

**Yukon River Panel Restoration and Enhancement Fund
Project Proposal Summaries for 2022**

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Conservation

#1. Temperature monitoring of Yukon River Chinook Salmon spawning and migration habitats in Canada. Year 10.

AvF Research & Development

This will be the final year of the Program. The Program was initially designed to provide data for a ten year period. It has largely met these criteria. Monitoring Stations on some rivers, however, have not been easy to operate. Recent high waters have initiated bank erosion and channel migration. Loggers have been lost. Remaining loggers will be removed in autumn of 2022. Third parties will be approached to replace my loggers with their own. As originally proposed, the Goal was: To develop a publicly accessible baseline of the thermal regimes of Yukon River Chinook Salmon spawning and migration habitats in Canada.

And the objectives of the program were:

1. To continue collection of high resolution, high quality water temperature data that are representative of the waters monitored, comparable to other streams and rivers, and allow measurements to be repeated in the near and more distant future.
2. To distribute data collected and the results of preliminary analysis (daily mean/maximum/minimum temperatures) to FN/State/Territory/Federal agencies, institutes and NGOs and others, encouraging a wider knowledge of water temperatures in the YR Canadian Sub-Basin.
3. To prepare an annual Project Report, resulting in dissemination of information and provision of network and environmental context to managers and interested parties.

#2. KDFN Michie Creek Salmon Monitoring Project 2022. Year 24.

Kwanlin Dün First Nation

The sustained focus of this project is the continued preservation of a unique Chinook population above the Whitehorse Rapids Dam. The Michie Creek spawning population represents one of the longest migrations of Chinook salmon in the Yukon Drainage Basin (~ 3,000 km) and is upstream of the Whitehorse Rapids Dam. It is also a unique stock that is extremely vulnerable to overharvest since these migratory fish must pass through multiple fisheries in Alaska and Yukon jurisdictions. Juvenile progeny from this population must also contend with mortalities associated with downstream passage through the Whitehorse Rapids Dam during outmigration.

The main spawning habitat for this population is situated in upper Michie Creek. Access is sometimes blocked by beaver dams especially during low water years. To mitigate potential barriers, KDFN crews typically survey the upper reaches for barriers just prior to the arrival of migrating salmon. If barriers are located, they are mitigated to allow for fish passage using hand tools. Barrier removal mitigation has been ongoing for over two decades.

The Whitehorse Rapids Fish Ladder provides upstream salmon migrants the ability to pass the Whitehorse Hydro Dam. The efficiency of this structure for passing upstream migrants remains

uncertain however a recent 4-year tagging study by the Canadian Wildlife Federation suggests the efficiency may be lower than expected. Evidence has not only included tagging to monitor salmon behaviour but successive years where many unspawned and partially spawned female carcasses of both wild and hatchery origin have been discovered in slack water areas below the dam. This project is intended to compare the incidence of successful spawning between a natural spawning area (Teslin River) with those below the Whitehorse Dam to identify if this is a potential bottleneck to the Michie Creek population.

This project has the following objectives and goals: • Maintaining access by adult Chinook to the primary spawning habitat in upper Michie Creek by removing any barriers that impede the upstream movement of salmon; • Environmental monitoring of hourly temperature and flow at the upper Michie Creek spawning site, and temperature at the Whitehorse Rapids Fish Ladder as an index of habitat quality; • Monitoring of the Chinook spawning populations in Michie Creek, M'Clintock River, Yukon River (Lewes Reach below the Whitehorse Rapids Dam) and Teslin River (Johnson's Crossing) by collecting age, sex, and length data; egg status and volume (females); coded wire tags (hatchery origin), and DNA collections as requested; • Continuation of KDFN stewardship activities related to the management, maintenance and protection of salmon stocks and habitat; • Provide local capacity building, including technical training and employment for Kwanlin Dun First Nation Citizens. • Deliverables: Report, prespawn and partially spawn comparisons between four separate Chinook spawning populations, hourly temperature (Whitehorse Rapids Fish Ladder and Michie Creek) and flow data with presentations as requested, meeting with stakeholders, KDFN beneficiaries, the media and other researchers to disseminate and collect information about the Michie Creek population and ambient conditions.

#3. Takhini River Chinook Salmon Sonar Project – Year 2.

Kwanlin Dün First Nation

This project involves continuing Chinook salmon enumeration on the Takhini River (Yukon River tributary) to monitor spawning escapement in the watershed. During 2017 and 2018, sonar enumeration of Chinook salmon was successfully completed by the Department of Fisheries and Oceans, Whitehorse. During 2017, DFO successfully conducted an assessment to determine the feasibility on sonar enumeration on the lower Takhini River. The sonar operated from August 10 to September 5 and including run expansion and species apportionment, an estimate of 1,872 Chinook was derived. Test netting was also conducted; 15 Chinook salmon and 36 freshwater fish were captured. The sonar was operated again during 2018 in an effort to enumerate a larger portion of the Chinook run with the project operational from August 1 to September 5. An estimate of 1,554 Chinook was derived, again including run expansion and species apportionment. The amount of test netting was increased compared to 2017 and resulted in the capture of 54 Chinook salmon and 11 freshwater fish.

The specific objectives of the 2022 Takhini River Chinook salmon sonar project are as follows:

- Provide an accurate, in-season and post season count of Chinook salmon escapement into the Takhini River during 2022;
- Conduct test netting to confirm species in the sonar count data between Chinook salmon and all other larger freshwater species;
- Collect age, sex, length (ASL), genetic and scale samples from Chinook salmon captured during the test netting program;
- Provide local capacity building, including technical training and employment for Kwanlin Dun First Nation Citizens; and
- Provided site tours and visits to the sonar to neighboring First Nation's technical staff, KDFN leaderships and citizens.

The deliverables of the 2022 project will include: • Daily sonar counts provided by KDFN and fisheries managers (DFO) during the operation of the sonar. • A detailed technical report outlining the methods used and results from this project (daily and cumulative estimates of Chinook salmon passage at the sonar site, test netting effort and capture data, pre and post season expansion and a discussion of suggestions for subsequent years of operation). • Samples (genetics and scales) will be collected from all adult Chinook encountered in the Takhini River during test netting and subsequently provided to DFO.

