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Options for Amounts Reasonably Necessary for Subsistence Uses of Salmon: Kuskokwim Area

Prepared for the January 2013 Anchorage Alaska Board of Fisheries Meeting

By

Hiroko Ikuta

December 2012

Alaska Department of Fish and Game

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the reports by the Department of Fish and Game. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

all commonly-accepted abbreviations e.g., Mr., Mrs., AM, PM, etc.	
all commonly-accepted professional titles e.g., Dr., Ph.D., R.N., etc.	
Alaska Administrative Code	AAC
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures):	first three letters (Jan,...,Dec)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

SPECIAL PUBLICATION NO. BOF 2012-07

OPTIONS FOR AMOUNTS REASONABLY NECESSARY FOR SUBSISTENCE USES OF SALMON: KUSKOKWIM AREA

PREPARED FOR THE JANUARY 2013 ANCHORAGE ALASKA BOARD OF FISHERIES MEETING

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ABSTRACT

This report provides options for amounts reasonably necessary for subsistence (ANS) for consideration by the Alaska Board of Fisheries (board) as it discusses proposals addressing subsistence salmon fisheries in the Kuskokwim Area during its January 2013 meeting. The subsistence salmon fisheries are important for residents of the Kuskokwim Area, as well as for subsistence fishers in the Yukon-Kuskokwim Delta in general. New information resulting from methodological changes in the postseason subsistence salmon harvest monitoring program warrants revisiting the data used by the board to establish the current ANS findings for the Kuskokwim Area.

Key words: Subsistence fishing, amount necessary for subsistence, customary and traditional uses, Kuskokwim River drainage, Kuskokwim Area, king salmon, chum salmon, sockeye salmon, coho salmon, Board of Fisheries.

INTRODUCTION

This report has been prepared for the Alaska Board of Fisheries (board) for reference when considering Proposal 104, which has implications for subsistence fisheries, during its January 2013 meeting. This proposal provides an opportunity for the board and public to revisit the amounts reasonably necessary for subsistence findings (ANS) for salmon stocks in the Kuskokwim Area. Under 5 AAC 01.286., current ANS findings are 64,500–83,000 king salmon in the Kuskokwim River drainage; 39,500–75,500 chum salmon in the Kuskokwim River drainage; 27,500–39,500 sockeye salmon in the Kuskokwim River drainage; 24,500–35,000 coho salmon in the Kuskokwim River drainage; and 7,500–13,500 salmon in the remainder of the Kuskokwim Area.

The subsistence salmon fisheries in the Kuskokwim Area are some of the largest in the state of Alaska, in terms of the number of residents who participate and the number of salmon harvested (Fall et al. 2012). Since 1994, when the department began acquiring reasonably complete statewide coverage of subsistence harvest survey data, 54% of king salmon harvested under subsistence regulations have been taken in the Kuskokwim Area, mostly in the Kuskokwim River drainage. Alaska Department of Fish and Game (department) Division of Subsistence studies in the region indicate that fish contribute as much as 85% to the total pounds of fish and wildlife harvested in a community, and salmon contribute as much as 53% to the total annual harvest of wild foods harvested for subsistence (Simon et al. 2007:1). Residents of the Kuskokwim Area harvest 5 species of Pacific salmon for subsistence purposes: king *Oncorhynchus tshawytscha*, chum *O. keta*, coho *O. kisutch*, pink *O. gorbuscha*, and sockeye *O. nerka* salmon (appendices A and B). Drift gillnetting, set gillnetting, and hook and line fishing are the primary methods used when harvesting salmon, although additional gear types are allowed as specified in 5 AAC 01.270.

SUBSISTENCE SALMON HARVEST MONITORING PROGRAM

The department has been estimating Kuskokwim Area subsistence salmon harvests annually by postseason subsistence harvest survey since 1960: by the Division of Commercial Fisheries in 1960–1987, by the Division of Subsistence in 1988–2007, and by the Division of Commercial Fisheries since 2008 (Carroll and Hamazaki 2012a, 2012b). The purpose of the survey is to collect data about the number and species of salmon harvested by area residents. The postseason subsistence harvest survey for the majority of communities was designed based on a stratified random survey methodology (Scheaffer et al. 1999). From 1989 to 2010, each household was classified into three strata based on the household's recent 2-year history of participation in the subsistence fishery. In 2011, the above household classification was expanded into 5 strata based on a household's most recent 2 known years of participation within the past 5 years of the subsistence fishery. These data are analyzed to provide an estimate of the number of salmon harvested for subsistence purposes. This information has been used by the department, the U.S. Fish and

Wildlife Service (USFWS), the board, and the Federal Subsistence Board to manage customary and traditional uses of salmon and to provide reasonable opportunity for continued customary and traditional (C&T) uses of salmon throughout the area.

