

Report to the Alaska Board of Fisheries

Chuitna River, Theodore River, and Lewis River King Salmon Stock Status and Action Plan, 2011

By

Cook Inlet Staff

February 2011

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)		General		Mathematics, statistics, fisheries	
Centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis	H_A
deciliter	dL	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
gram	g	And	&	catch per unit effort	CPUE
hectare	ha	At	@	coefficient of variation	CV
kilogram	kg	Compass directions:		common test statistics	F, t, χ^2 , etc.
kilometer	km			confidence interval	C.I.
liter	L		east E	correlation coefficient	R (multiple)
meter	m		north N	correlation coefficient	r (simple)
metric ton	mt		south S	covariance	cov
milliliter	ml		west W	degree (angular or temperature)	$^\circ$
millimeter	mm	Copyright	©	degrees of freedom	df
Weights and measures (English)		Corporate suffixes:		divided by	÷ or / (in equations)
cubic feet per second	ft ³ /s		Company Co.	equals	=
foot	ft		Corporation Corp.	expected value	E
gallon	gal		Incorporated Inc.	fork length	FL
inch	in		Limited Ltd.	greater than	>
mile	mi	et alii (and other people)	et al.	greater than or equal to	≥
ounce	oz	et cetera (and so forth)	etc.	harvest per unit effort	HPUE
pound	lb	exempli gratia (for example)	e.g.,	less than	<
quart	qt	id est (that is)	i.e.,	less than or equal to	≤
yard	yd	latitude or longitude	lat. or long.	logarithm (natural)	ln
Spell out acre and ton.		monetary symbols (U.S.)	\$, ¢	logarithm (base 10)	log
Time and temperature		months (tables and figures): first three letters	Jan, ..., Dec	logarithm (specify base)	log ₂ , etc.
day	d	number (before a number)	# (e.g., #10)	mid-eye-to-fork	MEF
degrees Celsius	°C	pounds (after a number)	# (e.g., 10#)	minute (angular)	'
degrees Fahrenheit	°F	registered trademark	®	multiplied by	x
hour (spell out for 24-hour clock)	h	Trademark	™	not significant	NS
minute	min	United States (adjective)	U.S.	null hypothesis	H_0
second	s	United States of America (noun)	USA	percent	%
Spell out year, month, and week.		U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	probability	P
Physics and chemistry				probability of a type I error (rejection of the null hypothesis when true)	α
all atomic symbols				probability of a type II error (acceptance of the null hypothesis when false)	β
alternating current	AC			second (angular)	"
ampere	A			standard deviation	SD
calorie	Cal			standard error	SE
direct current	DC			standard length	SL
hertz	Hz			total length	TL
horsepower	hp			variance	Var
hydrogen ion activity	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

REPORT TO THE ALASKA BOARD OF FISHERIES

**CHUITNA RIVER, THEODORE RIVER, AND LEWIS RIVER KING
SALMON STOCK STATUS AND ACTION PLAN, 2011**

by

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

February 2011

The Alaska Department of Fish and Game administers all programs and activities free from discrimination on the basis of sex, color, race, religion, national origin, age, marital status, pregnancy, parenthood, or disability. For information on alternative formats available for this and other department publications, contact the department ADA Coordinator at (voice) 907-465-4120, or (TDD) 907-465-3646. Any person who believes s/he has been discriminated against should write to: ADF&G, PO Box 25526, Juneau, AK 99802-5526; or O.E.O., U.S. Department of the Interior, Washington, DC 20240.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	V
LIST OF FIGURES	V
INTRODUCTION.....	1
STOCK ASSESSMENT BACKGROUND.....	1
ESCAPEMENT GOAL EVALUATION	3
Escapement Goal History	3
Spawner Data and SEG Analysis	3
Escapement Goal Recommendation	4
STOCK OF CONCERN RECOMMENDATION.....	4
Outlook	5
HABITAT ASSESSMENT	5
FISHERIES MANAGEMENT OVERVIEW AND BACKGROUND.....	5
Sport Fisheries	5
Past Sport Fisheries Management Actions.....	6
Commercial Fisheries	7
Past Commercial Fisheries Management Actions.....	7
Subsistence Fisheries	9
Past Subsistence Fishery Management Actions	9
MANAGEMENT ACTION PLAN OPTIONS FOR ADDRESSING STOCK OF CONCERN	10
ACTION PLAN GOAL.....	10
Action Plan Alternatives.....	10
Action #1 – Sport Fishery.....	10
Option A. – Status Quo.....	10
Option B. – Close Sport Fisheries.....	11
Action #2 – Commercial Fishery.....	11
Option A. – Status Quo.....	11
Option B. – Reduce Hours of Commercial Fishing Periods	12
Option C. – Reduce Number of Commercial Fishing Periods.....	12
Option D. – Close Specific Fishing Areas	13
Option E. – Close All Commercial Fishing in the Northern District	13
Action #3 – Subsistence Fishery.....	13
Option A. – Reduce Hours of Subsistence Fishing Periods	14
Option B. – Reduce Number of Subsistence Fishing Periods.....	14
2011 ALASKA BOARD OF FISHERIES REGULATORY PROPOSALS AFFECTING CHUITNA, THEODORE, AND LEWIS RIVERS.....	15
RESEARCH PLAN.....	15
Current Research Projects.....	15
LITERATURE CITED.....	17

LIST OF TABLES

Table		Page
1.	Chuitna, Theodore, and Lewis River king salmon escapement index counts and sport harvest, 1979–2010.....	18
2.	Historical subsistence salmon harvests, Tyonek Subdistrict, 1981–2009.	19
3.	Northern District commercial king salmon directed harvest by statistical area, 2001–2010.....	20

LIST OF FIGURES

Figure		Page
1.	Map depicting West Cook Inlet salmon streams	21
2.	Chuitna Sport harvest and angler effort estimates for Chuitna, Theodore, and Lewis River king salmon, 1997–2009.....	22
3.	Chuitna, Theodore, and Lewis River king salmon escapement index counts, 1979–2010.....	23
4.	Map showing harvest locations, Tyonek Subdistrict subsistence salmon fishery, 2006.	24
5.	Northern District statistical harvest reporting areas and commercial king salmon harvest, 2007–2010.....	24

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 Chuitna, Theodore, and Lewis rivers 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 Chuitna, Theodore, and Lewis rivers king salmon. Options are then presented for potential management actions for the commercial, sport, and subsistence fisheries, and research projects for these king salmon stocks.

In October 2010, the department recommended that the board declare Chuitna, Theodore, and Lewis rivers king salmon as a stock of management concern at the regulatory board meeting for the West Cook Inlet (WCI) Management Area in February of 2011¹. 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 the Chuitna, Theodore, and Lewis rivers (Figure 1) since 1979 to index spawning escapement of king salmon. These surveys are conducted from helicopters at slower speeds than traditional fixed-wing aircraft surveys.