The findings of this project will help to set the stage for stock restoration in the Takhini River watershed by providing accurate estimates of spawning escapement prior to the initiation of a well-designed restoration project.

#4. Tatchun Creek Chinook Enumeration. Year 2.

Little Salmon Carmacks First Nation

Tatchun Creek is a Chinook spawning and rearing creek that is approximately 5.5 km long running from Tatchun Lake to the Yukon River. The creek is located approximately 25 km north of Carmacks and within the Traditional Territory of the Little Salmon Carmacks First Nation. Tatchun Creek has long been known as an important spawning area, from both traditional use and the recent classification by Brown et al. (2017) as one of four spawning areas in the Yukon River mainstem(Canada) area that is a major producer.

Goal: This project will deploy a weir equipped with a video counter to record all adult salmon migrating into the Tatchun Creek from the mainstem Yukon River. This will build on the successful pilot program conducted in 2021, to restart regular enumeration of returning adult Chinook salmon to Tatchun Creek.

Objectives: Install and run a weir in Tatchun Creek just above the mouth into the Yukon River. Weir will run for 50 days including set up and take down. Deliverables: Reestablishment of regular Chinook salmon enumeration program at a historical weir site; Daily and total counts of adult Chinook escapement to the Tatchun Creek spawning ground; Determination of run composition (sex and size) determined passively from review of video files; Collection of daily environmental data (water level and temperature); and Active fish sampling is not planned for the 2022 project year but may be incorporated in future iterations.

#5. Klondike River Chinook Sonar – Year 3. Year 8.

Tr'ondëk Hwëch'in First Nation Government

Tr'ondëk Hwëch'in (TH) citizens are physically, culturally and spiritually connected to the Yukon River salmon fishery. This fishery has been a major contributor to the traditional economy since time immemorial and the Tr'ondëk Hwëch'in, or people of the river, have historically focused salmon harvest at the confluence of the Yukon and Klondike Rivers, or Tr'ochëk. As a primary stakeholder in subsistence and commercial salmon fisheries, TH has a vested interest in the health of salmon stocks found within our Traditional Territory. Klondike River Chinook salmon have faced declining populations for a number of decades and we have been involved with and have supported salmon restoration projects in our Traditional Territory. We hope that our continued and persistent involvement in restoration efforts will one day result in the return of healthy salmon stocks to this watershed. There are a number of candidate streams for Chinook stock restoration within the TH Traditional Territory due to a combination of historical harvesting practices and habitat associated effects. These include Coal Creek, Fifteenmile River, Chandindu River and Klondike River. The Klondike River appears to be the highest priority candidate for stock restoration due to connection with Tr'ondëk Hwëch'in culture and heritage, historic contributions, historical impacts and accessibility.

Klondike River Chinook have been impacted both during and after the Klondike Gold Rush due to large-scale dredging/placer mining and associated hydroelectric developments. It is for this reason that TH prepared a Chinook stock restoration plan for the Klondike River watershed during early 2018 (EDI and TH 2018). The restoration plan identified an instream incubation trial be conducted on the Klondike River to gather information on egg survival and timing of development. This project was funded by the Yukon River Panel during 2018, 2019 and a third year in 2020, however a combination of high water level, turbidity and poor run conditions prevented the instream incubation trails from occurring. Therefore, a fourth (final) year was initiated during 2021 through a concurrent proposal to the R&E Fund; at the time this proposal was prepared, the 2021 instream project is underway. A second component of the 2021 instream incubation project is the refinement of the Klondike River Chinook Stock Restoration Plan in order to further refine the methods for future restoration initiatives in the watershed. For 2022, TH has a concurrent proposal to the R&E Fund to build upon the success of the instream incubation project to use an egg incubator purchased during 2021 to release unfed emergent Chinook fry into the Klondike during the spring of 2023.

This current proposal is to continue sonar operations on the lower Klondike River during 2022 to monitor spawning escapement to the watershed. From 2009 to 2011, a sonar was operated successfully on the Klondike River by B. Mercer and Associates. However, the site used previously is no longer desirable due to land tenure and access constraints and therefore a new site was identified directly downstream of the Klondike River bridge 2.6 km downstream of the former site. In 2020, a sonar was operated successfully at this new site located on the north side of the river adjacent to a TH land parcel.

The specific objectives of the Klondike River Chinook sonar are as follows:

- Provide an accurate, in-season and post-season count of Chinook salmon escapement into the Klondike River watershed during 2022 (and ideally for at least one entire life cycle).
- Collaborate with DFO to refine the sampling design for the operation of the Klondike River Chinook sonar during previous years.
- Continue to focus on local capacity building, including technical training and employment for TH citizens with respect to sonar enumeration. The deliverables of this project will include:

- A detailed technical report outlining the methods used and the findings of the sonar and

associated carcass pitch and trial test netting. The report will also include recommendations for future operation of the sonar.

**#6. Genetic Stock Identification of Chinook Salmon in Alaskan Test Fisheries, 2022.
Year 7.**

Alaska Department of Fish & Game

Canadian-origin Chinook salmon (*Oncorhynchus tshawytscha*) migrate through approximately 1,200 miles of fisheries in the Alaska portion of the Yukon River drainage, and the Alaska Department of Fish and Game (ADF&G) manages those fisheries with a view to delivering to the Alaska-Yukon border the agreed spawning objective plus the midpoint of the Canadian guideline harvest range as defined in the Yukon River Salmon Agreement (YRSA). Within this context, effective management requires an understanding of the proportion of the total run of Yukon River Chinook salmon that is Canadian-origin, and effective evaluation of the YRSA requires an estimate of total harvest by stock. Genetic tissue samples collected from test fisheries operated in Alaska allow ADF&G to estimate run and harvest stock proportions. This project expands upon previous R&E funded proposals that provided estimates of stock proportions and stock-specific abundance using samples collected from the test fishery associated with the Pilot Station sonar (PSTF). For 2022, we propose to continue inseason and postseason genetic analysis of samples collected at the PSTF, but we will also include postseason genetic analysis of samples collected at the Lower Yukon Test Fishery (LYTF), which will inform stock specific harvest estimates for lower Yukon River fisheries. As in past years, the ADF&G Gene Conservation Laboratory (GCL) will use genetic mixed stock analysis (MSA) to report stock composition estimates of samples collected from the test fisheries.