In the Kuskokwim Area, there are 38 communities, 28 of which are surveyed each year on a voluntary basis (Figure 1). The north Kuskokwim Bay communities of Kwigillingok, Kongiganak, and Kipnuk are not located on the Kuskokwim River, but many subsistence salmon fishing households from these communities have traveled to the Kuskokwim River to fish. Except in 2000 and 2004, only the community of Kongiganak (92 households in 2010, Carroll and Hamazaki 2012a) has participated in the voluntary ADF&G harvest survey. The communities of Quinhagak, Goodnews Bay, and Platinum, located in south Kuskokwim Bay, comprise 7% of the total Kuskokwim Area households (Carroll and Hamazaki 2012b). Subsistence users from Bering Sea coastal communities have chosen to not participate in the department study for most years. These include the communities of Mekoryuk (on Nunivak Island), Newtok, Tununak, Toksook Bay, Nightmute, and Chefornak (Carroll and Hamazaki 2012a, 2012b).

In 2008, the responsibility for estimating the subsistence salmon harvest in the Kuskokwim Area was returned to the Division of Commercial Fisheries. Upon this transition, the Division of Commercial Fisheries reviewed the archived data from 1990 to 2007 and developed estimated harvests from reported harvests that were stratified and expanded to represent total annual harvests from some nonsurveyed households and some communities, based on their historical harvest patterns. The resulting estimates of harvest reported in each community were similar to the original estimates originally produced by the Division of Subsistence, and the analysis indicated that the change in methodology would not unduly bias or affect the accuracy of the results, compared with previous results (Carroll and Hamazaki 2012b Hamazaki 2011). However, after expanding reported harvest estimates to represent the total harvest for those communities considered, including some households and communities that were not surveyed, the new estimates tended to be higher than the original estimates. The difference was attributed to adopting a different stratified random sampling design from that used during 1988–2007; the new design was thought to better represent household fishing patterns within a community, and the department used a new statistical approach for estimating harvest from some unsurveyed or underrepresented communities based on each community's historical harvest patterns (Hamazaki 2011).

It is important to note that there are still some communities for which there have been no previous estimates of subsistence salmon harvests from which to develop models of recent harvests using this new method; thus, the data used in this report to revisit previous ANS findings on Kuskokwim Area salmon stocks is not without limitations. In short, the data included in this report represent the best available information to revisit historical subsistence salmon harvests in the Kuskokwim Area, although there is likely additional subsistence salmon harvest not represented here.

The new harvest enumeration method is thought to provide a more complete estimation of subsistence salmon harvests by species than previous methods because of the use of statistical techniques to model subsistence salmon harvest for some uncontacted communities based on prior years' harvest estimates. The resulting revised, expanded harvest estimates now produced by the Division of Commercial Fisheries tend to be higher than those previously published by the Division of Subsistence. The current ANS findings, adopted by the board in 2001, are therefore based on estimates that, after revision of harvest estimation methods, appear to have been too low and that cannot now be directly compared to estimates calculated by the new method.

BACKGROUND OF ANS DETERMINATION

Under AS 16.05.258(a), the board is charged with identifying fish stocks, or portions of stocks, that "are customarily taken or used for subsistence" (a "C&T" finding). If a portion of these stocks can be harvested consistent with sustained yield principles, the board "shall determine the amount of the harvestable portion that is reasonably necessary for subsistence uses" [AS 16.05.258(b)]. This is called the amount reasonably necessary for subsistence, or an "ANS finding."

In 1987, the board found that salmon in the Kuskokwim Area are customarily and traditionally taken or used for subsistence. In 1993, the board revisited C&T uses of salmon in the Kuskokwim Area, reaffirmed the 1987 C&T finding, and identified the ANS for subsistence for all salmon, combined, to be 192,000–242,000 salmon.

In 2001, the board again revisited the C&T finding of Kuskokwim Area salmon and made species-specific salmon C&T findings and corresponding species-specific ANS findings for the Kuskokwim River drainage (Appendix C). However, for the remainder of the Kuskokwim Area—that is, for all parts of the area except the Kuskokwim River drainage—the board maintained a C&T finding for salmon as a group, rather than making species-specific findings (Appendix D). The board set the ANS based upon the harvest history in the Kuskokwim Area during the years 1990–1999 (5 AAC 01.286). Division of Subsistence provided options for determining the ANS to the board in 2001, and the board chose to utilize the low harvest and the average harvest over the 10-year period to determine the ANS for each salmon species in the Kuskokwim River drainage (except pink salmon, due to the fact that subsistence harvests of pink salmon had not typically been documented as part of the postseason household survey program; Table 1). The board also chose, at this time, to determine the ANS for salmon as a group for the remainder of the Kuskokwim Area (Table 2).

Table 1.–Estimated subsistence salmon harvests in the Kuskokwim River drainage (1990–1999) used for ANS determination in 2001.

	Low	Average	High	ANS
King salmon	64,795	82,762	96,436	64,500– 83,000
Chum salmon	39,970	75,143	126,508	39,500– 75,500
Sockeye salmon	27,791	39,204	52,984	27,500–39,500
Coho salmon	24,864	34,803	50,370	24,500 –35,000

Source Customary and Traditional Use Eight Criteria Worksheet (ADF&G Division of Subsistence, 2001; see Appendix C).

