Report to the Alaska Board of Fisheries

Alexander Creek King Salmon Stock Status and Action Plan, 2020

By

Cook Inlet Staff

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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 in Division of Sport Fish Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications without definition. All others must be defined in the text at first mention, as well as in the titles or footnotes of tables and in figures or figure captions.

Weights and measures (metric)

Centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

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

Spell out acre and ton.

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s

Spell out year, month, and week.

Physics and chemistry

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

General

All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
And	&
At	@
Compass directions:	
east	E
north	N
south	S
west	W
Copyright	©
Corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
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
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
Trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

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	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
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.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
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
standard length	SL
total length	TL
variance	Var

REPORT TO THE ALASKA BOARD OF FISHERIES

ALEXANDER CREEK KING SALMON STOCK STATUS AND ACTION PLAN, 2020

by

Cook Inlet Staff
Alaska Department of Fish and Game
Divisions of Sport Fish, Commercial Fisheries, and Subsistence

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INTRODUCTION

The *Policy for Management of Sustainable Salmon Fisheries* (SSFP; 5 AAC 39.222) directs the Alaska Department of Fish and Game (department) to provide the Alaska Board of Fisheries (board) with reports on the status of salmon stocks and identify any salmon stocks that present a concern related to yield, management, or conservation during regularly-scheduled board meetings. This action plan provides the department's assessment of Alexander Creek king salmon as a stock of management concern, summarizes historical assessments of annual run sizes, and describes the existing regulations and emergency order (EO) authority that the department follows to manage Alexander Creek king salmon. Options are then presented for potential management actions for the commercial, sport, and subsistence fisheries, and research projects for this king salmon stock.

In October 2010, the department recommended that the board declare Alexander Creek king salmon as a stock of management concern at the regulatory board meeting for the Northern Cook Inlet (NCI) Management Area in February 2011[1]. This recommendation was based on guidelines established in the *Policy for Management of Sustainable Salmon Fisheries* (SSFP; 5 AAC 39.222). The SSFP states that a "management concern means a concern arising from a chronic inability, despite use of specific management measures, to maintain escapements for a salmon stock within the bounds of the SEG, BEG, OEG, or other specific management objectives for the fishery…" Chronic inability is further defined in the SSFP as "...the continuing or anticipated inability to meet escapement thresholds over a four to five-year period..." based on the generation time of most salmon species.

STOCK ASSESSMENT BACKGROUND

The department has conducted annual single aerial surveys on Alexander Creek (Figure 1) since 1974 to index spawning escapement of king salmon. These surveys are conducted from helicopters at slower speeds than traditional fixed-wing aircraft surveys.

Until 2008, Alexander Creek king salmon were harvested by three user groups: a sport fishery, the Northern District commercial set gillnet king salmon fishery, and a subsistence fishery that occurs in the Tyonek Subdistrict marine waters adjacent to the village of Tyonek. Sport harvests from 1977–2019 have been estimated from the Statewide Harvest Survey (Table 1; Figure 2). The sport fishery was closed in 2008 by the board. No estimates of harvest for Alexander Creek king salmon to the marine fisheries are available because the stock contribution of these fisheries has never been fully determined, but it is suspected to be small.

Escapement

The average escapements from 1979–1999 were approximately 3,700 fish (Table 1; Figure 3). The most recent 10-year average (2010 through 2019) was approximately 583 fish. Despite restrictive action since the mid-1990s and closure of the sport fishery in 2008, king salmon escapements to this system in the past five years have been below the SEG, averaging 727 fish annually. The SEG has not been achieved on Alexander Creek since 2005.

[1] Unpublished memorandum from J. Hilsinger and C. Swanton, ADF&G, to Board of Fisheries, September 30, 2010.

Harvest

The subsistence fishery occurs in the Tyonek Subdistrict marine waters adjacent to the village of Tyonek on West Cook Inlet (Figure 4). The subdistrict includes the area from one mile south of the mouth of the Chuitna River south to the easternmost tip of Granite Point, and from the mean point of high tide to the mean point of low tide. The average king salmon subsistence harvest from 1980–2018 was 1,421 fish (Table 2). The average number of permits issued during the same time period was 79 In the past five years (2014–2018), the subsistence king salmon harvest ranged from 896 to 1,308 fish.

Prior to 2002, the Northern District directed commercial set gillnet king salmon fishing season was the month of June. Fishing was allowed six hours each Monday (i.e., three 6-hour periods) unless a cap of 12,500 king salmon harvested was achieved, or until the regular season opened on June 25. The Northern District commercial fishery was liberalized by the board from six hours per period to 12 hours per period in 2005, and from three periods per season to four or five periods per season in 2008. Commercial harvest of king salmon in the Northern District averaged 1,626 for the last 5 years prior to 2018; the fishery was closed entirely from 2018 and 2019. Commercial harvests since 1993 averaged 2,150 fish.

Prior to 2000, Alexander Creek was one of the most popular king salmon sport fisheries in the entire westside Susitna River. From 1986–1994, this system experienced more than 20,000 angler days of sport fishing effort per year (Figure 2). In 2007, prior to its closure, there was an estimated 2,666 angler days of effort. Historically, sport harvest of king salmon from this system was as high as 6,548 fish (1991). In 2007, only 412 fish were harvested (Table 1; Figure 2).

ESCAPEMENT GOAL EVALUATION

ESCAPEMENT GOAL HISTORY

The *Salmon Escapement Goal Policy*, adopted by the department in 1992, established the formal process for setting escapement goals and required publication of the goals (Fried 1994). The escapement goal for this system was adopted in 1993 and was set as a point biological escapement goal representing the escapement that produced the greatest yield. The goal was calculated as 66% of the average escapement index. The escapement index for Alexander Creek is a single, aerial survey conducted by rotary-wing aircraft. A percentage of the average was used because biologists felt that the escapements used in calculating the average were generally above the level needed to sustain high average long-term production. The escapement estimates used in the averages occurred during 1974–1992, except for various years when conditions were too poor to survey. The king salmon escapement goal for Alexander Creek was 2,700 fish.

SPAWNER DATA AND SEG ANALYSIS

Per the *Policy for Statewide Salmon Escapement Goals* adopted in 2001 (5 AAC 39.223), spawner and return data were reviewed in 2001 to determine the type (BEG or SEG) of escapement goal and recommend an escapement goal range for Alexander Creek king salmon. King salmon harvest

data are available for this system for the sport fishery only (Table 1). Some marine harvest of these stocks is likely in the Tyonek subsistence and Northern District setnet king salmon fisheries, but the stock contributions of these fisheries have never been fully determined. In addition, escapements are indexed via rotary-wing aerial survey rather than estimated (e.g., weir count, sonar, mark-recapture), so total annual returns cannot be estimated. No age composition data are available from harvests or escapements. Based on the limitations of these data, the escapement goal policy indicates that a SEG be set based on 5 AAC 39.223 (a)(3): "establish sustainable escapement goals (SEG) for salmon stocks for which the department can reliably estimate escapement levels when there is not sufficient information to enumerate total annual returns and the range of escapements that are used to develop BEGs."

Eighteen years of spawner index counts between 1974 and 2000 were inspected and found to have fair data quality, with a medium contrast of 6.1 (ratio of highest escapement to lowest escapement). This indicated that the SEG range should be set from the 15th and 85th percentiles of the escapement data and rounded to the nearest 100 fish. The 15th percentile was 2,177 fish and the 85th percentile was 5,998, for a SEG range of 2,100 to 6,000 fish (Bue and Hasbrouck *Unpublished*). The SEG of 2,100–6,000 has been in place since 2002.

