

**STAFF ANALYSIS
FSA14-03**

ISSUES

The Napaskiak Tribal Council submitted Fishery Special Action Request FSA14-03, which asks the Federal Subsistence Board (Board) to close the Kuskokwim River drainage to Chinook salmon fishing except by Federally qualified subsistence users, and to conduct an analysis under Section 804 of the Alaska National Interest Lands Conservation Act (ANILCA).

DISCUSSION

The Napaskiak Tribal Council asked the Board to close the Kuskokwim River drainage to the harvest of Chinook salmon except by Federally qualified subsistence users with a customary and traditional use determination for Chinook salmon. Additionally, the Napaskiak Tribal Council asked the Board to allow only some Federally qualified subsistence users to harvest Chinook salmon, and that the determination of who will be eligible be based on three criteria: (1) customary and direct dependence upon Chinook salmon as the mainstay of livelihood, (2) local residency, and (3) the availability of alternative resources. A determination under the three criteria is required in Section 804 of ANILCA and is commonly called a “Section 804 analysis.”

The context of the Napaskiak Tribal Council’s request is that it is likely the 2014 Chinook salmon season will be closed preseason to the harvest of Chinook salmon. The proponent anticipates that the Yukon Delta Refuge Manager, in consultation with other fishery managers, may open the Yukon Delta Refuge waters to the harvest of Chinook salmon to only Federally qualified subsistence users at some point in June or July 2014. If this occurs, there may be a small number of Chinook salmon available to harvest relative to the large number of subsistence users (40 villages including Bethel) with a customary and traditional use determination to harvest Chinook salmon. Thus, there is a high potential for harvest to exceed the harvestable surplus. A Section 804 analysis is necessary to determine which of the 40 villages will be eligible to harvest Chinook salmon in Refuge waters.

A special public meeting of the Yukon Kuskokwim Delta Regional Advisory Council was held in Bethel on Monday, April 7, 2014. The Council supported FSA14-03. On April 8, 2014, in Bethel staff from the Office of Subsistence Management met in consultation with representatives of Tribes and Native corporations. On April 8, 2014, in Bethel staff from the Office of Subsistence Management conducted a public hearing concerning FSA14-03; specifically, the public was asked if the special action should continue for up to 60 days, or if the special action should continue past 60 days and up to 120 days.

The conclusion of the analysis has two parts: (1) preseason, the Yukon Delta Refuge Manager, in consultation with other fishery managers, should close Refuge waters to the harvest of Chinook salmon except by Federally qualified subsistence users; and (2) the Board should allow residents of the Kuskokwim River drainage and the coastal villages of Chefornek, Kipnuk, Kwigillingok, and Kongiganek to harvest Chinook salmon from Refuge waters, if there is a harvestable surplus. The area includes 32 villages. Presented from south to north, the villages are the following: Chefornek, Kipnuk,

Kwigillingok, Kongiganek, Tuntutuliak, Eek, Napakiak, Napaskiak, Kasigluk, Nunapitchuk, Atmauthluak, Oscarville, Bethel, Kwethluk, Akiachak, Akiak, Tuluksak, Lower Kalskag, Kalskag, Aniak, Chuathbaluk, Napaimute, Crooked Creek, Georgetown, Red Devil, Sleetmute, Stoney River, Lime Village, Takotna, Nikolai, Telida, and McGrath.

All of the Federal subsistence fishing regulations for Refuge waters are described in **Appendix A**.

Existing Federal Regulation

Kuskokwim Area—Fish

§100.27(e)(4)(ii) For the Kuskokwim area, Federal subsistence fishing schedules, openings, closings, and fishing methods are the same as those issued for the subsistence taking of fish under Alaska Statutes (AS 16.05.060), unless superseded by a Federal Special Action.

Proposed Federal Regulation

Kuskokwim Area—Fish

§100.27(e)(4)(ii) For the Kuskokwim area, Federal subsistence fishing schedules, openings, closings, and fishing methods are the same as those issued for the subsistence taking of fish under Alaska Statutes (AS 16.05.060), unless superseded by a Federal Special Action.

Unless re-opened by the Yukon Delta Refuge Manager, Federal public waters in that portion of the Kuskokwim River drainage that are within and adjacent to the exterior boundaries of the Yukon Delta National Wildlife Refuge are closed to the harvest of Chinook salmon except by Federally qualified subsistence users.

State of Alaska Regulations

Kuskokwim Area—Subsistence Fishing

5 AAC 01.260. Fishing seasons and periods

(a) Unless otherwise specified in this section, 5 AAC 01.275, or 5 AAC 07.365, finfish, except rainbow trout, may be taken in the Kuskokwim Area at any time. Rainbow trout taken incidentally in other subsistence finfish net fisheries and through the ice are legally taken and may be retained for subsistence purposes.

(b) In the waters of Districts 1 and 2 and those waters of the Kuskokwim River between Districts 1 and 2, salmon may be taken at any time, except that the commissioner may, by emergency order, close the subsistence fishing periods in the waters of Districts 1 and 2 and those waters of the Kuskokwim River between District 1 and 2 and reopen those waters to commercial fishing. In Subdistricts 1-A and 1-B, the commissioner may, by emergency order, reopen fishing periods where subsistence fishing will be allowed in portions of waters adjacent to the waters of Subdistricts 1-A or 1-B open to commercial fishing under this subsection.

Extent of Federal Public Land

For purposes of this discussion, the phrase “Federal public waters” is defined as those waters described under 50 CFR 100.3. The affected area consists of those waters of the Kuskokwim River drainage that are within and adjacent to the exterior boundaries of the Yukon Delta National Wildlife Refuge, including portions of Districts 1 and 2 of the Kuskokwim Fishery Management Area (Kuskokwim Area). The waters are generally described as the lower Kuskokwim River drainage from the mouth upriver to and including about 30 miles of the Aniak River (see **Map**).

Customary and Traditional Use Determination

Most residents of the Kuskokwim Fishery Management Area (except those persons residing on the United States military installations located on Cape Newenham, Sparrevohn USAFB, and Tatalina USAFB) have a customary and traditional use determination for Chinook salmon in the affected area (Refuge waters of the lower Kuskokwim River drainage). The area includes 40 villages. Presented from south to north, the villages area: Newtok, Tununak, Toksook Bay, Nightmute, Mekoryuk, Chefornek, Kipnuk, Kwigillingok, Kongiganek, Platinum, Goodnews Bay, Quinhagak, Tuntutuliak, Eek, Napakiak, Napaskiak, Kasigluk, Nunapitchuk, Atmauthluak, Oscarville, Bethel, Kwethluk, Akiachak, Akiak, Tuluksak, Lower Kalskag, Kalskag, Aniak, Chuathbaluk, Napaimute, Crooked Creek, Georgetown, Red Devil, Sleetmute, Stony River, Lime Village, Takotna, McGrath, Telida, and Nikolai (see **Appendix B Table 1**).

Biological Background

Run Size

Since 2007, the Kuskokwim River Chinook salmon stocks have been in a multi-year period of low productivity insufficient to meet necessary escapement levels and provide subsistence users with sufficient opportunity to harvest (Schindler et al. 2013). The average Kuskokwim River Chinook salmon run size from 1976–2013 was 239,000 fish, with the last five years, 2009–2013, averaging only 130,000 fish (**Appendix B Table 2**). Since 2010, the Chinook salmon runs have been some of the lowest runs on record, with the estimated 2013 run of about 95,000 fish. This was the lowest run ever documented (Elison 2014, pers. comm.) (see **Appendix C**).

Escapement

Escapement objectives for Chinook salmon have not been met on the Kuskokwim River the past four years. Prior to the 2012 Chinook salmon fishing season, the Federal and State inseason fisheries managers, with concurrence from the Kuskokwim River Salmon Management Working Group (Working Group), agreed on managing the subsistence fishery with an escapement goal of 127,000 fish, based on the Bethel Test Fishery abundance index. The estimated 2012 total run of 100,000 Chinook salmon in the Kuskokwim River was not only lower than the escapement goal, but turned out to be lowest run on record at the time, dating back to 1976.

In January 2013, the Alaska Board of Fisheries adopted a new Kuskokwim River Salmon Management Plan (5 AAC 07.365), and a new, drainage-wide Sustainable Escapement Goal (SEG) of 65,000–120,000 Chinook salmon. For the 2013 Chinook salmon fishing season, with this new SEG in place, the inseason fisheries managers, with concurrence from the Working Group, agreed on managing the subsistence fishery with an escapement goal of 85,000 fish. Due to run timing and compression, few restrictions were placed on Chinook salmon subsistence harvest throughout the 2013 fishing season which resulted in the lowest escapement on record (Elison 2014, pers. comm.) (see **Appendix C**).

Harvest History

From the mid 1970s through 2013, harvest of Chinook salmon for subsistence has averaged approximately 72,000 fish annually from the Kuskokwim River drainage (**Appendix B Table 2**). However, since 2010, the amount of harvest has trended downward, due to both record low runs and corresponding increased fishing restrictions in some years. The estimated 2010 subsistence harvest was 66,000 fish, and the 2011 estimated subsistence harvest was 59,000 fish. The estimated 2012 subsistence Chinook salmon harvest of 24,000 fish was the lowest on record. This occurred as a result of the lowest run size to date at the time, in conjunction with significant restrictions on Chinook salmon fishing throughout the 2012 fishing season. In 2013, subsistence users harvested an estimated 46,500 fish; almost twice as much as the previous year, but still well below the long-term average of 72,000 fish (Elison 2014, pers. comm.).

Background

People who are members of over 40 tribes and about 7 regional groups live in the Kuskokwim Fishery Management Area. The majority of people in the area are *Yup'ik* Eskimos. *Yup'ik* people self-recognize as belonging to a number of confederations of villages: *Qaluyaarmiut* on Nelson Island, *Nunivavaarmiut* on Nunivak Island are two commonly recognized groups; also, *Canineqmiut* along the coastal area from the mouth of the Kuskokwim River to Nelson Island and *Kusquqvagmiut* in the lower and central Kuskokwim River drainage. *Deg Hit'an* (or Ingalik), Upper Kuskokwim, and *Dena'ina* Athabascan peoples live in the villages along the central and upper Kuskokwim River drainage (Fienup-Riordan 1984, Oswalt 1980).

Many forces of change have influenced people's subsistence uses of salmon. One is the increased use of motorized boats, snowmachines, and airplanes that replaced dog sleds as the primary mode of transportation. People no longer find it necessary to harvest wild resources in order to feed the dogs that were once owned by almost every family. People fed their dogs mainly chum and sockeye salmon that were harvested later than Chinook salmon. People harvested Chinook salmon mainly for human consumption (Ikuta et al. 2013). Today, only some families own dogs, and subsistence harvests of chum and sockeye salmon have decreased greatly since the 1960s.

Most non-Natives living in the Kuskokwim Fishery Management Area reside in the regional hubs of Federal and State governments, transportation, trade, and services: Bethel, Aniak, and McGrath. Historically, people entered the area to mine, trade, missionize, homestead, and recreate. Some of the

villages were the staging areas for these activities (Fienup-Riordan 1983, 1984; Kilbuck 1988; Oswalt 1990; Oswalt and VanStone 1967).

In 2010, an estimated 17,454 people living in 4,894 households were described as permanent residents of the villages in the Kuskokwim Area by the U.S. Bureau of the Census. In 1960, the U.S. Bureau of the Census estimated that 6,776 people lived in the area (see **Appendix B Table 1**). The population of the Kuskokwim Area almost tripled in the 50 years between 1960 and 2010 (ADCCED 2014).

Section 804 Analysis

Section 804 of ANILCA requires the Secretary of the Department of the Interior and the Secretary of the Department of Agriculture to respond when the population of a fish or wildlife species in a particular area becomes depressed to the point that the Secretaries are forced by circumstances to choose between otherwise qualified rural residents who wish to fish, hunt, or trap from that depressed population. Section 804 of ANILCA requires the Secretaries to make a determination based on three criteria: (1) customary and direct dependence upon the populations as the mainstay of livelihood, (2) local residency, and (3) the availability of alternative subsistence resources.

ANILCA Section 804

Except as otherwise provided in this Act and other Federal laws, the taking on public lands of fish and wildlife for nonwasteful subsistence uses shall be accorded priority over the taking on such lands of fish and wildlife for other purposes. Whenever it is necessary to restrict the taking of populations of fish and wildlife on such lands for subsistence uses in order to protect the continued viability of such populations, or to continue such uses, such priority shall be implemented through appropriate limitations based on the application of the following criteria:

- (1) customary and direct dependence upon the populations as the mainstay of livelihood;*
- (2) local residency; and*
- (3) the availability of alternative resources.*

Codified Federal Regulations 50 CFR §__100.17 Determining priorities for subsistence uses among rural Alaska residents

(a) Whenever it is necessary to restrict the subsistence taking of fish and wildlife on public lands in order to protect the continued viability of such populations, or to continue subsistence uses, the Board shall establish a priority among the rural Alaska residents after considering any recommendation submitted by an appropriate Regional Council.

(b) The priority shall be implemented through appropriate limitations based on the application of the following criteria to each area, community, or individual determined to have customary and traditional use, as necessary:

(1) Customary and direct dependence upon the populations as the mainstay of livelihood;

(2) Local residency; and

(3) The availability of alternative resources.

(c) If allocation on an area or community basis is not achievable, then the Board shall allocate subsistence opportunity on an individual basis through application of the criteria in paragraphs (b)(1) through (3) of this section.

(d) In addressing a situation where prioritized allocation becomes necessary, the Board shall solicit recommendations from the Regional Council in the area affected.

Once a limited pool of qualified users is identified based on an analysis of the above three criteria and informed by recommendations from the relevant Regional Advisory Councils, other management actions are taken to ensure subsistence opportunities are available within the confines of specific conservation concerns. In other words, an analysis based on Section 804 of ANILCA and 50 CFR §__100.17 does not allocate resources among those within the limited pool of users; it simply identifies that pool of users.

In this case, such an analysis is required because the proponent requested it and because of the projected small harvestable surplus of Chinook salmon in the Kuskokwim River drainage relative to the large number of subsistence users with a customary and traditional use determination to harvest Chinook salmon. There is a high potential for harvest to exceed the harvestable surplus. The following section addresses these criteria as they relate to rural residents with a customary and traditional use determination for Chinook salmon in the Kuskokwim River drainage.