Table 2.–Estimated subsistence harvests in the remainder of the Kuskokwim Area (1990–1999) used for ANS determination in 2001.

	Low	Average	High	ANS
King salmon	3,535	4,511	6,699	n/a
Chum salmon	1,006	3,004	4,961	n/a
Sockeye salmon	823	2,073	3,420	n/a
Coho salmon	1,682	3,416	5,922	n/a
Total	7,046	13,004	21,002	7,500–13,500

Source Customary and Traditional Use Eight Criteria Worksheet (ADF&G Division of Subsistence, 2001; see Appendix C).

The Kuskokwim River drainage includes communities along the drainage as well as Kipnuk, Kwingillingok, and Kongiganak in North Kuskokwim Bay. The remainder of the Kuskokwim Area includes communities in South Kuskokwim Bay (Quinhagak, Goodnews Bay, and Platinum) and along the Bering Sea Coast (Mekoryuk, Newtok, Nightmute, Toksook Bay, Tununak, and Chefornak).

ANS OPTIONS IN 2013

Following are options for the board to consider should it choose to update its 2001 actions and adopt ANS ranges in regulation during its January 2013 meeting. The department submitted and supports reviewing the ANS ranges for salmon in the Kuskokwim Area due to Division of Commercial Fisheries' revised historical harvest estimates resulting from a new harvest estimation method applied to historical data originally collected by the Division of Subsistence. In 2001, the board set the ANS for subsistence findings based upon the low and average harvests in the Kuskokwim Area. The board may use a similar method, or it could use low to high harvest, or it could choose a different method when making new findings. The options presented below were developed using data resulting from the Kuskokwim Area postseason subsistence salmon harvest monitoring program (tables 3–6).

KUSKOKWIM RIVER DRAINAGE, OPTION A: RANGE BASED UPON LOW AND AVERAGE HARVESTS, 1990 –1999.

Option A is based upon the low and average harvests in the Kuskokwim River drainage 1990–1999 (Table 3). In 2001, the board set the ANS for subsistence findings in codified regulations based upon the low and average harvests on the Kuskokwim River drainage during the years 1990–1999. Option A uses the same logic as the board's ANS determination in 2001, yet, as Table 3 shows, it is based on the new harvest estimates produced by the Division of Commercial Fisheries in 2008 and therefore shows higher ANS ranges than the findings in the 2001, particularly for king salmon.

Table 3.–Low and average subsistence salmon harvests in the Kuskokwim River drainage, 1990–1999 (Option A).

Salmon species	Low	Average	High	Revised ANS	Current ANS
King salmon	72,775	89,016	109,778	72,800–89,000	64,500–83,000
Chum salmon	37,366	80,931	153,825	37,400–80,900	39,500–75,500
Sockeye salmon	30,905	42,438	51,616	30,900–42,400	27,500–39,500
Coho salmon	24,623	37,609	57,560	24,600–37,600	24,500–35,000

Source T. Hamazaki, Biometrician III, ADF&G Division of Commercial Fisheries, Anchorage, personal communication, September 24, 2012.

KUSKOKWIM RIVER DRAINAGE, OPTION B: RANGE BASED UPON LOW AND AVERAGE HARVESTS, 2000–2009.

Option B is based upon the low and average harvests in the Kuskokwim River drainage during 2000–2009; these harvest estimates are of more recent years (Table 4). This option excludes subsistence harvest estimates in 2010, when fishers made more efforts to meet their harvest goals due to a below-average king salmon run, and in 2011, when subsistence fishing was restricted and the harvest estimates did not meet the lower range of ANS.

Option B includes an ANS option for pink salmon based on the harvest data between 2005 and 2009. In 2001, the board was unable to determine ANS options for pink salmon due to lack of data. The department began collecting subsistence pink salmon harvest data in 2005, and there may now be enough information to establish an ANS. However, it should be understood that the harvest of pink salmon is likely incidental to harvest of other salmon species. Hence, the pink salmon harvest is not a

directed harvest for subsistence use. Currently, pink salmon are not actively managed in the Kuskokwim Area.

Table 4.–Low and average subsistence salmon harvests in the Kuskokwim River drainage, 2000–2009 (Option B).

	Low	Average	High	Revised ANS	Current ANS
King salmon	67,228	84,182	98,099	67,200 –84,200	64,500–83,000
Chum salmon	41,217	64,128	89,500	41,200–64,100	39,500–75,500
Sockeye salmon	32,237	43,253	58,732	32,200–43,300	27,500–39,500
Coho salmon	29,559	38,766	48,898	29,600–38,800	24,500–35,000
Pink salmon	517	1,269	1,989	500–1,300	n/a

Source T. Hamazaki, Biometrician III, ADF&G Division of Commercial Fisheries, Anchorage, personal communication, September 24, 2012 for king salmon, chum salmon, sockeye salmon, and coho salmon; and November 15, 2012 for pink salmon.

KUSKOKWIM RIVER DRAINAGE, OPTION C: RANGE BASED UPON LOW AND AVERAGE HARVESTS, 1990–2009.

