbet said.

The tribe held a neighborhood "Shellfish Downstream" gathering at Church Point, Marbet said.

"Taylor Shellfish was there along with Squaxin and Mason County," she said. "We talked about the ways waste ends up downstream. This includes managing waste of 'farm-lets' with a few chickens or goats. Even a concentration of rats getting into animal feed can add to the problem."

There was no need for major repairs on septic systems or enforcement action. Over a period of time, the water quality readings improved and the DOH was satisfied that harvest could again occur on the beach. The first harvest in nearly three years occurred in October.

"We appreciate the response from neighbors and the assistance from our management partners that made harvest possible again," said Andy Whitener, Natural Resources Director for the tribe.

– D. Preston

T. Royal

Traditional Foods Project manager Lisa Barrell and volunteer Brock Walker seed the Jamestown S'Klallam Tribe's new prairie with wildflowers behind the Audubon Dungeness River Center in Sequim.

From Field to Prairieland

The open grassland behind the Audubon Dungeness River Center is helping Lisa Barrell's dream become a reality.

The Jamestown S'Klallam Tribe's Traditional Foods Project manager always has wanted a working prairieland where the tribe could grow and harvest traditional plants and native grasses to be used for cooking, medicine and art.

"I am grateful to be walking the same lands our ancestors walked, planting the seeds and bulbs of plants our ancestors gathered for foods and medicines," Barrell said. "Through our efforts, we are welcoming our traditional foods home for our health and to honor our ancestors. When we harvest our first foods, we will nourish our mind, body and spirit as our ancestors did."

After the tribe purchased about 5 acres of land adjacent to the river center in 2016, it seemed like the right place and time to do it.

Mackenzie Grinnell, tribal member and program assistant, is leading the effort to turn an acre and a half of the parcel from grass to usable soil.

Prairies are a "cultural ecosystem" that the tribes have used since time immemorial, Grinnell said. Harvesting from prairies helps restore the land so it can keep producing while keeping the soil healthy. It also was common for tribes to burn prairies to help new growth of native plants.

The land was tilled and covered with garden plastic to kill the weeds in August. Grinnell and Barrell gathered tribal members, friends and colleagues to seed the area and cover with hay in October. They planted wildflowers such as lupine and goldenrod, as well as camas bulbs, a traditional food.

"It will also be a place to do cultural activities, such as elders teaching others how to dig camas, or have younger tribal members dig camas for them," Grinnell said. "It will be a great place to practice our culture."

It will be a good place for education and outreach with its proximity to the river center building, and next to the highly traveled Olympic Discovery Trail, where cyclists and walkers have been stopping to ask questions, Grinnell said.

Jocylen Elofson, a 10th-grade summer intern, spent her time learning about and planning what traditional vegetation would be planted.

"We want to teach people about the importance of why we need prairies because before everything that happened today – development, farms and trails – this area was filled with prairies that were used by the tribe," she said.

"If we don't have prairies, we don't have medicine or food or cultural resources, as well as less food for native animals."

– T. Royal

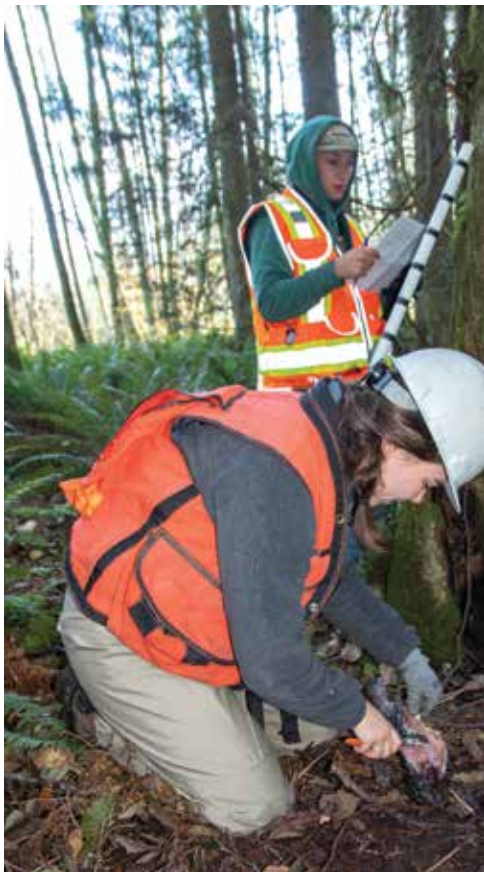
Partners Remove on Privately Own

Tribes in the Skagit watershed are helping restore fish passage on private forestland.

The Upper Skagit Indian Tribe and the Skagit River System Cooperative (the natural resources extension of the Swinomish and Sauk-Suiattle tribes) are collaborating with partners from Skagit County and the Skagit Fisheries Enhancement Group (SFEG) to identify high-priority restoration opportunities and help secure funding for private landowners to get the work done.

Tribes and their partners have been assessing fish-passage barriers in the Skagit River basin for the past three years. Updated information has been collected on many barriers, including eight undersized structures that prevented fish from accessing more than 4.2 miles of habitat on Carpenter Creek and its tributary English Creek, said Sue Madsen, SFEG restoration ecologist.

When those blockages are on private property, SFEG works through a state program called the Family Forest Fish Passage Program that connects the own-



e Fish Barriers hed Forestland

ers with engineers and funding to correct the problem.

In September, the program helped replace an undersized culvert with a bridge over Carpenter Creek, and another culvert replacement is planned for 2020 on a downstream property. Additional neighbors have expressed interest in working with SFEG to improve fish passage, Madsen said.

"When this project is completed, fish will be able to access the entire length of Carpenter and English creeks," she said.

Tributaries in the lower Skagit watershed provide spawning and rearing habitat for coho salmon, and Endangered Species Act-listed steelhead trout.

"Each project in isolation provides maximum benefit only as far upstream as the next fish barrier, but we have been able to use the information collected from our partnership to facilitate successive projects along Carpenter Creek that, when combined, provide a much greater habitat benefit," said Rick Hartson, Upper Skagit Tribe habitat biologist.

