Inside this issue:

The Taku River Tlingit (TRT) Fisheries Department is preparing for our 2022 field season. We wanted to update everyone on the Fisheries Program and provide information on the status of the Taku salmon runs. You may notice that some of the articles in this Newsletter are repeats from our previous newsletter (including "Some Background in How Salmon are Managed in the Taku" and "Sockeye Enhancement"). This is because these articles provide important background information that does not change year-to-year.

Any feedback on what you would like to see covered in our next newsletter would be most welcome!

We hope you enjoy the newsletter !

Fisheries Department Program Summary:

The core funding for TRT Fisheries Department comes from the Aboriginal Fisheries Strategy (AFS). This is Federal funding to support TRT involvement in salmon management on the Taku River.

The Fisheries Department has helped initiate the Taku salmon Resiliency Project thru funding from the Department of Fisheries and Oceans (DFO) and the Taku Atlin Conservancy (TAC). More on this project in the following pages.

2022 AFS Stock Assessment Projects

The TRT will be running its AFS (Aboriginal Fisheries Strategy) program again this summer with sockeye weirs at King Salmon and Kuthai Lakes as well as a Chinook carcass weir on the Nakina River. The Fisheries Department now uses underwater motion-activated video equipment on all our fish weirs. The advantage of using this equipment is that : 1.) it gives us a permanent record of fish moving through the weir that can be double-checked 2.) it allows the fish to pass through the weir at any time (fish are never being held up, and don't need to be handled) and 3.) reduces bear problems at weir as fish are not held in pens. The following are projects that the TRT has run for many years and intends to do so again this season.

Kuthai Lake Weir: This project erects a weir at the outlet of Kuthai Lake to record sockeye salmon entering the lake to spawn. The project starts on July 4th and runs until Sept 3rd. Kuthai Weir employs 2 Fisheries Technicians

King Salmon Lake Weir: This project erects a weir at the outlet of King Salmon Lake to record sockeye salmon entering the lake to spawn. The project starts on July 5th and runs until Sept 4th. King Salmon Weir employs 2 Fisheries Technicians

Nakina Carcass Weir: This project erects a weir across the Nakina River to try to sample 1000 chinook salmon carcasses for age (scales), length, sex and tags. The project starts July 30th and ends August 26th and employs 2 Fisheries personnel.

Canyon Island:

The TRT Fisheries Department provides one staff to support the Canyon Island fish wheels located just across the border in Alaska. This TRT staff person supports the Alaska Department of Fish and Game in tagging salmon for the mark-recapture program that is used to estimate salmon abundance on the Taku . More about mark-recapture to follow in this newsletter.

Photo (right): Fish wheel at Canyon Island

Tatsatua River Chinook Sampling:

This project collects age, sex and length data from Chinook on the Tatsatua River using rod and reel. Chinook are caught and measurements and scales taken. The project hires 2 TRTFN Fisheries technicians and runs from August 15 to approximately September 15th.

Photo (right) Jason Williams hard at work on the Tatsatua River

New TRT Fisheries /Lands Department Workshop and Office Space:

The TRTFN Fisheries Department is collaborating with the TRTFN Land Guardian Program to build a workshop to provide a space to store and maintain department equipment. The intention is to build office space on the second floor above the workshop. Construction of this facility is ongoing and is located directly North of the older TRTFN Administrative Building.

Tulsequah Fish Habitat Compensation Investigations:

Previous attempts to re-open Tulsequah Chief Mine required a federal authorization to impact fish habitat and resulted in a fish habitat compensation fund valued at approximately $760,000. The TRT Fisheries Department is collaborating with DFO on the development of a plan for how to use this bond to enhance fish habitat, develop a monitoring plan for the chosen option, and conduct community outreach. As part of this project we looked at several potential sites for creating fish habitat including Rodgers Slough (on the Tulsequah) and at the Taku slide. Current thinking is that connecting the Tulsequah Airstrip burrow pit to Shazah Creek may create excellent and self-sustaining salmon spawning habitat. This pit was dug to provide gravel for the construction of the Tulsequah airstrip. It is currently isolated from the adjacent watercourses, which limits the ability of fish to move in and out of the pond.

