



How People of the Yukon River Value Salmon:

A case study in the lower, middle, and upper portions of the Yukon River

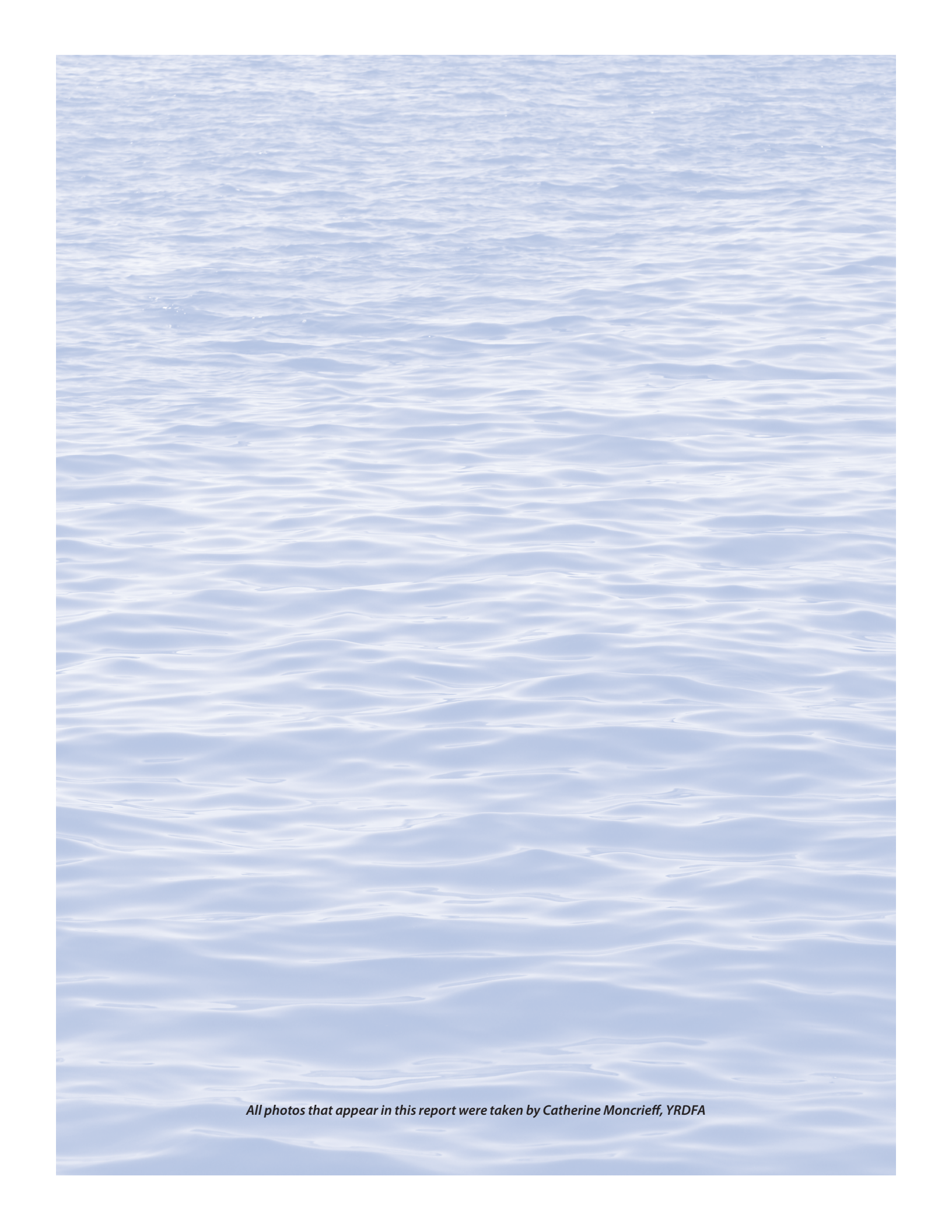
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All photos that appear in this report were taken by Catherine Moncrieff, YRDFA

ABSTRACT

People along the Yukon River rely on salmon for food, culture, and income. It is well known that salmon has a high value to the subsistence users along the Yukon River but the details of this value are not well described, nor are management decisions in times of shortage currently guided by knowledge of these values. A greater understanding of the values of salmon is needed. Through this project, case studies were developed for three Yukon River communities and Yukon River fishing families had the opportunity to share how they value salmon, why they value salmon, and the ways in which it is most important to them. Results show that the study communities value salmon as a food primarily but a food that represents their entire culture. Salmon is an essential nutritious, local food which sustains and connects them to their culture, their heritage. Fishing and the related activities of harvesting, processing, sharing, and eating are teaching tools that enable them to reach and pass on the heart of their culture.

KEY WORDS:

Salmon, Chinook salmon, (*Onchorychus tshawytscha*), chum salmon, (*Onchorychus keta*), Yukon River, food, culture, value.

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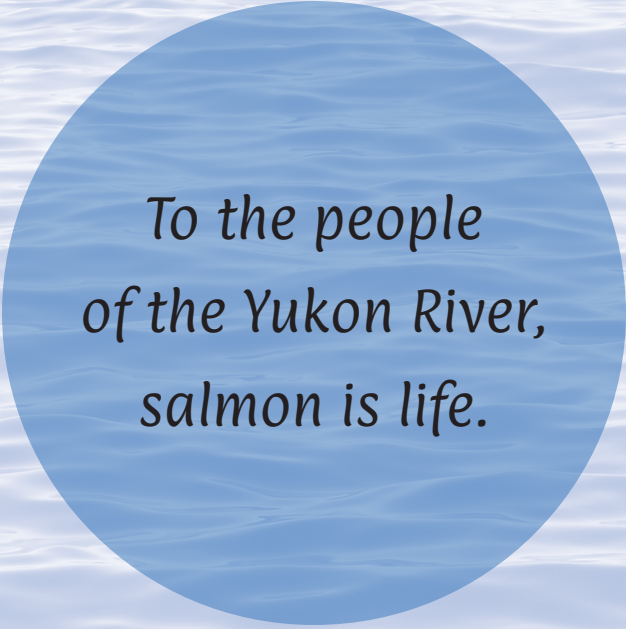
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*To the people
of the Yukon River,
salmon is life.*

INTRODUCTION

The people of the Yukon River are salmon people. Their lives and culture are based around salmon fishing, processing, eating, sharing, and trading. Salmon is their staple food (Andersen 1992; Wheeler 1998; Wolfe 1981, Wolfe and Scott 2010). There are over forty villages within the Yukon River drainage that depend on salmon as a main part of their diet and household needs. These villages are made up of primarily Alaska Native people from the Yup'ik or Athabascan cultures. They rely on wild foods, have a mixed-cash based economy and low per capita incomes (Wolfe 1984; Wolfe and Walker 1987). To the people of the Yukon River, salmon is life.

This study was undertaken to address imminent fishery management issues related to the use and conservation of Yukon River Chinook salmon that have been in decline. Examples of these issues are contentious allocation issues, regulation changes, and fishing closures. In order to address these issues, a greater understanding of the value of salmon to the people of the Yukon River is needed. Through this study, the Yukon River Drainage Fisheries Association (YRDFA) proposed to learn about and qualitatively document the value of salmon to people along the Yukon River through case studies. Yukon River people rely on salmon for food, culture and, in some communities, income. It is well known that salmon has a high value to fishers along the Yukon River but the details of this value are not well described, nor are management decisions in times of shortages currently guided by knowledge of these values. Through this project, Yukon River fishing families have the opportunity to share how they value salmon, why they value salmon, and the ways in which it is most important to them.

Geography and Socioecology of the Yukon River

The Yukon River is the 4th largest drainage in North America or the 5th largest by average annual discharge (Krupa 2010). One third of the drainage lies in Canada. It is nearly 2,000 miles long, originating on eastern side of Boundary Range of British Columbia's coast and draining an area of 331,726 square miles (Brown, Godduhn, et al. 2015). The river flows northwest through central Yukon, Canada, entering Alaska near Eagle and then flowing generally southwesterly across Alaska to its confluence with the Bering Sea (Krupa 2010).

Salmon has long been in demand as a high quality food. For 10,000 years, people of Yukon River have been hunting and gathering in small groups or extended family groups. These groups traveled between 3 to 4 seasonal camps for fishing in summer, hunting in fall, and trapping in spring (Brown, Godduhn, et al. 2015). On the lower Yukon, Yup'ik people were able to move inland from the coast because of the abundance of salmon and their knowledge of fishing technology which allowed them to live in sizeable villages in summer during salmon fishing periods (Vanstone 1984). They dispersed after the salmon season to pursue other resources. The Kuigpagmiut lived along the north bank of the lower Yukon River while the Maarmiut and the Kayaligmiut lived in the area between the Yukon and Kuskokwim rivers (Vanstone 1984a). The Athabascan people of the Yukon River are diverse and divided into multiple language groups. Moving upstream from the Yup'ik, the following Athabascan groups live along the Yukon River within Alaska: Deg' Hitan, Holikachuk, Koyukon, Tanana, Gwich'in and Han (Krause 1974). In prehistoric times the Athabascan people lived in family based bands and were highly nomadic (Hosley 1984). The Yukon River Athabascan people adapted their caribou hunting economy to include access to the abundant salmon available in the Yukon River and their human population densities were low.

There are 5 species of salmon that migrate up the Yukon River. Chinook (*Oncorhynchus tshawytscha*), chum (*O. keta*) and coho (*O. kisutch*) migrate into Canada. Chinook salmon are of primary importance to the subsistence fishery and are used as food for people. They are important species for subsistence, commercial, sport, and personal use fisheries. Their run timing spans the summer ice-free months extending into breakup and

freeze up in the spring and fall. In early June through mid July, Chinook salmon migrate up river and spawn throughout the Yukon River drainage. Chinook salmon are a favorite and staple food for people along the entire river. They are rich in oil and prized for their large size which provides more efficient fishing than smaller fish. Moving upriver, per capita consumption of Chinook salmon increases and Chinook salmon account for a larger component of the diet of people in the upriver portions of the river as compared to the diets of people in the lower river (Wolfe and Scott 2010). Chinook salmon are divided into 3 main stock groups of Lower (Alaska tributary streams from the Andreafsky River to near the Tanana River and the Lower Koyukuk River), Middle (Alaska tributary streams of Koyukuk and Tanana river drainages), and Upper (Canadian-origin) groups (Krupa 2010).

Chum salmon are most abundant and most heavily harvested. They migrate in two genetically distinct runs; summer chum which travel 500 miles upriver spawning in the lower river and fall chum which spawn in the middle and upper portions of the drainage in mid-July and continue through August. Both summer and fall chum are used for human and dog food. They have less oil content and dry faster than Chinook salmon. Chum salmon were used heavily in the 20th century to feed dogs for dogsled transportation and currently are targeted for commercial export to U.S. and foreign markets. In the lower river, they are popular as human food though referred to locally as dogfish. In the middle river, summer chum can be hard to process because of their low oil content so they are primarily used as dog food but occasionally eaten as human food. Fall chum are used both for humans and dogs in middle and upper river regions. Harvests of chum salmon are generally higher than Chinook salmon but they fluctuate in abundance over time and by region (Brown, Godduhn et al. 2015). Summer chum salmon spawn in the lower and middle river in run-off streams while fall chum salmon spawn in spring fed streams in the upper river (Krupa 2010). Fall chum salmon are an important species for subsistence fishers in middle and upper river communities.

Other species of salmon also are present in the Yukon River. Coho salmon enter the mouth of the river in early August and spawn throughout the drainage. They spawn primarily in the Tanana River and its tributaries and the Porcupine River in Canada. Pink salmon (*O. gorbuscha*) spawn in the Anvik and Gisasa rivers, as well as other places. Pink salmon are relatively unimportant as a species for subsistence needs. There are some sockeye (*O. nerka*) in the lower river but there are no significant spawning grounds (Brown, Godduhn, et al. 2015).

Salmon and People

Salmon are a very important part of life along the Yukon River. The timing of the salmon migration sets the schedule for the families who work together to harvest their food, spending time together, fishing, processing fish, distributing, and eating it. The importance of the bonding, learning, and cultural teaching that takes place with and around salmon transcend the use of fish as a dietary staple or merely a food (Brown, Godduhn, et al. 2015). This contemporary relevance has important historical roots. Salmon were used to feed dogs in the 1700s when dog teams were used for checking trap lines for the Russian fur trade. After the Alaska purchase from Russia in 1867, the Klondike gold rush from 1898-1902 increased traffic on the river. During this time there was an increased demand for fish to feed dogs who provided winter transportation. To meet this demand, local residents harvested chum salmon, dried them in bundles of 25-50 fish, and sold the bundles to local trading posts, becoming a common commodity along the river. By 1918, about 1 million chum salmon were being harvested each summer to feed approximately 6,000 sled dogs along the Yukon River (Andersen and Scott 2010:3). During this period, dog teams were used by trappers, miners, and the U.S. Postal Service as well as recreationally in winter carnivals (Brown, Godduhn, et al. 2015).

Beginning in the 1920s, dogs were replaced by airplanes, and then snow machines, as the main transportation method along the Yukon River (Pennoyer et al 1965:2). By the early 1940s airstrips had been built in many villages along the Yukon River and this reduced the need for dogs for transporting people, mail, and

other supplies although dog teams were still used for winter travel. In the 1960s and 1970s, snow machines became available and further reduced the need or reliance on dog teams. Sled dog racing continued with varying popularity in the 1970s and 1980s.

Fishing is an important part of the annual subsistence activities. Families integrate their subsistence activities with wage employment through a mixed, subsistence-based socioeconomic system (Wolfe 1984; Wolfe and Scott 2010). Today, subsistence activities take place with equipment that costs money and uses fuel. The cost of living in Yukon River villages is high (Loring and Gerlach 2009; Brown, Godduhn, et al. 2015). Most wage employment is scarce, seasonal, and intermittent. As cash became more important, adults of working age had to travel for work, leaving Elders and youth at home and at camp. Today with the increased cost of subsistence, higher gas prices, and lower abundance of salmon, people are going to fish camp less and less (Brown, Godduhn, et al. 2015). Reliance on salmon alleviates some of these costs but reduced availability of salmon increases these costs. Nonetheless, food security along the Yukon River and in rural AK today is still dependent on locally harvested wild foods but also includes access to global markets and goods. Store-bought foods in the villages are generally less nutritious, expensive, and processed. These imported foods are not a sufficient replacement for salmon in terms of nutrition, health or cultural value. As a result, whether in fish camp or in the village, extended families work together with flexible gender and age based divisions of labor. Fishing is an important part of the seasonal round of wild food harvest. Fish camps are important places to harvest food and conduct this cultural sharing but are used less today than in the past.

In addition to feeding people, as described above, salmon are also important to feed dogs along the Yukon River. Sled dogs historically have been fed large quantities of chum and coho salmon (Andersen 1992; Andersen and Scott 2010; Wolfe 1984). In the early 1990s the numbers of dogs in the Yukon River villages declined due to several factors including a collapse of the chum salmon stocks, an aging cohort of professional dog mushing racers, and the increased costs of maintaining teams (Wolfe and Scott 2010). Andersen (2010) found a further decline in numbers of dogs along the Yukon River from 1991 to 2008 and a decline in the number of mushing households of 56% in study communities. Even with the decline in the mushing households, existing dog teams in rural Yukon River communities continue to be highly reliant on salmon, especially chum salmon, for food. Drainage wide, this continues to represent large quantities of salmon harvested.

Gear type usage varies along the river and has changed through time. Gear changes and technological advancements have affected the volume of salmon harvests for some species. Historically, fishers used dip nets and fish traps in tributaries (Loyens 1966). In the 1800s, twine was introduced enabling fishers to make nets they could use in the main stem of the river. Fish wheels were introduced in the middle and upper areas of the river in the early 1900s, greatly increasing the efficiency of the fishery. These fish wheels were used to target chum and coho salmon in large quantities swimming close to the shore. Through the 1920s, Chinook salmon were harvested in the middle river with labor-intensive drift dip nets (O'Brien 2011:77). Chinook salmon were accessed more easily with set nets which reach farther out from shore and stretch deeper into the water column (Wolfe and Case 1998:4).

Around this same time, the first outboard motors were introduced in the middle river, which worked well with the fish wheels for both subsistence and later commercial fishing. Today in the upper river, set nets are the most common gear type for Chinook and fall chum with some wheels in use. Fish camps remain in use in the upper river more than other parts of river because setnet fishing is efficient with salmon swimming closer to shore here as the river narrows and fish approach their tributaries (Brown, Godduhn, et al. 2015:8). Throughout the river, set netting was, and still is, a primary means of catching fish without a wheel. Gillnets used with a motor boat became popular in the 1960s enabling fishers to drift for salmon (Retherford 2015 (in Brown, Godduhn, et al. 2015)). Driftnetting was reintroduced in 1980s allowed fishers to target Chinook salmon and remains a dominant gear type in the lower and middle portions of the river.

Today, commercial fishing for salmon is one of the few opportunities to earn cash in some Yukon River villages. It primarily takes place in the lower river and is a well-integrated part of the mixed-cash economy where fishers attempt to meet their subsistence needs first to take advantage of the prime drying weather. They then turn to the commercial harvest of salmon. In the past, commercial fishing existed all along the river in small family owned operations and was an extension of the subsistence fishing lifestyle. Commercial fishing has been restricted since 2008 due to the low Chinook salmon abundance and this has caused severe effects on family and communities involved (Brown, Godduhn, et al. 2015).

Management of Yukon River Salmon

Management of the Yukon River salmon fisheries is extremely complex due to mixed stock runs of multiple species with overlapping run timing, difficulty in determining abundance and run timing, variable efficiency of different gear types, allocation issues between upper and lower river, conservation needs, and the immense size of the drainage (Schmidt et al. 2015). Management of these overlapping species is a challenge, particularly during times of conservation of one species, such as the recent challenge of Chinook salmon declines when summer chum have remained abundant.

Yukon River salmon have been managed in one form or another since the early 1900s. In the early 1900s, salmon from the Yukon River were sold commercially at a level that depleted the subsistence fishery. In 1917-1918, commercial fishing efforts depleted the salmon runs and left the subsistence fishery in such dire straights that people reportedly were culling their dog teams due to lack of food available to feed them (Pennoyer et al. 1965). This was brought to the attention of the U.S. Department of Commerce and initiated their oversight and regulation of the fishery. In 1921, the Department of Commerce limited commercial fishing for export from within the river and 500 yards outside of the mouths and sloughs to protect the subsistence fishery and economy (Brown, Godduhn, et al. 2015). The commercial fishery was further restricted in 1924 to ensure enough salmon was available for the sled dogs needed to develop the territory. Commercial fishing was again allowed in 1931 but mesh size restrictions were put in place to avoid Chinook salmon. Additionally, harvest quotas and season limits were implemented but there were no subsistence fishing restrictions (Brown, Godduhn, et al. 2015:8).