ESCAPEMENT GOAL RECOMMENDATION

For the 2019–2020 review, the committee updated the escapement time series through 2005 (prior to apparently large impacts from invasive northern pike predation) and applied the percentile approach (Clark et al. 2014) to the data set. The committee recommends the Alexander Creek king salmon SEG be updated to 1,900–3,700.

STOCK OF CONCERN RECOMMENDATION

Escapement of king salmon has fallen below the lower end of the current SEG range for Alexander Creek in each of the past five years. Escapement of king salmon in Alexander Creek was compared to the current SEG range of 2,100 to 6,000 fish. Regulatory changes adopted in the 1995–1996 board meeting cycle, and closure of the sport fishery beginning in 2008 to correct this trend have proven to be insufficient to achieve the current SEG. Therefore, in October 2010, the department recommended that the board declare Alexander Creek king salmon a stock of management concern at the regulatory board meeting for Upper Cook Inlet in February 2011.

OUTLOOK

The department does not develop a formal forecast of northern-bound king salmon stocks, but based upon recent run performance, king salmon abundance is likely to be below the long-term average.

HABITAT ASSESSMENT

Land development activities affecting fish habitat in the Alexander Creek drainage have been very minor and there are no known upcoming development projects that would have significant impacts

on this watershed. Fish habitat assessment has been mostly limited to fish research activities and aquatic habitat assessment as it relates to invasive northern pike. Past escapement surveys on Alexander Creek documented king salmon spawning throughout the stream's course, with a large percentage spawning in tributaries upstream of Alexander Lake. More recent observations indicate few king salmon spawning in the mainstem above or below Sucker Creek (Figure 1), and none were observed spawning in tributaries upstream of the lake. Most of the king salmon production for Alexander Creek now takes place in lower Sucker Creek and the Wolverine Fork of Sucker Creek, where very little pike habitat occurs.

Northern pike were illegally introduced to at least one lake in the Susitna River drainage during the 1950s and have since spread throughout the drainage. Northern pike were first observed in Alexander Lake in the late 1960s and since then, have colonized the lake and 40 miles of creek. The system contains numerous backwater side-sloughs and oxbow channels, several tributaries, many interconnecting shallow lakes and ponds, and vast expanses of wetlands and marshes, all of which provide for optimum spawning and rearing habitat for northern pike. Unfortunately, juvenile king salmon habitat overlaps with northern pike habitat throughout this river system.

Northern pike are voracious, opportunistic feeders that prey on and prefer salmonids over other available prey. In the absence of refuge areas for juvenile salmon, predation by northern pike can lead to severe reductions in salmonid populations, such as king salmon. This is likely the cause for the decrease of king salmon escapement in the Alexander Creek drainage. Northern pike have colonized nearly all of the drainage (with the exception of lower Sucker and Wolverine creeks), while king salmon escapement has declined significantly. Because of the tremendous overlap of northern pike and juvenile king salmon habitat throughout most of this system, there is little refuge for juvenile king salmon to escape northern pike predation. Therefore, it is unlikely that Alexander Creek king salmon will rebound in this system without significant changes to the northern pike infestation. Other salmon species and resident fish populations have declined in this system as well, the extent of which is currently unknown since the department monitors only king salmon.

FISHERIES MANAGEMENT OVERVIEW AND BACKGROUND

SPORT FISHERIES

Alexander Creek (Figure 1) is a remote river accessible via float plane or boat. The creek is a low velocity, winding, clearwater system flowing into the west side of the Susitna River approximately eight river miles upstream from where the Susitna River empties into Cook Inlet. Sport fisheries, primarily the king salmon fishery in the Alexander Creek system, once supported nine full time lodges. In addition to the lodge operations, this system also supported several float plane charter operations based at Anchorage's Lake Hood, numerous boat charter/guide operations, and a cabin and boat rental business. Today, few if any, of these operations are still in business. Alexander Creek was closed to king salmon fishing in 2008 by the board, primarily to address a decade of declining king salmon escapements.

Past Sport Fisheries Management Actions

The commissioner may, by EO, change bag and possession limits and annual limits, and alter methods and means in sport fisheries (5 AAC 75.003). These changes may not reduce the

allocation of harvest among other user groups. An EO may not supersede provisions for increasing or decreasing bag and possession limits or change methods and means specified in regulatory management plans established by the board.

The department's sport fish harvest management strategy for northern pike in all Cook Inlet waters is considered very liberal. There are no bag or possession limits, spears and bow and arrows are allowed, and on many lakes anglers are allowed to use up to five lines when fishing through the ice. The only lake in the entire management area that deviates from these regulations is Alexander Lake. On Alexander Lake, a slot limit was instituted by the board in an effort to investigate potential management strategies that would provide opportunities for anglers to harvest large-sized northern pike (> 30 inches), but at the same time reduce the number of small-sized northern pike which are primarily responsible for decimating salmonid populations. This scenario was designed to maintain angler interest by providing the opportunity to catch a large northern pike while at the same time keeping as many small northern pike as they desire. Without the opportunity to catch large northern pike, anglers typically lose interest in fishing the area and pike populations continue to increase. At higher densities and in the absence of large-sized northern pike, northern pike growth tends to become stunted. The result is a large population of small, undesirable northern pike that few anglers want to fish for. The slot limit was ineffective as a pike management tool and was repealed in 2011.

REGULATORY HISTORY FOR ALEXANDER KING SALMON SPORT FISH

1979:
- Opened to king salmon fishing.

1980:
- Bag changed from one to two over 20 inches; only one over 28 inches.

1986:
- Bag/possession changed to two per day/four possession over 16 inches; only one daily/two possession over 28 inches.

1987:
- Season extended from July 6 to July 13.

1990:
- No seasonal limit.

1992:
- Seasonal limit of 5 over 16 inches; bag/possession changed to 1 daily/2 in possession over 16 inches.

1995:
- Bait prohibited; bag/possession of one over 16 inches.
- Closed fishing upstream of Trail Creek.
- Fishing allowed only between the hours of 6:00 a.m. to 11:00 p.m.

1996:
- Season ends June 30; harvest allowed downstream of Granite Creek only.

1999:
- Harvest area extended upstream of Granite Creek to Trail Creek.

2008:

- King salmon fishery closed.

REGULATORY HISTORY FOR NORTHERN PIKE FOR ALEXANDER CREEK/LAKE

1989:

- Bag/possession limit is 10/10.

1997:

- May use five lines in lake.
- No bag or possession limit for northern pike.

1998:

- Slot limit implemented. Northern pike 22–30 inches may not be retained; no limit for fish less than 22 inches; limit of one per day and in possession for fish greater than 30 inches.

2009:

- Slot limit modified. Northern pike less than 27 inches in length, no limit; 27 inches or longer, one per day and in possession.

2011:

- Size limit repealed.
- Bow and arrow and spears allowed for taking northern pike.
- Release of live northern pike prohibited.

COMMERCIAL FISHERIES

Some marine harvest of Alexander Creek king salmon stocks may occur in the Northern District setnet king salmon fishery, but the stock contribution of this fishery has never been fully determined. The current management plans pertinent to king salmon returning to this river are:

5 AAC 21.363. *Upper Cook Inlet Salmon Management Plan.*
5 AAC 21.366. *Northern District King Salmon Management Plan.*

The Northern District directed king salmon fishery opens for commercial fishing beginning on the first Monday on or after May 25, continuing through June 24, unless closed earlier by EO. Fishing periods are from 7:00 a.m. to 7:00 p.m. on Mondays. Set gillnets may not exceed 35 fathoms in length and six inches in mesh size, and no set gillnet may be set or operated within 1,200 feet of another set gillnet (twice the normal 600 feet in the Northern District sockeye salmon fishery). The most productive waters for commercial harvest of king salmon are found from one mile south of the Theodore River to the mouth of the Susitna River; however, this area is open to fishing for the second regular Monday period only (Figure 5). The harvest may not exceed 12,500 king salmon.