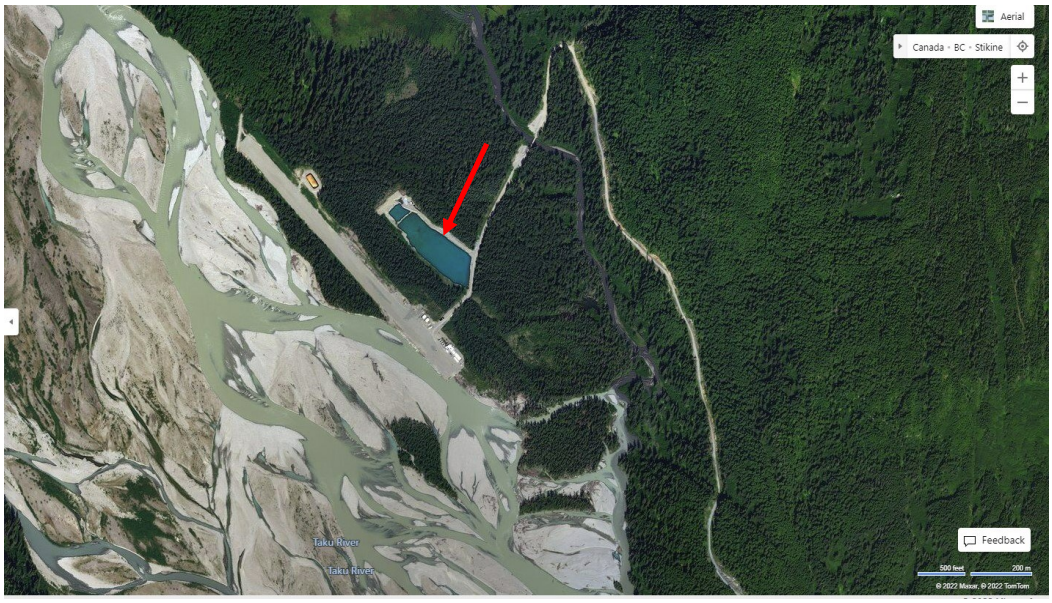


Photo (top) aerial photo showing the burrow pit (red arrow) near the Tulsequah airstrip

Photo (bottom) The burrow pit being considered as an option for enhancing fish habitat in the Tulsequah Valley.

Salmon Resiliency Project:

Taku Research Collaborative: Braiding Indigenous and Western Science to Assess and Advance Climate Resilience of a Salmon Watershed

The Taku is the physical and cultural heart of the Taku River Tlingit First Nation (TRTFN): the foundation for Tlingit *kustiyixh*, or 'way of life'. The TRTFN are committed stewards of the Taku watershed and their conservation and governance achievements have been significant. The Atlin-Taku Land Use Plan (2011), developed as part of on-going co-governance relationships between TRT and BC, designated the watershed as a no commercial logging zone, and established a system of protected areas across nearly 50% of the watershed. These conservation measures, co-governance model, and TRT's active participation in the Pacific Salmon Treaty provide a powerful foundation for activities to advance science, conservation, and governance that could serve as a flagship system for Indigenous-led research and stewardship.

The extent of protected areas, combined with the intact nature, size and diversity of the Taku watershed provide ecological resilience to the effects of climate change and a profound opportunity to understand how landscapes, salmon and the cultures tied to them may adapt and evolve to rapid change. The Taku River Tlingit have a long history of partnership with a diversity of organizations that share their stewardship commitment and interest in the Taku watershed. The Taku Research Cooperative will develop an Indigenous-led, holistic, place-based approach to watershed research, monitoring and management that can also serve as a scalable model across freshwater ecosystems that merges Indigenous knowledge and culture with Western science.

The Taku Research Cooperative includes three goals:

- Develop TRTFN-led research for assessing and monitoring current and potential future climate change effects at the watershed scale that brings together Indigenous knowledge and Western science;
- Develop enduring partnerships with research institutions and other organizations that can advance the generation of critical knowledge about the current and potential future conditions of the Taku River;
- Evaluate management options in response to anticipated climate change related challenges/ opportunities within the identified sub-watersheds in the Taku watershed.

