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Northwest Treaty Tribes

Protecting Natural Resources for Everyone

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Atlantic Salmon Must Go



by Lorraine Loomis
NWIFC Chair

The treaty tribes continue to be concerned about the non-native Atlantic salmon that have not been accounted for since their escape from a fish farm last summer.

There were more than 300,000 adult Atlantic salmon in a floating pen that collapsed Aug. 19 near Cypress Island. The owner, Cooke Aquaculture, recovered about half of the fish. Treaty tribal fishermen and sport anglers removed about 55,000 more. The remainder have since spread throughout Puget Sound and the Strait of Juan de Fuca, the Washington coast and British Columbia.

The non-native fish were still being found in December during tribal chum salmon broodstock collection on the Skagit River.

These Atlantic salmon are not wanted in our waters. Immediate steps should be taken to close remaining fish farms in the state. Treaty tribes in western Washington have adopted a policy rejecting Atlantic salmon aquaculture in our region because we believe the state's permitting requirements, oversight and response planning for Atlantic salmon net pen farming are seriously inadequate.

First Nations in Canada share our concerns about possible impacts from Atlantic salmon to our native Pacific stocks. Bands from Vancouver Island have stepped up their opposition by occupying and calling for removal of some facilities. While Washington has just a handful of farms – and California, Oregon and Alaska have banned them – there are more than 70 in British Columbia.

Since the spill, Washington state government has imposed a moratorium on permits for any new Atlantic salmon farm operations, but we think that's too little, too late. We want those fish gone as soon as possible.

We also want to make it clear that we will continue to support net pens used for short-term marine rearing of Pacific salmon or culturing of other species.

Though scientists say it is unlikely Atlantic salmon could establish themselves in our waters, it's not impossible. In 1998, juvenile Atlantic salmon found in the Tsitika River on Vancouver Island were found to be the offspring of natural spawning by escaped Atlantic salmon.

We have good reason to be concerned. There's a long history of fish escaping from fish farms throughout western Washington.

Between 1996 and 1999, more than 500,000 got loose in Puget Sound. In 2003, several hundred were found swimming in Scatter Creek, a tributary to the Chehalis River, after escaping from a private fish farm. In 2006, the Alaska Department of Fish and Game confirmed that Atlantic salmon caught in Cook Inlet came from the same facility. Some scientists say that one out of every 100 Atlantic salmon escape from fish farms in Washington and British Columbia.

We believe Atlantic salmon should be treated like all invasive species. We must remove those that we can, monitor our waters for new infestations, and act quickly to wipe them out.

We are failing to recover Pacific salmon in western Washington because their habitat is being lost faster than it can be restored. We don't need the additional problems that Atlantic salmon bring to our waters.



Northwest Treaty Tribes
Protecting Natural Resources For Everyone

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On the cover: Skokomish fisher Marlene "Babe" Johns hauls a chum salmon from a beach seine during a tribal fishery at the Hoodsport Hatchery in November. See related photo on page 13.
T. Royal

Lower Elwha Monitors Chinook Population After Dam Removal

The Lower Elwha Klallam Tribe, in cooperation with Washington Department of Fish and Wildlife and Olympic National Park, is determining how many hatchery-origin and natural-origin chinook salmon are returning to the Elwha River since two fish-blocking dams were removed.

The tribe and partners have been counting returning chinook adults from summer through early fall, and surveying chinook redds (egg nests) and collecting ear bones from salmon carcasses in mid-to-late September.

When an ear bone, or otolith, is removed from a carcass and placed under a microscope at the state's lab, scientists look for a mark on the bone that indicates it's a hatchery fish.

"When the fish are in the state hatchery, the water temperature is held at a certain degree for a certain period of time, resulting in marking a ring on the ear bone, which can be seen as a growth ring, like on a tree," said Mike McHenry, the tribe's habitat program manager.

"We used an otolith mark to indicate hatchery origin, rather than the standard adi-

pose fin clip, in order to reduce mortality in mark-selective fisheries and maximize the number returning to recolonize habitat the Elwha River," said Joe Anderson, a WDFW research scientist.

The tribe also uses a sonar system in the lower river to determine how many fish are returning between June and September. However, the sonar can't decipher the type of fish, so the tribe nets the river at the same time to identify fish, then correlates the data with the sonar data.

"We have seen a dip in the numbers of returning adult chinook over the last two years – about 2,500 fish compared to the previous three years of about 4,500," said Keith Denton, a consultant overseeing the tribe's sonar program. "This is most likely caused by the fact that returning adults from the last two years were juveniles in the river four and five years ago, and experienced the brunt of the sediment impacts from dam removal during a delicate part of their life."

Nevertheless, the number of adults returning the past two years is still about equal

T. Royal (2)



to the 20-year average, Denton said, and the fish seemed to have dealt with any short-term negative impacts from dam removal remarkably well.

