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**Management of Salmon Stocks in the Copper River,  
Report to the Alaska Board of Fisheries:  
December 2–7, 2011, Valdez, Alaska**

by

**Jeremy Botz**

and

**Mark A. Somerville**

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November 2011

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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<b>Weights and measures (metric)</b>		<b>General</b>		<b>Measures (fisheries)</b>	
centimeter	cm	Alaska Administrative Code	AAC	fork length	FL
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	mid-eye to fork	MEF
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	mid-eye to tail fork	METF
hectare	ha	at	@	standard length	SL
kilogram	kg	compass directions:		total length	TL
kilometer	km	east	E		
liter	L	north	N	<b>Mathematics, statistics</b>	
meter	m	south	S	<i>all standard mathematical signs, symbols and abbreviations</i>	
milliliter	mL	west	W	alternate hypothesis	H <sub>A</sub>
millimeter	mm	copyright	©	base of natural logarithm	e
		corporate suffixes:		catch per unit effort	CPUE
<b>Weights and measures (English)</b>		Company	Co.	coefficient of variation	CV
cubic feet per second	ft <sup>3</sup> /s	Corporation	Corp.	common test statistics	(F, t, $\chi^2$ , etc.)
foot	ft	Incorporated	Inc.	confidence interval	CI
gallon	gal	Limited	Ltd.	correlation coefficient (multiple)	R
inch	in	District of Columbia	D.C.	correlation coefficient (simple)	r
mile	mi	et alii (and others)	et al.	covariance	cov
nautical mile	nmi	et cetera (and so forth)	etc.	degree (angular)	°
ounce	oz	exempli gratia	e.g.	degrees of freedom	df
pound	lb	(for example)		expected value	E
quart	qt	Federal Information Code	FIC	greater than	>
yard	yd	id est (that is)	i.e.	greater than or equal to	≥
		latitude or longitude	lat. or long.	harvest per unit effort	HPUE
<b>Time and temperature</b>		monetary symbols (U.S.)	\$, ¢	less than	<
day	d	months (tables and figures): first three letters	Jan., ..., Dec	less than or equal to	≤
degrees Celsius	°C	registered trademark	®	logarithm (natural)	ln
degrees Fahrenheit	°F	trademark	™	logarithm (base 10)	log
degrees kelvin	K	United States (adjective)	U.S.	logarithm (specify base)	log <sub>2</sub> , etc.
hour	h	United States of America (noun)	USA	minute (angular)	'
minute	min	U.S.C.	United States Code	not significant	NS
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	null hypothesis	H <sub>0</sub>
<b>Physics and chemistry</b>				percent	%
all atomic symbols				probability	P
alternating current	AC			probability of a type I error (rejection of the null hypothesis when true)	$\alpha$
ampere	A			probability of a type II error (acceptance of the null hypothesis when false)	$\beta$
calorie	cal			second (angular)	"
direct current	DC			standard deviation	SD
hertz	Hz			standard error	SE
horsepower	hp			variance	
hydrogen ion activity (negative log of)	pH			population	Var
parts per million	ppm			sample	var
parts per thousand	ppt, ‰				
volts	V				
watts	W				

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## EXECUTIVE SUMMARY

The *Copper River District Salmon Management Plan* (5 AAC 24.360) is the foundation upon which salmon returning to the Copper River are divided among the commercial, subsistence, personal use, and sport users. Since the original plan became regulation in 1984, the number of participants in the subsistence, personal use, and sport fisheries has grown. The returns of sockeye and king salmon since 1984 have been well above historical averages and have supported increasing harvests in both the commercial and upriver fisheries.

In 1994, a proposal was submitted to the Alaska Board of Fisheries (board) to review the plan. The board initiated the review process by requesting that the Alaska Department of Fish and Game (ADF&G) conduct an analysis of the plan. The board subsequently appointed the Copper River Salmon Work Group (CRSWG) from participants in the various Copper River salmon fisheries to revise the *Copper River Personal Use Dip Net Salmon Fishery Management Plan* (5 AAC 77.591) and the *Copper River District Salmon Management Plan* (5 AAC 24.360), with technical support from the department, for presentation to the board at its December 1996 meeting regarding Prince William Sound (PWS) finfish issues. Although some general guidelines for changes to the management plans were agreed upon, no specific proposals were developed by the group for presentation to the board.