The Taku Research Cooperative follows the collaborative concept of '*wooshtin wudidaa*', meaning flowing together and the physical enactment of ethical space. The late respected TRT Elder, Jackie Williams, spoke about the confluence of the clear waters of the *Naak' ina. aa* (Nakina River) and the glacial *L'ooxh' u Heen* (Sloko River) in the Taku watershed as a metaphor for the power of collaboration between Tlingit and non-Indigenous partners. "This is what the coming together of the Nakina and Sloko represent. This is an example of how Mother Earth teaches us. She shows us how to work together." (Taku River Tlingit First Nation, 2013). See photo to right.

The Cooperative will support the creation of formal TRTFN Research Stations in the Taku watershed at already identified locations with existing infrastructure. The 1-2 Stations will provide support for: 1) research and monitoring activities in the Taku watershed; 2) training for Indigenous Land Guardians, Indigenous and non-Indigenous youth, and young professionals; and 3) places for cultural resurgence and reconnection of Tlingit to the watershed including through traditional protocols and ceremonies.

These collaborative processes, practices, and principles will lead to knowledge, management, and governance systems that are holistic, ethical, and that integrate multiple ways of knowing and support eco-cultural resilience in this era of rapid climate change.

Over the next 3 years, collaborative research will seek to understand how a changing climate is affecting the salmon habitats of the Taku through monitoring, research, predictive modeling, and expert knowledge elicitation. Salmon are highly susceptible to changes in climate due to their anadromous life histories and dependence on local environmental conditions. Potential impacts of climate change in the Taku include: increased summer water temperatures, increased winter peak flows, decreased summer and fall flows, decreased snow accumulation, glacier retreat, and natural hazards such as increasing numbers of landslides. The Taku River watershed supports a vast diversity of different environmental and habitat conditions that may well provide significant resilience for salmon.

The research priorities will include completing a resiliency assessment of sub-watersheds including understanding where existing critical salmon habitats (e.g., spawning, rearing, etc) may degrade, improve, or stay stable based on predicted shifts in environmental conditions. While some sub-watersheds may be threatened by warming temperatures and decreasing summer flows, other sub-watersheds may have potential opportunities for increases in salmon habitat quality and quantity in some locations with glacier retreat and changing environmental conditions.

A New Lake Forming in Tulsequah Valley

As the climate warms and the glacier retreats in the Tulsequah Valley, a large lake is forming at the toe of the receding glacier. This lake is of interest to the TRTFN Salmon Resiliency project due to its future influence on the valley's changing landscape and its potential to be fish habitat in the future. In the fall of 2021, researchers and TRT Fisheries staff investigated the lake as part of the Salmon Resiliency project.

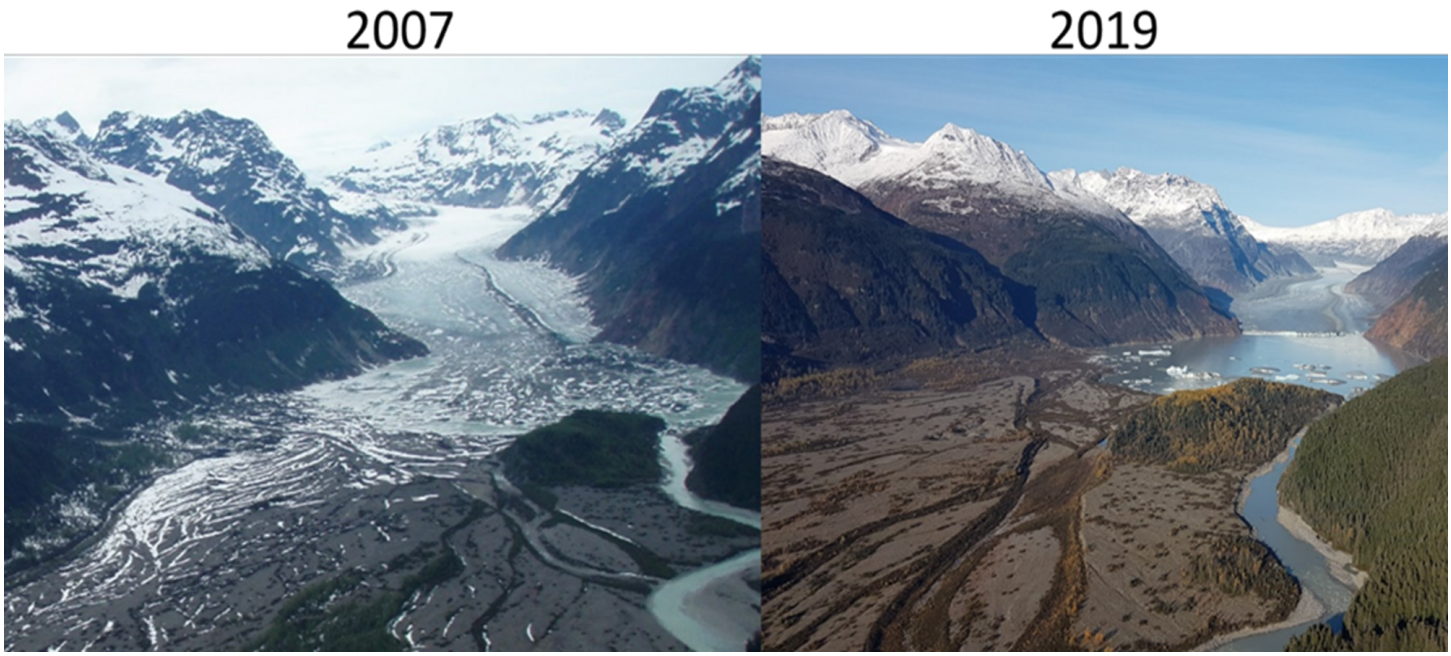
What we found is that the lake is VERY deep (over 110 meters deep!) and therefore will likely remain a persistent feature on the landscape for many years to come. Currently there is very little plankton (but some) in the lake due in part to the very cold temperature.