In 1959 when Alaska became a state, fisheries management authority was transferred from US Fish and Wildlife Service to the Alaska Department of Fish and Game (ADFG). This resulted in many changes to subsistence and commercial fishing including a change from a quota system of management to an adaptive fishing schedule (Brown, Godduhn, et al. 2015). Commercial fishing intensified in the early 1970s through the 1980s providing income to small-scale fishers. In the 1970s, commercial fishing was limited to prevent overfishing. The Alaska portion of the Yukon River was divided into districts (Shirley 1992:9). In 1993 commercial and subsistence fishing times were separated in the lower and middle river. The salmon runs collapsed and led to severe restrictions and changes to subsistence and commercial fisheries in the 1990s (Brown, Godduhn, et al. 2015; Wolfe and Spaeder 2009). The annual harvest was down and in 2009 most escapement goals were not met nor was the Canadian border passage requirement. There has been no directed Chinook commercial harvest since 2008 and the subsistence fishery has been severely restricted. The commercial harvest of chum salmon has also been restricted in order to protect Chinook.

Beginning in 1999, Yukon River fisheries in Alaska were jointly managed by the federal and state government through the ADFG and the US Fish and Wildlife Service. This coordinated subsistence fisheries management includes input from YRDFA and others. The Yukon River Panel, established in 2002 through the Pacific Salmon Commission, manages the international allocation of salmon between the United States and Canada. The Panel makes recommendations to the managing entities in the USA and Canada (Pacific Salmon Commission 2004)

Fishery scientists do not yet understand or know the cause of the decline in Chinook salmon and possible connections have been made to include bycatch of salmon in the pollock fishery in the Bering Sea, increased parasitic infection, more extreme and generally warmer weather, and changing hydrologic conditions. Regardless of the cause, the results of the Chinook salmon decline include a smaller total harvest and smaller individual fish size (Brown, Godduhn, et al. 2015:13). During their ocean phase, Chinook salmon feed on pollock (*Gadus chalcogrammus*) and are caught as bycatch in trawler nets in the Bering Sea pollock fishery. The North Pacific Fisheries Management Council (NPFMC) has addressed this issue by limiting incidental bycatch of Chinook salmon and providing incentives for the fleet to comply (ADFG 2011; Brown, Godduhn, et al. 2015:12). Researchers examining North Pacific Chinook salmon body size reductions found that ocean conditions increased salmon survival during the 1975-1993 period, along with the enhancement programs of the 1980s and 1990s, yet with the increased population there was also decreased access to food ocean-wide thus resulting in 45 of 47 North Pacific salmon populations decreasing in average body size (Bigler et al. 1996). The Joint Technical Committee of the Yukon River Panel (JTC 2006:8) also examined this issue and concluded that changes in Yukon River Chinook salmon populations were likely due to selective fisheries and long-term variation in the ocean environment. Others suggest that selective exploitation of large fish made possible by large mesh driftnetting may have reduced salmon size and age at maturation over the past few decades (Bromaghin et al. 2008). Additionally, in the mid-1990s, ichthyophonosis (*Ichthyophonus hoferi*), a parasitic infection, was seen in many Chinook salmon along the Yukon River. This increased infection rate may have been due to climate change or warmer weather but seems to have stabilized since then (Kocan and Hersherger 2003; Kocan et al. 2003; Zuray et al 2012). Other possible causes of the Chinook salmon decline are climate change effects where lower water levels during migration and increased sedimentation in tributaries from degradation of permafrost threaten salmon productivity (Prowse et al 2006).

Reason for this study/ report overview

YRDFA undertook this study at a time when fishers, managers, and other decisions-makers were greatly concerned about the health of the Yukon River Chinook salmon and the effects of its low abundance on Yukon River people. Additionally, there were rippling effects in other areas, for instance, concern over bycatch of Chinook salmon in the Bering Sea pollock fishery exacerbating the already low numbers of Chinook salmon. As managers and others were grappling with concern over the low Chinook salmon abundance and decision-making required by them to conserve Chinook salmon, the North Pacific Research Board requested proposals examining the value of Chinook salmon to the people of the river.

Few studies have investigated the value of salmon to subsistence fishers in rural Alaska. ADFG researchers examined the socioeconomic effects of the salmon disaster of 2009 on five Yukon River communities (Brown, Godduhn, et al. 2015) and found that subsistence fishing families throughout the drainage were affected in a variety of ways over time by the decline in Chinook salmon. Changes noted were less use of fish camps, increased fuel costs, increased need for wage employment, changing fishing regulations, and use of dogs. Earlier, Holen (2014) examined the role of commercial and subsistence fishing in the economic and social viability of three rural fishing villages of Prince William Sound, Bristol Bay, and Cook Inlet. Holen found that younger people are not participating in the fishery as much as in the past, causing concern about fishing traditions continuing, but that fishing continues to be valued as a social, cultural, and community activity for families. He also found that without subsistence fishing, residents in the study communities would not be able to afford to live in their communities. While this current research on the value of salmon does not detail the economic effects of the Chinook salmon decline on Yukon River villages, it does document the primary values of salmon to Yukon River fishers and changes they report in their fishery. This study focuses on three Yukon River communities, three age groups, and gives voice to the personal effects felt within these communities. Additionally, the participants in this study were able express the deep value of salmon to themselves, their families, and their communities.

A consideration of the value of salmon for individuals and communities is an explicit attempt to understand its role in people's lives in a more holistic way. It is a departure from examining the importance of salmon through run abundance, stock health, or other more focused biological inquiry. While participating in the YRDFA In-season Salmon Management Teleconferences in 2016, Martin Kelly of Pilot Station explained that he values salmon because the food in the local stores have a high cost and there are few jobs available in his village. He says, "people who have no job cannot afford the \$75 to go to the store for a plastic bag of food that would last one day." He describes what he says is a bad situation—cost of food in the village, lack of jobs, and the economic status of people in his community—which leads him to emphasize the value of salmon to himself and his community. Kelly is referencing more than the differential costs of wild food versus store food. In a place where jobs are few, the work of subsistence provides meaning and importance for an individual. In a place where money is scarce, salmon are a symbol of providing for one's family and community. Similarly, Beverly Hoffman (co-chair of the Kuskokwim Salmon Management Group) described the monetary value of salmon to Senator Begich in 2013 (B. Hoffman, personal communication 2017). She noted that her average annual harvest would be valued at \$84,000 at today's market rates. An individual salmon might exceed \$1,000 in value. But for Hoffman, the value of salmon exceeds these monetary estimates. Salmon are priceless because they are the food she shares with her family.

These relatively simple statements belie complex valuations of salmon. Subsistence activities, such as processing fish at fish camp with family members, create basic memories that define a sense of family and community. Sharing or distributing these resources promotes and propels the local values of generosity, respect for the knowledge of Elders, self-esteem for a successful harvest, and appreciation for the sharing of food and resources. These activities together provide the moral foundation and for continuity between generations (Calloway 2004).

Layout of this report

This study has been an opportunity for the residents of three Yukon River communities to describe how they value salmon through ethnographic interviews. The next chapter outlines the objectives and qualitative methods of this study. Following the methods, three community chapters—Russian Mission, Nenana, and Fort Yukon—describe how the people from these lower, middle, and upper river communities understand and value the role of salmon in their lives, families, and communities. Following the community chapters is a discussion that compares the results from each community and a conclusion summarizing the overall study results.

METHODS

Objectives

The objectives of this project were as follows:

- 1) Document the value of salmon to people in three Yukon River communities through ethnographic interviews. Describe how salmon / human relationships have changed over the last 20 years due to changes in abundance and availability of Chinook salmon.
 - a. Conduct semi-structured interviews with respondents from three separate age categories (18-29 year olds, active fishers aged 30-54 years old, Elders aged 55 and over) to collect information on values of salmon and changes over time in salmon / human relationships due to changes in salmon abundance/availability.
 - b. Develop a research protocol to access different uses/values of salmon and changes in priorities over time.
- 2) Promote capacity building in local communities, tribal organizations, and non-profit organizations.
 - a. Consult with local village tribal councils in developing research plan, designing interview questions, and collecting, reviewing, and analyzing data.
 - b. Train local tribal entities in interview procedures, use and application of research data.

Three communities in the Yukon River drainage participated in this study - Russian Mission, Nenana, and Fort Yukon. The project investigator (PI) selected these communities on the basis of their potential to fully represent the regional differences within the drainage and the interest expressed in initial inquiries. All three communities are strongly dependent on Chinook salmon or salmon in general and have good working relationship with YRDFA. Russian Mission is a Yup'ik community in the lower Yukon River in fishing district Y-3. They were selected because of their strong dependence on Chinook salmon, location in the lower Yukon River, and commercial fishing activity. Nenana is located on the Tanana River, a major tributary of the Yukon River, at the mouth of the Nenana River in fishing district Y-6. The people of Nenana are Lower Tanana Athabaskan and they are the only community in this study on the road system. Fort Yukon is located in the Yukon Flats at the confluence of the Yukon and the Porcupine Rivers in fishing district Y-5. The people are primarily Gwich'in Athabaskan. Fort Yukon is a regional hub for the Yukon Flats area.

To begin this research project, the PI began a literature review of available data documenting the value of salmon to the people of the Yukon River. The literature review included archival research from the early explorers to reflect the long history of use of salmon along the Yukon River as well as recent documents from YRDFA, state and federal agencies and other researchers from private and public non-profits and institutions. The literature review focused on each study sub-region of the Yukon River.

Before traveling to each community, the PI, Catherine Moncrieff, requested permission through each community's Tribal Councils to conduct the project. Although each community supported the project at the proposal stage, once funding was secured, the PI worked with each Tribal Council office to ensure they understood, agreed with, and had an opportunity to review and edit the research plan. The ethical guidelines, outlined in the National Science Foundation, for the conduct of research in the Arctic region were followed. The research agreements addressed ownership of data, participant consent and anonymity or acknowledgement, payment of participants, and community reporting. In each community, their Tribal Council chose to own or retain a copy of the interviews on their secure computer system.

The following possible hypotheses were included (not in order of priority) in the development of the research plan.

- Salmon as food will be valued the highest by people of the Yukon River; salmon will be valued most for use by Elders and children.
- The value of salmon as food and as a cultural / family activity cannot be separated out and is valued equally important.
- Local Yukon River families want to raise their children with knowledge of fishing and experiences growing up at fish camps teaching them knowledge, skills, and abilities that are critical to surviving life in rural Alaska.
- A lack of salmon abundance and availability has led to community problems in Yukon River communities.
- Lower incomes have occurred in Yukon River villages as a direct result of a lack of commercial fishing activities taking place due to a lack of the abundance and availability of salmon.

The PI held meetings with the Tribal Councils and community at large in each community to share the project, answer any questions, hear concerns, and to consider community feedback to the research question. Prior to the arrival of the PI, posters describing the project and community meeting were created and posted at the Tribal Office, post office and local stores.

Table 1. Communities, fieldwork dates, local hire and number of interviews.

Community	Fieldwork dates	Local Assistant	Community meeting date	# of interviews
Russian Mission	May 11-13, 2015	Pete Stephanoff	May 11, 2015	13
Nenana	Sept 9-10, 2014	Janet Allen	Sept 9, 2014	12
Fort Yukon	Sept 23-25, 2014	Charles Harriman	Sept 22, 2014	14

As part of the capacity building aspect of this project and to assist the PI while in the communities, a local research assistant was selected by the Tribal Councils in each community and hired to help arrange interviews, take notes, steer discussions, and interpret local language when necessary (Table 1).

Semi-structured interviews, a standard social science method for collecting qualitative data regarding a variety of topics, were used as the primary means of data collection. With this method, the PI guided each participant in a discussion, and the associations identified by the participant were used to guide the direction and scope of the interview. Open-ended questions were used to allow for the expansion of participants' observations and discussion (e.g., Huntington 1998). In each study community, individuals who are active in fishing activities were identified. Generally it is well known within a community who is active and/or skilled in an activity such as fishing (Usher 2000), and these individuals were identified using a snowball approach (Trotter 1998:705) in which participants or project contacts suggest other possible participants who are knowledgeable on the subject.

The PI attempted to interview an average of 15 individuals per community, including 5-8 participants per age group. The age groups were 18-29 year olds, 30-54 year olds, and over 55 year olds. The goal was to interview a minimum of 3-5 fishers in each category. This was accomplished in each community with the adaptation of expanding the youngest age group to 16-29 year olds. Participants were chosen based on a combination of factors including age, gender, fishing family groups, fishing locations, nominations from the

tribal council and other participants, and experiential differences. The PI focused on Elders who have long-term knowledge of fishing, middle aged fishers currently active, and younger people active in fishing and processing. The interview protocol (Appendix A) was designed to elucidate all aspects of value of salmon to the people of the Yukon River and changes that had taken place in the salmon and human relationship related to the abundance and the availability of Chinook salmon. Informed consent from participants was obtained prior to proceeding with the research.

The interview protocol included questions about each fisher's first memories of fishing and how they participated, who taught them to fish, when they started fishing independently, how fishing has changed over their lifetimes, how salmon is important to them, whether they were commercial fishers or conducted customary trade (exchange of subsistence food for cash), which species are most important, whether the salmon most important to them has changed over their lifetimes, whether a change in abundance and availability in Chinook salmon has impacted them, whether they got enough salmon last year, and in their opinion, who should have access to salmon in times of shortage. Each participant received an honorarium of \$50 for sharing their time and knowledge.

Key respondents covered a wide range of ages including 39 interviews with fishers in three age groups in the three study communities (see Appendix C). There were a total of 9 women and 30 men. There were 11 participants in the 16-29 age group, 14 in the 30-54 age group, and 14 in the 55 and over age group (Table 2). All but two of the interviews were digitally recorded and they varied in length from approximately 1½ hours to 6 minutes in length. In general the interviews were significantly shorter with the younger participants. Most interviews occurred at respondents' homes or at the Tribal Council building. The PI was unable to hire an intern from the region to assist with the research as originally planned; instead, she relied on the local research assistants from each community. Nina Oliver, a college student in the University of Alaska Fairbanks in the Fisheries Program, was hired to transcribe the interviews.

Table 2. Interview participants age ranges.

Community	Ages 16-29	Ages 30-54	Ages 55 and over
Russian Mission	5 (3 women, 2 men)	4 (all men)	4 (1 woman, 2 men)
Nenana	3 (2 women, 1 man)	4 (all men)	5 (1 woman, 4 men)
Fort Yukon	4 (all men)	5 (1 woman, 4 men)	5 (1 woman, 4 men)

The PI analyzed the content of each interview and separated comments by subject area, analyzing general themes and patterns that emerged from the interviews. This included comparisons of different perspectives, patterned regularities, and key observations. This enabled the PI to draw connections between different kinds of information provided by individuals in the various age groups interviewed. Specific topics or themes that emerged include the value of salmon as food, the need for food security, the importance of family activities, the benefit of a teaching tool for youth, a connection to their spiritually, and as an inspiration for art.

Participant observation was also employed as a research method for this project. Participant observation is a useful tool in understanding detailed aspects of the semi-directed interviews. In each community the PI had the opportunity to travel the river by boat with a fishermen, viewing their fishing locations, gear types, use of gear, and observed the river environment in general. This activity lent increased understand of the nuances of the interview discussions. For instance, in Russian Mission, the PI was able to learn about and watch the use of set nets as compared to the fairly new gear type dipnets. She was also able to have additional discussions about the learning curve and how a fisherman employs a method new to them. In Nenana, she was able to travel the river area surrounding the village and received a thorough narration about the tradi-

tional fishing methods and locations. In Fort Yukon, she was able to travel to fish wheels sites and observe fishermen check a set net. She also received an explanation about the challenges of this braided portion of the Yukon River.

Upon completion of the data analysis and preliminary report writing, the PI returned to each study community to present the preliminary findings and gather community comments for the final report (Table 3). A workshop was held in each community for review of the chapter and the discussion surrounding it. Draft copies of the chapter were brought to the meetings or sent prior to enable participants to review it in advance. The PI presented a detailed summary of each chapter and recorded community comments to incorporate into the final report.

Table 3. Community review meeting dates	
Communities	Community Review Meeting Dates
Russian Mission	February 28, 2017
Nenana	July 29, 2015
Fort Yukon	June 20, 2016

RESULTS –COMMUNITY SUMMARIES

RUSSIAN MISSION

Historical Background and Natural Environment

Russian Mission is located along the lower Yukon River, 213 miles from the mouth, in what fisheries managers refer to as district 3. It sits on the north bank of the river on a south-facing slope. To the west are several small ranges of hills and mountains. On the east bank, the landscape is flat with many small lakes and sloughs (Pete 1991).

Russian Mission is located along an important historical trade route, close to several pre-contact portage routes between the Yukon and Kuskokwim rivers (Zagoskin 1967 [1847]). Since before contact, the people of the Russian Mission area have had established trade networks. They traded their dried or frozen fish with people from the southern Norton Sound, the *Pastulirmiut*, for “laftak” (bearded seal skin used for boats and boot soles) and sea mammal oil. They acted as middlemen and traded these products with the *Akulmiut*, the people of the inland tundra between the Yukon and Kuskokwim Rivers for furs (Pete 1991, Zagoskin 1967[1847], Andrews 1989, Andrews 1994). Trading dried salmon was also important after the Nome gold rush in 1898 to mail carriers who traveled by dog team (Pete 1991).

Glazunov, a Russian exploration leader, in 1835 chose Russian Mission as a site for the first trading post along the Yukon River (Zagoskin 1967 [1847]). This was the beginning of sustained contact between the Indigenous people and non-Natives. At the time of contact, there was a fish camp at the site and a Native settlement about a half-mile upstream. The settlement was called *Kangiqucuk*, meaning “little bit of a bay” and referred to a ravine between two bluffs that provide a sheltered cove. The fish campsite became a community known as *Iqugmiut*, meaning “inhabitants of the settlement near the end or tip”, such as the end of a ridge or bluff. *Kangiqucuk* depopulated in 1838 due to the smallpox epidemic and oral tradition relates that only one couple survived and they relocated downriver to the point of the bluff (Pete 1991). The trading post only operated until 1839 when Kuskokwim Natives, angry about the smallpox epidemic, destroyed the post and killed its staff. It was re established in 1840 (Zagoskin 1967 [1847]) but only operated until 1846 when the Russians moved the materials down river to Andreafsky, near present day St. Mary’s (Pete 1991).



Dip nets in Russian Mission



Barge and fishing activity on the Yukon River as seen from Russian Mission

More influences followed this initial contact. The *Iqupmiut* and the people of the Yukon-Kuskokwim delta region were first exposed to Russian Orthodoxy in the 1830s through the redoubts or fortified Russian trading posts where Native people came to trade (Pete 1991). The first resident priest at Russian Mission arrived in 1845 and had a Russian Orthodox Church built there in 1851 (Oswalt 1963).

A second epidemic of measles and influenza in 1900 caused much death; survivors in small settlements consolidated into larger ones. For instance, residents of Dogfish Village or *Iqallivigmiut*, moved to Russian Mission but continued to use their traditional harvest areas (Pete 1991). Another influenza epidemic in 1921 caused more deaths, the collapse of nearby settlements, and the decline of the use of the *qasigiq* or men's house as Elders passed away.