ADF&G presented to the board a series of recommended changes to the *Copper River District Salmon Management Plan* that would better reflect the plan's intent, but would not change the allocations among users. These recommended changes included eliminating ambiguous terminology in the plan to more accurately state the escapement objectives necessary to provide for sustained yield; better defining the origin and composition of the inriver goal and; and clarifying the manner in which the department adjusts the inriver goal to meet management objectives. In addition to adopting the recommended changes, the board increased the spawning escapement goal for salmon other than sockeye from 15,000 to 17,500 fish. The board also made allocative changes to the management plan: (1) the sport fish allocation was changed from 3,500 sockeye and 2,500 king salmon to 15,000 salmon; (2) the Chitina Subdistrict personal use allocation was increased from 60,000 salmon to 100,000 salmon; and (3) the Glennallen Subdistrict subsistence allocation remained linked to the current harvest pattern and was given a range of 60,000 to 75,000 salmon.

In addition, the board developed the *Copper River King Salmon Management Plan* (5 AAC 24.361). This plan was formulated in response to the lack of consistent king salmon escapement data for the years preceding the 1996 board meeting. The purpose of the *Copper River King Salmon Management Plan* was to ensure that escapement of king salmon into the Copper River drainage was provided for at or above historic levels by reducing the harvest potential of the commercial, sport, and personal use fisheries by 5%. In 1999, the *Copper River King Salmon Management Plan* was modified to include a spawning escapement goal of 28,000 to 55,000 king salmon. This 6-year plan had a sunset clause of 2002 when the department, along with the affected users, was to develop a refined king salmon management plan with attainable goals and measurable objectives to present to the board for its consideration. ADF&G requested that the board adopt the existing plan, with minor adjustments, including an escapement goal of 24,000 king salmon or more. The board adopted this modified plan at its 2003 meeting. In 2005, the plan was again amended specific to management of the commercial fishery to provide

additional protection for king salmon during the early component of the run. In 1998, a process to initiate a strategic plan for research and management activities directed toward Copper River king salmon was begun by ADF&G. This plan was finalized and published in 2000. Fieldwork in support of this strategic plan was initiated in 1999 and has continued through the 2011 season.

This report summarizes the most recent fishing seasons and management actions which occurred in the Copper River commercial, subsistence, personal use, and sport salmon fisheries during those years, in addition to briefly summarizing recent research activities.



## ABSTRACT

Management of the Copper River commercial, personal use, subsistence and sport fisheries is guided by the *Copper River Personal Use Dip Net Salmon Fishery Management Plan* (5 AAC 77.591), the *Copper River District Salmon Management Plan* (5 AAC 24.360), the *Copper River Subsistence Salmon Fisheries Management Plan* (5 AAC 01.647), and the *Copper River King Salmon Management Plan* (5 AAC 24.361). This report presents background information relative to the management of the Copper River commercial, personal use, subsistence, and sport salmon fisheries and summarizes the performance of those fisheries and management actions taken through the 2011 season. King, sockeye, and coho salmon are the targeted salmon species within the Copper River fisheries and are fished from mid-May through the end of September. From 2001–2010 harvest averaged 1.61 million salmon in the Copper River District commercial fishery; 3,526 salmon in the Copper River District subsistence fishery; 113,932 salmon in the Chitina Subdistrict personal use dip net fishery; 76,361 salmon in the Glennallen Subdistrict subsistence fishery; 80 salmon in the Batzulnetas subsistence fishery; and 15,489 salmon in the Upper Copper River sport fisheries. Sockeye salmon account for over 70% of the commercial harvest and over 95% of the personal use and subsistence harvests and 74% of the sport harvest.

