Charting a Course for Yukon Chinook

Yukon Chinook Strategic Stock Restoration Initiative

Year 3 Accomplishments

YUKON SALMON SUB-COMMITTEE

YUKON RIVER CHINOOK SALMON STOCK RESTORATION

Photo courtesy of Peter Mather, 2016

Background

Chinook salmon are a cultural icon for Yukon First Nation communities and Yukoners. One of the most concerning issues among Canadian-origin Yukon River salmon populations has been the significant decline in Chinook over the past 17 years, leading to an increased interest in stock and habitat restoration within the territory. While significant effort has been made among governments and stakeholders to develop specialized expertise and projects in the field of salmon stock restoration, there have been limited opportunities to share, consolidate and strengthen the progress made across these different groups.

Yukon First Nation communities and Canadian stakeholders are both leaders and potential partners that support efforts to restore Yukon River Chinook salmon stocks in Canada. The salmon management community recognize that in order to undertake effective and appropriate stock restoration initiatives, there must be community support and the willingness and ability for salmon stakeholders to understand and play a role in the implementation of the stock restoration initiative. It is also essential that any proposed restoration action must be based on a plan that encompasses sound biological, traditional knowledge, technical, and local knowledge parameters.

Yukon Salmon Sub-Committee (YSSC) undertook a multi-year initiative from 2016 to 2019 to lessen the significant declines in Canadian-origin Yukon River Chinook. The Yukon River Panel has also made stock restoration a priority with an expanded focus between 2016 and 2019.

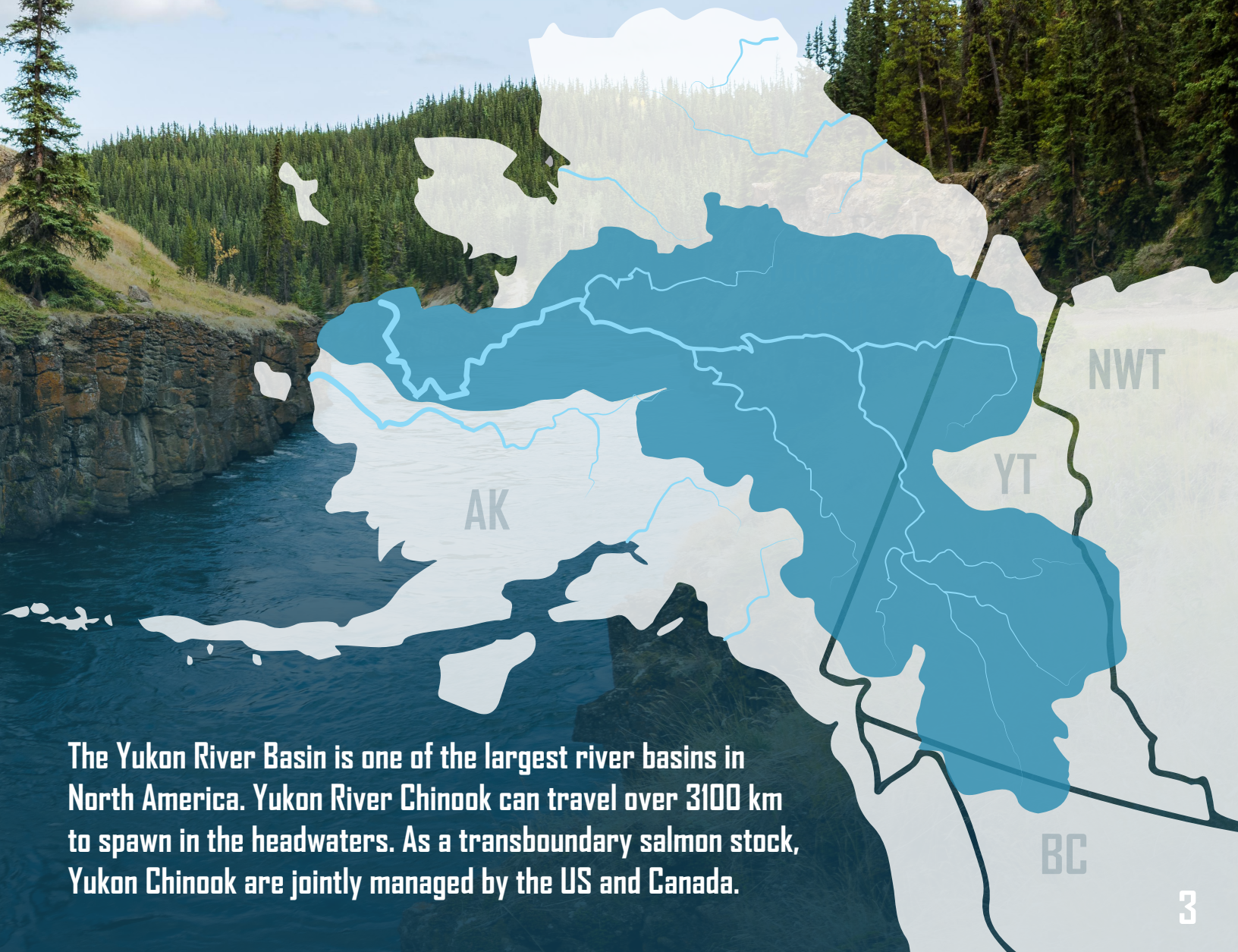
The YSSC Stock Restoration Technical Team (SRTT) had two overarching goals:

1. Support the development of a stock restoration framework based on community values, which can be used to help develop, evaluate and prioritize Chinook stock restoration initiatives in the Canadian portion of the Yukon River.