Between 1900 and 1950 former major settlements with ceremonial and social relations with the Russian Mission community, such as Dogfish Village, Paimiut, and Ohagamiut, eroded away and communities consolidated (Pete 1991). Iquarmiut was abandoned in 1955 following a minor epidemic. Some of its residents moved to Russian Mission and the site was used as a fish camp through 1984.

Russian Mission has an old and new section with the old town being located along the river within the flood plain. It was incorporated as a second class city in 1970. The new part of town was built up on the bluff in the 1970s in response to flooding threats and includes a K-12 school and housing. Remnants of food storage holes, called *qengenret*, remain dug into the sides of the ravines of the bluff. They were shored up with logs and doors hinged or held in place with wooden latches where dried salmon was traditionally kept in the fall with cool temperatures (Pete 1991). The bluff has several terraces in which are located the tribal office, city office, and two stores. Further up the bluff are family dwellings.

According to a recent survey, there were 73 households in Russian Mission and the average households size was 4.27 people (DCCED). The population was fairly evenly split between men and women with 20 more men in 2010 than women. The median household income was \$43,750 and 29% of the population was below the poverty level.

Russian Mission is typical of most rural Alaskan villages in that the people rely on a mixed cash-subsistence based economy. In 2011, the primary source of income in Russian Mission came from jobs with the local government (city and tribal) and this accounted for 47% of all income in Russian Mission (Ikuta et al. 2014), followed by services such as health care, social services and the local stores (12%). The Alaska Permanent Fund dividend made up another 11% of cash flow into Russian Mission. Mean household income (2011) was estimated at \$51,352 and there were an average of 3 jobs per household. In 2011, approximately 54% of the adults in the community were employed. Though over half of the adults were employed in 2011, many jobs are seasonal such as firefighting, construction, or limited commercial fishing and only 39% of the adults were actually employed year-round (Ikuta et al. 2014).

The cost of living is very expensive in rural Alaska. According to Ikuta et al. (2014), the mean amount spent on basic living expenses in Russian Mission in 2011 was approximately \$23,006, which included housing, utilities, groceries and subsistence expenses. Store-bought groceries cost each household an average of \$12,507 and were higher than housing costs at approximately \$8,383 per household. Costs related to subsistence activities or the procurement of wild foods were an average of \$2,115 per household which included \$1,457 per household for gasoline alone, or 68.9% of this category.

In 2011, the average harvest of wild foods per household in Russian Mission was 1,675 lbs. and per capita it was 329 lbs. (Ikuta et. al 2014). The overwhelming majority (98%) of Russian Mission households used at least 1 wild food resource in 2011 (Ikuta et al. 2014). Households harvested a total of 78 different types of resources while the average household harvested 16 resources. Households also reported *using* an average of 20 resources (Ikuta et al. 2014).

Fish played an important role in the wild food harvest in Russian Mission with 61% of their total harvest in 2011 being composed of salmon and nonsalmon fish species. Fish were the most widely used resource category (by 98% of households) and the most widely harvested (91% of households). Salmon alone accounted for 34% of the total estimated harvest for the community for 2011, with Chinook salmon making up 22% of the total (29,549 lbs or 74 lbs per capita) and summer chum composing 7% (8,978 edible pounds) of the total estimated harvest of wild foods (Ikuta et al. 2014). Salmon are also harvested in Russian Mission as food for dog teams. In 1991, the ADFG found that 7 mushers harvested 1,730 salmon for use as dog food. In 2011, the salmon harvest for dog food was reduced to 403 (Ikuta et al. 2014). Fishermen in Russian Mission also harvest other fish species for use as dog food including nonsalmon fish, blackfish and lamprey.

To harvest salmon, Russian Mission residents reported accessing a 20-mile continuous stretch of the Yukon River around their village (Ikuta et al. 2014). They drift from Roosevelt Island 12 miles downstream to Johnson Island 6 miles upstream. They also drift around Dogfish village in a 7-mile area and in a 4-mile area located 10 miles upriver from Marshall. They fish using setnets around the mouth of Kako Creek near Johnson Island and near Pearl Island, which is located 22 miles upriver.

In Russian Mission, as in many Alaska subsistence based communities, 35% of the households harvested 70% of the resources used by their community in 2011 (Ikuta et al. 2014). These harvesters who took a primary role in obtaining and sharing a majority of the wild foods eaten in their community show the importance of sharing within their culture and community. The ADFG study (Ikuta et al. 2014) found that the highest harvesting households were typically headed by a couple under the age of 40 or between the ages of 40 and 59.

Desired resources are not always available in the necessary quantities. For salmon, ADFG found that only 54% of their respondents to the comprehensive survey reported getting enough salmon in 2011. Those who did not get enough salmon reported that 42% experienced a minor impact while 47% reported a major impact and finally 11% reported a severe impact to their household from not being able to get enough salmon. Of those who did not get enough salmon, 89% reported that the species they needed was Chinook salmon and they did not get what they needed due to regulations, lack of time, and the resource just being unavailable during the study year (Ikuta et al. 2014).

This need for additional salmon harvests may have contributed to lower than average food security. Food security is defined as, "access by all people at all times to enough food for an active healthy life" (Nord et al. 2009:2[-SEE Ikuta et al. 2014]). Ikuta et al. (2014) found that for 2011, 63% of households in Russian Mission reported being food secure, 24% of households having low food security, and 13% of households with very low food security. As compared to the nation and the state of Alaska where 15% of households are food insecure, one-third of Russian Mission households (37%) reported food insecurity. Seasonal changes appear to influence the food security in Russian Mission with higher number of food insecure conditions occurring between October and April and a rise again in June (Ikuta et al. 2014). Of those households who reported needing more salmon, 89% reported needing more Chinook salmon, thus the decreased abundance of Chinook salmon in 2011 may have impacted households.

Seasonal Round

The subsistence round begins in Russian Mission in the spring with arrival of the migratory birds (ducks, geese, and swans) which are harvested around breakup in April and May (Ikuta et al. 2014). Simultaneously with the bird harvest, residents prepare for fishing season and bear hunting. Eggs are collected in late May and early June although this practice may have declined since the late 1970s (Pete 1991). Salmon fishing season also begins in late May and early June when setnets are placed in eddies to target Chinook salmon while also catching sheefish. Sheefish are the first fish species to run in large numbers up the Yukon River in the spring and frequently overlap with the early Chinook salmon (Pete 1991, Ikuta et al. 2014). Salmon fishing

continues all summer into September as Russian Mission residents harvest all five species of salmon which run up the Yukon River – Chinook salmon, chum (*Oncorhynchus keta*), coho (*O. kisutch*), sockeye (*O. nerka*), and pink (*O. gorbuscha*). Following, or overlapping with the Chinook salmon arrival, the chum salmon or ‘summer chum’ are an important species harvested in Russian Mission (Pete 1991). Sockeye and pink salmon are targeted in mid to late June although they arrive in lesser quantities. Fall chum salmon and coho are harvested through September and are important species for Russian Mission residents to meet their harvest needs (Ikuta et al. 2014).

Other fish are also harvested in Russian Mission including Dolly Varden, Arctic grayling, whitefish, Arctic lamprey, burbot and Alaska blackfish. Dolly Varden and Arctic grayling are taken during the summer primarily with rod and reel but some are harvested incidentally in salmon or whitefish nets (Pete 1991). Whitefish are harvested in the fall in setnets as they migrate downstream. This harvest takes place around freeze up and the nets are either placed in open water or under the ice or by jigging through the ice (Pete 1991:97). Ikuta et al. (2014) reported that respondents favor August and September for catching whitefish because the fish are healthy, fat, and abundant.

Moose, which have been in the Russian Mission area since the 1940’s, are hunted in September (Pete 1991). Family groups work together in the harvest and share the cost of gasoline. Berry gathering is important in the fall and black bears are also taken during this period when the opportunity arises. Whitefish migrate downriver in the fall and are harvested with setnets before and after freeze up as well as by jigging through the ice (Pete 1991, Ikuta et al 2014).

Arctic lamprey, or *eels* as they are referred to locally, are another important fish species in Russian Mission, particularly for feeding dog teams but also for human consumption (Ikuta et al. 2014:389). The eels migrate upriver in large, concentrated runs in a short window around freeze-up, but timing the harvest is difficult due to this short window that could take place in one night or early morning. Dip nets or “rakes” are used to sweep through trenches or holes in the ice in which the eels wrap themselves around (Ikuta et al. 2014:390). Nonsalmon fish, such as burbot or “*loche*” are harvested in whitefish nets in the summer and in setnets under the ice from freeze-up through late February and by jigging. Alaska blackfish are harvested using funnel shaped traps set in the water near Russian Mission just prior to freeze-up and left in place to be checked throughout the winter (Pete 1991:100).

During the winter trapping and hunting activities target beaver, river otter, lynx, marten, mink, muskrat, red fox, wolf, and wolverine. Fur quality and the ability to travel are best in November and December (Pete 1991, Ikuta et al 2014).

Chinook salmon in the Yukon River have been in decline since 2008 and this has caused great hardship for the people of Russian Mission. Russian Mission residents prefer Chinook salmon because of their fat content and great amount of meat but are very concerned about the decreasing size and abundance of the Yukon River Chinook salmon (Ikuta et al. 2014). To address this concern, even back in 2011, some Russian Mission fishers reported decreasing their harvest of Chinook salmon to protect the population and (hopefully) save them for their children.

Indeed, over the last 20 years Russian Mission subsistence harvests of Chinook, chum and coho salmon have declined (Ikuta et al. 2014). This is likely due to a variety of reasons including health of the salmon runs, regulatory changes, weather, and effort. Chinook salmon subsistence harvest levels in Russian Mission were estimated to be 1,894 in 2005 (Hayes et al. 2011) but dropped to 236 in 2013 (Estensen et al. 2015a) and as low as 16 in 2014 due to the closure and conservative management efforts required to protect this stock (Estensen et al. 2015b). Yukon River Chinook salmon harvests for subsistence for 2014 were estimated to be 90% below the 5-year average (2009-2013) and 94% below the previous 5-year average (2004-2008) (Estensen et

al. 2015c). The 2014 Chinook salmon harvest for subsistence was the lowest ever recorded by the ADFG for the period 1975 to 2014 (Estensen et al. 2015c).

Fishing History

As part of the ethnographic interviews, participants described how they learned to fish and their first memories of fishing. This was most often with their parents or grandparents. The oldest participants remember that they only lived in Russian Mission during the winter and the rest of the time they spent at their various camps – spring camp, summer camp, fall camp- where they were always working on getting their food supply. Some participants remember their parents using fish wheels and making their own fishnets. As children, their job was to wash the salmon, hang the fish on the drying rack, chop wood, help smoke the fish, keep the fire going, watch for bears, and haul water. Some even learned to cut salmon as young as 7 years old. Some of their first memories of fishing were helping their father check or set the net, walking to camp, or driving the boat at a very young age. One participant remembers throwing out the net (to set it) at 7 years old with his grandparents. Participants described their first memories of fishing with a relative - a parent, grandparent or aunt or uncle.

Over their history, Russian Mission residents have employed different tools to harvest salmon. This has included fish wheels, dip nets, fish traps with fences, and drift and set nets. In the past these were made from willow, sinew, or seal skin. Using their knowledge they selected from these gear types to target different species and various environmental conditions (Pete 1991). Fish wheels are not currently used in Russian Mission but Elders remember their use in the past and reported a communal fish wheel in place in front of the village until the 1960s (Ikuta et al. 2014)

Today, Russian Mission fishers use nets of various sizes depending on the current allowable gear. Participants have been drift net fishing in Russian Mission since the late 1960s and many prefer it to set net fishing. Drifting is more expensive with a higher gasoline cost but less labor intensive because the whole net does not need to come into the boat when removing fish. Many fishermen prefer drift net fishing because the fish are still alive when they pull them into the boat. Gillnets were used in 2011 for 94% of this harvest described above. Drifting was the preferred method over setnetting in 2011 with 73% of the total salmon harvest taken with a drift net that year (Ikuta et al. 2014). Russian Mission residents fish downriver from Russian Mission, out in front of the village and upriver. Many Russian Mission fish camps are located along the



Russian Mission riverbank as seen from fishing boat



Young fishers in Russian Mission

banks within the village area but there are also fishing camps located downriver or upriver from the village. Respondents spoke about how they established their camps, either through their parents or exploring a new place themselves.

Processing salmon is a multi-stepped process that takes time. Salmon are cut into slabs or strips and hung to dry outside for 3 days, then moved into the smokehouse where the smoking process can take about a week (Ikuta et al. 2014). Weather is an important component of this process. Subsistence fishermen strongly prefer the drier weather of early June to the regulatory openings later in June or early July; cool and rainy weather in mid summer can slow the process or even destroy the fish.

Russian Mission fishermen are concerned about their decreased harvests of salmon and the reduced abundance. Their consumption has been reduced and can be shown by comparing per capita levels over time with 1985 levels at 135 lbs of Chinook salmon, while in 2011 these numbers dropped to 74 lbs. per person. Similar reductions happened with summer chum, fall chum, coho and pink salmon (Ikuta et al. 2014:431).

Changes in gear and regulations over the last 20 years have combined to introduce various challenges to fishing for salmon in Russian Mission. Modern gear has improved fishing efficiency but increased regulations have changed fishing patterns. Some participants explain that it used to take them all summer to get their Chinook salmon for the winter. If there were Chinook salmon available today, fishermen would be able to reach their harvest goals in a much shorter time period due to larger nets and drift net fishing. One of the recent regulatory changes, the windowed subsistence openings intended to spread out the harvest, has changed fishing patterns in Russian Mission. In the past, fishermen were able to select fishing times based on environmental and personal conditions – the weather, the presence of salmon, and their need. Today, they can only fish for salmon during the windowed openings for their fishing district. This creates a situation with salmon at different stages of processing being caught in different openings. This change is difficult to adjust to because the timing of the run is critical for drying and processing due to the wetter weather that typically arrives later in the summer. “Being so used to cutting kings, then switching over to chums is a little bit more of a challenge because of the flies” (Peter Minock, Jr., Russian Mission 2015). Chinook salmon fishing is typically completed by the end of June and the ocean breeze dries the oily Chinook salmon on the racks. Chum salmon are cut from the end of June into mid July when the ocean breezes have usually ended and there is more wet weather. Fishing families who are accustomed to processing Chinook salmon struggle with processing their chum salmon without any waste. Salmon that cannot be dried before flies lay maggots in the flesh must be thrown away or given to dog mushers. Wasting salmon is disappointing and breaks a strong moral code of Russian Mission fishermen.

Fishermen are also coping with changing allowable net sizes to conserve Chinook salmon. Russian Mission fishers were not always prepared with the allowed gear as these changes were implemented and this affected their ability to participate in the fishery. Net sizes were reduced from 8½ to 7½ inch mesh by regulation to conserve the larger age classes of Chinook salmon and then further reduced to 6 inch mesh to target chum salmon and to 4 inch nets to target non-salmon species when salmon fishing was closed.

Some Russian Mission fishers believe the biggest changes in fishing today are the increases in cost. This has caused fisherman to make a variety of adjustments to their fishing strategies including the location of their fish camp, gear type, and teamwork. A lot of the Russian Mission fish camps today are located right along the bank in Russian Mission. One fisherman moved his camp to town 20 years ago because of the high gasoline prices. He uses a set net rather than a drift net to save money on gasoline. Fishing families pool their efforts, working as a team to save costs.

While drift and set nets were the primary gear type used in recent history (Pete 1991, Ikuta et al. 2014), dip nets were reincorporated into the gear mix by regulation (AAC 05.362) as an effort to target the abundant

chum salmon and conserve the declining Chinook salmon. This has provided an opportunity but also a hardship as a more difficult way to harvest salmon. The change to a dip net fishery, particularly for commercial fishing, has been hard but Yukon River fishermen are good at adapting. It takes longer, is harder work, and uses more gasoline but fishermen appreciate any opportunity to harvest salmon. During the first year of dip net fishing some families didn't have access to this gear type. Fishermen reported that it was difficult to harvest the quantity of salmon needed using a dip net as compared to a set or drift net. Dip netting is more labor intensive and may be too difficult for some Elders. Dip netting requires fishermen to release Chinook salmon and this is mentally difficult for fishermen who strongly desire these fish as food for their family's table. As one fisherman stated, "It hurts my family a lot to get a salmon and then let it go. It's food for my family" (Peter Askoar, Russian Mission 2015).

Within the past few years, subsistence fishing has been either been closed or severely restricted to conserve Chinook salmon and fishermen have had no choice but to turn to other species – chum salmon and non-salmon species – to meet their household needs. With the restrictions to conserve Chinook salmon, fishermen find it difficult to harvest enough chum salmon to meet their needs.

It's pretty hard, pretty hard to try to get what we need with the amount of openings... it costs us so much...everything is going up except pay, gas prices, what it costs us to smoke the fish, what it costs us to go get, even just to get the fish and the amount of fish that we get is ridiculously low...its very tough to feed the family and have enough for the winter.

—DANIEL ASKOAK, RUSSIAN MISSION 2015)

Chinook salmon is the primary salmon eaten by people in Russian Mission. ADFG found that their fishing district's 10-year average salmon harvest for the period 1998-2007 was composed of over half Chinook salmon (51%). This was the highest percentage of Chinook harvest for all Yukon River fishing districts for this time period showing Russian Mission's reliance on Chinook over other salmon species.

Some participants reported that when they are not able to harvest enough Chinook salmon it is a severe impact to their household. Others consider it a major impact. One participant reported that his household recently had to reduce what they ate and ration their food. His family had to buy more food from the store and this upsets them because of the high cost and lower quality alternative food. Other participants explain that when they run out, "they have to ask for some" to get dried fish from other people to make up for not being able to harvest enough Chinook salmon.

Some participants in Russian Mission believe that the biggest change in fishing is the shifting focus away from Chinook salmon to chum salmon because of availability. This is a major change in fishing patterns and diet as chum salmon is becoming a more important food source for humans and continues to be an important food source for dogs. "It's because they know [Chinook] salmon are declining and we can't get it." (Daryl Polty, Russian Mission 2015) They miss eating Chinook salmon and this is a big change in their diet. Participants explained that to replace a large Chinook salmon requires many smaller fish (chum salmon, whitefish or sheefish) and does not feel like a proper replacement. Many participants in Russian Mission are experimenting with ways to prepare chum salmon as human food. They are learning how to brine the chum salmon to make it more appealing and experimenting with making strips out of chum salmon rather than Chinook salmon. They are making *flat fish* (a way to cut fish) out of chum salmon. Reportedly, as their diet has changed they are also eating more moose meat and different kinds of fish other than chum salmon – whitefish, sheefish and pike.

In the past, many Russian Mission residents had dogs and thus the need for a large harvest of chum salmon to feed these dogs. Today there are still mushing teams and people raising dogs in Russian Mission and chum salmon is an important food source for them.

The reduced availability of Chinook salmon has decreased sharing and this eats away at their cultural traditions. One younger participant explained that with Chinook salmon being less available, her mother is no longer able to make salmon strips. Although fishermen are not happy about their reduction in Chinook salmon harvest, they acknowledge that it is important to conserve the declining Chinook salmon to ensure that it is available for future generations.

Value of Salmon

“If we don’t have fish, we don’t have anything.”

