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Northwest Treaty Tribes

Protecting Natural Resources for Everyone

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European green crab an ongoing threat



by Ed Johnstone
NWIFC Chairman

Efforts have ramped up to control the explosion of invasive European green crab (*Carcinus maenas*) in western Washington.

The invasive species reached San Francisco in 1989 and was first detected in small numbers on the Olympic coast in 1998. We've now reached the point where thousands are being caught every year in Grays Harbor, Willapa Bay and Makah Bay.

The Makah Tribe developed a robust trapping program, which has caught more than 19,000 crab since April. In the Tsoo Yess River channels, they can find up to 40 of them within a span of 5-10 minutes.

But not every tribe has the resources to keep up with this unchecked proliferation. My tribe, the Quinault Indian Nation, doesn't have the staff to trap aggressively in Grays Harbor.

It was only a matter of time before the crab reached the Salish Sea. In 2012, a population of green crab was found in the Sooke Inlet of Vancouver Island, and in 2015, the state's Washington Sea Grant Crab Team began monitoring Puget Sound shorelines. The team expanded its trapping efforts to Grays Harbor, Willapa Bay and Makah Bay in 2020. The crab have traveled as far south in the Salish Sea as Hood Canal, where a male European green crab was found in May 2022.

Last year, we saw exponential increases in green crab numbers in estuaries along the Olympic coast as well as in Lummi Nation's sea pond in north Puget Sound. The shallow 750-acre sea pond is part of Lummi's hatchery facility. It was designed to cultivate shellfish and juvenile salmon, which unfortunately made it a perfect incubator for this invasive species. The first green crab were found there in 2019. In 2021, thanks to an extensive trapping effort, the tribe captured 70,000 of them.

The Lummi Indian Business Council declared the European green crab invasion a disaster in November 2021. In January 2022, Gov. Jay Inslee ordered state agencies

to implement emergency measures to try to control the spread.

The state Legislature made \$8.6 million available in the 2022 supplemental budget signed in March. Lummi and Makah were given highest priority and received some of that emergency funding, and tribes are working with the state to direct more resources to population control on the coast.

At this point, there's no hope of eradicating European green crab in our region. They're here for good and they're threatening our shellfish industry.

We've seen the damage they cause. On the East Coast, European green crab are to blame for the collapse of the eastern soft-shell clam industry in Maine.

We know they destroy nearshore habitat by burrowing into the mud and damaging eelgrass beds, which are critical habitat for shellfish and salmon. But we don't yet know what the long-term effects will be on Washington's local crab populations including Dungeness crab.

Last summer, the Makah Tribe began researching the overlap between the habitat used by both species of crab to learn more about that threat. Part of the work involves setting up video cameras underwater to see whether green crab and Dungeness crab are aggressive toward each other or are preventing one another from accessing food.

Because of the decline in our salmon runs, tribes depend on Dungeness crab to sustain our economies and ways of life. If we don't slow down the spread of European green crab, we're at risk of losing Dungeness crab too.

We need all hands on deck if we're going to protect native species from this invasive threat. We need management and funding to support a coordinated effort with boots on the ground.



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On the cover:
Swinomish community member Kason Williams, 11, hands a rock to Joe Williams, the tribe's shellfish community liaison, to help form the foundation for the tribe's clam garden on the tidelands of Kukulati Preserve. See story on page 3.
Photo: Kari Neumeyer



Swinomish community members, volunteers and staff place rocks along the beach on Kukutali Preserve to create a wall for a clam garden. Photos: Top, Rob Eis; Right, Kari Neumeyer

New clam garden, old ways

After many years of planning, the Swinomish Indian Tribal Community has laid the foundation for the first known modern clam garden in the country.

Over two days in August, community members and invited guests passed rocks from hand to hand to build a 2-foot-high, 200-foot-long rock wall on the shore of Kukutali Preserve.

“The rock wall will form a terrace for our sea garden,” said Swinomish tribal member Joe Williams, the tribe’s shellfish community liaison. “As sediment builds up behind the wall and we tend to our garden, it will increase the abundance of all different sorts of sea life, such as shellfish, sea cucumbers, urchins, kelp and seaweed.”

By naturally leveling off the slope of the beach and increasing intertidal biodiversity, the area eventually should support harvestable numbers of clams and oysters, but not for years or even a generation. That increased biodiversity will improve climate resilience; clam gardens also can adapt to sea level rise and their high concentration of shell fragments can counter some of the effects of ocean acidification.

As part of the tribe’s climate resilience strategy, the project received funding from the National Oceanic and Atmospheric Administration’s Saltonstall-Kennedy Competitive Grants Program, the Northwest Climate Adaptation Science Center, Washington Sea Grant, the Environmental Protection Agency and the Bureau of Indian Affairs.

This traditional shellfish cultivation

method dates back thousands of years, but there are no known clam gardens still functioning in the United States. In British Columbia, the WSÁNEĆ and Hul’q’umi’num first nations have partnered with Parks Canada to restore clam gardens in the Gulf Islands National Park Reserve.

Over the past several years, the Swinomish Tribe’s fisheries and community environmental health programs organized visits to those sites where tribal members learned about clam garden construction, management and restoration. Tribal staff also worked with the tribal community to select the best site on Kukutali Preserve to provide both ecological and sociocultural benefits to current and future generations.