2. Provide technical support and capacity building at the First Nations and community level for stock restoration activities.

What is Stock Restoration?

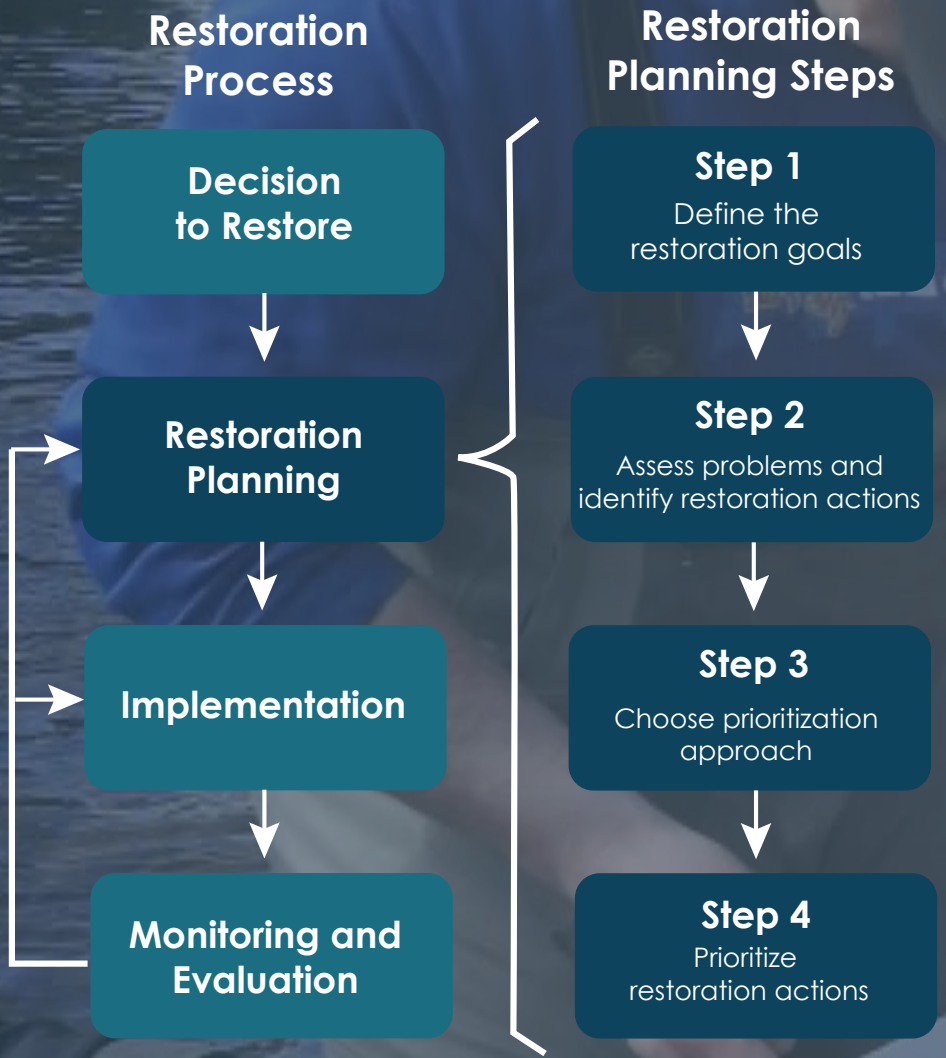
Stock Restoration is the deliberate attempt to return a wild salmon population to natural production levels - that is, the predicted population levels in the absence of one or more limiting factor that could jeopardize continued existence or drive low abundance.



The Yukon River Basin is one of the largest river basins in North America. Yukon River Chinook can travel over 3100 km to spawn in the headwaters. As a transboundary salmon stock, Yukon Chinook are jointly managed by the US and Canada.

Restoration Planning

The first year of the stock restoration multi-year initiative focused on restoration planning. After deciding to restore, this is first step in the overall restoration process. The following four restoration planning steps are the building blocks for implementation, monitoring and evaluating for Chinook salmon stock restoration.



Photos of fry releases courtesy of Elizabeth MacDonald, 2019

Restoration Actions to Support Community Capacity

Efforts in year two focused on supporting further planning, and moved to implementation, monitoring and evaluation of a subset of restoration actions that were identified in year one. Year two also focused on the detailed development of ranked restoration actions to support capacity building at the First Nation and community level. Based on priorities, various resources, and capacity of First Nations and communities, efforts focused on supporting community identified and led stock restoration activities.