Option C is based upon the low and average harvests in the Kuskokwim River drainage over the 20-year period 1990–2009 (Table 5). This option excludes 2010, when fishers made more efforts to meet their harvest goals due to a below-average king salmon run, and 2011, when subsistence fishing was restricted and the harvest estimates did not meet the lower range of ANS. Like Option B, Option C includes an ANS option for pink salmon based on the harvest data from 2005 through 2009. However, it should be understood that the harvest of pink salmon is likely incidental to harvest of other salmon species. Hence, the pink salmon harvest is not a directed harvest for subsistence use. Currently, pink salmon are not actively managed in the Kuskokwim Area. Note that the highest harvest for king, chum, and coho salmon was in 1990 (Table 5).

Table 5.–Low and average harvests in the Kuskokwim River drainage, 1990–2009 (Option C).

Salmon species	Low	Average	High	Revised ANS	Current ANS
King salmon	67,228	86,599	109,778	67,200–86,600	64,500–83,000
Chum salmon	37,366	72,529	153,825	37,400–72,500	39,500–75,500
Sockeye salmon	30,905	42,846	58,732	30,900–42,800	27,500–39,500
Coho salmon	24,623	38,187	57,560	24,600–38,200	24,500–35,000
Pink salmon	517	1,269	1,989	500–1,300	n/a

Source T. Hamazaki, Biometrician III, ADF&G Division of Commercial Fisheries, Anchorage, personal communication, September 24, 2012 for king salmon, chum salmon, sockeye salmon, and coho salmon; and November 15, 2012 for pink salmon.

Note n/a = not applicable because currently there is no ANS for pink salmon.

SOUTH KUSKOKWIM BAY, OPTIONS D, E, AND F: RANGE BASED UPON LOW AND AVERAGE HARVESTS.

In 2001, the board determined ANS options for all species of salmon for the remainder of the Kuskokwim Area, which consists of communities in South Kuskokwim Bay (e.g., Quinhagak, Goodnews Bay, and Platinum) and along the Bering Sea Coast (Table 6). As described earlier, Bering Sea coastal communities have chosen not to participate in the postseason harvest surveys for most years; therefore, a

time series of subsistence harvest data for the Bering Sea Coast subarea is lacking. Salmon fisheries are intensively managed in the South Kuskokwim Bay subarea and harvest data in the South Kuskokwim Bay communities are available from 1990 to 2011. Under subsistence law (5 AAC 99.010), the department suggests considering ANS options for the South Kuskokwim Bay subarea separately.

Table 6.–Low and average harvests in South Kuskokwim Bay (Quinhagak, Goodnews Bay, and Platinum; options D, E, and F).

Years	Low	Average	High	ANS Options	Current ANS
Option D: 1990–1999	6,939	11,312	16,975	6,900 –11,300	n/a
Option E: 2000–2009	8,973	11,593	16,220	9,000 –11,600	n/a
Option F: 1990–2009	6,939	11,286	16,975	6,900 –11,300	n/a

Source T. Hamazaki, Biometrician III, ADF&G Division of Commercial Fisheries, Anchorage, personal communication, September 24, 2012 for king salmon, chum salmon, sockeye salmon, and coho salmon; and November 15, 2012 for pink salmon.

BERING SEA COAST, OPTION G: RANGE BASED UPON LOW AND HIGH HARVESTS IN 2011.

Option G is based upon subsistence salmon harvest data collected for the 2011 fishing season by Wolfe et al. 2012. Sponsored by the Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative,[1] the project documented subsistence salmon harvests by six coastal Bering Sea communities: Cherfornak, Mekoryuk, Newtok, Nightmute, Toksook Bay, and Tununak. These communities typically choose not to participate in the department's annual salmon harvest monitoring program; therefore, this project provides the only available subsistence harvest data for the region. Since there is only a single year of harvest data, there is not enough information to understand harvest trends and variations. To develop an ANS range based on a single year's data, the 95% confidence limit of ±7.07% was applied to the six communities' estimated total salmon harvest of 13,446 salmon (± 951 salmon). Salmon harvested in this area are likely a mixture of local spawning stocks and salmon migrating farther north to the Yukon River and the Norton Sound-Port Clarence Area.

Table 7.–Estimated salmon harvest, with 95% confidence limit, for the Bering Sea Coast (Mekoryuk, Newtok, Nightmute, Toksook Bay, Tununak, and Cherfornak), 2011 (Option G).

Year	Low	Estimated	High	ANS	Current ANS
2011	12,495	13,446	14,397	12,500 –14,400	n/a

Source Wolfe et al. 2012:20

OPTION H: NO ACTION

Option H is to maintain status quo by keeping the current amounts reasonably necessary for subsistence.

1. The Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative is "the largest example of co-management of research funding addressing salmon within the Pacific Rim." (http://www.aykssi.org, accessed December 7, 2012). Signatory organizations are ADF&G; the Association of Village Council Presidents; Bering Sea Fishermen's Association; Kawerak, Inc.; NOAA Fisheries; Tanana Chiefs Conference; and the U.S. Fish and Wildlife Service.