The tribe owns and manages the Kukutali Preserve uplands with the Washington State Parks and Recreation Commission. Preserve lands were acquired in 2010 after many decades of nontribal private ownership. The tidelands surrounding Kukutali Preserve are owned by the United States in trust for the tribe.

“We kind of lost our connection to this particular site,” Williams said. “But since I did my first shellfish survey here, this is now my favorite place on the reservation by far.”

Williams learned about plans to build a clam garden in 2016 from Lorraine Loomis, who was the tribe’s fisheries manager and NWIFC chairperson until her passing last year. Her grandson, Tandy Grossglass, placed the first rock in the wall in August.

The clam garden is a legacy of Loomis’



advocacy for protecting fish and shellfish resources for future generations. In tribute to Loomis, Williams, along with Swinomish fisheries staff, wore red shirts from the annual Blessing of the Fleet and First Salmon Ceremony, another tradition Loomis helped revitalize.

“We have a closer tie to our first foods than just for sustenance,” said Larry Campbell, Swinomish community environmental health specialist. “It’s a spiritual connection. We’re building a community garden here to help build a better environment for our relatives.”

—Kari Neumeyer

Test fishing on the Elwha



Lower Elwha Klallam Tribe staff Wilson Wells and Ray Moses hold a chinook salmon caught in the test fishery. Photo: Tiffany Royal

The Lower Elwha Klallam Tribe is testing selective fishing methods on the Elwha River with the hope of reopening the river to fishing.

Tribal and nontribal fishing has been prohibited since 2011—when removal began of the river’s two fish-blocking dams after 100 years of operation—to protect the species during habitat restoration efforts. The moratorium is still in place and is evaluated annually.

The river historically was known for its chinook and steelhead populations, both of which the tribe and Washington Department of Fish and Wildlife (WDFW) have worked to boost before, during and after dam removal.

Those populations, as well as other fish species, were important fisheries for the tribal community, but suffered significant declines while the dams were in the river, said Ray Moses, the tribe’s project biologist overseeing the study. The dams also contributed to the listing of chinook and steelhead as threatened under the Endangered Species Act.

The idea is that the chosen method used by tribal fishermen will help the tribe catch surplus hatchery fish while releasing natural origin fish as the Elwha River watershed continues to recover, Moses said.

In anticipation of the study, tribal harvesters were asked about their preferred fishing methods for the Elwha River.

“This was an important component because the fishers are the primary target for the outcome of this project, and their acceptance of the selected method will be critical,” Moses said. “The fishers know what works for them and how to catch fish in the Elwha in general, so they’re bringing a wealth of ideas for this work.”

Another part of the study is figuring out which methods result in the fewest mortalities of the

targeted fish while also reducing bycatch such as bull trout, said Roger Peters, a supervisory research fisheries biologist for the U.S. Fish and Wildlife Service, which is a partner on the project.

The tribal and federal staff ran the test fishery for chinook weekly in July and August, fishing at two different locations on the river, drifting a 6-inch mesh gillnet for no more than five minutes at a time during a six-hour period. The team will run similar test fisheries for coho this winter and steelhead in spring 2023.

Other methods tested included set gillnets with two different mesh sizes, but they were not successful in catching fish, so the team decided to focus on the drift net method with the 6-inch gillnet, Peters said.

All chinook were tagged with an identification number. A portion were taken to WDFW’s hatchery on the Elwha River to be monitored for long-term survival until they’re spawned by the state for its broodstock program. The remainder of the chinook were released back into the river, some of which were radio-tagged for tracking their migration and survival to spawning. For the coho and steelhead, they also will be tagged on site but then transported to and monitored at the tribe’s hatchery.

As both a natural resources technician for the tribe and tribal fisher, Vanessa Castle sees the benefits of the study from both perspectives.

“I see why it’s necessary being on the scientific side, why it would be important for us to try to leave our natural origin fish while we’re still in this restoration phase,” she said. “It’s really exciting to me that they’re at least looking at possibilities of being able to have a sustainable harvest for subsistence to feed our people.” —Tiffany Royal

SEVEN GENERATIONS



Dave Adams pulls a chinook salmon from his gillnet in this photo from the early 1900s. Photo: Suquamish Museum Archives



Left: Liz Duffy, Long Live the Kings science project manager, freezes juvenile salmon collected by purse seine in July. Above: Staff from the Tulalip Tribes and Long Live the Kings spent two weeks aboard the *Viking Leader* collecting data to improve understanding of marine survival of juvenile salmon. Photos: Kari Neumeyer

How do ocean conditions affect juvenile salmon survival?

Not enough is known about what happens to salmon between the time they leave their natal rivers and when they return to spawn.

To learn more, the Tulalip Tribes is in the second year of studying juvenile salmon in Puget Sound's offshore marine areas. Tribal natural resources staff and a research biologist from the non-profit organization Long Live the Kings boarded the purse seiner *Viking Leader*, operated by a crew out of Canada, for two weeks in July to collect samples of salmon, forage fish and plankton from sites between Bellingham and Olympia.