—PETER ASKOAR, RUSSIAN MISSION 2015

As a Food Fishing is a top priority in Russian Mission and salmon are a main food source. Subsistence fishing is very important to the participants of this study. “It feeds us through the winter... That’s pretty much our main diet in my family” (Peter Minock, Jr., Russian Mission 2015). Russian Mission participants grew up eating salmon when there was no store or other option for food. Salmon are critical to them because their bodies are so used to it, they crave it if they can’t have it. They spend the summer harvesting salmon and processing and storing it as food for the winter.

Salmon is also highly valued because store-bought food is expensive and not as healthy. As one participant describes, “Our food is right there, we’re trying to eat-cause we can’t go to the store... people don’t have money” (Daryle Polty, Russian Mission 2015). People rely on salmon and other wild resources for food because jobs are very hard to come by. One fisherman describes how he feels about salmon as, “To subsist is our life. It’s not a game, it’s living off the land” (Peter Askoak, Russian Mission 2014). The minimal amount of cash raised by each household has a high demand for critical items -gas, oil, and equipment needed for subsistence activities (Ikuta et al. 2014:434) to offset the high cost of living, cost of gasoline, and lack of employment opportunities in their village. In Russian Mission, where jobs are few, people use their time and skills to provide for their families, neighbors and community, as they always have, by harvesting edible resources from the land. Participants in Russian Mission value Chinook salmon because it is a healthy, natural, unprocessed food. They want their children to know how to harvest salmon so they do not have to rely on the less healthy, processed, store-bought food available in Russian Mission.

Specific types of salmon are eaten at different times. Chinook salmon (king salmon) is important as a winter food because of their high oil content. “When it’s cold you need to eat a lot of oil to keep warm,” (Willie Pitka, Russian Mission 2015). Many participants described how they value Chinook salmon for its oil and its flavor, as winter food that keeps them warm and sustains them through the winter. Younger hunters explain that when they are out hunting, they eat a few strips of the rich Chinook salmon and they are warm. Particularly older participants described their need for Chinook salmon, explaining that it keeps them warm in the winter and that they need the oil to stay warm when it is cold. This is a high quality food that lasts longer in their stomachs and keeps them full. They grew up with this valuable food and ate it every day. For the people of Russian Mission, their main fish to eat is Chinook salmon.

Salmon is important for food but also for medicine. Russian Mission participants described salmon as more than a food but so important for their bodies that they consider it medicine as well. They are aware of the Omega 3 fatty acids in salmon and appreciate the value and health benefits. When the salmon is drying in the smokehouse, they catch the dripping oil and use it as a lotion or a salve for eczema.

Even though Chinook salmon harvest patterns have changed over time, all generations feel the need for it. Some of the older participants explain that they miss Chinook salmon. They feel a part of themselves missing, to go a year without Chinook salmon. One participant described how when they do have the opportunity to taste a Chinook salmon, even a small jack, they cut it into small pieces and make sure everyone gets a taste, and she has 11 people in her house. Others talk about the kind of dishes they miss the most, Chinook salmon soup and strips. Some of the younger participants explained that they value Chinook salmon so highly because they hardly get it. They used to see a lot of Chinook salmon drying on the racks but now they do not. They value it so highly because it is available for a short time of the year and now, with the decline, it is available even less. One of the reasons that Chinook salmon is so highly valued is because of its large size. One Chinook salmon can be shared and feed a lot of people. More are needed today though due to the shrinking size of Chinook salmon on the Yukon River.

Chum salmon is important as an alternate food for humans and as a primary food for dogs in Russian Mission. Some fishermen in Russian Mission raise dogs and need to harvest chum salmon and other fish to feed their dogs. Those in Russian Mission who rely more on snow machines for transportation in the winter need to harvest less chum salmon. Chum salmon dries faster than Chinook salmon but most participants preferred Chinook salmon strips over chum. As one young participant described, “chum salmon are something to get by on” (Stephan Duffy, Russian Mission 2015). His mother has been experimenting with making chum strips and flat fish (a way to cut and dry salmon). Not all chum salmon are in good enough condition to be used as food for people. Sometimes they have more worms and need to be given to the dogs. Alternatively, one participant in his 40s reported that chum salmon is his favorite salmon because Chinook salmon is too oily for him.

When participants run out of salmon, they trade with moose or other fish to get more if they can. They do not trade with cash because cash is a commodity that is rarely abundant in Russian Mission. “It is difficult to trade for cash because nobody has cash in Russian Mission” (Willie Pitka, Russian Mission 2015). According to participants in the community review workshop of 2017, people in Russian Mission feel it is “not right” to trade Native food for cash. It is okay to barter with things you have a lot of but trading Native food for cash feels wrong to people of Russian Mission.

Value of Subsistence Fishermen People who fish in Russian Mission are important providers. Wild foods and the skills to harvest them are highly valued in an area with few opportunities for cash employment and with a tradition of harvesting from the land. Subsistence fishermen support their families and their community by harvesting salmon and other fish and sharing it within their family and to those who need it. Many subsistence fishermen share their catch widely, ensuring their community is fed. Some fishermen in Russian Mission report that they provide salmon for up to four or more households.

Subsistence fishermen share their knowledge by teaching others how, when to fish, and value the physical exercise. Their children need to learn how to harvest and process salmon. They hope that their children will continue to fish for salmon and pass on the tradition to those younger than themselves. Knowing the importance of being ready when the salmon migrate past the village is part of being a subsistence fisherman. Participants value subsistence fishing for keeping them active, healthy, and getting them outdoors in the fresh air. The older participants appreciate this healthy lifestyle and described how their parents shared the importance of this with them.

Subsistence fishermen are often commercial fishermen in Russian Mission. Some participants described how they grew up helping commercial fishermen or family members who were commercial fishing, traveling around their region to fish near the local buyer in Emmonak, St. Mary’s, Mountain Village, or Pilot Station. Some have been commercial fishing for as long as they can remember. Commercial fishing kept them busy, active, and out of trouble as youth. Commercial fishing is often done as a family in Russian Mission. One younger participant described how her mother, a commercial fishing helper to her grandfather, received his permit when he retired and she became the helper to her mother.

The income earned by commercial fishing is extremely important to provide household cash and to support subsistence activities. The money earned through commercial fishing is used to buy gas, oil, and to maintain equipment for subsistence fishing. Jobs, or opportunities to earn cash, in Russian Mission are very limited in availability and are often seasonal. For many commercial fishermen in Russian Mission, the income they earn through fishing is their entire earned income for the year. "The little money we get from commercial fishing – it's not a lot- but it's enough to pay for our expenses, our bills, and to have a little money for emergencies, to go to the hospital. I rely on it every year" (Peter Minock, Jr., Russian Mission 2015). One participant explained that when he was active in commercial fishing it made up 75% of his annual income. Chum salmon is valued in Russian Mission as source of income through the commercial fishery.

As Culture and Tradition Salmon are valued by the people of Russian Mission because the activities surrounding fishing connects them to their culture and teaches them important skills and traditional moral codes. The activity of fishing creates a bond amongst Russian Mission families through sharing knowledge, resources, time, creating gatherings, and a feeling of community. Through subsistence activities young and old connect as they pass on skills necessary to thrive along the Yukon River and important moral values are taught - avoiding waste, sharing the harvest, taking care of others, and traditional fishing times.

Fish camp or fishing activities are an opportunity to transfer cultural knowledge surrounding the harvest and processing of salmon, teach skills and pass on traditional values. During fishing activities, everyone has a role to play from the youngest children to the oldest Elder. Salmon fishing in Russian Mission is a group effort with family groups establishing fish camps along the banks of the river in the community or nearby. Often a child's first jobs are to haul fish and water, wash and hang the fish, gather wood for the smokehouse, and, when old enough, handling a knife. Fishing season means quality time for families together. One father spoke of how much he enjoys fishing with his sons and his wife enjoys teaching their daughters to cut salmon. Other fishermen talk about how they continue to fish with and help their elderly parents. Elders help at their adult children's camp or continue to run their own. They teach their grandchildren how they cut fish. Working together at fish camp is a way for children to learn their traditions, gets them outside, and teaches them life lessons. Fishermen value family time and working together to put food in the freezer. It is important to participants to maintain their culture and tradition of fishing. They want healthy salmon runs for the next generation so that their children and grandchildren can continue fishing. They want to teach their children their fishing culture. "I want my kids to be able to fish, to be able to learn...We work together and everybody does their own part – and it's also a social gathering for everybody, brings the family together.....keeps us outside," (Daniel Askoak, Russian Mission 2015). Many in Russian Mission would like to ensure that their people continue to be knowledgeable and skilled in harvesting essential food from the lands surrounding them, allowing them to be more self-sufficient and, as a community, prepared in case of a natural disaster. When a cultural group lives off the land, cut off from the road system, they are aware that natural disasters or other events may cut them off from support from the urban areas. Daryle Polty (Russian Mission 2015 participant) describes this well when he says, "We are Alaska Natives... we have to gather our food. It's our natural instinct because if we happen to have floods in the springtime, and our runways are right down at sea level, it could flood over and we're gonna have no planes coming in."

Traditional moral values are taught and put into action at fish camp. Cultural values and traditions in Russian Mission require 'taking only what you need, no more'. Participants frequently emphasized that they did not 'over fish,' describing this important cultural value. Fishermen in Russian Mission also help other people by catching salmon and sharing it with those who do not have nets or can't fish, following another important moral code, "take only what you need but also make sure others have enough." An Elder participant explained this practice when describing how she and her husband harvested salmon when they were newly married. Once they had enough, they would share and ensure others had enough before removing their nets from the water. She explains, "You don't keep going (fishing) when you have enough, but you don't pull (your net) out. You make sure your neighbors have a little bit of fish, some fish" (Sandra Kozenvikoff, Russian

Mission 2015). The cultural values and traditions of Russian Mission also require no waste when it comes to food. They go to great efforts to ensure they do not waste salmon and are highly concerned about waste in the Bering Sea fisheries through the North Pacific Pollock fishery bycatch. The waste from the bycatch concerns them both because it is a threat to the health of the salmon but also because they are morally offended that their food is thrown away as waste.

Traditional cultural values tell Russian Mission fishermen to fish when the weather is good and the fish are present. This allows them a safe and successful harvest, processing with no spoilage, and the ability to share. Changing regulations have affected fishermen's ability to harvest and share as their traditions require, "take whatever they can, don't over-take and share with everybody." Through the windowed fishing schedule, open fishing periods sometimes fall on rainy days or when there are few fish and fishing periods close when the weather is good and the salmon are abundant. Poor or rainy weather can make drying and processing the salmon difficult or cause drying salmon to spoil. Letting food go, or swim by, that has presented itself to you also breaks a moral code that Russian Mission Elders grew up with. The following quote describes one Elder's disappointment when she feels she should fish but cannot,

We go to the banks to watch the river and see the fish surfing as they go up and we say, 'Gee, look at all those salmon.' You can tell when the salmon swim, when they surface they are big, and chum, you can tell them too. And we wait and watch and say, 'When will they open?' and they say, 'A couple of days,' and we say, 'Gee, they just passed.'

—SANDRA KOZENVIKOFF, RUSSIAN MISSION 2015

With the decline of the Chinook salmon, families, extended families, fishermen, and the entire community report they cannot share beyond their immediate family or feel like criminals if they have enough Chinook salmon to share. Participant described the severe impact of the Chinook salmon reduction and the pain they feel when they cannot generously share resources as tradition requires. This can even effect job choices. One fisherman, who usually works at a cannery in the summer and has his nephew harvest salmon for him, had to forgo his job to stay home and harvest his own salmon because his nephew was no longer able to reliably provide for his uncle's family as well as his own. Each family relies heavily on salmon for food and, for this fisherman, that food is a priority or a higher value than the seasonal employment.

Concerns and Adaptations

To adapt to the decline in availability of Chinook salmon, Russian Mission fishermen are targeting other subsistence resources, relying on friends and family for supplemental wild foods, teaming up and pooling resources, purchasing more food from the store, traveling to other regions, and sharing less than they may have in the past. Due to the low number of Chinook salmon available and the difficulty in fishing due to changing regulations, participants are relying more heavily on alternative wild foods. They are setting more nets under the ice to access fresh fish, nonsalmon species, for people and to feed their dogs through the winter. Others are targeting more chum salmon, whitefish, sheefish, and pike while at fish camp in the summer. They are harvesting more moose and increasing their trapping to make up for the unavailable Chinook salmon. Some Russian Mission fishermen report being unable to share salmon because they do not have enough for their own household and still have to buy store-bought food. Alternatively, some participants report relying on family and friends *more* for wild foods. Russian Mission fishermen report working in larger groups than in the past to share the cost of fishing. With the few numbers of Chinook

salmon available, the restricted access to chum salmon to conserve Chinook salmon, and the high cost of gas and oil some families are teaming up with three to four families in a few boats, sharing the costs of gas and gear. Other people are turning to the store for food although at a very high cost. They are upset that the store-bought choices are not healthy foods but less nutritious 'junk' food. Some are dissatisfied with this option because the prices are too high for their limited income. Because their need for salmon is so great, a few Russian Mission fishermen are traveling to Bristol Bay to harvest salmon. Others consider this option but find the price tag too high at \$5,000 - \$7,000 and they find the salmon to taste different. They consider this option because staying home to harvest salmon is also expensive and recently they may be less than successful in meeting their harvest goals, still having to spend significant amounts on lower quality food from the store.

A primary concern of participants in this study is their ability to harvest their food and feed their families. Participants are concerned about the impact to their families from the lack of salmon or food insecurity. One participant describing the impacts from the reduced abundance of salmon said that his family had to eat less and ration their food and this was a severe impact to his household. Some participants are concerned about the level of poverty in their villages and the additional hardship of increased regulations on salmon fishing. "There are needy people in the village without education who have very hard times. They don't have anything, they have food stamps, living off the system... depending on public assistance" (Daryle Polty, Russian Mission 2015). Participants are concerned about how reduced access to Chinook salmon is impacting the younger generation. They are concerned that there is a change in diet occurring to less nutritious store-bought processed food from the Chinook salmon and wild food diet they were raised eating. They are concerned about the health implications and about the loss of culture in their youth. Russian Mission fishermen are very concerned about the decline of Chinook salmon and the possibility that their children will not be able to fish for and eat Chinook salmon. They are concerned that youth are not participating in subsistence activities. Fishermen in Russian Mission are concerned that the burden of conservation is falling to them. They would like to see more attention and action taken to protect Yukon River salmon at other stages in their lifecycle. They are worried that their concerns are not being heard. They are concerned about bycatch in the Bering Sea Pollock fishery and are concerned and want similar restrictions on the Bering Sea fishing efforts. Participants are concerned about the health of the ocean, where the Chinook salmon spends much of its time. Participants are concerned about their Elders and their health, their lack of food and need for Chinook salmon. Russian Mission participants are concerned about rising cancer rates and their community's diet. They recognize that the Omega 3 in wild salmon is healthy and beneficial for them and is swimming by them but has become unavailable to them.

Recommendations

Recommendations from Russian Mission participants include prioritizing access to Chinook salmon when there are shortages, providing ample notice to fishermen about required gear changes, and supporting communities through the hardship of restricted Chinook salmon fishing. As part of this study, participants were asked who should have access to Chinook salmon in times of shortages. By far, most participants felt the Elders' access to Chinook salmon was a priority as it has always been a staple of their diet, a primary food they grew up with that feeds their bodies and their souls. The Elders rely on the oil content of Chinook salmon to keep warm in the winter. Others felt that everyone who lives along the Yukon River should have equal access to the limited Chinook salmon, because they are not on the road system and the cost of living is so high, thus they need the salmon as a food source. Some fishermen in Russian Mission would like the managers to provide ample notice about potential gear changes so that they have time to prepare and access the new gear type. They request a full year or more to be able to make these changes due to the high costs of nets and other gear. Finally, participants recommended that communities who are experiencing hardships related to the increased restrictions on salmon fishing issues would benefit from extra support. One way they could be supported would be distributing pressures cookers and establishing community-based processing stations.

NENANA

Historical Background and Natural Environment

Nenana is located in the Tanana River Valley in interior Alaska on the south bank of the Tanana River and just east of the Nenana River. It is 55 miles southwest of Fairbanks at mile 304 on the Parks Highway. The Tanana River is a major tributary of the Yukon River. The rivers entering from the south are mainly channeled, heavily silted, glacial streams, while streams entering from the north are clear. The Tanana is a heavily silted river with islands, sloughs, undercut banks, gravel bars, and beaches.

The Nenana Native Village is located in the western most part of the Tanana Athabascan territory. It was first known as Tortella which was an interpretation of “Toghotthele” meaning “mountain that parallels the river” (Shinkwin and Case 1984). The Nenana Valley is one of the earliest archaeological sites in North America dating between 11,000 and 12,000 years old.

The people of the Nenana Native Village are part of the Tanana Athabascans of the Northern Athabascan peoples (Osgood 1936). They extended over a region from the headwaters of the Tanana River to just west of the Kantishna River. The Koyukon Athabascans are to the east occupying the land around the confluence of the Yukon and Tanana rivers. Prior to contact with Europeans, the Athabascans of Alaska had no self-defined “tribal” identity but grouped themselves into small local bands interlocking with neighboring groups through marriage, trade, geography, and common interests to form regional groups (McKenna 1981). The Athabascans on the Tanana and Yukon Rivers make up a continuum of local bands with gradual changes in their language or dialect over geographic distances (McKenna 1981). Nenana is located within the most western group of the Tanana Athabascans, or a band called Lower Tanana (Osgood 1936). Traditionally, the Lower Tanana Athabascans traveled on the land hunting caribou and moose in the hills during the winter, and fishing and hunting waterfowl in the summer. People would divide into smaller groups or disperse depending on food availability. They intermarried and developed trading partnerships with other band members covering geographic distances.

The Lower Tanana Indians were one of the last groups in the Alaska to have contact with Europeans on their own land. The first documented arrival of non-Native people occurred in 1885, when Allen traveled the Tanana, and Koyukuk rivers (1887:75-80). At this time, the Tanana people were already accustomed to contact with Europeans because of their trading activities with the village of Tanana where the Russians traded western goods for furs. Today, the Lower Tanana Athabascan people live in Minto, Nenana, and Fairbanks. Minto is another



Fishwheel on bank of Tanana River near Nenana



Rondell Jimmie, checking strips in smokehouse, Nenana



Fishwheels on bank of Tanana River, Nenana

major community within the Lower Tanana Athabaskan region, located in the Minto Flats, a low-lying, lake-dotted plain on the lower Chatanika River. The early 1900s brought intense activity to the area after the discovery of gold in 1902 in Fairbanks. Gold mining operations during this period near Fairbanks caused some pollution in the lakes and streams of the Minto Flats and thus reduced fishing (Olson 1981). Also in the first decade of this century, a telegraph line, mail route, trading post, and roadhouse were established in Nenana (Brown and Kostick 2017). St. Mark's Episcopal Mission and school were built near Nenana in 1905. Native children from Minto attended school in Nenana. In 1915, the federal government began construction of the Alaska Railroad and Nenana's population doubled and its ethnic composition changed with the arrival of railroad workers. The railroad transformed the former mission village into a busy, commercial town with freight headed for Fairbanks and the Yukon River where it was transferred to steamboats in Nenana. Native people came to Nenana from various parts of interior Alaska to work with the railroad or the riverboats (Olson 1981).