Chuitna, Theodore, and Lewis rivers king salmon are harvested in inriver sport fisheries, in the nearby subsistence fishery that occurs in the Tyonek Subdistrict marine waters adjacent to the community of Tyonek, and in the Northern District commercial set gillnet king salmon fishery. Sport harvests from 1977–2009 have been estimated from the Statewide Harvest Survey for each river (Table 1; Figure 2). No estimates of harvest for the three king salmon stocks to the marine fisheries are available because the stock contribution of these fisheries has never been fully determined. Prior to 2008, the sport fishery likely contributed the majority of harvest.

Chuitna River

Escapement

The average escapement in the Chuitna River from 1979–2009 was approximately 1,900 fish (Table 1; Figure 3). A more recent average (2007–2010) is approximately 900 fish, nearly one-half the previous 10-year average (2000–2009). Despite restrictive action since the mid 1990s

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

and closure of the sport fishery in 2010, the sustainable escapement goal (SEG) was not achieved the past four consecutive years.

Harvest

The subsistence fishery occurs in the Tyonek Subdistrict marine waters adjacent to the community of Tyonek in WCI (Figure 4). The subdistrict includes the area from one mile south of the mouth of the Chuitna River south to the easternmost part of Granite Point, and from the mean point of high tide to the mean point of low tide. The average king salmon subsistence harvest, based on permit returns, from 1981–2009 was 1,269 fish (Table 2). The average number of permits issued during the same time period was 72, and the number of returned permits was 57 (79%). In the past five years (2005–2009), the subsistence king salmon harvest, based on returned permits, ranged from 636 to 1,281 fish.

Prior to 2002, the Northern District commercial set gillnet king salmon fishing season was the month of June. Fishing was allowed for six hours each Monday (i.e., three 6-hour periods) until a quota of 12,500 king salmon was harvested 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 approximately 2,700 over the past five years (Table 3) and about 2,400 since 1993.

The sport fishery includes the whole river; however, retention of king salmon is limited to the area downstream of an old cable crossing (a distance of about seven miles). From 1977–2001, this system experienced up to 4,500 angler days of sport fishing effort (Figure 2). In 2009, only 1,350 angler days were expended. Sport harvest of king salmon from this system was as high as 1,185 fish (1983); however, in 2009, only 109 fish were harvested (Table 1; Figure 2) and in 2010, the king salmon sport fishery was closed preseason by EO.

Theodore River

Escapement

The average escapement from 1979–2005 was approximately 1,090 fish (Table 1; Figure 3). A more recent average (2006–2010) is approximately 470 fish, less than one-half the previous 5-year average. The Theodore River failed to meet the SEG in six of the last 10 years, and for the past four consecutive years, despite a catch-and-release sport fishery for king salmon the past 11 years and closure in 2010.

Harvest

Currently, Theodore River king salmon are harvested by two user groups: the Northern District king salmon commercial fishery and the Tyonek subsistence fishery. See “Chuitna River” above for an explanation of the subsistence and commercial fisheries.

Sport fishing effort was relatively high from 1984–1994, with a peak of more than 6,000 angler days of sport fishing effort in 1987 (Figure 2). Sport harvest of king salmon from this system was as high as 1,400 fish (1986), and decreased to 183 fish prior to regulatory changes that closed the sport fishery in 1996 and then restricted sport fishing to catch-and-release in 1999

(Table 1; Figure 2). Anglers now spend an average of 650 days fishing the Theodore River to catch 600 fish.

Lewis River

Escapement

The average escapement from 1979–2005 was approximately 560 fish (Table 1; Figure 3). A more recent average (2006–2010) is 126 fish, approximately one-fourth the previous period’s average. The Lewis River failed to meet the SEG for king salmon the past four consecutive years despite a catch-and-release sport fishery and closure in 2010.

Harvest

Currently, Lewis River king salmon are harvested by two user groups: the Northern District king salmon commercial fishery and the Tyonek subsistence fishery. See “Chuitna River” above, for an explanation of the subsistence and commercial fisheries.

Although information on the sport fishery is spotty, this system has experienced as many as 1,300 angler days of sport fishing effort (Figure 2). Sport harvest was greater than 150 fish annually from 1987–1990, but the sport fishery was closed by regulation in 1996 and then restricted to catch-and-release by regulation beginning in 1999 (Table 1; Figure 2). Anglers now spend an average of 300 days fishing the Lewis River to catch 130 fish.

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 goals for these systems were adopted in 1993 and were set as point biological escapement goals representing the escapement that produced the greatest yield. The goals were calculated as 66% of the average escapement index. The escapement index for each river 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 1979–1992, except for various years when conditions were too poor at particular rivers. The king salmon escapement goals for the Chuitna, Theodore, and Lewis rivers were 1,400, 750, and 400 fish, respectively.

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 Chuitna, Theodore, and Lewis rivers king salmon. King salmon harvest data are available for these systems for the sport fishery only (Table 1). Some marine harvest of these stocks is likely in the adjacent 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.”

Chuitna River

Twenty years of spawner index counts between 1979 and 2000 were inspected and found to have fair data quality, with a high contrast of 8.4 (ratio of highest escapement to lowest escapement) and a moderate level of exploitation. This indicated that the SEG range should be set from the 25th and 75th percentiles of the escapement data and rounded to the nearest 100 fish. The 25th percentile was 1,225 fish and the 75th percentile was 2,890, for an SEG range of 1,200 to 2,900 fish (Bue and Hasbrouck *Unpublished*).

Theodore River

Twenty-one years of spawner index counts between 1979 and 2000 were inspected and found to have fair data quality, with a medium contrast of 6.0. This indicated that the SEG range should be set from the 15th and 85th percentiles of the escapement data. The 15th percentile was 535 fish and the 85th percentile was 1,607, for an SEG range of 500 to 1,700 fish (Bue and Hasbrouck *Unpublished*).

Lewis River

Twenty years of spawner index counts between 1979 and 2000 were inspected and found to have fair data quality, with a medium contrast of 6.5. This indicated that the SEG range should be set from the 15th and 85th percentiles of the escapement data. The 15th percentile was 250 fish and the 85th percentile was 790, for an SEG range of 250 to 800 fish (Bue and Hasbrouck *Unpublished*).

ESCAPEMENT GOAL RECOMMENDATION

The department has undertaken a review of escapement goals for these three systems in 2010 and recommends no change to these escapement goals (Fair et al. 2011).

STOCK OF CONCERN RECOMMENDATION

Escapements of king salmon have fallen below the lower end of the current SEG range for the Chuitna and Lewis rivers in four of the past six years, and five of the past six years in the Theodore River. Escapements of king salmon to these rivers were compared to the current SEG range for each system as follows: Chuitna River—1,200 to 2,900 fish, Theodore River—500 to 1,700 fish, and Lewis River—250 to 800 fish. Regulatory changes adopted in the 1995–1996 board meeting cycle and the most recent inseason management actions taken during the 2010 fishing season 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 Chuitna,

Theodore, and Lewis rivers 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 runs the last three seasons, king salmon abundance is likely to be below the long-term average.

