

# Report to the Alaska Board of Fisheries

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## Willow Creek and Goose Creek King Salmon Stock Status and Action Plan, 2011.

By

Cook Inlet Staff

February 2011

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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.

<b>Weights and measures (metric)</b>		<b>General</b>		<b>Mathematics, statistics, fisheries</b>
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 $F, t, \chi^2$ , etc.
kilometer	km			confidence interval C.I.
liter	L			correlation coefficient $R$ (multiple)
meter	m	east	E	correlation coefficient $r$ (simple)
metric ton	mt	north	N	covariance cov
milliliter	ml	south	S	degree (angular or temperature) °
millimeter	mm	west	W	degrees of freedom df
		Copyright	©	divided by $\div$ or / (in equations)
<b>Weights and measures (English)</b>		Corporate suffixes:		equals =
cubic feet per second	ft <sup>3</sup> /s	Company	Co.	expected value $E$
foot	ft	Corporation	Corp.	fork length FL
gallon	gal	Incorporated	Inc.	greater than >
inch	in	Limited	Ltd.	greater than or equal to $\geq$
mile	mi	et alii (and other people)	et al.	harvest per unit effort HPUE
ounce	oz	et cetera (and so forth)	etc.	less than <
pound	lb	exempli gratia (for example)	e.g.,	less than or equal to $\leq$
quart	qt	id est (that is)	i.e.,	logarithm (natural) ln
yard	yd	latitude or longitude	lat. or long.	logarithm (base 10) log
Spell out acre and ton.		monetary symbols (U.S.)	\$, ¢	logarithm (specify base) $\log_2$ , etc.
		months (tables and figures): first three letters	Jan, ..., Dec	mid-eye-to-fork MEF
<b>Time and temperature</b>		number (before a number)	# (e.g., #10)	minute (angular) '
day	d	pounds (after a number)	# (e.g., 10#)	multiplied by $\times$
degrees Celsius	°C	registered trademark	®	not significant NS
degrees Fahrenheit	°F	Trademark	™	null hypothesis $H_0$
hour (spell out for 24-hour clock)	h	United States (adjective)	U.S.	percent %
minute	min	United States of America (noun)	USA	probability $P$
second	s	U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	probability of a type I error (rejection of the null hypothesis when true) $\alpha$
Spell out year, month, and week.				probability of a type II error (acceptance of the null hypothesis when false) $\beta$
<b>Physics and chemistry</b>				second (angular) "
all atomic symbols				standard deviation SD
alternating current	AC			standard error SE
ampere	A			standard length SL
calorie	Cal			total length TL
direct current	DC			variance Var
hertz	Hz			
horsepower	hp			
hydrogen ion activity	pH			
parts per million	ppm			
parts per thousand	ppt, ‰			
volts	V			
watts	W			

***REPORT TO THE ALASKA BOARD OF FISHERIES***

**WILLOW CREEK AND GOOSE CREEK 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

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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 Willow Creek and Goose Creek king salmon as a stock of yield concern, summarizes historical assessments of annual run sizes, and describes the existing regulations and emergency order (EO) authority that the department follows to manage Willow Creek and Goose Creek 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 Willow Creek and Goose Creek king salmon as a stock of yield concern at the regulatory board meeting for the Northern Cook Inlet (NCI) Management Area in February of 2011<sup>1</sup>. 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 "yield concern means a concern arising from a chronic inability, despite use of specific management measures, to maintain expected yields, or harvestable surpluses, above a stock's escapement needs ..." 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 Willow Creek and Goose Creek (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.

Willow Creek and Goose Creek king salmon are harvested primarily in inriver sport fisheries. Sport harvests from 1977–2009 have been estimated from the Statewide Harvest Survey for each creek (Table 1; Figure 2). These stocks may also be harvested in 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. No estimates of harvest for Willow Creek and Goose Creek king salmon stocks to the marine fisheries are available because the stock contribution of these fisheries has never been fully determined.

### *Willow Creek*

#### **Escapement**

The average escapement in Willow Creek from 1979–2009 was approximately 2,300 fish (Table 1; Figure 3). A more recent average (2007–2010) is approximately 1,200 fish, nearly one-half the previous 10-year average (2000–2009). An estimated 2% hatchery fish stray into the Willow Creek escapement annually. Despite cautious incremental development of regulations since

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

1980 and closure of the sport fishery inseason during 2009 and 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 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 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 harvest of hatchery fish. Past studies (Ivey *et al.* 2009) estimated the contribution of hatchery fish to the sport harvest averaged 40%, and ranged from 26–51% (1991–2005). Beginning in 2003, stocking levels were reduced by 50%–60%, except in 2004 when a targeted release of approximately 200,000 smolt occurred. This may have resulted in a higher proportion of wild king salmon in the harvest than in past years. From 1979–2009, this system experienced up to 51,000 angler days of sport fishing effort per year (Table 1; Figure 2) and averaged approximately 27,000 angler days. In 2009, approximately 19,000 angler days were expended. Sport harvest of king salmon from this system was as high as 8,884 fish (1992); however, in 2009, only 499 fish were harvested (Table 1; Figure 2).

### ***Goose Creek***

#### **Escapement**

The average escapement from 1979–2009 was approximately 405 fish (Table 1; Figure 3). A more recent average (2007–2010) is approximately 91 fish. Despite cautious incremental development of regulation since 1980 and closure of the sport fishery inseason during 2009 and 2010, the sustainable escapement goal (SEG) was not achieved the past four consecutive years. It should be noted, however, that during the aerial survey in 2009 and 2010, a beaver dam appeared to block fish passage to the upper reaches of the index area (Figure 5). The beaver dam likely reduced the amount of spawning salmon above this location by an unknown amount, but surveyors typically observe the majority of spawning occurring below the location of the dam.