#7. Pilot Station fall season extension, 2022. Year 2.

Alaska Department of Fish & Game

The primary objective of this project is to more completely assess the late portion of fall chum and coho salmon passage at the Pilot Station sonar project by extending field operations beyond the August 31 end date to September 7. The daily estimates from the extended period will be reported to fishery managers daily, archived in the Arctic–Yukon–Kuskokwim Database Management System (AYKDBMS), and included in the annual project report.

#8. Pilot Station and Eagle Summer Sonar Extended Operation, 2022. Year 2.

Alaska Department of Fish & Game

The primary objective of this project is to increase the accuracy of Chinook salmon passage estimates generated at both the Pilot Station and Eagle sonar projects by extending field operations at both projects by one week, from May 24 -May 31 (Pilot Station) and June 23 -June 30 (Eagle). This would provide managers with greater confidence in both abundance, GSI, and border passage estimates for the Yukon River Chinook salmon run. The daily estimates from the extended period will be reported to fishery managers daily, archived in the AYK Database Management System (AYKDBMS), and included in the annual project report.

#9. An Integrated Run Abundance Projection Model for Canadian-origin Yukon River Chinook Salmon. Year 1.

We propose to develop a new statistical model to assist agencies responsible for managing the Canadian-origin Chinook salmon (*Oncorhynchus tshawytscha*) stock in meeting objectives outlined in the Yukon River Salmon Agreement. This new model will improve upon and seamlessly integrate existing preseason forecast and inseason run projection models within a unified Bayesian statistical framework. Our approach will use a process whereby preseason expectations of total run size can be updated in real-time based on available stock-specific information collected inseason. A Bayesian updating model, like the one we propose to develop, addresses the challenge management agencies face when deciding how and when to transition from making management decisions based on preseason information to decisions based on inseason information. By approaching this challenge through an integrated modeling framework, management agencies will benefit from inseason projections that are transparent, objective, reproducible, statistically defensible, and address uncertainty in ways that explicitly assist with fishery management decisions.

Our proposal builds upon the current work of the Yukon River Joint Technical Committee (JTC; Chinook Salmon Forecast Subcommittee) and Alaska Department of Fish and Game (ADF&G). We propose to develop an integrated Bayesian inseason abundance projection model for Canadian-origin Chinook salmon, which updates the JTC preseason forecast based on: (1) stock-specific daily abundance from Pilot Station Sonar, (2) preseason and inseason estimates of run timing, and possibly (3) run timing and abundance information from the Lower Yukon River Test Fishery. Performance of the integrated model will be evaluated daily for the preceding 10-year period, to retrospectively assess the reliability of model predictions throughout the season and the utility of incorporating run timing information.

#10. Juvenile Chinook Salmon Outmigration at the Yukon River Mouth. Year 4.

Yukon Delta Fisheries Development Association

This research would continue the development of a long-term data series on juvenile Chinook salmon as they migrate from the Yukon River. This data series was started in 2014 as a collaboration between the National Marine Fisheries Service (NMFS), the Alaska Department of Fish & Game (ADF&G), and the Yukon Delta Fisheries Development Association (YDFDA) to evaluate outmigration phenology, habitat use, size and condition of Chinook smolts at the Yukon River mouth prior to ocean entry. Data has been collected annually since 2014 using a

combination of grants and private funding. In 2018, 2020, and 2021 the Yukon Panel provided funding through the R&E fund for data collection and analysis. Since 2016, YDFDA has been the Principal Investigator for this research facilitating and overseeing the sampling process, collecting samples and environmental data, and providing support for field sampling crews. NMFS has been a collaborator on this research providing laboratory analysis of field samples for diet and energetic condition and managing and analyzing the field data. In addition to providing the only source of information on juvenile Yukon River Chinook salmon smolts immediately prior to ocean entry, this unique collaboration also directly involves members of the communities of Emmonak and Alakanuk in conservation and habitat science.

Of great concern to the project participants and communities along the Yukon River is the substantial declines in adult returns of both Chinook and chum salmon in recent years. The 2021 runs were particularly dismal. Subsistence fishing for almost all salmon species was closed. In addition to the data this project collects on Chinook smolt, we also collect relative abundance and size data on various other juvenile fish, including chum and coho salmon. As with many areas in northern latitudes, the Yukon River is experiencing rapid climatic changes that are evidenced in warmer water temperatures, decreased ice periods, and reduced ice thickness. Climate-induced impacts to freshwater systems are particularly concerning as temperature increases over land are predicted to exceed those over marine waters (IPCC, 2007) resulting in disruptions to the hydrological cycle (Woodward et al., 2010). Water temperatures in the lower Yukon River during this study have consistently exceeded by a degree or more a long-term average for the period from 1984 to 2013. Higher temperatures are associated with higher metabolic demand in juvenile fish, affecting juvenile Chinook salmon during their entire freshwater residence. In the presence of unlimited food resources, higher water temperatures can lead to increased somatic growth. However, higher temperatures also play a role in the growth, development, and quality of vertebrate and invertebrate prey (Dallas and Ross-Gillespie, 2015; Kjellman and Eloranta, 2002), creating an opportunity for a mismatch in predator-prey dynamics. Preliminary results from this research strongly suggest that freshwater factors are adversely affecting smolt productivity with implications for recruitment and adult returns.

The specific objectives of this research are to:

1. Quantify stock-group specific outmigration timing from ice out through the end of July.
2. Examine stock-group specific size (length and weight), growth, diet, and energetic condition of outmigrating juveniles in relation to environmental variables in the freshwater and nearshore marine environment.
3. Collect genetic samples to assess outmigrant origin.

The cumulative results of this research will be reported annually to the Yukon River Panel.

Restoration

#11. Klondike River Chinook Stock Restoration – Year 5. Year 6.