Key words: Copper River, Klutina River, Gulkana River, commercial, personal use, subsistence, sport fishery, Alaska Board of Fisheries, Cordova, management, king, sockeye, coho salmon, Arctic grayling, rainbow trout

## INTRODUCTION

### AREA DESCRIPTION

The Copper River drainage and estuary encompasses approximately 24,000 square miles and is Alaska's fifth largest river system (Figure 1). The river drains large portions of Interior Alaska. The drainage includes the communities of Glennallen, Gulkana, Gakona, Chitina, McCarthy, Kenny Lake, Copper Center, Paxson, Mentasta, and Slana/Nabesna. Adjacent to the outlet of the Copper River is the community of Cordova. The state's major highways, together with secondary roads and trails, in conjunction with the Copper River itself, provide relatively good access to most of the area's major fisheries. Principal land managers in the Copper River drainage are the National Park Service, U. S. Forest Service, Bureau of Land Management, Ahtna Native Corporation, Chitina Native Corporation, Chugach Native Corporation, Eyak Native Corporation, and the Alaska Department of Natural Resources.

### HISTORY OF THE COPPER RIVER SUBSISTENCE FISHERIES

From statehood until 1978, the dip net and fish wheel fisheries in the Copper River were classified as "subsistence". In 1978, Alaska passed its first subsistence law. Under this law, the Alaska Board of Fisheries (board) adopted the *Copper River Subsistence Salmon Management Plan*. This management plan established seasons, open areas, legal gears, permit requirements, and bag limits for a subsistence salmon fishery in the Copper River. The plan also directed Alaska Department of Fish and Game (ADF&G) to manage the Copper River commercial salmon fishery to assure adequate escapement for spawning and to provide for subsistence harvest. In 1980, with passage of the Alaska National Interest Lands Conservation Act, the federal government mandated subsistence hunting and fishing preference for rural residents on federal public lands. To comply with this requirement and prevent federal involvement in fishery management, the Joint Boards of Fish and Game adopted a regulation in 1982 stating only rural residents had customary and traditional (C&T) uses of fish and game and established 8 criteria for identifying use patterns. Due to growth in the fishery in the early 1980s, the board eliminated

nonbasin residents from the Copper River subsistence fishery based on an analysis of the 8 criteria in 1984. The preclusion of nonbasin residents from participating in the Copper River subsistence fisheries prevented many individuals from harvesting fish for their personal use. This led the board, in 1984, to create a personal use salmon fishery in the Copper River under the *Copper River Personal Use Salmon Management Plan*. The original plan remained relatively unchanged from 1984 through 1996.

Changes in harvest patterns and run timing rendered several aspects of the original plan obsolete. Increased numbers of fish contributing to the later portion of the run by the hatchery on the Gulkana River changed the overall timing of fish available for harvest inriver. In addition, harvests during the early portion of the season had been increasing in recent years. These changes made the aspects of the management plan that focused harvest during certain portions of the run contrary to sound management of a mixed stock fishery.

Due to changes in the distribution of fishing effort since the inception of the plan in 1984, a revised management plan was developed during the 1996 board meeting. The revised plan distributed the personal use harvest throughout the season based upon the daily projected sonar counts at the Miles Lake sonar. The maximum harvest level was increased from 60,000 to 100,000 salmon, not including any salmon in excess of the inriver goal or salmon taken after August 31. At its February 1998 meeting, the board passed a proposal (originally submitted as an agenda change request) that allowed personal use permit holders who have filled their original limit to obtain a supplemental permit for 10 additional fish in weeks when a harvestable surplus of 50,000 salmon or greater would be available in the Chitina Subdistrict.