"We are able to sample the same sites during the same time as last year, so we can start comparing our data from one year to another, and try to find ways to improve salmon survival in multiple watersheds," said Tulalip tribal member Andrew Skoog.

"I see the life cycle of these salmon from when they're just fry at the hatcheries all the way to when they swim up the rivers and spawn," he said. "Adding the marine offshore sampling on top of the nearshore and estuarine sampling we already do just bridges the gap."

Data collected each year can help fisheries managers throughout Puget Sound understand why ocean condi-

tions are good for salmon some years and not others. The sampling is an annual snapshot at each site, providing information about the number of fish, as well as their diets.

The research team measures the sampled fish to track growth and learns what the chinook have been eating by gently flushing their stomachs with water.

Last year, the team had to use sonar to find fish, said Liz Duffy, science project manager for Long Live the Kings. This year, she saw fish jumping out of the water at some sites. In addition to salmon, the purse seine caught an abundance of herring and smelt—two types of forage fish that salmon eat.

"Everybody is saying the ocean conditions are good this year, but we can't say exactly why that is," said Mike Crewson, Tulalip salmon enhancement scientist. "In years with poor ocean conditions, we need to understand how they affect survival of juvenile salmon and herring in order to be able to address causes or adapt to the changing conditions."

The Tulalip Tribes so far have funded the offshore marine sampling through the Bureau of Indian Affairs' Tribal Climate Resilience Ocean and Coastal

Management Planning program.

"The funding is helping us set up this critically important monitoring program that we need to assess Puget Sound ecosystem health and the effects of changing climate and ocean conditions on salmon growth and survival," Crewson said.

At least 10 years of data is needed for fisheries managers to begin drawing correlations.

"We need strategic long-term funding so it's not falling on Tulalip's shoulders," Duffy said.

In addition to the monitoring program, the tribal climate resilience funding provides training opportunities for tribal natural resources staff like Skoog.

"I used to fish for chinook and coho salmon with a set net in Tulalip Bay before I started working with the natural resources department," Skoog said. "Anything that helps us understand salmon better so we can have more fish return to where they were released is extra important to me and a lot of other tribal members who rely on fishing as their main source of income."

—Kari Neumeyer

Recycled water benefits fish

Goldsborough Creek will see more water for salmon

The Squaxin Island Tribe has partnered with the Washington Corrections Center in Shelton to ensure the corrections facility uses more treated wastewater—and less water from the local aquifer—for day-to-day uses.

Decades in the making, the project will save millions of gallons of water each year. That’s particularly good news for coho salmon in Goldsborough Creek, an already rebounding population expected to get a further boost from greater water flow now that the corrections facility is drawing water from another source.

“Whatever reclaimed water they’re using, they’re not pumping from their wells, and those wells pull water away from the springs feeding Goldsborough Creek,” said Erica Marbet, a water resources biologist for the tribe. “The more water, the more fish. In late summer, you can’t have too much water in there. Any additional amount is good for fish.”

The tribe spent years promoting the project, which included directing state Department of Ecology funding to the state Department of Corrections and the city of Shelton. The city planned additional reclaimed water storage, and Corrections put pipes in the ground. The funding will help Corrections use reclaimed water—wastewater treated to “almost drinkable” at Shelton’s reclamation plant—for uses such as irrigating crops, cleaning laundry and washing vehicles.

Corrections’ use of reclaimed water could reduce its aquifer consumption by 55,000 gallons a day and 21 million gallons a year.

“That’s enough to fill 178 million water bottles every year,” said James Chavez, the construction project coordinator. “The reduction we’re looking at is going to have a positive impact on the flows of the North Fork of Goldsborough Creek and the fish and wildlife it supports.”

The project’s pumps were turned on in late May.

The tribe was among the partners who conceived the initial construction of the water reclamation plant in 2009. An additional step, the construction of a storage facility to allow greater flexibility in the use of reclaimed water, has been designed and is awaiting construction.



The Squaxin Island Tribe was a key partner in a project to send reclaimed water to Washington Corrections Center in Shelton. The project is expected to reduce the facility’s aquifer use. *Photo: Squaxin Island Tribe*

Marbet said she’s grateful for the work the tribe and its partners did before she got involved and helped secure Department of Ecology funding. She’s excited for the partnership to continue and benefit the community at large.

“The tribe’s role is to push for better protections for treaty resources, but that also benefits everybody who lives in Mason County and South Puget Sound,” she said. —*Trevor Pyle*

“The reduction we’re looking at is going to have a positive impact on the flows of the North Fork of Goldsborough Creek and the fish and wildlife it supports.”

James Chavez
Project coordinator
State Department of Corrections



Ashley Bagley, Long Live the Kings project manager, gives a tour of a biofiltration pilot project that resulted from a partnership with the Nisqually Tribe and others. The project is intended to filter harmful materials from stormwater, making streams safer for fish. Photo: Trevor Pyle

Mobile biofiltration unit cleans stormwater

A pilot project by the Nisqually Tribe and partners may eventually make streams safer for fish and other aquatic creatures.

The tribe partnered with nonprofit Long Live the Kings, environmental solutions company Cedar Grove Composting and others to develop and test a mobile biofiltration unit, meant to filter harmful materials from stormwater.

The unit, which was operational from the beginning of the year until July, filtered water from three rain events near Highway 7 west of Eatonville.