#### **Harvest**

See “Willow Creek” above for an explanation of the subsistence and commercial fisheries.



From 1979–2009, this system averaged approximately 2,600 angler days of sport fishing effort per year (Table 1; Figure 2). Between 2007 and 2009, angler effort ranged from 1,895 angler days to 621 angler days. Sport harvest of king salmon from this system was as high as 1,033 fish (1992), but has not exceeded 150 king salmon since 2004.

## **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 for Willow Creek, and 1981–1992 for Goose Creek, except for years when conditions were too poor to conduct a survey. The king salmon escapement goals for Willow Creek and Goose Creek were 1,350 and 350 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 Willow Creek and Goose 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 possible 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. Some age composition data is available for Willow Creek escapements and harvest, although harvest data may not be stock specific because the majority of harvest occurs at the confluence of Willow Creek and the Susitna River. No age composition data are available from harvests or escapements of Goose Creek king salmon. 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.”

#### ***Willow Creek***

Twenty-one years of spawner index counts between 1979 and 2000 were inspected and found to have fair data quality, with a high contrast of 8.5 (ratio of highest escapement to lowest escapement) and moderate exploitation. This indicated that the SEG range should be set from the 25<sup>th</sup> and 75<sup>th</sup> percentiles of the escapement data and rounded to the nearest 100 fish. The 25<sup>th</sup>

percentile was 1,660 fish and the 75<sup>th</sup> percentile was 2,768, for a SEG range of 1,600 to 2,800 fish (Bue and Hasbrouck *Unpublished*).

### ***Goose Creek***

Nineteen years of spawner index counts between 1981 and 2000 were inspected and found to have fair data quality, with a medium contrast of 7.7 (ratio of highest escapement to lowest escapement). This indicated that the SEG range should be set from the 15<sup>th</sup> and 85<sup>th</sup> percentiles of the escapement data and rounded to the nearest 50 fish. The 15<sup>th</sup> percentile was 266 fish and the 85<sup>th</sup> percentile was 637, for a SEG range of 250 to 650 fish (Bue and Hasbrouck *Unpublished*).

## **ESCAPEMENT GOAL RECOMMENDATION**

The department has undertaken a review of these escapement goals in 2010 and recommends no change to the 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 Willow Creek and Goose Creek in each of the past four years. Escapements of king salmon to these rivers were compared to the current SEG range for each system as follows: Willow Creek—1,600 to 2,800 fish, and Goose Creek—250 to 650 fish. Recent inseason management actions taken during the 2009 and 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 Willow Creek and Goose Creek king salmon a stock of yield 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 potentially impacting fish habitat on the Willow Creek and Goose Creek drainages have remained relatively minor. There were several bridge/culvert repair projects conducted after the 2006 floods. Activity levels have subsided somewhat over the past several years, and projects have been limited to minor bridge and culvert maintenance, dock installation on tributary lakes, and water withdrawals that have little or no direct impacts to salmon production. Land development in the area continues, but no project or group of projects that could significantly impact salmon production have been proposed. Recreational suction dredging and small-scale commercial placer mining activities have been ongoing, mostly in the headwaters of the Willow Creek system. This type of mining activity has increased somewhat due to increased

gold prices, but has had little or no direct impact on salmon production because of its location and how it is conducted.

## **FISHERIES MANAGEMENT OVERVIEW AND BACKGROUND**

### **SPORT FISHERIES**

All streams crossing the Parks Highway south of the Susitna Bridge are within Unit 2 of the Susitna River. These streams provide ease of access to fishing and small to moderate runs of king salmon. Because access to these streams is primarily from the road system, they receive relatively high sport angling effort and are managed conservatively. Popular king salmon sport fisheries within Unit 2 include Willow, Little Willow, Caswell, Sheep, Goose, Greys, and Montana creeks, and the Kashwitna River. Development of king salmon sport fisheries on each stream has occurred through cautious, incremental liberalizations. Since these streams share similar high angling effort, easy access, and are geographically close together, they are managed collectively as a unit under the same regulatory structure. An EO to restrict (or liberalize) one fishery typically includes all other streams in the unit as well because a closure on one stream would result in intensified pressure on adjacent streams, possibly resulting in over harvest on those streams. Unit 2 streams are open to sport fishing January 1 and become weekend-only (Saturday–Monday) after the third Monday in June for the next three consecutive weekends to control harvest rates through the average peak of the run. Fishing, in general, is limited to the first few miles of stream which in most cases, equates to downstream of the Parks Highway. The last regulatory liberalization on Unit 2 streams occurred in 2005 with the addition of the third, three-day weekend.

Willow Creek is the largest king salmon fishery within Unit 2 largely because of a State Parks-owned campground near the mouth and because Willow Creek has been enhanced with hatchery reared king salmon since 1985. Creel studies estimate that the contribution of hatchery fish to the sport harvest averaged 40% and ranged from 26–51% for 1991–2005, years in which a full complement of stocked fish returned (Ivey *et al.* 2009). Reduced stocking levels since 2003 have likely lowered hatchery contributions to the Willow Creek harvest since 2009, resulting in additional pressure on wild stocks. Stocking levels are anticipated to return to normal levels beginning in 2012.

Goose Creek, like Willow Creek, has undergone cautious, incremental expansion of the king salmon fishery, although unlike Willow Creek which opened in 1979, Goose Creek joined the other weekend-only fisheries within Unit 2 in 1986. Goose Creek is not stocked with hatchery-reared fish.

### **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 amongst 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.

Unit 2 eastside Susitna River streams began to open to fishing for king salmon following a period when sport fisheries were closed to fishing for king salmon through the most of the 1970s. Cautious incremental expansion of fishing opportunity has been the management strategy since that time. Below is an outline of significant changes to sport fisheries that affected harvest and escapement of king salmon to Unit 2 streams:

1977:

- NCI king salmon greater than 20 inches in length closed to sport harvest.