During its 1999 meeting, the board ruled in favor of a positive C&T use finding for salmon stocks of the Chitina Subdistrict of the Upper Copper River. As a result of this decision, the Copper River personal use salmon dip net fishery regulation was repealed and a Chitina Subdistrict subsistence fishery was established. The regulations for the Chitina Subdistrict subsistence fishery remained similar to the Copper River personal use salmon dip net fishery regulations with 3 exceptions. These included an adjustment to the annual bag limit, a maximum harvest level of wild stock sockeye salmon of 85,000–130,000, and permit holders were no longer required to possess a sport fishing license. Annual bag limits continued to be 30 salmon for a household of 2 or more, and 15 salmon for a household of 1, of which only 1 fish could be a king salmon. The board determined that reducing the bag limit of king salmon from 4 in the personal use fishery to 1 in the subsistence fishery, provided for a reasonable opportunity to harvest a king salmon, but would also maintain king salmon harvests at historic levels. Based upon recent harvests, the board determined that 100,000–150,000 salmon were necessary for subsistence needs to be met for the Chitina Subdistrict fishery. This number included contributions of hatchery fish, and after this contribution was subtracted, resulted in the 85,000–130,000 wild stock harvest level. As a result of this determination, there were 3 subsistence fisheries in the Upper Copper River District during 2000–2002.

At its February 2003 meeting in Cordova, following a determination that new information was available, the board reestablished a negative C&T finding for the salmon stocks of the Chitina Subdistrict of the Upper Copper River. As a result, the Chitina Subdistrict subsistence fishery was repealed and the Copper River personal use dip net salmon fishery was re-established. The board viewed this as a name and allocation priority change only; management of the fishery continued as it had prior to the 1999 ruling, based upon the number of fish passing the Miles

Lake sonar. The exception to the 1999 regulations was that the 1 fish per household limit of king salmon remained, as did the harvest allocation of 100,000–150,000 salmon for the Chitina Subdistrict within the *Copper River District Salmon Management Plan*.

At its December 2005 meeting in Valdez, the board reaffirmed its negative C & T use finding for the salmon stocks of the Chitina Subdistrict of the Upper Copper River. In addition, the board increased the amount necessary for subsistence (ANS) for the Glennallen Subdistrict to 61,000–82,500 to account for increasing subsistence harvests. The revised ANS was based on average harvests in 3 subsections of the Glennallen Subdistrict.

The board declined to review its 2003 decision at its December, 2008 meeting in Cordova, citing no new information to justify reconsideration. Following the 2008 meeting, the Chitina Dipnetter's Association and Alaska Fish and Wildlife Fund sued the board over its 2003 decision. The Alaska Superior Court remanded the case back to the board due to the 2003 board members' inconsistent definition of the "subsistence way of life". In March 2010, the board held a 2-day meeting to consider 2 proposals addressing the court ruling. A proposal defining "subsistence way of life" as "a way of life that is based on consistent, long-term reliance upon the fish and game resources for the basic necessities of life" was adopted. The second proposal sought a positive C&T finding for the Chitina Subdistrict, considering the new definition of "subsistence way of life", and failed.

## **CURRENT MANAGEMENT TOOLS AND STRATEGIES**

### **RUN TIMING**

Several stocks of sockeye salmon with different run timing characteristics migrate through the Copper River's commercial fishery (Figure 2). Most king salmon that migrate through the district spawn in tributaries of the Upper Copper River. Three major stock components of sockeye salmon also return to the Copper River. The most abundant sockeye salmon component, referred to as the Upper Copper River wild stock, has both early and late returns that spawn in Copper River tributaries above Miles Lake. The second component is an enhanced sockeye salmon return that is produced at the Gulkana Hatchery. This enhanced return has a run timing that overlaps the late wild stock component. The Gulkana Hatchery has been producing sockeye salmon since the early 1970s and has produced enhanced returns of up to 1.1 million fish. The third group, referred to as the lower delta stock, spawns in systems below the Chugach Mountains between Eyak Lake and the Katalla River. Finally, there are 2 stocks of coho salmon that return to the management area. A small upriver stock of coho salmon shares a run timing with a much larger stock that returns to streams along the Copper River Delta (CRD) below Miles Lake.