Fish can sometimes be seen using the restored habitat within weeks of a project's completion, Madsen said. SFEG coordinates spawning surveys with a team of volunteers, counting salmon and their redds in past, present and potential project sites in the Skagit watershed.

The Family Forest Fish Passage Program is a partnership among the state Department of Natural Resources' Small Forest Landowner Office, Department of Fish and Wildlife, and the Recreation and Conservation Office.

– K. Neumeyer

K. Neumeyer

SFEG habitat restoration coordinator Erin Matthews samples a coho carcass found near restored habitat on English Creek, while intern Rob Clark records the data.

Chopper Brings Logs, Boulders

The Lower Elwha Klallam Tribe used nearly 2 million pounds of logs and rocks to improve salmon and lamprey habitat in two important salmon streams on the North Olympic Peninsula.

Using a heavy-lift tandem-rotor helicopter, logs and rocks were airlifted and set into place last fall in Little River, a tributary to the Elwha River, and Deep Creek, an independent tributary to the Strait of Juan de Fuca, west of Port Angeles.

Since the Elwha River dams were removed in 2013, Puget Sound chinook, steelhead, coho and pink salmon, and bull trout have been using Little River for spawning. It was one of the first tributaries that salmon recolonized after swimming past the old Elwha Dam site.

"While fish have been using Little River to spawn, the habitat has been degraded because of the historic logging practices in the area," said Mike McHenry, the tribe's habitat program manager. "Historic logging practices resulted in the loss of large riparian trees and in-channel wood, leading to the loss of pools and gravel, which salmon need for resting, feeding and spawning."

Without the wood, the fast-flowing water scours fine gravel needed for spawning, leaving behind larger rocks, and in some cases, bedrock.

To improve the habitat, the tribe placed 1.25 million pounds of logs and boulders at 78 locations within a 1.5 mile section of Little River.

It's part of a two-year effort to fix the river system; next year, the tribe will work downstream on private properties. This year's work required a helicopter because of a narrow canyon.

"It's a much more environmentally responsible way to move material as needed in those steep canyons and harder-to-reach areas," McHenry said.

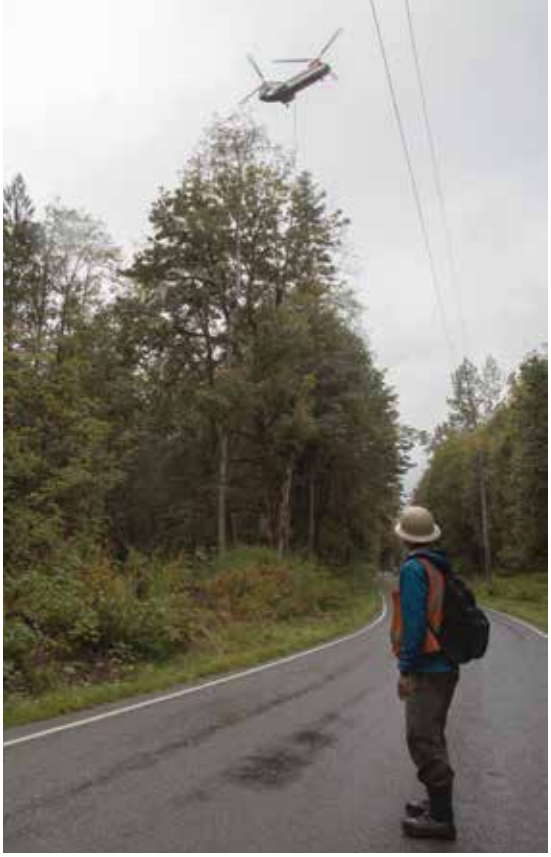
On Deep Creek, the tribe installed 589,000 pounds of logs in 15 sites along more than 1 mile of the creek. The logjams are designed to improve winter and summer habitat for coho, steelhead and chum salmon and cutthroat trout.

This effort is the tail end of 20 years of restoration work in this creek as part of the Strait of Juan de Fuca Intensively Monitored Watershed Project, an effort to evaluate the effects of watershed restoration on habitat and salmon populations.

Deep Creek's poor habitat also stems from historic logging practices. At one time it was a productive creek for salmon and a cultural site that included a small village.

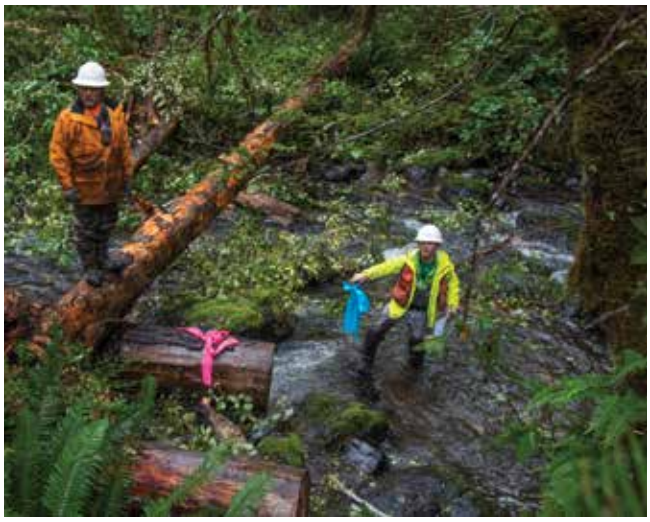
"Anywhere you have had industrial logging, you can predict the same impacts, which last centuries," McHenry said.

– T. Royal



Mike McHenry, the Lower Elwha Klallam Tribe's habitat program manager, watches a helicopter deliver logs and rocks to Little River.

A ground crew from Columbia Helicopter discusses where to place logs and rocks in Little River.