Tr'ondëk Hwëch'in First Nation Government

Tr'ondëk Hwëch'in (TH) citizens are physically, culturally and spiritually connected to the Yukon River salmon fishery. This fishery has been a major contributor to the traditional economy since time immemorial and the Tr'ondëk Hwëch'in, or people of the river, have historically focused salmon harvest at the confluence of the Yukon and Klondike Rivers, or Tr'ochëk. As a primary stakeholder in subsistence and commercial salmon fisheries, TH has a vested interest in the health of salmon stocks found within our Traditional Territory. Klondike River Chinook salmon have faced declining populations for a number of decades and we have been involved with and have supported salmon restoration projects in our Traditional Territory. We hope that our continued and persistent involvement in restoration efforts will one day result in the return of healthy salmon stocks to this watershed.

There are a number of candidate streams for Chinook stock restoration within the TH Traditional Territory due to a combination of historical harvesting practices and habitat associated effects. These include Coal Creek, Fifteenmile River, Chandindu River and Klondike River. The Klondike River appears to be the highest priority candidate for stock restoration due to connection with Tr'ondëk Hwëch'in culture and heritage, historic contributions, historical impacts and accessibility. Klondike River Chinook have been impacted both during and after the Klondike Gold Rush due to large scale dredging/placer mining and associated hydroelectric developments. It is for this reason that TH prepared a Chinook stock restoration plan for the Klondike River watershed during early 2018 (EDI and TH 2018). The restoration plan identified an instream incubation trial be conducted on the Klondike River to gather information on egg survival and timing of development. This project was funded by the Yukon River Panel from 2018 to 2020 and following the inability to capture broodstock during 2020, the final year of the project was delayed to 2021. Building upon the success of the instream project during previous year, TH is currently updating the stock restoration plan for the watershed to outline how stock restoration efforts be expanded beyond instream incubation in future years. As a component of the 2021 project, TH secured funding from the Yukon River Panel to purchase an egg-eyeing station. This self-contained incubation unit is capable of incubating eggs to the eyed-egg stage or swim up fry stage. For the 2022 project, TH plans to conduct an operational trial with this unit to incubate a small number of eggs to the swim up fry stage to be released into the Klondike during the spring of 2023.

The specific objectives of the Klondike River restoration project are as follows: • Conduct an aerial Chinook spawning survey to obtain a count of spawners and redds in the Klondike River and North Klondike River while also identifying potential broodstock and egg planting locations; • Collect broodstock and load up to 30,000 fertilized Chinook salmon eggs into the egg eyeing system during July 2022 to be released back into the Klondike River as unfed emergent fry during the spring of 2023. The number of eggs collected from broodstock will be dependent upon the size and health of the Chinook run during 2022; • Provide local capacity building, including technical training and employment for local community members.

The deliverables of this project will include: • A detailed technical report outlining the methods used and the findings of the project including the aerial survey results, lessons learned from the egg-eyeing station, and fry release numbers; • Samples (genetics and scales) and ASL data collected from all adult Chinook encountered in the Klondike River broodstock collection and subsequently provided to DFO.

#12. Ta'an Kwäch'än Council - Fox Creek Salmon Restoration Project. Year 17.

Ta'an Kwäch'än Council

Fox Creek is a lake-headed tributary to Lake Laberge and the Yukon River, located approximately 50 km north of Whitehorse. It lies within the traditional territory of Ta'an Kwäch'än Council (TKC) and historically supported a Chinook salmon fishery. However, since the late 1950's this stock has been extirpated. Habitat changes (forest fire, beavers and/or overfishing) may have played a role in this decline. To rebuild this extirpated stock, the Fox Creek Salmon Restoration Project, formerly known as the Community Stewardship Project, was designed in 2006 and field work on the project began in the spring of 2007. The Chinook Salmon Stock Restoration Plan was completed in 2008 and was based on Traditional Ecological Knowledge (TEK) and technical expertise from the Department of Fisheries and Oceans (DFO). The first fry were released in Fox Creek in 2009 and since then, Ta'an Kwäch'än Council (TKC) has worked closely with project partners; DFO, Yukon Energy Corporation (YEC), Whitehorse Rapids Fish Hatchery (WRFH), McIntyre Creek Incubation Facility (MCIF), Yukon College (YC) and Yukon Salmon Sub-Committee (YSSC), to restore salmon habitat and salmon stocks in Fox Creek.

Since 2013 adult Chinook salmon have been observed returning to spawn. In subsequent years TKC increased adult survey frequency on Fox Creek to ensure returning salmon were documented and spawning locations identified. This added effort allowed TKC to document redd locations, and observations and sampling efforts at these sites, in the following season, resulted in the confirmation of spawning success with abundant wild 0+fry emergence documented each summer since 2016. In 2020 TKC implemented a video enumeration weir near the mouth of the creek to obtain a more accurate number of returning Chinook. This also allowed for condition, size, sex, and origin of the adults to be more accurately documented.

After 15 years of data collection and 11 years of fry releases in Fox Creek, we are now in phase II or the second salmon life cycle of this project. With assistance and guidance from project partners we are analyzing the data to determine the success of reaching our overarching goal and the future direction of this program. Overarching Goal: "Ta'an Kwäch'än Council's goal for the Fox Creek Chinook Salmon Restoration Program is to re-establish a self-sustaining population of Chinook with sufficient spawners to have a high probability of long-term persistence, in the face of variability in survival due to natural changes in the environment. TKC aims to ensure that a viable natural stock is abundant enough to contribute to a sustainable harvest for current and future generations as part of their natural culture and heritage".

Deliverables: • TKC, with support from project partners, will continue to compile and analyze data collected over the life of the project including: juvenile Chinook condition factors; wild vs. enhanced present; spawning activity; enumeration of adults returning; water quality and temperature; hydrology. The results and conclusions will form part of the annual YRP reporting process. • By February 28, 2023, a complete 2022/23 Fox Creek Chinook Salmon Restoration annual report and financial update as well as an update of Appendix B – Phase II Annual Implementation and Monitoring Plan of the Fox Creek Chinook Salmon Restoration Plan will be provided.

#13. Deadman Creek Chinook Salmon Restoration Project – Year 6. Year 8.