If the Theodore, Lewis, or Ivan rivers are closed to sport fishing, the area from an ADF&G regulatory marker located one mile south of the Theodore River to the Susitna River shall be closed to commercial king salmon fishing for the remainder of the directed king salmon fishery. If the Deshka River is closed to sport fishing, the commercial king salmon fishery throughout the

Northern District shall be closed for the remainder of the directed king salmon fishery. If the Chuitna River is closed to sport fishing, the area from an ADF&G regulatory marker located one mile south of the Chuitna River to the Susitna River shall be closed to commercial king salmon fishing for the remainder of the directed king salmon fishery.

Past Commercial Fisheries Management Actions

The *Northern District King Salmon Management Plan* was first adopted in 1986 and has been changed at various board meetings. In the early 1990s, various EOs and regulatory changes were issued limiting the commercial harvest of king salmon. Prior to 2002, the Northern District commercial king salmon fishing season was the month of June, and fishing was allowed for six hours each Monday until a quota of 12,500 king salmon was harvested or until the season closed on June 24. In 2005, fishing time was increased from six to twelve hours due in part to fewer registered users and a trend of increasing king salmon runs. Each participant was allowed one 35-fathom gillnet and a minimum distance of 1,200 feet had to be maintained between nets.

Below is an outline of significant changes to commercial fisheries that may have affected harvest and escapement of king salmon returning to Alexander Creek:

1994:
- Closed final commercial fishing period by EO.

1995:
- Commercial fishing limited by EO to only one period.

1996:
- Commercial fishing limited by EO to only one period.

1997:
- Closure of Northern District commercial salmon fishery from one mile south of Theodore River to the mouth of Susitna River.
- Commercial fishing in remainder of Northern District limited by EO to only one period.

1998:
- Closure of Northern District commercial salmon fishery from one mile south of Theodore River to the mouth of Susitna River.
- Commercial fishing in remainder of Northern District limited by EO to two periods.

1999:
- Northern District commercial king salmon season opened June 1 through June 24.
- The area from one mile south of the Theodore River to the Susitna River opened the first Monday in June only.

2002:
- Northern District commercial king salmon fishery opened on or after May 25, but not to exceed three fishing periods.
- The area from one mile south of the Theodore River to the Susitna River opened on the second fishing period only.

2005:
- Increased commercial fishing periods from six hours to twelve hours.

2008:
- Increased commercial fishing periods from three periods to four or five periods by extending the season through June 24.
- Closed fifth commercial fishing period by EO.

2009:

- Reduced first two fishing periods from 12 hours to 6 hours by board emergency regulation.
- Closed fourth and fifth commercial fishing period by EO.

2010:

- Closure of Northern District commercial king salmon fishery from one mile south of Chuitna River to the mouth of Susitna River by EO.
- Third commercial fishing period reduced from 12 hours to 6 hours.

2011:

- Closed that portion of the General Subdistrict of the Northern District from a point at the wood chip dock located approximately three miles south of Tyonek to the Susitna River.

2012:

- Reduced fishing time in all areas of the Northern District commercial king salmon fishery from 12 to 6 hours per open period.
- Closed that portion of the General Subdistrict of the Northern District from a point at the wood chip dock located approximately three miles south of Tyonek to the Susitna River.
- Closed Northern District salmon fishing period of June 25.

2013:

- Closed all of Northern District commercial king salmon fishery for May 27.
- Reduced fishing time in all areas of the Northern District commercial king salmon fishery from 12 to 6 hours per open period.
- Closed that portion of the General Subdistrict of the Northern District from a point at the wood chip dock located approximately three miles south of Tyonek to the Susitna River.

2014:

- Closed all of Northern District commercial king salmon fishery for May 26.
- Reduced fishing time in all areas of the Northern District commercial king salmon fishery from 12 to 6 hours per open period.
- Closed that portion of the General Subdistrict of the Northern District from a point at the wood chip dock located approximately three miles south of Tyonek to the Susitna River.

2015:

- Closed all of Northern District commercial king salmon fishery for May 25.
- Reduced fishing time in all areas of the Northern District commercial king salmon fishery from 12 to 6 hours per open period.
- Closed that portion of the General Subdistrict of the Northern District from a point at the wood chip dock located approximately three miles south of Tyonek to the Susitna River.
- Restored Northern District commercial king salmon fishery to 12 hours for June 15 and 22; not including area from wood chip dock to the Susitna River.

2016:

- Reduced fishing time in all areas of the Northern District commercial king salmon fishery from 12 to 6 hours per open period.

- Closed that portion of the General Subdistrict of the Northern District from a point at the wood chip dock located approximately three miles south of Tyonek to the Susitna River.

2017:

- Closed that portion of the General Subdistrict of the Northern District from a point at the wood chip dock located approximately three miles south of Tyonek to the Susitna River.
- Reduced fishing time in all areas of the Northern District commercial king salmon fishery from 12 to 6 hours per open period on June 19.

2018:

- Closed all of Northern District commercial king salmon fishery.
- Closed Northern District salmon fishing period of June 25.

2019:

- Closed all of Northern District commercial king salmon fishery.

SUBSISTENCE FISHERIES

In 1981, the board made a positive customary and traditional use finding for salmon in the Tyonek Subdistrict (5 AAC 01.566 (a)(1)(A)) and set an amount necessary for subsistence at 850–3,600 salmon (ADF&G 1995:33). . In 2011, the board specified the amounts of salmon reasonably necessary for subsistence in the Tyonek Subdistrict as 700–2,700 king salmon and 150–500 other salmon. Subsistence fishing is allowed only in the Tyonek Subdistrict of the Northern District, which include salt waters adjacent to the community of Tyonek on WCI. Subsistence fishing is open during two seasons per year. The early season, which runs from May 15 through June 15, is open for three periods per week—Tuesdays, Thursdays, and Fridays—and for 16 hours per period, from 4:00 a.m. through 8:00 p.m. The late season, which runs from June 16 through October 15, is open for one period per week—Saturday—and for 12 hours, from 6:00 a.m. to 6:00 p.m.

A subsistence fishing permit is required and there are separate permits for each season of the fishery. The permit is a household permit. The total annual possession limit for each permit is 25 salmon per head of household and 10 salmon for each dependent of the household member. In addition, the holder of a Tyonek permit may take 70 additional king salmon. .

Past Subsistence Fishery Management Actions

There have been no restrictions to the subsistence fishing season or methods taken on this fishery since regulations were adopted in 1980 until 2019, when the fishery was restricted by closing one (Tuesdays) of the three open days per week.

MANAGEMENT ACTION PLAN OPTIONS FOR ADDRESSING STOCK OF CONCERN

ACTION PLAN GOAL

To rebuild the Alexander Creek king salmon runs back to levels that achieve the current SEG range.

ACTION PLAN ALTERNATIVES

Potential management actions described below are allocative and do not necessarily reflect endorsement by the department. The benefits and detriments described below are intended to reflect only those related to the goal of rebuilding king salmon to levels that achieve the current SEG range for Alexander Creek.