The late summer chinook redd surveys assess where fish are going in the watershed.

"Chinook are showing good signs already," McHenry said. "They want to move upstream and have occupied natural habitat on their own."

While salmon spawning in the river during dam removal

from 2013-2015 didn't fare as well because of the drastically changing river, there was an uptick in the out-migration of natural chinook smolts in 2017, McHenry said.

"I expect when those fish return as 3-, 4- and 5-year-olds, we'll see the contribution of natural-origin chinook increase," he said, "But for now, basically, 90 percent of the returning chinook adults are still hatchery-origin."

– T. Royal

Above: Heidi Hugunin, a National Park Service fish technician, helps tribal fisheries consultant Keith Denton measure a chinook salmon in the Elwha River.

Left: Otoliths are small mineral structures often referred to as "ear bones," which can be used to determine a salmon's origin.





K. Neumeyer (2)

Stillaguamish Tribe's Sampling Discovers Harmful Algal Bloom

Port Susan closed to shellfish harvest in October because of a harmful algal bloom that was detected by the Stillaguamish Tribe's routine plankton sampling.

"Port Susan was one of the last remaining open areas in the sound," said Franchesca Perez, Stillaguamish marine and shellfish biologist. "It is now closed due to the risk of paralytic shellfish poisoning."

After the dinoflagellate *Alexandrium catenella* was found in a sample from Kayak Point, mussels collected from the area were found to have three times the amount of toxins that could kill a person who consumed one mussel. Notifications were sent out to the public and the bay was closed to harvest.

The tribe has been sampling plankton at Kayak Point since 2013 as part of the SoundToxins early warning program.

"If a certain concentration of toxin-producing algae is found in a plankton tow,

then the program notifies the Department of Health, which then tests shellfish tissue to determine if the toxin is present," said Maggie Taylor, Stillaguamish natural resources technician.

Perez and field project coordinator Rick Rogers scraped about 100 mussels from the pier at Kayak Point and shipped them overnight to Olympia.

"Within 24 hours of collection, the toxin concentration was determined," Perez said.

The first mussel sample contained more than 1,600 micrograms of the toxin per gram of tissue. A second sample taken the following week measured about 500 micrograms per gram of tissue.

This is the first time the tribe's sampling has discovered a harmful algal bloom.

"Thanks to the tribe's participation, it was detected early, just as the monitoring is designed to do," Perez said.

"We have not seen any more

of the offending organism, *Alexandrium catenella*, in our plankton tows," Taylor said. "Since this is the first time we have observed a high concentration of *Alexandrium* in Port Susan, it's difficult to say how long the toxins will persist. Bloom duration is highly variable between Puget Sound sub-basins but typically only lasts a few weeks."

The factors that cause a toxic bloom are not entirely understood. They have been associated with higher water temperatures, which could mean that rising temperatures due to climate change could lead to greater severity and duration of the events.

The SoundToxins program is managed by the National Oceanic and Atmospheric Administration's Northwest Science Center, Washington Sea Grant and the Washington Department of Health.

– K. Neumeyer



Top: Stillaguamish natural resources technician Maggie Taylor scrapes mussels from a pier in December to determine whether the shellfish tissue still contains a poisonous toxin following a harmful algal bloom in October. Above: Taylor packs mussels to send to the Department of Health to test for harmful toxins.

Toxins Detected Before Shellfish Are Afflicted

The Skokomish Tribe is measuring the amount of toxins in harmful algal blooms in Hood Canal as part of an early warning system for shellfish poisoning.

While the tribe is part of the SoundToxins program to monitor shellfish and algae, it also is adding another level of precaution.

“The concept is to quantify the toxins in the water and algae before they get into shellfish tissues so we can share that information with the researchers at DOH and SoundToxins and say, ‘Hey, look for this in your samples,’ ” said Seth Book, the tribe’s environmental biologist.

Toxins associated with algal blooms can cause sickness and even death when contaminated shellfish are eaten.

During the first year of the tribe’s program, samples were taken weekly from 13 locations between the Hood Canal Bridge and Belfair from May to September. Bloom events and associated toxins in Hood Canal were identified and categorized.

The tribe hired Dr. Sang Seon Yun to use the tribe’s newly developed water quality lab to analyze the samples on site instead of sending them away for testing.

The biggest success so far has been seeing the tribe’s testing

methods work, since they were able to find toxins as low as parts per billion, Book said.

“Although the levels we found were extremely low, shellfish concentrate these toxins in their flesh,” he said.

If a harmful algal bloom occurs in Hood Canal during the winter months, the tribe’s lab immediately will be able to analyze samples, said Ron Figlar-Barnes, the tribe’s lab manager.