Criterion 1: Customary and Direct Dependence upon the Population as the Mainstay of Livelihood

Sources of descriptions of the subsistence economy can be found in the literature cited at the end of the analysis and include: Fienup-Riordan 1983, 1984; Ikuta et al. 2013; Oswalt 1959, 1990; Wolfe and Ellanna 1983; Wolfe and Spaeder 2009; and Wolfe et al. 1983. The information below is based on the detailed descriptions in **Appendix D** of where people harvest, process, and preserve Chinook salmon.

1. Residents of South Kuskokwim Bay

Goodnews Bay, Quinhagak, and Platinum—Salmon are a mainstay of livelihood and the subsistence economy for the villages; however, salmon are harvested from drainages nearby the villages including the Kanektok, Goodnews, and Arolik rivers and not from the Kuskokwim River.

2. Residents of Nelson Island, Newtok, and Cheformak (Qaluyaarmiut)

Newtok, Nightmute, Tununak, and Toksook Bay—The villages rely more heavily on herring, other nonsalmon fishes, and marine mammals than they do on salmon. Salmon is harvested, but from the marine waters closer to the villages and not from the Kuskokwim River drainage.

Chefornak—People at Chefornak, while culturally and linguistically related to the people of Nelson Island, do not have opportunities to harvest herring at the high levels seen on Nelson Island. Other nonsalmon fishes, marine mammals, and salmon are likely harvested at high levels. Historically, people maintained fish camps at the mouth of the Kuskokwim River all summer to harvest, process, and preserve salmon. Before outboards, the trip took 4 days by boat. Currently, a few Chefornak families still travel to the Kuskokwim River fish camps. People also harvest a mixed variety of salmon from near-shore waters of Etolin Strait and Cape Vancouver.

3. Residents of Nunivak Island

Mekoryuk—People at Mekoryuk harvest large numbers of nonsalmon fishes and marine mammals. People occasionally harvest Chinook salmon when they travel across Etolin Strait to Cape Vancouver and fish with gillnets.

4. Residents of the Coast

Kwigillingok and Kongiganek—Salmon fishing has long been one of the primary activities of the people living along this area of the coast. Historically people moved to camps on both sides of the Kuskokwim River mouth below Eek Island in order to harvest, process, and preserve salmon all summer. Today, men generally go by boat to harvest salmon at the mouth of the Kuskokwim River and return to Kwigillingok or Kongiganek the same day. People do not have access to other runs of Chinook salmon.

Kipnuk—Kipnuk is situated on the Kuguklik River near the coast, about 60 miles from the mouth of the Kuskokwim River. Kipnuk's wild food harvest includes large amounts of nonsalmon fishes including herring, blackfish, halibut, cisco, Pacific cod, and smelt. Marine mammals are probably also a mainstay of the subsistence economy in Kipnuk. Historically, some families stayed at fish camps situated at the mouth of the Kuskokwim River to harvest, process, and preserve salmon all summer, a trip taking up to 3 days before outboards. Kipnuk people's fish camps were generally located along the east side of the Kuskokwim River mouth at the north end of Kuskokwim Bay, across and south from Eek Island. In recent years, a few Kipnuk families still travel to the Kuskokwim River fish camps to harvest, process, and preserve salmon. Other people harvest salmon from the local area and from the Kuskokwim River usually returning in a single day or after camping overnight, especially during Chinook salmon season; however, a few travel to Bethel by airplane to harvest from fish camps near Bethel.

5. Residents of the Lower and Central Kuskokwim River Drainage

Tuntutuliak, Eek, Napakiak, Napaskiak, Kasigluk, Nunapitchuk, Atmauthluak, Oscarville, Bethel, Kwethluk, Akiachak, Akiak, Tuluksak, Lower Kalskag, Kalskag, Aniak, and Chuathbaluk—Seventeen villages are situated in the lower and central Kuskokwim River drainage. All 17 villages rely on the harvest of fish, economically, spiritually, and as a matter of survival. They rely most on salmon. The salmon runs are generally consistent, predictable, and large, and people organize their economic, spiritual, and social lives around harvesting, processing, and preserving salmon. People process a lot of the salmon they harvest by carefully tending to it while it is drying and smoking, a process that takes several weeks in dry weather. Chinook salmon are available for harvest in June during normally dry weather. Historically,

people harvested enormous quantities of chum and sockeye salmon to feed their dogs, when all winter travel was by dog sleds. Occasional harvests of Chinook salmon were preserved for human consumption and not fed to dogs. People preserved chum and sockeye salmon for later use by drying and smoking it. Chum and sockeye salmon are available for harvest in July and August when periods of wet weather are typical, and when drying and smoking salmon takes more time. Today, people rely more heavily on Chinook salmon to feed themselves because it can be processed and preserved during dry weather, and very large quantities can be stored that will remain suitable for human consumption throughout the winter.

6. Residents of the Upper Kuskokwim Drainage

Napaimute, Crooked Creek, Georgetown, Red Devil, Sleetmute, Stony River, and Lime Village—The villages in the upper Kuskokwim River drainage rely on salmon as a mainstay of their subsistence economy. People rely on the large quantities of salmon, including Chinook salmon, that they harvest from the Kuskokwim River drainage. Large quantities of nonsalmon fishes are also harvested. For Lime Village, moose and caribou are a mainstay of the subsistence economy also.

7. Residents of the Kuskokwim River Headwaters

Takotna, Nikolai, and McGrath—People at the villages rely on their harvests of moose, caribou, and salmon, including Chinook salmon, as the mainstay of their subsistence economy.

Criterion 2. Local residency

People living within the Kuskokwim River drainage have the highest level of local residency. Within the Kuskokwim River drainage, people presently occupy 25 village sites. They are listed in **Appendix B Table 3**. Two other villages, Kwigillingok and Kongiganek, while not within the drainage are situated within a few miles west of the mouth of the Kuskokwim River. Kipnuk is about 60 miles west of the mouth, further west is Chefornek, and farthest west are the villages of Nelson Island and Nunivak Island. The south Kuskokwim Bay village nearest to the mouth is Quinhagak, about 40 miles from the mouth. Goodnews Bay and Platinum are located further south.

Criterion 3. Availability of Alternative Resources

People follow a seasonal cycle of harvesting wild resources that varies from year to year, and from village to village, depending on the availability of wild resources. People's past harvesting patterns may be an indication of the available wild resources in their use areas and information is presented in **Appendix B Table 5** and **Appendix B Figure 1**. The availability of alternative resources (other than Chinook salmon) is assessed below.

1. Residents of South Kuskokwim Bay

Goodnews Bay, Quinhagak, and Platinum—People at Quinhagak along south Kuskokwim Bay harvested more salmon per person than other resources in 1982. Next most harvested was nonsalmon fishes (such as

herring, whitefishes, and pike) and marine mammals. Moose and caribou are not found in large numbers nearby the villages. Coho and sockeye salmon are available locally.

2. Residents of Nunivak Island, Nelson Island, Newtok, and Chefnak

Chefnak, Newtok, Nightmute, Mekoryuk, Tununak, and Toksook Bay—People at Tununak reported harvesting nonsalmon fishes (such as tomcod, halibut, Pacific cod, and herring) at the highest levels in 1986. Next was marine mammals and then salmon. Moose and caribou are generally not observed in the area, except near Chefnak. Chum, sockeye, and smaller numbers of coho salmon are available in areas accessible to the villages.

3. Residents of the Coast

Kipnuk, Kwigillingok and Kongiganek—People at the villages harvest locally available populations of nonsalmon fishes (such as sculpin and sole) and marine mammals. Chum and sockeye salmon are available locally, primarily in marine waters. A small and growing population of moose area available for harvest.

4. Residents of the Lower Kuskokwim River drainage

Tuntutuliak, Eek, Napakiak, Napaskiak, Kasigluk, Nunapitchuk, Atmauthluak, Bethel, Oscarville, Kwethluk, Akiachak, Akiak, Tuluksak—People at the villages harvest large quantities of locally available nonsalmon fish species (such as whitefishes, pike, and burbot) in addition to salmon, while other wild resources are harvested at much lower levels. Chum, sockeye, and coho salmon are available locally and harvested in large quantities. A healthy but small population of moose is available for harvest, and there is some opportunity to harvest caribou in the use areas of some of the villages.

5. Residents of the Central Kuskokwim River Drainage

Lower Kalskag, Kalskag, Aniak, and Chuathbaluk—People at villages in the central Kuskokwim River drainage reported harvesting salmon at the highest levels followed by nonsalmon fishes (such as sheefish and pike), except in Lower Kalskag and Chuathbaluk in 2009 when large land mammals were harvested at the next highest levels behind salmon. There is some opportunity to harvest small populations of moose and caribou. Chum, sockeye, and coho salmon are available locally and harvested in large quantities.

6. Residents of the Upper Kuskokwim River Drainage

Napaimute, Crooked Creek, Georgetown, Red Devil, Sleetmute, Stony River, and Lime Village—People at villages in the upper Kuskokwim River drainage reported harvesting salmon at the highest levels followed by nonsalmon fishes; however, at Lime Village in 2007 large land mammals were the next most harvested wild resources behind salmon. More opportunity exists to harvest moose and caribou for Lime Village than other upriver villages. Chum, sockeye, and coho are available locally and are harvested in large numbers.

7. Residents of the Kuskokwim River Headwaters

Takotna, Nikolai, and McGrath—People at villages in the Kuskokwim River headwaters reported harvesting large land mammals at the highest levels, except Nikolai in 1984 when more salmon was harvested. Moose and caribou are available for harvest in the use areas of the villages. The next most harvested resource was salmon. Chum salmon are available locally and harvested in large quantities.

Conclusion of Section 804 Analysis

Residents of the Kuskokwim River drainage and the coastal villages of Chefornak, Kipnuk, Kwigillingok, and Kongiganek have the greater customary and direct dependence on Chinook salmon from the Kuskokwim River drainage than do the remaining villages after consideration of the three criteria in Section 804. The 32 villages consist of an estimated 14,739 people living in 4,226 households. Presented from south to north, the area includes the following villages: Chefornak, Kipnuk, Kongiganek, Kwigillingok, Tuntutuliak, Eek, Napakiak, Napaskiak, Kasigluk, Nunapitchuk, Atmauthluak, Oscarville, Bethel, Kwethluk, Akiachak, Akiak, Tuluksak, Lower Kalskag, Kalskag, Aniak, Chuathbaluk, Napaimute, Crooked Creek, Georgetown, Red Devil, Sleetmute, Stoney River, Lime Village, Takotna, Nikolai, Telida, and McGrath (see **Appendix B Table 1**). The villages have similar characteristics. Most are situated within or adjacent to the Kuskokwim River drainage. Most harvest salmon at higher levels than other resources (such as nonsalmon fish, land mammals, marine mammals, birds and eggs, and plants); they generally harvest Chinook salmon in large quantities to dry and smoke during June; they are not situated near alternative Chinook salmon runs; and they generally are not situated near other alternative resources that can be harvested, processed, and preserved in numbers large enough to replace Chinook salmon as a mainstay of livelihood.

Allocation

The U.S. Fish and Wildlife Service is the Federal agency that would be responsible for coordinating the allocation of Chinook salmon to the residents of the 32 villages if the Yukon Delta Refuge Manager, in consultation with other fishery managers, deems a harvestable surplus of Chinook salmon has entered the Kuskokwim River.

Effects of the Proposal

If this request is approved, the Refuge Manager would close Refuge waters to the harvest of Chinook salmon. The Federal closure would affect sport fisheries that target Chinook salmon, and they would not be allowed in Refuge waters. The Refuge Manager, in consultation with other fishery managers, would open a Federal subsistence Chinook salmon fishery only if a harvestable surplus of Chinook salmon enters the Kuskokwim River. The residents of only the Kuskokwim River drainage and the coastal villages of Chefornak, Kipnuk, Kongiganek, and Kwigillingok would be allowed to harvest Chinook salmon. Presented from south to north, the villages are the following: Chefornak, Kipnuk, Kongiganek, Kwigillingok, Tuntutuliak, Eek, Napakiak, Napaskiak, Kasigluk, Nunapitchuk, Atmauthluak, Oscarville, Bethel, Kwethluk, Akiachak, Akiak, Tuluksak, Lower Kalskag, Kalskag, Aniak, Chuathbaluk, Napaimute, Crooked Creek, Georgetown, Red Devil, Sleetmute, Stoney River, Lime Village, Takotna,

Nikolai, and McGrath. Other residents of the Kuskokwim Fishery Management Area would not be allowed to harvest Chinook salmon in Refuge waters.

If this request is not approved, the Yukon Delta Refuge Manager, in consultation with other fishery managers, will likely close Refuge waters, and the State fishery manager will likely close the Kuskokwim River drainage, to the harvest of Chinook salmon because of the forecasted small Chinook salmon run. The Yukon Delta Refuge Manager may open Refuge waters if a harvestable surplus of Chinook salmon enters the Kuskokwim River. The State fishery manager may open the State subsistence fishery, which would be open to all residents of Alaska. The State is not expected to open a commercial fishery targeting chum salmon before June 30 because of the expected high level of incidental harvest of Chinook salmon that would occur.

OSM CONCLUSION

Support Special Action Request FSA 14-03. The regulation should read:

Kuskokwim Area—Fish

§100.27(e)(4)(ii) For the Kuskokwim area, Federal subsistence fishing schedules, openings, closings, and fishing methods are the same as those issued for the subsistence taking of fish under Alaska Statutes (AS 16.05.060), unless superseded by a Federal Special Action.

Unless re-opened by the Yukon Delta Refuge Manager, Federal public waters in that portion of the Kuskokwim River drainage that are within and adjacent to the exterior boundaries of the Yukon Delta National Wildlife Refuge are closed to the harvest of Chinook salmon except by the residents of the Kuskokwim River drainage and the villages of Chefornek, Kipnuk, Kwigillingok and Kongiganek.

Justification

It is likely that the 2014 Chinook salmon run into the Kuskokwim River will not provide a significant harvestable surplus, and the directed Chinook salmon subsistence fishery will most likely be closed. Federal public waters should be closed because the forecasted run of Chinook salmon is expected to fall short of established escapement goals in the Kuskokwim River drainage. A closure is justified considering the requirements of ANILCA Section 815(3). If the Yukon Delta Refuge Manager, in consultation with other fishery managers, determines that there is a harvestable surplus, it is likely that any harvest would exceed the harvestable surplus because of the large number of subsistence users. There is a need to limit the number of subsistence users eligible to harvest Chinook salmon. Their eligibility to harvest Chinook salmon in the area was reviewed by applying the three criteria that are described in Section 804 of ANILCA: (1) customary and direct dependence upon the populations as the mainstay of livelihood, (2) local residency, and (3) the availability of alternative subsistence resources. The results indicate that residents of only the Kuskokwim River drainage and the villages of Chefornek, Kipnuk, Kongiganek, Kwigillingok should be eligible to harvest Chinook salmon from the Refuge waters of the Kuskokwim River drainage. The area includes 32 villages. Presented from south to north, the villages are

the following: Chefornak, Kipnuk, Kwigillingok, Kongiganek, Tuntutuliak, Eek, Napakiak, Napaskiak, Kasigluk, Nunapitchuk, Atmauthluak, Bethel, Oscarville, Kwethluk, Akiachak, Akiak, Tuluksak, Lower Kalskag, Kalskag, Aniak, Chuathbaluk, Crooked Creek, Red Devil, Sleetmute, Stoney River, Lime Village, Takotna, Nikolai, and McGrath.