Recommendations

- build connections and capacity;
- match support to needs;
- support beaver management;
- support harvest management; and
- engage recreational anglers.

What Do We Mean By Habitat Restoration and Enhancement?

Habitat restoration (return of productivity to some pre-disturbance level) and enhancement (increase in productivity beyond natural levels) includes a broad range of actions that may be taken to increase the productivity of spawning and rearing habitats. Habitat restoration can include re-vegetating stream banks, adding structures including large organic debris and other materials to stream channels, stabilizing eroding stream banks to reduce sediment input to streams, restoring access to spawning or juvenile salmon over “soft” obstructions (non-bedrock) such as roadway stream crossings, beaver dams or log jams. Habitat enhancement includes building habitats and may include the excavation of groundwater-fed channels for rearing and overwintering Chinook, removing “hard” obstructions (bedrock) to allow Chinook access to areas that they have never occupied, or connecting isolated streams or water bodies to habitats used by Chinook. Removal of hard obstructions and beaver dams are described later on in this report.

Obstruction and Beaver Management for Upstream Migration

During year three, the project evolved to reflect the findings of the activities undertaken in Year one and Year two, and the changing administrative environment related to salmon management in the Yukon River Canadian Sub-basin. Yukon First Nations and communities were most interested in management of non permanent obstructions to upstream migration of adult and juvenile Chinook salmon and to human made obstructions. The management of obstructions of biological origin, particularly beaver dams, raised the most concern.

The SRTT found that there was little guidance documentation regarding the effects of beaver dams to determine whether intervention through breaching or removal of dams was advisable; the form that intervention should take; or the means by which evaluation of the intervention could take place in a fiscally responsible and safe manner.

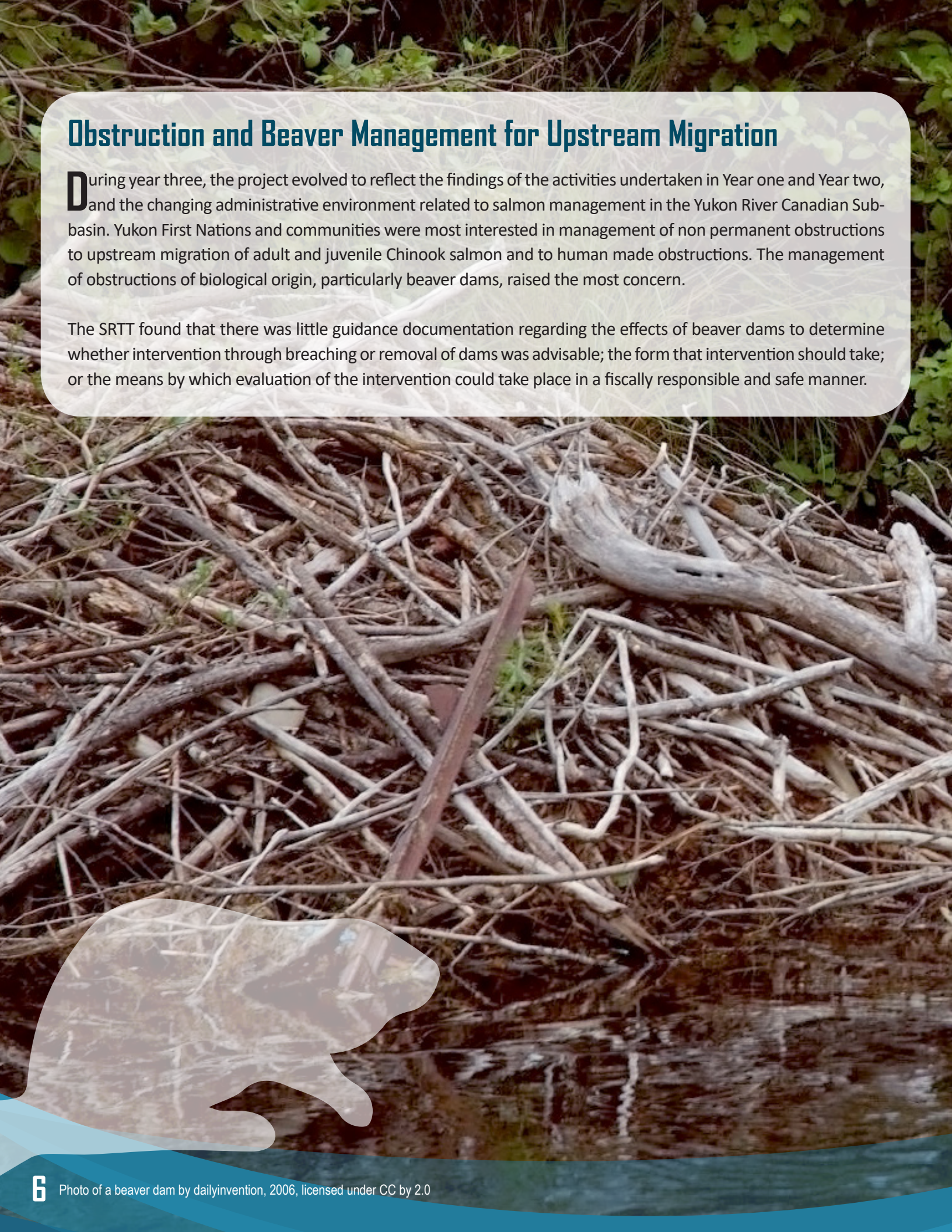


Photo of a beaver dam by dailyinvention, 2006, licensed under CC by 2.0

What Do We Mean By Beaver Dam Management?