The tribe looks for eight main toxins, including domoic acid, which causes amnesic shellfish poisoning and can result in permanent loss of short-term memory, or even death in severe cases. Other algal toxins of interest to the researchers are toxins associated with diarrhetic and paralytic shellfish poisoning.

These toxins are often associated with the term “red tide,” which occurs when certain phytoplankton species with reddish pigments bloom.

“Not all harmful algae are colored red though, and not every algae bloom is harmful, but it is still a mystery what triggers algae to produce the neurotoxin,” Figlar-Barnes said. “When the toxin occurs, the poisonings can affect sea animals, birds and humans.” – T. Royal

Skokomish Tribe intern Aaron Bentson-Royal takes water samples from Hood Canal last summer as part of the tribe’s harmful algal bloom monitoring program.

T. Royal



T. Royal

Skokomish tribal member Danielle Cagey harvests invasive varnish clams from the Skokomish Estuary tidelands.

Varnish Clams Find Market

The Skokomish Tribe removed thousands of pounds of invasive varnish clams from Skokomish Estuary tidelands last summer.

A varnish clam looks similar to a manila clam, but has a peeling brown shell, like old furniture. The non-native clam from Japan showed up on the West Coast in the early 1990s and is found throughout Hood Canal.

“There are so many varnish clams here, we’re trying to figure out if we can create a bait or consumption market for them,” said Blair Paul, the tribe’s shellfish biologist. Although this was the first harvest, by fall the tribe had found a consumption market with weekly demand up to 2,000 pounds.

The project is part of a larger effort to improve the shellfish habitat after damage from upstream land use.

Historic logging practices, hydropower projects, agriculture and transportation activity, plus the construction of dikes and levees, altered the river’s natural processes for decades.

As a result, the tidelands were starved of coarse sediment and smothered by fine sediment. To remedy this, 1,000 cubic yards of gravel were spread on the tidelands over the summer.

The tribe plans to spread Pacific oyster cultch (shells) and clam seed on the tidelands each spring for the next three years. Ultimately, about 13 acres of manila clam habitat and 15 acres of oyster habitat will be added.

Technical assistance is being provided by the Puget Sound Restoration Fund, with funding from Naval Base Kitsap. – T. Royal





Squaxin Island tribal member Joey Furtado bags oysters picked on Hammersley Inlet.



John Furtado, Squaxin Island Tribe, tosses a couple of oysters into a bucket on a private tideland on Hammersley Inlet.

E. O'Connell (2)

Tribe, Landowners Share Oyster Bumper Crop

The Squaxin Island Tribe partnered with private landowners to share the benefits of a bumper crop of oysters.

“Over the last two years, environmental conditions seemed to have improved for Pacific oysters, and we saw an unusually large natural set across the area,” said Eric Sparkman, shellfish biologist for the tribe. “While there are usually a handful of places where we see self-sustaining populations of Pacifics, the set we saw was really off the charts.”

The increased population meant more oyster harvest op-

portunities for Squaxin tribal members.

Some of the highest densities were on private tidelands, where the tribe has a treaty right to half the naturally occurring shellfish. Tribal staff proposed an alternative that benefited tribal harvesters as well as a dozen private tideland owners along Hammersley Inlet.

Under the plan, tribal harvesters would pick the entire harvestable population of oysters and then sell the harvest to a non-tribal buyer. Part of the proceeds of that sale would go back to the private tidelands

owner.

The process of working with the tribe and the harvest itself were painless, said John Culton, one of the private tideland owners.

“I was working with their staff for weeks. They were there every step of the way. They were very friendly,” Culton said. “They did everything, from doing the survey to setting up the pick. The next thing I knew there was a check in the mail.”

“Twenty years ago, when we were working through how we’d exercise our treaty-reserved and court-affirmed

harvest right on private tidelands, there was a lot of fear-mongering going on,” said Andy Whitener, natural resources director for the tribe. “People were claiming that we’d trample on private property rights and it would be a disaster. But because we work together, everyone sees a benefit, from the tribal harvesters, the landowners, and even the private shellfish dealer who is able to sell the oysters.” – E. O’Connell

“While there are usually a handful of places where we see self-sustaining populations of Pacifics, the set we saw was really off the charts.”

– Eric Sparkman,
Squaxin Island Tribe shellfish biologist

Invasive Knotweed Replaced with Forest

The Squaxin Island Tribe is replacing salmon-killing invasive weeds with a streamside forest.

The tribe recently planted an acre of new forest along Skookum Creek. During the last five years, the tribe and Mason County Conservation District effectively have controlled the invasive knotweed

that was rapidly spreading throughout the watershed.

"It is almost impossible to find any knotweed left in the watershed," said Andy Whitener, natural resources director for the tribe. "We're replacing it with a forest that can help salmon."