King salmon returning to the Copper River drainage begin passing through the CRD and entering the Copper River in early May. Peak migration into the river is generally from mid-May through mid-June and the run is essentially complete by July 1. Sockeye salmon run timing in the Copper River District begins in mid-May and ends in mid-to-late August. The early-timed Upper Copper River wild stocks are in the commercial fishing district from mid-May to mid-June. The late-timed Upper Copper River wild stocks and hatchery stock sockeye salmon enter the commercial fishing district from mid-to-late June and are in the fishery through August. Some components

of the Lower CRD wild stock run timing begin in mid-May, but a majority of the delta return is not abundant until mid-June. Coho salmon return to the Copper River District from mid-August through October.

## **ESCAPEMENT ENUMERATION**

Enumerating the number of fish that escape the various fisheries and make it to the spawning grounds is an essential component of managing salmon for sustained yield. In 1992, ADF&G adopted a *Salmon Escapement Goal Policy*, which was subsequently put into regulation (5 AAC 39.223) in 2001 that formalized the procedure for establishing escapement goals. Various terms relating to escapement goals were adopted as part of the *Policy for Management of Sustainable Salmon Fisheries* (5 AAC 39.222) in 2000. The sockeye salmon stocks in the Upper Copper River are managed to achieve a sustainable escapement goal (SEG) of 300,000–500,000 spawners.

In 2002, an SEG of 24,000 or more spawners was created for Copper River king salmon. The CRD sockeye stock SEG is 55,000–130,000 spawners, and the delta coho salmon SEG is 32,000–67,000. Delta escapements are estimated using aerial surveys.

The 3 methods used to estimate salmon that return to the Copper River District are the DIDSON sonar at Miles Lake, aerial surveys of the Upper Copper River tributaries and Lower CRD streams, and a mark-recapture study to assess king salmon.

### **Miles Lake Sonar**

The Miles Lake sonar project began in 1978 with a single Bendix side-scan sonar unit on the south bank of the Copper River. In 1979, an additional unit was placed on the north bank. Beginning in 2003, Dual-frequency Identification Sonar (DIDSON) has been used. Sonar units are installed each spring below Miles Lake after shore ice is gone, which generally occurs around May 20.

The total inriver goal for the Miles Lake sonar site is established annually (Table 1). Upriver SEG and allocations are fixed in regulation while the hatchery broodstock and hatchery surplus components are determined annually. The sonar operates from mid-May to the end of July. Although king salmon and coho salmon pass the sonar site, they constitute a minor portion of the total count and species apportionment is currently not possible. Sonar passage information, therefore, is primarily used for inseason sockeye salmon management and forecasting. Daily escapement projections are compared to actual daily counts to evaluate the run's timing and abundance. Temporal achievement of the inriver goal should ensure adequate escapement for all upriver sockeye salmon components. Sonar is the primary commercial fisheries management tool until mid-June, when aerial surveys are used to estimate escapement into the delta systems.

Bendix sonar counters at Miles Lake were replaced by the new DIDSON acoustical lensing sonar system in 2008. From 2003 through 2007, DIDSON sonar units were deployed in close proximity to Bendix sonar devices with both technologies operated simultaneously. Their resultant upriver escapement counts were then compared with little significant variation observed between the 2 systems. Improvements in the DIDSON system include target tracking, digital capture and archiving of acoustic data, and the ability to conduct real time data processing and interpretation. DIDSON sonar is also able to distinguish the direction of fish migrations and

identify specific individual targets within complex groups. These features are highly useful to distinguish directional movement of fish and are useful in detecting false counts frequently created by glacial ice and debris moving downstream through the ensonified zone at Miles Lake. Additionally, this technology is being aggressively developed for a variety of industries. Future improvements in DIDSON technology could potentially provide greater information regarding salmon as they pass the counting station at Miles Lake.

### **Aerial Surveys**

Aerial surveys of delta streams are conducted weekly beginning in mid-June through mid-October. These counts are used in conjunction with inriver counts at the Miles Lake sonar to adjust commercial fishery periods in order to assure adequate escapement of sockeye and coho salmon into the Lower CRD streams. Due to the large number of spawning systems on the Lower CRD, total escapement enumeration cannot be obtained. Instead, an escapement index is estimated from aerial surveys of selected streams. The observed weekly escapement indices are compared to anticipated weekly escapement indices that are averages of past years' (1971–2010) escapement observations. The SEG range for the CRD (55,000–130,000 sockeye salmon) is compared to the combined total of the peak count for each index stream.