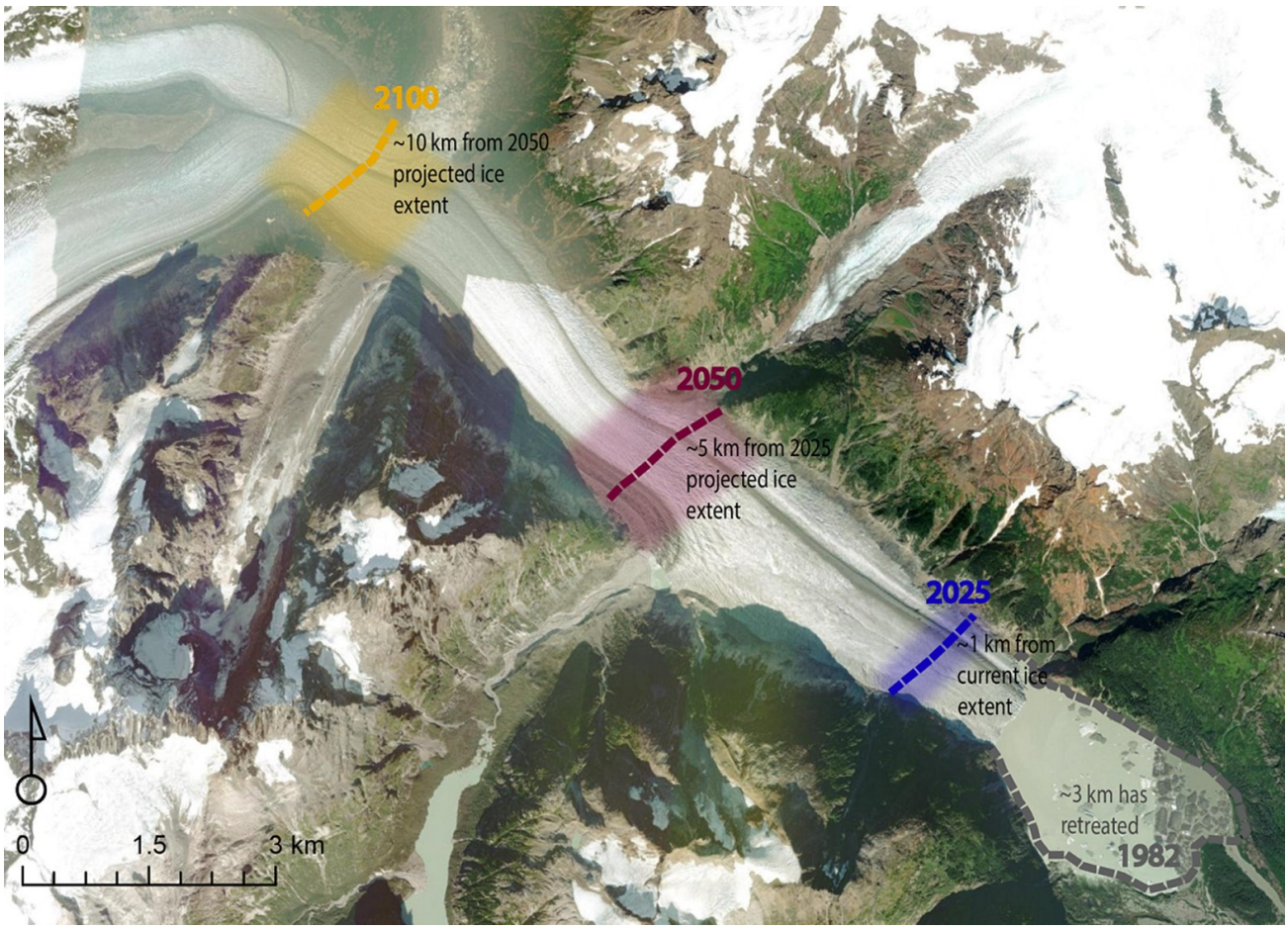
We will continue to monitor this lake into the future to see how/when it becomes fish habitat.