“Our interest is trying to find ways to ensure stormwater road runoff is as clean as possible,” said Nisqually salmon recovery program manager Chris Ellings. “We’ve known for a long time that stormwater is bad. There are so many different chemicals and heavy metals: copper is dangerous for fish and other aquatic organisms; brake pads have asbestos and other chemicals. It’s been on our radar for a long time.”

Concern over stormwater was sharpened with the recent discovery of the dangers of 6PPD, a chemical

used to prevent tires from breaking down too quickly. A team of Pacific Northwest-based scientists discovered that the chemical is deadly to coho when stormwater runoff reaches urban streams.

“It’s incredible to find a silver bullet that’s causing direct mortality,” Ellings said. “It’s definitely been a driver to find interim solutions until the (tire) industry can develop alternative chemicals.”

The system was installed on land purchased by the Nisqually Land Trust near Ohop Creek. It’s a crucial area for the tribe, which has worked with partners for years to rejuvenate the once-thriving rearing and spawning habitat for several species of salmon, including coho.

“We’re partners in the ownership, it’s in a salmon recovery priority area, we can isolate it—it’s a great spot to pilot it,” he said.

A pair of large boxes collected samples and filtered stormwater from three locations during three rain events. Samples will be tested to see how effectively the unit performed at leaching harmful materials such as metals like copper and zinc, and chemicals including

6PPD. Full results of the biofiltration unit’s effects on stormwater are expected as early as this fall.

Ellings said the unit’s eventual use will be determined by its effectiveness but he is excited about this effort.

“Stormwater’s nasty stuff, and any time we can clean the water in ways like this we should,” he said.

“We are committed to protecting as much of the Nisqually watershed as possible, and this is another important way of protecting our water for the salmon that depend on clean water,” said Nisqually Chairman Willie Frank III.

Additional project partners include Fremont Analytical, the Nisqually Land Trust, Herrera Environmental Consultants, University of Washington at Tacoma, Washington State Department of Transportation and Washington State University at Puyallup.

In addition to the tribe, funding for the project came from Puget Sound Stewardship and Mitigation Fund, Royal Bank of Canada, Sustainable Path Foundation and Washington Sea Grant. —Trevor Pyle

Tribe, schools take part in salmon science

When 100,000 chinook salmon were freed from net pens at Point Defiance earlier this summer, it didn't just mark the beginning of their potentially epic journey to the Pacific Ocean and back again. It also marked a milestone for the burgeoning partnership between the Puyallup Tribe and local schools, including Chief Leschi Schools and Tacoma Public Schools' Science and Math Institute (SAMI).

The partnership allows students to raise, study and eventually release salmon provided by the tribe and Washington Department of Fish and Wildlife (WDFW). The students get experience caring for the fish; the tribe gets to build partnerships, grow scientific knowledge and kindle appreciation in younger people for caring for salmon.

"Collaboration is where it's at for helping our salmon," said Blake Smith, Puyallup Tribe's fisheries enhancement chief, who was among those present for the salmon release behind the Point Defiance Anthony's restaurant.

He noted the fish had quadrupled in size while they were raised in the net pens. "Bigger fish have a better chance of survival," he said.

It's the fourth year of the partnership, but the first when salmon were released in the Point Defiance area, and the first when fish provided by WDFW were among those raised and released by SAMI students.

Chief Leschi students also are crucial to the partnership, traveling to the tribe's Clarks Creek Hatchery and helping spawn the chinook that were shipped to the Tacoma net pens.

Smith started the research and education program four years ago with Wayne Harmond, the founder of the nonprofit Northwest Salmon Research. There had been ideas floated previously about raising



Volunteers release chinook from net pens at Point Defiance, a benchmark moment in the partnership between the Puyallup Tribe, WDFW and local students. Photo: Trevor Pyle

chinook in net pens but the projects never materialized.

"We thought we could make it a little better for everyone, working together as co-managers," Harmond said. "We all want to preserve the unique salmon culture."

With the tribe providing the fish to be raised, other groups pitched in, including members of the Gig Harbor chapter of Northwest Anglers, who helped assemble and transport the nets.

The SAMI students' involvement began as a club in the life sciences pathway, one of two offered at the school. Matthew Lonsdale, a marine science teacher, helped guide students as they helped with water quality testing and fish feeding.

Eventually the school's involvement grew to include more students, and more activities. Students from the math and

physical sciences pathway also became involved. Recently more than 100 students total took part in inspecting nets, helping with the design of the nets and building underwater robots.

While helping educate students is among the tribe's goals, scientific benefits also may emerge. The tribe is eager to study whether chinook released directly into Puget Sound have a higher survival rate, perhaps because they can avoid predators, toxins and other pollutants found on their usual route to the sea. The released fish have coded-wire tags.