The next few decades brought more change to Nenana. In the 1920s, the Native community established their first Council and Nenana was incorporated as a city in 1921 (Shinkwin and Case 1984). During the 1925 diphtheria epidemic in Nome, serum from Anchorage was transported to Nenana by train before being sent by dogsled to Nome. According to census records, over 800 residents lived in Nenana during this time; however, completion of the railroad was followed by a population decline due to the departure of many non-Natives (Shinkwin and Case 1984). Disease during the 1920s decreased the Native population and possibly increased the dependence of orphans and Elders on the Episcopal mission. The population in 1930 was recorded at 291. During the 1920s and 1930s, Native men in Nenana were employed in wage labor and the women ran the family fish camps (Shinkwin and Case 1984). The families spread out to hunting and trapping camps over the winter. In the 1940s, Native people were moving to the outskirts of Nenana where the children were in school and the old and sick had become permanent residents relying on the Mission for their services (Shinkwin and Case 1984). They continued to use Nenana as a seasonal base for employment, health care, schooling, and supplies. Nenana became a transportation hub with increased military activity in World War II. The road from Fairbanks reached the bank opposite Nenana in 1960 and a bridge was built across the river in 1967. The Parks Highway was completed in 1970, connecting Nenana to Anchorage (Shinkwin and Case 1984; Brown and Kostick 2017).

Today, Nenana is an active community of just under 400 people. The population of Nenana is a diverse mixture of non-Natives and Native people; approximately 38% of Nenana residents (142 people) identify as

Alaska Native (DCCED, 2015). Nenana is important place for river freighting with 2 barge companies operating. It has a health clinic, mental health clinic, public library, and a fire department (Brown and Kostick 2017). It has two schools, serving the local community and the larger population of the state, with the Nenana City School with 208 students and the CyberLynx Correspondence School with 766 students. The Nenana Student Living Center, one of three statewide boarding facilities for high school students, has students from around the state; it attracts students due to its extensive programs, academic quality, and vocational studies. The majority of residents participate in subsistence activities and several Iditarod sled dog race competitors and former champions are residents of Nenana. There are 21 commercial fishing permit holders in the community and the cost of gasoline in 2014 was \$4.96 a gallon. Per capita income was \$27,815 and the median household income was \$59,583 (DCCED).

Seasonal Round

The season round begins in the spring with snaring small game and gathering wild rhubarb and potatoes, followed by traveling to the Minto Flats area for duck hunting. As soon as the ice goes out, they set nets in the sloughs of the Tanana River for whitefish (Brown and Kostick 2017). Fishing for Chinook salmon and summer chum in Nenana takes place in the summer months. It continues through to the fall chum, arriving in late August and September, and coho salmon, into late September or early October (Shinkwin and Case 1984). Non-salmon species such as whitefish, sheefish, burbot, and pike are also caught during salmon fishing. Whitefish nets are set in the fall and grayling and pike are targeted using rod and reel fishing in sloughs west of Nenana. Whitefish are also target in the spring using nets.

Logs for building fish wheels are collected beginning in April after the river ice breaks up. During June, fishers prepare their equipment for fishing, repairing fish wheels or nets. Drying racks, smokehouses, boats, and engines are prepared for the fishing season. Historically, the people of the Nenana area spent their fall and winter hunting and trapping, targeting ducks, small game, and moose in the south of them between the Nenana and Toklat Rivers (Shinkwin and Case 1984). They gathered firewood, roots and berries in the fall.

Chinook salmon are preferred for their taste and size but coho and fall chum are harvested in larger quantities (Brown and Kostick 2017). The first Chinook salmon harvested are celebrated with a ceremony and shared. A traditional belief tells that being generous with your first catch will ensure good future harvests (Shinkwin and Case 1984). Chinook salmon are also important for sharing throughout the year such as at with Elders or at potlatches and they are set aside or frozen whole for this purpose. Salmon are shared with family, friends, and Elders. Brown and Kostick (2017) found that salmon are used by 76% of the households in Nenana but are only harvested by 26% of the households, illustrating the amount of sharing and wide distribution of the harvest. They further found that salmon was the resource harvested in the largest quantity, making up 41% of the total community harvest of subsistence resources. Coho salmon, followed by fall chum salmon, made up the largest portion of salmon harvested in Nenana in 2015 (Brown and Kostick 2017). Chinook salmon was used by 31% of the community while only 10% harvested them.

Salmon is harvested as food for both people and dogs in Nenana. In 2015, when the ADFG conducted their comprehensive survey, they found that only fall chum and coho salmon were fed to dogs (Brown and Kostick 2017).

Fishing History

In 1885, early explorer H.T. Allen encountered a camp at the location of present day Nenana which was described as a large seasonal settlement of Athabascan Indians gathered for a midwinter potlatch and for summer salmon fishing (Shinkwin and Case 1984). Allen learned about local fishing methods such as fish traps and large dip nets used at weirs built across tributary streams and near outlets of lakes. These methods were used both for whitefish and for salmon. Salmon were also harvested with dip nets from canoes on the main river. The fish weirs required collective effort in their construction and use and brought people together in

the fishing effort. Most of the fish were dried and stored in underground caches (McKenna 1981). Around the turn of the century the fish wheel was introduced in interior Alaska, bringing great changes and improved efficiency in fishing. The fish wheel allowed people to fish the Tanana River and provided a surplus of fish for people and dog teams. By 1930, local fishers were fishing for subsistence as well as selling some of their catch through the commercial market in 50lb bales of Chinook and chum salmon, which produced sources of income for the local Native people (Brown and Kostick 2017).

Today, salmon fishing in the Nenana area is conducted in the Tanana River, mostly on the bank opposite the village where there are good sites for nets or fish wheels. There is one site under the bridge which has been used as a fish wheel site for 100 years. Most fishing sites are close to the village. Fish wheels need a strong current to turn the wheel and be placed in an area the fish swim close to the bank. The water should be deep enough for the fish wheel to turn within a foot or so from the bottom of the river bottom to catch the fish swimming near the bottom (Shinkwin and Case 1984). Fish nets need large eddies when salmon swim at different depths. Sites are often family owned and permission must be granted prior to using a site (R. Jimmie, personal communication 2015). In 2015, Brown and Kostick (2017) found that gillnets were used to harvest two-thirds of all the salmon harvested in Nenana and dip nets were used to harvest an additional 16%. Coho salmon was harvested primarily in gillnets (84%). Fall chum made up 23% of the total salmon harvest in 2015 and fish wheels were used to harvest 25% of the fall chum, 14% were taken from the commercial catch and the remaining was harvested with gillnets.

Chinook salmon, locally called king salmon, are the most preferred salmon because they arrive first, are the biggest salmon, and because their meat is of higher quality with a red color and more oil than other types of salmon. Chinook salmon is versatile; there are many ways to process and prepare it. It is considered a delicacy. In the Minto area, Chinook salmon is reserved for Elders, potlatches, and special occasions. It was considered a special fish and not for everyday consumption. As Rondell Jimmie, who grew up in Minto explains,

King salmon were for Elders. They were for potlatch, they were for special occasions at the house.... You rarely ever see king salmon, until, I don't know, when they pull it out of the cache in January, surprise us with it.

—RONDELL JIMMIE, NENANA 2014

Chinook salmon are even more important today because their numbers are currently low and there are significant restrictions on subsistence fishing. Over the period of this study, fishermen had few opportunities to harvest Chinook salmon. There are fewer Chinook salmon in the Tanana River compared to the Yukon River so Nenana residents often receive salmon from people along the Yukon River; the low abundance of Chinook salmon in the Tanana River makes it very much appreciated. People look forward to the arrival of the first Chinook salmon. This is the first fresh salmon of the season; it is the local custom to eat the first ones and then save the rest for the winter or for your family members.

Chum salmon, although not as favored as the Chinook salmon, is also a very important salmon. It is a necessary fish to feed the dogs. In the Minto area, it was fish for children and non-Elders. The chum salmon in the Nenana area are large in size and are considered the second favorite salmon. Chum salmon are divided into two categories: *silver salmon* are usually fall chum salmon that are still ocean bright or have silver colored skin. These fish are considered eating fish for people. Chum salmon that are no longer silver colored and are starting to turn red are reserved for dog food. There are many locally understood categories for chum salmon. These include summer chum, fall chum, good fish, females, males, good for smoked fish, great for dog food, and eating fish.

Nowadays people are not able to rely solely on subsistence to feed their families. Chinook salmon on the Yukon River have been in decline for 15 years. This has had a large effect on fishermen and the community of Nenana. Salmon is less available today and people feel lucky to be able to put any away for the winter. They are finding that they need to get more moose, other animals, or shop for groceries to make up for less salmon available. Additionally, there are not as many active fishermen and women as in the past when the banks of the Tanana River was lined with active fish camps yet there are still many people who want to eat salmon. As one fisher stated, the biggest change is in the Chinook salmon. The Chinook salmon have changed in size and in abundance and this has had a large impact on fishing in Nenana. There used to be 200-300 people fishing in Nenana, at fish camps. Times have changed and now we see few fishermen providing for many people. Participating fishermen in Nenana reported that there are less fishers or fewer active fishers in Nenana Village today. This is due to there being not as many active men as in the past. Participants suggested that people in Nenana Native Village don't know how to swim or don't like to be in boats today. Other barriers to fishing include the increased price of gas and increased regulations. Fishers report that today it costs too much to fish and regulations make it difficult to make it worth your effort due to closures, shortened fishing schedules and changing allowable gear types. Much more work and effort are required today as compared to 20 years ago. It costs money to fish, if you don't have money you can't fish because you can't pay for gas. As fisherman, Donald Charlie, describes in the following quote why he thinks less people are fishing today, "Could be the price of gas I hear a lot of people talk about. It costs too much, damn many to go catch fish at about 2 times to 3 times a day." Additionally, not many people know how to fish with a net in Nenana today so people may want fish but not many know how to get it anymore.

Chinook salmon fishing has been closed the last few years and this affects how fishing begins and who participates. Fishers in Nenana begin their summer fishing season with Chinook salmon fishing and then move on to other species. If they cannot begin with Chinook salmon fishing, some do not prepare for and begin fishing at all. As Nenana fisher, Victor Lord (2014), states, "[Fish] Camp is for king salmon so why go to camp? King salmon starts everything." Without Chinook salmon fishing, people are reluctant to fish for chum salmon because it is not worth the effort of getting the wheel ready and into the water. Fish wheels are large, hand-built contraptions that often require heavy equipment to move. Fishers describe it as feeling unnatural to start the fishing season with chum salmon. Additionally, the decreasing size of the Chinook salmon has also affected its local value and the number needed to meet household needs. With low numbers of salmon, salmon have become more valuable or costly to purchase. Prices are reportedly high, quoted in the interviews at \$40/pound for strips from a middle river community in 2014 (Albert Demientieff, Nenana 2014). Participants remember getting paid in salmon for commercial fishing when they were younger. Because of these changes, salmon were not available for sale due to low numbers and people needed to keep what they caught. The result is that people buy more commercial food today to make up for the low salmon abundance and availability. People in Nenana are running out of salmon before spring, unable to dry enough salmon to last throughout the year as they did in the past. Salmon has traditionally been a staple and primary winter food, so this is a big change and a challenge to maintaining their culture. People in Nenana reportedly value salmon more because it is less plentiful, yet some of them are turning to different kinds of fish for potlatches and other traditional ways of sharing because salmon is less available.

My dad tries to put away fish for families that are doing potlatches and stuff. Yeah, but salmon is not one of them. I know he tries to put away whitefish and stuff. To, you know, give to potlatches and stuff but yeah salmon, like I said... it's hard to come by now.

—TERESA LORD, NENANA 2014

In the past, one big Chinook salmon was a lot of fish but today Chinook salmon are smaller in size. Today a Chinook salmon produces smaller portions or steaks, as one fisherman says, he used to eat one steak and now it would he could eat 5 at one meal.

Less people in Nenana are able to fish due to reduced salmon availability, rising costs of fuel, and other socio-economic changes in their lifestyle and this has resulted in changes in the harvest and sharing of salmon. During the interviews, people spoke of not being able to share as much as they did in the past or that sharing has become more difficult today. Fishers want to share their fish but their ability to share as far and as wide has been highly taxed during these times of low Chinook salmon returns and reduced fishing opportunity. Fishermen and women reported that they try to give their salmon to the senior center so that the Elders can eat salmon once a week all winter. One fisherman is no longer able to do this.

...give some away to people that don't fish, and I [used to] do that all the time. I do that whenever. Senior citizens, seniors I used to give them fish out. I fill their freezer up. I used to give them tubs, washtubs, long wash tubs, I used to give them two or three of them full every year.

—DONALD CHARLIE, NENANA 2014

Fishers try to give their salmon to people who don't fish and these non-fishers rely on salmon given to them by those who do fish. The recipients of shared fish report that today they cannot get the dry fish or salmon strips because those who fish are keeping what they catch for themselves. It used to be that a non-fisher could ask for salmon and they would get between 5 and 8 fish when there was more available. Reportedly when people ask for salmon, they are only given a fish head or a sample of a salmon. People who live in Fairbanks rely on their Nenana relatives to provide fish for them but for many, this practice has become no longer possible due to low numbers of salmon. People who do not have the ability to fish spoke of not receiving salmon as much or as freely as they did in the past. This is a hardship on the entire community. It affects residents' health, as they have to rely on less healthy, store bought food. It affects their traditions as sharing the harvest is a strong traditional activity that connects families and neighbors.

This current situation is a hardship both for the non-fishers and the fishers. There is a feeling held by many fishers in Nenana that you should always share your food. This is important for the harvester because he or she appreciates that you never know what that food will do or how important that food is for the people who receive it. When fishers are able to harvest their own salmon they realize the importance of taking care of their catch so that it maintains its high quality or value and what they share has increased value if it has been processed.

I give away whole salmon and I very rarely give away my smoked salmon. But the people that get it really appreciate it. And, the value of fish has changed over the years, it costs more to go get it so, if you go get it, you definitely have to take care of it.

—RONDELL JIMMIE, NENANA 2014

When sharing is reduced, trade is also reduced. In times of shortage, such as the people of the Yukon River have been experiencing recently, sharing continues with only your closest relatives. Prized items like salmon

strips are hard to come by and Chinook salmon is not always available at potlatches. People of the region are used to having salmon strips on the table as a snack but now they cannot afford to provide this treat. This makes them feel disappointed that they are not able to provide salmon strips. As one fisher states, "It's important for visitors, when they'd visit, to have them [salmon strips] on the table with a cup of tea and some crackers" (Darlene Jensen, Nenana 2014). People can't fill their freezers so they feel stingy and save the precious salmon for special occasions.

I grew up where we used to come to Nenana and go visit a certain person and they would go to their smoke house and come back with some fish and hand it to you. And if you seen those people's faces that received the fish, you would know the value of salmon and what it means. It's not just face value, it's uh... it's a deeper understanding for fish.

—RONDELL JIMMIE, NENANA 2014

Value of salmon

As a food... Salmon is a primary food source for both the people of the Nenana and as dog food. Overwhelmingly, interview participants ranked salmon as most important as a food. It is important to feed families and because the people of the Nenana area grew up on salmon. The connection they feel to salmon connects them to their entire life, their youth, their cultural practices, and history of living off the land.

Salmon is an important food in the winter and the summer. In the summer, people eat salmon as fresh, healthy, natural food. Salmon is important in the winter because it preserves so well as a dried or frozen product. People in the Nenana area eat salmon all year long until they run out in the spring. As Victor Lord states,

[We] Native people got to have our grub. The cultural connection... I really believe that food is going to put a couple years on their livelihoods. I really do believe it is a health food for us. Helps with diabetes and high blood pressure.

—VICTOR LORD, NENANA 2014

Fisherman Rondell Jimmie believed that children like to eat subsistence foods because they know how much fun it is to get them. Participating in the harvest of salmon as a child was a strong memory for most adult participants in Nenana. Most interview participants preferred salmon from their local area over salmon from other areas.

The kids, I think the kids really like to eat subsistence food. They know it's natural, they know how much fun it is that they had to go get it. And I think they enjoy it more when they do eat it.

—RONDELL JIMMIE, NENANA 2014

Value of the Subsistence Fisherman The role of the subsistence fisherman has become more and more important as less people are fishing yet everyone still wants to eat fish. Increasingly, the subsistence fishermen of Nenana need to provide for and teach others; they need to connect their family members to the land, acting as a guide and teaching children the value of food and how to process the salmon they harvest. They usually enjoy the freedom of the woods and value gathering food for more than just themselves. They think about where the animal or food will go after he or she gets it, who they will share it with, and how much the Elder or other will appreciate the gift. It is important to harvest salmon to share with the Elders who can no longer fish themselves. The role of the subsistence fisherman in Nenana has changed over the last 20 years due to lower abundance and availability of Chinook salmon. In fact, their role has likely become more critical as the salmon have become less available. The subsistence fishermen who participated in this research spoke of their role in teaching children the value of food and acting as a guide to family members who may now live in the city and rely on them to provide access to the river and fishing. Finally, they highly value being able to fish with others or alone, yet provide for their whole village. As fewer people are able to fish themselves for various reasons, the community of Nenana relies more and more on their subsistence fishermen to bring in the salmon they crave and need to eat to sustain their bodies, their traditions, and their health.

As Culture and Tradition Many participants value salmon so highly because salmon and salmon fishing are such a strong and important part of their culture. Fishing is a way to practice their culture. Participants stated that salmon is something their people have always depended on. The people on the Nenana Native Village are river people or salmon people as compared to other groups of people who may rely on a different animal such as the caribou people. They believe that the harvest of salmon is part of a cycle. As one of the participants, Donald Charlie, says, "If we don't fish, we break the cycle." Their practice or tradition is often called "subsistence" but the participants felt that this was a word imposed on their cultural practice and they prefer to think of it as their "way of life." A fishing lifestyle is a healthy lifestyle. They value it because it is good physical activity and good for their physical and mental health. Fishing keeps people busy and out of trouble.

Salmon are highly valued by the people of the Nenana Native Village because they can use subsistence fishing as a teaching tool to share their culture and traditions. Fishing is a community event, bringing together young and old, teaching about fishing practices as well as how to dry and process their catch, how to share in a traditional and meaningful way, and how to feed and care for their community. It is important to be able to fish so that they can teach their grandchildren and other relatives how to fish, how to build a smokehouse, and all the other aspects of a fishing lifestyle.

Nenana Native Village hosts a community fish camp in the summer in which many children attend and learn about their culture practices of harvesting and sharing salmon. Fish camp is an important time for many people in Alaska. In the region around Nenana, subsistence fishing is important so that younger children can learn how to cut fish. Through this camp they have the opportunity to interact with Elders, fishermen, and the community. They get to participate in the harvest, processing, and sharing of salmon, which is a very important part of their culture. Using salmon as the teaching tool, they learn about the food they eat, how to care for their food, and how to honor their Elders by presenting their catch to them in the proper way. This is important to the people of Nenana so that fishing continues to be a part of their culture. They value fishing because it keeps youth connected to their culture. This traditional activity keeps them busy and away from less healthy distractions. Fishing also keeps adults busy and away from unhealthy distractions.