The TRTFN Elders have been updated and are considering a Tlingit name for this lake.

Photo above shows the new lake with the Tulsequah glacier in the background.

The photos below show how much the lake has formed since 2007.





The image above shows the predicted rate of glacial retreat in the Tulsequah Valley over the next 75 years.

Photo of new lake at the toe of the Tulsequah glacier (right)

2021 Taku Water Temperature Monitoring

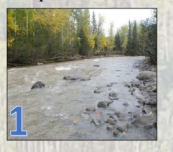
Project Objectives

- Collect hourly water temperature data across a variety of habitats (38 sites) and retrieve first year of data in fall 2022
- Integrate data into a broader assessment of sub-watershed vulnerability of salmon to climate change

Water temperature & salmon

- Water temperature influences salmon survival, growth, and behavior
- Warm water can inhibit upstream migration of spawning salmon
- Water temperature influences egg hatch timing, juvenile growth rates, and thus ocean survival

Sloko upstream of Nakonake



Headwaters of the Nakina

Water temperature & the Taku

We predict that a variety of watershed features will influence water temperatures and thus climate resilience, including:

- Glaciers
- Wetlands, beaver ponds, and lakes
- Average air temperature
- Snowline elevation
- Rain timing and magnitude

Tulsequah-Shazah focal area

Nahlin near mouth of Tseta Creek

Mouth of the Dudidontu

Tatsatua Creek below Tatsatua Lake

Installation components

(many temperature loggers are attached to cables bolted to rocks)

Water temp logger | Rock drill | Rock bolt hardware | Finished installation

TAKU RIVER TLINGIT First Nation

SFU SIMON FRASER UNIVERSITY

FLATHEAD LAKE BIO STATION UNIVERSITY OF MONTANA

Field crew: Mark Connor (TRT), Jon Moore (SFU), Chris Sergeant (UM), Erin Sexton (UM); Background image: Confluence of the Nakina and Sloko Rivers; Images taken by Chris Sergeant and Jon Moore

Knowledge Hubs : Food Fishing at Inklin Camp

As part of the Salmon Resiliency initiative, we are seeking to bring together Tlingit people with scientists and resources mangers to allow for an open exchange of ideas and information. This summer we will be conducting Tlingit food fishing at the Taku Atlin Conservancy's (TAC) Inklin Camp on the confluence of the Inklin and Taku Rivers. Using this camp for food fishing will expand where food fishing occurs on the Taku and hopefully allow more Tlingit people to participate. It is our hope and expectation that the Inklin Camp will evolve to be a centre for Tlingit food security, cultural exchange and traditional practices.