HABITAT ASSESSMENT

Activities affecting fish habitat in WCI between the Beluga and Susitna rivers have been relatively minor and related primarily to access road maintenance of gas production facilities in the Beluga area. Recent projects included stabilizing the banks of the Theodore and Lewis rivers directly upstream of the bridges and clearing debris from bridge supports. These activities likely have had minimal impact to area fish stocks. There are no known upcoming projects that would have significant impacts on Chuitna, Theodore, and Lewis rivers.

Proposed coal mining on the upper Chuitna River drainage could negatively affect fish habitat. The proposed coal mine would directly impact about half of one tributary's watershed, including about 11 miles of spawning and rearing habitat, and potentially impact two adjacent tributaries, all associated with king salmon spawning. Potential impacts affecting king salmon include: increased sediment input and water temperature downstream of the project, reduction of marine- and terrestrial-derived nutrient input into the system, changes in water chemistry and to ground and surface waters, and wastewater discharges from mine and camp facilities. The development is in the pre-permitting phase and no permit applications have been submitted to date. Environmental baseline studies are ongoing and potential impacts have not been thoroughly evaluated.

Natural events also impact king salmon habitat in WCI streams. Significant rainfall throughout the region in October 1986 led to massive flooding, substantial streambed scouring and channelization, and erosion and landslides that deposited earth and debris into the streams. This caused direct mortality of juvenile fish and eggs, and impacted spawning habitat in subsequent years. In summer 2007, the Lewis River channel diverged into an open muskeg, so no water from the river flowed into Cook Inlet. The channel divergence was repaired, but this natural event reduced the number of king salmon spawning in the Lewis River that year; no king salmon were observed during the aerial escapement survey.

FISHERIES MANAGEMENT OVERVIEW AND BACKGROUND

SPORT FISHERIES

The Chuitna River is the most productive king salmon river flowing into the West Cook Inlet Management Area (WCIMA). This river system is a small- to medium-sized clearwater system initiating in the foothills of the Alaska Range, generally flowing in a southeasterly direction and emptying into WCIMA near the community of Tyonek. There are two sport fish lodge operations that target Chuitna River king salmon, as well as several sport fish guide operations.

The Theodore and Lewis rivers are small clearwater systems initiating in the foothills of Little Mount Susitna, flowing into WCIMA. These systems are pristine, with almost no human disturbances or development, and access is limited to aircraft or boat because there is no road link to the Southcentral Alaska road system. Historically, these systems were a popular sport fishing destination for king salmon anglers, with the Theodore River being the second-most productive king salmon system in WCIMA.

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.

In the 1990s, escapement goals were not met for some streams (Figure 3). Reduced abundance of spawning king salmon in WCIMA in the early 1990s was probably due to elevated sport harvest and flood-related mortality of eggs and juveniles in 1986. Inspection of coastal streams after an October 1986 flood revealed substantial streambed scouring and channelization. In association with flooding, there was severe erosion, landslides, and subsequent deposition of earth and debris into the streams. Beginning in the early 1990s, various EOs and regulatory changes were issued limiting the sport harvest of king salmon. Below is an outline of significant changes to sport fisheries that affected harvest and escapement of king salmon to the Chuitna, Theodore, and Lewis rivers:

1984:

- Opened to king salmon fishing.

1992:

- Annual limit of five king salmon established.
- Guides prohibited from fishing while engaged in guiding activities for king salmon.

1993:

- King salmon sport fishing season reduced by 13 days to end on June 30.
- Bag and possession limit was reduced from one per day/two in possession to one per day/one in possession.
- Designated specific upstream areas in Chuitna, Theodore, and Lewis rivers where king salmon could not be retained and use of bait prohibited.

1995:

- EO prohibiting the use of bait during king salmon season and allowing sport fishing only between the hours of 6:00 a.m. and 11:00 p.m.

1996:

- Lewis River closed to sport fishing, including catch and release, for king salmon.

1997:

- Theodore River closed to sport fishing, including catch and release, for king salmon.
- In all fresh waters of WCI, after taking a king salmon 16 inches or greater in length, a person was prohibited from fishing for king salmon during that same day.

1999:

- Anglers allowed to continue fishing for king salmon after they harvested their limit.
- Opened lower Theodore River to catch-and-release fishing for king salmon from January 1 through June 30, only single hook artificial lures allowed. Bait is prohibited.
- Fishing allowed only between the hours of 6:00 a.m. and 11:00 p.m.

2002:

- Theodore and Lewis rivers were opened in their entirety to catch-and-release fishing for king salmon. No bait, single hook only.

2010:

- EO closed sport fishing, including catch and release, for king salmon on Chuitna, Theodore, and Lewis rivers.

COMMERCIAL FISHERIES

Some marine harvest of Chuitna, Theodore, and Lewis river king salmon stocks is likely in the adjacent 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 these rivers are:

5 AAC 21.363. *Upper Cook Inlet Salmon Management Plan.*

5 AAC 21.366. *Northern District King Salmon Management Plan.*

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. 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 the Chuitna, Theodore, and Lewis rivers:

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:

- Season 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:

- Season 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 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.

SUBSISTENCE FISHERIES

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 an administrative finding made in November 1992, the board established the following amounts as reasonably necessary for subsistence for this fishery: 750–2,750 king salmon, 100–275 sockeye salmon, 50–100 chum salmon, 50–100 pink salmon, and 100–375 coho salmon. The board has not adopted this ANS finding in regulation. Subsistence fishing is allowed only in the Tyonek Subdistrict of the Northern District and 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, but no more than 4,200 king salmon may be taken from May 15 through June 30. If 4,200 king salmon have been taken in the early season, the early season closes by emergency order and the late season cannot open until July 1.

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.

MANAGEMENT ACTION PLAN OPTIONS FOR ADDRESSING STOCK OF CONCERN

ACTION PLAN GOAL

To rebuild the Chuitna, Theodore, and Lewis rivers king salmon runs back to levels that achieve the current SEG range.

ACTION PLAN ALTERNATIVES

Potential management actions described below, other than status quo, 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 Chuitna, Theodore, and Lewis rivers.

ACTION #1 – SPORT FISHERY

Objective: Reduce harvest and catch-and-release mortality of sport-caught king salmon.

Background: Chuitna River is open to king salmon harvest downstream of the old cable crossing from January 1 through June 30. Waters upstream of the old cable crossing are open to catch and release only for king salmon. The king salmon bag limit is one per day, one in possession for fish 20 inches or greater in length; ten per day, ten in possession for fish less than 20 inches in length; and there is a five fish annual limit for fish 20 inches or greater in length.

Theodore and Lewis rivers are open to catch-and-release only for king salmon from January 1 through June 30. Only one, single-hook, unbaited, artificial lure may be used January 1–June 30.