Teslin Tlingit Council

This project involves the continuation of the 2016, 2017, 2018 and 2019 projects to reintroduce a spawning population of Chinook salmon to Deadman Creek using in-stream egg incubation (egg planting) methods and to further refine these methods as a restoration tool for Yukon River Chinook. The 2016 work followed a project conducted by TTC during 2015 to identify potential Chinook stock and/or habitat restoration projects in the Teslin River watershed. In 2016 TTC began the process of preparing a Chinook restoration plan for the Teslin River watershed and now has a working summary of this plan which is attached to this proposal. TTC also has a working version of a stock restoration plan for Deadman Creek which is also attached here.

The 2022 project does not plan to plant additional eggs into Deadman Creek but rather to continue monitoring juvenile Chinook in the stream and operate a video counter on the stream to determine if any adults are returning the stream as a result of egg planting efforts in previous years. In order to adequately determine whether instream incubation – or some other method – should be used to continue working towards stock restoration on Deadman, TTC requires additional time to fill knowledge gaps on egg survival from the donor stream (Morley River) through the assessment of wild survival as outlined in the concurrent Morley River 2022 proposal. The operation of the video counter on Deadman Creek during 2022 will provide valuable insights on the success of the instream incubation efforts in previous years. TTC secured the equipment for the video counter during 2021; however, the counter could not be made operational in time for deployment due to shipping and sourcing delays associated with the COVID-19 pandemic. Most Chinook in the Teslin River watershed return to spawn as 5-year olds with few 4 and 6-year olds. Egg planting numbers to date have been highest during 2017 and 2018 and as such, 2022 and 2023 have a modest potential for small numbers of returning adult Chinook to Deadman Creek.

The specific objectives of the Deadman Creek Chinook restoration project are as follows:

- Deploy a video counter on lower Deadman Creek to determine if adult Chinook are returning to the stream as a result of egg planting efforts during 2017 and 2018.
- Conduct a juvenile Chinook sampling program on Deadman Creek during the late summer of 2021 to determine the origin of the juveniles present in the stream (via genetic analysis).
- Provide local capacity building, including technical training and employment for local community members and TTC personnel.

The deliverables of the 2022/2023 project will include:

- A detailed technical report outlining the methods used and the findings of the project activities conducted including the juvenile Chinook monitoring and the video counter results.

It is important to note that the results of this project will also be used to guide TTC's future plans for Chinook stock restoration in the watershed by identifying suitable methods/conditions for hands-on restoration projects. TTC has a concurrent proposal to the R&E Fund to continue investigations and collection of comparative egg survival data on the Morley and Nisutlin rivers.

#14. Morley River Chinook Stock Restoration Research. Year 3.

Teslin Tlingit Council

This project involves the continuation of a combination of field assessments and office-based tasks to set the stage for Chinook stock restoration on the Morley River, a tributary of Teslin Lake in the upper portion of the Teslin River watershed. Morley River is well known as a high-quality Chinook spawning stream and the stream continues to be used for spawning currently. During TTC's 2018 and 2019 upper Teslin River Chinook telemetry project, 10% of the Chinook which migrated upstream of Teslin Lake were relocated in the Morley River. The watershed has two distinct portions, the first of which extends 22 km from Teslin Lake upstream to Morley Lake. The second portion extends nearly 50 km upstream to Slim and Morris lakes.

Although there are historic records of Chinook upstream as far as Slim Lake, the lower portion of the river between Teslin and Morley lakes is the most extensively used. The Deadman Creek Chinook stock restoration project has collected a considerable amount of information on Chinook spawning in Morley as this stream has served as a source of brood stock and a control stream for egg planting methods being used in Deadman Creek. From 2016 to 2020, both egg-hatching and emergence success were high and provided strong evidence of the quality of the incubation conditions in Morley River, particularly the portion directly downstream of Morley Lake where this work has focused. The portion of the Morley River where this work was undertaken is located 1-2 km downstream of Morley Lake and therefore has very little fine sediment present and the stream remains open during the winter months due to the outflow of relatively warm water from the lake. Despite these highly suitable conditions for spawning, spawner returns to the watershed are far below historic levels based upon local/traditional knowledge and historical aerial survey data. For example, four aerial surveys were completed on Morley River (August 2019) between Teslin Lake and Morley Lake as a component of the 2019 Deadman Creek Restoration project. The surveys indicated a high count of 71 Chinook on August 20 and a total count of 85 redds was made on August 29 when it is expected that nearly all spawning was complete. Aerial surveys were again completed during 2020 with the highest counts observed on August 27 counting 15 live fish and 36 redds. Historical aerial surveys conducted during the early 1980s counted as many as 326 Chinook (Barton 1984) which appears to be considerably more than have been present in recent years. Based upon this collective information and the accessibility of the watershed, Morley River is an ideal location to conduct a stock restoration initiative. The current project is proposed to collect additional information on the Morley River Chinook stock to refine a working version of a watershed-specific restoration plan for Morley River Chinook and to set the stage for implementation of a restoration initiative in the watershed.

The specific objectives of the 2021/2022 Morley River Chinook stock restoration project are as follows:

- Conduct four aerial surveys on the lower Morley River (Teslin Lake to Morley Lake) and one survey of the upper Morley River (Morley Lake to Slim Lake) to help inform future restoration efforts and provide an indication of spawning habitat utilization. In the absence of a stock assessment project on the Morley River, these surveys and the associated analysis (area-under-the-curve) can be used to provide a coarse indication of spawner escapement,
- Conduct an assessment of wild egg survival in a small number of natural redds in the Morley River using freeze coring methodology. The information collected is a key consideration for future stock restoration in Morley River through instream incubation (egg planting). THIS COMPONENT ONLY TO BE COMPLETED IN THE EVENT THAT SUITABLE NUMBERS OF CHINOOK RETURN TO THE WATERSHED DURING 2022.

- Conduct an additional year of egg planting on Morley River in order to continue to collect egg survival data and provide a benchmark of comparison for this high quality spawning habitat as compared to Deadman Creek and Nisutlin River.
- Conduct stress physiology sampling of brood stock captured to document stress levels in Morley River Chinook and the potential effects on egg survival.
- Provide local capacity building, including technical training and employment for local community members.