Photo (right) Currently most food fishing occurs on the lower Taku River near Cranberry island

Chinook Stocks Continue to Struggle in 2022

Information and studies are showing that the downturn in Taku Chinook production is not likely related to any freshwater issues, but rather marine / ocean survivals. In particular, early marine survival is suspected as a key problem. Indications from some research suggests that juvenile Taku Chinook (in the near shore marine environment) are "hanging out" on their own and therefore more prone to predation. Whereas juvenile coho are "hanging out" with an abundance of pink and chum, which provides them with a predation buffer. To note, other ocean conditions are likely to be contributing factors further along in the Chinook life cycle (i.e. warming ocean temperatures, food web, competition, predation of adults etc.) Unfortunately, there is very little / nothing obvious we can do to help Chinook at this specific life stage. What we can and have been doing is limiting harvest of Chinook salmon in the commercial and sport fishery.

The Taku Chinook forecasted run size for 2022 is the lowest on record. As a result there will once again be no directed commercial fisheries for Canada or the U.S. during the 2021 season. There will also be no retention of any Chinook in the sport fishery. The issues with Chinook are not just in the Taku and are part of a larger regional issue.

Kuthai Lake Access Issues

The purpose of this project is to address the decline of sockeye salmon in Kuthai Lake since 2006 . Field assessments revealed that the decline in Kuthai sockeye is the result of access problems in the lower Silver Salmon River canyon. Since the fall of 2018, a TRTFN Fisheries crew has been working in the canyon to improve passage for sockeye to Kuthai Lake. Prior to 2021, access issues had been due only to low water conditions.

In 2021 the Silver salmon experienced very high water levels. Monitoring found that sockeye were not making it past the falls. This was puzzling because previously, high water had not caused problems in the canyon. Review of past video showed that a rock had shifted and blocked a high water by-pass channel that had allowed for fish passage previously. The TRTFN Fisheries Department will access the site in April 2022 to rectify with support from DFO.

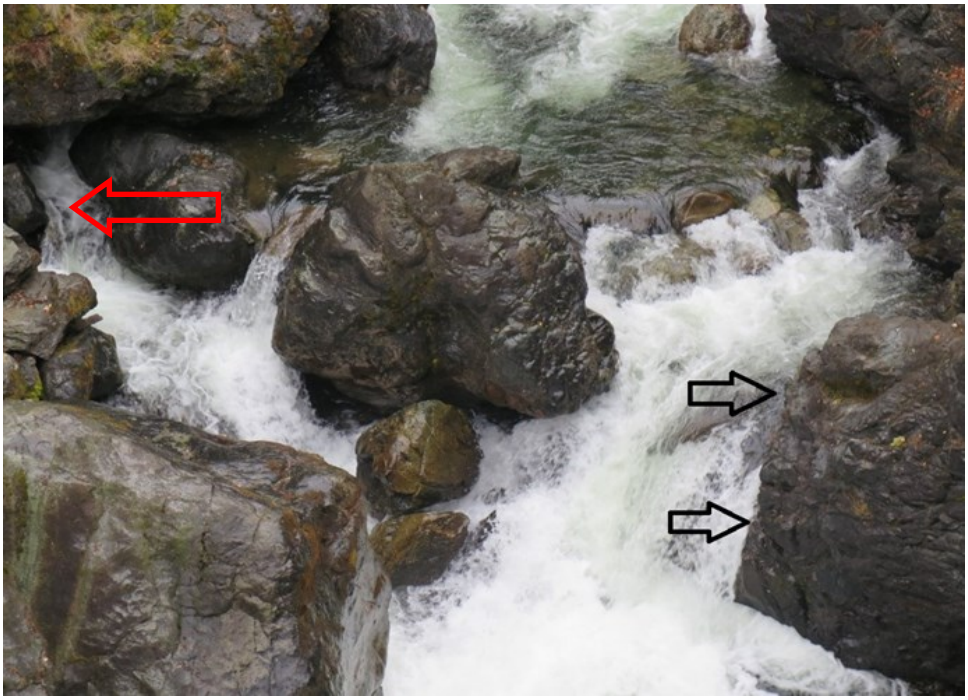


Photo above left: red arrow shows potential by-pass channel. This photo was taken in 2019. Note absence of rock. Black arrows show where rock work at falls has been undertaken previously by TRT Fisheries to improve low water passage

Photo (left) from 2021 showing 'new rock' (red arrow) note salmon attempting to get past

Sockeye Enhancement

In recent years, the TRT Fisheries Department has been active in working to address concerns regarding the enhancement of Taku sockeye. Engagement and actions have been conducted at political, management, community and project levels. In this regard, we have been mindful of long-standing (but still relevant) TRT mandates that include:

- Continuing to support the development and use of a comprehensive planning, assessment and review process for enhancement projects;
- Having TRTFN clearly involved in the decision-making process, including the consideration of social and cultural values;
- Helping to specify timelines, thresholds and guidelines for major decisions on projects.