APPENDIX A

Existing Federal Regulations

Kuskokwim Area—Fish

§ ___100.27(e)(4)

(i) *Unless otherwise restricted in this section, you may take fish in the Kuskokwim Area at any time without a subsistence fishing permit.*

(ii) *For the Kuskokwim area, Federal subsistence fishing schedules, openings, closings, and fishing methods are the same as those issued for the subsistence taking of fish under Alaska Statutes (AS 16.05.060), unless superseded by a Federal Special Action.*

(iii) *In District 1, Kuskokuak Slough, from June 1 through July 31 only, you may not take salmon for 16 hours before and during each State open commercial salmon fishing period in the district.*

...

(v) *In District 2, and anywhere in tributaries that flow into the Kuskokwim River within that district, from June 1 through September 8 you may not take salmon by net gear or fish wheel for 16 hours before or during, and for 6 hours after each open commercial salmon fishing period in the district. You may subsistence fish for salmon with rod and reel 24 hours per day, 7 days per week, unless rod and reel are specifically restricted by paragraph (e)(4) of this section.*

...

(vii) *You may not take subsistence fish by nets in the Kanektok River upstream of ADF&G regulatory markers placed near the mouth 16 hours before or during, and for 6 hours after each State open commercial salmon fishing period.*

(ix) *You may only take salmon by gillnet, beach seine, fish wheel, or rod and reel subject to the restrictions set out in this section, except that you may also take salmon by spear in the Kanektok, and Arolik River drainages, and in the drainage of Goodnews Bay.*

(x) *You may not use an aggregate length of set gillnets or drift gillnets in excess of 50 fathoms for taking salmon.*

(xi) *You may take fish other than salmon by set gillnet, drift gillnet, beach seine, fish wheel,*

pot, long line, fyke net, dip net, jigging gear, spear, lead, handline, or rod and reel.

(xii) You must attach to the bank each subsistence gillnet operated in tributaries of the Kuskokwim River and fish it substantially perpendicular to the bank and in a substantially straight line.

(xiii) Within a tributary to the Kuskokwim River in that portion of the Kuskokwim River drainage from the north end of Eek Island upstream to the mouth of the Kolmakoff River, you may not set or operate any part of a set gillnet within 150 feet of any part of another set gillnet.

(xiv) The maximum depth of gillnets is as follows:

(A) Gillnets with 6-inch or smaller stretched-mesh may not be more than 45 meshes in depth;

(B) Gillnets with greater than 6-inch stretched-mesh may not be more than 35 meshes in depth.

(xv) You may not use subsistence set and drift gillnets exceeding 15 fathoms in length in Whitefish Lake in the Ophir Creek drainage. You may not operate more than one subsistence set or drift gillnet at a time in Whitefish Lake in the Ophir Creek drainage. You must check the net at least once every 24 hours.

APPENDIX B

Table 1. The number of people living at the 40 villages in the customary and traditional use determination for Chinook salmon in the Kuskokwim River drainage, 1960-2010, based on U.S. Bureau of the Census estimates.

U.S. CENSUS POPULATION							
Village	1960	1970	1980	1990	2000	2010	2010 number of households
South Kuskokwim Bay and Coast							
Platinum	43	55	55	64	41	61	19
Goodnews Bay	154		168	241	230	243	76
Quinhagak	228	340	412	501	555	669	165
Newtok	129	114	131	207	321	354	70
Tununak	183	274	298	316	325	327	84
Toksook Bay		257	333	420	532	590	125
Nightmute	237	127	119	153	208	280	59
Mekoryuk	242	249	160	177	210	191	70
Chefornak	133	146	230	320	394	418	92
Kipnuk	221	325	371	470	644	639	153
Kwigillingok	344	148	354	278	338	321	82
Kongiganek		190	239	294	359	439	94
Subtotal	1,914	2,225	2,870	3,441	4,157	4,532	1,089
Lower Kuskokwim River Drainage							
Tuntutuliak	144	158	216	300	370	408	96
Eek	200	186	228	254	280	296	91
Napakiak	190		262	318	353	354	96
Napaskiak	154	259	244	328	390	405	94
Oscarville	51	41	56	57	61	70	15
Kasigluk	244		342	425	543	569	113
Nunapitchuk	327	526	299	378	466	496	124
Atmauthluak			219	258	294	277	63
Bethel	1,258	2,416	3,576	4,674	5,471	6,080	1,896
Kwethluk	325	408	454	558	713	721	192
Akiachak	229	312	438	481	585	627	183
Akiak	187	171	198	285	309	346	90
Tuluksak	137	195	236	358	428	373	92
Subtotal	3,446	4,672	6,768	8,674	10,263	11,022	3,145
Central Kuskokwim River Drainage							
Lower Kalskag	122	183	246	291	267	282	75
Kalskag	147	122	129	172	230	210	60
Aniak	308	205	341	540	572	501	166
Chuathbaluk		94	105	97	119	118	36
Subtotal	577	604	821	1,100	1,188	1,111	337
Upper Kuskokwim River Drainage							
Napaimute							
Crooked Creek	92	59	108	106	137	105	38
Georgetown							
Red Devil	32	25	48	42	46	29	11
Sleetmute	152	81	39	53	48	23	12
Stony River	122	109	107	106	100	86	36
Lime Village	40		48	38	50	52	22
Subtotal	438	274	350	345	381	295	119
Headwaters							
Takotna	75	74	62	51	61	54	20
McGrath	241	279	355	528	401	346	147
Telida							
Nikolai	85	112	91	109	100	94	37
Subtotal	401	465	508	688	562	494	204
TOTAL	6,776	8,240	11,317	14,248	16,551	17,454	4,894

Black cell=no information available.
Source: ADCCED 2014.

Table 2. Kuskokwim River Chinook salmon estimated total run, escapement and harvest, 1976-2013.

Year	Estimated		Harvest				Total
	Total Run	Escapement	Subsistence	Commercial	Sport	Test Fish	
1976	233,967	143,420	58,606	30,735		1,206	90,547
1977	295,559	201,852	56,580	35,830	33	1,264	93,707
1978	264,775	180,853	36,720	45,641	116	1,445	83,922
1979	253,990	157,688	56,283	38,966	74	979	96,302
1980	300,573	203,605	59,892	35,881	162	1,033	96,968
1981	389,791	279,392	61,329	47,663	189	1,218	110,399
1982	187,354	80,353	58,018	48,234	207	542	107,001
1983	166,333	84,188	47,412	33,174	420	1,139	82,145
1984	188,238	99,062	56,930	31,742	273	231	89,176
1985	176,292	94,365	43,874	37,889	85	79	81,927
1986	129,168	58,556	51,019	19,414	49	130	70,612
1987	193,465	89,222	67,325	36,179	355	384	104,243
1988	207,818	80,055	70,943	55,716	528	576	127,763
1989	241,857	115,704	81,175	43,217	1,218	543	126,153
1990	264,802	100,614	109,778	53,504	394	512	164,188
1991	218,705	105,589	74,820	37,778	401	117	113,116
1992	284,840	153,573	82,648	46,872	367	1,380	131,267
1993	270,295	169,816	87,674	9,735	587	2,483	100,479
1994	365,246	242,616	103,343	16,211	1,139	1,937	122,630
1995	360,513	225,595	102,110	30,846	541	1,421	134,918
1996	302,605	197,092	96,415	7,419	1,432	247	105,513
1997	303,190	211,247	79,382	10,441	1,788	332	91,943
1998	213,879	113,627	81,219	17,359	1,464	210	100,252
1999	189,939	112,082	72,775	4,705	279	98	77,857
2000	136,676	65,180	70,883	444	105	64	71,496
2001	223,707	145,232	78,009	90	290	86	78,475
2002	246,297	164,635	80,983	72	319	288	81,662
2003	248,883	180,687	67,228	158	401	409	68,196
2004	388,136	287,178	97,110	2,300	857	691	100,958
2005	366,608	275,598	85,097	4,784	572	557	91,010
2006	307,671	214,004	90,094	2,777	444	352	93,667
2007	273,044	174,943	96,139	179	1,478	305	98,101
2008	237,070	128,978	98,099	8,865	708	420	108,092
2009	204,741	118,478	78,225	6,664	904	470	86,263
2010	118,504	49,073	66,053	2,732	354	292	69,431
2011	132,651	72,097	58,836	748	633	337	60,554
2012 ¹	100,818	76,000	24,000	400	0	418	24,818
2013 ²	94,680	47,500	46,500	419	0	261	47,180
Historic Average	239,018	144,730	71,935	21,205	518	644	94,288
2004-2013 (10yr)	222,392	144,385	74,015	2,987	595	410	78,007
2009-2013 (5yr)	130,279	72,630	54,723	2,193	378	356	57,649

¹ Schaberg et al. *in prep*

² Elison 2014

Table 3. The estimated number of Chinook salmon harvested for subsistence by residents of the villages that participate in the yearly postseason harvest survey, 2002-2012.

YEARLY POSTSEASON HOUSEHOLD SURVEY													
CHINOOK SALMON HARVEST													
Village	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	5-year average	10-year average
South Kuskokwim Bay and Coast													
Platinum	154	45	122	74	45	66	42	61	14	62	24	49	69
Goodnews Bay	723	807	863	869	713	647	1,012	585	480	834	389	712	753
Quinhagak	2,649	2,563	4,563	3,505	5,163	4,686	3,923	2,976	2,692	2,588	2,396	3,373	3,531
Kongiganek	1,349	2,003	2,663	1,536	1,729	1,984	2,086	1,148	1,470	1,208	571	1,579	1,718
Subtotal	4,875	5,418	8,211	5,984	7,650	7,384	7,063	4,770	4,656	4,692	3,380	5,713	6,070
Lower Kuskokwim River drainage													
Tuntutuliak	3,907	2,657	3,912	4,545	4,469	4,614	4,341	3,067	3,205	3,032	1,123	3,652	3,775
Eek	2,514	2,075	2,954	3,133	2,700	2,635	2,877	1,812	1,761	1,378	1,004	2,093	2,384
Kasigluk	4,470	4,212	7,859	4,488	4,304	5,350	2,928	2,341	3,020	2,823	552	3,292	4,180
Nunapitchuk	4,503	3,179	4,921	4,103	4,121	4,661	4,296	3,320	2,548	3,559	845	3,677	3,921
Atmauthluak	1,479	547	2,153	1,927	1,422	1,890	1,737	1,581	1,091	1,236	234	1,507	1,506
Napakiak	2,702	2,438	2,839	3,060	5,125	3,245	2,165	2,335	1,640	1,963	457	2,270	2,751
Napaskiak	3,922	3,390	4,058	4,485	5,877	6,392	4,425	5,170	4,313	3,360	1,108	4,732	4,539
Oscarville	1,115	1,153	1,325	1,069	1,052	1,360	1,351	754	618	694	51	955	1,049
Bethel	22,892	24,584	29,443	28,293	27,805	30,422	35,205	26,302	24,973	25,093	7,321	28,399	27,501
Kwethluk	6,880	4,206	7,157	6,089	7,258	6,466	8,209	6,409	4,445	2,467	1,709	5,599	5,959
Akiachak	6,946	2,493	7,131	5,411	5,561	7,621	9,509	7,078	4,470	3,852	2,862	6,506	6,007
Akiak	3,390	3,905	3,775	3,860	4,423	4,297	3,784	3,247	3,625	2,455	856	3,482	3,676
Tuluksak	2,860	3,286	3,766	2,655	2,372	3,886	3,374	3,212	2,110	1,230	651	2,762	2,875
Subtotal	67,580	58,125	81,293	73,118	76,488	82,839	84,201	66,628	57,819	53,142	18,773	68,926	70,123
Central Kuskokwim River drainage													
Lower Kalskag	1,535	1,556	1,991	1,417	3,494	1,937	2,442	2,525	1,030	1,260	459	1,839	1,919
Kalskag	1,545	1,328	2,498	2,533	1,569	1,383	2,368	1,696	1,500	1,772	562	1,744	1,819
Aniak	4,576	1,837	3,022	1,977	2,412	3,417	3,252	2,062	2,212	2,214	993	2,631	2,698
Chuathbaluk	505	405	1,460	913	887	1,007	772	877	551	409	103	723	779
Subtotal	8,161	5,126	8,971	6,840	8,362	7,744	8,834	7,160	5,293	5,655	2,117	6,937	7,215
Upper Kuskokwim River drainage													
Crooked Creek	859	582	946	948	736	734	573	608	240	402	124	511	663
Red Devil	293	31	156	181	232	301	177	258	33	186	225	191	185
Sleetmute	604	600	906	522	750	861	668	723	272	242	132	553	615
Stony River	415	118	688	325	278	561	699	704	189	134	212	457	411
Lime Village	206	34	69	176	125	120	57	100	81	120	29	96	109
Subtotal	2,377	1,365	2,765	2,152	2,121	2,577	2,174	2,393	815	1,084	722	1,809	1,982
Headwaters													
McGrath	970	395	587	882	689	495	619	593	257	829	68	559	632
Takotna	10	0	16	9	0	12	4	11	0	0	0	5	6
Nikolai	535	120	493	553	696	504	184	298	402	450	276	368	423
Subtotal	1,515	515	1,096	1,444	1,385	1,011	807	902	659	1,279	344	932	1,061
TOTAL	84,508	70,549	102,336	89,538	96,006	101,554	103,080	81,853	69,242	65,852	25,336	84,316	86,452

^a 5 and 10 year averages do not include 2012.

Source: Sheldon et al. *in prep.*

Table 4. The estimated harvest and use of Chinook salmon for subsistence by residents of villages who participated in household harvest surveys of all wild resources.

