FP21-03 Executive Summary	
General Description	Proposal FP21-03 requests to allow drift gill nets, in addition to set gill nets, in Kuskokwim River tributaries. *Submitted by the Yukon Delta National Wildlife Refuge.*
Proposed Regulation	**§___.27 (e)(4) Kuskokwim Area** * * * * *(xii) You must attach to the bank each subsistence* ***set*** *gillnet operated in tributaries of the Kuskokwim River and fish it substantially perpendicular to the bank and in a substantially straight line.*
OSM Preliminary Conclusion	**Support**
Yukon-Kuskokwim Delta Subsistence Regional Advisory Council Recommendation	
Western Interior Alaska Subsistence Regional Advisory Council Recommendation	
Interagency Staff Committee Comments	
ADF&G Comments	
Written Public Comments	**None**

DRAFT STAFF ANALYSIS
FP21-03

ISSUES

Proposal FP21-03, submitted by the Yukon Delta National Wildlife Refuge, requests the Federal Subsistence Board (Board) allow drift gill nets, in addition to set gill nets, in Kuskokwim River tributaries.

DISCUSSION

The proponent states that until the Alaska Board of Fisheries (BOF) meeting in January 2020, the language of the State regulalation and the Federal regulation were aligned. However, during the same BOF meeting, the Alaska Department of Fish and Game (ADF&G) added the word "set" in front of gillnet during the "error and omissions" part of the meeting. Therefore, the State regulation now reads the way the proponent for this proposal suggests how the current Federal regulation should be rewritten. The current Federal regulation is more restrictive than the State current regulation (i.e., no drifting in any tributaries versus drifting allowed in tributaries). Implementing this change will align Federal and State regulations.

Existing Federal Regulation

§___.27 (e)(4) Kuskokwim Area

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(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.

Proposed Federal Regulation

§___.27 (e)(4) Kuskokwim Area

****

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

Existing State Regulation

5 AAC 01.270. Lawful gear and gear specifications and operation

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(d) Each subsistence set gillnet operated in tributaries of the Kuskokwim River must be attached to the bank, fished substantially perpendicular to the bank and in a substantially straight line.

Extent of Federal Public Lands/Waters

For purposes of this analysis, the phrase "Federal public waters" is defined as those waters described under 36 CFR §242.3 and 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 (Refuge), including District 1 and portions of District 2 of the Kuskokwim Fishery Management 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 (**Figure 1**).

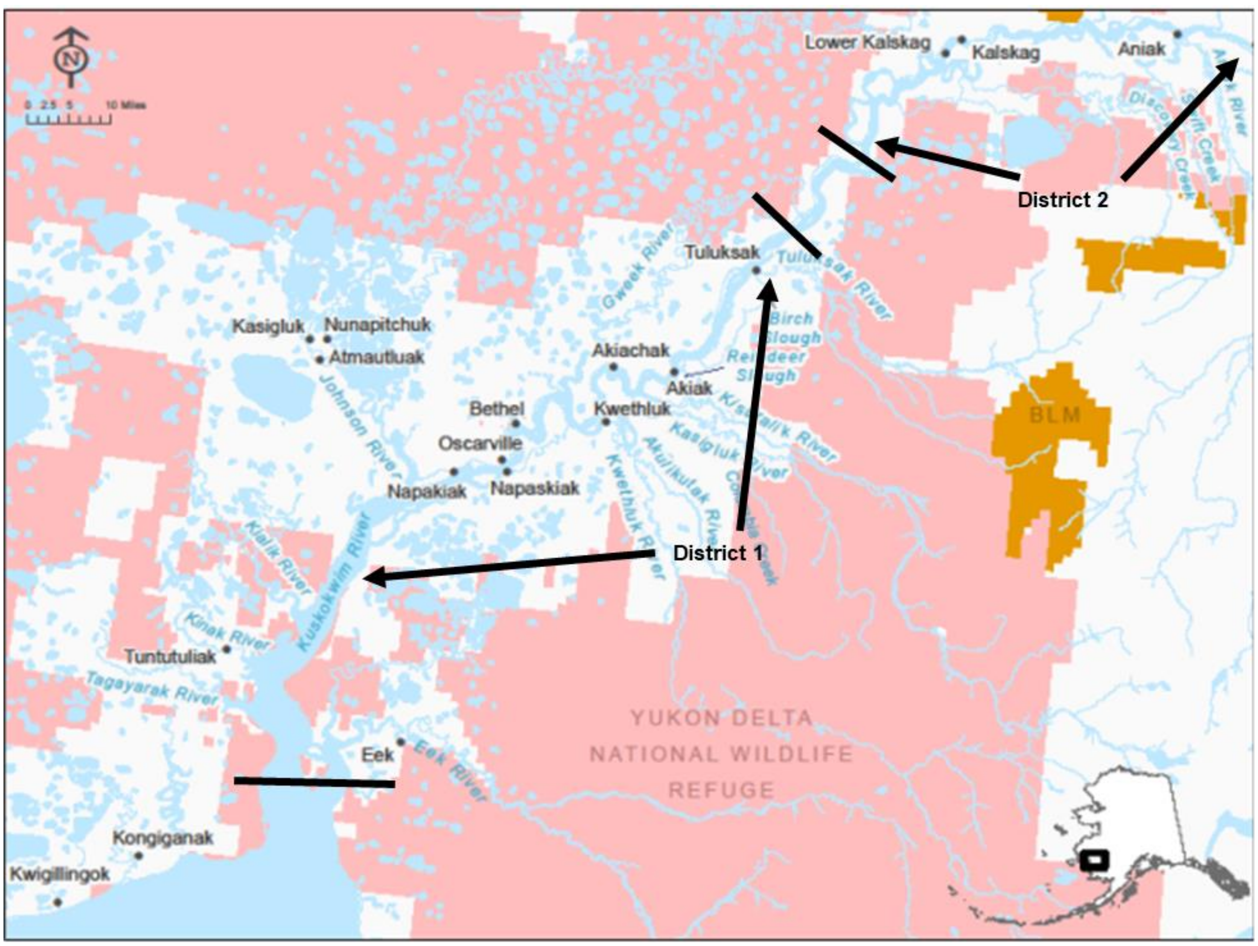

Figure 1. The lower Kuskokwim River drainage.

Customary and Traditional Use Determinations

Residents of the Kuskokwim Area, except those persons residing on United States military installations located on Cape Newnham, Sparrevohn USAFB, and Tatalina USAFB, have a customary and traditional use determination for all fish except Rainbow Trout in the Kuskokwim River drainage.