Figure 1.–Kuskokwim Area.

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APPENDIX A: HISTORICAL SUBSISTENCE HARVEST ESTIMATES FOR ALL SPECIES OF SALMON IN THE KUSKOKWIM RIVER DRAINAGE, 1990–2011

Year	King	Chum	Sockeye	Coho	Pink	Total
1990	109,778	153,825	45,897	57,560	–	367,060
1991	74,820	87,237	47,370	39,252	–	248,679
1992	82,648	116,373	43,486	52,305	–	294,811
1993	87,674	59,797	51,616	28,485	–	227,572
1994	103,343	76,937	42,362	36,609	–	259,251
1995	102,110	70,977	30,905	36,828	–	240,819
1996	96,415	100,900	40,589	43,199	–	281,103
1997	79,382	37,366	38,745	29,817	–	185,309
1998	81,219	61,652	36,052	24,623	–	203,545
1999	72,775	44,242	47,360	27,409	–	191,786
2000	70,833	59,369	48,766	45,911	–	224,878
2001	78,009	56,005	53,245	31,089	–	218,349
2002	80,983	86,406	32,272	42,617	–	242,278
2003	67,228	41,217	32,237	33,291	–	173,973
2004	97,110	64,899	40,405	48,898	–	251,312
2005	85,097	58,020	41,517	33,351	1,516	219,500
2006	90,094	89,500	43,143	41,272	1,989	265,998
2007	96,139	73,561	47,272	35,212	1,306	253,490
2008	98,099	68,678	58,732	46,461	1,015	272,985
2009	78,225	43,621	34,943	29,559	517	186,865
2010	66,053	46,143	38,130	32,094	435	182,855
2011	58,836	49,717	40,207	29,583	713	179,055
10-year average (1990–1999)	89,016	80,931	42,438	37,609	–	249,994
10-year average (2000–2009)	84,182	64,128	43,253	38,766	–	230,328
5-year average (2005–2009)	89,531	66,676	45,121	37,171	1,269	239,768
Historical average (1990–2011)	84,403	70,293	42,511	37,519	–	234,726

Source T. Hamazaki, Biometrician III, ADF&G Division of Commercial Fisheries, Anchorage, personal communication, September 24, 2012 for king salmon, chum salmon, sockeye salmon, and coho salmon; and November 15, 2012 for pink salmon.

Note Dash (–) indicates no pink salmon harvests collected; pink salmon harvests were not collected until 2005.

APPENDIX B: HISTORICAL SUBSISTENCE SALMON HARVEST ESTIMATES FOR ALL SPECIES OF SALMON IN THE SOUTH KUSKOKWIM BAY (QUINHAGAK, GOODNEWS BAY, AND PLATINUM), 1990–2011.

Year	King, chum, sockeye, and coho	Pink	Total
1990	16,330	–	16,330
1991	14,379	–	14,379
1992	16,975	–	16,975
1993	10,712	–	10,712
1994	11,338	–	11,338
1995	8,079	–	8,079
1996	8,152	–	8,152
1997	6,939	–	6,939
1998	10,120	–	10,120
1999	10,098	–	10,098
2000	8,973	–	8,973
2001	9,582	–	9,582
2002	9,429	–	9,429
2003	9,007	–	9,007
2004	12,887	–	12,887
2005	11,118	50	11,168
2006	15,560	173	15,733
2007	12,885	37	12,922
2008	15,886	334	16,220
2009	9,978	26	10,004
2010	9,925	232	10,157
2011	9,058	29	9,087
10-year average (1990–1999)	11,312	–	11,312
10-year average (2000–2009)	11,531	–	11,593
5-year average (2005–2009)	13,085	124	13,209
Historical average (1990–2011)	11,246	–	11,286

Source T. Hamazaki, Biometrician III, ADF&G Division of Commercial Fisheries, Anchorage, personal communication, September 24, 2012 for king salmon, chum salmon, sockeye salmon, and coho salmon; and November 15, 2012 for pink salmon.

Note Dash (–) indicates no pink salmon harvests collected; pink salmon harvests were not collected until 2005.

APPENDIX C: CUSTOMARY AND TRADITIONAL USE EIGHT CRITERIA WORKSHEET, KUSKOKWIM RIVER DRAINAGE, PREPARED BY ADF&G DIVISION OF SUBSISTENCE, JANUARY 2001

RC412

CUSTOMARY AND TRADITIONAL USE EIGHT CRITERIA WORKSHEET

Prepared by the Division of Subsistence
Alaska Department of Fish and Game
January 2001

KUSKOKWIM RIVER DRAINAGE:
CHINOOK SALMON
CHUM SALMON
SOCKEYE SALMON
COHO SLMON
PINK SALMON

In 1987 and again in 1993 the Board of Fisheries heard a report from the Division of Subsistence and made a finding that there are customary and traditional uses of Kuskokwim Area salmon. In 1993, the board also identified the amounts necessary for subsistence for all salmon to be 192,000 – 242,000.