HOUSEHOLD HARVEST SURVEYS											
CHINOOK SALMON HARVEST											
Community (from south to north)	Study year	Percentage of households:					Chinook salmon harvest				
		Using Chinook salmon	Attempting to harvest Chinook salmon	Harvesting Chinook salmon	Giving Chinook salmon	Receiving Chinook salmon	Estimated Harvest	Lower Estimate	Higher Estimate	Per Person	95% confidence interval
							(fish)	(fish)	(fish)	(lb)	(+/- lb)
Quinhagak	1982			83%			4,565	1,693	7,437	138	85
Newtok	2011	4%		31%			144	133	165		
Tunuank	2011	65%		33%			51	29	73		
Tununak	1986	100%	58%	58%	46%	55%	411	233	589	23	10
Toksook Bay	2011	48%		49%			365	332	398		
Nightmute	2011	100%		40%			98	78	125		
Mekoryuk	2011	41%		0%			0	0	0		
Chefornak	2011	27%		16%			161	134	238		
Kipnuk	2011	28%		18%			479	179	937		
Napakiak	2011	77%	59%	59%	30%	36%	2,552	2,546	2,559	76	16
Napaskiak	2011	91%	70%	70%	39%	45%	4,227	4,219	4,236	83	16
Oscarville	2010	100%	75%	75%	42%	25%	1,097	810	1,383	164	43
Nunapitchuk	1983			65%			4,262	1,633	6,891	140	85
Kwethluk	2010	95%	66%	66%	43%	51%	5,459	4,394	6,523	72	14
Kwethluk	1986		70%	70%			5,824			193	0
Akiachak	1998	96%	88%	88%	51%	33%	12,131	10,680	13,581	394	47
Akiak	2010	86%	63%	57%	44%	37%	5,229	4,150	6,308	128	27
Tuluksak	2010	94%	76%	76%	38%	32%	3,798	3,195	4,401	79	13
Tuluksak	1983						1,671	1,671	1,671	62	0
Lower Kalskag	2009	86%	86%	49%	25%	49%	2,034	1,708	2,390	64	12
Kalskag	2009	94%	94%	75%	46%	46%	2,639	2,223	3,055	123	20
Aniak	2009	79%	79%	61%	30%	39%	3,576	3,163	3,990	67	8
Chuathbaluk	2009	90%	90%	60%	23%	47%	875	729	1,163	68	22
Chuathbaluk	1983	27%					1,503			131	0
Crooked Creek	2009	82%	82%	61%	30%	30%	841	694	994	69	12
Red Devil	2009	73%	73%	45%	18%	45%	148	126	202	44	16
Sleetmute	2009	88%	88%	69%	41%	38%	1,041	900	1,299	109	27
Sleetmute	1983						180			20	0
Stony River	2009	58%	58%	50%	33%	25%	982	589	1,866	147	132
Lime Village	2007	86%	86%	71%	57%	57%	341	217	510	142	71
Takotna	2011	36%	14%	7%	0%	36%	5	4	5	1	1
McGrath	2011	71%	35%	31%	20%	54%	1,157	1,155	1,159	31	7
McGrath	1984						830			21	0
Nikolai	2011	73%	65%	42%	35%	58%	1,143	1,131	1,155	92	37
Nikolai	2002	81%	59%	59%	48%	48%	751	563	939	92	23
Nikolai	1984		79%				795			103	0

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Source: ADF&G 2014a.

Table 5. The estimated harvest of wild resources in lbs edible weight per person by residents of villages that have participated in household harvest surveys.

Village (from south to north)	Per person harvest	95% Confidence limit (+/-)	Percentage of total harvest
	Pounds		
Quinhagak 1982			
Salmon	342	78%	45%
Nonsalmon fish	150	51%	20%
Large land mammals	103	117%	13%
Small land mammals	14	107%	2%
Marine mammals	124	68%	16%
Birds and eggs	29	65%	4%
Marine invertebrates	0		0%
Berries and plants	4	115%	1%
Total	766	47%	100%
Tununak 1986			
Salmon	114	23%	10%
Nonsalmon fish	663	19%	61%
Large land mammals	19	47%	2%
Small land mammals	2	42%	0%
Marine mammals	220	25%	20%
Birds and eggs	32	19%	3%
Marine invertebrates	5	21%	0%
Berries and plants	38	20%	3%
Total	1,093	15%	100%
Napakiak 2011			
Salmon	232	30%	47%
Nonsalmon fish	151	22%	31%
Large land mammals	50	27%	10%
Small land mammals	4	44%	1%
Marine mammals	9	62%	2%
Birds and eggs	25	21%	5%
Marine invertebrates	<1	122%	0%
Berries and plants	19	17%	<1%
Total	490	21%	100%

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Table 5. *Continued from previous page.*

Village (from south to north)	Per person harvest	95% Confidence limit (+/-)	Percentage of total harvest
	Pounds		
Napaskiak 2011			
Salmon	175	17%	43%
Nonsalmon fish	105	52%	26%
Large land mammals	61	23%	15%
Small land mammals	1	75%	<1%
Marine mammals	29	47%	7%
Birds and eggs	24	20%	6%
Marine invertebrates	0		0%
Berries and plants	16	19%	4%
Total	411	21%	100%
Oscarville 2010			
Salmon	256	22%	49%
Nonsalmon fish	169	36%	33%
Large land mammals	42	28%	8%
Small land mammals	0	0%	0%
Marine mammals	14	45%	3%
Birds and eggs	18	24%	3%
Marine invertebrates	0		0%
Berries and plants	21	18%	4%
Total	520	21%	100%
Nunapitchuk 1983			
Salmon	288	58%	36%
Nonsalmon fish	365	37%	46%
Large land mammals	21	61%	3%
Small land mammals	30	14%	4%
Marine mammals	20	78%	2%
Birds and eggs	34	26%	4%
Marine invertebrates	0		0%
Berries and plants	44	15%	5%
Total	802	31%	100%
Kwethluk 2010			
Salmon	170	24%	47%
Nonsalmon fish	84	38%	23%
Large land mammals	48	18%	13%
Small land mammals	8	26%	2%
Marine mammals	25	53%	7%
Birds and eggs	13	21%	4%
Marine invertebrates	<1	109%	<1%
Berries and plants	16	29%	4%
Total	364	17%	100%

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Table 5. Continued from previous page.

Village (from south to north)	Per person harvest	95% Confidence limit (+/-)	Percentage of total harvest
	Pounds		
Kwethluk 1986			
Salmon	446		53%
Nonsalmon fish	269		32%
Large land mammals	51		6%
Small land mammals	17		2%
Marine mammals	8		1%
Birds and eggs	21		3%
Marine invertebrates	0		0%
Berries and plants	26		3%
Total	838		100%
Akiachak 1998			
Salmon	649	12%	49%
Nonsalmon fish	248	12%	19%
Large land mammals	245	10%	18%
Small land mammals	26	16%	2%
Marine mammals	31	47%	2%
Birds and eggs	69	11%	5%
Marine invertebrates	0		0%
Berries and plants	61	12%	5%
Total	1,329	8%	100%
Akiak 2010			
Salmon	292	28%	48%
Nonsalmon fish	209	55%	34%
Large land mammals	57	17%	9%
Small land mammals	10	20%	2%
Marine mammals	6	56%	1%
Birds and eggs	21	18%	3%
Marine invertebrates	<1	80%	<1%
Berries and plants	21	55%	3%
Total	616	30%	100%
Tuluksak 2010			
Salmon	173	13%	48%
Nonsalmon fish	87	26%	24%
Large land mammals	34	21%	9%
Small land mammals	7	17%	2%
Marine mammals	6	66%	2%
Birds and eggs	21	20%	6%
Marine invertebrates	0		0%
Berries and plants	31	15%	9%
Total	359	14%	100%

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Table 5. *Continued from previous page.*

Village (from south to north)	Per person harvest	95% Confidence limit (+/-)	Percentage of total harvest
	Pounds		
Lower Kalskag 2009			
Salmon	99	16%	53%
Nonsalmon fish	32	17%	17%
Large land mammals	35	17%	19%
Small land mammals	3	33%	2%
Marine mammals	0		0%
Birds and eggs	5	14%	3%
Marine invertebrates	0		0%
Berries and plants	13	26%	7%
Total	187	12%	100%
Kalskag 2009			
Salmon	199	17%	58%
Nonsalmon fish	48	26%	14%
Large land mammals	46	28%	13%
Small land mammals	8	63%	2%
Marine mammals	0		0%
Birds and eggs	8	19%	2%
Marine invertebrates	0		0%
Berries and plants	36	47%	10%
Total	345	25%	100%
Aniak 2009			
Salmon	190	18%	65%
Nonsalmon fish	50	57%	17%
Large land mammals	41	14%	14%
Small land mammals	3	46%	1%
Marine mammals	2	959%	1%
Birds and eggs	2	14%	1%
Marine invertebrates	0		0%
Berries and plants	6	14%	2%
Total	294	27%	100%
Chuathbaluk 2009			
Salmon	159	26%	65%
Nonsalmon fish	20	36%	8%
Large land mammals	41	38%	17%
Small land mammals	8	65%	3%
Marine mammals	0		0%
Birds and eggs	3	36%	1%
Marine invertebrates	0		0%
Berries and plants	14	32%	6%
Total	245	27%	100%

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Table 5. *Continued from previous page.*

Village (from south to north)	Per person harvest	95% Confidence limit (+/-)	Percentage of total harvest
	Pounds		
Crooked Creek 2009			
Salmon	171	17%	70%
Nonsalmon fish	29	19%	12%
Large land mammals	25	37%	10%
Small land mammals	7	36%	3%
Marine mammals	0		0%
Birds and eggs	2	25%	1%
Marine invertebrates	<1	85%	<1%
Berries and plants	11	11%	4%
Total	245	15%	100%
Red Devil 2009			
Salmon	142	28%	46%
Nonsalmon fish	120	74%	39%
Large land mammals	21	54%	7%
Small land mammals	9	68%	3%
Marine mammals	0		0%
Birds and eggs	6	28%	2%
Marine invertebrates	0		0%
Berries and plants	8	26%	3%
Total	306	52%	100%
Sleetmute 2009			
Salmon	277	17%	68%
Nonsalmon fish	53	14%	13%
Large land mammals	44	20%	11%
Small land mammals	15	31%	4%
Marine mammals	0		0%
Birds and eggs	6	21%	1%
Marine invertebrates	0		0%
Berries and plants	11	12%	3%
Total	406	14%	100%
Stony River 2009			
Salmon	366	56%	69%
Nonsalmon fish	92	87%	17%
Large land mammals	20	70%	4%
Small land mammals	39	78%	7%
Marine mammals	0		0%
Birds and eggs	5	65%	1%
Marine invertebrates	0		0%
Berries and plants	10	41%	2%
Total	532	55%	100%

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Table 5. *Continued from previous page.*

Village (from south to north)	Per person harvest	95% Confidence limit (+/-)	Percentage of total harvest
	Pounds		
Lime Village 2007			
Salmon	556	57%	59%
Nonsalmon fish	50	68%	5%
Large land mammals	243	71%	26%
Small land mammals	17	51%	2%
Marine mammals	0		0%
Birds and eggs	22	60%	2%
Marine invertebrates	0		0%
Berries and plants	48	33%	5%
Total	935	54%	100%
Takotna 2011			
Salmon	1	127%	1%
Nonsalmon fish	8	52%	5%
Large land mammals	131	35%	82%
Small land mammals	5	103%	3%
Marine mammals	0		0%
Birds and eggs	11	67%	7%
Marine invertebrates	0		0%
Berries and plants	4	70%	3%
Total	160	33%	100%
Nikolai 2011			
Salmon	131	39%	26%
Nonsalmon fish	76	50%	15%
Large land mammals	247	27%	49%
Small land mammals	11	47%	2%
Marine mammals	0		0%
Birds and eggs	24	34%	5%
Marine invertebrates	<1	119%	<1%
Berries and plants	10	26%	2%
Total	499	27%	100%
Nikolai 2002			
Salmon	115	21%	29%
Nonsalmon fish	29	17%	7%
Large land mammals	231	20%	58%
Small land mammals	10	19%	2%
Marine mammals	0		0%
Birds and eggs	10	16%	2%
Marine invertebrates	<1	22%	<1%
Berries and plants	6	15%	1%
Total	401	Not available	100%

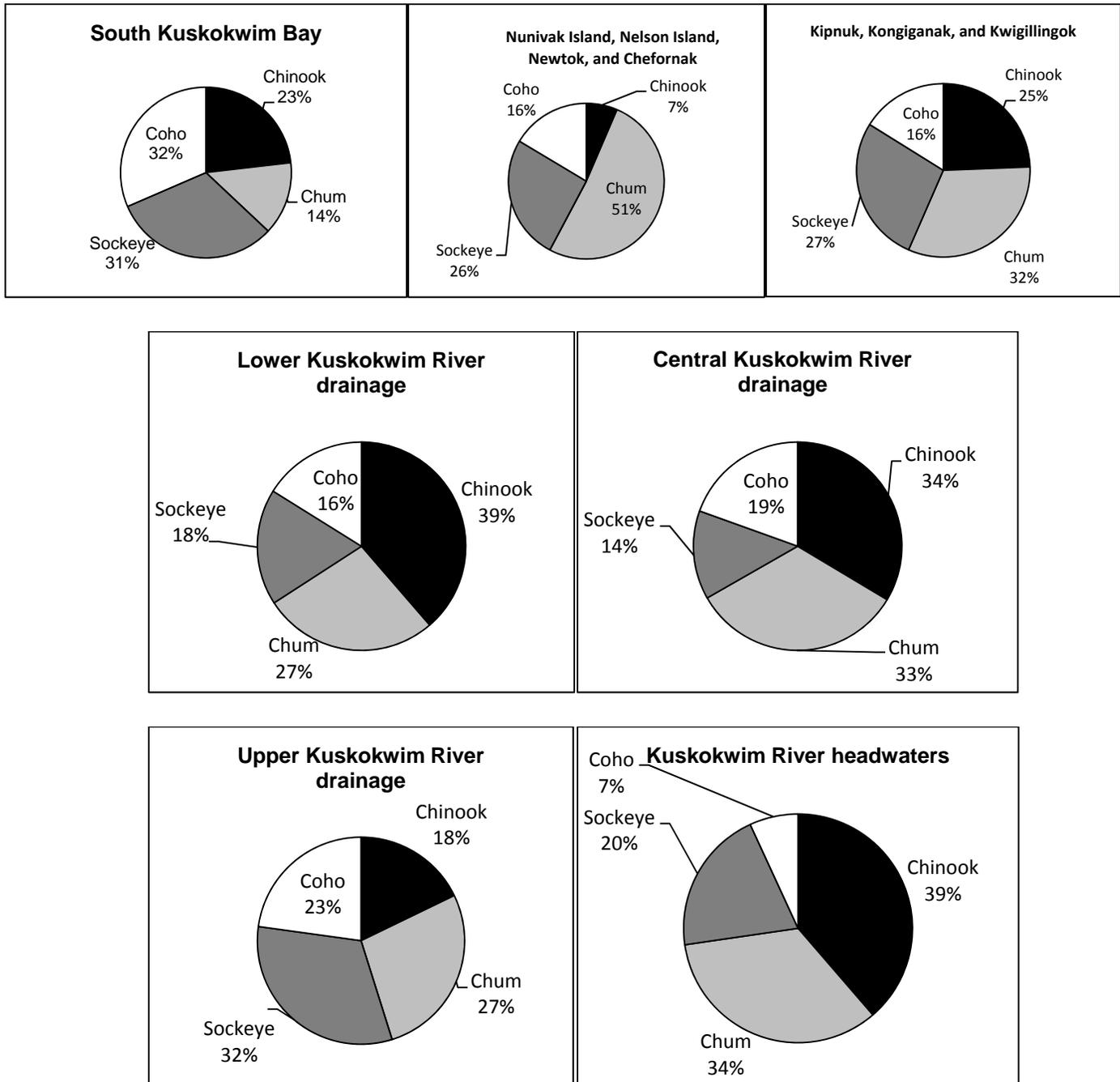
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Table 5. *Continued from previous page.*