1979:

- King salmon sport fishing open on Saturdays and Sundays for four consecutive weekends.
- Bag and possession limit of one king salmon 20 inches or greater in length.
- Annual limit of five king salmon established.

1980:

- Bag and possession limit changed to two per day greater than 20 inches, but only one could be greater than 28 inches.

1981:

- Bag and possession limit changed to one per day and two in possession greater than 20 inches.

1986:

- Bag and possession limit changed to one per day and two in possession greater than 16 inches.

1987:

- King salmon sport fishing open on Saturdays, Sundays, and Mondays for four consecutive weekends.

1990:

- No seasonal limit.

1992:

- Seasonal limit of five king salmon greater than 16 inches.
- Guides prohibited from fishing while engaged in guiding activities for king salmon.

1995:

- Bag and possession limit changed to one per day and one in possession greater than 16 inches.
- The use of bait was prohibited during king salmon season and allowing sport fishing only between the hours of 6:00 a.m. and 11:00 p.m.

1997:

- A person may not fish for king salmon during the same day after taking a king salmon 16 inches or greater in length.

1999–2003:

- King salmon sport fishing season extended by EO for Willow Creek.

2005:

- King salmon season extended by regulation for an additional three-day weekend.

2009:

- EO closed sport fishing, including catch and release, for king salmon on Parks Highway streams during final weekend.

2010:

- EO closed sport fishing, including catch and release, for king salmon on Parks Highway streams during final two weekends.

## COMMERCIAL FISHERIES

Some marine harvest of Willow Creek and Goose Creek king salmon stocks may occur 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 6). 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 Willow Creek and Goose 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:
- 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 Willow Creek and Goose Creek 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 Willow Creek and Goose Creek.

### ACTION #1 – SPORT FISHERY

**Objective: Reduce harvest of sport-caught king salmon.**

**Background:** Willow Creek and Goose Creek are open to king salmon fishing downstream of the Parks Highway from January 1 through the third Monday in June and for the next three consecutive three-day weekends. The king salmon bag limit is one per day, one in possession for fish 20 inches or greater in length, and only unbaited, artificial lures are allowed June 1–July 13. There is a five fish annual limit for king salmon 20 inches or greater in length.

The Division of Sport Fish used the commissioner’s EO authority inseason to close sport fishing, including catch-and-release, for king salmon on Willow Creek and Goose Creek during the final weekend in 2009 and the final two weekends in 2010. The EO applied to other Parks Highway streams (Unit 2) because management of these road-accessible streams must be considered collectively due to effort and harvest shifting between these streams. In addition, management of other Susitna River streams, Units 3–6, must also take into consideration possible increased angling effort and harvest.

#### **Option A. – Status Quo**

Continue to use department EO authority. The inseason sport fishery closure in 2009 and 2010 was not the most restrictive management action that could be implemented by the Division of Sport Fish. An EO could be issued closing the fishery even earlier than what occurred in 2009 and 2010. The Division of Sport Fish will continue to use its EO authority to manage Willow Creek, Goose Creek, and other Susitna River 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 Parks Highway streams (Unit 2) king salmon sport fishery by implementing closures as needed inseason. Action may also be taken in other Susitna River management units to account for shifting of anglers.



**Benefits:** The benefit of the department continuing to manage Willow Creek and Goose Creek 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. If king salmon abundance appears sufficient to achieve escapement goals, the EO may be rescinded and sport fishing could resume prior to the end of the season.

**Detriments:** Average and below average runs are difficult to detect so EO actions would be reacting to previous seasons' index counts, general regionwide trends, staff surveys of angling success, and inseason aerial monitoring of escapements which can't occur until later in the season.

### **Option B. – Reduce Hours Open to Sport Fishing for King Salmon**

Willow Creek and Goose Creek are open 24 hours per day during four three-day weekends.

**Specific Action to Implement the Object:** Take board action to reduce hours open to king salmon fishing on Willow Creek and Goose Creek, or all Parks Highway streams (Unit 2).

**Benefits:** Reducing hours open to king salmon fishing may increase king salmon escapement by an unknown amount.

**Detriments:** Depending on the movement of king salmon, this option may not decrease king salmon harvest by a measureable amount. King salmon can hold in confluence areas for an extended length of time before ascending the creek to spawn.

### **Option C. – Reduce the King Salmon Sport Fishing Season**

**Specific Action to Implement the Object:** Take board action to close the last three-day weekend on all Parks Highway streams (Unit 2) to fishing for king salmon, the same as the fishery operated by regulation prior to 2005.

**Benefits:** Closing the season earlier would increase king salmon escapement by an unknown amount. The season could be extended by EO during years of large runs as was done prior to 2005.

**Detriments:** This action may not reduce harvest enough during periods of poor productivity unless timely EOs reducing harvest earlier in the season accompanies this action.

### **Option D. – Reduce the Annual Harvest Limit**

Willow Creek and Goose Creek are a part of the Cook Inlet freshwater annual limit of five king salmon.

**Specific Action to Implement the Object:** Take board action to reduce the annual limit for king salmon greater than 20 inches harvested from Willow Creek and Goose Creek to less than five annually.

**Benefits:** Reducing the annual limit would increase king salmon escapement by an unknown amount. The annual limit could be increased by EO during years of large runs.

**Detriments:** Reducing the annual limit for only these two streams may cause shifting of effort to other Susitna streams and result in unintended consequences to those systems. Surpluses of hatchery king salmon in Willow Creek may go unharvested.

### **Option E. – Close Sport Fisheries**

Willow Creek and Goose Creek and/or all Parks Highway streams (Unit 2) 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 these rivers to fishing for king salmon or to close to all sport fishing during the king salmon season.