Most participants grew up going to fish camp but today with less people fishing, increased costs, and restrictions on Chinook salmon fishing, there are few active fish camps. People from the Nenana area still go to fish camp but they do not stay as long. It is important to them to be able to teach their grandchildren about where their grandparents came from and what their mother and father did when they were children. Fishermen are teaching their nieces and nephews the value of food. They feel a responsibility to keep fishing to

retain their culture for relatives who are busy working and unable to participate. Some people are unable to go to fish camp because the fishermen are needed by family members in the city to get out fishing and hunting and these fishermen are not fishing or not able to be available when the city folks have their time off. It is also expensive to go fishing, to maintain their culture. Not everyone has the ability to do this. People from Nenana feel a need to eat their traditional food, food that they grew up on and they feel sustains them --their body, their mind, their culture. They expressed that they feel dissatisfied with other foods and that they need their "Native grub", as expressed below,

It's Native people that have heritage ..., like my sister that lives in Fairbanks. I think she's gotta have that fish. She was raised on it. ... the food in the store is not good for her ... it's in her Native blood and the way she was raised, food that she was raised on. Yeah, I think other Native people got to have our grub, got to have our grub.

—VICTOR LORD, NENANA 2014

Concerns and Adaptations

Low Chinook salmon abundance leaves a gap in residents' annual subsistence harvest. Adaptations reported by Nenana participants include harvesting more moose and other animals, buying more store-bought or processed food, and sharing less. Participants report they are no longer able to harvest enough salmon to last through the winter or reliably have salmon available for potlatches. As an adaptation, participants report bringing different kinds of fish to their potlatches. When they are able to harvest Chinook salmon, participants report that they require a high number because of smaller size of Chinook salmon today. Finally, participants report sharing less and not sharing specialty items such as salmon strips.

Participants in Nenana reported a variety of concerns relating to salmon. They are concerned about the low abundance and shrinking size of Chinook salmon. They are concerned that in Nenana, fewer people are fishing, sharing, or teaching others. And finally, they are concerned about other barriers to fishing such as higher gas prices and increased regulations. With fewer people fishing in Nenana, the few fishermen still active need to provide for a larger group of people or less people will be eating salmon. This challenges cultural patterns as they are a salmon people and their culture is based on salmon, salmon fishing, processing and sharing of the harvest. Someone needs to teach the younger generation how to fish and all the activities surrounding the harvest. With less active fishers, their community has less ability to engage in this activity and the few that do become critical culture bearers teaching others. The Chinook salmon closures were of great concern to the people of Nenana. Chinook salmon are the favored salmon in Nenana and during the study years when Chinook salmon fishing was closed, some fishers did not fish for the less popular chum salmon as an alternative. With the Chinook salmon closure, they were not motivated to prepare for and begin fishing, lead them to stop fishing completely for salmon in those years. Some participants in Nenana believe that 'not fishing' is breaking an important cycle in which they are expected to participate. Some Nenana participants were concerned that, with less people fishing, their children would not be able to learn to fish for salmon and not have access to an activity that keeps people in Nenana busy and out of trouble, both youth and adults. Finally, less Chinook salmon means less ability to teach the specifics of their culture related to Chinook salmon – fishing, processing, sharing, and eating. The smaller size and abundance of Chinook salmon caused concern. More salmon are needed to meet their needs when each individual salmon is smaller. However, recent restrictions have kept participants from harvesting more Chinook salmon when there is a low abundance. Additionally, with less Chinook salmon there is less of an ability to share. Sharing is an important part of their culture and a way to distribute the harvest.

Recommendations

In times of shortages, participants in Nenana overwhelmingly supported Elders having a priority for access to the limited salmon. Additionally, they felt that people who have been fishing all their lives and families with young children should continue to have access to salmon. Some participants felt that Native people or people who live in rural villages along the river should have access to limited salmon. Elders were the priority for limited salmon in Nenana as described by one participant, Tim McManus, "They're used to it. That's what they ate their whole life. You can't stop them or it will break them down or hurt them." Other participants further described the health benefits to the Elders when they are able to continue eating salmon – helping their heart, eyesight, diabetes, and high blood pressure. Victor Lord, Nenana participant, further described the health benefits, "got to have our grub. I believe that [Native] food is going to put a few years on their lives. It's a health food for us, helps with diabetes and high blood pressure." Participants suggested that fishermen continue to be allowed to harvest salmon for the Elders. They favored a practice of harvesting subsistence foods, especially salmon, and storing them in the Native Council freezer for community use at potlatches and for serving to Elders. Some participants were also concerned about young families with young children and ensuring their continued access to salmon. This is important because they want their young people eating health food, learning to process and respect for their traditional foods, and to economically feed large Native families. By harvesting salmon with and for their children, Nenana participants are able to teach the next generation how to process and save it. Some felt that subsistence fishermen should be able to harvest what they need for the winter based on the size of their family. Another recommendation was to harvest other species if one species was declining in number. These participants felt they should turn to another species such as chum salmon or moose when species such as Chinook salmon were unavailable.



Fishwheel in the Yukon River near Fort Yukon

FORT YUKON

Research in Fort Yukon took place in 2016, a highly unusual year for the community and fishermen because subsistence fishing for Chinook salmon was closed. This situation affected fishermen's discussions with the Project Investigator.

Historical Background and Natural Environment

Fort Yukon is located in the middle of Yukon Flats at the confluence of the Yukon and Porcupine Rivers in Northeast Alaska about 145 air miles northeast of Fairbanks and five miles north of the Arctic Circle (DCCED). It is surrounded by the Yukon Flats National Wildlife Refuge. Today there are 564 people in Fort Yukon, as estimated by the Department of Labor Estimate for 2015. Fort Yukon is the largest Athabascan community in Alaska (Sumida and Andersen 1990) and is one of the oldest permanent settlements in Interior Alaska. Surrounding the village are Native lands. Fort Yukon is located in the continental climate zone and has extreme temperature differences with extremely cold winters and warm summers. Extended periods of -50 to -60 often occur. The Yukon River is ice-free from the end of May through mid-September (DCCED).

The Gwich'in people are a strong distinctive group of Athabascans. There are nine or ten regional groups of Gwich'in Athabascans and each group is based on a major river in Northeast Alaska and Northwest Canada. The Yukon Flats Gwich'in cover the territory of the Yukon River from Sam Creek to the Chandalar River and they have a very strong riverine orientation (Osgood 1934; Slobodin 1981). The people of the Fort Yukon region are descendants of the Yukon Flats, Chandalar River, Birch Creek, Black River, and Porcupine River Gwich'in Athabascan tribes.

As one of the oldest permanent settlement locations in interior Alaska, Fort Yukon has long been and continues to be an administrative and service center for the Yukon Flats region offering greater wage employment opportunities and a more diverse population than the smaller communities in the region (Sumida and Andersen 1990). Fort Yukon was an important trading center for the Gwich'in who lived in the lowlands of the Yukon Flats and the river valleys. In 1847, Fort Yukon became a Canadian outpost in Russian territory. The Hudson Bay Company, a British trading company operated here from 1846 to 1869. The Alaska Commercial Company took over the running of the Fort Yukon Trading Post after the purchase of Alaska in 1867 when it was determined that Fort Yukon was on American soil. The fur trade of the 1800s, the whaling boom on the Arctic Coast (1889-1904), and the Klondike Gold Rush spurred economic activity but major epidemics greatly affected the community from the 1860s until the 1920s (Slobodin 1981). When the Hudson Bay Company surveyed the population of Fort Yukon and the surrounding area in 1858, they found 842 people living in a

broad area of the Upper Yukon and Porcupine Rivers, many of whom were distributed among 6 tribes (Osgood 1970:15). By 1879, the population was reduced by the introduction of disease following Euroamerican contact. The population in Fort Yukon rose over time including in-migration from surrounding seasonal camps and response to the construction and staffing of the Air Force communications site in Fort Yukon (Sumida and Andersen 1990).

The local people of Fort Yukon are very knowledgeable about their history. During the community review workshop, Richard Carroll III spent time with the PI describing his knowledge of the history of Fort Yukon and the Gwich'in people. Prior to the arrival of the Hudson Bay Company, Gwich'in people spent time in the Fort Yukon area in the summer for fishing where they set community-run weirs. Because of long sandbars and a shallow soft bottom, people were able to put weir stakes in the riverbed. There was a period when Gwich'in people from Canada would travel downriver to catch salmon because ash had covered their land and streams and salmon could not spawn. They were unable to fish in their area so they traveled to the current Fort Yukon area to harvest their salmon. In 1890, the Gwich'in territory was large with 1,200 years of people using the Yukon Flats. There was a time with there were no trees, just mud bars and sand dunes and it was easy to get salmon then in the Yukon Flats. Then in 1900, the river was polluted by the many sternwheelers moving on the river. Reportedly, there were 60 sternwheelers at one time traveling the river during the gold rush and a total of 140 sternwheelers operating during the gold rush era. Richard Carroll's grandmother remembers 13 sternwheelers parked on the banks of Fort Yukon at one time. There was oil floating on the river near the bank and the people could not drink water from the river because of this pollution. It became illegal to obstruct river traffic and the weirs were outlawed, ending this type of fishing in the Fort Yukon area.

Fort Yukon is accessible only by air and water transportation. Most goods and people arrive by air but river barges and boats provide additional services in the summer (DCCED).

Subsistence Round

The subsistence round in Fort Yukon begins in April or May with the breakup of river and lake ice. People get busy setting nets for whitefish, trapping, hunting, and harvesting ducks, geese and cranes. In June, the activity shifts to fishing when nets are set for whitefish, cisco, pike and other fish near tributary streams. Sometimes logs are gathered and transported during the high water of breakup. The king (Chinook) salmon arrive in late June or early July. They are harvested using set gill nets or fish wheels. When the salmon runs are strong, fishing for salmon is the primary activity during July and August. The Chinook salmon run ends by late July and the chum salmon run picks up in mid-August. During the summer, pike and grayling are caught with rod and reel. Sheefish are often caught in fish wheels. Fishing can continue into September for some households catching late run chum and coho salmon (Sumida and Andersen 1990). Fishing continues into the winter with nets set under the ice for whitefish and other species.

In addition to salmon, non-salmon fish are also an important component of the summer and fall harvest. The year-round availability of non-salmon species, especially whitefish, adds to their importance. Additionally, grayling, pike and burbot (loche) are fished through the ice in late winter (DCCED). Non-salmon fish are a source of fresh meat during the long winter; most residents eat non-salmon species shortly after catching them and most families do not preserve them for later use as they do with salmon (Koskey and Mull 2009).

Moose, bear, and caribou are hunted in the fall. Both the first kill of the young men as well as the celebration of the appearance of the first salmon were, and still are, important celebrations (DCCED). Porcupine is hunted from June through September (Sumida and Andersen 1990). Berries are gathered in August. Trapping takes place after freeze-up for marten, lynx, red fox, wolverine, and wolf from November to March. Sometimes moose are taken in the winter. Beaver are taken with snares or traps in the early spring as well as jigging through the ice for fish. Nets are set for freshwater fish and once the geese arrive the cycle begins again.

Today, fishers' ability to meet their subsistence needs in the Yukon Flats relies on their ability to access wage employment and/or to be able to purchase fuel (Brinkman et. al 2014). Researchers found that over the last 10 years, harvesters in the Yukon Flats have reduced the distance they travel and the number of trips they take to harvest salmon and other resources due to high fuel prices. Fuel prices in the Yukon Flats area can be as high as twice or three times as much as the lower 48 fuel prices. In 2016, gas was \$7 a gallon. Fishers must use a lot of fuel because of the necessity of checking their net or wheel frequently to remove their catch or to maintain their equipment (Brinkman et. al 2014).

Fishing History

Three species of salmon occur in the upper Yukon River: Chinook, chum and coho salmon. Chinook salmon or king salmon generally arrive between late June and mid-July and run through July. In Fort Yukon, the Gwich'in term for Chinook salmon is *luk* or *luk choo*. After the Chinook salmon, there is a lull in the salmon migration. By mid-August fall chum salmon start to arrive. Two types of chum salmon are recognized locally, "silvers" and "dog salmon." In Fort Yukon, the Gwich'in term for chum salmon or silvers is *khii* or *shii*. The silvers arrive first and tend to run on the south side of the Yukon River while dog salmon run along the north side of the river, heading to spawning streams in the Porcupine River drainage. The silvers are richer and in better condition than the dog salmon (Sumida and Andersen 1990).

When fishing was strong, fishing groups were often related through kinship representing extended families residing in multiple households. In 1987, Sumida and Andersen found 12 fish camps occupied by Fort Yukon residents. Today that may be reduced due to the low Chinook salmon runs and related fishing restrictions. Families tend to use the same general fishing area from year to year, using set gill nets and fish wheels to harvest salmon, but the site they actually set their net or fish wheel may change due to bank erosion, water levels, and the constantly changing channels, bars, and eddies (Sumida and Andersen 1990).

In 1987, subsistence harvest and use of local fish and wildlife resources were an integral part of the mixed economy of Fort Yukon (Sumida and Andersen 1990). This is consistent with studies showing the importance of wild resources nearly 70 years ago in 1949 when researchers found that 70% of Fort Yukon's population were supported entirely by trapping, hunting, and fishing (Shimkin 1955:228). In 1986-7, all Fort Yukon households used some type of wild food resources and they found a high level of sharing of these resources. Indeed, 30% of households in Fort Yukon harvested over 90% of the community's overall wild foods (Sumida and Anderson 1990). Sharing of wild resources, including salmon, is an integral part of the pattern of subsistence in Alaska (Langdon and Worl 1981; Magdanz 1988). Salmon was clearly shared most widely as over twice as many households used salmon as compared to those who harvested it. They found that 93.8% of the households used Chinook salmon (Sumida and Andersen 1990).

Salmon fishing in Fort Yukon is a very important subsistence activity. Salmon harvests from year to year are highly variable for various reasons. Sumida and Andersen (1990) found that for a core group of Fort Yukon residents, salmon fishing is a routine summer and fall activity. They found that another portion of the population makes a weighted decision each year whether to fish or not. The decision is based on many factors including wage employment, perceived strength of the salmon runs, environmental conditions, and the availability of boats, motors, and nets. High water conditions can also hinder fishing efforts and result in low harvests.

Participants described when they started fishing and who taught them fishing. Most participants started fishing or participating in fishing activities appropriate for their age with their families when they were very young. Some participants did not grow up in fishing families and learned from friends or relatives when they were still young people. Some of the young participants who use fish wheels today learned to build wheels in their teenage years.

Most fishers base their fishing operations out of Fort Yukon. But most participants had the opportunity to spend time at fish camp when they were young. These fish camps are located within 10 to 20 miles of Fort Yukon. This was also true twenty-five years ago when other researchers found that salmon fishing was concentrated within 10 or 20 miles of Fort Yukon (Sumida and Andersen 1990). During the review workshop in 2016, participants added that Fort Yukon fishers may travel as far as 25-30 miles to their fishing sites today and in the past some fishermen would fish very far away and did not actually move to Fort Yukon until around 1955.

Fishing in Fort Yukon, is done with fish wheels and with nets and costs money. Fish wheels tend to catch more fish but are more labor to build, place in the river, and stop and start around fishing openings. Fishermen and women process their fish with their families or friends. Subsistence fishing costs money- for gas, nets, food, and equipment. Fishing groups share the costs and the labor, with each person contributing what they can.

Salmon are used to feed dogs in Fort Yukon. Chum salmon made up the greatest percentage of resources used to feed dogs and Chinook salmon is not commonly used to feed dogs (Andersen 1991). The number of sled dogs in Fort Yukon declined from 245 in 1991 to 135 in 2008 (Andersen and Scott 2010). Andersen and Scott found a decline of 50% in sled dog usage for the Yukon River for this period, but Fort Yukon was one of his study communities that continued to be most involved with sled dogs in 2008. Their study attributed the decline largely to the increased cost of living in rural communities. Included in this is the need for employment that interferes with summer fishing activities and low salmon numbers since the mid-1990s. Finally, a lack of young people beginning mushing to replace older mushers has led to the decline in the total number of sled dogs. Even with the decline in sled dogs, mushers in Fort Yukon still feel optimistic that it will not disappear.

Some participants described the biggest change today as a decrease in the number of people fishing along the river. There are less people out on the river today and less people at fish camps. According to participants, the number of people fishing has dropped dramatically. For example, in one area where five families fished, now there are none. Now people who are able to fish, fish closer to Fort Yukon and then process their fish in Fort Yukon. This reportedly is due to higher gas prices and lower Chinook salmon abundance. People who are still fishing are finding ways to spend less in gas money. By fishing closer to Fort Yukon, they no longer travel the 17 miles to their traditional campsite, saving gas but losing in experiences. These fishers head out after work or they wake up early and go fishing at 6am, check their wheel and are able to be at work at 8am. Today it is easier for them to have their fish camp in town and their smoke house and drying rack just outside their house.

Today, participants are not going to fish camp for extended periods and if they still go to a fish camp, it may be more of a weekend camping trip. Their ability to pass on their culture and tradition through their fish camp activities has been significantly reduced. People used to live right by the fish wheel and build camps. Regulations and closed fishing periods have made it inconvenient to stay at camp as they used to. Participants enjoyed fishing and miss the opportunities they once had to be *out on the river*. One participant described how happy he feels to be involved with fishing and how much he misses going out on the river to check the fish wheel.

Some fishermen in Fort Yukon are no longer fishing because they are discouraged by the Chinook salmon fishing closures that have resulted because of the declines in Chinook salmon abundance. Participants are concerned about the changes in regulations and restrictions. They are having trouble keeping up with the changes in net sizes, fishing times, and other changes that are being made in an effort to conserve the Chinook salmon run. In 2014, the year of interviews for this project in Fort Yukon, the subsistence Chinook salmon fishery was closed due to the drastic reduction in numbers of Chinook salmon and the concern about enough salmon crossing the international border and reaching their spawning grounds in Canada. Because of the lack of Chinook salmon, fewer people are fishing today in Fort Yukon. Participants observe the reduced salmon available in their lifetime by comparing what their Elders experienced as an average

day's catch to today's harvest. Fishers described how the very short open fishing periods, sometimes only 24 hours, are too short of a period for them to make the effort of getting their wheel ready for fishing. These fishers feel that a longer fishery opening would make it worth the effort to fish.

Participants are also concerned about Chinook salmon getting smaller. One participant reported that fishers would be lucky if they ever saw a 40-pound king salmon today when they were once common. He and others reported that they used to see 70-pound to 98-pound Chinook salmon and they no longer see these big fish today. Value of Chinook salmon has changed because it is less available and therefore much more valuable.

