| FP21-02 Executive Summary | |
|---|---|
| **General Description** | Proposal FP21-02 requests to reduce the required distance between set nets in Kuskokwim River tributaries from 150 feet to 75 feet. *Submitted by the Yukon Delta National Wildlife Refuge.* |
| **Proposed Regulation** | **§___.27 (e)(4) Kuskokwim Area**<br><br>* * * *<br><br>*(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* ***75*** ~~*150*~~ *feet of any part of another set gillnet.* |
| **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**
**FP21-02**

## ISSUES

Proposal FP21-02, submitted by the Yukon Delta National Wildlife Refuge, requests the Federal Subsistence Board (Board) reduce the required distance between set nets in Kuskokwim River tributaries from 150 feet to 75 feet.

## DISCUSSION

The proponent states that current Federal subsistence fisheries regulations are not parallel with State regulations. This requested regulation change would align Federal and State regulations. The current Federal regulation is more restrictive than the current State regulation. The Alaska Board of Fisheries (BOF) changed the State regulations during the Arctic-Yukon-Kuskokwim (AYK) BOF meeting in January 2019. In addition, the proponent also states that the adoption of this proposal will reduce user confusion and enforcement concerns.

### Current Federal Regulation

***§___.27 (e)(4) Kuskokwim Area***

****

*(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.*

### Proposed Federal Regulation

***§___.27 (e)(4) Kuskokwim Area***

****

*(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 **75** ~~150~~ feet of any part of another set gillnet.*

**Existing State Regulation**

> ***5 AAC 01.270. Lawful gear and gear specifications and operation***
>
> ****
>
> *(e) In that portion of the Kuskokwim River drainage from the north end of Eek Island upstream to the mouth of the Kolmakoff River, no part of a set gillnet located within a tributary to the Kuskokwim River may be set or operated within 75 feet of any part of another set gillnet.*

**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**).

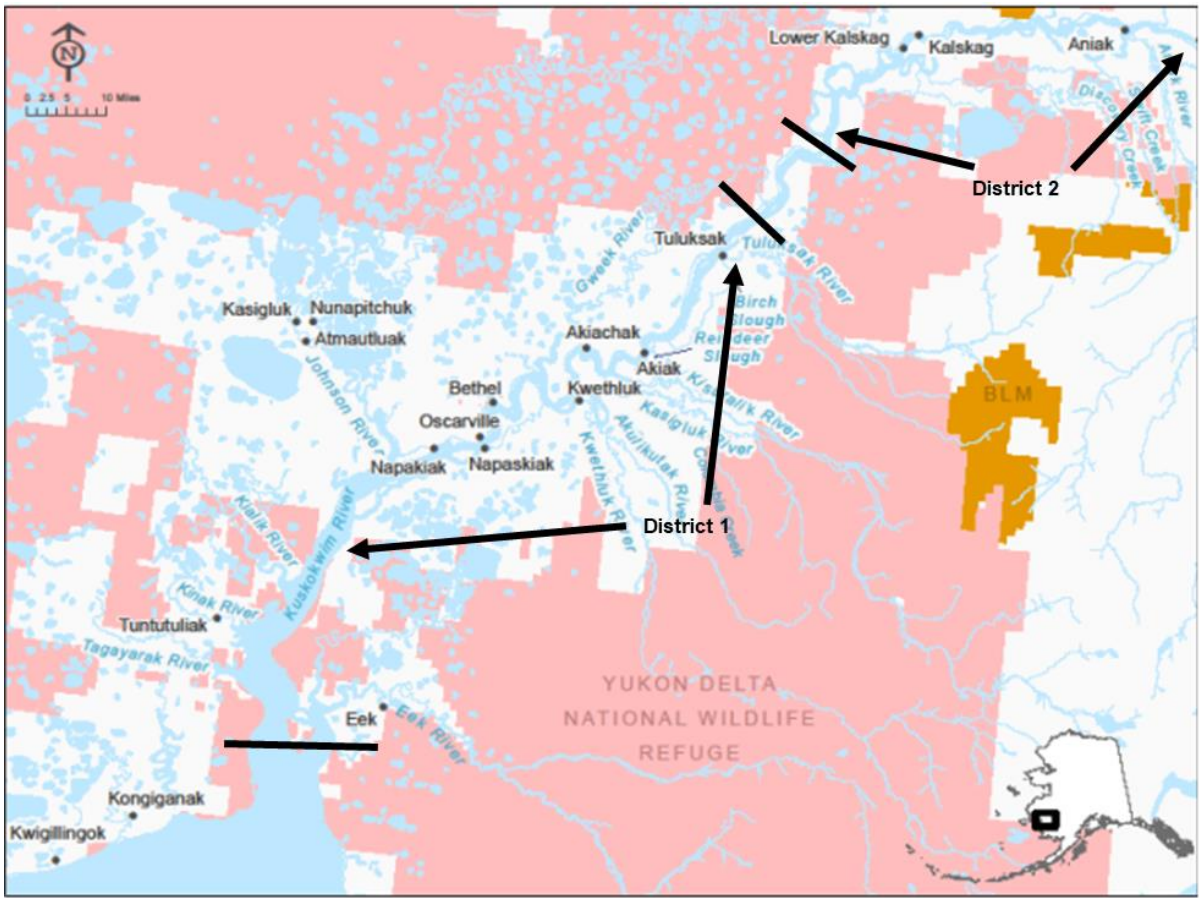


**Figure 1**. The lower Kuskokwim River drainage.

**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**

These regulations were adopted by the Federal Subsistence Board in 1999 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 January 2019, the Alaska BOF took action on Proposal 106, submitted by the Organized Village of Kwethluk, which requested modifying State regulation at 5 AAC 01.270 Lawful gear and gear specifications and operation. The regulation read:

> *(e) In that portion of the Kuskokwim River drainage from the north end of Eek Island upstream to the mouth of the Kolmakoff River, no part of a set gillnet located within a tributary to the Kuskokwim River may be set or operated within 150 feet of any part of another set gillnet.*

The proponent requested allowing the operation of a set gillnet within 50 feet of another set gillnet. The proposal justification stated:

> All throughout the Kuskokwim River drainage there are a few eddies to set gillnets during spring to fall and under ice set nets during winter months where we see nets set less than the current regulation. People along the Kuskokwim River drainages have set gillnets in eddies in spring to fall and under ice gear in winter which are usually less than 150 feet in length. In order to correct this, the department must adopt a revised regulation that meets the needs of set netters throughout the year (ADF&G 2019a).

The Alaska BOF amended Proposal 106 to "within 75 feet" of another set gillnet (ADF&G 2019b: 5). Board members were concerned that nets might get tangled with one another and user conflict might ensue, so they shortened the distance requirement to 75 feet rather than to 50 feet as requested by the Organized Village of Kwethluk.

**Biological Background**

Chinook Salmon

*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 the Alaska Department of Fish and Game (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 |

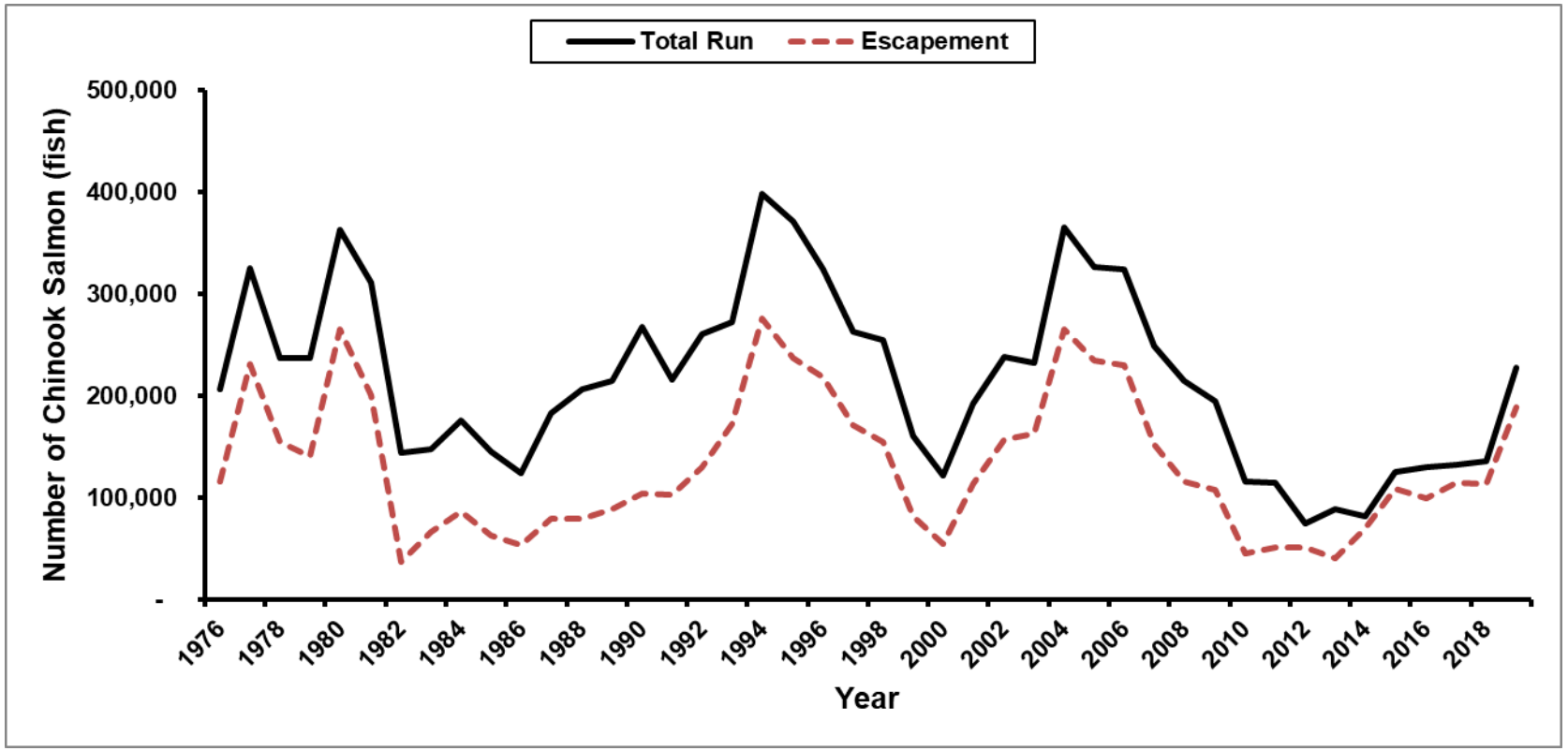


**Figure 1**. Estimates of Kuskokwim River Chinook Salmon total run-sizes and escapements from 1976 to 2019. Estimates are produced from the Kuskokwim River Chinook Salmon Run-Reconstruction Model (Larson 2020).

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).

**Cultural Knowledge and Traditional Practices**

Seventeen communities, from Tuntutuliak to Chuathbaluk, are situated in the lower and middle Kuskokwim River drainage within or near the exterior boundary of the Yukon Delta National Wildlife Refuge. The majority of residents belong to the *Kusquqvagmiut* confederation of villages and Yup'ik cultural tradition (Oswalt 1980, Fienup-Riordan 1984). Most non-Natives living in the area reside in Bethel and Aniak, the regional hubs of Federal and State governments, transportation, trade, and services. The population of the area tripled in the 50 years between 1960 and 2010. In 1960, the U.S. Census Bureau's population estimate was 4,023 people. In 2010, it estimated 12,133 permanent residents were living in 3,482 households across these communities (ADCCED 2014).

Fishing with nets in tributaries of the Kuskokwim River is a well-documented subsistence activity (Andrews and Peterson 1983; Brown et al. 2012, 2013; Coffing 1991; Coffing et al. 2001; Ikuta et al. 2013, 2014, 2016; Krauthoefer et al. 2007; Oswalt 1959; Ray et al. 2010).

At the BOF meeting in January 2019, several residents of Kwethluk provided oral testimony on how this regulation might affect subsistence users. One said, "We recognize very few good areas from the mouth [of the Kuskokwim River] up to Kolmakoff, set gillnet sites that are productive. The Kuskokwim is a changing river every year. We don't have any issues or problems with 50 ft. [separation of nets]. There are very few eddy areas, good set net areas for subsistence users" (ADF&G 2019c). Another testifier recounted being ticketed along with four elders for having their nets too close together in the Kwethluk River. It is not unusual to see people staking their set nets closer than 150 ft. from one another with no conflict. One resident explained,