Village (from south to north)	Per person harvest	95% Confidence limit (+/-)	Percentage of total harvest
	Pounds		
Nikolai 1984			
Salmon	379		48%
Nonsalmon fish	7		1%
Large land mammals	340		43%
Small land mammals	18		2%
Marine mammals	0		0%
Birds and eggs	18		2%
Marine invertebrates	0		0%
Berries and plants	24		3%
Total	787		100%
McGrath 2011			
Salmon	66	20	28%
Nonsalmon fish	26	15	11%
Large land mammals	115	11	49%
Small land mammals	6	34	3%
Marine mammals	0		0%
Birds and eggs	9	22	4%
Marine invertebrates	<1	97	<1
Berries and plants	14	13	6%
Total	236	10	100%
McGrath 1984			
Salmon	75		41%
Nonsalmon fish	19		11%
Large land mammals	76		42%
Small land mammals	1		1%
Marine mammals	0		0%
Birds and eggs	8		4%
Marine invertebrates	0		0%
Berries and plants	2		1%
Total	182		100%

Source: ADF&G 2014a.

Figure 1. The relative size of the Chinook, chum, sockeye, and coho salmon harvests, in fish, by residents of villages that participate in the yearly postseason household harvest survey, based on 10-year averages (2002 to 2011).^a



^a Villages situated on Nunivak Island, Nelson Island, Newtok, Chefnak, and Kipnuk generally have only one year of data, 2011 (shown in **Table 3**).

Source: Sheldon et al. *in prep*; Wolfe et al. 2012.

APPENDIX C

SUMMARY OF KUSKOKWIM RIVER CHINOOK SALMON HARVEST AND MANAGEMENT

Introduction

The Kuskokwim River drainage is the second largest in the state of Alaska and has provided Alaska Natives and other residents of the Kuskokwim watershed an abundance of fishery resources, including Chinook salmon, for subsistence purposes. For thousands of years, Alaska Native movements and settlements were based on these abundant fishery resources. In addition to subsistence uses, salmon have been commercially harvested in the Kuskokwim River drainage for more than 100 years. Federal management of this fishery began in the early 1900s. In 1960, the State of Alaska assumed management responsibility, and the Alaska Department of Fish and Game began regulating commercial and subsistence harvest.

Commercial Fishery

In the 1800s, a commercial salmon fishery began in the Kuskokwim River drainage, and most of the catch was sold locally for dog food (Brown 1983, Oswald 1990). In 1913, salmon commercially harvested in Kuskokwim Bay began to be exported (Pennoyer et al. 1965). During the 1950s, the river was closed or restricted to commercial fishing due to concerns of over-exploitation voiced by subsistence fishers (Pennoyer et al. 1965). During 1954, only Chinook salmon were allowed to be harvested commercially, possibly to reserve chum salmon for the subsistence fishery. The largest commercial harvests of Chinook salmon occurred in the late 1970s and early 1980s (**Appendix C Figure 1**). In 1985, commercial fishing was restricted to gill-net mesh sizes less than or equal to 6 inches. In 1987, the directed commercial fishery for Chinook salmon was eliminated and the sale of Chinook salmon that year was 14,000 Chinook salmon incidentally harvested during the June chum salmon commercial fishery (Brazil et al. 2013).

Subsistence Fishery

The subsistence fishery in the Kuskokwim River drainage was first surveyed in 1924. Between 1933 and 1936, Chinook salmon comprised between 1 and 5% of the subsistence harvest of salmon (Pennoyer et al. 1965). Since 1936, Chinook salmon harvest has increased and now surpasses the chum salmon harvest (**Appendix C Figure 2**).

The subsistence harvest of Chinook salmon peaked in 1990 (**Appendix C Figure 3**). Despite recent declines in the subsistence harvest of Chinook salmon, the Kuskokwim River still maintains the largest Chinook salmon subsistence fishery in the state of Alaska with an annual average subsistence harvest of 88,250 Chinook salmon between 2001 and 2010 (Brazil et al. 2013). Since 2000, the subsistence harvest of Chinook salmon has accounted for 91%–99% of all the Chinook salmon harvested in the Kuskokwim River (Elison et al. 2012). Currently, permits or harvest limits are not required for subsistence harvest of Chinook salmon in the Kuskokwim River drainage.

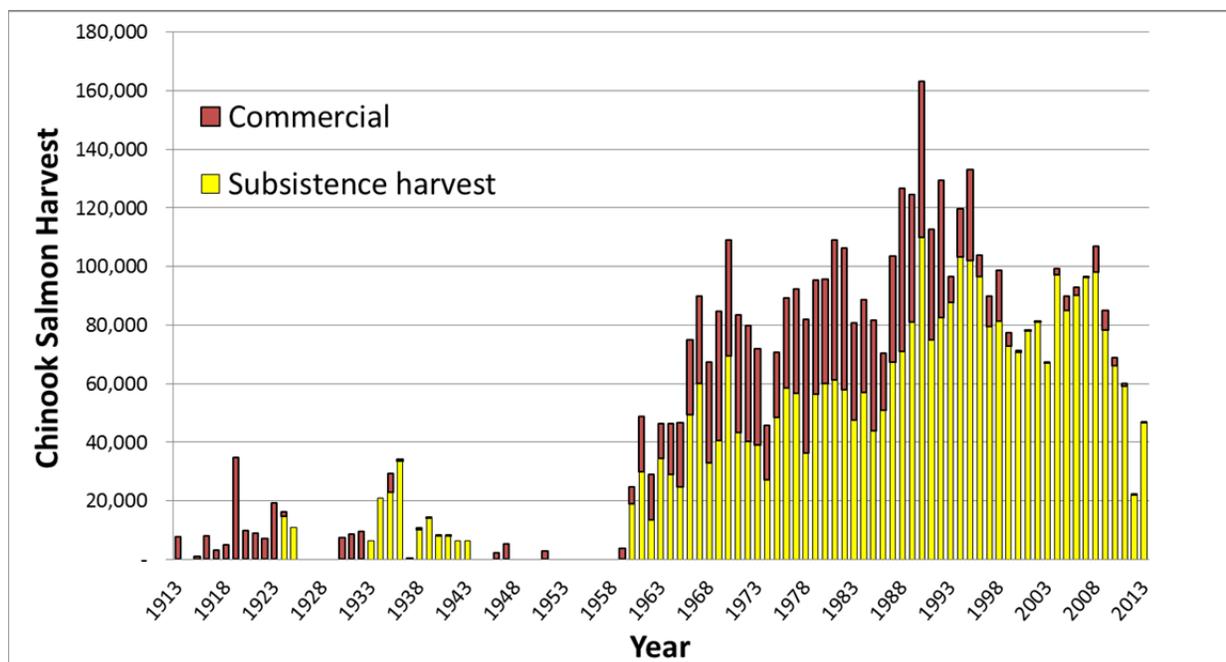


Figure 1. Commercial and subsistence Chinook salmon harvests from the Kuskokwim River from 1913 to 2013. Data prior to 1960 are incomplete.

Escapement Monitoring and In Season Management

Escapement Monitoring

Monitoring the distribution and estimating total escapement of salmon within the Kuskokwim River drainage is challenging due to the remoteness of escapement projects and the size of the drainage. To monitor escapement, aerial surveys have been flown in the Kwethluk, Kisaralik, Tuluksak, Salmon (Aniak), Kipchuk, Aniak, Holokuk, Oskawalik, Holitna, Cheeneetunuk, Gagaryah, Pitka, Bear, and Salmon (Pitka) rivers since the early 1960s. The Bethel test fishery has been operated above Bethel since 1984 and provides a long term data set on species composition and relative abundances that is comparable to data on run abundance at a small portion of weir escapement projects. The Kogrukuk River weir has been operated since 1969 on a tributary of the Holitna River and is the longest running weir within the Kuskokwim watershed. Additional escapement projects have been added since 1991 through 2000 and include; the Aniak River Sonar, Tuluksak, Kwethluk, George, Tatlawiksuk and Takotna River weirs.

Inseason Management

During times of low abundance management of the Chinook salmon subsistence fishery can be especially difficult. As the human population has increased within the Kuskokwim watershed, the demand for Chinook salmon has also grown. The majority of subsistence harvest of Kuskokwim River Chinook salmon occurs below escapement projects, therefore these projects do not serve as good inseason management tools, but are used to evaluate the run postseason. For inseason management and run

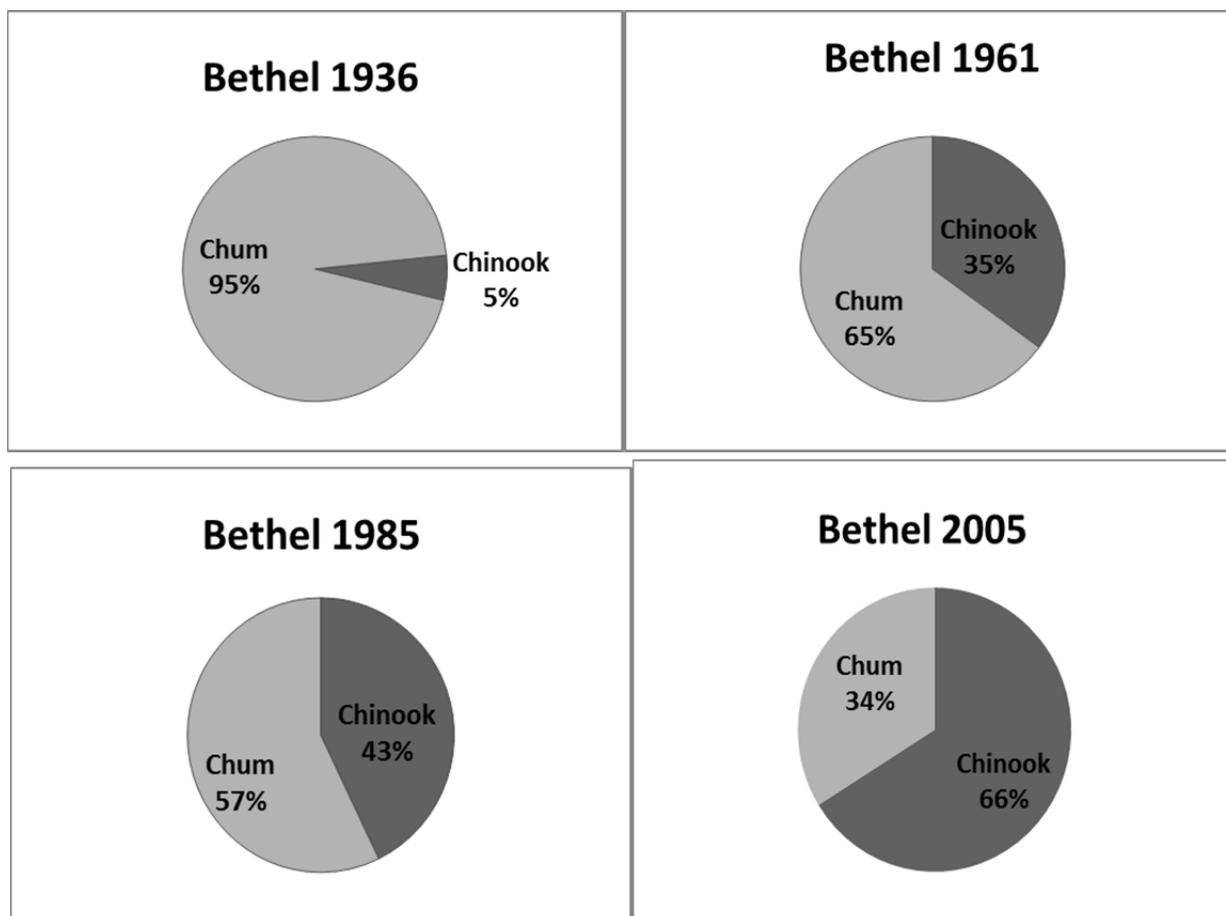


Figure 2. Changes in harvest preferences between Chinook and chum salmon at Bethel. Data from 1936 may have included other species with chum salmon. Post 1960 data from ADF&G estimates of subsistence harvest.

strength indicators, managers rely on the drift gill-net test fishery that is operated near Bethel, commercial catch statistics, and informal reports from subsistence and recreational anglers. Often 50% or more of the subsistence harvest occurs prior to 10%–15% of the run being monitored at the Bethel test fishery (**Appendix C Figure 4**). Based upon catch rates in the Bethel test fishery, Chinook salmon represents approximately 15% of the relative in river abundance of chum, Chinook, and sockeye between June 1 and July 1, when approximately 90% of the annual harvest of Chinook salmon occurs below the test fishery. Approximately 40% of the subsistence harvest of Chinook salmon occurs below the Bethel test fishery (Schaberg 2014, pers. comm.).