Previously, aerial surveys were used to estimate escapement of King salmon into the Upper Copper River. King salmon are broadly distributed throughout the Copper River basin, having been observed in approximately 40 tributaries. Aerial surveys have been conducted for 35 of these systems. However, only 9 of these streams were surveyed consistently from 1966–2004. In 2005, the number of surveyed spawning streams was reduced to 4 (Gulkana River, East Fork Chistochina River, and Manker and St. Anne creeks in the Klutina River drainage), due to data gathered from the king salmon radiotelemetry study that indicated only a minor component of the king salmon return actually spawned in the clear water tributaries of the glacial rivers (such as the Tazlina and Tonsina rivers). As with the delta's sockeye and coho salmon, assessment of king salmon spawning escapements through aerial surveys of key index areas does not provide an estimate of the total spawning population. The current 4-index streams provide an inseason index of run strength for the major sport fisheries and Upper Copper River king salmon stocks. Spawning escapement abundance is estimated by the mark-recapture fish wheel study conducted by the Native Village of Eyak (NVE).

## **OVERVIEW OF COPPER RIVER SALMON FISHERIES**

Salmon fisheries in the Copper River District primarily harvest king, sockeye, and coho salmon. These salmon stocks are harvested in 4 fisheries: 1) a commercial gillnet fishery at the mouth of the Copper River; 2) a subsistence gillnet fishery at the mouth of the Copper River, a subsistence dip net and fish wheel fishery in the Copper River between Chitina and the Slana River confluence, and a subsistence fish wheel, dip net and spear fishery in Tanada Creek and the Copper River near the traditional village site of Batzulnetas; 3) a personal use dip net fishery in the Copper River near Chitina; and 4) sport fisheries that occur in various spawning tributaries. In addition, since 1999 federal subsistence fisheries occur in the Glennallen and Chitina subdistricts and the Batzulnetas area. Prior to 1999, participants in these subsistence fisheries participated in the state fisheries and overall participation has not increased as a result of the

federal fisheries. Since 1984, total harvest of king salmon has ranged from 14,777 in 2009 to over 85,000 king salmon in 1998 (Figure 3); for sockeye salmon, 479,289 in 2009 to slightly more than 3 million in 1997 (Figure 4); and coho salmon harvest has ranged from less than 30,000 in 1997 to nearly 700,000 in 1994 (Table 2).

## COMMERCIAL FISHERIES

Copper River District includes all waters of the Gulf of Alaska between Hook Point and Point Martin (Figure 5). The seaward boundary of the Copper River District is a line 3 miles due south of a line from the southernmost tip of Pinnacle Rock on Kayak Island to the tip of Hook Point on Hinchinbrook Island. The inshore boundary line is from Government Rock to a point 500 yards seaward of the junction of Mountain Slough, Center Slough, and Eyak River, then east within a line bounded by markers located approximately 2 miles seaward of the grass banks and in Boswell Bay. The inshore boundary line has remained in effect since the 1964 earthquake when the delta area rose 2 meters. Before the earthquake, the inshore boundary was within 500 yards of the grass banks. After the earthquake, the inshore boundary was moved seaward to protect rivers and sloughs from gillnets closing off the entire channel during low-water sets. With the loss of fishing area inside the islands, many fishermen moved outside the islands. This move outside the barrier islands lessened some of the congestion in the inside waters.

Average 10-year commercial harvest from the Copper River District for the years 2001–2010 was 29,871 king; 1,139,198 sockeye; and 290,699 coho salmon (Tables 3, 4, and 5). The 25-year average for the years from 1986–2010 is 38,003 king; 1,240,705 sockeye; and 281,112 coho salmon. Preliminary 2011 harvest was 18,407 king; 2,023,763 sockeye; and 120,123 coho salmon.