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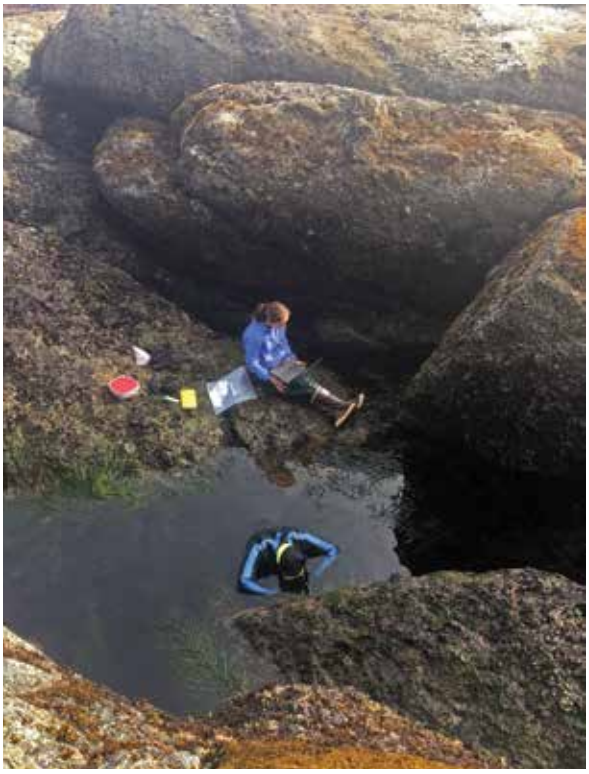
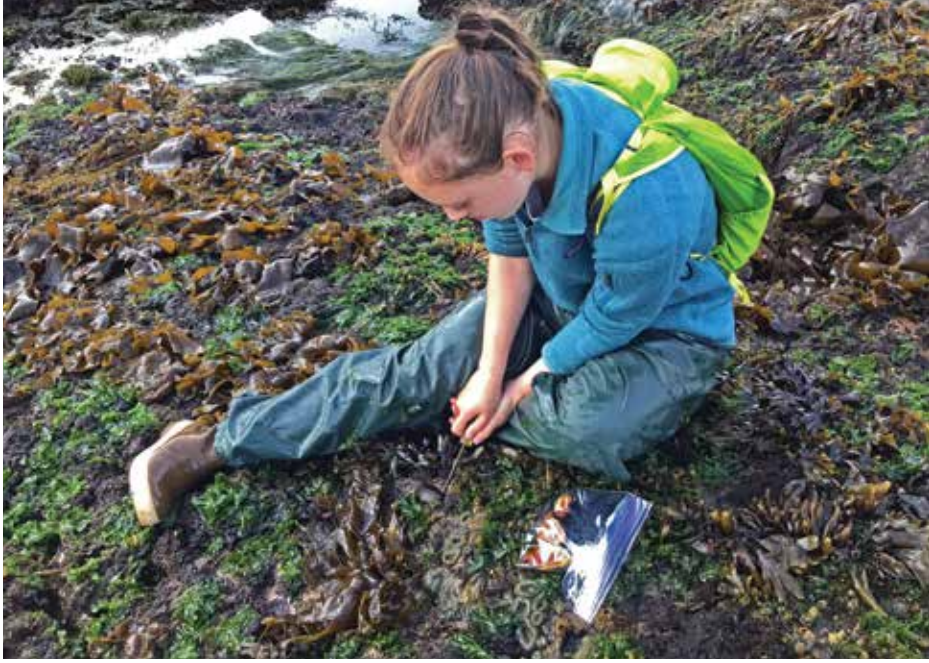




Courtesy of Makah Tribe (3)

Left: Intern Angelina Woods helps University of Chicago student Khashiff Miranda record data on nitrogen-fixing bacteria in surf grass sediments on Tatoosh Island. Above: Woods harvests chitons on Tatoosh Island. Below: Intern Laney Keyes, right, helps University of Chicago student Brooke Weigel set up an experiment on the impact of heat stress on photosynthetic rates of kelp.

Interns Gain Real-World Science Experience

The Makah Tribe has been providing tribal youth with opportunities to work with real-world data, in hopes it will spark an interest in a career in environmental science and natural resources management with the tribe.

Through the tribe's summer internship program, four high school and college-aged students got a six-week crash course on what it's like to work in the tribe's fisheries, forestry, wildlife and environmental science departments.

"We want to excite youth about working in one of these departments, so they will pursue a degree and then return to Neah Bay as the future scientists, managers, and environmental leaders for the tribe," said Liz Allyn, a Makah marine mammal technician and program coordinator.

The interns shadow staff members and work alongside scientists from outside organizations and research groups, including the Northwest Indian Fisheries Commission, University of Washington, University of Chicago, Olympic Coast National Marine Sanctuary and others.

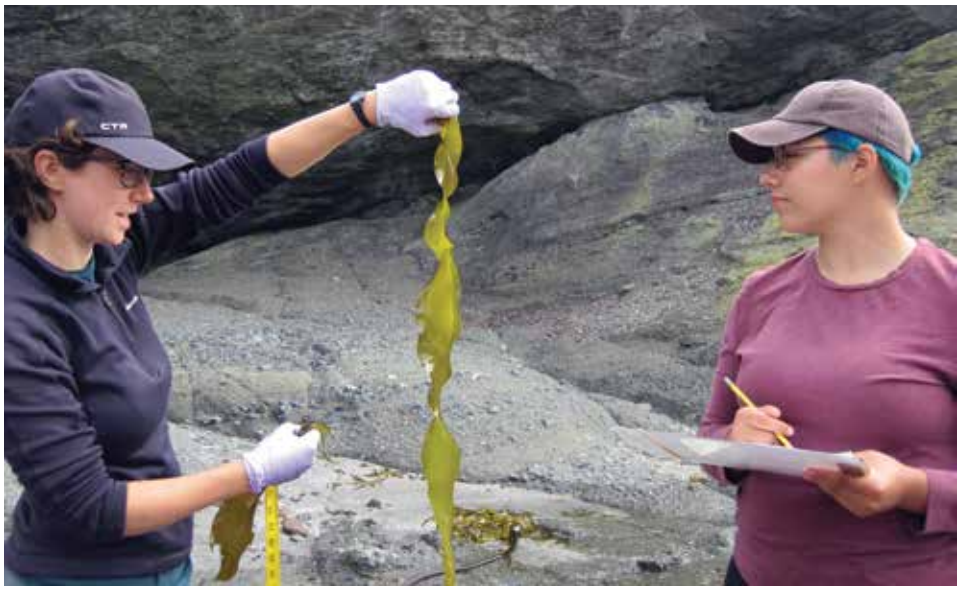
They also conduct their own independent research projects from start to finish, from which they develop a scientific poster that is presented to the community at the end of the program.