For adult Chinook salmon, this entails removing or breaching beaver dams in productive streams to allow access to upstream spawning areas. For juvenile Chinook, it requires capturing fry downstream then releasing them upstream of beaver dams to restore and maintain migration to upstream rearing and over wintering hawbitats. The action may be associated with beaver management plans (e.g., trapping or disturbing beavers) in select streams to reduce the probability of beaver dams being established in the first place.

Industrial trapping did not begin in Yukon until after the collapse of the global beaver market in 1843. Beaver are considered fur-bearing animals in Yukon and therefore can only be taken by the holder of a registered trap line. Beaver pelt prices have been depressed for decades and so little harvest takes place. Beaver populations probably exceed pre-contact levels, in part as First Nation use of beaver has been constrained by the registered trap line system.

There has been considerable debate regarding the risk that beaver pose to salmonids. Most general North American attitudes are based on situations that have occurred, and studies that have been conducted, in environments distant from the Upper Yukon River. The focus here is on the Yukon River Basin in Canada, and the effects of beaver dams on upstream migrating Chinook salmon.

Obstruction management on small productive and vulnerable Yukon River Chinook salmon spawning streams

Chinook salmon in the Yukon River Canadian Sub-basin spawn in a wide variety of stream sizes. These include a number of small streams that support significant spawning populations and are vulnerable to obstruction, primarily due to beaver damming, at almost all flows. A larger number of streams are vulnerable under seasonal low flows or during multi-year low flow periods. The dams may obstruct the upstream migration of Chinook salmon to their preferred spawning locations or delay the migration. As the Chinook are at the end of a very long upstream migration, obstruction or delay could result in death due to exhaustion or predation before they have a chance to spawn. Beaver dams may also cause adults Chinook to spawn in lower quality habitats downstream.