Copper River District is managed using 3 primary tools: 1) escapement enumeration at the Miles Lake sonar site; 2) aerial escapement surveys of lower delta systems; and, to a lesser extent, 3) weekly anticipated harvest estimates (forecasts) with environmental conditions such as river height taken into account (Figure 6). The anticipated catch is based on the current year midpoint harvest forecast and the 1998–2007 harvest timing. The objective is to have a fishing schedule of 2 evenly-spaced periods per week. Fishing schedules are adjusted inseason to account for variations in river flow, run timing, run strength, fishing effort, and other factors. In early to mid-August, the department's priority switches to coho salmon management.

There are 4 proposals currently before the board that concern commercial fisheries in the Copper River and Bering River districts specifically:

Retention of fish taken in the commercial fishery (1 proposal)

- #116 - Add restrictions on homepack and set homepack limit to match sport fishing possession limit.

Copper River King Salmon Management Plan (1 proposal)

- #117 - Establish an optimal escapement goal of 30,000 king salmon for the Copper River. Closed waters (2 proposals)
- #118 - Close commercial fishing inside barrier islands prior to June 15.
- #119 - Correct regulatory boundary descriptions in Copper River District.

## **2011 Sockeye and King Salmon Fisheries, Season Summary**

The 2011 commercial harvest forecast for Copper River District was 9,211 king; 1,183,425 sockeye; and 293,470 coho salmon. The enhanced sockeye salmon run forecast to Gulkana Hatchery (GH) was 320,424. Prince William Sound Aquaculture Corporation (PWSAC) requires approximately 19,840 fish for broodstock, leaving 300,584 sockeye salmon as part of GH excess (100,602 fish) and common property harvest (199,822 fish). The commercial gillnet fishery in the Copper River District was forecast to harvest 163,854 GH sockeye salmon. The 2011 inriver goal for salmon passing the Miles Lake sonar was 622,380 to 822,380 fish. This number equated to a preseason sonar goal of 603,971 to 798,174 salmon by July 31, the normal season ending date for sonar counting at Miles Lake.

The 2011 Copper River commercial sockeye salmon harvest was 2,023,763, 71% greater than forecast and 78% greater than the 10-year average of 1,139,198 fish. The commercial harvest of 18,407 king salmon was 100% greater than forecast and 62% of the 10-year average of 29,871 fish. Escapement to the Upper Copper River on July 28 (final day of sonar operation) surpassed the minimum inriver escapement goal for that date of 597,287 salmon, with a total of 914,231 salmon counted by the sonar. The aerial escapement index for sockeye salmon escapement into CRD streams was 76,507 and was within the SEG range of 55,000–130,000 fish.

A total of 483 drift gillnet permits were active in the Copper River District in 2011 out of a total of 532, with peak participation of 439 permit holders occurring in the third fishing period of the season on May 23.

The Miles Lake north bank sonar became operational on May 10 and the south bank became operational on May 16. The first observed salmon escapement occurred on May 16, with the south bank passing 198 fish and the north bank passing 54 fish. Both banks began 24-hour escapement monitoring on May 20.

Due to a poor king salmon forecast, inside waters as described in 5 AAC 24.350(1)(B) were closed for the first 5 fishing periods, 3 fishing periods beyond the regulatory requirement in 5 AAC 24.361(b). Actual king salmon harvest was at or above inseason harvest projections for the first 5 periods and cumulative harvest tracked ahead of the previous 3 years for this time period, prompting the department to open the inside waters based on the likelihood of a larger than anticipated king salmon run.

The first Copper River District commercial fishing period on Monday, May 16 was for 12 hours, with 421 commercial drift gillnet permits fishing. Harvest from this period was 101,957 sockeye and 1,658 king salmon. Anticipated harvest was 40,804 sockeye and 1,641 king salmon. Sockeye salmon harvest was more than double the anticipated harvest, providing an early indication of the large run to come. The second 12-hour period occurred on Thursday, May 19 with 353 permit holders reporting deliveries. Harvest from this period was 114,559 sockeye and 1,081 king salmon, and remained above the anticipated harvest of 52,669 sockeye and 1,046 king salmon. High winds and rough seas during this period were significant contributing factors to reduced harvest and participation. The third 12-hour period occurred on Monday, May 23. Harvest from this period was 235,421 sockeye and 2,789 king salmon, with 438 permit holders reporting deliveries. Anticipated harvest for this period was 99,740 sockeye and 1,469 king salmon. Sockeye salmon harvest was more than double the anticipated and cumulative harvest, and king salmon harvest was near anticipated and cumulative harvest for that date. King salmon

harvest was slightly below, and sockeye salmon was more than double, the comparable 5-year average cumulative harvest (2006–2010). The sockeye salmon harvest for this period ranked fourth largest historically.