Knotweed is a fast-spreading and adap-

tive invasive species mostly found along stream corridors. Controlling it across an entire watershed is a significant accomplishment.

"Knotweed is incredibly tough; people have even found it growing on slopes with no apparent water source," said Sarah Zaniewski, a tribal salmon habitat biologist.

Tribal and conservation district staff tracked knotweed infestations each growing season throughout the watershed using global positioning system technology. Conservation district crews then used that data to treat the infestations with herbicide by either spraying the plants or swabbing the leaves by hand.

The tribe is replanting with native species found to grow well throughout the watershed, providing shade and nutrients that support healthy stream habitat.

"Streamside forests should include the kind of features that salmon evolved to depend on," Zaniewski said.

Skookum Creek has crucial coho and chum spawning and rearing habitat. Naturally spawning populations of coho are on a gradual decline throughout the region, in part because of declining freshwater habitat. – E. O'Connell



E. O'Connell

David Dorland, Squaxin Island Tribe natural resources technician, plants a tree along Skookum Creek.

Logjams Reverse Erosion Limiting Salmon Habitat

Last fall the Squaxin Island Tribe and the South Puget Sound Salmon Enhancement Group built 14 logjams at the mouth of Goldsborough Creek in Shelton.

The logjams will capture sediment and help restore the creek's estuary, where the stream bed has been eroding since the early 1990s.

"The logjams at the mouth of the creek and in the harbor will restore the equilibrium that has been disturbed since a ferry dock was removed decades ago," said Scott Steltzner, environmental program

manager for the tribe.

The erosion hasn't just limited salmon habitat, but has threatened underground utility lines.

"Over the next decade or so, we'll see sediment building up and the creek will start repairing itself," Steltzner said.

The logjam project is part of a larger salmon restoration effort being led by the tribe on Shelton Harbor. The tribe is coordinating the effort with Simpson Timber, Sierra Pacific Industries, the Port of Shelton, Capitol Land Trust, Mason Conservation District and the



E. O'Connell

Scott Steltzner, Squaxin Island Tribe environmental program manager (left), points out a logjam to Brandon Palmer with the Port of Shelton.

enhancement group.

"This project shows that we can accomplish significant gains in salmon habitat while also protecting the existing in-

dustry and jobs in the harbor," said Andy Whitener, natural resources director for the tribe.

– E. O'Connell



K. Neumeyer

From left: Tulalip tribal members Shana Simpson, Lynette Frye and Annie High Elk mix a cold and flu remedy tea at a traditional medicines class taught by Elise Krohn (in red).

Got a cold? Try a cedar steam

Tulalip tribal members learned how traditional plants can keep them healthy through the winter, and took home some healing tea and honey from a class offered by the Diabetes Prevention and Care Program in November.

Participants also prepared a cedar steam by cutting boughs into a bowl, covering with hot water, and breathing under a towel. Cedar repels bacteria and viruses, while stimulating white blood cells and promoting immune function. The steam relieves congestion.

The class was part of a series taught by traditional foods educators Elise Krohn and Elizabeth Campbell, in collaboration with Lower Elwha Klallam storyteller Roger Fernandes. Participants received a *Feeding 7 Generations* Salish cookbook produced by Krohn and Valerie Segrest, who coordinates the Muckleshoot Tribe's Food Sovereignty Project.

In addition to medicinal plants, lessons focused on traditional foods such as deer, elk, berries, tea, salmon and shellfish.

The goal is to connect food education with traditional teachings about the land and environment, said

Veronica Leahy, Diabetes Care and Prevention coordinator.

"We weave everything together," she said. "It's our health and it's all connected. And part of that is teaching about feeding the seven generations; learning to live with the spirit; diversifying your diet; eating more plants, traditional and wild foods; how we cook and eat with good intention; and giving back to the land."

Multiple generations of families attended the classes. At the end of the winter remedies lesson, tribal members mixed a cold and flu tea from elderflower, elderberry, peppermint, yarrow, licorice root and rosehips. Others strained an herbal honey that had been cooking throughout the lesson in the Betty J. Taylor Early Learning Academy kitchen.

Tulalip's Diabetes Prevention and Care Program is a comprehensive program for the treatment of diabetes and promotion of long-term holistic health. In May, it received the Portland Area Director's Award at the Department of Health and Human Services Indian Health Service Recognition of Excellence ceremony. – K. Neumeyer

ANCESTRAL TEACHINGS



Courtesy of Shallee Baker

Suquamish tribal member Trentin Moss, left, class taught by Port Gamble S'Klallam elder community smokehouse.



T. Royal

Chief Kitsap Academy student Brandy Boure practices filleting salmon. The students participated in the Suquamish tribal salmon harvest. They learned to harvest, fillet, clean, brine, smoke and can salmon.