> Traditionally we do our set net fishing in respect for other set nets. We don't set our nets right next to next person due to respect and old traditional way. One of the elders said to me, "Why are they putting regulations on our set nets like this? I'm an old person. I am not going to set my net with a yard stick." We don't try to set net close to next person. You can set your net wherever you want and if a fish comes along, it's not going to say that net's better than the other one. We catch what we want. To my point of view, regulations discourage younger people to go out and do subsistence. In a way they are good, but over-regulating everything since I was growing up. . . . I learned everything on my own. My dad didn't tell me to do this or that. He let me go out and learn by myself. You can get it if you're learning by yourself. Old traditional way is we don't set right next to them. We keep our distance (ADF&G 2019c).

**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 pounds (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) (ADF&G 2018). 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 Northern 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**

If Proposal FP21-02 is adopted, Federally qualified subsistence users will be able to place set nets 75 feet apart in tributaries of the Kuskokwim River. Typically, there are limited numbers of good set net sites on a river, and this regulation change may allow more users to be able to fish during subsistence opportunities. In addition, Federal and State regulations will be aligned, decreasing confusion among users. Tributaries that have spawning populations of salmon have been closed to fishing during the Chinook Salmon run since 2015 under Federal special actions. If regulations to conserve Chinook Salmon continue into the future, fishing with set nets only 75 feet will only occur in non-salmon spawning tributaries during the Chinook Salmon run. However, increasing the numbers of set nets placed in the tributaries may increase harvest on anadromous and resident species. Conversely, the catch rates of each set net may decrease due to increased competition.

If Proposal FP21-02 is not adopted, if and when Federal public waters in Kuskokwim tributaries are closed to the harvest of salmon by nonsubsistence uses, then Federally qualified subsistence users will not be able to fish under the less restrictive State regulations. This may limit the number of users who can place a set net in good fishing locations on the river. Also, Federal and State regulations would not be aligned, potentially creating confusion.

**OSM PRELIMINARY CONCLUSION**

**Support** Proposal FP21-02.

**Justification**

There are a limited number of good set net sites within the Kuskokwim River drainage. Allowing Federally qualified subsistence users to place subsistence nets 75 feet apart will increase fishing opportunities within the tributaries of the Kuskokwim River drainage. Harvest will not likely increase as users can already set nets 75 feet apart under State regulations. In addition, aligning State and Federal regulations will reduce user confusion.

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