Thru previous international negotiations, the TRT interests listed above have been acknowledged in provisions of the Pacific Salmon Treaty. Now we are seeking to put them into practice and utilization. The TRT Community Enhancement Workshop conducted in late 2019 provided key input to move forward with. It demonstrated that cultural values cannot be simply listed out, rather they are engrained in how TRT members respect, treat and interact with salmon in our Territory. It also confirmed that in general, TRT citizens have a:

- High level of support for access improvement projects (like Kuthai Lake/Silver Salmon);
- Comfort level of enhancement for stock restoration purposes (like King Salmon Lake);
- Consistent discomfort for enhancement which is only conducted for production purposes.

Currently a relatively small proportion of the Taku sockeye run are "enhanced" (hatchery) fish and the Taku run is predominately wild fish. Some enhancement activities are ongoing at Tatsaminie and Little Trapper/Trapper Lakes.

Photos (above and to left) sockeye smolts at King Salmon Lake

Some Background on How Salmon are Managed in the Taku

Salmon from the Taku River drainage are caught by US and Canadian fishers. Sockeye are the primary commercial species. The number of fish each country is allowed to catch is set out in the international Pacific Salmon Treaty. Right now Canada gets about 20% of Taku sockeye and Alaska gets 80%.

Commercial salmon fishing in the Taku is managed by determining how many salmon above the 'escapement' can be harvested. Escapement refers to the number of salmon that 'escape' to make it back to the spawning areas. The 'escapement goal' refers to the number of salmon that are needed to return to the spawning areas to ensure the salmon population is sustained.

The amount of commercial fishing allowed is determined based on an estimate of how many salmon are returning to the river. One of the major ways biologists use to determine how many fish are returning is with the 'mark/recapture' method.

Mark/recapture:

Salmon are captured in a 'fish wheel' located just across the Canadian border in Alaska. The current of the river turns the wheel and salmon are captured in the baskets. Salmon are tagged, measured and sexed. The fish are then released back into the river to continue their upstream migration to the spawning areas. The number of tags recaptured in the commercial fishery and weirs is used to calculate the salmon run size.

In simple terms, the mark recapture method uses the proportion of tags collected relative to the number of tags put on salmon to determine the population of salmon. For example, let's say the fish wheel puts out 100 tags and the commercial fishery captures 200 fish total, 50 of which have tags. So this means the fishery has caught half the tags (100 tags put out, 50 recovered = 1/2). Therefore we estimate the fishery has captured half the fish in the river. Since the total number of fish caught by the commercial fishery was 200, we estimate that the total run size during that time was 400 fish (200 x 2 =400). This is a simplistic presentation, in reality things like drop-out rate (number of fish who die after being tagged) needs to be factored in. This estimate is done every week during the commercial fishery and is used to determine how much fishing can be done. The amount of fishing is regulated by the length of 'Openings'. An Opening is a period of time a fisher is allowed to fish. So a 2 day Opening means you can fish for 2 days.

This in-season adjustment to the catch (openings) is why we want to know every week from our camps how many tags have been recovered at the weirs.

In many regions sockeye salmon spawn only in lakes. However, in the Taku we have some sockeye that spawn in lakes and other populations that spawn in rivers (mainstem spawners). There are 4 main sockeye spawning lakes in the Taku drainage (Tatsamine, Little Trapper, Kuthai and King Salmon). All the 4 sockeye lakes have weirs. The purpose of these weirs is to:

- Collect precise information on the number of returning salmon
- Count the number of tags in the returning population of salmon (part of the mark/recapture work)
- Sample some of the returning salmon for sex and length
- Collect scales for aging the fish sampled
- Use this information to get a picture of (reconstruct) the run characteristics (ages, sex ratio, numbers)

Fish scales are collected for aging the salmon. Salmon grow at different rates during the year (slower in winter) and this shows up on their scales as rings (Annuli). You can count the annuli and age the fish much like you can age trees by counting their rings. The reason we want to know the age of fish is to determine the age composition of the run because this helps us predict what future run sizes will be.