Residents of the communities of Akiachak, Akiak, Aniak, Atmautluak, Bethel, Chuathbaluk, Crooked Creek, Eek, Goodnews Bay, Kasigluk, Kwethluk, Lower Kalskag, Napakiak, Napaskiak, Nunapitchuk, Oscarville, Platinum, Quinhagak, Tuluksak, Tuntutuliak, and Upper Kalskag have a customary and traditional use determination for Rainbow Trout in the Kuskokwim River drainage.

Regulatory History

In 1999, the Federal Subsistence Board adopted this regulation when promulgating the initial Federal regulations for fish in navigable waters, in addition to non-navigable waters (64 Fed. Reg. 5. 1306 [January 8, 1999]).

In 2019, the Board adopted Proposal FP19-10, submitted by James Charles of Tuntutuliak, with modification that "All tributaries not expressly closed by Federal special action, or as modified by regulations in this section, remain open to the use of gillnets more than 100 yards upstream from their confluence with the Kuskokwim River" (§100.27(e)(4) Kuskokwim Area; 84 Fed. Reg. 155, 39750 [August 12, 2019]).

In June 2019, the Commissioner of ADF&G, under his delegated authority from the Alaska BOF, proposed to adopt regulation changes correcting errors and omissions, ambiguities, and technical deficiencies dealing with certain finfish and shellfish fisheries, including the following Kuskokwim Area regulation: "5 AAC 01.270. *Lawful gear and gear specifications and operation* is proposed to be changed to add the word 'set' in front of the word 'gillnet' for clarity" (ADF&G 2019a).

After a public comment period ending July 8, 2019, without further notice, the Commissioner adopted this proposed regulation change. The revised regulation clarifies that drift nets are a legal subsistence gear in tributaries of the Kuskokwim River.

Biological Background

<u>Chinook Salmon</u>

Run-Size

Estimates of drainage-wide run size are produced by the Chinook Salmon run-reconstruction model. This model uses multiple sources of data such as weir and aerial escapement indices, commercial catch and effort, mark-recapture estimates, and harvest to estimate annual returns (Larson 2020).

Chinook Salmon abundance in the Kuskokwim River system has been highly variable with cyclical (~10 years) peaks around 400,000 and valleys around 80,000-100,000 fish returns. The last peak run-size occurred in 2004 with an estimated 365,368 Chinook Salmon. Run-sizes have dropped steadily from this peak until reaching an all-time low of 75,010 salmon in 2012. Since 2012, the population appears to be on a slightly increasing trend, with a larger jump in 2019 (**Table 1, Figure 2**). Estimated Chinook Salmon run-sizes from 2015–2018 have been 125,578, 130,475, 131,677, and 136,135, respectively (Tiernan et al. 2018). The 2019 estimated run-size for Chinook Salmon was approximately 226,987 (Larson 2020).

Direct estimates of total run-size for Kuskokwim River Chinook Salmon are available from 2003–2007 and 2014–2017 through extensive mark-recapture surveys performed by ADF&G. The mark-recapture projects from 2003 to 2007 and in 2014 were performed above Kalskag during above average run abundances (with the exception of 2014), while the 2015 to 2017 projects were performed in the lower Kuskokwim River just above Eek during below average run abundances. Methods for estimating escapement to unmonitored tributaries downriver of the tag site also were changed in 2015 to 2017 (Liller 2017). From 2003 to 2007, direct estimates ranged from 242,000 to 423,000 Chinook Salmon, while 2014–2017 estimates ranged from 78,600 to 133,200 Chinook Salmon.

An updated run reconstruction model was created and published during 2018 (Liller et al. 2018). The new model uses data collected from a 2014-2017 Chinook Salmon mark recapture project initiated in the lower river, almost doubling the amount of information used for model scaling. The information used in scaling now covers periods of record high and record low run sizes (Liller et al. 2018).

In addition to the mark-recapture abundance estimates, ADF&G in 2017 began operating a sonar and drift gillnet apportionment project near Church Slough above Bethel in order to estimate daily and total abundance of adult salmon species returning to the Kuskokwim River. Given that the sonar is located above Bethel, the total abundance reported is in terms of numbers of Chinook Salmon escaping past the Bethel fishery. In order to calculate a total abundance number, Chinook Salmon harvest and escapement (i.e. Eek River) downriver from the sonar would need to be added to the sonar abundance estimate. As 2017 was the first year the sonar was in full operation, the initial results should be taken into consideration carefully until the project has accumulated several more years' worth of data. The data collected for this project is not currently used in the run-reconstruction for Kuskokwim River Chinook Salmon; however, once enough data is accumulated and any challenges are identified and fixed, the sonar data will be analyzed as an additional data source in run-reconstruction. The preliminary abundance estimate for Chinook Salmon at the sonar site in 2019 was 162,672 (138,473-186,871 fish) (ADF&G 2019).

Escapement

Chinook Salmon escapement is monitored throughout the Kuskokwim River drainage with a variety of weir and aerial surveys. Currently, six weirs are utilized as data sources in the run-reconstruction model: two in the lower river (Kwethluk and Tuluksak) and four in the upper river (George, Kogrukluk, Tatlawiksuk, and Takotna). ADF&G discontinued the Takotna weir in 2014, however, the Kuskokwim Inter-Tribal Fish Commission, with assistance from the Takotna Tribal Council restarted the weir in 2017. Two other weirs in the drainage are not used as data inputs in the run-reconstruction model (Salmon River of the Aniak drainage and Salmon River of the Pitka Fork drainage). In addition to the weir projects, data from 14 aerial index surveys are used in the run-reconstruction model: three in the lower river (Kwethluk, Tuluksak, and Kisaralik) and 11 in the upper river (Salmon-Aniak, Kipchuk, Aniak, Holokuk, Oskawalik, Holitna, Cheeneetnuk, Gagaryah, Pitka, Bear, and Salmon-Pitka).

Total escapement estimates follow the same general trend as total run estimates with cyclical peaks and valleys. Average high escapement years were around 260,000 Chinook Salmon, while average low escapements were around 85,000 Chinook Salmon. The last peak was in 2004, with an escapement of around 265,000 fish. After the last peak, the Chinook Salmon escapement dropped to a record low of around 41,000 fish in 2013 (**Table 1, Figure 2**) (Larson 2020, ADF&G 2019).