**Benefits:** In Willow Creek, there could be a harvest savings of 500 fish during a weak year to 4,000 fish on a strong return year, of which 21%–56% may be hatchery fish. In Goose Creek, there could be a harvest savings of 1–400 fish.

**Detriments:** If harvest is not the only factor limiting escapement, then this action is not a long-term solution. In Willow Creek, hatchery fish would not be harvested.

## **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 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 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 Willow Creek and Goose Creek king salmon stocks inseason with EO authority is retaining the ability to return to more liberal fisheries if king salmon runs to those systems rebuild prior to the next board meeting. These benefits would likely apply to Willow Creek and Goose Creek king salmon runs as well.

**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 for Chuitna, Theodore, and Lewis rivers and general regionwide trends. These trends may not necessarily reflect trends in Willow and Goose creeks.

### **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 Willow and Goose creeks 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 Willow and Goose creeks 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 Willow and Goose creeks 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 Willow and Goose creeks 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 Willow and Goose creeks 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 Willow and Goose creeks 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 WILLOW CREEK AND GOOSE CREEK**

- 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 265 – Standardize Willow Creek salmon fishing regulations upstream to Deception Creek.
- Proposal 266 – Prohibit fishing from boats at the mouth of Willow Creek and the Susitna River.
- Proposal 270 – Restrict sport, commercial, and subsistence fishing for Alexander Creek king salmon.

### **RESEARCH PLAN**

To date there has been little research directed at king salmon in the Willow and Goose creeks. 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:

The following research programs have been and are being conducted to gather detailed information about king salmon stocks in Unit 2:

1. King Salmon Genetic Baseline: The department is developing a genetic baseline for king salmon in Alaska. As part of this program, Willow Creek king salmon were identified as a stock 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 74 mainstem Willow Creek king salmon have been collected and analyzed by the Gene Conservation Laboratory, and 98 samples have been collected from Deception Creek king salmon, 67 of which have been analyzed.
2. Aerial Surveys: The department plans to continue the single annual aerial surveys (helicopter) at Willow and Goose creeks to monitor trends in king salmon abundance.

3. Hatchery Contribution: The department plans to continue annual escapement sampling to estimate the contribution of hatchery fish to the mainstem Willow Creek king salmon escapement.
  
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 NCI.

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Table 1. Willow Creek and Goose Creek king salmon escapement index counts, and sport harvest and effort, 1979–2010.

Year	Willow Creek <sup>a</sup>			Goose Creek		
	Escapement	Harvest	Effort	Escapement	Harvest	Effort
1979	848	459	18,911			
1980		289	29,011			
1981	991	585	14,060	262		
1982	592	629	19,704	140		
1983	777	534	13,405	477		
1984	2,789	774	21,649	258	0	1,305
1985	1,856	1,063	16,282	401		
1986	2,059	1,017	10,733	630	145	1,993
1987	2,768	1,987	13,583	416	334	1,865
1988	2,496	2,349	27,758	1,076	218	2,947
1989	5,060	2,846	23,811	835	385	3,058
1990	2,365	3,237	32,200	552	504	3714
1991	2,006	3,208	32,520	968	288	2811
1992	1,660	8,884	50,958	369	1,033	4,908
1993	2,227	8,626	41,218	347	633	3,423
1994	1,479	5,980	34,362	375	361	3300
1995	3,792	2,742	29,392	374	226	1993
1996	1,776	2,690	23,508	305	437	1796
1997	4,841	3,135	21,511	308	298	3,151
1998	3,500	2,793	23,920	415	348	2,510
1999	2,081	4,988	37,384	268	371	3,561
2000	2,601	3,782	44,648	348	258	3,266
2001	3,188	4,573	34,979		<sup>c</sup> 160	2,339
2002	2,758	3,591	31,997	565	403	2,845
2003	3,964	3,922	29,668	175	350	2,965
2004	2,985	2,818	26,722	417	335	2,645
2005	2,463	2,466	24,181	468	150	2,039
2006	2,217	2,141	21,927	306	27	2,593
2007	1,373	2,258	22,139	105	31	621
2008	1,255	<sup>c</sup> 1,101	17,953	117	134	1,895
2009	1,133	499	19,019	65	<sup>d</sup> 0	1,640
2010	1,173	NA	NA	76	<sup>d</sup> NA	NA
<u>Averages</u>						
1979–2009	2,330	2,773	26,100	405	297	2,607
2000–2009	2,394	2,715	27,323	285	185	2,285
2007–2010	1,234	NA	NA	91	NA	NA
SEG <sup>b</sup>	1,600–2,800			250–650		

<sup>a</sup> Includes hatchery fish.

<sup>b</sup> SEG = sustainable escapement goal.

<sup>c</sup> Poor count due to timing, poor visibility or weather conditions.

<sup>d</sup> Beaver dam blocks fish passage.

NA = Not available until 2011.