Salmon return to spawn at different ages, but the proportion of the run that returns in any year stays about the same. Therefore if you know what the age composition of the run is in any year it helps you predict what future run sizes will be.

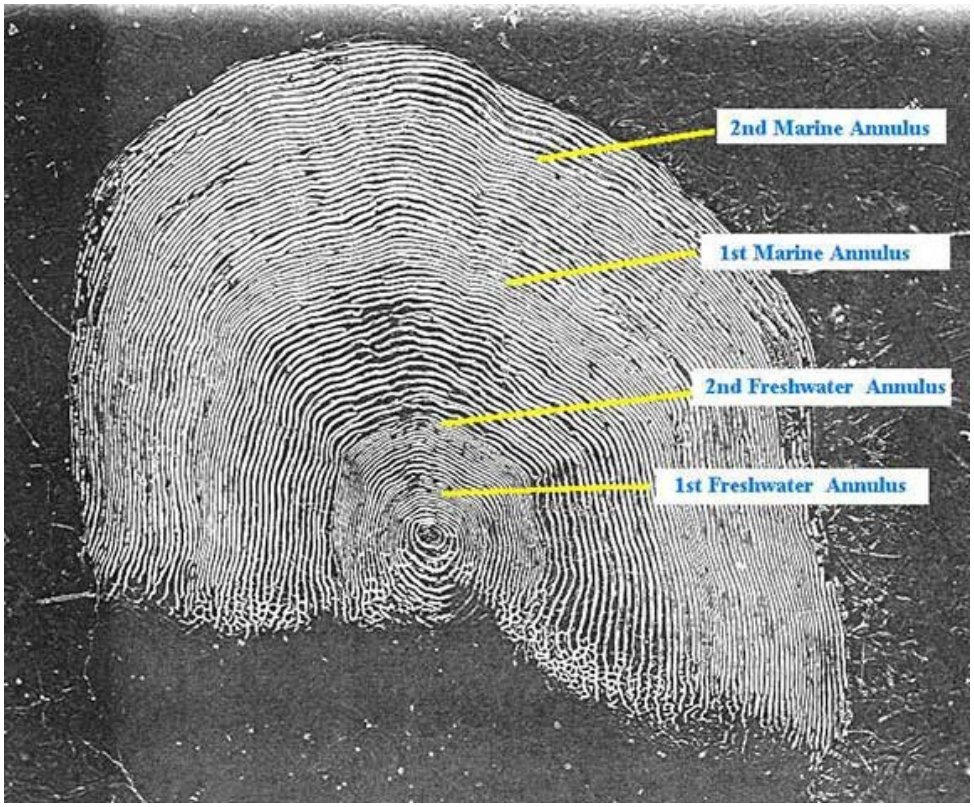


Photo (right) Example showing annuli of a fish scale

Summary of 2021 Taku River Salmon Run:

The following tables summarize last season's 2021 Taku River salmon run :

2021 Taku salmon escapement* :

	Chinook	Sockeye	Coho
Escapement estimate	11,341	153,531	75,526
Escapement goal range	19,000—36,000	40,000-75,000	50,000-90,000

***** The escapement is the number of fish that 'escape' to make it back to the spawning grounds

Taku River Salmon Run Forecasts 2022

Below are the forecasts for the 2022 Taku River salmon terminal runs. Of note is the very low forecast for Taku chinook.

Species	**Preseason run Forecast**	**Average run size (10 year)**	**Escapement Goal (range)**
Chinook	6,600	16,000	19,000-36,000
Sockeye (wild)	128,000	150,000	40,000-75,000
Sockeye (enhanced)|	5,500	10,000	n/a
Coho	87,000	99,000	50,000 –90,000

Gunalchéesh !

Thanks for taking the time to read up on what the TRT Fisheries Department is up to these days. If you have any questions, concerns or information you would like to see presented in our next newsletter please don't hesitate to contact us:

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Taku River Tlingit Fisheries