In the 2013 Chinook Salmon fishing season, a new sustainable escapement goal (SEG) was established (65,000–120,000 fish). In-season fisheries managers, with concurrence from the Kuskokwim River Salmon Management Working Group, agreed on managing the fishery with an escapement goal of 65,000-120,000 Chinook Salmon (ADF&G 2020a) . Due to run timing and the return being compressed, few restrictions were placed on Chinook Salmon subsistence harvest throughout the 2013 fishing season. However, the resulting overharvest from a lack of management actions in-season resulted in the lowest escapement on record (an estimated 37,000 fish) (**Table 1, Figure a**) (OSM 2015).

In 2014, the Kuskokwim River Chinook Salmon forecast was for a return of 71,000–116,000 fish. In-season fishery managers, with concurrence from the Working Group, agreed to start the fishing season closed to the harvest of Chinook Salmon. At the time, the estimated drainage-wide run size was predicted to be 135,000 Chinook Salmon, and resulted in an escapement of 123,987 fish, which was slightly above the upper limit of the SEG (120,000 fish). However, two weir projects in the Kwethluk and Kogrukluk rivers failed to reach their tributary-specific escapement goals (OSM 2015). The new run reconstruction model revised these estimates lower, with a total run size near 84,000 and an escapement near 73,000 Chinook Salmon.

In 2015, the Kuskokwim River Chinook Salmon forecast was 96,000–163,000 fish. At the time, the estimated drainage-wide run size was 172,000 Chinook Salmon, which resulted in an escapement estimate of approximately 155,000 Chinook Salmon. This estimate was near average and larger than the SEG of 65,000–120,000 Chinook Salmon (OSM 2015). However, the new run reconstruction model revised these estimates lower also, with a run size near 125,000 and an escapement near 108,000 Chinook Salmon.

In 2016, the Kuskokwim River Chinook Salmon forecast was 125,000–219,000 fish. The Federal in-season manager and the Kuskokwim River Inter-Tribal Fisheries Commission compromised to set a fundamental escapement objective of at least 100,000 Chinook Salmon. Coinciding with that decision, the Working Group set an escapement objective of 85% of the upper bound of the SEG (65,000–120,000 fish), which was approximately 102,000 Chinook Salmon. The estimated total Chinook

Salmon run size in 2016 for the Kuskokwim River was around 129,000 fish, and resulted in an estimated escapement of around 98,000 fish.

The 2017, the Kuskokwim River Chinook Salmon forecast was 132,000–222,000 fish. The Federal in-season manager compromised with the Kuskokwim River Inter-Tribal Fisheries Commission to set a fundamental escapement objective of 110,000 Chinook Salmon. The preliminary estimated total run size in 2017 for Chinook Salmon in the Kuskokwim River was around 167,000 fish, which resulted in an estimated escapement of around 150,000 fish. This level of escapement would have been above the upper bound of the SEG of 120,000 Chinook Salmon. However, the new run reconstruction model revised these estimates lower, with a run size near 133,000 and escapement near 117,000 Chinook Salmon.

The initial 2018 Kuskokwim River Chinook Salmon forecast was 140,000–193,000 fish (Smith and Liller 2018). However, this forecast was revised following updates to the original run-reconstruction model to 115,000–150,000 fish (Liller et al. 2018). The Federal in-season manager, working with the Kuskokwim River Inter-Tribal Fisheries Commission, set a fundamental escapement objective of 110,000 Chinook Salmon. The preliminary estimated total run size in 2018 for Chinook Salmon in the Kuskokwim River was around 141,000 fish, which resulted in an estimated escapement of around 110,000 fish.

The 2019 Kuskokwim River Chinook Salmon forecast was 115,000–150,000 fish. The Federal in-season manager, in consultation with the Kuskokwim River Inter-Tribal Fisheries Commission, set a fundamental escapement objective of 110,000 Chinook Salmon. The preliminary estimated total run size in 2019 for Chinook Salmon in the Kuskokwim River was around 227,000 fish, which resulted in an estimated escapement of around 188,000 fish, exceeding the current SEG of 65,000–120,000 Chinook Salmon.

In-Season Run Timing and Composition

In-season management relies heavily on in-river abundance via test fisheries, creel surveys, effort counts, and pre-season forecasts in order to inform harvest decisions that control subsistence opportunities. The main in-river abundance indicator used in season is the Bethel Test Fishery. The Bethel Test Fishery has operated upstream of Bethel since 1984 and provides a long term data set on species composition, relative abundance, and run-timing. There are complications using data from the test fishery to help in-season management because abundance estimates are confounded by run-timing, as well as the test fishery being located upstream of where much of the Chinook Salmon harvest takes place. Specifically, there is a large amount of variation in historical run-timing, which complicates in-season predictions of run abundance. These factors highlight the importance of the pre-season forecast during the early stages of in-season management.

Table 1. Published estimates of Kuskokwim River Chinook Salmon run-size, escapement, and harvest from 1976 to 2019. Total Run and Escapement are estimated from the Kuskokwim River Chinook Salmon Run-Reconstruction Model (Larson 2020).

Kuskokwim River Drainage							
Year	Total Run	Escapement	Harvest				
			Subsistence	Commercial	Sport	Test Fish	Total
1976	206,672	116,125	58,606	30,735		1,206	90,547
1977	324,860	231,153	56,580	35,830	33	1,264	93,707
1978	237,518	154,046	36,270	45,641	116	1,445	83,472
1979	236,554	140,252	56,283	38,966	74	979	96,302
1980	362,290	265,322	59,892	35,881	162	1,033	96,968
1981	311,309	200,910	61,329	47,663	189	1,218	110,399
1982	143,957	36,956	58,018	48,234	207	542	107,001
1983	148,051	65,906	47,412	33,174	420	1,139	82,145
1984	175,501	86,325	56,930	31,742	273	231	89,176
1985	145,163	63,236	43,874	37,889	85	79	81,927
1986	123,817	53,205	51,019	19,414	49	130	70,612
1987	182,967	78,724	67,325	36,179	355	384	104,243
1988	206,619	78,856	70,943	55,716	528	576	127,763
1989	214,473	88,320	81,175	43,217	1,218	543	126,153
1990	267,793	103,607	109,778	53,502	394	512	164,186
1991	215,518	102,370	74,820	37,778	401	149	113,148
1992	260,878	129,778	82,654	46,872	367	1,380	131,273
1993	272,385	172,718	87,674	8,735	587	2,515	99,511
1994	398,188	276,084	103,343	16,211	1,139	1,937	122,630
1995	371,220	236,491	102,110	30,846	541	1,421	134,918
1996	323,884	218,309	96,413	7,419	1,432	247	105,511
1997	262,498	171,164	79,381	10,441	1,227	332	91,381
1998	254,674	154,702	81,213	17,359	1,434	210	100,216
1999	160,332	81,739	72,775	4,705	252	98	77,830
2000	122,228	54,019	67,620	444	105	64	68,233
2001	192,625	113,985	78,009	90	290	86	78,475
2002	238,337	156,489	80,982	72	319	288	81,661
2003	231,825	163,120	67,134	158	401	409	68,102
2004	365,368	264,727	96,788	2,305	857	691	100,641
2005	326,910	235,134	85,090	4,784	572	557	91,003
2006	324,338	229,953	90,085	2,777	444	352	93,658
2007	248,762	151,902	96,155	179	1,478	305	98,117
2008	214,991	116,086	98,103	8,865	708	420	108,096
2009	195,102	107,168	78,231	6,664	904	470	86,269
2010	116,048	45,384	66,056	2,732	354	292	69,434
2011	114,599	50,570	62,368	747	579	337	64,031
2012	75,010	51,518	22,544	627	0	321	23,492
2013	88,515	41,027	47,113	174	0	201	47,488
2014	82,096	70,330	11,234	35	0	497	11,766
2015	125,578	108,974	16,124	8	0	472	16,604
2016	130,475	99,257	30,676	0	0	522	31,198
2017	131,677	115,007	16,380	0	0	290	16,670
2018	136,135	113,404	22,266	0	0	465	22,731
2019	226,987	188,483	37,941	0	0	563	38,504