These monitoring projects increase knowledge of salmon abundance within some of the tributaries of the Kuskokwim River and have been used to set tributary escapement goals and manage the salmon fisheries. Data from escapement projects, harvest estimates in the subsistence and commercial fisheries, and mark and recapture data sets can be combined with available age information to reconstruct total runs by age and to estimate brood tables. Using these estimates of total run by age, a Bayesian state-space spawner-recruit analysis was conducted encompassing the years from 1976 through 2005. Based on these findings

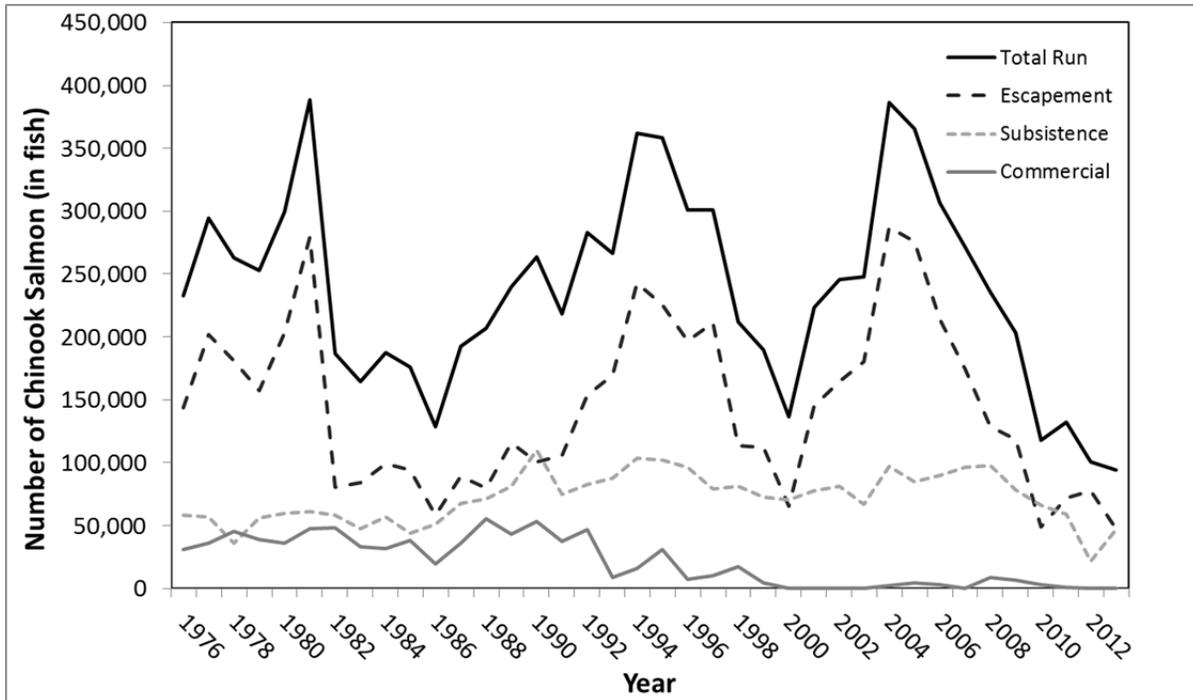


Figure 3. Estimates of Kuskokwim River escapements and commercial and subsistence harvests. Source: Schaberg et al. *in prep*; Elison 2014, pers. comm.

the Alaska Department of Fish and Game developed a drainage wide escapement goal of 65,000 to 120,000 (Elison et al. 2012, Hamazaki et al. 2012).

These monitoring projects increase knowledge of salmon abundance within some of the tributaries of Kuskokwim River and have been used to set tributary escapement goals and manage the salmon fisheries. Data from escapement projects, harvest estimates in the subsistence and commercial fisheries, and mark and recapture data sets can be combined with available age information to reconstruct total runs by age and to estimate brood tables. Using these estimates of total run by age, a Bayesian state-space spawner-recruit analysis was conducted encompassing the years from 1976 through 2005. Based on these findings the Alaska Department of Fish and Game developed a drainage wide escapement goal of 65,000 to 120,000 (Elison et al 2012, Hamazaki et al. 2012).

Since 2010, Chinook salmon returns to the Kuskokwim River have been some of the lowest on record. In 2012, severe restrictions were put in place to limit the subsistence harvest and conserve Chinook salmon. As a result of these restrictions, it is estimated that 22,527 Chinook salmon were harvested in 2012 for

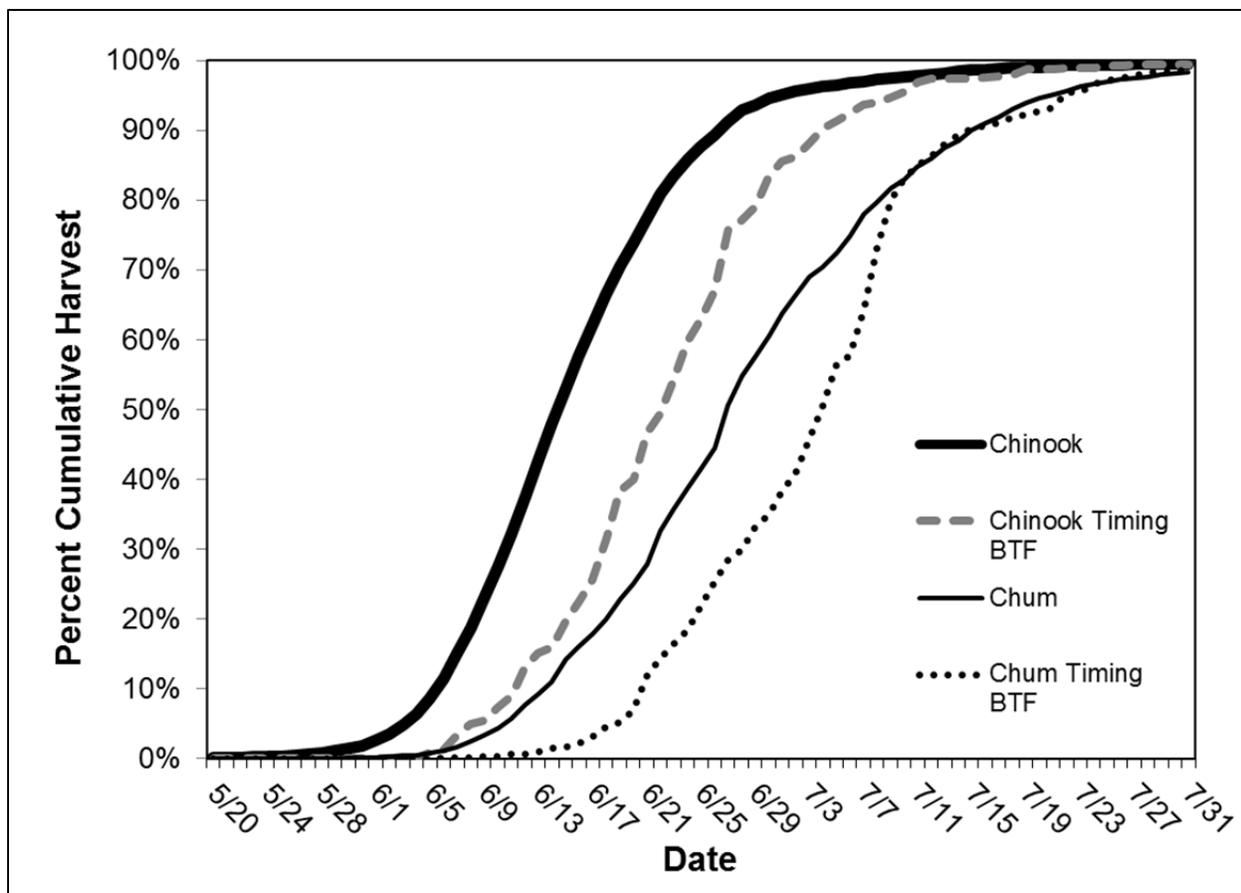


Figure 4. Chinook and chum run timing through the Bethel Test Fishery and harvest near and below Bethel 1989–1999 (ADF&G 2013).

subsistence purposes, which is approximately 25% of the harvest during normal years. The estimated escapement in 2012 was 76,000 Chinook salmon.

During 2013, conservative management actions were not imposed at the beginning of the season due to an optimistic preseason forecast predicting a return of Chinook salmon adequate in size to satisfy both the newly established basin wide escapement goal of 65,000–120,000 fish and subsistence harvest needs of approximately 80,000 fish. In addition, weekly fishing reports from subsistence users indicated that the run appeared to be average and no concerns were noted. However, as the season progressed returns of Chinook salmon abruptly stopped and the lowest escapement on record was observed. The preliminary 2013 escapement is estimated to be 47,500 (Elison 2014, pers. comm.).

Other Considerations

Exploitation Rates

Hankin and Healy (1986) suggest that Maximum Sustained Yield (MSY) exploitation rates are dependent upon rates of ocean survival and age at maturity. Northern stocks of Chinook salmon, like the late

maturing Kuskokwim Chinook salmon stocks, have an estimated MSY harvest that is approximately one half of the harvest rate for early maturing Chinook salmon stocks more typically in more southern stocks.

From 1976 through 2007, exploitation (harvest) rates of Kuskokwim River Chinook salmon have ranged from 25% to 62% (Hamazaki et al. 2012). Restrictions on fishing time in 2012 reduced the Chinook salmon harvest to approximately 22,527 thereby reducing the harvest exploitation rate below 25% for the first time since 1976. In 2013, subsistence fishing went unrestricted and the exploitation rate of Chinook salmon was approximately 51%. The Hankin and Healey model suggested that higher exploitation rates lead to loss of older age classes and finally a population crash.

Productivity

Productivity (returns per-spawner) of Kuskokwim River Chinook salmon from 1976 through 2005 has averaged 2.04 fish (**Appendix C Figure 5**). During this time, only three Chinook salmon brood years had productivity levels greater than 2:1 returns-per-spawner and seven Chinook salmon brood years had productivity levels less than or equal to 1:1 returns-per-spawner (Schindler et al. 2013).

Quality of Escapement

The quality of escapement may be affected individually or by a combination of factors that influence the weight, length, age, and overall fecundity of fish within the population. Harvest pressure and selectivity can directly influence the quality of escapement. Recent scientific literature has focused on the growing concerns regarding size selective fishing and its effects on the genetic structure of a fish population. Several peer reviewed articles have strongly encouraged managers to address adverse effects of harvest selectivity on animal populations (Allendorf et al. 2008, Hard et al. 2008, Dunlop et al. 2009, and Enberg et al. 2009). Bromaghin et al. (2011) modeled harvests of Yukon River Chinook salmon and in nearly all fishing scenarios considered, the mean lengths declined by approximately one third in simulations using high productivity stocks and one fourth in low-productivity stocks.

Reports from subsistence users throughout the Kuskokwim watershed have cited a reduction of larger Chinook salmon from their harvests. In addition, fisheries biologists have also reported a declining trend in size and/or average age of Chinook salmon stocks in the Kuskokwim River drainage. These patterns have been observed in other Alaskan Chinook salmon populations or stocks (Bigler et al. 1996, Bromaghin et al. 2011, Hyer and Schleusner 2005). Gill-nets are known to be size-selective (Bromaghin 2005) and the use of large mesh nets may have contributed to the loss of the larger Chinook salmon within the Kuskokwim River.

Weight

A reduction in the average weight of commercially harvested Chinook salmon has been noted in the Kuskokwim River (**Appendix C Figure 6**). This may be an artifact of commercial fishing gill net mesh size restrictions put in place in 1985 leading to the selective harvest of smaller fish; however, since mesh

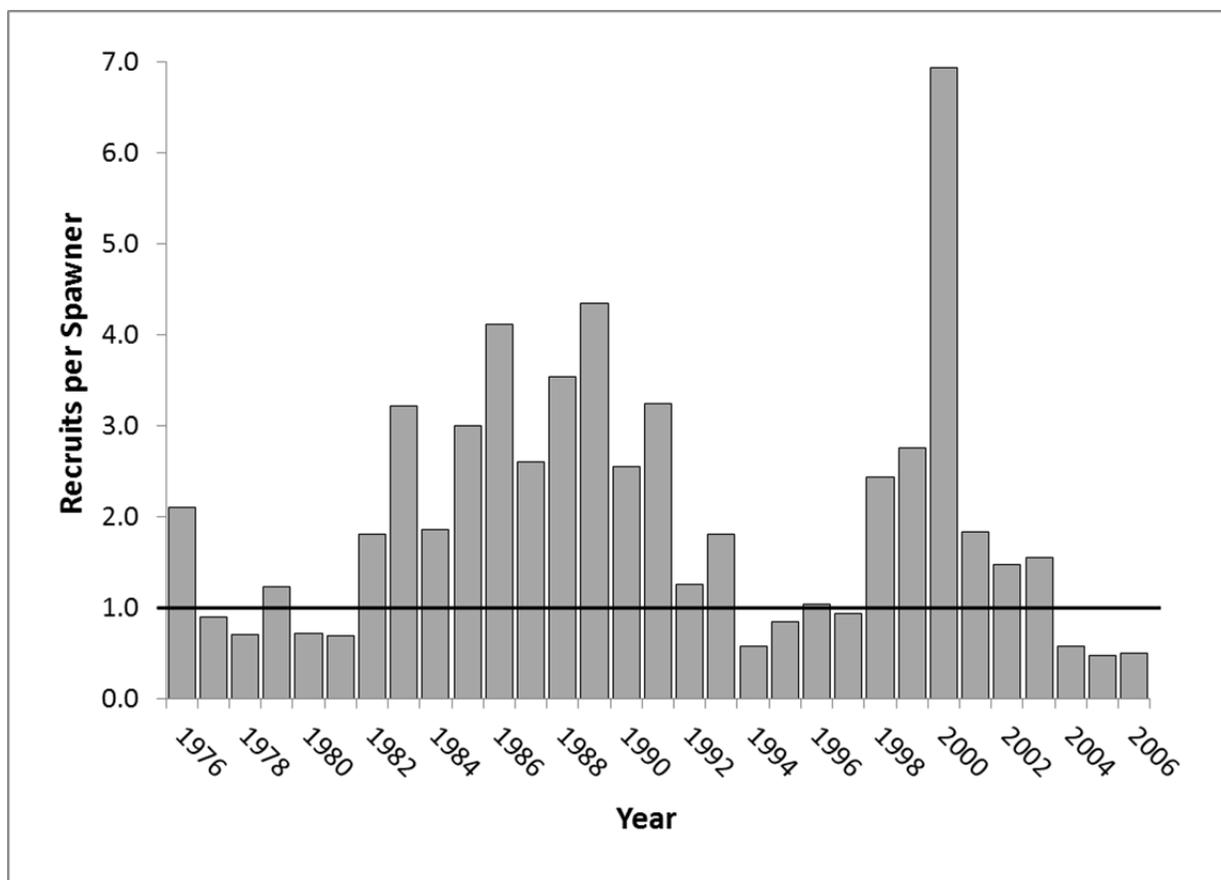


Figure 5. Chinook salmon brood-year productivity (returns per spawner, bars) 1976–2006. Productivity as measured as the sum of returns from a given brood year divided by the escapement that produced them. The horizontal line represents the productivity required for the population to replace itself.

restrictions were implemented the average weight of Chinook salmon harvested in the commercial fishery appears to be on a continued decline. There are many variables potentially influencing the average weights of Chinook salmon harvested in the commercial fishery.