"I thought it would be an excellent time to give it a go and see what happens when we release fish farther from Commencement Bay," Smith said. "Maybe they'll survive better. And we want to know what happens after. Do they come back to the hatchery?" —Trevor Pyle

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Blake Smith
Fisheries enhancement chief
Puyallup Tribe



Workshops hosted by Nooksack tribal members included harvesting devil's club (left), which was used historically to make fishing lures and medicinal treatments, and canning salmon (above). *Photos: Indigenous Beginnings*

Group teaches use of traditional resources

Led by Nooksack tribal member Jenny Roberts, a group of mostly tribal members ventured into the tribe's forested homelands near Deming in July in search of the understory shrub devil's club to turn into a topical pain-relief salve for tribal members. Devil's club, which grows long prickly stems adorned by maple-like leaves, has been a medicinal resource for Nooksack and other tribes since time immemorial. The plant is now gaining interest in Western medicine.

During the harvest in July, the group clipped stems of devil's club, shaved off the plant's prickles, and convened in a kitchen to stir up the salve. That process involved chopping, soaking and stewing the woody plant material.

The harvest-to-salve event was one of many workshops organized by the young nonprofit Indigenous Beginnings, established and run by Nooksack tribal member Stephanie Cultee. The organization launched in July 2021 with a similar devil's club workshop.

The nonprofit is dedicated to teaching tribal and nontribal participants how to harvest and prepare traditional foods and how to carve, weave and otherwise transform natural resources into useful items. Events have included making jelly from fireweed, weaving cedar into baskets and headbands, carving wood into paddles, making drums from wood and hide, beading and

weaving wool, with lessons led primarily by Nooksack, Tulalip, Lummi and Quinault tribal members.

Indigenous Beginnings was created to help spread the cultural teachings of these and other tribes in western Washington, sharing the diversity of knowledge of Native Americans in both urban and reservation settings in a culturally appropriate way. While the majority of workshop participants are Native American, the events are open to nonnative community members. The workshops are generally offered at no cost with materials provided.

The nonprofit received support to continue this work with a grant from the Association of Tribal Archives, Libraries, and Museums (ATALM) for 24 workshops for the Nooksack and Tulalip communities. The funding came from a portion of the American Rescue Act intended to help native cultural institutions recover from the COVID-19 pandemic and continue to provide programming.

"Unfortunately, a lot of our cultural education is not provided in schools. We're motivated to fill this void by freely giving and sharing traditional teachings through our in-person, hands-on workshops taught by inspirational knowledge keepers," said Michael Rios, an Indigenous Beginnings Board of Directors member. "Through their guidance, and with support of organizations like ATALM, we will continue to share with youth, adults and elders in our communities who wish to create a bridge between our modern way of life and the cultural values that powered our ancestors."

When it comes to devil's club, the resource's values are many. Parts of the plant were used historically to make materials such as fish hooks and lures, tattoo ink, deodorant, and medicinal treatments for ailments including arthritis and lice. Devil's club also can be consumed as a tea known to help with indigestion, and may have properties helpful for regulating blood sugar in the treatment of diabetes. —*Kimberly Cauvel*

Logjams help fish and nearby community

With the efforts of the Quileute Tribe and partners, a series of logjams have sprung up around the lower Quillayute River this summer in a project called the Reach 3 restoration.

Combined with channel excavation, the logjams are intended to “stream train” a section of the river, which should reduce flood risks for the village of La Push while improving valuable salmon habitat.

Stream training is a restoration approach that uses natural processes to encourage river energy to move away from sensitive banks that need protection and toward underused floodplains, transforming the river energy into fish habitat.

Quileute water quality biologist Nicole Rasmussen said the effort will encourage the river to follow a less harmful route, protecting the surrounding infrastructure and habitat.

“The river wants to heal itself after years of wood being removed and habitat being altered,” she said.

The Quillayute River’s 625-square-mile watershed is home to 23 distinct salmon runs, including steelhead and all five species of Pacific salmon. The health of the river is crucial to the people living nearby and the salmon that live, feed and spawn there.

Over the last couple of decades, the river shifted. To the south, the bank lost 44 acres of land, threatening a culturally important site known as Thunder Field. To the north, the shift imperils Mora Road, a crucial road for accessing and maintaining the jetty that protects La Push from storm surges.

In 2019, the tribe received a grant to evaluate the habitat conditions and restoration potential of the river. A key finding was that the river is severely lacking large wood, which is vital for healthy salmon habitat. That study resulted in an action plan including a series of projects that can be implemented at the reach scale. The tribe started with the Reach 3 project and will continue restoration work up the river.

Using logs harvested and donated by the tribe, the Quileute Natural Resources Department began installing logjams of various sizes this summer and expects to be done by mid-October.



“Wood is a natural part of a healthy river system. We’re working with the river and healing the river.”

Caroline Walls
Habitat restoration biologist
Quileute Tribe

Fifty-three structures will be installed. More than 1,200 logs were provided for the project, which also entails excavating floodplain paths so the river can better “find” those routes.

The structures have two purposes: to deflect the flow of the river away from eroding banks and into floodplains, and to provide fish friendly habitat, said habitat restoration biologist Caroline Walls.

Wood is a boon for fish. It provides protective structures to hide fish from predators, encourages deep pools for them to rest in and attracts insects for them to snack on.

“Wood is a natural part of a healthy river system,” Walls said. “We’re working with the river and healing the river.”

The project will be monitored after completion. Funding was provided through grants from Washington Coast River Resiliency Initiative, National Fish and Wildlife Foundation, and Natural Resources Conservation Service.