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

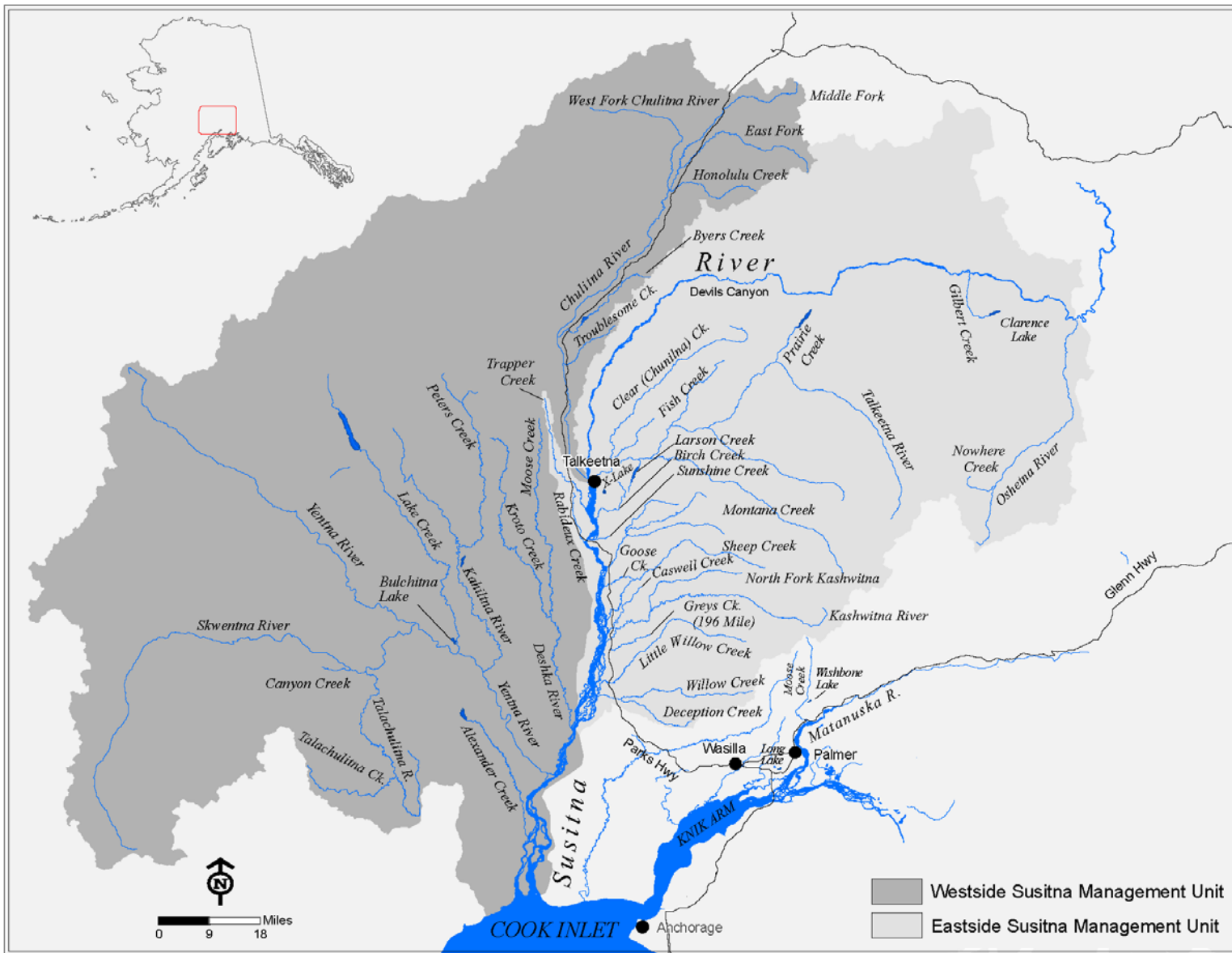


Figure 1. Map depicting Susitna River drainages.