Length

The average length of fish in the escapement has also decreased. Subsistence users have noted that large Chinook salmon in the 39–45 inch (1000 mm+) range, once common in their harvests, have become the exception. The longest running data set for escapements is the Kogrukluk River weir (1976–2013). Between 1976 and 2011 the length of female Chinook salmon in the Kogrukluk River has decreased by approximately 3 inches (80 mm; **Appendix C Figure 7**; US Fish and Wildlife Service, Kenai Field Office, unpublished data).

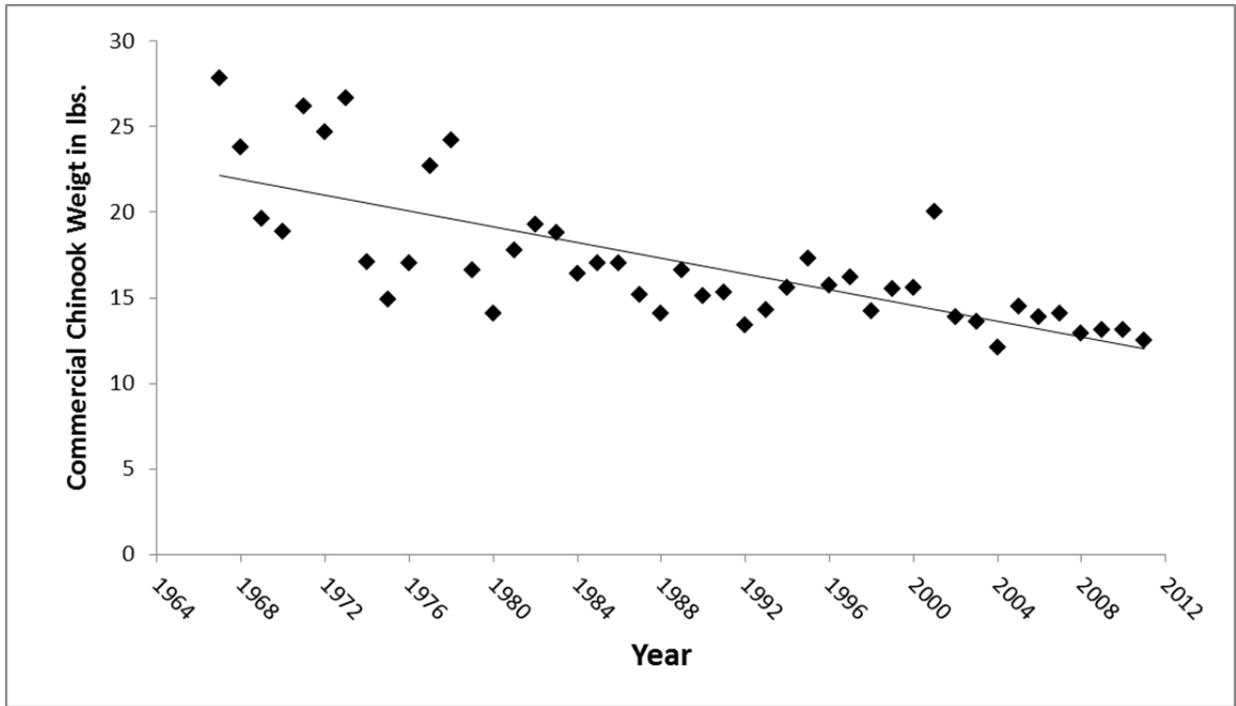


Figure 6. Average weight of commercially harvested Chinook salmon from the Kuskokwim River (Brazil et al. 2013).

Fecundity

Fish size and percent females are important proxies for quality of escapements as both can affect the quantity of eggs deposited on spawning grounds. Samples taken from Yukon River female Chinook salmon have shown that fecundity (number of eggs per female Chinook salmon) is directly correlated to fish size (Skaugstad and McCracken 1991, Jasper and Evenson 2006, Bromaghin et al. 2011). The average size of female Chinook salmon in the Kogrukluk River a tributary to the Kuskokwim River has decreased between 1976 and 2011 (**Appendix C Figure 7**). This reduction in size of female Chinook salmon is directly correlated to fecundity which has decreased by an estimated 16% in the Kogrukluk between 1976 and 2011 (**Appendix C Figure 8**). It is suspected that the Kogrukluk is representative of the larger Kuskokwim River drainage and therefore an overall reduction in female size has occurred throughout the Kuskokwim River drainage. Continued selective harvest pressure on larger older age fish may continue the downward trend in Chinook salmon in the Kuskokwim River drainage.

In addition to a reduction in size being observed in portions of the Kuskokwim River drainage, female Chinook salmon may also be experiencing disproportional harvest pressure. Approximately 41% of the subsistence harvest has been comprised of female Chinook salmon. By comparison, escapement monitoring projects have recorded an average of 32% female Chinook salmon (Molyneaux et al. 2004).

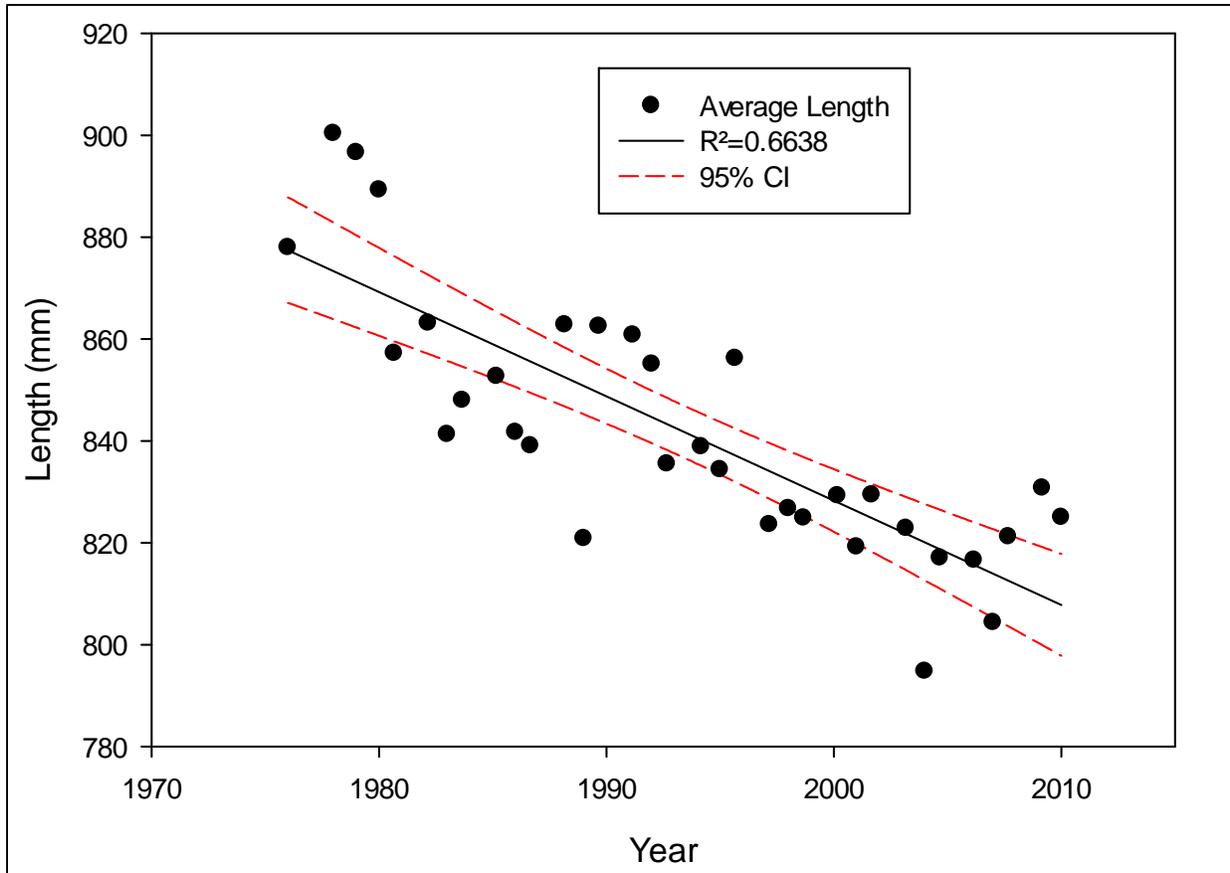


Figure 7. Decrease in weighted average size of female Chinook salmon passing the Kogrukluk River weir 1976-2011 (Source ADF&G 2014b; US Fish and Wildlife Service, Kenai Field Office, unpublished data).

National Wildlife Refuge Mandate

The preservation of wild stocks in their natural unenhanced state is the National Wildlife Refuges’ first priority. The Eek, Kwethluk, Kisaralik, Kasigluk, and Tuluksak rivers and a portion of the Aniak River are located on the Yukon Delta National Wildlife Refuge and all support spawning populations of Chinook salmon for which the Service is responsible. Fish passage projects (weirs) to monitor Chinook salmon escapements have been established on two of these rivers, the Kwethluk and the Tuluksak. Data from these projects provide a means of monitoring and maintaining these populations as stable and continuing natural populations to provide opportunity for continuance of subsistence uses. Chinook salmon returning to the Kwethluk River in 2014–2017 will be progeny from 2007–2013. Because of the low escapements during those parent years, estimates of returns using similar returns per-spawner from brood years 2005–2010 suggest that meeting the lower end of the escapement goal in each of the next three years for this system may be challenging. Managing the fishery to ensure escapements are met may require varying levels of subsistence fishing restrictions in the near term to meet Federal mandates and minimize the likelihood of irreversible or long-term adverse effects upon these Chinook salmon stocks.

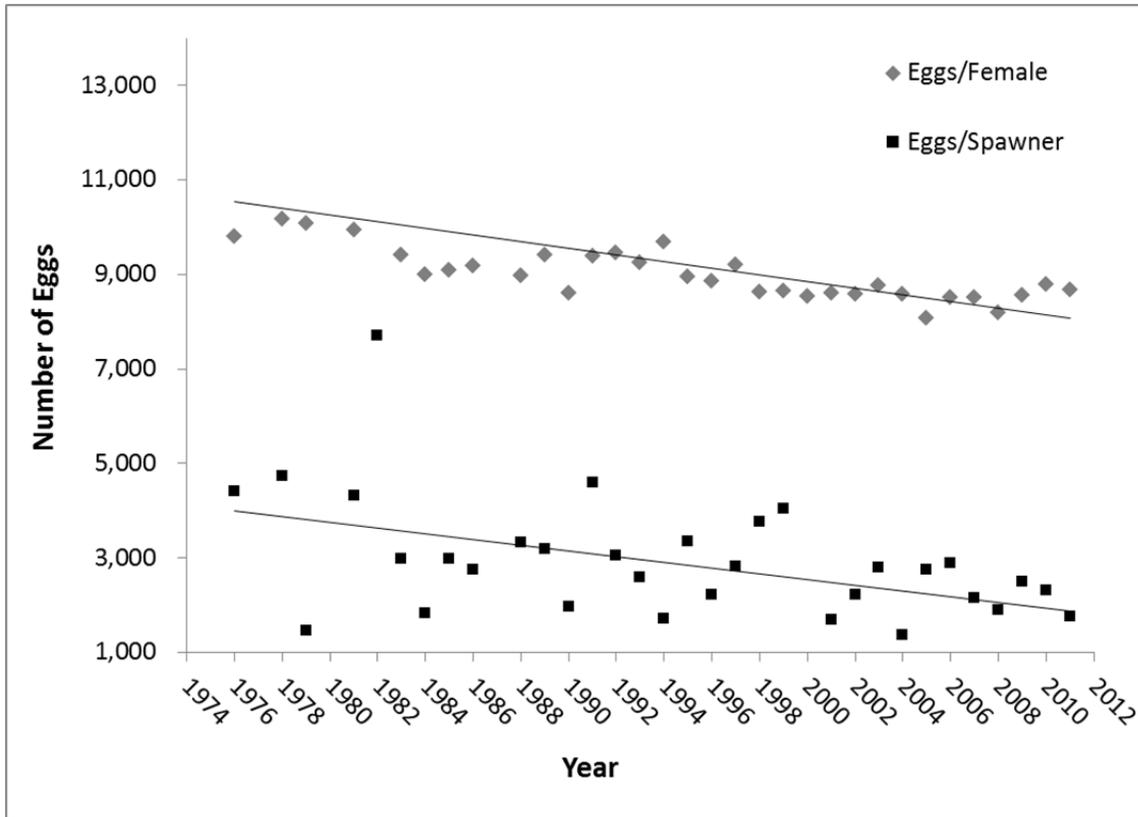


Figure 8. Estimated average eggs per spawning female and average eggs per spawning fish on the Kogruklu River. High fluctuations in numbers per spawner (male and female) are influenced by high numbers of returning age 1.2 males (US Fish and Wildlife Service, Kenai Field Office, unpublished data).

APPENDIX D

Sources of descriptions of the subsistence economy can be found in the literature cited at the end of the analysis and include: Fienup-Riordan 1983, 1984; Ikuta et al. 2013; Oswald 1959, 1990; Wolfe and Ellanna 1983; Wolfe and Spaeder 2009; and Wolfe et al. 1983. Below are descriptions of where people living in the Kuskokwim Area harvest, process, and preserve Chinook salmon.

1. Residents of South Kuskokwim Bay

Goodnews Bay, Quinhagak, and Platinum—Chinook salmon spawn locally in the Kanektok, Goodnews, and Arolik river drainages, arriving in May. Historically, people harvested Chinook salmon while living at summer fish camps located in the drainages. Currently, people harvest salmon closer to the villages and return to processing sites located nearby their homes. People moved from the historical village of Apokak when the bank eroded into Apokak Slough (around 1935). Apokak Slough is located just inside the Refuge boundary at the mouth of the Kuskokwim River. Some people chose to move to Eek while others moved to Quinhagak (LaVine et al. 2007).