Gene Jones, right, in the Port Gamble S'Klallam



Collin Edwards super-
school's Ocean To Table program, where they
on.



Courtesy of Josh Mason

Ancient Shrimp Pot Design Still Works 3,000 Years Later

Shrimp pot technology from 3,000 years ago holds up compared to modern designs.

Squaxin Island tribal member Josh Mason made a cedar shrimp pot based on an artifact found near the mouth of Hood Canal.

"When researchers first looked at it, they assumed it was a crab pot," Mason said. "But they were able to find shrimp DNA on it."

Like contemporary models, the cedar pot allows shrimp to enter the main chamber through a tunnel. Shrimp climb the walls as they try to escape, but an inverted rim directs them back to the pot's center.

"The design of it was pretty ingenious that our ancestors came up with," Mason said. "With the technology that they had, they could understand how shrimp couldn't swim straight up."

Mason tested the pot with cousin Daniel Kuntz, a commercial crabber.

"The first time we pulled it up, we had 13 shrimp," Mason said. "The second time we pulled it up, we had 23 shrimp."

"I didn't have any expectations," Kuntz said. "I was like 'What? Holy cow! Let's get this thing back down there. Let's get some time on this thing.'"

Mason studied under Ed Carriere, a master weaver and Suquamish tribal member. He previously made a shrimp pot based on a 2,500-year-old artifact, as well as a fish trap and a clam basket.

The cedar pot is durable compared to contemporary metal and rubber shrimp pots.



E. O'Connell

Above: Squaxin Island tribal member Josh Mason made a cedar shrimp pot based on an artifact. Top: The pot catches shrimp efficiently.

"It holds its own with modern pots," Mason said. "Even after the pot had been in the water for a long time, I thought it would be loosened up. It kept its shape."

"The biggest difference between this pot and one you'd buy today is that it's all organic," Mason said. "If one of those new ones falls apart, you have junk. If this one falls apart, I guess you have firewood."

— E. O'Connell

Surveying Neah Bay's Rocky Beach Habitat

The Makah Tribe studied the marine habitat and species along its rocky shoreline in Neah Bay last summer.

The tribe's long-term goal is to gather baseline data for comparison after a catastrophic event such as an oil spill and to monitor the effects of climate change.

Makah's marine ecologist Adrienne Akmajian and a team of technicians noted the types of seaweed, grasses and algae, plus urchins, anemones, sea stars and other invertebrates.

The tribe focused on 28 sections of beach within the reservation during the lowest tides to catalog species composition and abundance.

"The reservation's primary beach habitat is made up of low, flat rock platforms," Akmajian said. "We want to know what are the dominant

vegetation and invertebrates."

The tribe also wants to compare beaches to determine similarities between species within similar habitat types.

"Because I cannot survey every inch of beach on the reservation, I want to know if I can use the data gathered from one area and extrapolate to other areas with similar habitat or shoreline," Akmajian said.

"The intertidal is a highly variable ecosystem and I hope to implement annual monitoring of at least a handful of sites," she said.

By collecting the baseline data, follow-up surveys over the next few decades will allow the tribe to see shifts in species composition, abundance or life history that could be related to climate change or other possible disturbances, she said.

– T. Royal



T. Royal

Makah's marine ecologist Adrienne Akmajian and fisheries technician Erica Hundrup note species found during a survey of the rocky shoreline in Neah Bay.

Wetland Inventory Update Addresses Climate Change

The Tulalip Tribes are updating their wetland management plan and inventory using high-resolution imaging, field data collection and climate change forecasts.

"Accurate, detailed and current wetland mapping is a cornerstone of sound wetland management and protection efforts," said Jonathan Hall, Tulalip wetland biologist.

The work includes refining an inventory of 475 reservation wetlands, ponds and lakes. Improved aerial and satellite data will update a geographic database used by tribal staff in the natural resources, planning, fisheries, wildlife, forestry, construction development, public works and code enforcement departments.

The wetland plan aims to provide sound, consistent and effective standards to enhance native vegetation diversity and increase habitat for culturally significant fish and wildlife.

In 2016, the tribes began a climate change adaptation planning effort to identify at-risk resources, including wetlands,

streams and other aquatic sites.

"We're looking at potential changes to coastal wetlands as a result of climate change," Hall said. "As sea level rises, habitat types will shift inland and upstream. We're trying to estimate what effect sea level rise will have on the reservation. What's now salt marsh, in 20 years might be mud flat. What's now forested wetlands along Quil Ceda Creek – those non-brackish wetlands will change from forested to salt marsh."

In the meantime, the tribes are restoring lost types of wetlands in the region.

Tulalip has seen a surge in development activity because of positive economic factors.