1. **A long term (1 generation or more), consistent pattern of taking, use, and reliance on the fish stock or game population that has been established over a reasonable period of time, excluding interruption by circumstances beyond the user's control, such as unavailability of the fish or game caused by migratory patterns.**

The use of salmon for subsistence by people living in the Kuskokwim Area predates recorded history. Records and journals written by early explorers, traders, and missionaries who came into contact with local residents in the 1800s and early 1900s describes the use of salmon and indicates that salmon were an important subsistence resource for many of the area inhabitants (Zagoskin 1847; Nelson 1899, Spurr 1950, Oswalt 1963, Hinkleman & Vitt 1985, Bendell 1987). Reports prepared by federal fisheries management staff occasionally described the subsistence fishery during the period from the 1920s to statehood (Bower 1923, Pennoyer, Middleton and Morris 1965, U.S. Department of Interior 1931, 1939 and 1940). The Department of Fish and Game has collected subsistence salmon harvest information for most Kuskokwim Area communities since 1960 (Walker and Brown 198, Alaska Department of Fish ad Game 1989 – 2000). Descriptions of the harvest and use of salmon in the 1980s are provided in Charnley 1984, Stickney 1984, Wolfe et al. 1984, Stokes 1985, Kari 1985, Andrews and Coffing 1986, Andrews and Peterson 1983 and Coffing 1991.

1

2. A use pattern recurring in specific seasons of the year.

Customarily, salmon were harvested from the time they first arrived in spring until freeze-up in fall. Harvest timing is directly related to run timing of the salmon, which varies along the length of the Kuskokwim. Peak times for harvesting chinook salmon are June 5 through July 5, however, in some years it is mid-July before chinook salmon reach some subsistence fishing areas used by Nikolai residents (Stokes 1985). Sockeye and chum salmon are harvested primarily from June 10 through July 25 and most coho salmon are taken from August 1 through September 15. Some level of coho fishing effort harvests continues well through October in several communities located along Kuskokwim Bay, as well those communities located along the Kuskokwim River drainage. Except for closures related to commercial salmon fishing periods, subsistence salmon fishing in the Kuskokwim Area is open continually.

3. A use pattern consisting of methods and means of harvest which are characterized by efficiency and economy of effort and cost.

Salmon were customarily harvested with traps, weirs, spears, seines, dipnets, as well as set and drift gill nets made of seal skin or willow bark. Near the turn of the century, fishwheels were introduced by miners and readily adopted by local fishermen along the middle and upper Kuskokwim River drainage. Today, set and drift gillnets are the most common type of gear used to harvest salmon throughout most of the Kuskokwim Area. Fishwheels continue to be used by some families in the middle and upper Kuskokwim drainage. Spears are used in portions of the Kuskokwim Area including the Kanektok River drainage. Some families who do not have boats or nets rely on rod and reel gear for catching salmon for their family. When residents of Nikolai were notified in 1967 that their customary use of fish traps to take salmon was illegal, people adopted the use of rod and reel gear for harvesting chinook salmon along the Salmon Fork and the Little Tonzona rivers. Rod and reel gear is the most efficient gear in this area for taking chinook salmon.

4. The area in which the noncommercial long term and consistent pattern of taking, use, and reliance upon the fish stock or game population has been established.

Subsistence salmon fishing areas are usually reasonably accessible from a family's community or salmon fishing camp. As local people have done for generations, many families return to summer fishing camps along the river where they base their salmon fishing and processing activities. Many of these camps have been used for generations, however, relocation of fishing camps due to erosion or changes in the river channel are common (Coffing 1991). Some fishcamps are located relatively close to a family's permanent residence while others are located many miles away. Residents of some communities located away from good fishing waters move to fishing camps along the Kuskokwim River or its tributaries during the summer fishing season. For example, residents of three communities located along the Johnson River, west of Bethel, move to fishing sites located along the Kuskokwim River. Residents of Nikolai move to remote fishing sites 130 miles from their community to take chinook salmon near the confluence of the North and South forks of the Kuskokwim River, along the Salmon River, and along the Little Tonzona River. Salmon are also harvested near where people are camped while involved in other subsistence activities such as berry picking and moose hunting.

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5. The means of handling, preparing, preserving, and storing fish or game which has been traditionally used by past generations, but not excluding recent technological advances where appropriate.

Most of the chinook, sockeye, and chum salmon are processed by drying and smoking. Many households own or share a smokehouse and other necessary processing equipment and facilities. Coho salmon are also dried, however, because of unfavorable drying weather during August and September when coho are available, drying and smoking is difficult. Freezing is another common way of preserving salmon. Household freezing capacity is usually limited, therefore, this method is used primarily for coho salmon. Chinook, sockeye, and coho are also preserved by salting and canning. During the fishing season, fresh salmon are a common and frequent food at many meals. Dried salmon is eaten daily throughout most of the year and is a preferred source of lightweight high-energy food which is taken along on most hunting, trapping, and fishing trips.

6. A use pattern which includes the handing down of knowledge of fishing or hunting skills, values, and lore from generation to generation.