Work conducted by interns has included developing a monitoring plan and population estimates for culturally important olive snails; studying the effects of eelgrass on species diversity; analyzing sea otter foraging habits; determining the best types of bait to use with a traditional halibut hook (*čibu·d*); looking at how harbor porpoise abundance and distribution have changed in the Makah usual and accustomed area; and studying Western spotted skunk habitat characteristics.

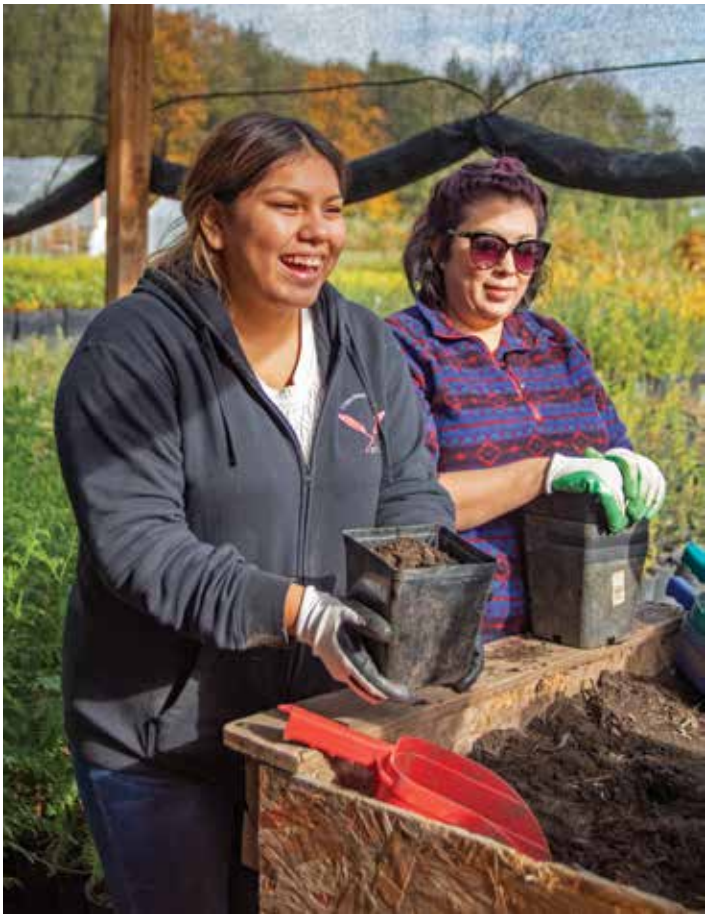
Jon Scordino, the tribe's marine mammal biologist, has developed the program to make sure it provides a quality experience for students while also building the tribe's research capacity with applicable data.

"They're job shadowing with excellent researchers from the outside while getting an amazing and immersed experience, and working with real data," Scordino said.

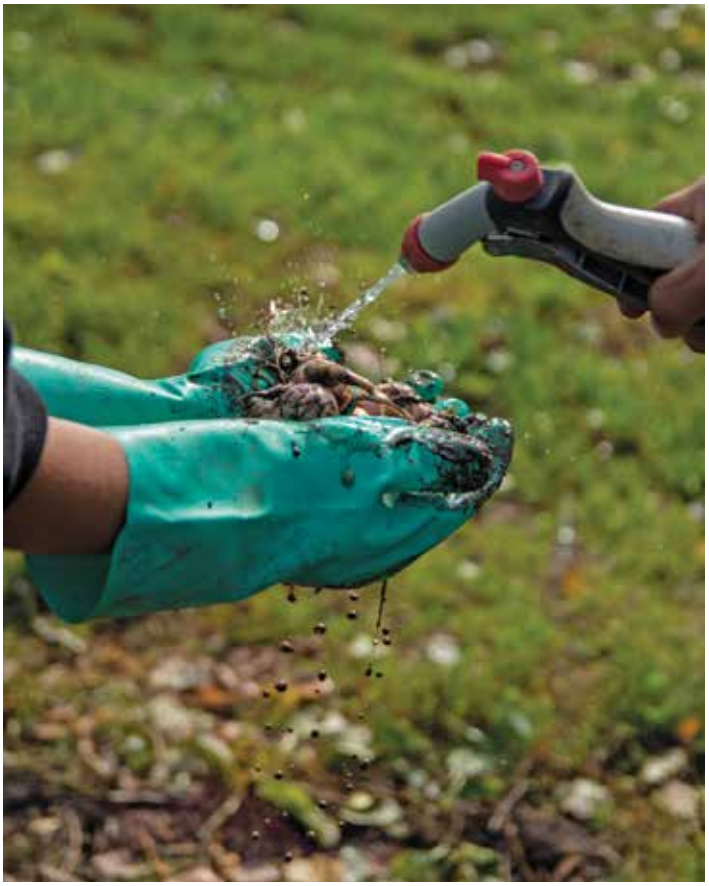
A blog about the research conducted by the program's interns can be found at *mfminterns.home.blog.* Funding for the program comes from Bonneville Power Administration and the National Science Foundation. – *T. Royal*



Between the Two Worlds of Natural Resources



K. Neumeyer (2)



The Swinomish Tribe is educating the next generation of natural resources managers through an indigenous science program called Between Two Worlds.

"This program was specially designed to help students learn about contemporary technologies from both western and indigenous paradigms," said Jennifer Willup of the Swinomish Department of Environmental Protection's (DEP) education program. "The goal is to provide the tools and resources for tribal youth to be able to successfully walk in both worlds."

The year-long program aims to teach Swinomish high school students hands-on skills while reinforcing their cultural connection to natural resources. Along the way, they will learn more about possible careers in science.

"Students will go on to succeed as informed young scientists who understand the importance of resources management, scientific methods and the world around them," Willup said.