ACTION #1 – SPORT FISHERIES

Objective: Reduce abundance of northern pike.

Background: Northern pike are not indigenous to the NCI management area and have threatened multiple fish species in the Alexander Creek drainage. In Alexander Lake, there is no bag limit for northern pike, northern pike may not be release alive back into the water; spears and bow and arrow may be used to take northern pike in Alexander Lake. Sport fishing through the ice with five lines is allowed on Sucker and Alexander lakes and Alexander Creek provided the fishing gear is closely attended and all other fish caught are released immediately. Pike caught in Alexander Creek and Lake may not be released alive.

Changes to the management strategy employed to control northern pike abundance in Alexander Creek are warranted to reduce the immediate impact of pike predation on juvenile salmon. The department implemented a control netting program on Alexander Creek in spring 2011. Suppression of northern pike in Alexander Lake is ongoing.

Option A. – Liberalize methods and means for harvesting northern pike in Alexander Lake

Specific Action to Implement the Object: Board action has been taken to liberalize methods and means and prohibit release of live pike. Continue to support department's suppression and eradication efforts.

Benefits: Reducing the abundance of northern pike would benefit salmonid productivity.

Detriments: Increasing harvest will only suppress northern pike abundance and not eradicate its presence.

ACTION #2 – COMMERCIAL FISHERY

Objective: Reduce commercial harvest of king salmon.

Background: The Northern District king salmon fishery opens for commercial fishing beginning on the first Monday on or after May 25, continuing through June 24, unless closed earlier by EO. There are four or five fishing periods annually, depending on the calendar year. Fishing periods are from 7:00 a.m. to 7:00 p.m. The commercial fishery is managed to not exceed a harvest limit of 12,500 king salmon. The recent Northern District directed king salmon commercial fishery average harvest is 1,309 fish (2012-2018) with a long-term average harvest of 2,067 fish (1993-2018) with a range of 0 to 3,855 fish. It is unknown what proportion of these fish are from Alexander Creek. In 2018 and 2019 the entire Northern District directed king salmon commercial fishery was closed be EO.

The *Northern District King Salmon Management Plan* (5 AAC 21.366) contains three provisions closing waters of the northern district by EO contingent on closures to sport fisheries:

- If the Theodore, Lewis, or Ivan rivers are closed to sport fishing, the area from an ADF&G regulatory marker located one mile south of the Theodore River to the Susitna River shall close to commercial king salmon fishing for the remainder of the directed king salmon fishery.
- If the Deshka River is closed to sport fishing, the Northern District shall close commercial king salmon fishing for the remainder of the directed king salmon fishery.
- If the Chuitna River is closed to sport fishing, the area from an ADF&G regulatory marker located one mile south of the Chuitna River (Wood Chip Dock) to the Susitna River shall close to commercial king salmon fishing for the remainder of the directed king salmon fishery.

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Option A. – Reduce Hours of Commercial Fishing Periods

Current fishing periods are from 7:00 a.m. to 7:00 p.m.

Specific Action to Implement the Object: Take board action to reduce commercial fishing periods to fewer than twelve hours in length.

Benefits: Reducing the Northern District king salmon commercial fishing time would increase king salmon escapements in Alexander Creek by an unknown amount.

Detriments: The harvest of king salmon of Alexander Creek origin would still occur.

Option B. – Reduce Number of Commercial Fishing Periods

Current fishing periods are four or five periods, depending on the calendar year.

Specific Action to Implement the Object: Take board action to reduce commercial fishing periods to fewer than four or five periods.

Benefits: Reducing the Northern District king salmon commercial fishing time would increase king salmon escapements in Alexander Creek by an unknown amount.

Detriments: The harvest of king salmon of Alexander Creek origin would still occur

Option C. – Close Specific Fishing Areas

Past commercial fishing management actions have focused on closing areas near the Chuitna, Theodore, or Lewis rivers.

Specific Action to Implement the Object: Take board action to reduce areas open to commercial king salmon fishing.

Benefits: Reducing the area open to commercial fishing would increase king salmon escapements Alexander Creek by an unknown amount.

Detriments: The harvest of king salmon of Alexander Creek origin would still occur.

Option D. – Close All Commercial Fishing in the Northern District

The entire Northern District would be closed until the start of the sockeye salmon season on June 25.

Specific Action to Implement the Object: Take board action to close commercial fishing in the Northern District until June 25.

Benefits: This could result in a harvest savings of 1,100 to 3,900 Northern District king salmon and an unknown increase in escapement to Alexander Creek because the contribution of this stock to commercial fisheries has never been fully determined.

Detriments: If harvest is not the only factor limiting escapement, then this action is not a long-term solution.

ACTION #3 – SUBSISTENCE FISHERY

Objective: Reduce subsistence harvest of king salmon.

Background: The subsistence fishing season operates in two parts. The first part, which focuses on king salmon, is open from 4:00 a.m. through 8:00 p.m. on Tuesdays, Thursdays, and Fridays from May 15–June 15. The second part is open from 6:00 a.m. through 6:00 p.m. on Saturdays

from June 16–October 15. Allowable gear is one 10-fathom (60 ft) gillnet with mesh size no greater than six inches and 45 meshes in depth.

Option A. – Reduce Hours of Subsistence Fishing Periods

Current fishing periods are from 4:00 a.m. through 8:00 p.m.

Specific Action to Implement the Object: Take board action to reduce subsistence fishing periods to fewer than 15 hours in length.

Benefits: Reducing the subsistence fishing time would increase king salmon escapements in Alexander Creek by an unknown, but likely small, amount.

Detriments: The harvest of king salmon of Alexander Creek origin will still occur and may not be lower than historical harvest ranges. Restricting area or time in the subsistence fishery may not provide a reasonable opportunity for success in harvesting salmon for subsistence uses.

Option B. – Reduce Number of Subsistence Fishing Periods

Current fishing periods are 3 days per week from May 15–June 15, for a total of 13–15 periods depending on the calendar year.

Specific Action to Implement the Object: Take board action to reduce subsistence fishing periods to fewer than 13–15 periods.

Benefits: Reducing subsistence fishing time would increase king salmon escapements in Alexander Creek by an unknown, but likely small, amount.

Detriments: The harvest of king salmon of Alexander Creek origin will still occur and may not be lower than historical harvest ranges. Restricting area or time in the subsistence fishery may not provide a reasonable opportunity for success in harvesting salmon for subsistence uses.

2020 ALASKA BOARD OF FISHERIES REGULATORY PROPOSALS AFFECTING ALEXANDER CREEK

- Proposal 80- Prohibit retention of king salmon greater than 36” in the Upper Cook Inlet commercial gillnet fisheries
- Proposal 199- Amend the *Northern District King Salmon Management Plan*
- Proposal 200- Close the Northern District commercial king salmon fishery when the sport fishery in the Susitna or Knik Arm drainages are restricted
- Proposal 201- Amend paired restrictions in the Deshka River king salmon sport and commercial fisheries
- Proposal 202- Amend the *Northern District King Salmon Management Plan* to allow operation of one set gillnet per permit

- Proposal 203- Provide additional fishing periods in the Northern District king salmon commercial fishery when the Deshka River king salmon sport fishery is liberalized
- Proposal 205- Clarify the definition of "minimize" in the *Northern District Salmon Management Plan*
- Proposal 206- Amend the *Northern District Salmon Management Plan* to allow for regular amounts of set gillnet gear in the Northern District commercial sockeye salmon fishery during times of reduced effort in the Central District
- Proposal 207- Remove the Eastern Subdistrict gear restrictions in the *Northern District Salmon Management Plan*
- Proposal 213- Allow anglers to use 5 lines when fishing for pike through the ice

RESEARCH PLAN

To date there has been a substantial amount of research has occurred at Alexander Creek. Research has been mostly related to invasive northern pike. Limited research has been directed at the invasive aquatic plant, elodea and native king salmon.