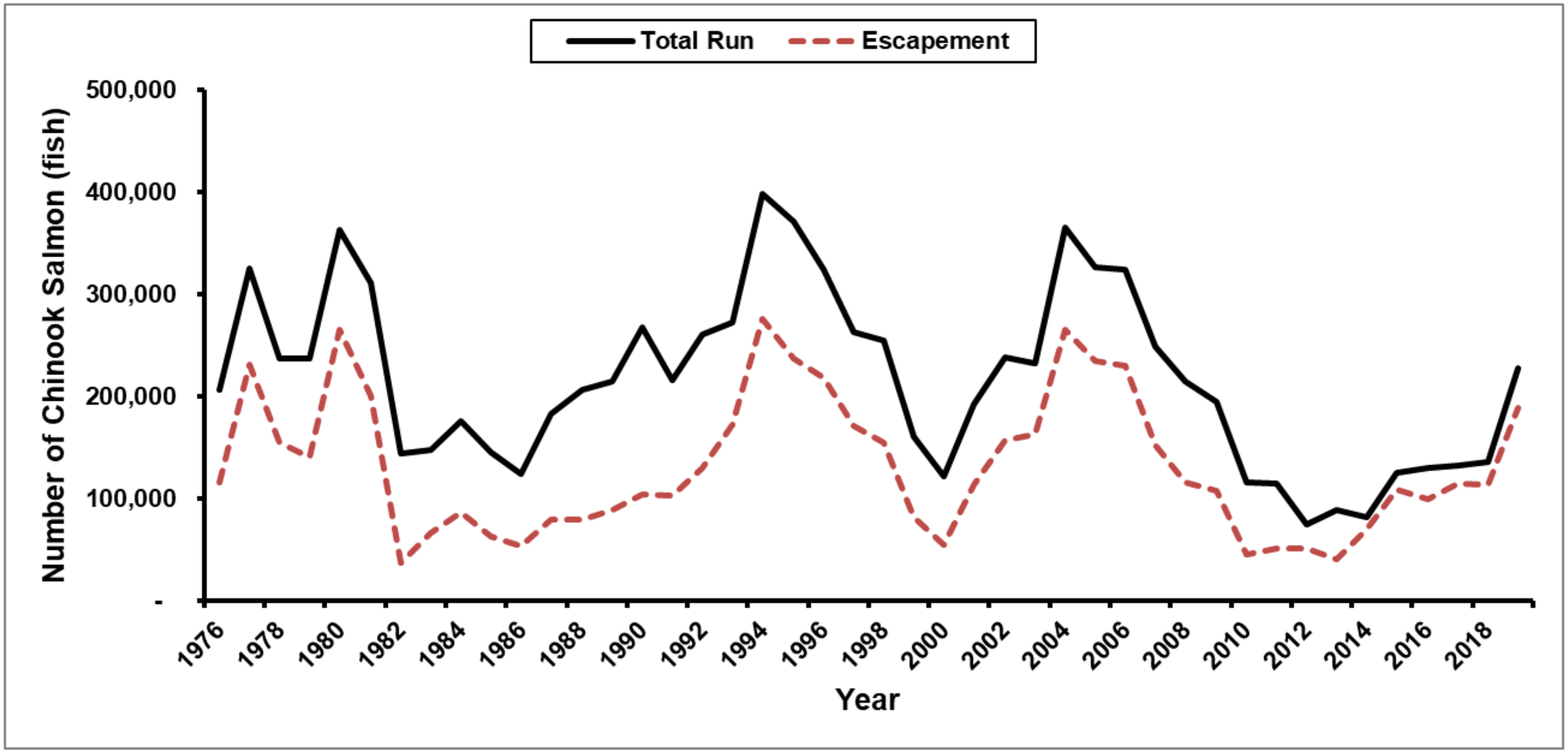

Figure 1. Estimates of Kuskokwim River Chinook Salmon total run-sizes and escapements from 1976 to 2019. Estimates are produced from the Kuskokwim River Chinook Salmon Run-Reconstruction Model (Larson 2020).

Chinook Salmon enter the Kuskokwim River beginning in late May and continue through early August. The Bethel Test Fishery starts operating around the end of May and continues till late August. The cumulative catch of Chinook Salmon at the test fishery can best be described by a sigmoidal shaped curve (i.e., logistic), which is used to generalize run-strength, run-timing, and species composition. From 1984 to 2019, the estimated dates at which 50% of the Chinook Salmon run has passed the Bethel Test Fishery (D50) ranges from June 14 to July 2, with the average being June 22 ± 4 days. Past research has shown that Chinook Salmon migrating to the upriver portions of the drainage tend to migrate earlier than Chinook Salmon migrating to the middle or lower portions of the drainage (Stuby 2007). This pattern is supported by recent telemetry research on Chinook Salmon in the Kuskokwim River (Clark and Smith 2019).

Chinook Salmon are the main salmon species migrating in the Kuskokwim River in the beginning of the season; however, the composition of the run transitions to Chum and Sockeye Salmon over a period of a few weeks. From 1984 to 2016, the average date when the proportion of Chinook Salmon was equal to that of Chum Salmon plus Sockeye Salmon at the Bethel test fishery (1:1 ratio) was June 13. The overall composition of catch by species at the Bethel test fishery is dominated by Chum and Sockeye Salmon, which on average account for 93% of the catch, while Chinook Salmon account for only 7% of the total catch.