2. Residents of Nelson Island, Newtok, and Cheformak (Qaluyaarmiut)

Newtok, Nightmute, Tununak, and Toksook Bay—Herring, other nonsalmon fishes, and marine mammals are harvested at high levels by Nelson Island people. Tununak and Toksook Bay are located near the best herring harvesting areas. Herring are generally abundant near the villages. Some residents of Newtok and Nightmute set up camps near to Tununak or Toksook Bay to harvest, process, and preserve their herring. In 1986, Tununak people participated in a house to house harvest survey. People reported harvesting nonsalmon fishes at the highest levels, 663 lbs edible weight per person (61% of their wild resource harvest) and 220 lbs per person of marine mammals (20% of the wild resource harvest). People reported harvesting 114 lbs per person of salmon (10% of the wild resource harvest) (**Appendix B Table 5**) (Fienup-Riordan 1983, Wolfe et al. 2012).

Cheformak—The people of Cheformak inhabit the flat coastal region between the mouth of the Kuskokwim River and Nelson Island at the juncture of the Keguk and Kinia rivers, 12 river miles from the Bering Sea. Early in the 1950s people moved from the village of Old Svarnak to the location of Cheformak near the new Bureau of Indian Affairs school. People at Cheformak began harvesting herring from areas near their village fairly recently (before 1984). Other nonsalmon fishes, marine mammals, and salmon are likely harvested at high levels when they are available (Fienup-Riordan 1983).

Historically, some families traveled to the Kuskokwim River to fish for salmon from June to August based at seasonal fish camps where they harvested, processed and preserved salmon. The trip took up to 4 days by boat. Outboard motors shortened travel time. Currently, a few Cheformak families still travel to the Kuskokwim River fish camps to harvest, process, and preserve salmon. A few people retain salmon from their commercial harvests in Bristol Bay. They harvest a mixed variety of salmon from near-shore waters of Etolin Strait and Cape Vancouver (Umkumiut to the cape). People catch coho salmon during August in the Kinia River that is adjacent to the village (Wolfe et al. 2012).

In 2011, people harvested an estimated 161 Chinook salmon that was about 31% of their harvest of salmon, in lbs edible weight. They harvested chum salmon at the highest level, about 34% of the salmon harvest, in lbs edible weight. Wolfe et al. (2012:7) reported that “salmon was commonly cut as flanks and strips and salted, dried, and smoked, or half-dried (fermented) and cooked, or frozen for later use. Some families salted heads. Some salmon used to be buried and aged underground (taken out before winter), but this was not common anymore.”

3. Residents of Nunivak Island

Mekoryuk—Most *Nunivavaarmiut* live at Mekoryuk on Nunivak Island. People at Mekoryuk do not rely on herring as much as the people of Nelson Island, probably because the herring are less predictable and harder to locate in harvestable numbers. Also, the arrival of herring coincided with walrus hunting season. People harvest large numbers of nonsalmon fishes and marine mammals. In 2011, during a house to house harvest survey, people reported harvesting only chum, coho, and pink salmon. At least one stream on Nunivak supports a sockeye run. People occasionally harvest Chinook salmon when they travel across Etolin Strait to Cape Vancouver to fish with gill nets (Drozda 2010, Pete 1984, Wolfe et al. 2012).

4. Residents of the Coast

Kwigillingok and Kongiganek—The people of Kwigillingok and Kongiganek inhabit the flat coastal region between the mouth of the Kuskokwim River and Nelson Island. Salmon *fishing has long been one* of the primary activities of the people living along this area of the coast (Stickney 1983). In the 1960s, some residents of Kwigillingok, in order to escape flooding, moved their houses and established the village of Kongiganek about 9 miles away. Historically people moved to seasonal fish camps on both sides of the Kuskokwim River mouth below Eek Island in order to harvest, process, and preserve salmon. Probably starting in the 1930s, people moved their fish camps to locations near to Napakiak and Napaskiak. By the 1980s, people generally did not move to fish camps in the lower Kuskokwim River area. Men generally go by boat to harvest salmon at the mouth of the Kuskokwim River and return to Kwigillingok or Kongiganek the same day. Salmon are processed in the village. Some residents have commercial fishing permits for the Kuskokwim Area and likely return home with some Chinook salmon retained from their commercial catches. People do not have access to other runs of Chinook salmon. Salmon is dried and smoked in June and July. August is generally rainy, and not favorable for drying. Chinook salmon is available through June. In 1983, the combined harvest of Chinook and chum salmon usually numbered in the several hundred per household (Stickney 1983).

Kipnuk— Kipnuk is situated on the Kuguklik River near the coast, about 60 miles from the mouth of the Kuskokwim River. Kipnuk’s wild food harvest includes herring, blackfish, halibut, needlefish, tomcod, whitefish, cisco, Pacific cod, and smelt. Additionally, in 2011, Kipnuk people harvested an estimated 3,147 salmon, and 25% was Chinook salmon, in lbs edible weight. Sockeye salmon were harvested at the highest level, 32% in lbs edible weight. Two thirds of Kipnuk’s salmon harvest was from the Kuskokwim river, and 95% of Kipnuk’s estimated Chinook salmon harvest of 479 fish was from the Kuskokwim River (**Appendix B Table 4**) (Wolfe et al. 2012)

Historically, some families traveled to the Kuskokwim River to fish for salmon from June to August based at seasonal fish camps where they harvested, processed and preserved salmon. Kipnuk people’s fish camps were generally located along the east side of the Kuskokwim River mouth at the north end of Kuskokwim Bay, across and south from Eek Island. Before outboard motors, the trip took up to 3 days. In recent years, a few Kipnuk families still travel to the Kuskokwim River fish camps to harvest, process, and preserve salmon. Other people harvest salmon from the local area and from the Kuskokwim River usually returning in a single day or after camping overnight, especially during Chinook salmon season; however, a few travel to Bethel by airplane to harvest from fish camps near Bethel. Wolfe et al. (2012:8) described that in Kipnuk “drying salmon was rare. Because of the high oil content of ocean salmon and the wet weather, key respondents reported that it was difficult to dry salmon taken locally. Some families traded for dried salmon from the Kuskokwim area, offering seal, halibut, and other products.” Salmon were half-dried and frozen, or frozen whole, and cooked. Some salmon were salted.

5. Residents of the Lower and Central Kuskokwim River Drainage

Tuntutuliak and Eek—Eek is located on the Eek River about 12 miles from the Kuskokwim River. In the 1930s, many people moved to the present site from inland locations that were flooding seasonally and to

attend the school. Currently, people maintain summer fish camps on Eek Island, near the entrance of Eenayarak River. Tuntutuliak is located on the north bank of Kinak River (also called the Tunt River). In about 1957, people moved from the Kinak settlement, situated at the mouth of the Kinak River where it enters the Kuskokwim River, and *Qukaqlircaraq* settlement, situated inland, when a school was built at the present site of Tuntutuliak. The site is not located in an area that was much used historically, and people must travel away from the village for many hunting and fishing activities. Many families continue to move seasonally to spring, summer, and fall camps (Ikuta et al. 2013, Ray et al. 2010).

Their earlier fish camps situated at the mouth of the Kinak River eroded out, and before 1950 most families harvested, processed and preserved salmon from seasonally-occupied fish camps situated directly across the Kuskokwim River from the Kinak River. Eventually, people observed fewer near shore fish. Between 1950 and 1965, most families abandoned these fish camps and moved seasonally to Fish Camp Island (*Kuiguuyuk*) in the Johnson River area, during a period that coincided with school vacation. People began to fish from Tuntutuliak when improvements in motors made it possible to reach the Kuskokwim River quickly. Currently, few people stay at summer fish camps, instead operating salmon processing and preservation stations nearby their homes in Tuntutuliak. People dry salmon roe, eat the organs, backbones and skin, and clean, braid, and dry the stomachs, esophaguses, and intestines. People make stinkheads or salt the heads. Chinook salmon is the most popular eating fish. People dry Chinook salmon when the weather is ideal in order to produce the best possible fish for the winter. “Drying fish in wet weather is more demanding, takes longer, and produces an inferior product, if it works at all.” Additionally, rainy weather can be rough and dangerous. “Better to let the weather make the windows” (Ikuta et al. 2013:39).

Napakiak, Napaskiak, and Oscarville—The site of Napaskiak was a seasonally-occupied camp. The semi-permanent winter village was a mile upriver, called “Oovingiyuk.” It was partially washed away when people moved the village to its present site (Oswalt 1959). People hunted, fished, and trapped in nearby waters of the Kuskokwim River and the lakes and tundra inland. People from “Eelchuk” located about a mile downriver also relocated to the present site of Napaskiak. More recently, people from nearby, now-abandoned settlements at Loamavik (near the present location of Bethel), “Painuk” (probably *Painguq*, along the lower Johnson River) and “Akuleruk,” moved to Napaskiak. Close ties existed with people at Kwethluk, Napakiak, and Eek. Oscarville was the site of the Oscarville Trading Post and a few families moved nearby (Oswalt 1959).

In 1956, early in June almost every family in Napaskiak had a large-meshed net in an eddy along the Kuskokwim River in order to harvest Chinook salmon. When Chinook salmon were harvested at a rate of three or four per night, people began drifting, usually in front of the village. People processed and preserved Chinook salmon nearby their homes at Napaskiak. Chinook salmon were dried and smoked for a week or two. Sometime before 1956, more than half the village went to summer fish camps at sites up to 30 miles away. In 1956, only two families were away all summer at fish camp. People at Napaskiak and Napakiak recently described their harvests and uses of wild resources in a publication that is being prepared (ADF&G *in prep*, Oswalt 1959).

Kasigluk, Nunapitchuk, and Atmauthluak, Bethel, Kwethluk, Akiachak, Akiak, Tuluksak, Lower Kalskag, and Kalskag—People rely most on salmon as the mainstay of their livelihood. They harvest salmon from the lower Kuskokwim River drainage almost exclusively (Andrews 1989, Andrews and Peterson 1983, Brown et al. 2013, Brown et al. 2012; Coffing 1991, Coffing et al. 2001, Ikuta et al. 2013).

Aniak—People at Aniak harvest Chinook salmon from the lower Kuskokwim River drainage from a point midway between Kalskag and Aniak to a point halfway between Chuathbaluk and Kolmakoff. Chinook salmon are processed and preserved at fish camps that are located nearby their homes at Aniak. Chinook salmon are dried and smoked. Chinook salmon are processed into “blanket” fish or cured into “salt fish.” Preservation methods can include drying, freezing, jarring, or vacuum packing of whole, stripped, or sectioned fish. People’s harvest of other salmon species depends on how successful they are harvesting Chinook salmon, which are preferred and generally harvested early enough to avoid the rainy season and the flies that accompany it (Brelsford 1987, Brown et al. 2012). “Unless cut salmon had dried slightly and formed a ‘crust,’ flies were likely to lay eggs on cut fish. And, they added, it is a laborious process, indeed, to remove fly eggs from cut fish. Even if flies were not the problem, fish tend to sour or mold rather than dry in wet weather” (Brown et al. 2012:25).

Chuathbaluk—Chuathbaluk (also known as Little Russian Mission) is situated at the confluence of Mission Creek and the Kuskokwim River. The Russian trading fort Kolmakovsky Redoubt was about 12 miles from present day Chuathbaluk when people built the Orthodox Church at the site of Chuathbaluk. For a while, small migrations of Deg Hit’an (or Ingalik) Athabascans and Yup’ik Eskimos moved to the church site. In the 1950s, the Orthodox Church was rebuilt and families again moved to the site at Chuathbaluk. From there, people relocated seasonally to summer fish camps that were located between Aniak and Chuathbaluk. Chinook salmon arrive in front of the village around the middle of June and continue to run through late July. Salmon are harvested from the central Kuskokwim River drainage and from the lower Kuskokwim River drainage, such as the Aniak River that supports a large run of Chinook salmon. People sometimes travel as far as Bethel to harvest salmon (Brown et al. 2012, Oswalt 1980).

6. Residents of the Upper Kuskokwim Drainage

Crooked Creek—Crooked Creek is situated at the confluence of Crooked Creek and the central Kuskokwim River. Historically, Crooked Creek was at the intersection of Central Yup’ik and Deg Hit’an, and Dena’ina cultures and languages. Historically, people moved to seasonal fish camps at the site of the present-day village. People formed a semi-permanent settlement around a trading post at the site. People from nearby Georgetown, Oskawalik, and Canoe Town moved to nearby the trading post. People from Crooked Creek harvest Chinook salmon at the mouth of the George River and at the mouth of Oskawalik River. They process and preserve salmon at fish camps that are located nearby their homes at Crooked Creek (Brelsford 1987, Brown et al. 2012, Oswalt 1980).

Red Devil and Sleetmute—Red Devil along the central Kuskokwim River drainage is not located at the mouth of a tributary. People chose the site to mine mercury from the 1930s to the 1970s. People living in seasonal settlements along the Holitna River moved to Red Devil when the school was built. Currently,

the people living at Red Devil are a mix of Yup'ik, Athabascan, and non-Natives who obtained Federal homesteads. The village has close ties with nearby Sleetmute. People from Red Devil harvest, process, and preserve Chinook salmon at sites nearby their homes at the village. People harvest salmon also from the George River and Holitna River (Brelsford 1987, Brown et al. 2012).

Sleetmute (*Sikmiut* or *Cellitmiut* in Yup'ik and *Tovishq'vl ghunh* in Deg Hit'an) was likely the site of a seasonal fish camp during historical times. People occupying seasonal camps along the Holitna and Hoholitna river drainages moved to the more permanent settlement of Sleetmute, attracted to a new school and trading post. Non-Natives came to Sleetmute after obtaining Federal homesteads. Families harvest, process, and preserve Chinook and sockeye salmon at summer fish camps that are situated up to 3 miles from the village. People take few coho salmon because coho salmon are available during a normally rainy season when people have a hard time smoking them. People do not prefer to eat frozen coho salmon (Brown et al. 2012).

Stony River and Lime Village—Stony River village is located on the central Kuskokwim River 2 miles from its confluence with Stony River. The settlement has been called Moose Village and Moose Creek. Non-Native people first moved to the site of Stony River village, attracted to the trading post. In the 1960s, Dena'ina families from Lime Village and Dena'ina and Deg Hit'an families living in the area began staying at Stony River. People harvest salmon and whitefishes, especially Chinook salmon and humpback whitefish, as the bulk their subsistence diet. Salmon are harvested from the central Kuskokwim River mainstem and Stony River. Lime Village is located well off the mainstem central Kuskokwim River along Stony River (Kari 1983, 1985; Oswald 1980; Brown et al. 2012).

7. Residents of the Kuskokwim River Headwaters

Takotna, Nikolai, and McGrath—People at the villages rely heavily on their harvests of moose, caribou, and salmon, including Chinook salmon (Brown et al. 2012, Brown et al. 2013, Ikuta et al. 2013).

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