PAST RESEARCH PROJECTS

The following research programs have been conducted to gather detailed information at Alexander Creek:

1. Lake – 1995 - abundance estimate was 12,959 (SE=2,216) northern pike; 36 fish/hectare.
2. Lake – 2008 - evaluation of 12-year slot limit effect on size structure. In 2008, 1,305 northern pike >12 inches were caught, of which about 22% were >22 inches and 5% >30 inches. Historic size structure appears to be maintained 1996 and 2008.
3. Creek – 2006 and 2009–2010 northern pike control netting feasibility/mapping of side channel sloughs and stomach content analysis was conducted along a 10-mile stretch downstream of Sucker Creek confluence. Goal was 85% reduction over 3-week period.
4. Creek – 2011–2013 - One hundred fifty northern pike greater than 400 mm in fork length were captured in Alexander Lake, fitted with radio transmitters, and tracked using radiotelemetry. Investigators found there was minimal outmigration of adult northern pike from Alexander Lake (7.2% of 125 fish tagged in the spring were later relocated outside of Alexander Lake in the same year). Of the radiotagged fish that migrated out of the lake, all were later recaptured in suppression gillnets (Dunker 2014).
5. Creek - 2011–2019 - Northern pike suppression gillnetting project. From 2011 through 2019 funding was provided by the Alaska State Legislature, Alaska Sustainable Salmon Fund, Matanuska-Susitna Borough, and US Fish and Wildlife Service to support this project at various levels of intensity (Bradley et al. 2019). Gillnets were used to capture and kill northern pike in side-sloughs along the full length of Alexander Creek.
6. Creek - 2014–2017 - King salmon escapement enumeration weir. A floating weir was operated at river kilometer 21 to count adult king salmon and other species and to gather age, sex, and length data from king salmon. In 2014, 66 king salmon were counted through the weir; this count was incomplete due to a late-season install. In 2015, 2,152 king salmon

were counted, in 2016, 727 were counted, and in 2017, 354 were counted. The 2015–2017 counts were complete (St. Saviour 2017, St. Saviour and Logelin *In prep*.).

7. Lake –2014- 2019 - The invasive aquatic plant, elodea, was discovered by ADF&G staff in Alexander Lake in 2014. Alaska Department of Natural Resources staff attempted to eradicate the invasion using herbicide in 2016 and 2017, and treated to contain in 2019. To date, elodea eradication has been unsuccessful.

CURRENT RESEARCH AND NORTHERN PIKE SUPPRESSION PROJECTS

The following research programs have been and are being conducted to gather detailed information about king salmon or northern pike in Alexander Creek:

1. Long-term Northern Pike Suppression: The Alexander Creek northern pike suppression project is currently funded through 2021 by the US Fish and Wildlife Service. Project objectives are to gillnet up to 69 side sloughs for northern pike, calculate catch per unit effort by minnow trapping of juvenile salmon, implement an incentivized angler harvest program, and collect biological data from handled fish (Bradley et al. 2019).
2. Aerial Surveys: The department plans to continue the single, annual aerial surveys (helicopter) of Alexander Creek to monitor the trends in king salmon abundance.

CONDITIONS FOR REDUCING MANAGEMENT RESTRICTIONS OR DELISTING A STOCK OF CONCERN

1. If the lower bound of the biological escapement goal range is met or exceeded in at least 3 consecutive years or is met in at least 4 out of 6 consecutive years, the department may recommend removing Alexander Creek king salmon as a stock of management concern at the first Upper Cook Inlet board meeting after this condition is met.
2. Management measures could be relaxed in specific areas if updated stock composition and harvest data indicates areas where restrictions are no longer needed to ensure the escapement goal is met.
3. In the event that two consecutive years of escapements are near the upper bound of the escapement goal range or above the range, management restrictions may be relaxed or set aside using EO authority.

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Table 1.–Alexander Creek king salmon escapement and harvest, 1991–2019.

Year	Escapement	Sport Harvest
1991	2,727	6,548
1992	3,710	4,124
1993	2,763	5,154
1994	1,514	3,070
1995	2,090	1,217
1996	2,319	1,005
1997	5,598	1,470
1998	2,807	1,275
1999	3,974	2,241
2000	2,331 [a]	2,721
2001	2,282	2,313
2002	1,936	1,992
2003	2,012	2,293
2004	2,215	1,294
2005	2,140	1,052
2006	885	1,396
2007	480	412
2008	150 [a]	0
2009	275	0
2010	177	0
2011	343	0
2012	181	0
2013	588	0
2014	911	0
2015	1,117	0
2016	754	0
2017	170	0
2018	296	0
2019	1,297	0
Average		
2010-2019 mean	583	0
2015-2019 Mean	727	0
Escapement Goal 2,100-6,000		

[a] Low count due to timing, poor visibility, or weather conditions.

Table 2.–Historical subsistence salmon harvests, Tyonek Subdistrict, 1980–2018.

	Permits		Estimated salmon harvests					
Year	Issued	Returned	King	Sockeye	Coho	Chum	Pink	Total
1980	67	67	1,936	262	0	0	0	2,198
1981	70	70	2,002	269	64	32	15	2,382
1982	69	69	1,590	310	113	4	14	2,031
1983	73	73	2,755	251	78	6	0	3,090
1984	70	70	2,364	310	66	23	3	2,766
1985[a]	176	ND	1,967	163	91	10	0	2,231
1986[a]	101	ND	1,674	198	210	44	45	2,171
1987	64	61	1,689	174	156	25	10	2,055
1988	47	42	1,776	102	283	13	9	2,183
1989	49	47	1,303	89	120	1	0	1,513
1990	42	37	886	75	400	14	23	1,397
1991	57	54	925	20	69	0	0	1,014
1992	57	44	1,170	96	294	24	9	1,594
1993	62	54	1,566	68	88	25	23	1,769
1994	58	49	905	101	122	27	0	1,154
1995	70	55	1,632	54	186	18	0	1,891
1996	73	49	1,615	88	177	9	27	1,917
1997	70	42	1,051	200	241	13	0	1,505
1998	74	49	1,430	251	97	3	2	1,783
1999	77	54	1,620	247	175	20	66	2,127
2000	60	47	1,461	78	103	0	8	1,649
2001	84	58	1,450	254	72	9	6	1,790
2002	101	71	1,609	314	162	6	14	2,106
2003	87	74	1,384	136	54	12	9	1,595
2004	97	75	1,751	121	168	0	0	2,040
2005	78	67	1,183	65	159	2	0	1,409
2006	82	55	1,366	32	23	1	0	1,422
2007	84	67	1,526	249	164	3	4	1,946
2008	94	77	1,492	146	227	11	16	1,892
2009	89	69	817	229	320	2	1	1,369
2010	105	77	1,116	281	223	3	3	1,626
2011	114	63	851	202	34	10	10	1,107
2012	89	69	1,102	223	174	3	5	1,507
2013	82	48	1,352	278	311	0	32	1,973
2014	92	73	896	487	575	15	5	1,978
2015	83	72	1,070	505	568	16	6	2,165
2016	74	64	1,030	188	225	8	12	1,462
2017	74	49	1,304	442	306	31	6	2,089
2018	65	27	1,308	188	136	10	7	1,649
5-year average (2014–2018)	78	57	1,122	362	362	16	7	1,869
10-year average (2009–2018)	87	61	1,085	302	287	10	9	1,693
Historical average (1981–2018)	79	59	1,421	197	185	12	10	1,825

Source ADF&G Division of Subsistence, ASFDB 2018 (ADF&G 2019).

a Harvests were not expanded due to unknown permit returns.