Knowledge and skills associated with subsistence salmon fishing are taught by involving young or less experienced individuals in all aspects of salmon fishing, equipment repair and maintenance, and processing. Elder family members often oversee salmon production activities and direct younger family members who cooperatively share in production tasks. Children are often involved in the activities and learn the skills necessary for becoming successful fishers and processors by assisting experienced adults. Men are the primary harvesters while females are the primary processors.

7. A pattern of taking, use, and reliance where the harvest effort or products of that harvest are distributed or shared, including customary trade, barter, and gift-giving.

Households, family groups consisting of related individuals, and complex networks of extended families share fishing camps as well as harvesting and processing responsibilities. Family members unable to actively participate in harvest or production activities provide assistance in the form of fishing gear, gasoline, processing equipment, or other necessary items. Distribution of salmon generally occurs along the same kinship lines which serve to affiliate salmon production groups. Salmon are also shared with friends, elders, and relatives living in other communities.

8. A pattern that includes taking, use, and reliance for subsistence purposes upon a wide diversity of the fish and game resources and that provides substantial economic, cultural, social, and nutritional elements of the subsistence way of life.

Households harvesting salmon for subsistence tend to harvest a wide variety of resources. Freshwater fish, waterfowl, small game, furbearers, and plants are also harvested by most communities. For many Kuskokwim Area communities, salmon represent more than half of the total amount (edible weight) of subsistence resources harvested. In some communities, 70 percent of the households are actively involved in harvesting and processing subsistence salmon.

Examples of per capita harvests of salmon in the Kuskokwim Area are: 613 pounds in Chuathbaluk (1982), 446 in Kwethluk (1986), 342 in Quinhagak (1982), 288 in Nunapitchuk (1983), 211 in Sleetmute (1982), 113 in Tununak (1986).

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KUSKOKWIM AREA SUBSISTENCE SALMON HARVESTS 1990 – 1999.

	District 1 (Lower River)			District 2 (Middle River)			Upper River (All Above District 2)		
	Minimum	Average	High	Minimum	Average	High	Minimum	Average	High
Chinook	52,795	69,207	78,956	7,181	9,357	12,754	3,082	4,197	4,750
Sockeye	21,671	30,733	42,883	2,183	3,315	5,089	3,121	5,156	7,445
Coho	18,979	26,725	43,362	2,010	2,926	4,448	2,976	5,153	7,112
Chum	32,790	58,001	93,743	3,916	10,304	19,132	2,297	6,837	13,633
ALL SPECIES	153,722	184,667	233,946	16,097	25,902	34,691	15,202	21,343	30,583

	District 2 and Upper River			District 4 (Quinhagak)			District 5 (Goodnews/Platinum)		
	Minimum	Average	High	Minimum	Average	High	Minimum	Average	High
Chinook	10,263	13,554	17,480	2,746	3,698	6,013	374	666	917
Sockeye	5,572	8,471	12,534	400	1,173	1,951	253	750	1,282
Coho	4,986	8,079	10,295	1,264	2,427	4,174	305	853	1,828
Chum	7,001	17,142	32,765	600	1,459	3,234	133	325	1,006
ALL SPECIES	31,299	47,245	65,274	5,853	8,757	15,372	1,404	2,594	4,176

	KUSKOKWIM RIVER			REMAINDER OF KUSKOKWIM AREA			TOTAL KUSKOKWIM AREA		
	Minimum	Average	High	Minimum	Average	High	Minimum	Average	High
Chinook	64,795	82,762	96,436	3,535	4,511	6,699	68,686	87,272	100,159
Sockeye	27,791	39,204	52,984	823	2,073	3,420	28,622	41,276	56,404
Coho	24,864	34,803	50,370	1,682	3,416	5,922	27,239	38,220	55,620
Chum	39,970	75,143	126,508	1,006	3,004	4,961	40,976	78,147	131,469
ALL SPECIES	188,476	231,912	293,554	7,588	13,003	20,968	198,466	244,915	314,522

APPENDIX D: CUSTOMARY AND TRADITIONAL USE EIGHT CRITERIA WORKSHEET, THE REMAINDER OF THE KUSKOKWIM AREA, PREPARED BY ADF&G DIVISION OF SUBSISTENCE, JANUARY 2001

CUSTOMARY AND TRADITIONAL USE EIGHT CRITERIA WORKSHEET

Prepared by the Division of Subsistence
Alaska Department of Fish and Game
January 2001

KUSKOKWIM AREA EXCLUDING THE KUSKOKWIM RIVER DRAINAGE: ALL SALMON (REMAINDER OF KUSKOKWIM AREA)

In 1987 and again in 1993 the Board of Fisheries heard a report from the Division of Subsistence and made a finding that there are customary and traditional uses of Kuskokwim Area salmon. In 1993, the board also identified the amounts necessary for subsistence for all salmon to be 192,000 – 242,000.