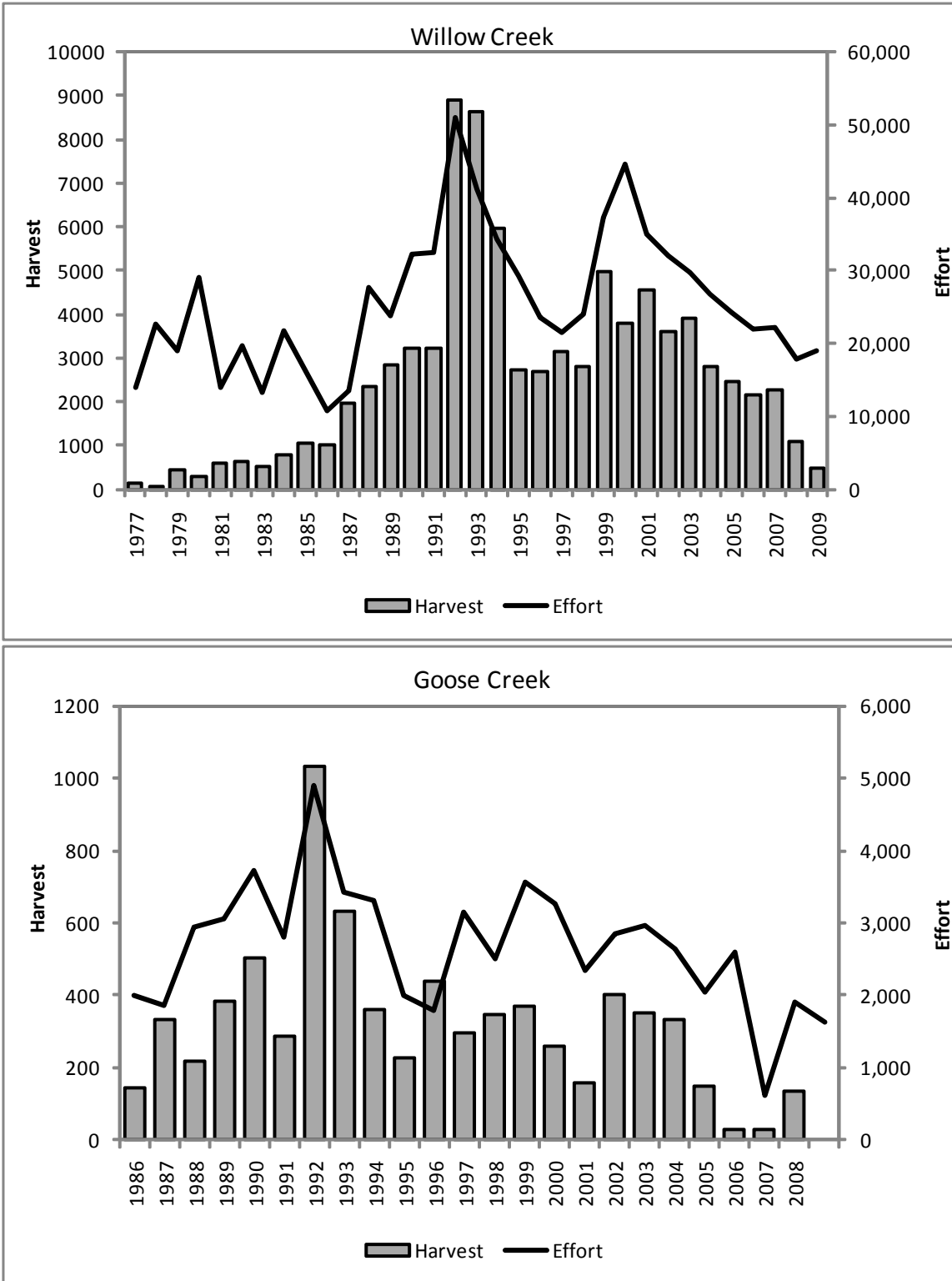


Figure 2. Sport harvest and angler effort estimates for Willow Creek and Goose Creek king salmon, 1997–2009 (Jennings *et al.* *In prep.*).

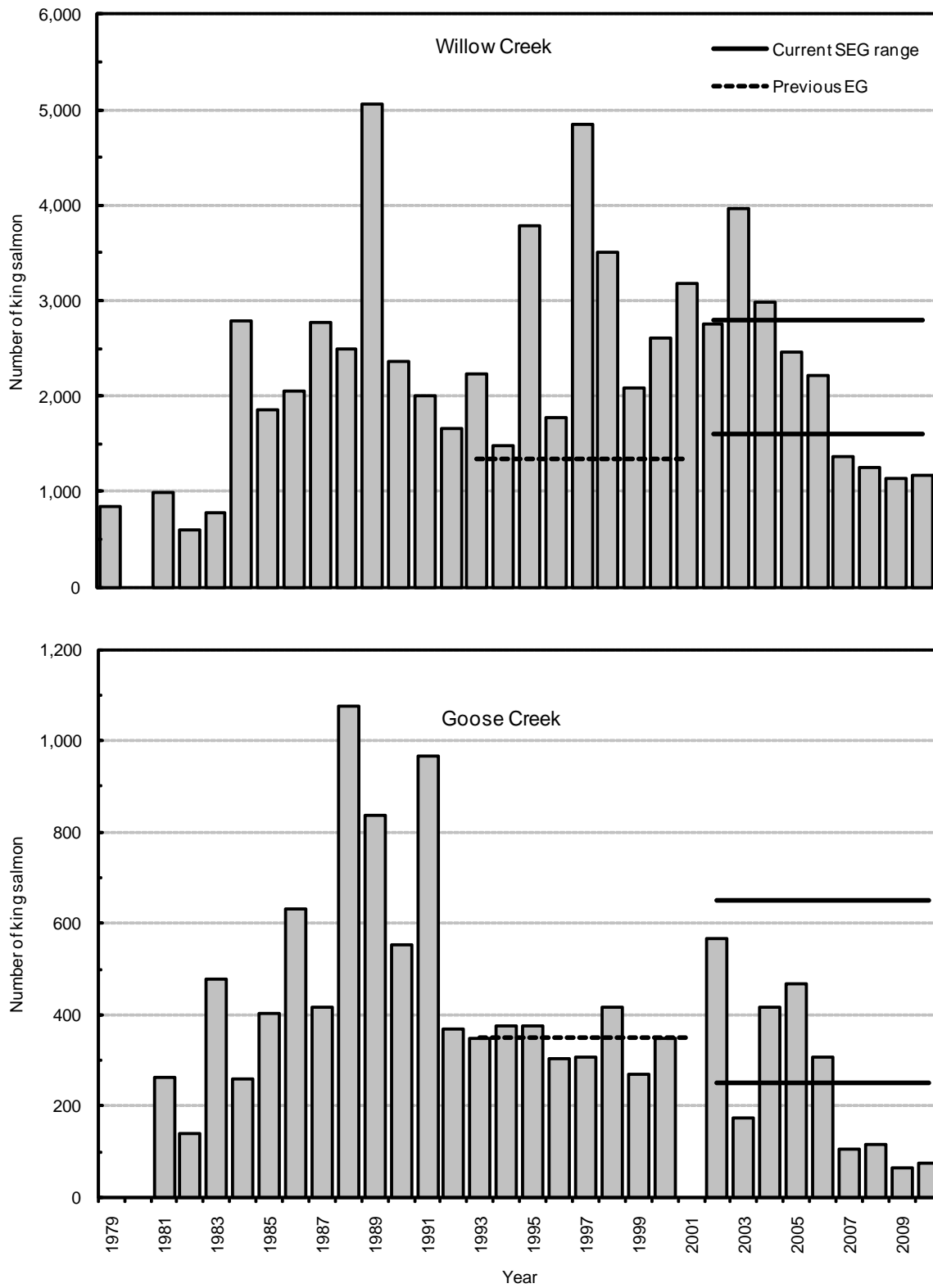


Figure 3. Willow Creek and Goose Creek king salmon escapement index counts, 1979–2010.