"In a wetland buffer, we have to work with landowners doing development," Hall said. "We provide technical advice if they have to do mitigation. If we find violations, we often provide technical advice on restoring or enhancing wetlands."

– K. Neumeyer



K. Neumeyer

Tulalip wetland biologist Jonathan Hall checks on the progress of a wetland restoration.



T. Royal (2)

Left: Hans Daubenberger, Port Gamble S'Klallam senior research scientist, transfers an adult female chum into a test tank. Above: Port Gamble S'Klallam project biologist Julianna Sullivan, left, and biologist Emily Bishop measure a female chum.

Testing Dissolved Oxygen Levels on Salmon Eggs

The Port Gamble S'Klallam Tribe is studying how low dissolved oxygen (DO) levels affect salmon egg development.

The tribe took 18 adult female chum salmon that returned to the tribe's Little Boston hatchery last fall and exposed groups of them to tanks of fresh water with various DO levels.

One group of fish was exposed to 10 milligrams of DO per liter of water, representing the preferred water conditions for healthy streams around Hood Canal. A second group was exposed to 2 milligrams of DO per liter and a third group was exposed to 3 milligrams of DO per liter. Each group was exposed in its assigned tank for 36 hours.

"The brief exposure mimics when fish swim through Hood Canal during a low DO event, versus a chronic exposure, when they're in a low DO situation and can't swim away," said Hans Daubenberger, the tribe's senior research scientist.

The 2 and 3 milligram levels are what fish may encounter during a low DO event or while in a low-flow stream during the summer, he said.

Following exposure, the salmon were spawned and incubated in the tribe's hatchery. Daubenberger and his staff will evaluate the development of the eggs over the winter as they mature.

The primary indicator is expected to be significant egg mortality, he said, but if that isn't apparent,

then they'll observe the physical development of the fish.

The experiment is two-fold: to assess climate change impacts and fisheries management techniques.

"With climate change, we expect to see warmer water temperatures in the near future, which causes low DO," he said. "It's an inverse relationship – as water temperatures increase, the maximum saturation of dissolved oxygen in water decreases."

Because fisheries managers survey creeks for egg nests as a way to determine fish populations, it would be helpful for them to know if the eggs are dying because of low dissolved oxygen, he said.

– T. Royal

"With climate change, we expect to see warmer water temperatures in the near future, which causes low (dissolved oxygen)."

Hans Daubenberger,
Port Gamble S'Klallam Tribe senior research scientist

Sutherland Kokanee, Elwha Sockeye Possible Cousins

The Lower Elwha Klallam Tribe has discovered that Lake Sutherland kokanee is a unique population, possibly related to Elwha River sockeye.

For nearly 15 years, the tribe has been studying the genetics and health of Lake Sutherland kokanee before, during and after the removal of the Elwha River's two fish-blocking dams in 2011-2014. Lake Sutherland is connected to the river by Indian Creek.

Aside from annual testing for parasites, bacteria and viruses, scientists from the National Oceanic and Atmospheric Administration and the University of Washington studied the kokanee's genetics and egg sizes.

"A genetics baseline showed that the Lake Sutherland kokanee population didn't match up with other stocks in the state, including those that were planted in other lakes," said Mike McHenry, the tribe's habitat program manager. "This suggests that the Sutherland stock is unique and possibly related to the anadromous population in the Elwha River."

The study showed that the eggs from Lake Sutherland kokanee were larger than other populations, also suggesting a link to their sockeye cousins, he said.

Unlike sockeye, kokanee spend their entire lives in fresh water. Because they don't migrate to sea to feed, kokanee tend to be much smaller than their anadromous counterparts.

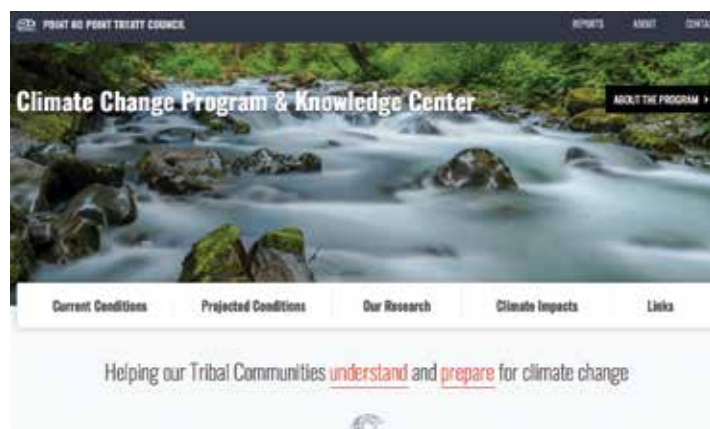
Like sockeye, kokanee spawn only once in their life cycle, typically in rivers and streams that are tributaries to lakes but also on lake shores, mainly where groundwater comes up through gravel.