1. **A long term (1 generation or more), consistent pattern of taking, use, and reliance on the fish stock or game population that has been established over a reasonable period of time, excluding interruption by circumstances beyond the user's control, such as unavailability of the fish or game caused by migratory patterns.**

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7

2. A use pattern recurring in specific seasons of the year.

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Subsistence salmon fishing areas are usually reasonably accessible from a family's community or salmon fishing camp. As local people have done for generations, many families return to summer fishing camps along the river where they base their salmon fishing and processing activities. Many of these camps have been used for generations, however, relocation of fishing camps due to erosion or changes in the river channel are common (Coffing 1991). Some fishcamps are located relatively close to a family's permanent residence while others are located many miles away. Residents of some communities located away from good fishing waters move to fishing camps along the Kuskokwim River or its tributaries during the summer fishing season. For example, residents of three communities located along the Johnson River, west of Bethel, move to fishing sites located along the Kuskokwim River. Residents of Nikolai move to remote fishing sites 130 miles from their community to take chinook salmon near the confluence of the North and South forks of the Kuskokwim River, along the Salmon River, and along the Little Tonzona River. Salmon are also harvested near where people are camped while involved in other subsistence activities such as berry picking and moose hunting.

8

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KUSKOKWIM AREA SUBSISTENCE SALMON HARVESTS 1990 – 1999.

	District 1 (Lower River)			District 2 (Middle River)			Upper River (All Above District 2)		
	Minimum	Average	High	Minimum	Average	High	Minimum	Average	High
Chinook	52,795	69,207	78,956	7,181	9,357	12,754	3,082	4,197	4,750
Sockeye	21,671	30,733	42,883	2,183	3,315	5,089	3,121	5,156	7,445
Coho	18,979	26,725	43,362	2,010	2,926	4,448	2,976	5,153	7,112
Chum	32,790	58,001	93,743	3,916	10,304	19,132	2,297	6,837	13,633
ALL SPECIES	153,722	184,667	233,946	16,097	25,902	34,691	15,202	21,343	30,583

	District 2 and Upper River			District 4 (Quinhagak)			District 5 (Goodnews/Platinum)		
	Minimum	Average	High	Minimum	Average	High	Minimum	Average	High
Chinook	10,263	13,554	17,480	2,746	3,698	6,013	374	666	917
Sockeye	5,572	8,471	12,534	400	1,173	1,951	253	750	1,282
Coho	4,986	8,079	10,295	1,264	2,427	4,174	305	853	1,828
Chum	7,001	17,142	32,765	600	1,459	3,234	133	325	1,006
ALL SPECIES	31,299	47,245	65,274	5,853	8,757	15,372	1,404	2,594	4,176

	KUSKOKWIM RIVER			REMAINDER OF KUSKOKWIM AREA			TOTAL KUSKOKWIM AREA		
	Minimum	Average	High	Minimum	Average	High	Minimum	Average	High
Chinook	64,795	82,762	96,436	3,535	4,511	6,699	68,686	87,272	100,159
Sockeye	27,791	39,204	52,984	823	2,073	3,420	28,622	41,276	56,404
Coho	24,864	34,803	50,370	1,682	3,416	5,922	27,239	38,220	55,620
Chum	39,970	75,143	126,508	1,006	3,004	4,961	40,976	78,147	131,469
ALL SPECIES	188,476	231,912	293,554	7,588	13,003	20,968	198,466	244,915	314,522

KUSKOKWIM AREA

5 AAC 01.286 CUSTOMARY AND TRADITIONAL SUBSISTENCE USES OF FISH STOCKS. (a) The Alaska Board of Fisheries (board) finds that the following fish stocks are customarily and traditionally taken or used for subsistence:

(1) Salmon, halibut, Pacific cod and all other finfish except as specified in (2) of this section, in the Kuskokwim Area; and

(2) herring and herring roe, along the coast between the westernmost tip of the Nasknoat Peninsula; and the terminus of the Ishowik River, and along the coast of Nunivak Island.

The department recommends repealing the above language and adopting the substitute language below:

Range based on low harvest and median harvest of last ten years: ← ☆

5 AAC 01.286 CUSTOMARY AND TRADITIONAL SUBSISTENCE USES OF FISH STOCKS AMOUNTS NECESSARY FOR SUBSISTENCE USES. (a) The Alaska Board of Fisheries (board) finds that the following fish stocks are customarily and traditionally taken or used for subsistence:

(1) Halibut, Pacific cod and all other finfish except as specified in (2) of this section, in the Kuskokwim Area; and

(2) Chinook salmon, chum salmon, sockeye salmon, coho salmon, and pink salmon in the Kuskokwim River drainage

(3) Salmon in the remainder of the Kuskokwim Area

(4) herring and herring roe, along the coast between the westernmost tip of the Nasknoat Peninsula; and the terminus of the Ishowik River, and along the coast of Nunivak Island.

(b) The Board finds that the following amounts are reasonably necessary for subsistence uses

(1) 64,500-83,000 chinook salmon in the Kuskowkim River drainage

(2) 39,500-75,500 chum salmon in Kuskowkim River drainage

(3) 27,500-39,500 sockeye salmon in the Kuskowkim River drainage

(4) 24,500- 35,000 coho salmon in the Kuskowkim River drainage

(5) 7,500- 13,500 salmon in the remainder of the Kuskokwim Area

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