—Trevor Pyle



Top: Quileute Tribe water quality biologist Nicole Rasmussen (left) and habitat restoration biologist Caroline Walls confer at the site of the tribe’s Reach 3 restoration project in July. Above: Rasmussen takes a closer look at the water within the project site. Photos: Trevor Pyle

More wood for fish in Skokomish River

More than 1,000 logs were placed strategically in the South Fork Skokomish River this summer during the Skokomish Tribe's latest project to restore much needed salmon habitat in the watershed.

Focusing on a 3-mile stretch, most of the 15 logjams were constructed within the floodplain and stream channel of the South Fork, with a few constructed in the nearby Church Creek tributary.

"The ongoing objective is to increase habitat functionality by installing new structures to facilitate the development of pools and riffles, and guide sinuous characteristics of a river channel that more resembles what we believe existed historically and is more productive fish habitat," said Joseph Pavel, the tribe's natural resources director.

Deteriorating fish habitat conditions throughout the watershed are the result of historic logging and road building associated increased sediment loads, and the removal of wood that had naturally settled into the river. These impacts have resulted in fewer pools that provide deep water refuge and habitat cover for adult and juvenile salmon.

The logjams also will help stabilize the riverbanks for vegetation that will provide shade for the water and existing habitat and promote development of deeper and narrower channels, plus substrate conducive to spawning.

"These different habitats also will support benthic invertebrates (small aquatic

animals and larval insects) which are, of course, a major food source," Pavel said.

While spring chinook historically used this stretch of river, they have been eradicated. The tribe and its partner Tacoma Power are working to bring back a population of spring chinook similar to the native population. Steelhead, rainbow, cutthroat, and bull trout also have been documented in the project area.

This project is one of five the tribe has embarked on since 2010 when the tribe and its partners, Mason Conservation District and the U.S. Forest Service, started adding woody debris to the watershed to beef up salmon habitat within 15 miles of the upper South Fork. —*Tiffany Royal*



Above: Skokomish Tribe habitat biologist Lisa Belleveau takes measurements in the South Fork Skokomish River next to one of the recently installed logjams. Below: From left to right, Skokomish Tribe restoration planner Alex Papiez, Belleveau and Skokomish Tribe habitat program manager Alex Gouley evaluate the water level and new logjam in the South Fork Skokomish River. Photos: *Tiffany Royal*





A seaweed seed bank for the future

Motivated by the need to build climate change resilience, the Jamestown S’Klallam Tribe is exploring seaweed beds along the Strait of Juan de Fuca to study—and potentially restore—vegetation integral to the overall ecosystem.

Marine vegetation, especially kelp, is important for species that are ecologically, economically and culturally important to the tribe, as well as to Puget Sound, said Annie Raymond, the tribe’s shellfish biologist.

“Seaweed and kelp are important to the tribe for subsistence purposes, but are also critical habitat for the marine life that is

important to the tribe as well,” Raymond said.

Seaweed beds, both along the shoreline and in the subtidal zones, provide refuge and are feeding and nursery grounds for marine life including crab, sea cucumber, urchins, rockfish, juvenile salmon, lingcod, eulachon and forage fish such as herring. These underwater forests also provide housing for marine life that are part of the food web for seabird and marine mammal populations, including southern resident orcas.

“I would say it’s one of the few species, especially bull kelp, that creates a 3D structure throughout the whole water column, which is pretty critical for the aquatic ecosystem,” Raymond said. “Crab, salmon and others use these kelp forests during their different life stages.”

The tribe is partnering with Puget Sound Restoration Fund (PSRF) for a two-year study to collect data on existing seaweed beds, then create a seed bank to preserve them for potential restoration needs in the future.

“PSRF is excited to work with the Jamestown S’Klallam Tribe to advance seaweed restoration options and to use our scientific and cultivation capacity in support of tribally led projects,” said Hilary Hayford, PSRF’s habitat research director.

Developing a baseline of what currently exists is important because, similar to eelgrass, the overall marine ecosystem depends on kelp habitat that has been disappearing from parts of Puget Sound the past few decades.

The change in sizes of bull kelp beds have differed by geographic region throughout time, Raymond said. For example, South Sound kelp are getting smaller over time, yet some regions of the eastern Straits have not experienced much decline.

In addition to targeting kelp species with ecological importance for survey work, the study team has consulted with subsistence harvesters to seek out species and places that are important to the tribe.

In 2023, the tribe and PSRF will expand on the past several years of work by PSRF and partners to develop a local seed bank, adding important kelp species that could be used for future restoration needs. For example, if kelp disappears from shorelines, stored seed from that population could be grown and outplanted, potentially enhancing the kelp resource.

“We don’t know how kelps in the straits are going to be doing in the next 100 years, but this work will help us know what changes are happening and be better equipped to do restoration work in the future if needed,” Raymond said. —*Tiffany Royal*



Top: Brian Allen and Kathy Burnham with Puget Sound Restoration Fund take bull kelp samples from the Strait of Juan de Fuca. Left: Jamestown tribal natural resources technician Casey Allen counts types of seaweed. Photos: *Tiffany Royal*

Breaking into the seafood market

Program helps tribal members go commercial



Top: Port Gamble S’Klallam fisherman Bill Ives retrieves a shrimp pot during a fishery in Quilcene Bay. Bottom: Port Gamble S’Klallam fisherman Tanner Cheney checks on his catch during a coho salmon fishery on the Quilcene River. Photos: Tiffany Royal



The Port Gamble S’Klallam Tribe has been giving its fishers an economic boost with workshops and grants to help them sell fish and shellfish commercially.