Population Assessment

The output from the run-reconstruction model, along with estimates of harvest and age composition from harvest and escapement, is then fed into a Bayesian State Space spawn-recruit analysis (Hamazaki et al. 2012). The spawn-recruit analysis produces drainage-wide estimates of productivity, carrying capacity, age, and recruitment variation. These estimates and the uncertainty around them are used to derive biological reference points that are then used to develop drainage-wide escapement goals for the Kuskokwim River (the current SEG is 65,000–120,000), as well as goals for selected tributaries (Kwethluk, George and Kogrukluk).

Chum Salmon

Run-Size

In-season run abundance and run timing of Kuskokwim River Chum Salmon is monitored utilizing the Bethel Test Fishery. The relative strength of a run is assessed by comparing the cumulative end of the season catch per unit effort (CPUE) of any one year to the CPUE of one or more other years.

The most recent 10-year average (2008–2018) cumulative CPUE for Chum Salmon is 6,314, with a range of 2,942 in 2015 to 10,028 in 2011 (Lipka and Tiernan 2018 and ADF&G 2020b). The 2019 CPUE was 4,990, while Bethel Sonar chum salmon passage was an estimated 385,409 fish (95% CI = 320,026–450,792).

Escapement

Escapement of Kuskokwim River Chum Salmon was monitored at three weirs located on the Kwethluk, George, and Kogrukluk during 2019. In 2019, escapements were above average at all three weirs, but remained within the historical range.

The Kogrukluk River has the longest data set, starting in 1976 and is the only tributary with an established escapement goal for Chum Salmon; a range of 15,000–49,000 fish. Annual escapement has been greater than the lower bound of the goal range every year since 2001, with the exception of 2012, when counts were very close to the minimum escapement goal even while missing 19 days of counting due to high water. The upper bound of the goal range has been exceeded in six of the past 10 years (Lipka and Tiernan 2018 and ADF&G 2020b).

The average escapement for the Kogrukluk River for the years 2009–2018, minus three years when estimates were not made, is 61,344 fish, with a range of 30,763 fish in 2014, to 94,387 fish in 2017 (Lipka and Tiernan 2018). The Kogrukluk River escapement goal was achieved in both 2018 (54,211) and 2019 (70,577) (ADF&G 2020b).

The average escapement for the Kogrukluk River for the years 2009–2018, minus three years when estimates were not made, is 61,344 fish, with a range of 30,763 fish in 2014, to 94,387 fish in 2017 (Lipka and Tiernan 2018). The Kogrukluk River escapement goal was achieved in both 2018 (54,211) and 2019 (70,577) (ADF&G 2020b).

The Kwethluk River does not have an established escapement goal. Only partial escapements counts are available for 2012 and 2013, so are not included in this analysis. The average escapement for the years 2009–2018 is 26,773 fish (range of 17,941 to 53,741). The escapement for 2018 was incomplete; escapement for 2019 was 42,013 fish. The 2014 escapement was the second lowest and the 2015 escapement was the sixth lowest for the years recorded since 2000 (counts incomplete in 2001) (ADF&G 2020b).

The George River does not have an established escapement goal. The average escapement for the years 2009–2018 is 29,590 fish (range of 7,944 to 48,277). The escapement for 2018 was 48,277 fish and for 2019 was 40,072 fish. The 2014 and 2015 escapements were the ninth and tenth lowest amounts, respectively, for the years recorded since 1996 (ADF&G 2016 and ADFG 2020b).

In-season Run-Timing and Composition

Chum Salmon start moving past the Bethel Test Fishery near the middle of June, with the earliest capture date at the test fishery being June 1. On average, early July (July 3 – July 6) is when 50% of the run has passed the Bethel Test Fishery. From the beginning of June until early July, Chum Salmon transition to become the dominant salmon species captured at the Bethel Test Fishery. From 1984 to 2016, Chum Salmon, on average, accounted for 68% of the yearly catch composition at the Bethel Test Fishery in comparison to Chinook and Sockeye Salmon, which accounted for 7% and 25%, respectively.

Population Assessment

Given the lack of drainage-wide, run-size estimates of Kuskokwim River Chum Salmon, there has not been an analysis of stock productivity to evaluate the effectiveness of fisheries management actions. This analysis can only occur when accurate and reliable drainage-wide run-size estimates of Kuskokwim River Chum Salmon are available.

Sockeye Salmon

Run-Size

Similar to Chum Salmon, accurate and reliable estimates of drainage-wide run size are not available for Kuskokwim River Sockeye Salmon; however, like with Chum Salmon, attempts have been made to develop annual drainage-wide estimates of abundance.

In 2009, an ADF&G project was funded by the Alaska Sustainable Salmon Fund (Project No. 45920) to develop estimates of the number of Sockeye Salmon that returned to the Kuskokwim River annually from 1985–2012 using a statistical model that combines data collected from mark-recapture investigations with historical escapement data. The project was not successful at estimating total numbers of Sockeye Salmon. A statistical model was completed, however, but an accurate reconstruction of annual run-size required independent estimates of abundance for scaling purposes. The mark-recapture portion of this project was conducted 2010–2012 to provide independent estimates of abundance for scaling the statistical model. The mark-recapture portion of the project was not successful in 2010 and 2012 due to high water conditions, which prevented the sufficient recapture of tagged fish. The tagging study was successful in 2011, but had significant biases that could not be corrected (Alaska Sustainable Salmon Fund 2015). Since 2012, there has not been any attempt to provide independent estimates of abundance through mark-recapture projects; however, ADF&G initiated a sonar project in the Kuskokwim River in 2017 that will be used to monitor all salmon species.

Currently, the Kuskokwim River Sockeye Salmon run is monitored in-season via the Bethel Test Fishery. The relative strength of a run is assessed by comparing the cumulative end of the season CPUE of any one year to the cumulative CPUE of one or more other years. However, caution should be used when comparing cumulative CPUE amongst years, especially comparisons between years with and without subsistence fishing restrictions. This is because the Bethel Test Fishery is located upstream of where a majority of the salmon harvest occurs, so any regulations restricting harvest would influence in-season run abundances, which confounds relative strength of run assessments.

The end of season cumulative CPUE at the Bethel Test Fishery for Sockeye Salmon (2008–2018) ranged from 1,376 to 2,690 fish, with an average of 1,762 (Lipka and Tiernan 2018 and ADF&G 2020b). The 2019 CPUE was 1,753, while Bethel Sonar Sockeye passage was an estimated at 924,579 fish (95% CI = 839,112–1,010,046).