The Division of Sport Fish used the commissioner’s EO authority preseason to close sport fishing, including catch-and-release, for king salmon on Chuitna, Theodore, and Lewis rivers for the 2010 fishing season.

Option A. – Status Quo

Continue to use department EO authority. The preseason sport fishery closure in 2010 was the most restrictive management action that could be implemented by the Division of Sport Fish. The Division of Sport Fish will continue to use its EO authority to manage the Chuitna, Theodore, and Lewis rivers king salmon stocks to achieve their respective escapement goals and rebuild these stocks from the recent period of low productivity.

Specific Action to Implement the Object: Use EO authority to restrict the Chuitna, Theodore, and Lewis king salmon sport fishery by implementing closures as needed inseason.

Benefits: The benefit of providing the department the flexibility to manage Chuitna, Theodore, and Lewis rivers king salmon stocks inseason with EO authority is retaining the ability to return to more liberal fisheries if king salmon runs rebuild prior to the next board meeting. In the Chuitna River, there could be a harvest savings of 100 fish during a weak year to 1,200 fish on a

strong run year. A closure to the sport fishery in these fisheries will also result in a closure of the Northern District commercial salmon fishery from one mile south of Chuitna River to the mouth of Susitna River.

Detriments: EO actions need to be taken preseason because stock assessment activities occur well after the fishing season. No formal forecast can be made, so EO actions would be reacting to previous seasons' index counts and general regionwide trends.

Option B. – Close Sport Fisheries

The three rivers would be closed to sport fishing for king salmon, including catch-and-release fishing.

Specific Action to Implement the Object: Take board action to close all three rivers to fishing for king salmon or to close to all sport fishing during the king salmon season.

Benefits: The Chuitna River king salmon stock would benefit more from this action because it is still open for sport harvest, whereas the Theodore and Lewis rivers are open only to catch-and-release for king salmon. In the Chuitna River, there could be a harvest savings of 100 fish during a weak year to 1,200 fish on a strong return year. Prohibiting catch-and-release on the Theodore and Lewis rivers may increase spawning escapement by 0–50 fish.

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

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.

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 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 close to commercial king salmon fishing for the remainder of the directed king salmon fishery.

Option A. – Status Quo

The Division of Commercial Fisheries will continue to manage this fishery as directed in the *Northern District King Salmon Management Plan*. Commercial fishing closures on northern-

bound stocks would be dependent on sport fishing management actions, and EO authority would be used to close the Northern District commercial salmon fishery from one mile south of Chuitna River to the mouth of Susitna River when sport fishing is closed by EO for king salmon on the Chuitna, Theodore, or Lewis rivers.

Specific Action to Implement the Object: Use EO authority to close Northern District commercial salmon fishery in designated areas when sport fishing is closed by EO for king salmon on the Chuitna, Theodore, or Lewis rivers.

Benefits: The benefit of providing the department the flexibility to manage Chuitna, Theodore, and Lewis rivers king salmon stocks inseason with EO authority is retaining the ability to return to more liberal fisheries if king salmon runs rebuild prior to the next board meeting.

Detriments: Emergency order actions are reactive to actions taken in the sport fishery. Emergency orders need to be taken preseason because stock assessment activities occur well after the fishing season. No formal forecast can be made, so actions would be reacting to previous season's index counts and general regionwide trends.

Option B. – 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 the Chuitna, Theodore, or Lewis rivers by an unknown amount. This may limit future growth in this fishery during years of larger runs.

Detriments: The harvest of king salmon would still occur and may not be lower than historical harvest ranges.

Option C. – 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 the Chuitna, Theodore, or Lewis rivers by an unknown amount. This may limit future growth in this fishery during years of larger runs.

Detriments: The harvest of king salmon would still occur and may not be lower than historical harvest ranges.

Option D. – 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 the Chuitna, Theodore, or Lewis rivers by an unknown amount. This may limit future growth in this fishery during years of larger runs.

Detriments: The harvest of king salmon would still occur and may not be lower than historical harvest ranges.

Option E. – 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 3,800 Northern District king salmon and an unknown increase in escapement to the Chuitna, Theodore, or Lewis rivers 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. This season closes by emergency order when 4,200 king salmon have been harvested. The second part is open from 6:00 a.m. through 6:00 p.m. on Saturdays from June 16–October 15; however, if 4,200 king salmon have been taken before June 16, the second part does not open until July 1. Allowable gear is one 10-fathom (60 ft) gillnet with mesh size no greater than six inches and 45 meshes in depth.

The board has determined that the current three day per week fishing period from May 15 through June 15 provides a reasonable opportunity for subsistence in the Tyonek Subdistrict subsistence fishery.

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 the Chuitna, Theodore, or Lewis rivers by an unknown amount.

Detriments: The harvest of king salmon will still occur and may not be lower than historic harvest ranges. Restricting area or time in the subsistence fishery may not provide a reasonable opportunity for subsistence.

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 the Chuitna, Theodore, or Lewis rivers by an unknown amount.

Detriments: The harvest of king salmon will still occur and may not be lower than historic harvest ranges. Restricting area or time in the subsistence fishery may not provide a reasonable opportunity for subsistence.

2011 ALASKA BOARD OF FISHERIES REGULATORY PROPOSALS AFFECTING CHUITNA, THEODORE, AND LEWIS RIVERS

- Proposal 102 – Modify gear for subsistence fishing.
- Proposal 133 – Make consumptive use a priority for fishing for king and coho salmon.
- Proposal 142 – Revise the *Northern District King Salmon Management Plan*.
- Proposal 143 – Modify the *Northern District King Salmon Management Plan* to articulate recreational use priority.
- Proposal 158 – Restrict all harvest until minimum escapement goals are reached.
- Proposal 270 – Restrict sport, commercial, and subsistence fishing for Alexander Creek king salmon.
- Proposal 271 – In Lewis and Theodore rivers, prohibit catch and release of kings or require barbless hooks, and determine impact of invasive species.

RESEARCH PLAN

To date there has been little research directed at king salmon in the Chuitna, Theodore, and Lewis rivers. Aside from the current aerial survey program, estimates of harvest by user group, and ancillary information collected from king salmon during other projects, there has been no research to estimate the total abundance of king salmon or age composition information needed to better determine productivity parameters of this stock.