Value of salmon

As a Food Overwhelmingly in Fort Yukon, participants stated that Chinook salmon has primary importance as a food source. In many households, subsistence fishing continues to be extremely important to meet their needs in terms of food. For some participants, subsistence fishing is one of the main sources of food for their family. It is a hardship when people have less of it. Some participants spoke of how their families rely heavily on Chinook salmon and other kinds of salmon as food. Chinook salmon is relied on primarily but people also eat fall chum (silvers) and whitefish.

Salmon is a very healthy food. People in Fort Yukon describe it as *"the best thing for your diet."* They know that it has the nutrients and vitamins that our bodies need. They value that it is natural, not processed, and has the omega 3 fatty acids that are becoming well known as something good for us. Some participants believe that their subsistence foods are more nutritious than many western foods available to them, that they do not need to eat as much or the volume of processed western foods. People in Fort Yukon like to jar and dry it so that they can eat salmon in the middle of winter. They like to put dried salmon in their pockets to eat when they get hungry while out hunting. Some participants call this their *'candy'* (Diane Bridges, Fort Yukon 6.20.16).

Participants described how they value salmon for its taste. Many particularly like salmon spread, jarred salmon, strips and eating fish. Although not everyone eats it every day, as one family described how they do not rely on subsistence salmon for every day food but consider it a treat. Chinook salmon is important as a food and as a tradition, as Elder Fred Thomas (2015) states, "If you don't have salmon, then you don't have anything to eat." He went on to say that he eats salmon once a week all year long. He cooks it many ways such as baking it or frying it.

Participants in Fort Yukon spoke of how both eating salmon and going fishing are healthy ways of living. James Kelly, Sr. (2015) sums it up well when he says that, "going out fishing cleanses your whole body. When you leave Fort Yukon, you leave the dust behind. It is a different setting, breathing clean air, drinking right from the river. The environment is not polluted." Participants further explained that fishing is something good to do in summer. Fishing makes you feel good about yourself, especially when you are catching something.

One participant spoke about people getting sick and needing to move to Fairbanks to be closer to a doctor or treatment. They had trouble getting their traditional foods in the city. Sometimes someone will bring it in for them and cook it and this makes them feel good inside and out. Traditional foods are very important for people who are used to eating them.

Chinook salmon is the favorite food of Fort Yukon fishers. It is the tastiest, biggest, and richest of all the fish that swim through Fort Yukon. Chinook salmon is considered the most valuable salmon by the study participants because of the excellent taste, size, and oil content of the Chinook salmon. For eating fish or Chinook salmon, participants in this study want a full freezer and a couple of cases of jarred salmon to get them through the winter.

Many participants of this study in Fort Yukon spoke of how they rely on salmon to meet their needs for food. For some of the older participants, salmon has been their main source of food over their lifetime and they are concerned because their food caches are now empty. They have to ask for salmon, from their children and others. It is too expensive for them to buy food from the store in Fort Yukon or to travel to Fairbanks to buy food at a cheaper rate. Not only the Elders are experiencing empty caches and freezers in Fort Yukon today but other participants reported this as well. Some people are not even eating Chinook salmon at fish camp but saving anything they get. Participants wonder how they will adapt to the lack of Chinook salmon. They feel vulnerable, not knowing when or if they can get their fish. Some people feel angry and frustrated.

Because of the low number of Chinook salmon, people are not making strips like they used to. There is great concern among study participants about the nutritional effect of their people not eating salmon like they used to. Participants are sad to lose access to such a good, healthy food – Chinook salmon. Without Chinook salmon available and in their diet, participants are watching themselves and the people they know eat less healthy food such as chips, greasy food, and other food they normally would not eat. Because a subsistence lifestyle requires physical activity and salmon and moose are healthy alternatives to store-bought food, researchers echo this concern when they found that less reliance on subsistence reduces the physical and cultural health of rural communities (Lambden et. al 2007; Smith et. al 2009).

Although summer chum salmon do not migrate through Fort Yukon in significant numbers and those that do are not edible, fall chum salmon do run through this part of the Yukon River. Fall chum salmon are important in Fort Yukon as dog food when the salmon are abundant. Dog mushers must harvest a large quantity of chum salmon to feed their dogs. Some fishers in this study build fish wheels to catch the abundant fall chum salmon for their dogs. Dog mushing is still quite popular in this part of the Yukon River. One participant described his household's salmon needs for dogs as 2,000 to 3,000 fall chum to feed their dogs annually. This household, as many participants echoed, also eats fall chum salmon in good condition locally called '*silvers*'. These '*silvers*' are valued as a food for people because they are rich tasting although not as rich as Chinook salmon.

Value of the Subsistence Fishermen Throughout the interviews, there was a lot of discussion of the role of the subsistence fisherman. A participant in the review workshops even stated that, "the subsistence fishermen are very important for the health of our community" (Richard Carroll III 6.20.16). Subsistence fishermen and women in Fort Yukon feel responsible to both provide food and to teach others how to fish so the activity continues into the future.

Fort Yukon fishermen and women feel responsible to "put food on the table", and not just their own table, but also of their relatives, friends and trading partners. This is a big responsibility because it takes a lot of salmon for a fisherman to share with all of the people he feels a responsibility towards,

By the time you give some to your grandparents, your mother, you know your couple aunts, your three sisters and then your own house and then your neighbor... plus what you're eating...it's distributed so everybody just got a little bit. Our close family, anyway.

—ANDREW FIRMIN, FORT YUKON 2015

Other fishermen spoke of how they must fish and bring salmon to their elderly parents and others. One fisherman spoke of how, as he gets older he feels more and more responsibility in regards to fishing and processing salmon. It is expected that he will catch more salmon, turn it into dried fish, half dried, provide for his family, and share it with others beyond his family. The workshop participants further described the way

salmon is shared in Fort Yukon, they said that if you are a fisherman, you don't have a big full freezer while everyone else has none or very little salmon, you share what you have.

Fishermen in Fort Yukon spoke of how they value sharing their salmon with many people. The sharing brings them together, for instance in potlatches. They spoke of how providing from the land and sharing with others was a source of pride for them giving them a sense of purpose. Fishing ties the people of Fort Yukon to the land and to their heritage and to their community. There is also a feeling of healthy competition: *how much wood did you haul? How many geese did you get?*

In the review workshop held in 2016, participants further explained that fishermen share their gear- their wheels, nets, and boats. This helps them to share their responsibility as fishermen and helps them to "bond as people who fish" (Richard Carroll III 6.20.16). In the interviews, one fisherman spoke of how when he started out fishing he and his partner caught a lot of salmon and they gave their fish wheel to a large family that need fish. Other participants spoke of how, if they had a good spot that was catching a lot of salmon, they would feel even more obligated to share. Richard Carroll went on to state that one fish wheel in Fort Yukon can support 20 families. This includes making the fish wheel, sharing the wheel, and sharing the harvest (Richard Carroll 2016).

Additionally, Fort Yukon fishers feel a responsibility to pass on their knowledge and skills, to teach others. Many participants spoke to this. One fisherman spoke of the responsibility he felt to teach everyone about their way of living, *"until the fish quit running."* More than one participant described how fishing is important to them as part of their identity as fishermen, they were taught by someone important to them and they want to teach as they learned. As Duane Solomon states, "I want them to carry on the tradition and I want them to know how to do it." They feel a responsibility to teach their children and their grandchildren this practice, this cultural tradition. One Elder, Fred Thomas (2015), remembered people looking forward to going to fish camp, "I remember years ago, people would look to going out to fish camp. And then they would make dry fish and make salmon strips and all of that." Other fishers spoke of how men (in Fort Yukon) always teach their children how to fish. One participant spoke of how he works with his sons to set up fish camp, run their fish wheel and camp nearby while running the wheel. In the workshop, Richard Carroll described a memorable experience with his daughter fishing with his fish wheel and the pride they both felt. He spoke of the comradery, family, and bonding experiences that ties them together as people who fish.



Boats on bank of Yukon River near Fort Yukon.



Salmon drying on rack in Fort Yukon

Salmon is an important teaching tool. Fishing activities provide an avenue for passing on culture and tradition in the Fort Yukon area. One participant spoke of how she and her husband took many children, other than their own, to their fish camp site and taught them how to fish, how to set up camp, how to clean fish, how to cut fish and everything associated with fishing. Every summer they harvested enough fish for the winter and shared their salmon.

The following quote sums up how many participants described their role as a subsistence fisher,

It is important you know, not only to feed my family with fish, but also to train my children how to fish. And passing that art on, how to fish, I mean, this is a big Yukon River. You just can't throw your net in the middle of the river and expect you are going to catch salmon, you gotta learn that from, from your Elder or your parents. You know where to set that net, look at the current, look at where the river runs. You know, stuff like that, there's a lot of changes and we learn as we go and it's important to continue, continue honing our culture. ... It's important for my children to learn and it's important for my people. Because that's where we come from and that's something to be proud of there. That's what makes us Native people, is the land we live on and how we subsist off this land.

—WALTER PETER, FORT YUKON 2015

These fishermen feel good when they can say, "I taught my children [or grandkids] how to fish." They teach the young people the importance of fishing, how to eat fish, and how to value fish. One fisherman proudly reported that his sons are his fishing partners.

Some participants went as far as to state that fishing defines them. Fishing is so important to them as a food, a cultural value, a lifestyle, a source of income and a teaching tool as shown by the following quote,

When you ask what it means to be defined as a fisherman, it's the most important and all of the other things come into play as a provider. Eating it, trading, bartering, sending fish to Arctic Village. When people see you they say, 'oh gee, that salmon you sent me was good.' You know and it just makes you feel good as a person. And that's what you are supposed to do by living out here.

—PAUL SHEWFELT, FORT YUKON 2015

As Culture and Tradition

Hey, have you ever tasted salmon? You fall in love with that taste, you know. You share it with people, you bring it to potlatch, people had salmon, they'd give it to you. Salmon everywhere. Everybody had salmon, lots of

salmon, it's good salmon. You know that's just important. It's part of our tradition, but culture is deep down and keep that alive in salmon.

—DUANE SALOMON, FORT YUKON 2015

As the quote above described, fishing culture is rooted in the activities of eating salmon, sharing salmon, going fishing, cutting fish, and going to fish camp. Fish camp is a place where families come together and teach younger generations their culture and traditions. Participants fished with their relatives—parents, grandparents, uncles, aunts, cousins, and children. It was and still is important to teach their youth how to make fish wheels, cut salmon, hang and dry salmon, run the smokehouse and the myriad of other fish camp activities. Most participants' first memories of fishing are when they were very young— in a boat, at fish camp or along the riverbank near Fort Yukon. Children learn at an early age how to help out at fish camp— hanging fish, keeping the smoke in the smokehouse going, and checking the fish net. They helped with hauling water and wood, and mending nets. "Cleaning and whenever we needed to mend the nets, I helped with the nets. And packing, always packing water and always packing wood" (Duane Solomon, Fort Yukon 2015). Fishing was a family event and some families went to camp and stayed for 3 months. Everyone would work together to cut salmon, and they caught a lot of Chinook salmon. This would prepare the children to take over the task of fishing as their parents and grandparent became older and unable to fish. It takes time and practice, as one participant reported that it takes 15 years of cutting fish to become really good. Some participants did not have a parent who fished. They first fished with cousins or uncles. Some participants learned to fish as adults from mentors such as a father-in-law. Whether they learned as children or as adults, fishing continues to be a family activity.

Sharing salmon is a critical and important part of the way of life in Fort Yukon. Fishers share their catch widely. Many fishers spoke of how they are teaching their children to share with the Elders. Another fisher appreciates the redistribution process and how it helps him stay connected to his family, friends, and Elders in the community. Having salmon to share gives him an excuse to reach out to family members, neighbors, and Elders and keeps the culturally important activity of sharing and visiting people alive. This fisher described that he feels more comfortable to have something to give when he goes to visit and sharing salmon provides an appropriate reason and gift. Another fisher talked about how important sharing is as part of taking care of his community members. People share or trade with others who might not have enough salmon. A major change that some participants in Fort Yukon report is a reduction in their ability to share their salmon. The amount of salmon they are able to bring home has become unpredictable. Fishers spoke of how they want to share with their parents, aunts, grandparents, and Elders but they just don't have the salmon available to give. Many participants are no longer making customary food and they consider the reduction in Chinook salmon availability to be a major impact to them. The quality and availability of salmon to make strips has been reduced. Fishers that used to share with many families have ended their sharing. This impacts many families. One of the older participants spoke of how he used to share salmon straight from his fish wheel. He would give salmon to anyone who wanted it. Today, he reiterated, people are not catching enough Chinook salmon to share.

Sharing, barter, and trade are important ways to distribute the harvest. This method of re-distribution ensures salmon and dried fish are available to relatives and friends in Fairbanks, and villages alike. Some participants in Fort Yukon harvest Chinook salmon and trade with the people of Arctic Village for caribou. This is a good trade for both sides, as they each desire a taste of the others' harvest. Trade of salmon has been impacted by the reduction in available Chinook salmon. Study participants spoke of how they used to trade salmon for caribou with their neighboring community of Arctic Village. Now their neighbors in Arctic Village don't have the opportunity to get traded salmon. The decline in Chinook salmon affects not only the people along the river, but villages off the river that rely on them for sharing and trading their catch.

Retaining fishing culture and tradition is extremely difficult without the fishing activity. Going to fish camp is an important part of the lifestyle in Fort Yukon and without Chinook salmon fishing, this is changing. Participants reported that they enjoy being out on the river during the hot, early summer and miss this activity. Without time at fish camp, their children are not learning to help with fishing activities as they once did. It is also important for young people to eat salmon so that they are used to it and consider it part of their tradition. Participants are concerned about how to retain their culture and fishing traditions. Expert fish cutters are no longer able to cut Chinook salmon and teach their youth this skill. Now some fishers are spending their time doing other things such as getting logs when they used to be fishing. If they are no longer fishing, they are not building fish wheels with their young people, teaching them the skills and sharing the knowledge passed down generation to generation. If they are still able to fish, there is less room for error thus they cannot let their children run the net or let their children practice cutting the few salmon they bring home. Fishermen in Fort Yukon are concerned about their youth and how they are growing up, the experiences they feel the youth need to continue their lifestyle, culture, and tradition.

Concerns and Adaptations

People are adapting in different ways. Some are banding together, chipping in on one fishing operation rather than going out on their own. They are changing the amount of time that they dedicate to fishing. They are changing what they eat and where they get their food in response to the lower Chinook salmon numbers. But participants claim that fishermen find a way to adapt. They may put out more fishing effort, more nets or they may cut their fish more carefully to avoid any waste. They also reported struggling with the high gas prices in their area and how fuel for their boats has such a high costs when subsistence fishing. This is supported by research that (Brinkman et al. 2014) found that harvesters are making sacrifices such as putting off paying monthly bills in order to buy fuel for subsistence activities. Participants confirmed this in the 2016 review workshop in Fort Yukon for this report and also state that they may change boat motors to adapt to higher fuel costs.

Salmon fishing in Fort Yukon has changed over the last decade. It used to be an activity that would last a few days to a week to catch what they needed. Now some fishers are finding that they need to fish for 30 days straight, getting as much as they can for as many households as they can because no one else will be fishing. Others have just stopped fishing because of the difficulty of responding to the new regulations. Finally, today with Chinook salmon fishing restrictions, many of the participants in this study are not operating their fish wheels but choosing to use nets instead.

The reduced amount of Chinook salmon available is a hardship for many of the participants and they have less to eat in the winter. During the study period, participants were not able to get enough Chinook salmon, if any, for their households. Today, many people in Fort Yukon have to buy more food from the store or rely more heavily on other subsistence resources such as fall chum salmon, rabbits, whitefish, or moose. They harvest more geese in the spring and more moose in the fall but this still does not make up for the lack of Chinook salmon. To some participants this was a major impact while there were some participants who reported it as minor impact. Food from the store is extremely expensive. During the study year, a loaf of bread cost \$6.21 and a box of cereal cost \$8 at a local store in Fort Yukon. The same box of cereal cost \$4-5 in Anchorage during this time period. One participant claimed food in Fort Yukon was double what it costs in Fairbanks. Some families travel to Fairbanks to buy food from the store. This adds a flight to their annual food cost.

Although Chinook salmon continues to be the primary eating fish and favorite in Fort Yukon, chum salmon as an eating fish is rising in use. With the unavailability of Chinook salmon, particularly the year of these interviews when Chinook salmon fishing was closed, fishers were talking more and more about ways to eat fall chum or *silvers* or *khii*. It appears that the value of fall chum salmon, as the only available salmon, is increasing and people are becoming creative with ways to make this less desirable fish taste better. People are switching to chum salmon out of necessity because it is available and Chinook salmon is not. They are experimenting

with chum salmon, drying it into strips and jarring it. Some have not done this before and find it edible but not an equal replacement to the Chinook salmon. They eat it because they need to have something to eat.

Others report that the Gwich'in are very adaptive people. When there is a shortage of one species, they find another food source. When the Chinook salmon have been in low abundance over the past decade, the people of Fort Yukon have turned to whitefish, chum salmon, other fish, and other subsistence resources such as moose, grouse, and geese. Participants of this study are also adapting to the shortage of Chinook salmon by buying food from the store, either in their community at very high prices or after purchasing a ticket to Fairbanks.

Participants are concerned about the health of the Chinook salmon; becoming smaller, the low numbers of Chinook salmon, and the need to rebuild the Chinook salmon stocks. They are concerned about the health or fat content of their salmon. They are concerned about fishing regulations and how that affects them and their lifestyle. Additionally, participants spoke of climate change and how natural indicators they use to predict when the salmon would arrive have become less reliable. Examples of these natural indicators include observing other aspects of the environment such as when the horse flies arrive and when the cotton from local trees flies through the air. Now they must use their phones and fishery management reports to know when the salmon will arrive. Climate change may be making the river water temperature rise, affecting the salmon. Participants are concerned that climate change may be affecting the natural indicators they have relied on for thousands of years to predict salmon run timing and abundance.

The use of chum salmon has changed in recent years. With the decline and shortage of Chinook salmon, the people of Fort Yukon have been experimenting with eating more chum salmon, particularly the '*silvers*' or *khii*, ocean bright early run fall chum salmon. This can be challenging to fishers and hunters living off the land because the fall chum salmon season overlaps with moose hunting season in the Fort Yukon area. A change in the chum salmon harvest and use is that participants are starting to jar it when in the past they only jarred Chinook salmon. They report that the chum salmon is not as tasty as the Chinook salmon as one participant reports that she finds chum salmon more dry than Chinook salmon. She eats her jarred chum salmon with more spices to make it taste better. Other participants felt strongly that chum salmon cannot replace Chinook salmon. Some participants no longer have dogs. Fishing has changed for them since they don't need the chum salmon as dog food.

Recommendations

In times of shortages, many participants felt that the Elders should be the ones who have access to the few available Chinook salmon. Some felt this way because they have always eaten it and they surmised that the Elders miss it the most. They feel that the Elders are so dependent on the taste of salmon they need it to survive and thrive. Others felt that those who have lived on the salmon traditionally and customarily should have first access to the salmon in times of shortages. This should also be extended to those who live also in economically depressed areas.