Escapement

The escapement of Kuskokwim River Sockeye Salmon is currently monitored at four weirs located on the Kwethluk, George, and Kogrukluk rivers; the fourth weir is on the outlet of Telaquana Lake.

The Kogrukluk River has the longest data set and is the only tributary with an established escapement goal for Sockeye Salmon that has a range of 4,400–17,000 fish. From 2009 to 2018, Sockeye Salmon escapement in the Kogrukluk River ranged from 6,411 to 27,315 fish, with an average escapement of 15,305 fish. In 2019, the upper bound of the escapement goal range was exceeded by almost 15,000 Sockeye Salmon with a total of 31,816 fish. The annual escapement has been greater than the lower bound of the goal range every year since 2001. The upper bound of the goal range has been exceeded in five of the past 10 years (ADF&G 2017).

The Kwethluk River does not have an established escapement goal. From 2009 to 2018, Sockeye Salmon escapement in the Kwethluk River ranged from 2,031 to 29,939 fish, with an average of 10,523 fish. The weir did not operate or provided incomplete counts in 2012, 2013 and 2018. The 2019 Sockeye Salmon escapement was 30,306, which is the highest observed escapement level in the weir's recorded history. The number of Sockeye Salmon passing the Kwethluk River weir in 2019 was almost triple the 2009–2018 average escapement (ADF&G 2020b).

The George River does not have an established escapement goal. From 2009 to 2018, Sockeye Salmon escapement in the George River ranged from 43–2,807 fish, with an average of 609 fish. (ADF&G 2020b). The 2019 Sockeye Salmon escapement was 3,973 fish, which is the highest on record dating back to 2003 (Lipka and Tiernan 2018).

The Telaquana River weir has been operated cooperatively by ADF&G and the National Park Service since 2010. The system is by far the biggest contributor of Sockeye Salmon in the Kuskokwim River drainage. From 2010 to 2018, Sockeye Salmon escapement in the Telaquana River ranged from 23,005–197,352 fish, with an average of 78,138 fish. The last two years of the project have seen the largest numbers of Sockeye Salmon escapement with 197,352 fish and 190,265 fish, respectively (ADF&G 2020b).

In-season Run-Timing and Composition

Sockeye Salmon start moving past the Bethel Test Fishery in early June, with the earliest capture date on June 1. On average, late June (June 27 –30) is the time when 50% of the run has passed the Bethel Test Fishery. During the latter half of June, on average, Sockeye Salmon overtake Chinook Salmon as the second most abundant species of salmon at the Bethel Test Fishery.

Population Assessment

Given the lack of drainage-wide run-size estimates of Sockeye Salmon in the Kuskokwim River, there has not been an analysis of stock productivity to evaluate the effectiveness of fisheries management actions. This analysis can only occur when accurate and reliable drainage-wide run-size estimates of Kuskokwim River Sockeye Salmon are available.

Coho Salmon

Run-Size

Estimates of drainage-wide run size are produced by the Coho Salmon run-reconstruction model using multiple sources of data, such as weir escapement indices, commercial catch and effort, mark-recapture estimates, and harvest (Schaberg and Liller 2015).

Estimates of Coho Salmon abundance in the Kuskokwim River system are available from 2000 – 2015 (Schaberg and Liller 2015). Coho Salmon runs ranged from 499,951–2,699,102 fish with an average run size around 1,000,000 ± 550,000 Coho Salmon during this time period.

Estimates of total inriver abundance for Kuskokwim River Coho Salmon are available from 2001 – 2004 and 2008 – 2009 via mark-recapture projects conducted near Kalskag. From 2001 to 2004, direct estimates ranged from 603,414 to 2,024,571 Coho Salmon, while in 2008 – 2009, 963,058 and 714,481 Coho Salmon were estimated.

Coho Salmon are still passing through the Bethel Test Fishery and Sonar sites when the project is removed for the season, therefore, the counts are incomplete. However, the end of season cumulative CPUE at the Bethel Test Fishery for Coho Salmon (2008 – 2018) ranged from 2,024 to 6,785 fish, with an average of 3,236 (Lipka and Tiernan 2018 and ADF&G 2020b). The 2019 CPUE was 1,799, when the Bethel Sonar ceased operations on July 26, prior to the majority of Coho Salomon passing through the area.

Escapement

The escapement of Kuskokwim River Coho Salmon is monitored at three weirs located on the Kwethluk, George, and Kogrukluk rivers. Estimates of drainage-wide escapement are produced by the Kuskokwim River Coho Salmon run-reconstruction model (Schaberg and Liller 2015). From 2000 to 2015, drainage-wide escapement for Coho Salmon ranged from 407,065 to 2,375,943 fish with the average over the time series being 810,398 ± 497,276 fish. The last peak in drainage-wide escapement occurred in 2014 with an estimated 1,435,689 Coho Salmon, while the 2015 estimate was 919,421.

In-season Run-Timing and Composition

Coho Salmon are the last of the major salmon species to migrate into the Kuskokwim River with the earliest capture date at the Bethel Test Fishery being July 6. On average, early August (August 7 – 9) is when 50% of the run has passed the Bethel Test Fishery. Because of the late date when the majority of Coho Salmon pass through the Bethel Test Fishery, the composition of the run is almost all Coho Salmon. Caution should be taken in interpreting Bethel Test Fishery data for Coho Salmon because the test fishery operations generally cease by August 24, which means late-run Coho Salmon might not represent the entire run of Coho Salmon during years with late-run timing.

Population Assessment

Currently, the only assessment for Kuskokwim River Coho Salmon is ADF&G's run-reconstruction model (that includes creation of a brood table). The run-reconstruction provides information for the formulation of fisheries management strategies for Coho Salmon in the Kuskokwim River, but does not provide an assessment of stock productivity, unlike the spawn-recruit assessment used for Kuskokwim River Chinook Salmon. The data is adequate to assess spawner-recruit dynamics, which could then be used to develop drainage-wide escapement goals (Schaberg and Liller 2015). However, to date, a spawn-recruit assessment has yet to be completed or published by any entity.

Whitefish Species

Six common whitefish species are present in the Kuskokwim River: Inconnu (Sheefish), Broad Whitefish, Humpback Whitefish, Least Cisco, Bering Cisco, and Round Whitefish. Biological data on distribution, migration, and life history for these whitefish species come from directed sampling and radio telemetry studies in the drainage. Age and length data are available for some of the species in the Kuskokwim River drainage, but it is not adequate to provide a complete assessment of the populations.