CURRENT RESEARCH PROJECTS

The following research programs have been and are being conducted to gather detailed information about king salmon stocks in the WCIMA:

1. West Cook Inlet King Salmon Genetic Baseline: The department is developing a genetic baseline for king salmon in Alaska. As part of this program, Chuitna, Theodore, and Lewis rivers king salmon were identified as stocks to be included in the genetic baseline. A minimum of 100, and ideally 200, adult king salmon from the spawning population within each river (Chris Habicht, ADF&G Gene Conservation Laboratory, personal communication) should be sampled to complete the baseline. Samples from 142 Chuitna River king salmon were collected in 2008 and 2009. The department may collect additional Chuitna River king salmon samples. Samples from 34 Theodore River king salmon were collected in 2010 and the department plans to collect the remaining 166 samples in 2011 and 2012. The department also plans to collect 200 samples from the Lewis River in 2011 and 2012. Recent published results from the department show a high likelihood that king salmon from WCI will be distinguishable from many other Pacific Rim stocks, including other stocks within and outside Cook Inlet, using genetic stock identification methods (Chris Habicht, ADF&G, Gene Conservation Laboratory, personal communication).
2. Aerial Surveys: The department plans to continue the single annual aerial surveys (helicopter) at the Chuitna, Lewis, and Theodore rivers to monitor trends in king salmon abundance.

3. King Salmon Weirs: The department has obtained a project award from the Alaska Sustainable Salmon Fund to conduct a 3-year study to obtain reliable temporal/spatial estimates of king salmon escapements by age/sex/length. Secondly, this project will be used to evaluate the effectiveness and accuracy of the single aerial surveys. Floating weirs will be placed in the Chuitna and Theodore rivers prior to significant fish entry into the river and maintained throughout the run. Weirs will be maintained daily to ensure they are fish-tight and fish cannot pass uncounted. Fish will be counted through a gate in the weir in a manner that does not impede migration or hold fish behind the weir for a prolonged period. Fish will be sampled for age, sex, and length throughout the run according to the current ADF&G sampling protocol. Genetic samples may be taken, if necessary or desired.
4. Marine Harvest Sampling: If a useful amount of discrimination exists in the genetic baseline, the department plans to propose sampling marine king salmon fisheries in Northern Cook Inlet.

LITERATURE CITED

- Bue, B. G. and J. J. Hasbrouck. Unpublished. Escapement goal review of salmon stocks of Upper Cook Inlet. Report to the Board of Fisheries, Alaska Department of Fish and Game, Sport Fish Division, Anchorage.
- Fair, L. F., T. W. Willette, J. W. Erickson, R. J. Yanusz, and T. R. McKinley. 2011. Review of salmon escapement goals in Upper Cook Inlet, Alaska, 2011. Alaska Department of Fish and Game, Fishery Manuscript Series No. 10-06, Anchorage.
- Fried, S. M. 1994. Pacific salmon spawning escapement goals for the Prince William Sound, Cook Inlet, and Bristol Bay areas of Alaska. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Special Publication No. 8, Juneau.
- Fried, S. M. 1999. Upper Cook Inlet Pacific salmon biological escapement goal review: Department findings and recommendations to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A99-05, Anchorage.
- Howard, K. G., and D. F. Evenson. 2010. Yukon River Chinook salmon comparative mesh size study. Alaska Department of Fish and Game, Fishery Data Series No. 10-92, Anchorage.
- Templin, W. D., J. E. Seeb, J. R. Jasper, A. W. Barclay, and L. W. Seeb. 2011. Genetic differentiation of Alaska Chinook salmon: the missing link for migratory studies. *Molecular Ecology Resources*. XX.XX-XXX

Table 1. Chuitna, Theodore, and Lewis River king salmon escapement index counts and sport harvest, 1979–2010.

Year	Chuitna River		Theodore River		Lewis River	
	Escapement	Harvest	Escapement	Harvest	Escapement	Harvest
1979	1,246	78	512	20	546	9
1980		^a 17		17		12
1981	1,362	115	535	77	560	0
1982	3,438	105	1,368	42	606	0
1983	4,043	1,185	1,519	0		^a
1984	2,845	723	1,251	1,110	947	
1985	1,600	734	1,458	1,195	861	
1986	3,946	960	1,281	1,418	722	
1987		^a 146	1,548	1,146	875	100
1988	3,024	312	1,906	1,137	616	
1989	990	581	1,026	1,317	452	185
1990	480	1,064	642	748	207	246
1991	537	377	508	369	303	190
1992	1,337	516	1,053	522	445	285
1993	2,085	893	1,110	527	531	16
1994	1,012	530	577	581	164	
1995	1,162	201	694	360	146	27
1996	1,343	844	368	183	257	
1997	2,232	728	1,607	0	777	0
1998	1,869	551	1,807	0	626	0
1999	3,721	561	2,221	0	675	0
2000	1,456	513	1,271	0	480	0
2001	1,501	457	1,237	21	502	0
2002	1,394	629	934	0	439	
2003	2,339	592	1,059	13	878	
2004	2,938	333	491	0	1,000	0
2005	1,307	294	478	0	441	0
2006	1,911	445	958	0	341	0
2007	1,180	984	486	0	0	^c 0
2008	586	46	345	0	120	0
2009	1,040	109	352	0	111	0
2010	735	0	202	0	56	0
<u>Averages</u>						
1979–2009	1,859	504	1,020	348	504	49
2000–2009	1,565	440	761	3	431	0
2007–2010	885	285	346	0	72	0
SEG ^b	1,200-2,900		500-1,700		250-800	

^a No count conducted, turbid water.

^b SEG = sustainable escapement goal.

^c River diverged into open muskeg 1/2 mile below bridge. No water in mainstem.

Table 2. Historical subsistence salmon harvests, Tyonek Subdistrict, 1981–2009.

Year	Permits		Reported salmon harvests					Total
	Issued	Returned	King	Sockeye	Coho	Chum	Pink	
1980	67	67	1,757	235	0	0	0	1,992
1981	70	70	2,002	269	64	32	15	2,382
1982	69	69	1,590	310	113	4	14	2,031
1983	75	75	2,665	187	59	6	0	2,917
1984	75	75	2,200	266	79	23	3	2,571
1985	76	NA	1,472	164	91	10	0	1,737
1986	65	NA	1,676	203	223	46	50	2,198
1987	64	61	1,610	166	149	24	10	1,959
1988	47	42	1,587	91	253	12	8	1,951
1989	49	47	1,250	85	115	1	0	1,451
1990	42	37	781	66	352	12	20	1,231
1991	57	54	902	20	58	0	0	980
1992	57	44	907	75	234	19	7	1,242
1993	62	54	1,370	57	77	17	19	1,540
1994	58	49	770	85	101	22	0	978
1995	70	55	1,317	45	153	15	0	1,530
1996	73	49	1,039	68	137	7	21	1,272
1997	70	42	639	101	137	8	0	885
1998	74	49	1,027	163	64	2	1	1,257
1999	77	54	1,230	144	94	11	32	1,511
2000	60	59	1,157	63	87	0	6	1,313
2001	84	58	976	172	49	6	4	1,207
2002	101	71	1,080	209	115	4	9	1,417
2003	87	74	1,183	111	44	10	7	1,355
2004	97	75	1,345	93	130	0	0	1,568
2005	78	66	982	61	139	2	0	1,184
2006	82	55	943	20	14	1	0	978
2007	84	67	1,281	200	123	2	3	1,609
2008	94	77	1,178	121	194	9	13	1,515
2009	89	69	636	184	258	2	1	1,081
5-year average								
(2005–2009)	85	67	1,004	117	146	3	3	1,273
10-year average								
(2000–2009)	86	67	1,076	123	115	4	4	1,323
Historical average								
(1980–2009)	72	59	1,285	134	124	10	8	1,561

Source ADF&G Division of Subsistence Alaska Salmon Fishing Database 2010.