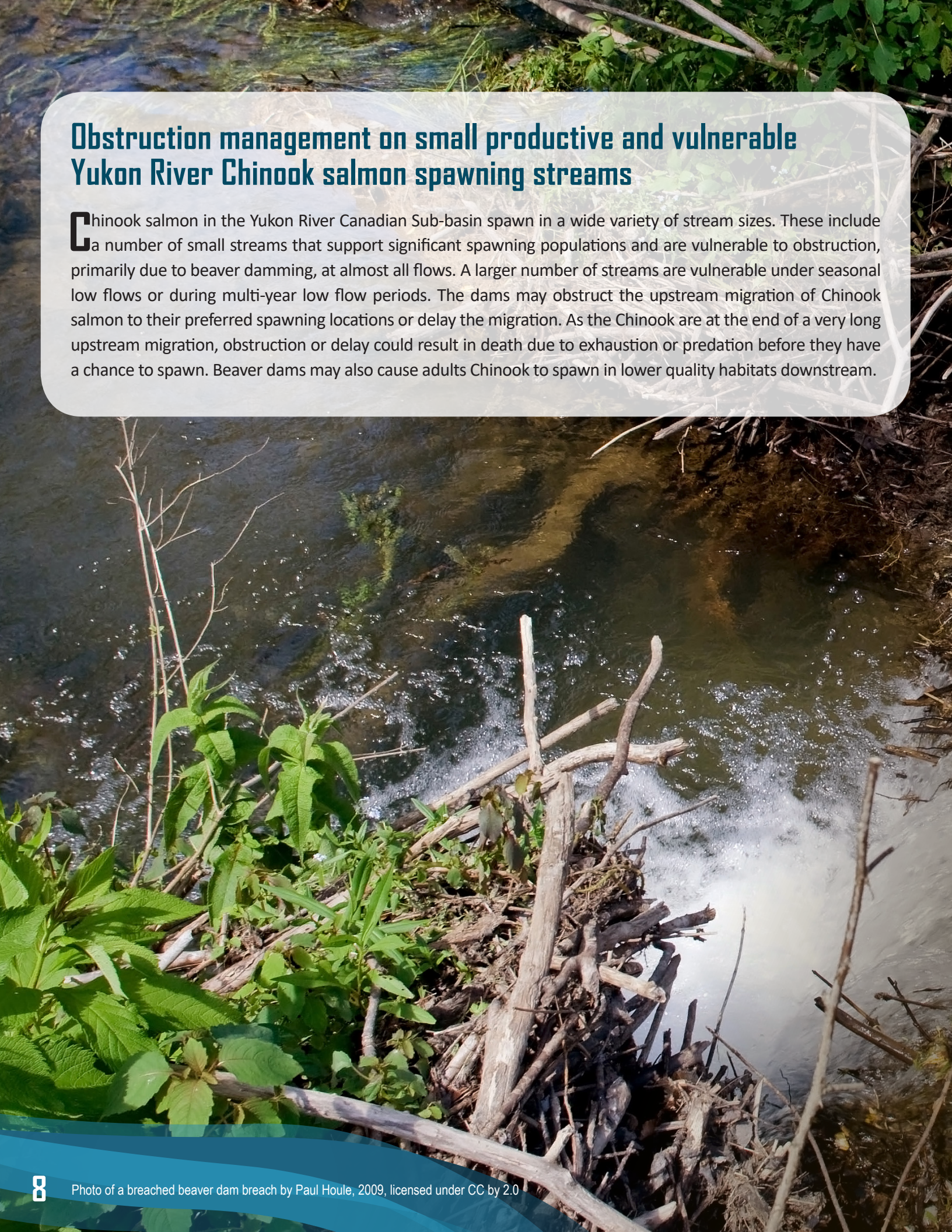


Photo of a breached beaver dam breach by Paul Houle, 2009, licensed under CC by 2.0

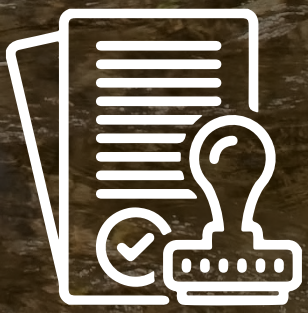
Beaver Dam Management Protocol

A suggested protocol is encouraged for obstruction management projects funded by the Yukon River Panel within the Canadian Sub-basin and in the collection and reporting of data related to these activities.

Documentation of Obstruction

Debris jams and beaver dams should be located and documented, preferably with a GPS, and the coordinates noted. Each obstruction should be given a unique identifier which will be used whenever referring to it. The identifier should include the following information: the name of the creek, the last two digits of the year that it was first observed, and by number. If the obstruction is a beaver dam, the unique identifier should be marked at the dam site, preferably on a blazed tree adjacent to the dam.