ND = no data

Table 3.–Northern District commercial king salmon directed harvest by statistical area, 2002–2019.

Year	Date	247-10	247-20	247-30	24-741	247-42	247-43	247-70	247-80	247-90	Total
2002	27-May	95			13	60	4	37	56	5	270
	3-Jun	223	136	85	87	57	16	64	70	72	810
	10-Jun	159	131		34	104	3	63	115	58	667
	Totals	477	267	85	134	221	23	164	241	135	1747
2003	26-May	18		36	37	45		24		19	179
	2-Jun	5	101	4	45	43	54	74	17	6	349
	9-Jun	47	396	67	53	49	2	33	9	1	657
	Totals	70	497	107	135	137	56	131	26	26	1185
2004	31-May	74	33	17	30	43	40	108		9	354
	7-Jun	62	285	147	266	101	82	100		23	1066
	14-Jun		137	47	46	56	38	59		16	399
	Totals	136	455	211	342	200	160	267		48	1819
2005	30-May	166	320		224	203	85	160		5	1163
	6-Jun	103	430	290	97	60	69	65	18	31	1163
	13-Jun	26	391		98	113	129	33	34		824
	Totals	295	1141	290	419	376	283	258	52	36	3150
2006	29-May	174	133	20	76	47	78	80	19	13	640
	5-Jun	322	312	150	247	108	74	127	23	13	1376
	12-Jun	335	489	212	165	116	232	204	79	39	1871
	Totals	831	934	382	488	271	384	411	121	65	3887
2007	28-May	178	99	21	15	42	7	78	28	30	498
	4-Jun	237	162	228	131	94	124	240	36	18	1270
	11-Jun	94	366	126	120	87	181	346	24	20	1364
	Totals	509	627	375	266	223	312	664	88	68	3132
2008	26-May	39	272	42	33	16	27	35	24	11	499
	2-Jun	110	165	49	72	50	37	96	7	11	597
	9-Jun	103	535	143	275	208	153	168	72	31	1688
	16-Jun	118	282	138	162	81	110	132	33	15	1071
	Totals	370	1254	372	542	355	327	431	136	68	3855
2009	25-May		28	14	6	3	1	24	3		79
	1-Jun	111	147	36	12	24	15	68	32	10	455
	8-Jun	148	181	94	64	101	56	77	3	8	732
	Totals	259	356	144	82	128	72	169	38	18	1266
2010	31-May	141	102		43	48	42	32	5	20	433
	7-Jun	180	302		71	63	71	74	22	19	802
	14-Jun		61		8	54	25	19	8	5	180
	21-Jun	17	147		2	23	39	20	7	4	259
	Totals	338	612		124	188	177	145	42	48	1674

Table 3. –Cont

2011	30-May	118	85		57	73	129	55	29	6	552
	6-Jun	305	192		51	53	112	64	19	25	821
	13-Jun	132	208		31	60	72	66	18	13	600
	20-Jun	27	83		18	20	32	22	3	9	214
	Totals	582	568		157	206	345	207	69	53	2187
2012	28-May	129	20		7	5	2	32	9	8	212
	4-Jun	35	27		36	26	44	40		6	214
	11-Jun	252	101		16	29	11	58	19	5	491
	18-Jun	10	34		12	14	16	20		7	113
	Totals	426	182		71	74	73	150	28	26	1030
2013	3-Jun	117			91	75	51	24	9		367
	10-Jun	179			52	74	51	87	14	12	469
	17-Jun	121			16	13	15	55	8	4	232
	24-Jun	44			3	13				6	66
	Totals	461			162	175	117	166	31	22	1134
2014	2-Jun	125	38		39	40	43	92	74	30	481
	9-Jun	263			37	45	71	22	10	3	451
	16-Jun	103			15	39	32	48	14	6	257
	23-Jun	41	95		8	23	5	10	3	3	188
	Totals	532	133		99	147	151	172	101	42	1377
2015	1-Jun	83	38		52	38	93	39	25	9	377
	8-Jun	92	76		48	27	85	72	41	22	463
	15-Jun	93	80		58	80	75	38	5	7	436
	22-Jun	86	29		34	33	51	37	10	4	284
	Totals	354	223		192	178	304	186	81	42	1560
2016	30-May	315	170		39	5	45	131	23	23	751
	6-Jun	43	177		1	46	19	76		6	368
	13-Jun	152	74		32	52	101	173		16	600
	20-Jun	42	93		11	37	55	71	1	1	311
	Totals	552	514		83	140	220	451	24	46	2030
2017	29-May	36	81		4	23	62	35	13	3	257
	5-Jun	291	97		7	80	111	151	25	4	766
	12-Jun	160	287		28	33	99	88	24	17	736
	19-Jun	37	107		14	37	43	27	3	4	272
	Totals	524	572	0	53	173	315	301	65	28	2031
2018	Closed										
2019	Closed										