– T. Royal



T. Royal
Matt Stinson, Northwest Indian Fisheries Commission microbiologist, takes tissue samples from kokanee to test for parasites, bacteria and viruses.

Climate Change Website Focuses on Tribal Research



The Point No Point Treaty Council has published a new website that stresses the importance of climate change science and how it is affecting Northwest treaty tribes' natural resources.

"The goal of the site is to help tribes, agencies, partners and the general public better understand the science behind climate change in the Northwest, using local examples," said Cynthia Rossi, the council's habitat program protection manager.

The PNPTC is a consortium that supports the Jamestown and Port Gamble S'Klallam tribes' natural resources departments.

The website explores the region's current and projected habitat conditions, current research, and climate impacts to natural resources.

"Interactive components include maps to help visitors visualize the broader area of concern and illustrate the importance of natural resources to our tribal communities," Rossi said.

The site features ongoing tribal research, including studies of estuaries in Hood Canal and the Strait of Juan de Fuca that are important for shellfish harvesting and salmon habitat.

There are also easy-to-read visuals that plot current and projected conditions that reveal higher air temperatures and rising sea levels for the region, using models based on historic data that goes back as far as the 1950s.

"This website strives for clear visuals combined with scientifically validated information, which can identify vulnerabilities in the region," Rossi said. "It can also assist our tribes and partners as they develop plans for better adaptation strategies into the future."

The PNPTC Climate Change Program and Knowledge Center can be found at climate.pnptc.org. – T. Royal

Choice Chum



T. Royal

Skokomish tribal member Lena Prest pulls in a beach seine during a chum salmon fishery at the Hoodspout Hatchery in November. The tribe typically exercises its treaty right to harvest chum salmon in front of the hatchery every fall.

Fish Ticket System Goes from Paper to Electronic

A fisheries innovation grant is helping tribal fish buyers transition from paper to an electronic fish ticket system.

The Northwest Indian Fisheries Commission received the National Fish and Wildlife Foundation grant to provide hardware and training to licensed seafood dealers as well as tribal fisheries staff who are licensed as dealers by member tribes.

Dealers receive an Android-based tablet to collect data that have traditionally been recorded on paper tickets. The buyer enters the data at the time of sale, and the information is transmitted to a secure website where it is available for download by the tribes. A transaction receipt can be printed for the buyer and seller for each sale. The receipt is designed to meet enforcement needs.

The grant pays for the tablets and printers. The electronic system is

likely to reduce data entry errors or redundant reports. The system also will provide fisheries managers with real-time harvest data, and gives tribes the ability to limit the information shared with state co-managers.

Buyers and staff for the Lummi Nation have tested the tablets, said Craig Dolphin, database manager for Lummi Natural Resources.

"I have adapted our database to import e-ticket information from the portal, and have worked with the developers to provide the ability to automate ticket downloading," Dolphin said. "We have plans to have some buyers begin using the e-tickets in tandem with paper tickets."

Tribes that are interested in transitioning to the electronic fish ticket system should contact Amy Seiders at aseiders@nwifc.org or (360) 528-4361.

– K. Neumeyer



K. Neumeyer

Breena Apgar-Kurtz, Lummi harvest management biologist, tests the new electronic fish ticket system.

Reflecting on the Fish Wars, Treaty Rights Struggle

Decades after the Fish Wars of the 1960s and '70s, Puyallup tribal members are still working to protect tribal treaty rights.

At the tribe's annual Fish Wars remembrance in September, tribal members and activists reflected on the civil disobedience that led to the Boldt decision reaffirming tribal treaty fishing rights.

Puyallup tribal members Dakota Case and Chester Earl spoke just hours after being arrested at a protest against a planned liquefied natural gas plant on the Puyallup Tribe's reservation. Construction had continued at the plant despite the Puyallup tribal council issuing a Stop Work Order.

"The most amazing part of that night was when I got released at four o'clock in the morning, this elder right here, Ramona Bennett, was sitting outside the jail waiting for us," Earl said. Bennett is a Puyallup tribal member who was influential in the fishing rights struggle.

Earl pointed out that decades earlier, Bennett met his mother when she was released from jail after her arrest during a fishing rights protest.

Other speakers described how the struggle for treaty rights impacted families, especially women.

Nancy Shippentower-Games, a Puyallup tribal member, recalled a specific 1965 fish-in when state fisheries enforcement officers used violent tactics to arrest women on the Nisqually River.

"There are all these books about



E. O'Connell

Dakota Case (left) and Michael Hall, members of the Puyallup Tribe of Indians, open the annual remembrance of the Fish Wars.

these men. I'm looking at these books and there are women in these stories," Shippentower-Games said. "Our women stood up and were warriors just like the men were."