The deliverables of this project will include:

- A detailed technical report outlining the methods used and the findings of the field investigations conducted. This report will include a detailed description of the aerial surveys and the wild survival monitoring and draw upon comparative data from elsewhere in Teslin River watershed and further afar from other portions of the Yukon River watershed.
- ASL data, scale samples and genetic samples from broodstock captured to be provided to DFO. It is important to note that the results of this project (wild survival) will not only be useful for this project but will also fill a considerable data gap for Yukon River Chinook and will help to inform Chinook stock restoration projects elsewhere in the Yukon River watershed, particularly those involving instream incubation.

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#15. Nisutlin River instream incubation trial and aerial surveys – Year 3. Year 2.

Teslin Tlingit Council

This project involves a combination of field work and assessments, aerial surveys, and office tasks to complete a third year of a small instream incubation trial in the mainstem of the Nisutlin River with the intent of gathering comparative data for Chinook egg survival in Deadman Creek, Morley River and other Yukon Chinook spawning areas. The Nisutlin River is the largest Chinook spawning area in the upstream portion of the Teslin River watershed (upstream of Teslin Lake) as determined by local knowledge, historical information, and further supported by the results of the 2018/2019 Upper Teslin River Chinook telemetry project conducted by Teslin Tlingit Council. In recent years, Morley River has been used as a control for Chinook restoration in the Teslin River watershed (Deadman Creek). It is now believed that the incubation conditions in Morley River are near to perfectly ideal for Chinook and as such, observed survival rates from monitoring activities here likely misrepresent the average natural survival rates of salmon eggs through to emergence that would be naturally expected for a healthy spawning population to exist in other water bodies throughout this watershed. Egg survival during the 2018/19 Deadman project indicated a mean hatching rate of 75% in Morley River and 44% in Deadman Creek. Previous work done on the Nisutlin River has shown that it could potentially be a better control to compare to restoration efforts in the Teslin River watershed, and, more specifically, provide more appropriate comparisons for assessing the success of incubating activities in Deadman Creek or other spawning areas in the Teslin River watershed.

The specific objectives of the project are as follows:

- Conduct 2 aerial surveys on the Nisutlin River mainstem, and single surveys on One Hundred Mile Creek and the Wolf River, to help inform future restoration efforts, provide an index of spawners, and aid in locating broodstock collection areas. Surveys to be timed for peak spawning (to count spawners) and at the end of the spawning period (to obtain a total redd count).
- Complete an instream incubation investigation with eggs planted at a maximum of 4-6 sites in the mainstem of the Nisutlin River between the access point known as Portage and One Hundred Mile Creek.
- Conduct an assessment of wild egg survival in a small number of natural redds in the Nisutlin River using freeze coring methodology. The information collected is a key consideration for future stock restoration in the Nisutlin River through instream incubation (egg planting), and to compare to Deadman creek. THIS COMPONENT ONLY TO BE COMPLETED IN THE EVENT OF LARGER CHINOOK RETURNS AS COMPARED TO RECENT YEARS. Refer to the Technical Merit section for details.
- Conduct stress physiology sampling of brood stock captured to document stress levels in Nisutlin River Chinook and the potential effects on egg survival.
- To serve as comparative data for Deadman Creek, conduct assessments on One Hundred Mile creek, a small creek in the Nisutlin tributary similar in size to Deadman Creek, including a small instream incubation trial to assess egg survival and a wild survival assessment. This component is pending sufficient numbers of brood stock present in the stream to support the egg take. Refer to the Technical Merit section for details.
- Provide local capacity building, including technical training and employment for local community members.

The deliverables of this project will include:

- A detailed technical report outlining the methods used and the findings of the field investigations conducted. This report will include a detailed description of the aerial surveys and the wild survival monitoring as well as the field assessments on One Hundred Mile Creek.

It is important to note that the results of this project (wild survival) will not only be useful for this project but will also fill a considerable data gap for Yukon River Chinook and will help to inform Chinook stock restoration projects elsewhere in the Yukon River watershed, particularly those involving instream incubation.

#16. Fishing Branch River Chum Exclusion Device Feasibility Study and Implementation Plan. Year 1.

Vuntut Gwitch'in Government

During 2022/2023, VGG is proposing to build upon the results of several years of habitat assessment that found chum salmon in the Fishing Branch River were spawning in areas that seasonally dewatered. This project arose to begin exploring the options for excluding chum salmon from the dewatered areas discovered during our successful four-year habitat assessment project. VGG has also executed one year of instream incubation studies on the Fishing Branch River in 2019/2020. Collectively, the past habitat assessments, instream incubation studies and the currently proposed chum salmon exclusion device feasibility study and dewatering extent investigations all set the stage for future restoration of Fishing Branch River chum. A key finding of the habitat assessment work conducted from 2013 to 2018 is that a portion of the Fishing Branch River becomes dewatered during the winter months, resulting in complete egg mortality

for chum that spawn in this area. The extent of this seasonally dewatered area varies from year to year and increases in length over the course of the winter and early spring. In some years, as many as 20% of the total number of redds upstream of the DFO enumeration weir become dewatered within this area. With this information in mind, the primary objective of the 2022/2023 project is to continue completing total redd counts in the fall, investigate the dewatered extent in the spring, and complete a desktop assessment and research the feasibility of installing and maintaining a spawning chum salmon exclusion device at the downstream end of the dewatered areas. In a past year of study in this location (2019), female chum spawners were physically removed and relocated away from these dewatered areas in an effort to increase egg survival. While this was considered a success, the chum spawning run extends over a month, thus relocating females is unfeasible to do throughout the entire run timing window. While the past instream incubation studies did have positive and successful results, the returning chum numbers have been low in recent years. At the time of writing this proposal during the 2021 return, chum numbers returning to Fishing Branch are at a record low. As such, the focus for the 2022/2023 year is to shift away from instream incubation, to limit disturbance to the returning spawning population. Instead, the proposed project for 2022/2023 aims to collect more information on the number of redds in the dewatered area, as well as the extent of the dewatered area, and ultimately to direct efforts at keeping chum from entering these areas. The first year of this study would continue the fall redd count aerial surveys and the spring dewatered extent investigations, as well as concentrate on a desktop exercise to ascertain the best technique and hardware to exclude fish from these areas. Additionally, the current 2021/2022 study will conduct on the ground assessments and measure several metrics to inform the future placement of such an exclusion device. Using this information, a future project would aim to install and monitor the device for the duration of the spawning run to exclude chum from spawning in an area where egg survival is virtually nil.