NA = Information regarding the number of permits returned in 1985–1986 does exist; however, it was not available at the time this report was written.

Table 3. Northern District commercial king salmon directed harvest by statistical area, 2001–2010.

Year	Date	247-10	247-20	247-30	247-41	247-42	247-43	247-70	247-80	247-90	Total
2001	6/4/2001	173	218	80	30	42	15	59		15	
	6/11/2001	300	282		22	119	21	37		12	
	6/18/2001	118			6	28	23	7		9	
	Total	591	500	80	58	189	59	103	0	36	1,616
2002	5/27/2002	95			13	60	4	37	56	5	
	6/3/2002	223	136	85	87	57	16	64	70	72	
	6/10/2002	159	131		34	104	3	63	115	58	
	Total	477	267	85	134	221	23	164	241	135	1,747
2003	5/26/2003	18		36	37	45		24		19	
	6/2/2003	5	101	4	45	43	54	74	17	6	
	6/9/2003	47	383	67	53	49	2	33	9	1	
	Total	70	484	107	135	137	56	131	26	26	1,172
2004	5/31/2004	74	33	17	30	43	40	108		9	
	6/7/2004	62	285	147	266	101	82	100		23	
	6/14/2004		137	47	46	56	38	59		16	
	Total	136	455	211	342	200	160	267	0	48	1,819
2005	5/30/2005	166	320		224	203	85	160	18	5	
	6/6/2005	103	430	290	97	60	69	65		31	
	6/13/2005	26	391		98	113	129	33	34		
	Total	295	1141	290	419	376	283	258	52	36	3,150
2006	5/29/2006	174	133	20	76	47	78	80	19	13	
	6/5/2006	322	312	150	247	108	74	127	23	13	
	6/12/2006	335	489	212	165	116	232	204	79	39	
	Total	831	934	382	488	271	384	411	121	65	3,887
2007	5/28/2007	178	99	21	15	42	7	78	28	30	
	6/4/2007	237	162	228	131	94	124	240	36	18	
	6/11/2007	94	366	126	120	87	181	346	24	20	
	Total	509	627	375	266	223	312	664	88	68	3,132
2008	5/26/2008	39	272	42	33	16	27	35	24	11	
	6/2/2008	110	165	49	72	50	37	96	7	11	
	6/9/2008	103	535	143	275	208	153	168	72	31	
	6/16/2008	118	282	138	162	81	110	132	33	15	
	Total	370	1254	372	542	355	327	431	136	68	3,855
2009	5/25/2009		28	14	6	3	1	24	3		
	6/1/2009	111	147	36	12	24	15	68	32	10	
	6/8/2009	148	181	94	64	101	56	77	3	8	
	Total	259	356	144	82	128	72	169	38	18	1,266
2010	5/31/2010	141	102		43	48	42	32	5	20	
	6/7/2010	180	302		71	63	71	74	22	19	
	6/14/2010		61		8	54	25	19	8	5	
	6/21/2010	17	147		2	23	39	20	7	4	
	Total	338	612	0	124	188	177	145	42	48	1,674

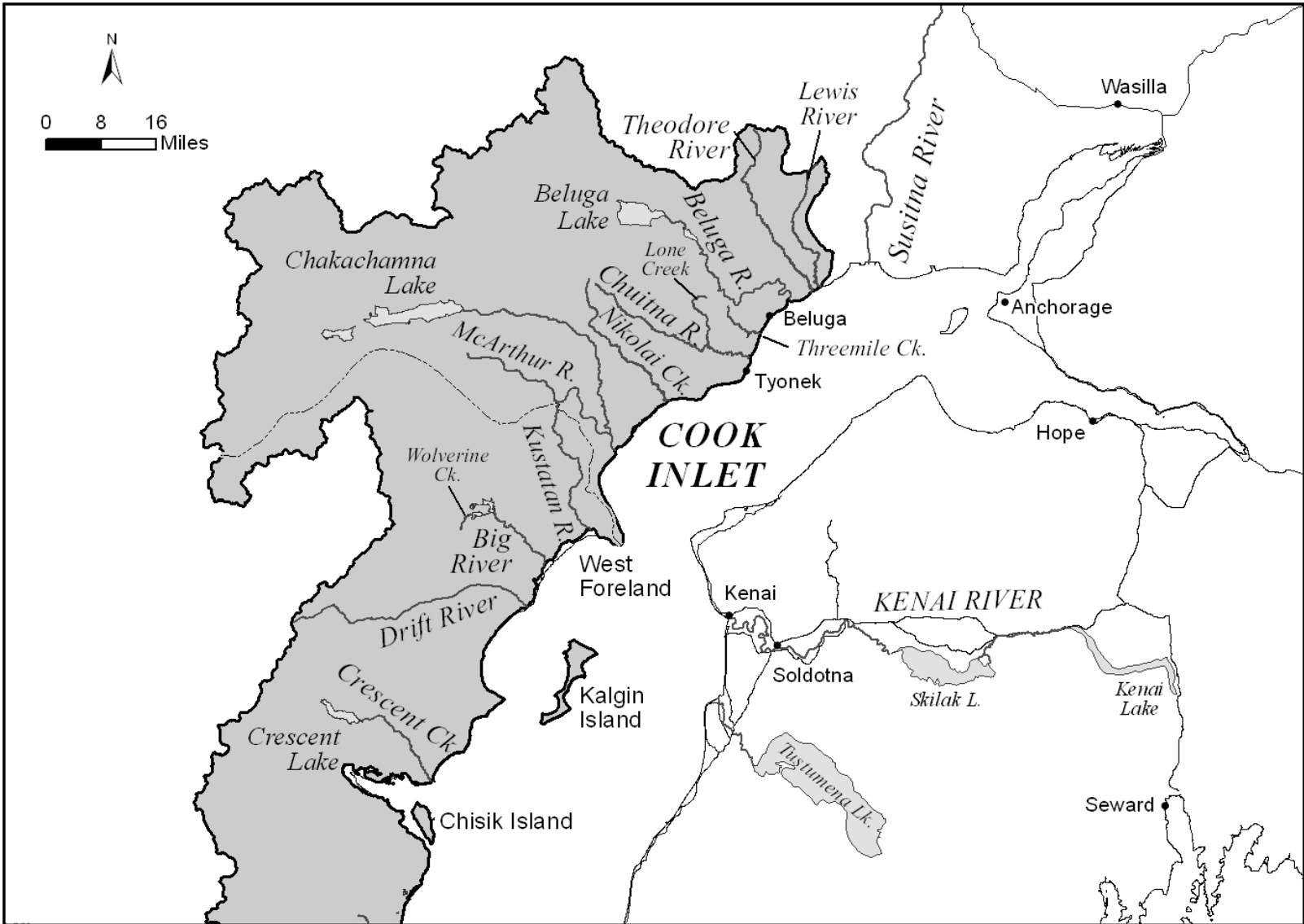


Figure 1. Map depicting West Cook Inlet king salmon streams.