Sheefish, Broad Whitefish, Humpback Whitefish, and Least Cisco are generally distributed from the Kuskokwim River mouth to the Swift Fork of the Kuskokwim River. Bering Cisco appear to have a limited distribution, which ranges from the mouth to the South Fork of the Kuskokwim River (Brown et al. 2012, Alt 1973). Based on weirs operated in several of the Kuskokwim River's salmon tributaries, it does not appear as though large whitefish migrations occur in most salmon spawning streams; however, data is limited to (~ 3 month) windows when the weirs do operate.

Sheefish are known to be seasonally migratory, moving to the marine environment during the winter and then returning to the river during the summer and fall to feed and spawn (Alt 1977, Stuby 2010). Most appear to overwinter from the lower Holitna River to Kuskokwim Bay (Alt 1977, Stuby 2010). Summer feeding habitats include slow flowing reaches of numerous tributaries in the lower river into the North Fork of the Kuskokwim River. Fall spawning habitats are known to exist in four primary areas in upper river tributaries: Swift Fork, Big River, Middle Fork, and Slow Fork near Tonzona (Alt 1972, 1981, Stuby 2010). Spawning typically occurs between late September and mid-October. Sheefish, as well as the other riverine whitefish species, are broadcast spawners, spreading their eggs over gravel substrate in the fall and larvae emerge after a winter of developing, where they are distributed downstream by river currents to feeding areas (McPhail and Lindsey 1970, Gates et al. 2017).

Riverine populations of Broad Whitefish, Humpback Whitefish, and Least Cisco rear, feed, and overwinter in the lower drainage and in Kuskokwim Bay (Maciolek 1986; Harper et al. 2007, 2008, 2009). Beginning mid to late summer, pre-spawning individuals migrate from feeding habitats to upstream spawning habitats in gravel substrate reaches of the drainage (for example: Big River, Swift

Fork, lower Holitna River). Broad Whitefish typically spawn later than most species of whitefish, usually beginning in early November (Harper et al. 2009). Humpback Whitefish usually begin to spawn in late September or early October (Stein et al. 1973, Alt 1979, Brown 2006). Migration data are not available for Least Cisco, Bering Cisco, or Round Whitefish populations in the Kuskokwim River drainage. These species generally start migrating toward overwintering grounds by the end of the fall (late October–early November).

Harvest History

Estimates of the harvest of fishes in Kuskokwim River tributaries are not available. Harvests are generally recorded during household surveys and are not area and gear specific. Research conducted between 2009 and 2013 shows that residents of lower and middle Kuskokwim River drainage communities harvest salmon at the highest rate, in lbs. edible weight, than other resource categories (non-salmon fishes, large land mammals, small land mammals, birds and eggs, marine invertebrates, and berries and plants). Residents of lower Kuskokwim River drainage communities (Eek to Tuluksak) also harvested high rates of non-salmon fishes (23–46% of annual harvests of all wild resources in lbs. edible weight). Non-salmon fish species harvested by residents of communities in the lower river were primarily Pike and whitefishes and smaller amounts of blackfish, Burbot, and smelt. Few char, trout, or Grayling were reported in these harvests (ADF&G 2018). Typically, communities in the middle Kuskokwim River drainage, from Lower Kalskag to Chuathbaluk, reported harvesting non-salmon fishes at a lower rate (5–17% of annual wild food harvests) than lower river communities. The most common non-salmon fishes harvested in middle river communities were whitefishes. Other fish harvested included smelt, blackfish, and Grayling (ADF&G 2018).

Effects of the Proposal

Adoption of Proposal FP21-03 would allow Federally qualified subsistence users to use drift nets in tributaries of the Kuskokwim River Drainage. Drifting nets in some tributaries is already a common practice, and adoption of this proposal will make it legal for the users under Federal subsistence regulations. Adoption would also align State and Federal Regulations.

Adoption of this proposal may lead to higher harvest rates on some stocks of fish in some tributaries. However, fishery managers have the authority to set times, dates, methods, and areas. Therefore, they have the ability to close tributaries with stocks at high risk, as is currently done to avoid harvest of Chinook Salmon in salmon-spawning tributaries.

If Proposal FP21-03 was not adopted, it would remain illegal under Federal regulations to drift a gill net in tributaries of the Kuskokwim River. Currently, it is common practice to drift gill nets in non-salmon spawning tributaries of the Kuskokwim River, particularly during closures to fishing on the mainstream. Federal regulations would remain more restrictive than State regulations. Fishers would be able to fish under State regulations unless superseded by Federal special action.

OSM PRELIMINARY CONCLUSION

Support Proposal FP21-03.

Justification

Drifting gill nets is a traditional way to fish for salmon and other fish species in tributaries of the Kuskokwim River. Adoption of this proposal would give Federally qualified subsistence users the opportunity to drift gill nets in tributaries of the Kuskokwim River under Federal regulations. Harvest would not likely increase as this is already legal under State regulations. In addition, this regulation change would align Federal and State regulations reducing user confusion and regulatory complexity.

LITERATURE CITED

ADF&G. 2016. Kuskokwim River Salmon Management Working Group. April 20 Meeting Information Packet. http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareakuskokwim.kswg#/2013. Accessed April, 2016. Division of Commercial Fisheries. Anchorage, AK.

ADF&G. 2017. Regulation Announcements, News releases, and Updates: Commercial, Subsistence, and Personal Use Fishing. On line database. http://www.adfg.alaska.gov/index.cfm?adfg=cfnews.main. Juneau, AK.

ADF&G 2018. 2018 Preliminary Kuskokwim Area salmon season summary. October 4, 2018. Division of Commercial Fisheries. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/995616595.pdf, accessed May 27, 2020.

ADF&G. 2019a. Notice of proposed changes to correct errors and omissions in the regulations of the Alaska Board of Fisheries. June 7, 2019. https://adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/2019_notice_corrections.pdf, accessed May 29, 2020.

ADF&G 2019. 2019 Preliminary Kuskokwim Area salmon season summary. October 2, 2019. Division of Commercial Fisheries. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/1118498937.pdf, accessed May 27, 2020.

ADF&G. 2019. Regulation Announcements, News releases, and Updates: Commercial, Subsistence, and Personal Use Fishing. On line database. http://www.adfg.alaska.gov/index.cfm?adfg=cfnews.main. Juneau, AK.

ADF&G. 2020. 2020 Kuskokwim Management Area Commercial Fisheries Bethel Test Fish Database. On line database. https://adfg.alaska.gov/index.cfm?adfg=commercialbyareakuskokwim.btf. Juneau, AK.