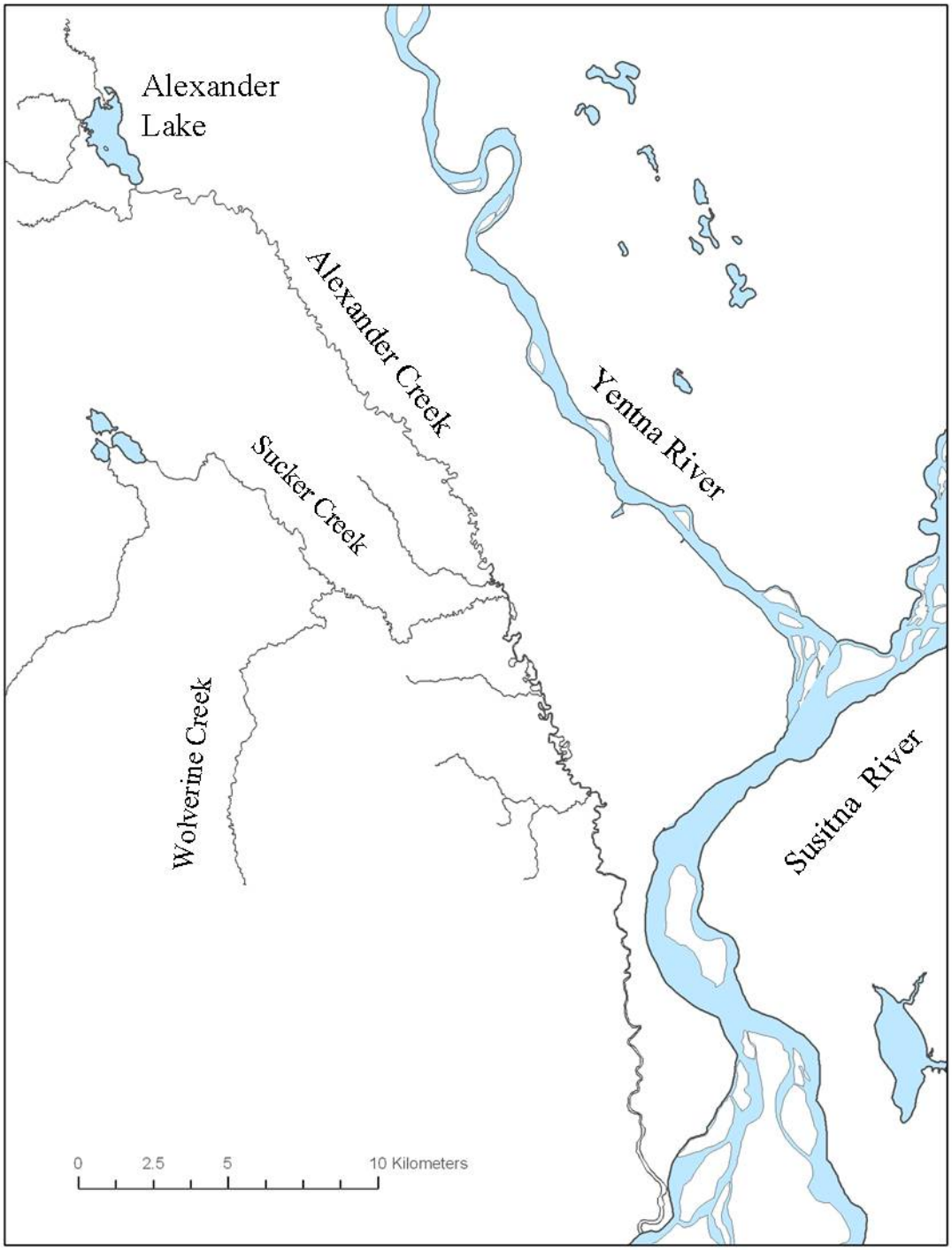

Figure 1.–Map depicting Alexander Creek drainage.

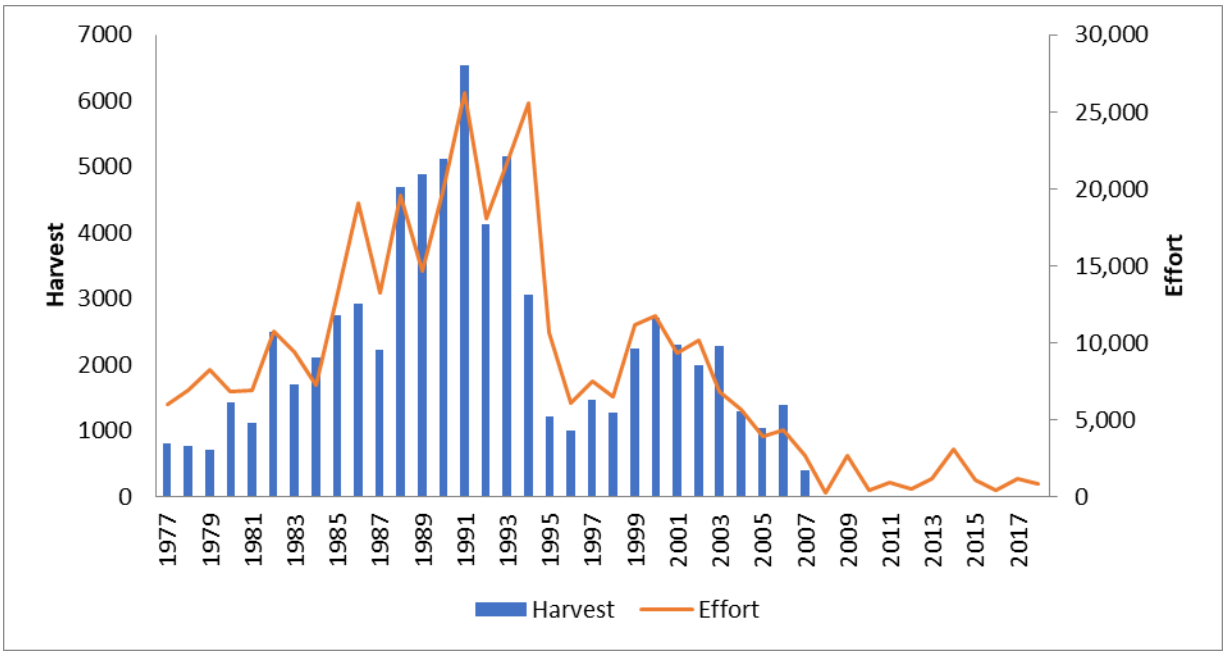

Figure 2.–Alexander Creek king salmon sport harvest and fishing effort, 1977–2017 (Jennings *et al. In prep*.).

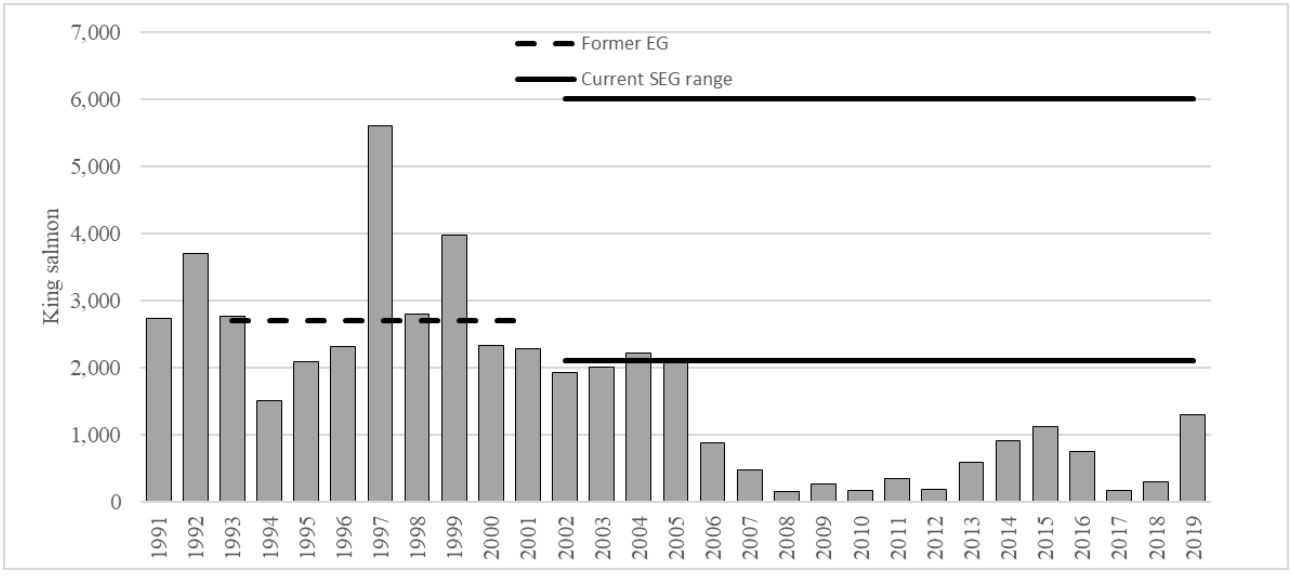

Figure 3.–Alexander Creek king salmon escapement index counts, 1991–2019.