The current proposal is shifting the focus from instream incubation to begin the first stages of planning and preparing a chum exclusion fence by conducting a desktop research exercise and continuing the fall and spring investigations. The following components are included as part of this proposal:

- An end-of-run aerial survey for an accurate total redd count within the same extent as previous years;
- Installation of a time lapse camera within the vicinity of the seasonally dewatered area to document changes in habitat conditions over the winter;
- Conduct field assessments to determine the feasibility of an exclusion weir to restrict access to spawning habitats which become dewatered during the late winter;
- Complete a desktop review as part of the exclusion fence feasibility study and implementation plan.

Stewardship

#17. Vuntut Gwitchin Young Fishers: studying energy flows in the Porcupine. Year 1.

Vuntut Gwitchin Government

Stewardship is defined by the Yukon River Panel as: “Involve and educate users and non-users in communities to increase their desire to maintain and protect salmon stocks and habitat”. Stewardship exists at different levels, and all levels of Stewardship are important. In respect of the aquatic resources of the Yukon River Basin, Stewardship can be considered to be celebratory, where a happy event is publicly acknowledged; structural, where policies are developed or explained; or, in the case of the Vuntut Gwitchin Young Fishers, local, where the knowledge of the Porcupine River and its fish is increased. All components of Stewardship have value.

The Vuntut Gwitchin Young Fishers is a local Canadian Stewardship project and a pilot project for what will hopefully become a long-term Stewardship Program for the Vuntut Gwitchin First Nation (VGFN). This project will be an ongoing collaboration between the Vuntut Gwitchin Government and the Chief Zzeh Gittlit School of Old Crow that will engage senior students in a collective fishery science project every year. We will not confine ourselves to the YRP R&E Program as a funding source but will also look elsewhere. Local, Regional (i.e. Yukon), and Institutional Advisors will assist with technical details. For fiscal year 2022-23, this pilot project will have Young Fishers collecting, dissecting, examining, and documenting the stomach contents of predatory fish captured in Community Fisheries. Concurrently, we will seek to have the stomach contents analysed by genetic methods in a research laboratory. During this pilot stage the main source of samples will be the winter burbot fishery at the mouth of the Old Crow River. Opportunities to sample other fisheries will be taken if possible, in particular during a spring expedition to the headwaters at Whitestone Village. Juvenile Chinook, (fall) chum, and coho salmon will be the prey species and life stages of interest. The stomach contents will be a proxy for the energy flow through the ecosystems of the Porcupine River: essentially, which fish eats which other fish and how important are salmon species as prey.

Our goal is simple: We want to increase our collective knowledge of the fish and ecosystems of the Porcupine River, particularly their implied energy flows, and to engage the next generation of Vuntut Gwitchin fishers, fishery technicians, and managers in learning about their watershed.

Our objectives to address the goal are:

1. Form the Vuntut Gwitchin Young Fishers and engage them in capturing fish, conducting analysis, and reporting the findings to the Community of Old Crow.
2. To determine and utilize the most efficient and effective means to use the science of genetics to contribute to the knowledge generated by the Young Fishers.
3. To report the findings.
4. To build local capacity to manage our salmon fishery and to develop the future capacity to participate in international fishery management processes.

Deliverables to address each objective will be in an annual report at the projects end and will include:

1. Youth participation– we will provide an accounting of the number of youth that participate. A short narrative of tasks completed will be provided. A summary of sites sampled and samples collected will be provided.

2. School dissections – we will provide a description of the school dissections and the results of that activity.
3. Use of genetics – we will describe the progress of this objective based on technical advice from Dr. Erik Schoen. When samples are genetically analysed, we will provide a summary of the samples collected and the lab findings.
4. Report of findings – we will provide a list of communication activities that will describe the type of activity and, if possible, the numbers of people directly communicated with.
5. Building of local salmon fishery management capacity – we are at the start of a long voyage, and the results will not be complete for 2 decades or more. The number of Young Fishers engaged will be the best descriptor of capacity being built.

#18. Whitehorse Rapids Fishway Stewardship. Year 23.

Yukon Fish and Game Association

This cooperative project with the Yukon Fish and Game Association (YFGA) and Yukon Energy will contribute a portion of the wages of staff of the Whitehorse Fishway program. These staff, including youth, will provide educational services to visitors at the Fishway, including information on salmon species, life cycles, habitat and fisheries for visitors to the Whitehorse Rapids Fishway, including assisting with an open house in August. Fishway staff will monitor the returns of Chinook to the ladder and report daily to DFO on the run composition (sex, approximate size, daily total, hatchery or wild). Staff will assist Whitehorse Rapids hatchery with broodstock collection and ASL sampling from the fishway. The ladder will be open from June to Sept 2022. YFGA will prepare a report summarizing the project.

Communications

#19. Salmon in the Schools. Year 6.

Rivers to Ridges

The Salmon in the Schools (SIS) program was piloted in 2017-18, delivered and refined in 2018-19, was further enhanced for 2019-2020 and programming was reinforced through 2020-2021 and 2021/2022. We propose to sustain and maintain the programming and content in 2022-2023. Rivers to Ridges (R2R) will continue to enhance the classroom, public relations, partnership development, media relations and communications components of the program.

In this next stage of the program, we aim to work with the relevant stories and modules we made in the past, and work with and support Yukon educators and local salmon stewards to provide training with educators so they can learn to facilitate the curriculum we have developed. While DFO currently supports these technical elements (tanks, egg takes, maintenance, etc.) of the Stream to Sea program, R2R will offer relevant story-based support to educators and learners by offering resources, classroom visits across the Yukon, relevant educational support that is outdoor, land-based, and culturally connected. The curriculum document we spent three years producing with this fund ('Salmon in the Schools' Yukon) - has been printed, and 150+ copies have now been distributed across the Yukon at many classrooms and communities for educators to access.