In terms of fishing regulations, participants in the 2016 review workshop recommended that Yukon River fishers be allowed to use a variety of net sizes so that salmon of a variety of sizes are harvested rather than all the big ones or all one size. Some participants favored a communal fishing approach during times of Chinook salmon shortages. This is one way the salmon could be shared widely within the community. The catch would be stored in the Tribal Council freezer and used for potlatches and other occasions determined by the community. Other ideas included a quota of fish to catch so that people can catch what they need and then let other people fish, perhaps sharing a communal fish wheel. Finally, one participant would like to see his Native Village regulating fishing in his area.

DISCUSSION

Similarities:

The three communities participating in this study are spread along the length of the Yukon River and represent different cultures, fishing styles, and access to the salmon at different stages of their migration. There are many similarities in their experiences and many differences. This section compares and contrasts the results between the three communities.

There were many notable similarities in how all three of these Yukon River communities value salmon. The one that was stated in the strongest way in all of the study communities was that Chinook salmon has paramount importance as a primary and essential food. Chinook salmon is an important food but not just because it provides healthy and nutritious sustenance. Chinook salmon is a culturally based food. When the first Chinook salmon of the season is caught, it is celebrated. It is talked about excitedly. They don't even have to say what kind of salmon it is. This salmon is shared throughout the community. It is presented to Elders as a gift to thank and honor them. The sharing of salmon connects their communities and reminds them of their history and ancestors, their connection to the land, the water and the animals. Chinook salmon are also important because they are a healthy, locally based, economical food. Compared to expensive, store bought food, salmon is far better than the less nutritious options presented in village stores. Job opportunities are limited in Yukon River villages making store food purchased even more of a hardship.

Concern over the decline in Chinook salmon abundance was universal. Participants throughout the study were concerned about the overall health of Yukon River Chinook salmon, its declining abundance, and shrinking size. They were also concerned about the restricted fishing regulations and how these changes affect their way of life in the village.

Salmon fishing is a highly valued activity. The people of the Yukon River have a culture that has evolved for thousands of years focused around the preparation, harvest, processing and preserving, sharing, eating, and celebrating salmon. The harvest of salmon is an important way that the people of the Yukon River teach their culture to their young people. The act of fishing is also a healthy activity and part of a healthy lifestyle. Participants agreed that part of the value of fishing is the physical activity and lifestyle surrounding the harvest. Keeping active and busy is good for the body and the mind. Engaging both youth and adults in fishing keeps them healthy through physical activity and healthy choices.

Subsistence fishers are highly valued in all of the study communities. They are providers of food for their family and their community. They are culture bearers, responsible for teaching others to respect, harvest, process, preserve, share, celebrate, and eat salmon.

Participants in the study communities are targeting other subsistence resources and purchasing more food from the store to make up for reduced availability of Chinook salmon. During this study, Chinook salmon fishing was severely restricted and fishers and their families were struggling with alternative food choices. In Russian Mission participants reported more winter fishing with nets under the ice because their salmon supplies no longer lasted all winter. They reported targeting more whitefish, sheefish, and pike. Russian Mission participants also reported more hunting for moose and increased trapping. In Nenana, participants also reported being unable to rely on salmon as their primary food and having to turn to other food sources. In Fort Yukon, participants reported targeting whitefish, chum salmon, and other fish to make up for the unavailability of Chinook salmon. They are targeting more moose, grouse, and geese.

Other adaptations that some of the communities are employing are banding together, working in larger groups to share the increasing costs of fishing. This is taking place in Russian Mission and in Fort Yukon. Ways

to share the cost of fishing include sharing equipment, taking turns with one net or wheel, and partnering up with larger fishing groups.

Differences:

There were also differences in the way that these three communities reported adapting to changes in salmon availability.

The study community participants agreed that the role of the subsistence fisher is very important but the number of people continuing to fish today was different in the study communities. In Fort Yukon and in Nenana participants reported that during the study years fewer people were fishing thus the importance of the few remaining subsistence fishers has grown and more people are relying on their harvest. Russian Mission participants did not report less active fishermen. In Nenana, one participant described the impact of fishers missing a season and reported that once they leave the fishery, it is difficult to come back. This participant further described the impact of the Chinook salmon fishery restrictions in that, fishers in his area start their season with Chinook salmon fishing and go on to other species. Chinook salmon is so highly valued that the effort to prepare a wheel, repair your boat or net, or do other activities to prepare for the fishing season is considered worth the effort. But if there is no Chinook salmon fishing, Nenana participants found that fewer fishermen prepared for and began fishing.

Other differences include adaptations to the reduced availability of Chinook salmon including an increased importance in chum salmon in Russian Mission and in Fort Yukon. This can also be seen in their harvest history where summer and fall chum salmon harvests increased in Russian Mission and fall chum harvest increased in Fort Yukon between 2011 and 2013 (Jallen et al. 2012; Jallen et al. 2017). In both communities there was much discussion of experiments on how to prepare chum salmon differently so that it tasted better. Although it is less desirable because it has less oil, chum salmon is still a healthy and high quality food. When Chinook salmon is unavailable, participants in both of these communities reported increasing their consumption of chum salmon and becoming creative in how to serve it. Participants in Nenana also eat chum salmon but there was little discussion of the challenge in learning to prepare and eat it differently. Chum salmon was reported in Nenana as their second favorite fish after Chinook.

Other adaptations that participants in Fort Yukon described are fishing for longer time periods to ensure they are able to harvest enough for their household food needs. This was described as ‘fishing harder.’

In Russian Mission, participants reported a mix of impacts on sharing from the reduced Chinook salmon availability. Some households are sharing their salmon more to make up for the reduced Chinook salmon while others are sharing less. Either way they were describing the impact and their struggle to adapt to changing resource availability. In both Nenana and Fort Yukon, participants reported a reduction in their ability to share Chinook salmon and that this reduction in sharing was a major impact. In Fort Yukon, participants reported not catching enough to share and not being able to making their customary foods such as Chinook salmon strips. In Nenana, fishers reported not being able to share salmon with their Fairbanks relatives and non-fishers reported not receiving salmon as freely as in the past. The reduction in sharing in Nenana is a hardship on the entire community affecting their health as people are eating less nutritious store bought food and a breakdown in their culture of sharing and the connections maintained through this distribution system. Finally, participants in Nenana miss the tradition of always having “strips on the table” to share with guests.

Russian Mission participants described how important Chinook salmon is to them as a winter food. Because of its high oil content they feel that it keeps them warm in the winter. Nenana participants agreed with this and added that it is a good winter food because it preserves so well. Participants in both communities languish over missing this important part of the annual food.

Participants in Russian Mission are highly concerned about following their cultural guidelines, “take only what you need and ensure no waste.” They were morally offended by the bycatch reports in the Bering Sea Pollock fishery because they felt this was wasteful of their primary food and against their moral values.

Both communities of Fort Yukon and Russian Mission reported traveling out of the Yukon River drainage in the effort to meet their household needs for salmon. Fort Yukon participants may travel to the Copper River to harvest salmon while some Russian Mission participants may fly to Bristol Bay to harvest salmon. These tactics are expensive and lend an understanding of the importance of harvesting salmon.

Other impacts from the reduced Chinook salmon availability include a financial impact to the community of Russian Mission. Commercial has been curtailed since the Chinook salmon declines and this effects the limited income sources in Russian Mission. This is a hardship in a place with low incomes, few opportunities to earn income, and high poverty rates. Although Chinook salmon commercial fishing closure is not as new, the recent declines have affect chum salmon commercial fishing because both species are in the river at the same time. While Chinook salmon needed to be protected, chum salmon fishing needed to be reduced so as to avoid incidentally catching Chinook salmon in their nets. Dip nets were introduced to allow for live release of Chinook salmon but this very labor-intensive method was not an option for all fishers. Thus the Chinook salmon decline has reduced the income available in Russian Mission. Commercial fishing in Nenana and Fort Yukon has not been a viable income source in recent years

RECOMMENDATIONS

Overwhelmingly, the participants in this study recommend a priority for Elders access to Yukon River salmon in times of shortages. This recommendation came from almost every participant in all three communities. There were a variety of ways that participants thought Elders should be prioritized when it comes to limited salmon numbers. Some felt that salmon should be harvested and kept in a community freezer, available for potlatches or Elders lunch programs. Others felt that Elders should have priority to harvest the salmon or a proxy harvesting for them. Finally, others felt that salmon should be shared with Elders as a priority.

Other recommendations include the Fort Yukon suggestion of continuing to use a variety of net sizes with the goal of targeting salmon of difference sizes and thus spreading the harvest. In Russian Mission, participants requested better or more ample notice of gear changes to enable them to prepare properly for the fishing season. Finally, also in Russian Mission, participants requested support to communities experiencing hardships due to the declining salmon runs.

More research could be conducted investigating the effect on the social order of fishing by a declining resource. This study found that the decline in Chinook salmon appears to have resulted in fewer fishermen in the two study communities of Nenana and Fort Yukon. This change amounts to a smaller number of people harvesting salmon in these upper river communities while in the lower river community participants did not report less fishermen. Additional research could investigate why this reduction in number of fishermen was more prevalent in the upper river. Could it be related to the greater number of fish or the commercial fishing opportunities in the lower river? Do these differences provide fishermen with the resources necessary to engage in fishing? Are there other differences not yet explored?

CONCLUSION

This study was initiated at a time of restricted salmon fishing on the Yukon River and subsequent hardships felt by the people of the Yukon River villages who depend so heavily on these salmon runs. Concern was growing about the declining Chinook salmon run and the effects on people. The goals of the study were to describe how people of the Yukon River value salmon through case studies in three communities – Russian Mission, Nenana, and Fort Yukon.

Results show that the primary value of salmon for people of the Yukon River is for food. Salmon is their essential food and a lack of it leads to less food security. Many participants reported not being able to harvest enough salmon to get them through the winter, particularly their preferred species – Chinook salmon. They have adapted, for now, by sacrificing their preferred food and attempting to adapt relying on other food sources. Their alternative food sources include expensive store bought food, other fish such as chum salmon and non-salmon species, and other wild resources such as moose.

For all the Yukon River communities participating in this study, salmon is not just a food but also a connection to their cultural and traditions. When the people of the Yukon River are forced to sacrifice their preferred food, they are not just missing out of eating delicious Chinook salmon. They are also sacrificing their culture, their cultural traditions, and the passing or teaching of their cultural traditions to the youth. It threatens their community wellbeing. They recognize the vast healthy benefits of salmon fishing. These include teaching to their youth about their way of life, healthy activities for youth and adults, and healthy economical food for their community.

Participants reported changes over the last 20 years. In some communities, less people are fishing and more people are relying on the few subsistence fishers remaining active. There were less Chinook salmon available during this study period but that did not change the number of people who wanted to eat Chinook salmon. With less Chinook salmon available, communities are coping by eating other wild resources and purchasing expensive store food. These changes strain their household and community well being.



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APPENDIX A: INTERVIEW GUIDE

**HOW PEOPLE OF THE YUKON RIVER VALUE SALMON:
A CASE STUDY OF THE LOWER, MIDDLE, AND UPPER PORTIONS OF YUKON RIVER**

SEMI- STRUCTURED INTERVIEW GUIDE

Name: _____ Birthplace: _____

Birth Date: _____ Community of Residence: _____

A note to respondents: Today I would like to discuss salmon with you. I would like to learn about the role salmon plays in your life, in your household, and the importance or value it holds for you.

Interview goal: three separate age categories (18-29 year olds, active fishers aged 30-54 years old, Elders aged 55 and over). Minimum of 4 interviews in each category.

Consent form

QUESTION TOPICS:

Personal fishing history

- What are your first memories of fishing? In what ways did you participate?
 - o Who did you fish with?
 - o Where did you fish?
 - o What kind of gear did you use?
- When did you first start fishing independently as an adult? What year was it? How old were you?
 - o Where did you first fish as an adult? Where do you fish now? (if a change in location, why?)
 - o What kinds of gear did you use when you first began fishing as an adult?
 - o What was abundance like when you first began fishing for salmon? How many fish did you harvest in a season?
 - o What kind of regulations were in place when you first started fishing?
- How has fishing changed since you began?
 - o How has subsistence fishing changed over the past 20 years?
 - o Do you still go to a family fish camp?
 - o Who did you fish with 20 years ago?
 - o Do you fish now? With who? Where do you fish now?
 - o Where do you process your fish? Where did you process it 20 years ago?
- Do you think fishing for subsistence is important to meet the needs of your household in terms of food?
- Do you think continuing to subsistence fish is important for other reasons besides food? Elaborate.
- Are you a commercial fisherman? (or members of your household)
 - o How much of your income comes from commercial fishing?
 - o How long have you or members of your household participated in commercial fishing?
 - o Do you think commercial fishing is important for your community?

- Do you practice customary trade or exchanging fish for cash?
 - o How much of your income comes from customary trade?

Value of salmon

- In what way is salmon most important to you? (As a food, as a teaching tool, cultural value, as a source of income, other ways?) Describe.
- Which species of salmon are most important to you? Why?
 - o What are the top 3 most important fish eaten in your household?
- Has the value or uses of salmon changed for you over the last 20 years?
 - o When you were a child what was salmon most valued for?
 - o Today, what is the most important thing about salmon?
- How has changes in abundance and availability in Chinook salmon / other salmon species impacted your family?
 - o How has the change in king salmon abundance affected you?
 - o Have you experienced changes with other species of salmon?
 - (no Salmon strips on the table as a snack
 - Not going to traditional camps anymore
 - Not being able to share salmon with others
 - Focus on youth and keeping them connected to their culture
 - High rates of suicide and link to salmon fishing decline?)
- Last year, did your household get enough salmon?
 - o How would you describe the impacts to your household of not getting enough salmon? (minor, major, severe)
 - o Did your household do anything differently because you did not get enough salmon?
- In times of shortage, who should have access to the limited salmon available?

APPENDIX B: PARTICIPANT CONSENT

PARTICIPANT CONSENT FORM**How People of the Yukon River Value Salmon:
A case study in the lower, middle and upper portions of the Yukon River.**

Funded by the North Pacific Research Board
Project carried out by the Yukon River Drainage Fisheries Association

Contact: Catherine Moncrieff
PO Box 100498
Anchorage, AK 99510-0498
Telephone: 1-877-999-8566
E-mail: Catherine@yukonsalmon.org

I, _____, understand that the purpose of this research project is to learn about and record how people value salmon in three communities in the Yukon River drainage and that it is funded by the North Pacific Research Board.

I am willing to take part in this project and I understand that I can end my participation in this project at any time during or after the interview.

I understand that I will have the opportunity to review the preliminary findings and that I will be able to correct or edit the preliminary findings to ensure that they are accurate and not harmful to me or my community.

I give permission to Catherine Moncrieff and YRDFA to use my name and/or photo and to record this interview through digital recording, photograph, and/or video. (yes___ no___) I also understand I can participate anonymously.

I understand that I will receive \$50 honorarium for my time.

Interviewee: _____ Date: _____

Address: _____

Phone #: _____ Bank Account # _____

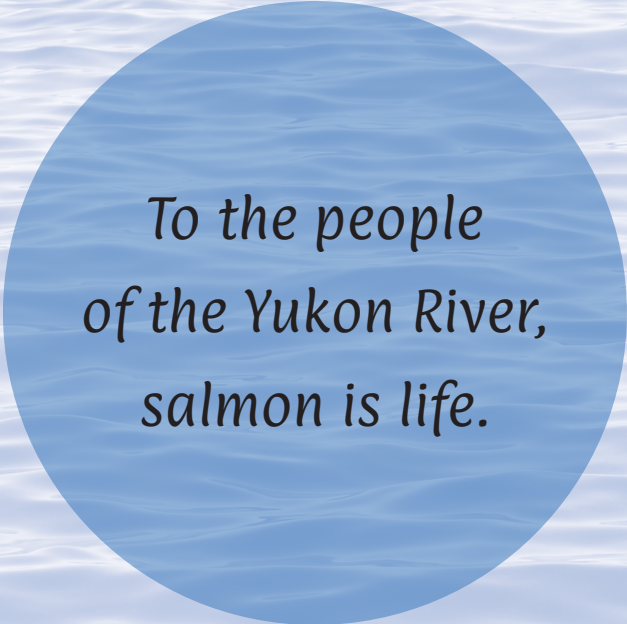
Bank Routing # _____

Interviewer: _____

☐ This consent form was translated. Translator _____

APPENDIX C: PARTICIPANT LIST

	name	location	date of interview	birth year	age
1	Henry R. Ketzler	Nenana	9.9.14	1927	87
2	Moses Paul	Nenana	9.10.14	1933	81
3	Donald E. Charlie	Nenana	9.10.14	1947	67
4	Darlene Jensen	Nenana	9.9.14	1951	63
5	Victor Lord	Nenana	9.9.14	1956	58
6	Timothy D. Ketzler	Nenana	9.10.14	1964	50
7	Rondell Jimmie	Nenana	9.9.14	1965	49
8	Albert Demientieff	Nenana	9.10.14	1967	47
9	Timothy J. McManus	Nenana	9.10.14	1979	35
10	Theresa Lord	Nenana	9.10.14	1987	27
11	Dillon McManus	Nenana	9.10.14	1995	19
12	Miranda Taylor	Nenana	9.9.14	1996	18
13	Jerry Carroll	Fort Yukon	9.24.14	1998	16
14	Franklin Carroll	Fort Yukon	9.24.14	1996	18
15	Trey Petersen	Fort Yukon	9.25.14	1995	19
16	anonymous	Fort Yukon	9.24.14	1995	19
17	Andrew Firmin	Fort Yukon	9.23.14	1979	35
18	Walter Peter	Fort Yukon	9.23.14	1976	38
19	Diana D. Peter	Fort Yukon	9.26.14	1973	41
20	Duane Solomon	Fort Yukon	9.25.14	1965	49
21	Gerald Carroll	Fort Yukon	9.24.14	1962	52
22	Paul Shewfelt	Fort Yukon	9.24.14	1959	55
23	James C. Kelly	Fort Yukon	9.24.14	1955	59
24	Samson Peter III	Fort Yukon	9.24.14	1944	70
25	Hannah J. Solomon	Fort Yukon	9.25.14	1932	82
26	Fred Thomas	Fort Yukon	9.23.14	1919	95
27	William E. Pitka	Russian Mission	5.12.15	1947	68
28	Sandra Kozenikoff	Russian Mission	5.12.15	1947	68
29	Peter Askoar	Russian Mission	5.12.15	1948	67
30	John Changsak	Russian Mission	5.13.15	1960	55
31	Josephine Edwards	Russian Mission	5.13.15	1996	49
32	Peter Minock Jr	Russian Mission	5.12.15	1972	43
33	Daryl Polty	Russian Mission	5.11.15	1975	40
34	Victor Shorty	Russian Mission	5.11.15	1977	38
35	Daniel Askoak	Russian Mission	5.12.15	1980	35
36	anonymous	Russian Mission	5.13.15	1982	33
37	Stephan Duffy	Russian Mission	5.13.15	1989	26
38	Curtis Pitka	Russian Mission	5.13.15	1992	23
39	Henriann Nickoli	Russian Mission	5.11.15	1996	19



*To the people
of the Yukon River,
salmon is life.*



YUKON RIVER DRAINAGE FISHERIES ASSOCIATION