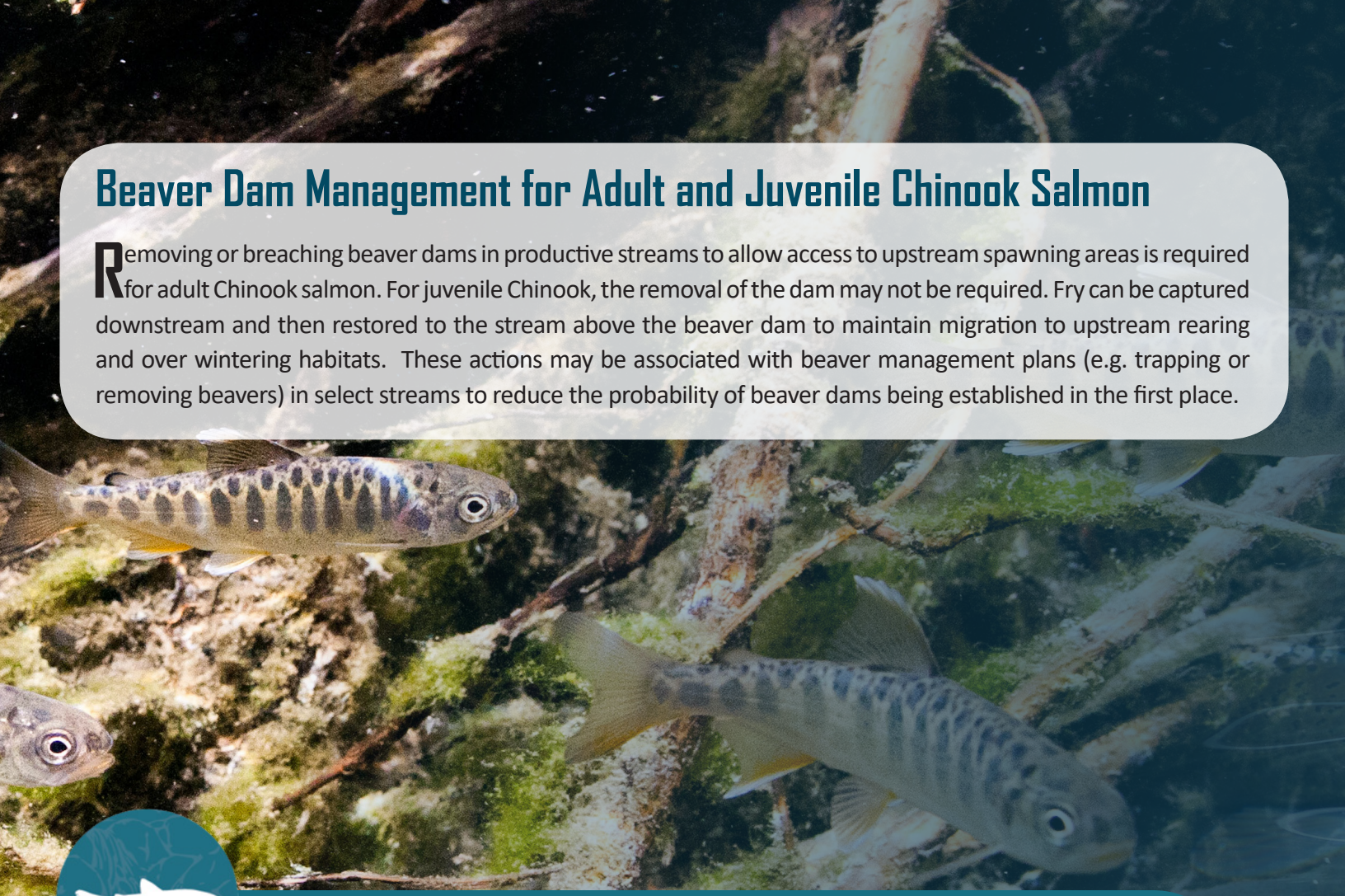
Permitting



In Yukon, beaver dam breaching or removal requires a permit under the Wildlife Act. The permit process has been efficient in the past. Permits have been granted almost immediately if a dam was found to be obstructing upstream adult migrations.

Beaver Dam Management for Adult and Juvenile Chinook Salmon

Removing or breaching beaver dams in productive streams to allow access to upstream spawning areas is required for adult Chinook salmon. For juvenile Chinook, the removal of the dam may not be required. Fry can be captured downstream and then restored to the stream above the beaver dam to maintain migration to upstream rearing and over wintering habitats. These actions may be associated with beaver management plans (e.g. trapping or removing beavers) in select streams to reduce the probability of beaver dams being established in the first place.



The Ecology of Salmon Fry

- Alevins become fry (0+ juveniles) when they can swim freely.
- Fry may remain in their natal streams for the first summer, however, most fry move downstream and ascend other streams which are referred to as non-natal and may be over 1000 km or more downstream of their natal stream.
- Dispersal to non-natal tributaries in the a area begins in late May and about a month later in the Dawson area at a fork length of 45 – 55 mm.
- Juveniles may migrate significant distances (greater than 20 km) upstream in non-natal tributaries.
- Young of year juveniles are seldom found in completely still water such as beaver ponds in non-natal rearing streams.
- At any given time during the summer, fry in upstream areas of non-natal tributaries tend to have greater average lengths than do those closer to the mouth.
- High densities of small fry may be found immediately downstream of partial- or total obstructions such as beaver dams, implying interrupted upstream migration.
- Fry are absent or present in low densities in waters with high turbidity, or where periods of high turbidity are frequent.
- Densities of fry tend to be low in clear water streams after summer storms cause high water/ high turbidity events, implying displacement.
- Fry are generalist feeders, and consume all available invertebrates that are of an appropriate size.
- Aquatic predators of fry are known to include northern pike, burbot and inconnu.
- Avian predators on fry include but are not limited to kingfishers, gulls and loons.

How To Breach Beaver Dams On Spawning Streams For Adult Chinook Salmon

Chinook salmon spawn in smaller streams in the Upper Yukon River Basin. Beavers may dam these streams, particularly when the streams drain from upstream lakes. The dams have to be breached physically to allow Chinook to migrate upstream. Below are some recommended steps to safely breach a beaver dam:

- It is recommended that First Nations, Conservation Officers and Fisheries and Oceans Canada be consulted on beaver dam breaching prior to starting.
- The dam only has to be breached by about 2/3 of its height to allow adult Chinook to migrate upstream. Determine which section of the beaver dam should be breached.
- Once the breach area has been determined, begin by removing the surface logs.
- Start at the top of the dam, removing loose pieces using, for example, a regular garden rake. The flowing water will help to move smaller pieces.
- To avoid causing a log jam lower on the creek, larger logs should be placed above the high-water mark.
- As the dam is breached, the reservoir above the dam will start to drain. The extra water will help dislodge pieces from the dam. If the dam is larger, gushing water can also be a hazard to workers. Be cautious!
- Once the water is flowing, continue your work on this area until the channel is formed.
- Continuing removing downstream debris to provide Chinook access right up to the dam.
- When using an axe or a chainsaw, shoes with toe protection should be worn and the operator should be experienced as logs under pressure can snap when cut.
- Once the beaver dam has been lowered to the desired height (approximately 1/3 of the original height), remove any last loose pieces that may block the approach to the dam.
- Adult Chinook can now easily migrate over this dam.

How to Move Juvenile Chinook Salmon Upstream

The upper Yukon River Basin, fry emerge from the beds of spawning streams in spring and disperse. They may swim up small tributary streams to feed and overwinter. In these streams they are vulnerable to obstructions such as beaver dams. Beaver dams can block salmon from productive upstream rearing and overwintering habitats.