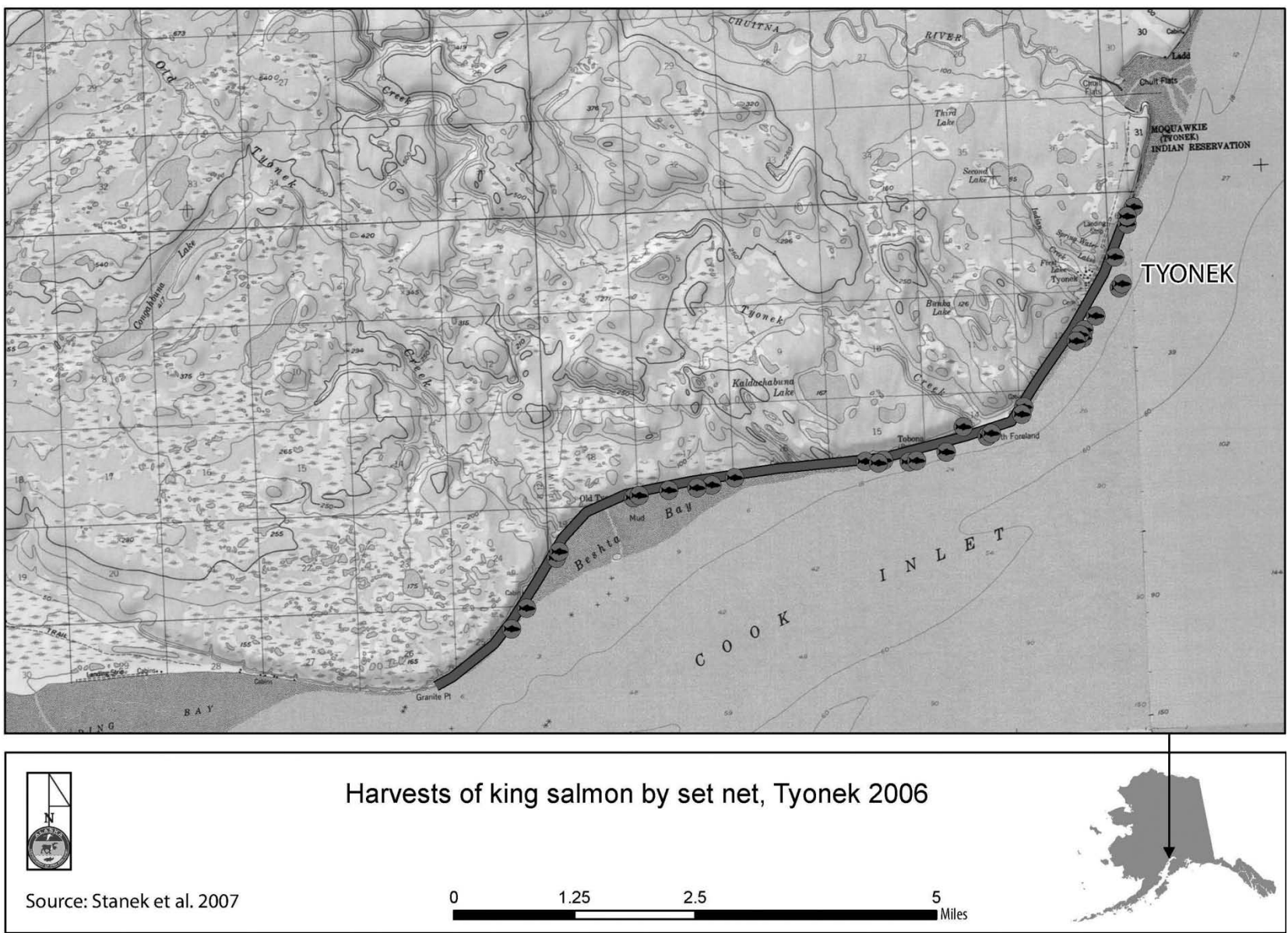


Figure 4. Map showing harvest locations of king salmon by set gillnet, Tyonek Subdistrict subsistence salmon fishery, 2006.