The group of about 10 students meets every other week through June. Each lesson focuses on a different aspect of natural resources management, such as salmon recovery, traditional foods, air and water quality, shellfish and habitat restoration.

"Swinomish DEP hopes that Between Two Worlds students will be inspired by what they learn in this program, be ambassadors for tribal environmental issues, and continue their education in science," said Todd Mitchell, DEP director. "Ultimately we hope many come back to work for us as scientists for the tribe."

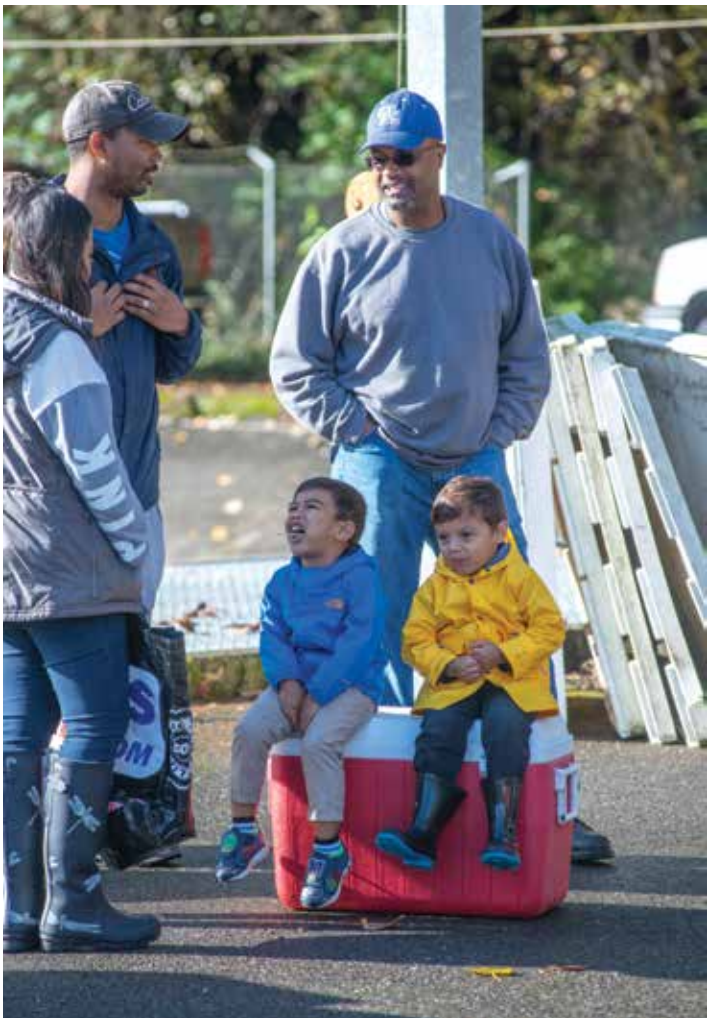
Students will have opportunities to practice Swinomish culture by learning the Lushootseed language, traditional values, oral traditions and why it is important to take care of their home.

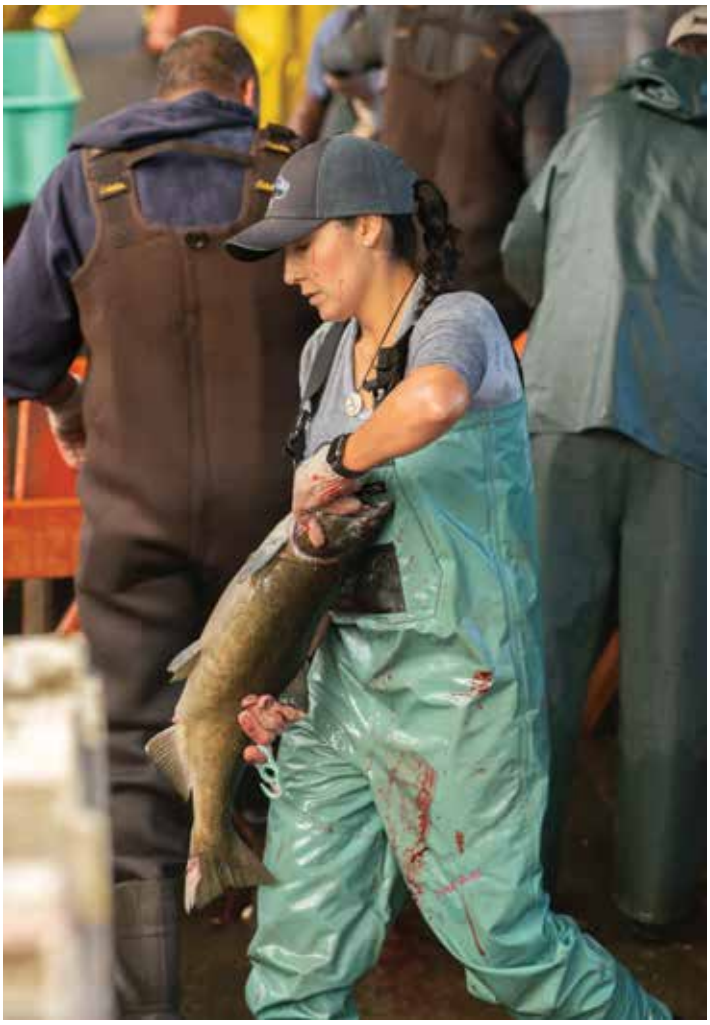
"Tribal sovereignty, traditional foods, cultural values, heritage, and identity will be discussed with students as they engage in technical processes," Willup said. "Threaded throughout the units are connections to salmon, both as cultural keystone species and an important part of the ecosystem."

The program kicked off in the fall with a three-day lesson for the entire ninth-grade class at La Conner High School. About 50 students learned about the connection between water quality and healthy salmon populations. During a field trip to Lone Tree Beach, they sampled water and looked at sea creatures under microscopes. – *K. Neumeyer*

> "Swinomish (Department of Environmental Protection) hopes that Between Two Worlds students will be inspired by what they learn in this program, be ambassadors for tribal environmental issues and continue their education in science."
>
> *Todd Mitchell*
> Swinomish Indian Tribal Community
> Director, Department of Environmental Protection

Top: Student Leila Crume-Lora, left, and Jennifer Willup of the Swinomish Department of Environmental Protection's education program, transplant camas bulbs at the Skagit River System Cooperative's Pulver Road nursery. Left: A handful of wapato bulbs are rinsed off after the students harvested the traditional food at the nursery.