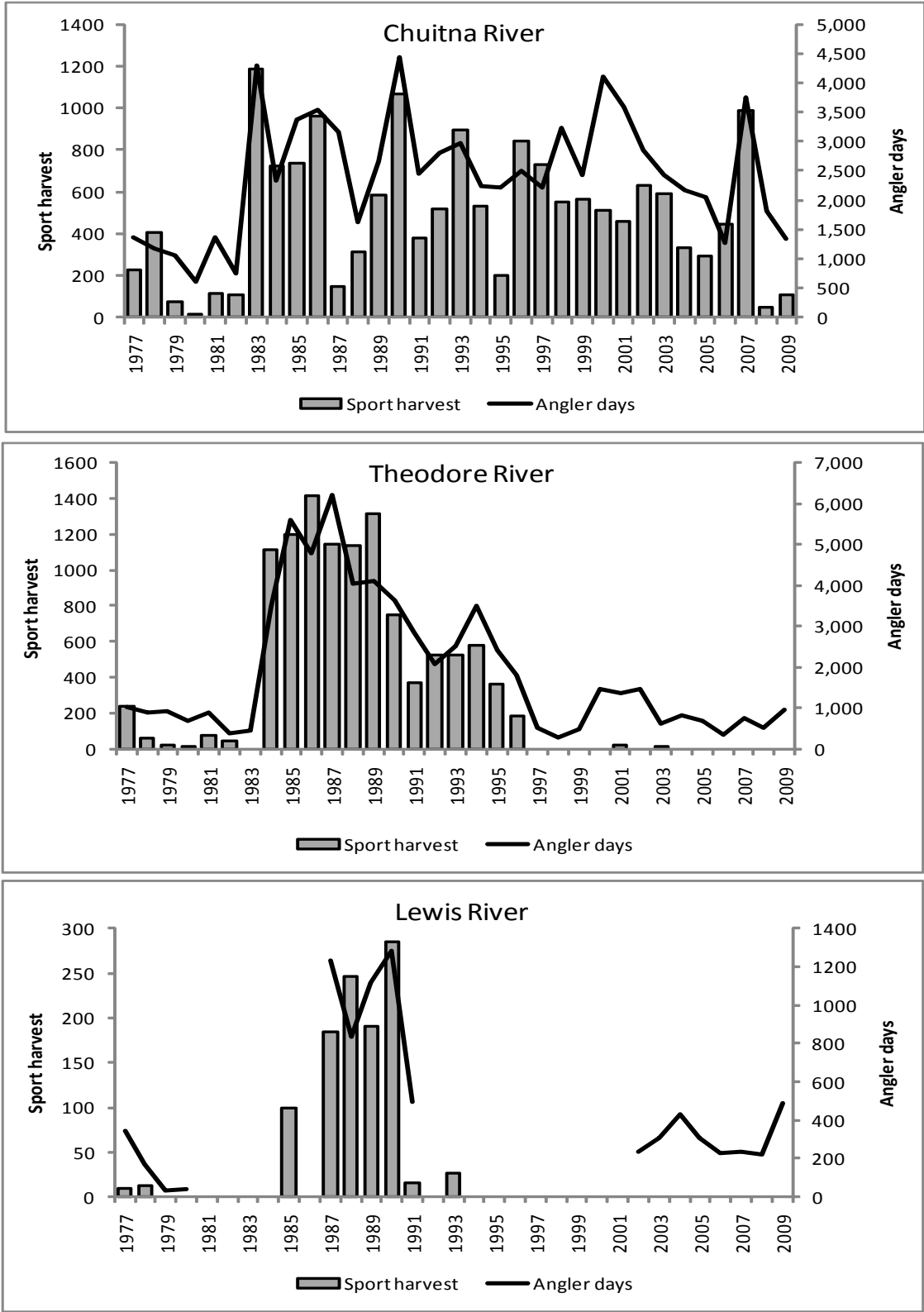


Figure 2. Sport harvest and angler effort estimates for Chuitna, Theodore, and Lewis rivers king salmon, 1977–2009.