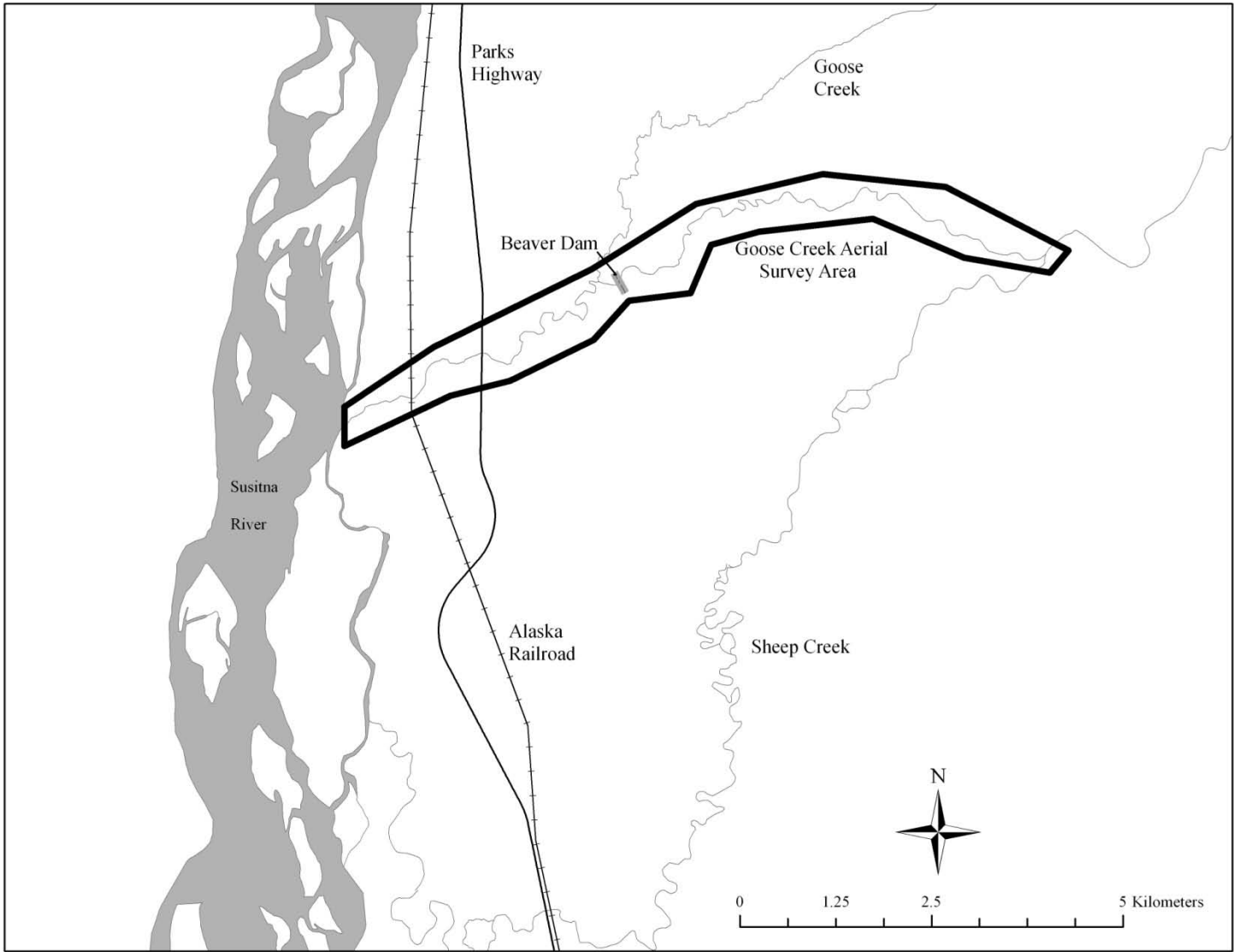


Figure 5. Goose Creek aerial survey index area.



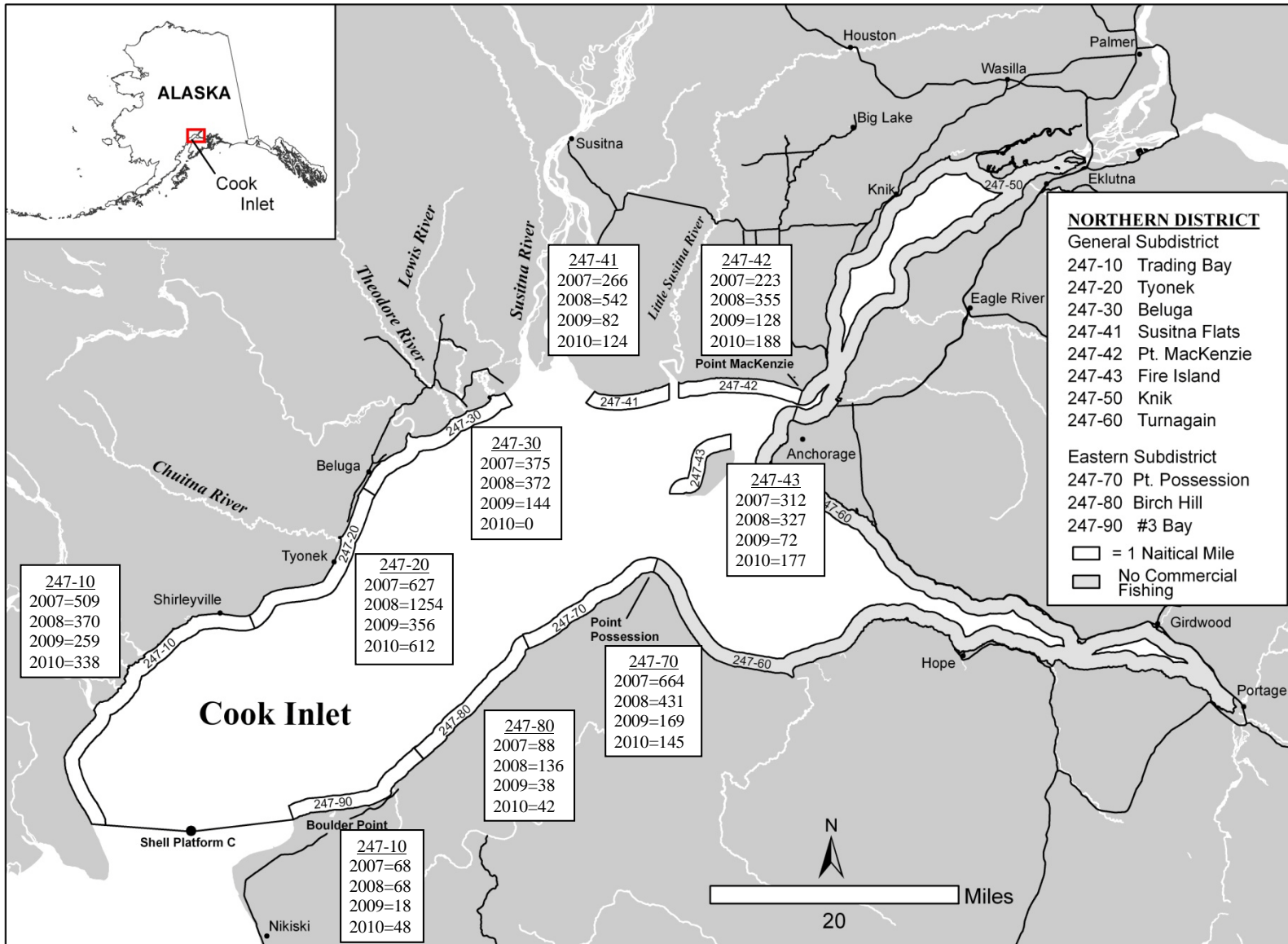


Figure 6. Northern District statistical harvest reporting areas and commercial king salmon harvest, 2007–2010.