D. Preston (2)

Fish Giveaway

Left: A family waits patiently for the Nisqually Tribe's chinook salmon giveaway at the tribe's Clear Creek Hatchery on Joint Base Lewis-McChord. Right: Amber Left-Hand-Bull, a fisheries technician with U.S. Fish and Wildlife, helps with spawning at the hatchery. Many volunteers assist with the operation, including high school students who learn how the hatchery provides for the community. Area schools also receive fish to use for dissection.

Generations

Chief Leschi and his brother Quiemuth are re-buried in a Puyallup tribal cemetery after their original burial sites were condemned.

The city of Tacoma took nearly two-thirds (3,300 acres) of the lands given to Nisqually at the time of the Medicine Creek Treaty, to create what is now Joint Base Lewis-McChord. When the land was condemned, many Nisqually people were kicked out of their homes with no place to go.

Pictured, from left: Bill Quiemuth, Luke Boyalkh, George Leschi, Yelm Jim and Old Steilacoom or Washington.

Courtesy of the Nisqually Tribe

'Instant Hatchery' in a Shipping Container

An "instant hatchery" will increase the Skokomish Tribe's chum salmon egg production at its Enatai Creek Hatchery at minimal cost.

The small capacity of the tribe's 50-year-old hatchery has prevented the tribe from taking more than 3.5 million chum salmon eggs annually, said Robert Blankenship, the tribe's hatchery manager.

The tribe received funding to produce 5 million chum smolts for Washington's Orca Task Force program from the Bureau of Indian Affairs and the federal Hatchery Reform Project. Blankenship reached out to Redd Zone, an Astoria-based company run by two former hatchery and fisheries managers in Oregon and Alaska, to see about expanding the tribe's production capacity.

Redd Zone developed a hatchery system that operates inside a shipping container and is a fraction of the cost of constructing a brick-and-mortar building.

The 40-foot-long steel container is outfitted with 36 incubator boxes, each with a substrate and screen system that mimics the gravel egg nests in the river, while limiting the amount of light exposure to the eggs.

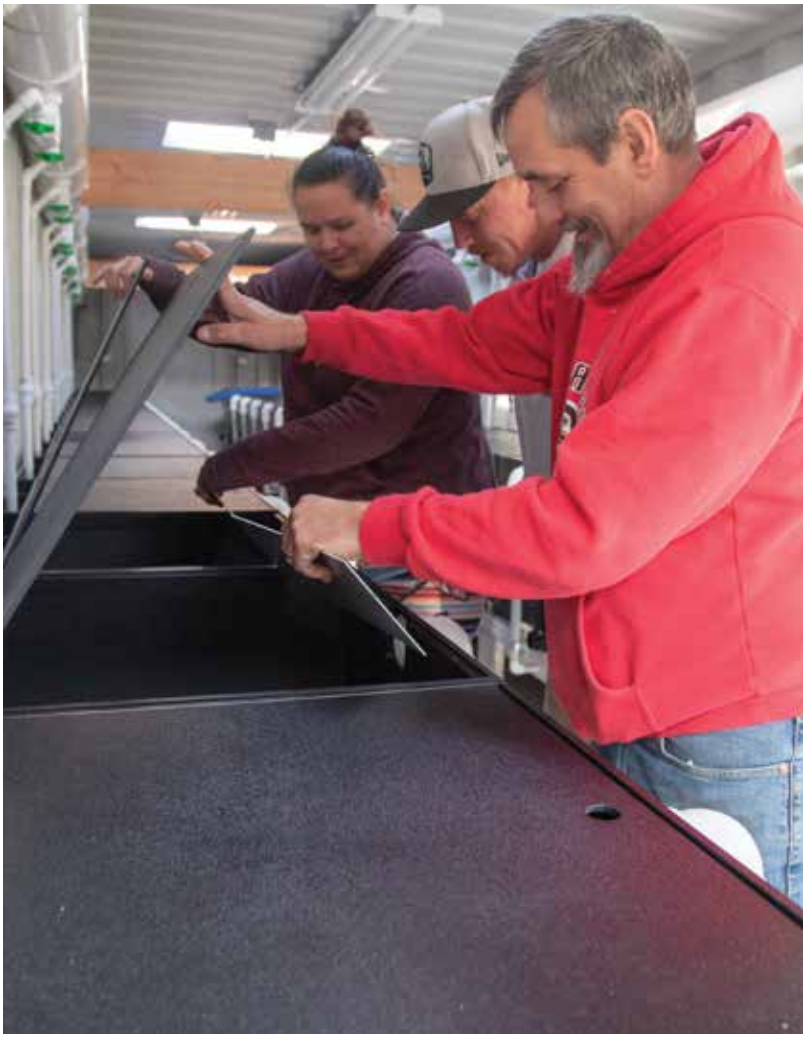
"It can up our production from 3.5 million fish to 5 million, plus we'll have extra incubators to help start a coho program if we want to, or produce more chum," said Dickie Adams, a Skokomish tribal hatchery technician.

The container is plumbed with water intake and outflow plumbing systems that will minimize handling of the fish when they are transferred from the boxes to the rearing ponds. Each incubator box has its own water supply and flow valve controller.

"It's pretty much self-contained, so if something happens, the whole hatchery isn't affected," Adams said. "Also, it's a lot easier to clean than our concrete raceways, and we can send the fish out to the circular tanks with less handling."

The tribe received the trailer this fall and will use it during the 2020 fall chum salmon spawning session.

"It's basically plug-and-play," Adams said. "The design is awesome. It's not going to just benefit the tribe, it's going to benefit everyone who comes in contact with those fish. It's a win-win for everybody." – *T. Royal*



T. Royal (2)

Above: Skokomish Tribe hatchery technician Jenna Adams, contract worker Daniel Meehan and hatchery technician Dickie Adams inspect an incubator box inside the new hatchery structure. Below: The 40-foot-long "instant" hatchery was delivered to the tribe in November.