People have breached beaver dams to allow the fry to move upstream. A simple, alternative method is to by-pass the beaver dams, by capturing fry downstream of the dam and restoring them to the creek immediately above the dam. This method is easier for the beaver because the dam will not have to be repaired. This alternative method is also easier and safer for workers than breaching dams.

Below are some recommended steps to move juvenile Chinook salmon upstream of an obstruction:

Photos of fry releases courtesy of Elizabeth MacDonald, 2019

- Yukon River Salmon roe is recommended as bait. Use sandwich bags. Slice the bags with a sharp knife and put a walnut sized piece of roe in them
- Freeze the bait in plastic bags or containers before going into the field. This reduces the potential of attracting bears.
- Use baited Gee-type minnow traps to capture fry.
- Ten baited traps for each dam is suggested.
- Set the traps in areas of low stream velocities below the dam. Eddies or locations below debris piles work well.
- Setting traps for an overnight period is best, as the fry may be more active overnight.
- Retrieve traps.
- Place captured fry into buckets. Count the total number of fry captured below each dam and record it If there are a lot of fry, you can reset the traps for a second night.
- Carry the bucket of fry over the dam.
- Pour the fry and water slowly into the still waters of the pond.

Most fry will move swiftly upstream to flowing water and access previously inaccessible, productive habitat. Some of these fry will survive and return to the Yukon River to spawn to help sustain the Chinook salmon stocks and the fisheries that depend on them.

As a final note, the restoration of the fry to upstream habitats above beaver dams must be done legally. The legal system for the Upper Yukon River Basin is undergoing constant change. However, at the time of this publication, the legal requirement was a Fisheries and Oceans Canada's (DFO) License for Scientific and Educational Purposes. The license application is available from DFO in Whitehorse or on their website. When planning a program, it is best to contact the Yukon Government and the relevant First Nation Government(s).

Charting a Course for Yukon Chinook Salmon Moving Forward

Beaver dam management is just one of the methods identified to increase salmon stock and habitat restoration within Yukon. On the Adaptive Management cycle, obstruction management would fall under the "Do" section (referenced below).

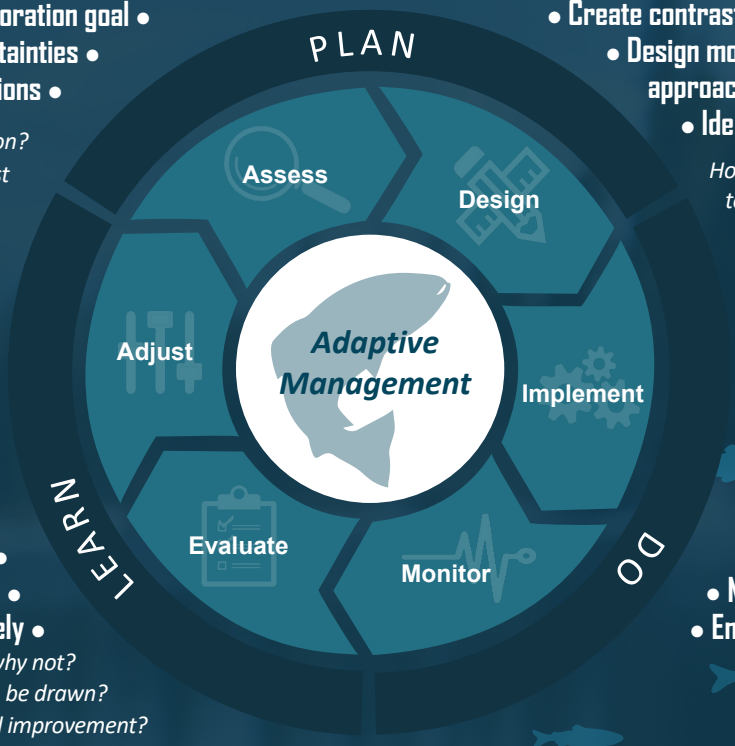
As stock restoration initiatives move from planning, to doing, to learning on the Adaptive Management cycle, it is important to note that all stages are important and need to be considered towards the overarching goals of the SRTT described on page 2 of this report.

The continued collaborative approach involving all partners is key for the success of the Yukon River Chinook salmon stock restoration initiative along the Yukon River Basin.

Further details on obstruction management on small productive and vulnerable Yukon River Chinook salmon spawning streams, can be found in the Charting a Course for Yukon Chinook, Yukon Chinook Strategic Stock Restoration Initiative, Technical Team Year 1, Final Report.

All Yukon Stock Restoration Initiative published material, including this report, and additional educational material on management of obstructions to upstream migrating Yukon River Chinook salmon including as videos, factsheets, and other resources can be found on the YSSC website: www.yssc.ca.

The six stages of the Adaptive Management cycle can be adapted for stock restoration activities.



Assess problem and identify limits to production • Define restoration goal • Identify critical uncertainties • Identify alternative actions •

What is limiting population? Which actions are most likely to promote recovery?

• Prioritize actions, design management experiments • Create contrast ("Go big or go home") • Design monitoring and evaluation approach, identify key indicators • Identify expected outcomes

How do we expect key indicators to respond to our management experiments and how will we monitor them?