Alaska Sustainable Salmon Fund. 2015. July 2015 Completion Report for Kuskokwim River Sockeye Salmon Phase 2. Project Number 44706. Anchorage, AK.

Alt, K. T. 1972. A life history study of sheefish and whitefish in Alaska. ADF&G, Division of Sport Fish, Annual Performance Report, 1971–1972, Federal Aid in Fish Restoration, Project F-9-4, Vol. 13:1–34, R-11, Juneau, AK.

Alt, K. T. 1973. Contributions to the biology of the Bering cisco (*Coregonus laurettae*) in Alaska. Journal of the Fisheries Research Board of Canada 30:1885–1888.

Alt, K. T. 1977. Inconnu, (*Stenodus leucichthys*), migration studies in Alaska 1961–74. Journal of the Fisheries Research Board of Canada 34:129–133.

Alt, K. T. 1979. Contributions to the life history of the humpback whitefish in Alaska. Transactions of the American Fisheries Society 108:156–160.

Alt, K. T. 1981. A life history study of sheefish and whitefish in Alaska. ADF&G, Division of Sport Fish, Annual Performance Report 1980–1981, Federal Aid in Fish Restoration, Project F-9-13, Vol. 22:1–28, R-II-A&B, Juneau, AK.

Brown, R. J. 2006. Humpback whitefish *Coregonus pidschian* of the upper Tanana River drainage. U.S. Fish and Wildlife Service, Alaska Fisheries Technical Report Number 90, Fairbanks.

Brown RJ, Brown C, Braem NM, Carter III WK, Legere N, Slayton L. 2012. Whitefish biology, distribution, and fisheries in the Yukon and Kuskokwim River Drainages in Alaska: a Synthesis of Available Information. Alaska Fisheries Data Series Number 2012-4. U.S. Fish and Wildlife Service. Technical Report

Gates, S., K. Harper, J. Boersma. 2017. Population demographics of Broad Whitefish spawner near McGrath, Alaska, 2014 and 2015. U.S. Fish and Wildlife Service, Alaska Fisheries Data Series Number 2017-06, Soldotna, AK.

Hamazaki T., M. J. Evenson, S.J. Fleischman, and K. L. Schaberg 2012. Spawner-Recruit analysis and escapement goal recommendation for Chinook Salmon in the Kuskokwim River Drainage, ADF&G, Fishery Manuscript Series No. 12-08, Anchorage, AK.

Harper, K. C., F. Harris, R. J. Brown, T. Wyatt, and D. Cannon. 2007. Stock assessment of broad whitefish, humpback whitefish and least cisco in Whitefish Lake, Yukon Delta National Wildlife Refuge, Alaska, 2001–2003. U.S. Fish and Wildlife Service, Alaska Fisheries Technical Report Number 88, Kenai, AK.

Harper, K., F. Harris, S. J. Miller, and D. Orabutt. 2008. Migratory behavior of broad and humpback whitefish in the Kuskokwim River, 2006. U.S. Fish and Wildlife Service, Alaska Fisheries Data Series Number 2007-11, Kenai, AK.

Harper, K. C., F. Harris, S. J. Miller, and D. Orabutt. 2009. Migration timing and seasonal distribution of broad whitefish, humpback whitefish, and least cisco from Whitefish Lake and the Kuskokwim River, Alaska, 2004 and 2005. U.S. Fish and Wildlife Service, Alaska Fisheries Technical Report Number 105, Kenai, AK.

Larson, S. 2020. 2019 Kuskokwim River Chinook salmon run reconstruction and 2020 forecast. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A20-02, Anchorage, AK.

Liller Z., H., 2017. 2016 Kuskokwim River Chinook Salmon Run Reconstruction and 2017 Forecast, ADF&G, Regional Information Report 3A17-02, Anchorage, AK.

Liller, Z. W., H. Hamazaki, G. Decossas, W. Bechtol, M. Catalano, and N. J. Smith. 2018. Kuskokwim River Chinook Salmon run reconstruction model revision – executive summary. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A.18-04, Anchorage, AK.

Lipka C., and A. Tiernan. 2018. 2017 Kuskokwim area management report. Alaska Department of Fish and Game, Fishery Management Report No. 18-22, Anchorage, AK.

Maciolek, J. A. 1986. Interrelationship of beaver and fishes on the Yukon Delta National Wildlife Refuge. U.S. Fish and Wildlife Service, Division of Fishery Resources, Unpublished Report, Anchorage, AK.

McPhail, J. D., and C. C. Lindsey. 1970. Freshwater fishes of northwestern Canada and Alaska. Fisheries Research Board of Canada, Bulletin 173, Ottawa.

OSM. 2015. Staff Analysis FSA15-02/03/05/07/08. https://www.doi.gov/sites/doi.opengov.ibmcloud.com/files/uploads/FSA15-02_03_07_08.pdf. Office of Subsistence Management, USFWS. Anchorage, AK. 86 pp.

Schaberg, K. L., and Z. W. Liller. 2015. Estimates of the historic run and escapement for the coho salmon stock returning to the Kuskokwim River, 2000-2012. Alaska Department of Fish and Game, Fishery Data Series No. 15-18, Anchorage.

Stein, J. N., C. S. Jessop, T. R. Porter, and K. T. J. Chang-Kue. 1973. Fish resources of the Mackenzie River valley, interim report II. Canada Department of the Environment, Fisheries Service, Winnipeg.

Smith, N. 2020. 2019 season summary and 2020 preseason salmon outlook. Presentation at Yukon-Kuskokwim Delta Subsistence Regional Advisory Council meeting on March 17, 2020 in Bethel, AK. Division of Commercial Fisheries ADF&G. Anchorage, AK.

Smith N. and Z. Liller , 2018. 2017 Kuskokwim River Chinook Salmon run reconstruction and 2018 forecast. ADF&G, Regional Information Report No. 3A18-02 Anchorage.

Stuby, L. 2007. Inriver abundance of Chinook Salmon in the Kuskokwim River, 2002-2006. ADF&G, Fishery Data Series No. 07-93, Anchorage, AK.

Stuby, L. 2010. Spawning locations, seasonal distribution, and migratory timing of Kuskokwim River sheefish using radiotelemetry, 2007–2009. ADF&G, Division of Sport Fish and Commercial Fisheries, Fishery Data Series Number 10-47, Anchorage, AK.

Tiernan, A., C. Lipka, and N. Smith. 2018. Kuskokwim River salmon stock status and Kuskokwim area fisheries, 2019: a report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Special Publication No. 18-19, Anchorage, AK.