Community Event Celebrates Forest

More than 1,200 Muckleshoot tribal and community members gathered in the rural foothills of Mount Rainier at the tribe's Tomanamus Forest property for a community celebration last fall.

The tribe celebrates Tomanamus Community Day annually at Medicine Eagle Flats within the forest.

Salmon, elk, deer and medicinal teas are prepared and served. There are outdoor activities, traditional games, information about programs associated with the forest property, and other tribal programs promoting wellness, education, outdoor activities and careers.

"The tribe restored this nearly 100,000 acres of traditional territory to tribal members by purchasing it in 2013," said Cinnamon Bear, a key organizer of the event. "It's a good way to familiarize the community with this property, how it's managed, how the youth are involved in coming here to learn culture and job opportunities, and how tribal members can access it and use it."

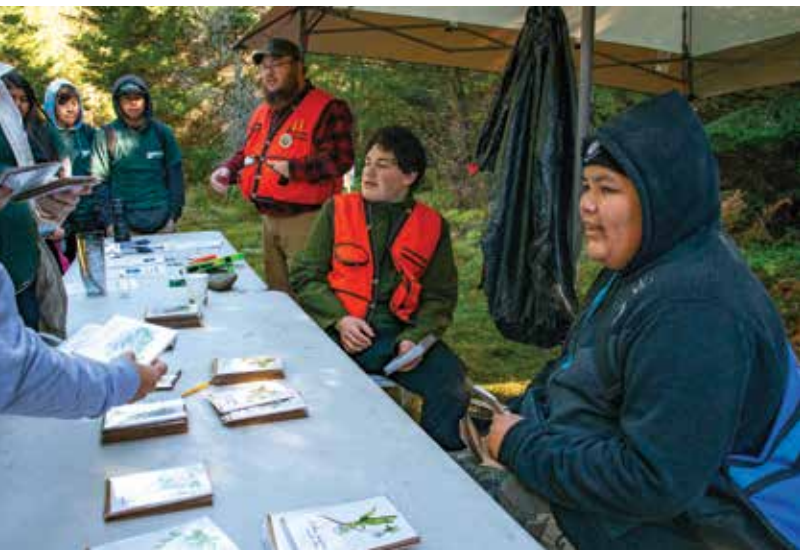
D. Preston (2)

Top: Eric Anderson, Muckleshoot wildlife enforcement officer, talks to tribal members about wildlife management activities. Below: Muckleshoot Tribal School students Cameron Williams and Brandon Moran hand out cards identifying indigenous plants on the tribe's property.

Attendees were welcomed by a carved sign designed by Muckleshoot tribal artist and carver Keith Stevenson. The sign was erected by a Muckleshoot youth forestry crew as part of the summer work program, which included cutting and stripping the cedar poles used to mount the sign.

Hancock Forest Management (HFM), which carries out the tribe's management plans on the land, had a booth detailing job openings and forestry practices on the property. Such practices include harvesting cedar bark for baskets, hats, clothing and other uses before a section is logged. HFM works with Muckleshoot Wildlife and Fisheries and other departments when planning these units.

Also at the event was SSC Contractors, who are contracted by Muckleshoot to teach forestry skills to adult and teen tribal members.



"I've seen lives changed from folks being outside, learning skills and feeling good about themselves," said Bob Sokol, general manager for SSC Contractors.

The Muckleshoot Tribal School's Forestry Club booth gave out cards to Muckleshoot community members showing important cultural plants found on the property.

Science instructor and forestry club adviser Benjamin Price teaches a "Tend, Gather, Grow" curriculum developed by a coalition of tribal educators led by Elise Krohn of the nonprofit Garden Raised Bounty (GRuB). This community-driven curriculum is designed to connect youth with plants, place and culture. Price brings the students to the property as often as possible.

Students engage in projects such as calculating how much the forest aids in combating climate change by removing carbon from the atmosphere.

"It's applied science and math and the more they come out here, the more engaged they become," Price said.

Cooks prepared mounds of crab, salmon and shellfish on the fire and many hands, including youth, cooked duck bone broth and elderberry syrup, and made teas of Douglas fir tips, dandelion leaves and rose hips.

"We see a future of culturally empowered Muckleshoot natural resource managers," said Louie Ungaro, Muckleshoot tribal councilman and lead organizer for the gathering. "The work we are doing here is all about preparing the land for those advocates and preparing the advocates to be better stewards of the land than we are today.

"We are always thinking of our future and how it can be even better for not just the next generation of humans, but for all living things that dwell on these lands." – *D. Preston*

Walking On

Stanley Gale Jones Sr.
Chief *Scho-Hallem*

Stanley Gale Jones Sr., *Scho-Hallem,* died Nov. 5 on the Tulalip Reservation. He was 93.

Jones was born July 10, 1926 in Monroe to George Culver Jones and Juanita Jones (Giddings).

He enlisted in the U.S. Marine Corps when he was 17 and served two years in Platoon 770, where he saw action along the front lines of World War II.

After being honorably discharged from the military in August 1946, he met JoAnn Barrie. They eloped in 1950 and were married for 69 years.

They have five children: Jeanne McClain, Stanley "Sonny" Jones Jr., Gayle Jones, Teri (Billy) Gobin and Randy Jones.

His family tree grew to include 14 grandchildren, 27 great-grandchildren and many more great-great-grandchildren.

Jones served as the longest running Tulalip Tribes board member in history, joining in 1966 and serving 44 consecutive years. For 26 of those years, he served as chairman.

Some of his accomplishments include working on the Boldt decision, serving as the first chairman of a national task force on Indian gaming, and negotiating the first tribal-state casino compact. He retired from the Tulalip Tribes Board of Directors in 2010.

Jones' family said in his final moments he was still concerned with the well-being of the tribe and was at peace knowing his Tulalip people are "staying the course."