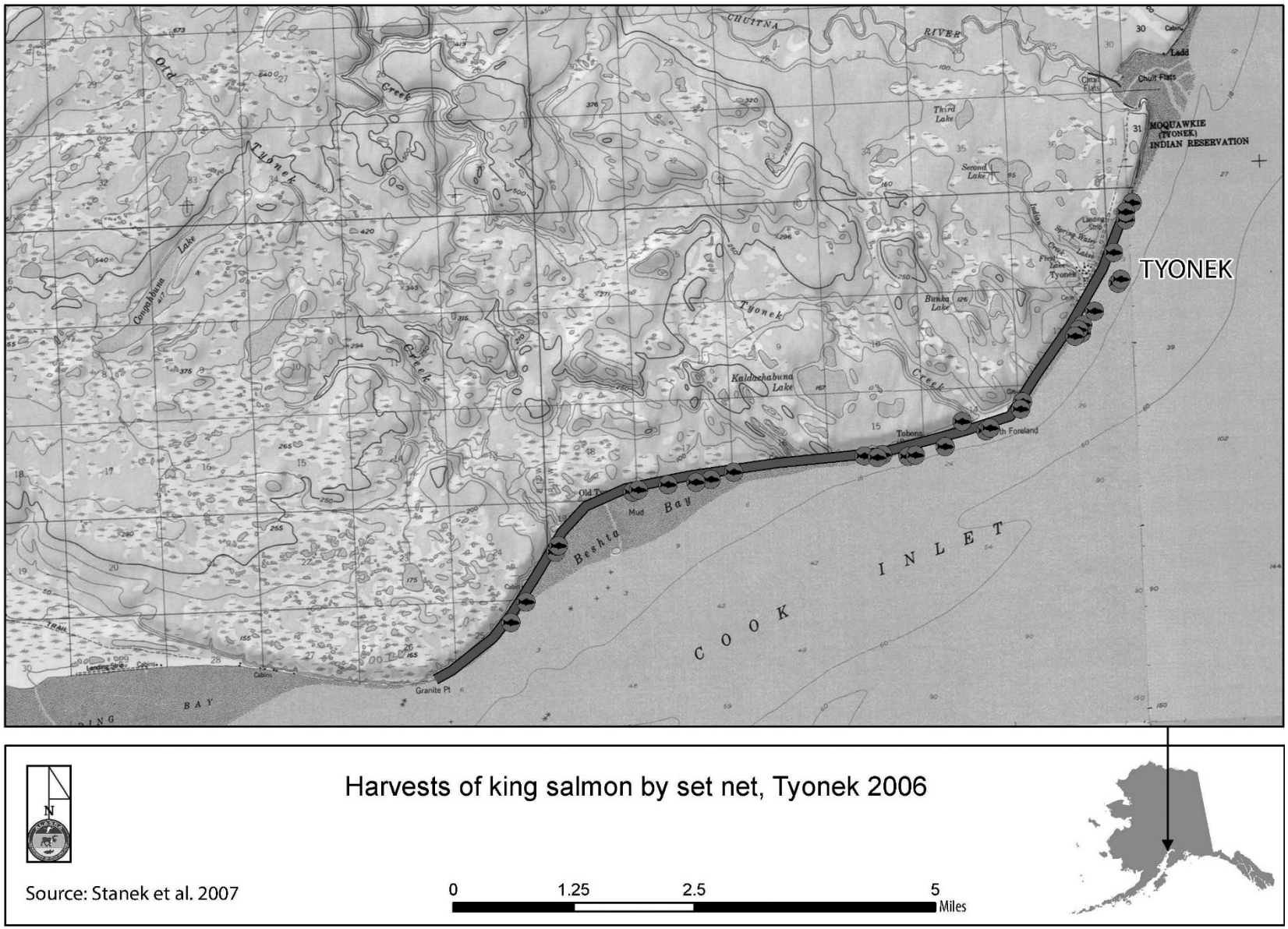

Figure 4.–Map showing harvest locations of king salmon by set gillnet, Tyonek Subdistrict subsistence salmon fishery, 2006.

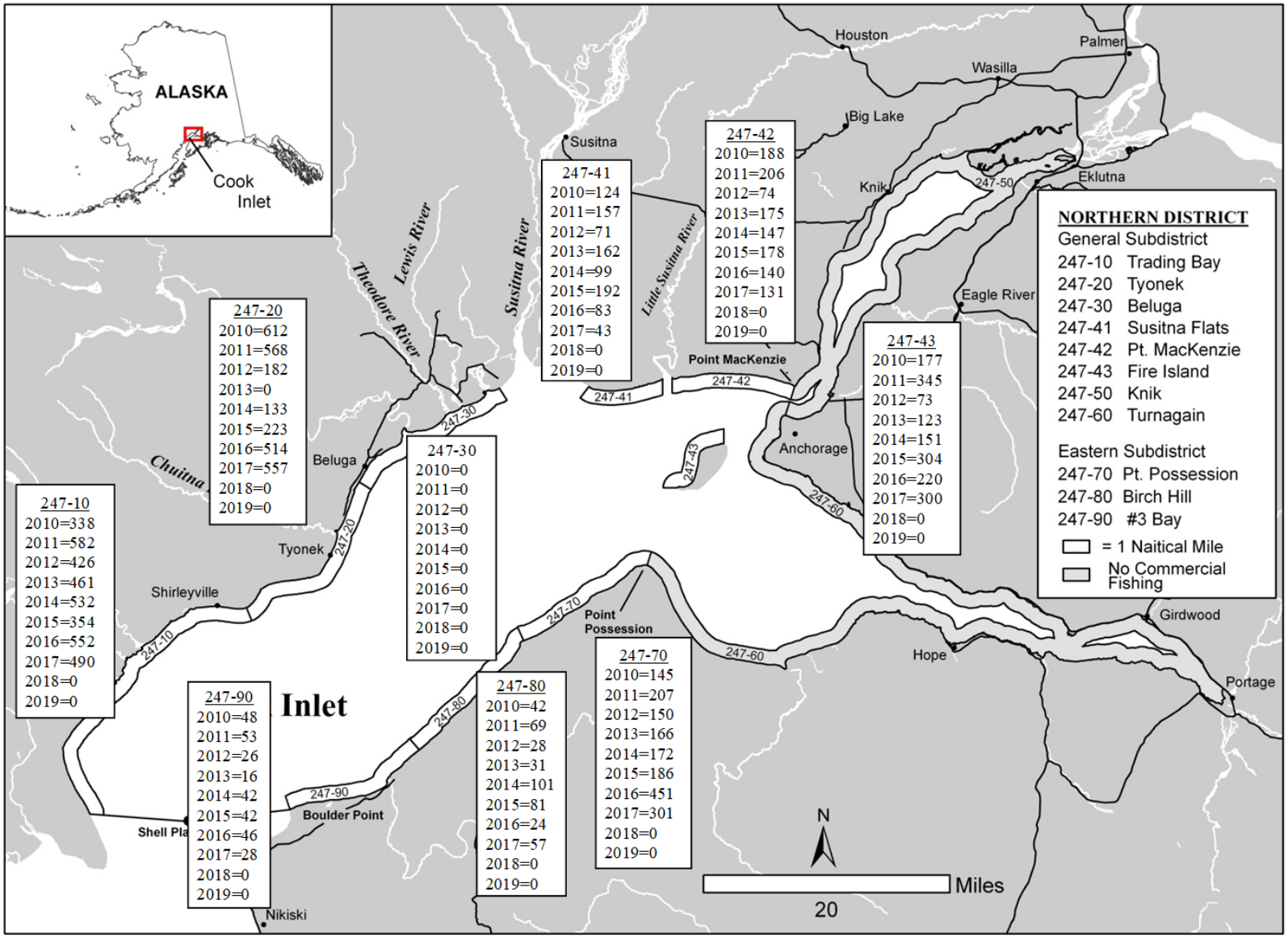

Figure 5.–Northern District statistical harvest reporting areas and directed commercial king salmon harvest, 2010–2019.