Through the S’Klallam Harvester’s Resiliency Expansion Project, the tribe’s natural resources, economic, education and nonprofit departments have put together a program that helps fishers better understand the tribe’s regulations and policies for selling fish and shellfish to buyers and directly to consumers.

“The outcomes of the seafood business and marketing workshop efforts are to equip tribal members with the knowledge they need to feel confident to achieve the potential for greater income for tribal fishers and the ability to secure more competitive prices for their products,” said Julianna Sullivan, the project biologist overseeing the program.

The program was inspired by feedback the tribe received from its fishers about barriers to participating in commercial fisheries and seafood sales. One barrier has been trying to interpret tribal laws related to fisheries and selling seafood, as the price per pound for fishermen for wholesale sales is quite low, she said.

“With the decline in salmon stocks in the 1980s and 1990s, the tribe has had to refocus harvest efforts on shellfish, such as Dungeness crab and geoduck clams, as a primary source of income,” Sullivan said.

Workshops included training videos on topics such as how to become a commercial fisher, the intricacies of federal Indian policies and fishing laws, how to conduct roadside sales, and seafood and business marketing plans. Another goal of the program is to create a physical market on the reservation where fish and shellfish

can be sold directly to the customer, Sullivan said.

Upon completion of the training, fishers receive an \$800 grant to help them with startup expenses such as starting or marketing their seafood business, or purchasing equipment.

With nearly 100 participants, many felt the workshop was beneficial in starting their own seafood business or becoming a buyer. They also appreciated learning more about their treaty rights and jurisdictions of fishing areas, and being able to provide seafood to fellow tribal members unable to harvest.

“I always thought it was as simple as having an ID, harvesting and selling,” said tribal member Kaylee Jones, who took the workshop. “I’m glad I was able to learn more about the jurisdiction, articles and regulations. I’ve had a few opportunities to practice my treaty rights and always felt nervous and in the dark on what to expect. Now I have more knowledge.”

“I learned that there are more diverse ways to market tribally caught seafood,” said tribal member Chris Jones. “That is very useful because the value isn’t always reflected in the prices that fishermen are paid.”

Additional outcomes from the workshop have included providing fisheries management with better data because there has been increased fisheries participation and reporting since people are taking more opportunities to fish, Sullivan said.

“Based on the positive feedback we received, this workshop provided tribal members with more confidence and understanding for exercising their treaty rights and where the opportunities are for entrepreneurship,” she said. —Tiffany Royal

A salmon-focused look at the American dipper

The Lower Elwha Klallam Tribe wants to better understand how American dippers, North America’s only aquatic songbird, respond to the presence of salmon in their territories.

For more than a decade, the tribe has contributed to research on dippers in the Elwha, Sol Duc and Dungeness rivers, and for comparison, ongoing studies that examine dippers in streams without salmon, such as Barnes Creek on Lake Crescent.

Dippers are a great indicator species because they live in both aquatic and terrestrial environments, said Scott Walters, a Ph.D. candidate from the University of Western Ontario who is leading the



“They’re getting their nutrients from the salmon directly as well as indirectly.”

Scott Walters

Research partner with Lower Elwha Klallam Tribe

research. The tiny gray birds live on land and breathe air but also have aquatic behaviors such as swimming and flying underwater. They primarily feed on macroinvertebrates (tiny aquatic bugs) and salmon fry and eggs.

“They’re getting their nutrients from the salmon directly as well as indirectly through invertebrates that are also eating the salmon,” Walters said. “Then they’re transmitting the nutrients through themselves, into their chicks and into the terrestrial environment.”

Walters specifically is interested in learning if dippers acquire certain fats from anadromous salmon, whether those fats convey benefits, and

how natural barriers or dams that block fish may block the dietary compounds that fish may carry.

Fats can be important to different aspects of animal physiology, especially development, Walters said, and young birds receiving a greater amount of certain fatty acids could have improved development.

The work is a follow-up to a 2011 study that showed that the health of the birds relied on marine sources such as salmon. That study also showed how dippers help transport nutrients from one environment to another and looked at barriers both above and below the fish-blocking dams on the Elwha River at



The Lower Elwha Klallam Tribe has been studying the American dipper on the Olympic Peninsula for more than a decade to better understand how salmon are an important part of the songbirds’ diet. Above: A dipper’s head is measured as part of the data gathered to better track the development of the songbird population. Photos: *Tiffany Royal*

the time.

The data from this work will support the tribe’s ongoing effort to document salmon recolonization and restoration on the North Olympic Peninsula, said Kim Sager-Fradkin, the tribe’s wildlife biologist. It also may answer ecological questions of how wildlife is

impacted by and benefits from nutrients provided by salmon.

“For us, it’s a continued storyline that we tell a lot in outreach materials—the benefit of salmon nutrients in wildlife—with the dipper being the perfect example in these systems,” she said.