Jones is preceded in death by his parents George and Juanita Jones; son Stan "Sonny" Jones Jr.; siblings Jack Jones, Gloria St. Germaine, George Jones Jr., LaVerne Jones, Caroline "Uppy" Thornberry, Alpheus "Gunny" Jones, Lynn "Stomper" Jones, William Jones and Chuckie Jones.

In addition to his wife and other children, he is survived by his siblings Virginia Carpenter, Dawn Simpson, Joy Lacy, Dale (Barb) Jones, Marvin Jones, Richard (Toby) Jones and Delmer Jones; grandchildren Mike, Shawn, Kenny, Laurie, Michelle, Stanley "Skipper" (Krystle), McKenna, Auri, Kingston, Tyee, Teresa (Jeff), Mika, Jordan, Tashena, Faith, Bow, Ryan, Mario, Nina, Teonie, Colten, Leora, Lyndsey, Kayla and Nate; four dedicated caregivers Dee, Maria, granddaughter Tashena and niece Rossane; and his always faithful canine companion, Champ. He also leaves behind numerous extended family members and a tribal community that he loved.

Russell Woodruff

Russell James Woodruff Sr. died Oct. 28 at the Forks Community Hospital.

He was born in La Push to Frederick Richard Woodruff Sr., and Sarah Ida Ward, on June 24, 1941, and attended schools in Forks. He married Stephanie in 1959.

Woodruff worked as a logger and for La Push Public Works. He also was part of the Quileute tribal leadership, serving as tribal chairman and working for the tribal government.

He was an extraordinarily big-hearted man. He always looked for and found the good in people and people were drawn to his kindness. He had many friends he considered family.

Woodruff loved to fish, cut firewood, sit by a campfire and visit, and try his luck at casinos with Stephanie. Most of all, he loved family time.

He was preceded in death by his wife Stephanie Woodruff; and son Jeffrey Allen Woodruff.

Woodruff is survived by his daughter Rhonda (John) Crowl; sons Russell (Sheril) Woodruff, Jr. and Chas (Renee) Woodruff; sisters Bertha Wallerstead and Delores Woodruff; grandchildren Heather Brux, Cody Woodruff, Jordann Woodruff, Tyler Woodruff and Hailey Woodruff; great-grandchildren Garrison, Jeffrey, Harley, Presley, Jax and Mackenzy.

Violet Irene Fernando

Violet "Vi" Irene Fernando, the eldest elder of the Upper Skagit Indian Tribe, died Nov. 9. She was 97.

She was born May 27, 1922, in Rockport, the eldest daughter of Lottie Tom. Her grandfather, Frank Tom, ran the cable ferry across the Skagit River at Rockport for many years.

As a young child, Vi spoke a mix of Skagit Lushootseed language and English. At about 6 years old, she went to the federal Indian school on the Tulalip Reservation near Marysville, where Indian children were punished for speaking their language or practicing their traditions. She was delighted to relearn the language in the 1970s from her cousin Violet Hilbert.

Her first husband was Richard Moses of Marblemount, with whom she had daughter Linnette and sons Richard Jr. and Harold. She married her second husband, Faustino "Fred" Fernando, in July 1941. They had 10 more children, and remained together 54 years until Fred's death.

Fernando moved back to Skagit Valley shortly after the 1974 Boldt decision. As a child, she had set salmon nets by cedar canoe with her mother, so she was excited to learn drift gillnetting with her grown children, now using motorized river skiffs. Together, Vi and Fred would keep the campfire and coffee hot, and watched over the grandchildren at the family fishing camp.

In the late 1970s, Fernando was elected to the Upper Skagit Tribal Council and was re-elected several times. She also became a community health representative for the U.S. Indian Health Service.

Fernando was preceded in death by all but one of her siblings; sons Richard Moses Jr., Eddie Fernando and Harold Moses; and in 1995 by her husband Fred.

She is survived by youngest sister Wanda Pressley of Burlington; daughters Linnette Hernandez of Sedro-Woolley, Doreen Maloney of Mount Vernon, Beverly Lemen of Burien, Rosie Snyder of Kent and Carmella Fernando of Sedro-Woolley; sons Fred Dennis Fernando of Kent, Jim Fernando of Bellingham, Vic Fernando of Yuma, Ariz., Andy Fernando of Yelm and David Fernando of La Conner; 47 grandchildren; 84 great-grandchildren; 38 great-great-grandchildren; and one great-great-great-grandchild; plus many sons- and daughters-in-law, nieces, nephews and other folks who knew her as "Grandma Vi."

Crystal Green

Crystal Lynne Green died Nov. 9 at Mason General Hospital in Shelton. She was 34.

She was born April 5, 1985 to Eddie Green Sr. and Debra McFadden at Tacoma General Hospital.

Green was a Skokomish tribal member. Her passion was to fight for the salmon and for her Skokomish people. Green received an associate's degree in Environmental Science and Technology at Clover Park Technical College in March.

While attending Clover Park, she interned at the Northwest Indian Fisheries Commission with Bruce Jones in SSHIAP and with Marcia House in the Fish Health Lab. She worked for Tacoma Power at the North Fork Skokomish Hatchery and Saltwater Salmon Hatchery.

Green was preceded in death by her grandparents John "Jack" McFadden, Sheila McFadden and Shirley Allen and brother Donald Green.

She is survived by her parents Eddie Green Sr. and Debra McFadden; children Nalynne Peterson, Estefawnie Vasquez, Lokadah Nunes and Elias Nunes; boyfriend Raph Nunes; siblings Jennifer Green, Nichole Green, Eddie Green Jr., Shawn Green, Hunter Green and Kyler Gall; nephews Isaiah Ives, Roman Green and Carter Miller; niece Henley Green; and many aunts, uncles, cousins and friends.

D. Preston

Midnight Oysters

Margaret Homerding, Nisqually Tribe's shellfish biologist, right, and Jodie Toft from the Puget Sound Restoration Fund work the midnight to 4 a.m. shift in 20-degree temperatures in October, spreading Olympia oysters in South Sound.

An estimated 180,000 clams were spread and mapped on Nisqually's shellfish farm and community farm in Henderson Inlet. The project is conducted under the Department of Agriculture's Natural Resources Conservation Service and the Puget Sound Restoration Fund.