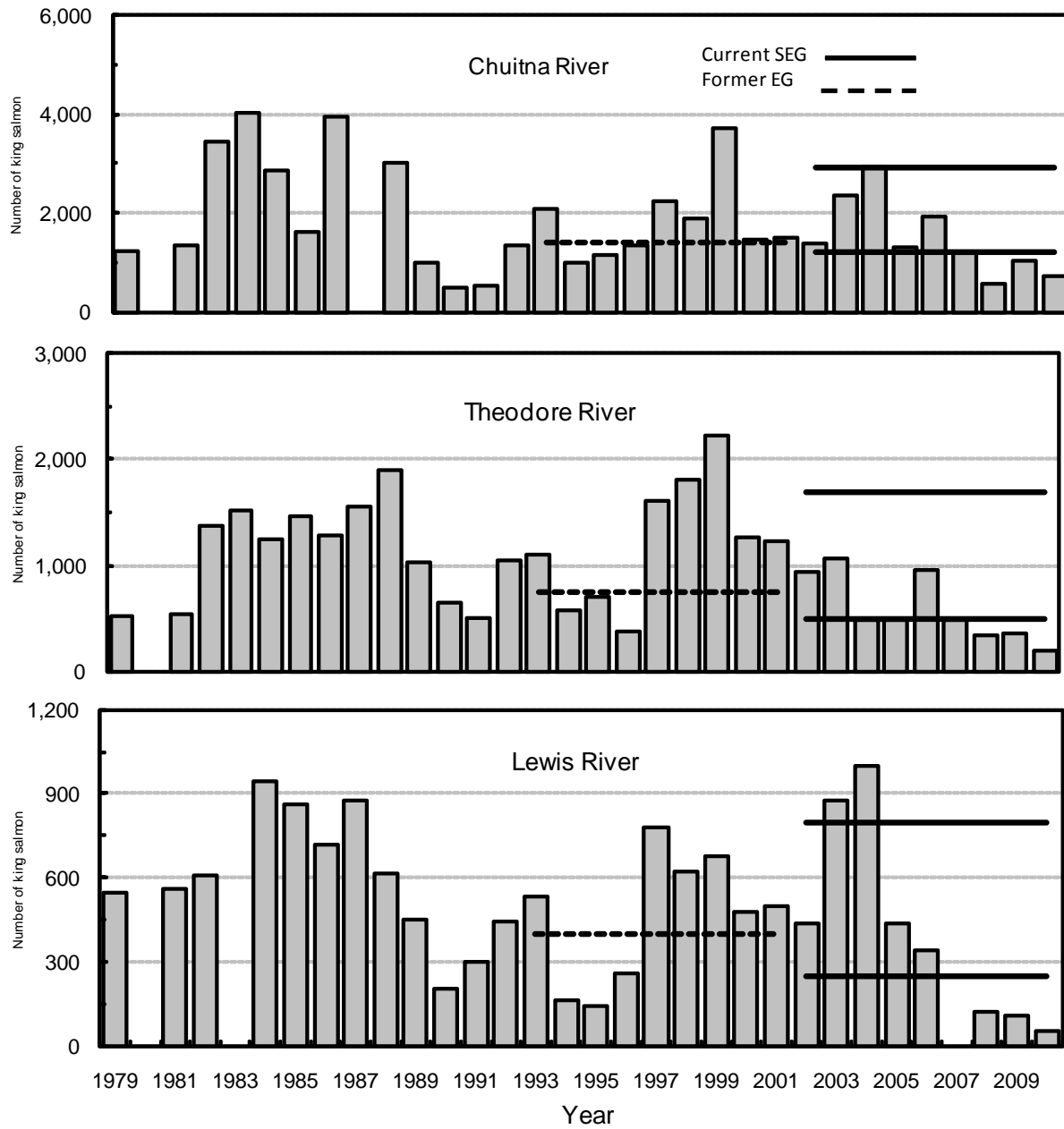


Figure 3. Chuitna, Theodore, and Lewis rivers king salmon escapement index counts, 1979–2010.

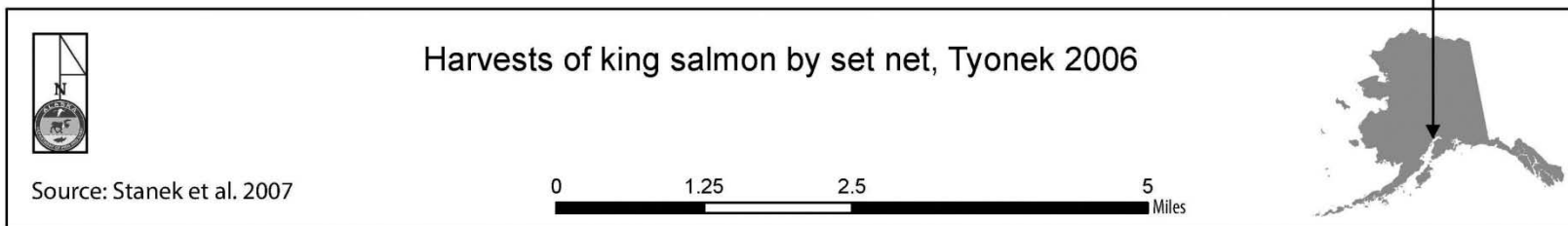


Figure 4. Map showing harvest locations of king salmon by set gillnet, Tyonek Subdistrict subsistence salmon fishery, 2006.

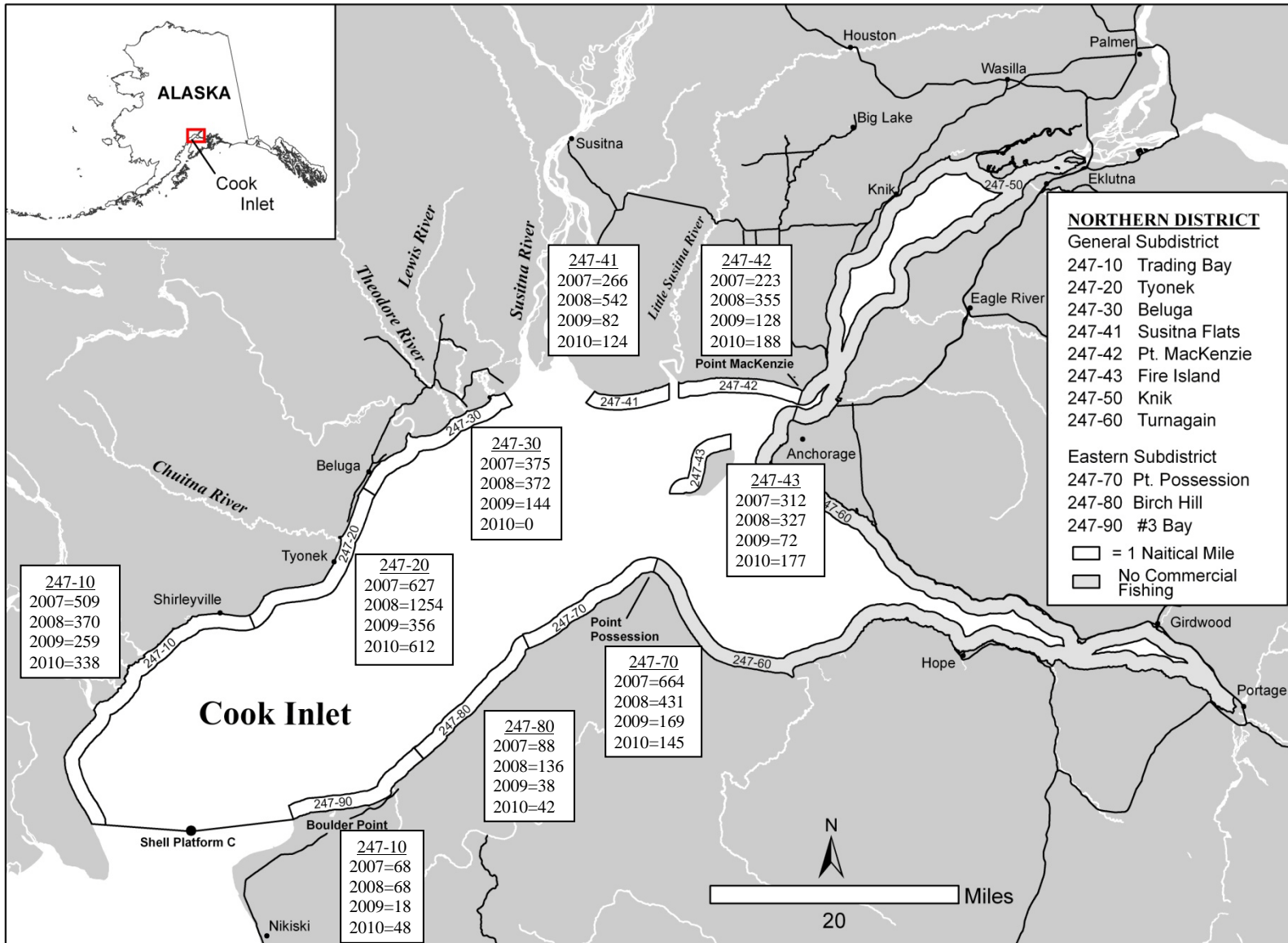


Figure 5. Northern District statistical harvest reporting areas and commercial king salmon harvest, 2007–2010.