Adjust actions, hypotheses, or monitoring based on learning •

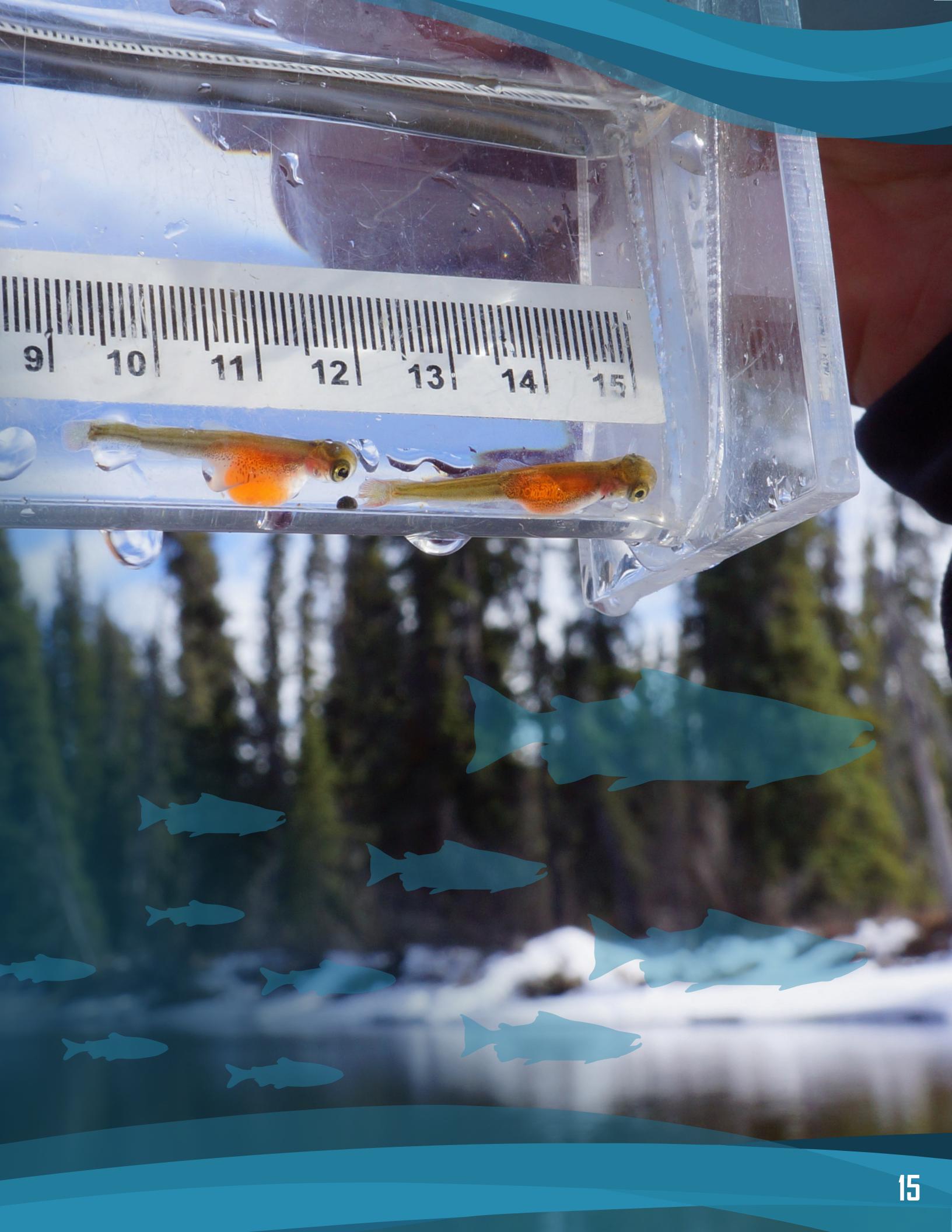
• Follow implementation plan • Document deviations • Present interim results

Compare results with predictions • Rapidly translate data into insights • Share learning widely •

Were the results expected? If not, why not? What did we learn? What conclusions can be drawn? Does our approach need improvement?

• Monitor key indicators • Ensure good data management

Photos of fry releases courtesy of Elizabeth MacDonald, 2019


9
10
11
12
13
14
15

Charting a Course for Yukon Chinook

Yukon Chinook Strategic Stock Restoration Initiative

www.yssc.ca

Acknowledgements

Yukon Salmon Sub-Committee would like to thank Fisheries and Oceans Canada for their input into this project and to Yukon River Panel Restoration and Enhancement Fund (project # CRE-19-17-17) for the funding. We would also like to thank Dr. Natascia Tamburello of ESSA Technologies for her communications and design expertise in creating this document. The expertise, enthusiasm and participation of the Technical Team was greatly appreciated.

A special thank you to Ta'an Kwäch'än Council for their contribution to the production of the educational videos and to the numerous individuals from First Nation communities across Yukon for contributing their time and expertise to discuss Chinook stock restoration and community goals and values.