The impetus for this project continues to be driven by the concern that the Yukon public is losing their connection to Yukon salmon. In the absence of being able to fish for Canadian-origin Yukon River and Porcupine salmon (recreational and commercial) and drastic conservation (subsistence) amongst First Nations and rural Alaska and Yukon, there are limited opportunities to harvest and make a connection. In the absence of this connection there is a concern that they will no longer value and protect this resource.

The goals of the project are:

- To continue deepening public education and awareness around Yukon River and Porcupine River salmon;
- To support and encourage learners and educators across the territory to learn about Yukon River and Porcupine River salmon through locally relevant, land-based means;
- To increase the profile and utilization of the Salmon in the Schools program in Yukon; and
- To ensure the Salmon in the Schools message reflects the current resource and management realities for Yukon River and Porcupine River salmon and the people and communities that depend upon them.

The objectives of the project are:

- To work with educators to ensure the Salmon in the Schools program is well understood, utilized and fully subscribed;
- To connect those educators and classrooms in the program together to continue to build the Salmon in the Schools community (especially our online platform);
- To ensure the curriculum reflects the current resource status (i.e. low productivity, lack of females, size changes), the sacrifices being made by Alaskans and Yukoners, and the Yukon River Salmon Agreement treaty specifics and implications;

- To work to ensure the media and other salmon stakeholders are aware of the program through media releases, stories in publications, social media;
- To document the successes of the program through testimonials (written and visual), photography, and/or video; and
- To build capacity within rural Yukon communities through mentoring opportunities.

For 2022-2023, the deliverables for this project include:

- Continue to deepen relationships with schools, educators and learners throughout the Yukon around the Salmon in the Schools curriculum.
- Continue to build up the manipulative materials with more hands-on accessible supplies and activities that educators can use to further engage their learners on the topic of salmon.
- Make contact with existing and new educators and the Department of Education to ensure they are aware of the specifics and the enhanced education and outreach status of the program (continued from last year).
- Deliver the new curriculum in as many Yukon schools as possible.
- Enhance programming through further curriculum development for preschoolers and deepening curriculum for grades 5 and up.
- Begin offering Salmon in the School Curriculum to French speaking learners at French Schools in Whitehorse, beginning with translating a few activities to pilot.
- Work with a translator to adapt the Educator Activity Guide & Manual to meet the needs of French speakers.

For the 2022-2023 year, our main intention is to support Yukon schools and educators in offering innovative, Yukon-based salmon programming with hands-on resources and virtual/in-person visits from preschool to grade 12 in English and French.

#20. Yukon River Salmon Preseason Planning Meeting. Year 11.

Yukon River Drainage Fisheries Association

The project goal is to conduct public outreach to an adult audience of active Yukon River fishers to build a more aware public constituency that is motivated to maintain and protect salmon stocks of Canadian-origin. Over the past ten years the Yukon River Drainage Fisheries Association (YRDFA) has hosted a one-day meeting to discuss pre-season planning for the management of declining Canadian-origin Chinook salmon, fall chum and other important issues related to the upcoming fishing season. Meeting attendees include Tribal Council representatives, state and federal agencies and other Yukon River fishery stakeholders. The meetings are a necessary annual event convening stakeholders, representing a majority of Yukon River fishing communities along the Alaskan portion of the Yukon River, with Alaskan agency fishery managers to discuss how to protect Canadian-origin Chinook and fall chum salmon.

Meeting the Canadian escapement goals defined through the Yukon River Salmon Agreement of 2001, requires a close, respectful, and detailed approach to fisheries management and social communications support in Alaska. There is no replacement for finding agreement on management objectives, gaining buy-in from fishers from the 42 villages of the Alaskan Yukon River drainage, than the Summer Pre-season Preparation meeting. This meeting sets the stage for the fishing season to come. Through an inclusive process with the fishers and communities they represent, the views and concerns of those most affected by management goals and decisions are incorporated and this process builds the social and scientific support they need to

make difficult sacrifices, when called upon. Additionally, this meeting builds the working structure necessary for managers to gain the information and relationships necessary to meet management goals. Paramount among these goals is meeting the agreed upon escapement range of 42,500-55,000 Canadian-origin Chinook salmon and 70,000-104,000 fall chum salmon.

#21. International Salmon Summit. Year 1

Yukon Salmon Sub-Committee

This Summit will build on the International Salmon Summit of 2014 between Yukon First Nations and affected Alaskan Tribes and inter-tribal groups. That project had the goal of increasing the capacity of users and non-users of the salmon resource in communities along the entire Yukon River drainage to maintain and protect Canadian-origin salmon stocks and their habitats. Results from that meeting showed that participants left the Summit with an enhanced understanding of salmon biology, the various fishing practices along the Yukon, the laws and regulations in the Yukon and Alaska and participants gained considerable knowledge of the importance of salmon to Indigenous cultures. Participants agreed that it is important that the U.S. and Canada continue to co-manage Yukon River salmon. Participants were asked if they thought another, similar event would be helpful, and an overwhelming number indicated they would support another Summit. While Yukon River Panel (YRP) meetings have provided opportunities for these groups to meet in the past, these opportunities are limited in scale and in participation. This proposal is distinguished by the fact that the project will involve those most directly affected by the salmon decline, the users along the river.

The goal of this project is to work towards developing a people's plan for Yukon River Chinook, with a priority of Canadian-origin Chinook. This will be achieved through creating a greater understanding of one another (e.g. cultural use, family needs, food security), of salmon, and of salmon management. In essence, this project aims to enhance cross-border knowledge and understanding amongst organizations, communities, fishers and First Nations involved in Yukon River fisheries.

The objective is to host a 3 day International Salmon Summit. The agenda is crafted to develop trust and understanding among participants so that they can work together for all people along the river. The meeting will take place near Fairbanks, preferably at Chena Hot Springs Resort in November, 2022 and include 30 participants from each country.

Deliverables will include any plans, resolutions or declarations developed at the meeting. The project will result in increased understanding, and stronger relationships for future work and cooperation. Further, a professionally developed and designed report will be sent to every invited organization. A suite of multi-media communications products (e.g. videos, graphic facilitation) are being considered as additional outputs but will be dependent upon exterior funding. In addition, we would like to include additional participants, but this will also be contingent upon securing additional funds.