Despite the hardships, families pulled together around their children. Tribal communities held dances and salmon bakes to raise money for struggling families. They also provided emotional support

for children with parents in jail.

"During the fishing rights struggle, I felt so loved, like most of the kids that went through the struggle," said Roberta Wright-Basch, a Puyallup tribal member. "When you're going through the trauma, you walk through it. And yeah, part of it was trauma, but the other part was such great love." – *E. O'Connell*

GENERATIONS

Willie Frank Sr., Nisqually Tribe, guides a river canoe in 1962. The father of NWIFC Chairman Emeritus Billy Frank Jr., Frank Sr. also was an important witness leading to the Boldt decision and later cases. He was 104 years old when he died in 1983.

River canoes differ from open water or ocean canoes because of their shorter length and flat bottoms. They effectively navigate shallow stretches of Puget Sound rivers and are easy to control. The canoes are light and buoyant enough for a single fisherman to steer with a long pole in one hand, while playing out a drift net with the other.



Courtesy of the Washington State Historical Society

Nisqually Tribe Hatchery Shares its Salmon Bounty

Salmon fishermen aren't the only ones who benefit from the Nisqually Tribe's Clear Creek Hatchery.

Every fall, about 2,000 people line up for free salmon at the hatchery on Joint Base Lewis-McChord. The tribe needs only the eggs and milt from returning adults to raise the next generation of salmon. Some hatcheries sell the rest of the fish, but Nisqually wants to make sure its neighbors have access to the bounty.

Sgt. Kenneth Hubbard was first in line for the salmon giveaway this year. When Hubbard showed up last year, he found a long line.

"This year I got here a little before eight o'clock," he said. "I wanted to make sure I got down here early."

Soldiers and their families, in particular, benefit.

"I didn't know that this was a resource that could be shared with so many people," Hubbard said. "It is good for the soldiers, it is a great event."

In addition to the community giveaway, the tribe also saves a portion for tribal elders.

"We are a community that has always depended on salmon," said Farron McCloud, chairman of the Nisqually Tribe. "This food is vital to us and sharing it is part of our culture. It's also a way to educate people about how important it is to us and what salmon need to thrive. It takes all of us for that to happen."

The tribe releases 4 million chinook and 700,000 coho each year from its hatcheries. In addition to Clear Creek Hatchery, the tribe operates a hatchery on Kalama Creek and a rearing pond on McAllister Creek. – E. O'Connell



E. O'Connell

Clear Creek Hatchery volunteers hand out free salmon to community members after the fish were spawned in the hatchery.

K. Neumeyer



Thankful for Salmon

Swinomish Sen. Kevin Paul, left, watches Willie Montoya of the Swinomish Fish Co. pack boxes of smoked chinook and coho salmon.

The fish plant smoked thousands of pounds of the fish to share with tribal families at Thanksgiving and Christmas.

"The creator has blessed us with the best food in the world," said Swinomish Chairman Brian Cladoosby, after sampling the finished product.

WALKING ON

Lonnie Foster



Lonnie Thomas Foster, 61, of the Quileute Tribe, passed away Nov. 10, after a brief yet aggressive battle with cancer. He was born April 10, 1956.

Foster had recently married his longtime love and business partner, Karen, on Oct. 29, after a 35-year courtship and three children.

Nicknamed Lonzo, he was both a logger and a fisherman. After working in the woods for years, he switched careers to become a deckhand in La Push, eventually purchasing the 37-foot *F/V Vega*. He earned his captain's license and

later upgraded his vessel with the 68-foot *F/V C.F. Todd*.

Foster served on the Quileute Natural Resources Committee from the 1990s until present day, helping make policy decisions and preserve treaty rights. Foster also held a seat on the Quileute Tribal Council from 2010-2013.

Foster is survived by his wife Karen Foster; sons Josh (Lindsey) Sims and Rio Foster; daughter Emily Foster; brothers Tony (Narcissus) Foster, Ed Foster and Charlie (Bonnie) Sampson; sisters Rae Lynn Martinez and Ardis Minter; father Vern (Alice Mae) Foster; and many loving nephews, nieces, grandchildren and extended family.

He is preceded in death by his mother Marvella Sampson, stepfather Wilbur Sampson and sister Ardis Foster.

Salmon Film Featuring Billy Frank Jr. Earns Top Award

A video featuring Billy Frank Jr. won best animated short film in November at the American Indian Film Festival in San Francisco.

The film, *sčədadx*™ (salmon) was produced by Salmon Defense with Injunuity, an Oakland, California, production company.

It features an animated Billy Frank Jr. floating upriver, telling the story of salmon's connection to the Pacific Northwest people, the arrival of the settlers, habitat degradation, and the unification of people throughout the world working together to save salmon and salmon habitat.

Watch the video at nwtt.co/salmonbfj.