—*Tiffany Royal*

Celebrating Elwha River science

Lower Elwha Klallam Tribe dancers and singers welcomed attendees to the third Elwha River Science Symposium in August.

Dozens of scientists studying the Elwha River watershed over the past 30 years gathered to share outcomes and observations from their research on how the watershed has responded to the removal of two fish-blocking dams a decade ago.



Highlights from post-restoration research included evidence that adults and juveniles of all salmon species, steelhead and bull trout have made it past the Glines Canyon dam site; vegetation in the former reservoirs has grown significantly; and sediment flowing down river from the reservoirs drastically changed the behavior of the estuary at the mouth of the river. Photos: USGS

Stewart Mountain Community Forest moves forward

The first major step toward establishing a Stewart Mountain Community Forest to support healthy summer streamflows in the South Fork Nooksack River took place earlier this year, when Whatcom County allocated funding to purchase a 550-acre block of forestland.

Salmon need cold, clean water to thrive in rivers like the Nooksack, and streams that drain from healthy forests into salmon-bearing rivers are cooler and cleaner thanks to the shade and rainwater filtration that mature trees offer. Because of that connection—and evidence that improvements are needed in forestlands feeding the South Fork—the tribe is working with partners to better manage forests on Stewart Mountain.

By establishing a public community forest on the mountain, the partners can care for the land in ways that will bolster water quantity and quality in the

South Fork during the critical summer months when streamflows are lowest and temperatures highest—a deadly combination for fish.

“The more we can create these opportunities of preservation and conservation along the South Fork is good for everyone,” said Jeremiah Johnny of the tribe’s culture department.

The long-term goal is to acquire 5,500 acres of Stewart Mountain, about 30 miles east of Bellingham, to protect and improve the South Fork Nooksack River.

In June, the Whatcom County Council allocated funding for the purchase of the first 550 acres.

Nooksack ancestors have used the forest and streams of Stewart Mountain to gather resources for hundreds of generations, Johnny said. Not least among them is the chinook salmon native to the Nooksack River watershed.

“Like the pumping heartbeat, the blood that flows through the body, that’s how we see the Nooksack River in relationship to the Nooksack identity,” he said.

For more information: nwtt.co/stewartmntn. —Kimberly Cauvel



Stewardship of a community forest on Stewart Mountain will help protect salmon in the South Fork Nooksack River watershed. Photo: Sustainable Northwest

WALKING ON

Terry Williams

Terrance Rollo Williams walked on at age 74 on July 19. He died peacefully in his sleep with loving family members nearby, just days after he and his wife Suzanne celebrated their 50th wedding anniversary.

Williams was born April 23, 1948, the second of four children of Reverends Adam Williams and Marjory Williams.

After returning from Vietnam as a decorated U.S. Army veteran, Williams was recruited by Tulalip leaders Bernie Gobin and Stan Jones to the tribal police department, where enforcement issues soon led him to fisheries and eventually to natural resources and treaty rights. He worked alongside longtime NWIFC Chairman Billy Frank Jr. and was appointed to a series of influential leadership positions by governors Booth Gardner and Christine Gregoire, and by presidents Clinton and Obama.

As the Tulalip Tribes' climate spokesperson for almost four decades, Williams fought to bring together traditional knowledge and western science on the battleground of climate action. He spread the message of Indigenous leadership and created numerous tribal, governmental, business and nonprofit coalitions. Williams opened doors for Indigenous peoples to enter the halls of power as experts. For his reputation as a thought leader and change agent, Williams received countless honors and lifetime achievement awards.

He is survived by his wife Suzanne Claire Tabacco Williams; sons Joshua, Jesse and Jamie Williams; grandchildren Alysa, Camila, Isla and Noah Williams; sister Sandy Tracy; and brother Daryl Williams.



Clifford Keeline

Clifford Keeline, former chairman of the Muckleshoot Indian Tribe, walked on July 29 surrounded by family in his home on the Muckleshoot Reservation. He was 75.

Keeline was born Feb. 14, 1947, to Ethel Courville and Robert Keeline. He grew up in Toppenish, then enlisted in the U.S. Marine Corps when he was 17. He served from 1967 to 1969 in Vietnam and was honorably discharged after two tours, 26 air medals and 520 combat missions.

After the war, Keeline began his family with Helen Gobin-Henson, having three children.

He served as chairman in the late 1970s as the Boldt decision proceedings worked their way through the legal system. He also worked as a logger and commercial fisherman.

In 2001, Keeline traveled to Peru where he met the love of his life, Virginia "Vicky," and gained another son, Jefry. Cliff and Vicky then had a daughter, Milagritos.

He is survived by children Bobbi (Voxfini) Keeline-Young, Scott (Tash) Keeline, Joel (Trista and Brittany) Keeline, Jefry Basurto, Milagritos Valencia-Keeline and Robert (Crystal) Keeline; brother Chester "Buzz" (Shirley) Brown; Ethel "FE" (Tom) Tull; and many grandchildren, great-grandchildren, nieces and nephews.

He was preceded in death by his grandparents Maggie Daniels Barr and Amos Courville; mother and father Ethel and Robert Keeline; sisters Roberta and Jeanette Morrison; brother Johnny; grandson Dayton Lugo-Hatch; and nieces Pamela and Cindy.