In addition to stormy conditions, the largest series of spring tides (greater than 14 feet) in May occurred during the first week of the commercial fishing season. Larger tidal cycles typically are a contributing factor to salmon movement and passage, frequently correlating to above-expected commercial harvests and counts at the Miles Lake sonar station. Sonar passage during statistical week 21 (May 15–21) was variable, with 8,798 salmon estimated compared to an inriver goal of 16,748 for the week. Sockeye salmon escapement appeared to be 2–3 days late as evidenced by sonar counts lagging behind anticipated counts by 2–3 days.

Harvest from the fourth period that started on Thursday, May 26 was 164,094 sockeye and 3,262 king salmon, with 455 permit holders reporting deliveries. This harvest was double the anticipated sockeye harvest and nearly 4 times the anticipated king salmon harvest of 857. This fishing period was the first 36-hour period of the season. Sonar estimates during the first half of this week neared the cumulative minimum inriver goal on Tuesday, May 24 and by the end of the week (May 28), cumulative sonar passage was twice the cumulative minimum inriver goal.

Even with a regular fishing schedule, Miles Lake sonar passage averaged 35,225 fish per day from May 24–29 and resulted in a cumulative passage of 211,350 fish, almost a third of the minimum inriver goal. In contrast to, but with similar results, the Copper River salmon run was compressed and late in 2010 and resulted in an extended fishery closure. These back-to-back closures contributed to the passage of 168,000 salmon in a week. This pattern of sonar estimates waning in the early portion of the season and then booming as hundreds of thousands of salmon entered the district and river following a closure of the commercial fishery has occurred frequently in the past and is difficult to predict with limited early-season run entry information. A regular fishing schedule helps to alleviate some of these large swings in escapement, but as the 2011 Copper River salmon run illustrated, even with a regular schedule of openings and expanded fishing time after the third fishing period, episodes of high escapement will likely occur with large salmon runs.

Harvest from the 36-hour period on Monday, May 30 was 134,577 sockeye and 2,389 king salmon, with 335 permit holders making deliveries. Anticipated harvest was 97,636 sockeye and 1,087 king salmon. Harvest from the Thursday, June 2 period (36 hours) was 84,284 sockeye and 1,420 king salmon, with 278 permit holders making deliveries. Anticipated harvest was 88,087 sockeye and 806 king salmon. Salmon passage at the Miles Lake sonar was greater than the daily inriver goal through May 29 and averaged about 1,000 fish less than the daily inriver goal for the remainder of statistical week 23 (May 29–June 4). This decrease in escapement occurred while the cumulative inriver escapement estimate reached an early-season peak of 118,621 fish over the minimum inriver goal.

Daily sonar passage during for the remainder of June (June 5–30) was erratic with daily sonar counts both above and below the daily inriver goal. The actual sonar count averaged a daily deficit of 1,155 fish over this time period. Thirty-six-hour periods were held on Monday, June 6 and Thursday, June 9, with sockeye salmon harvest averaging 74,282 fish and king salmon harvest averaging 1,426 fish, representing declines from the previous week's sockeye and king salmon harvest averages of 109,430 and 1,905 fish, respectively. Participation in the fishery



declined by 148 permits from May 30 through June 10. This reduction in fishing effort was likely the result of permit holders choosing to focus on robust returns of hatchery sockeye salmon to the Main Bay hatchery in PWS. From June 13 to June 24, participation in the fishery was relatively stable, with a range of 147–187 permits and an average of 172 permits per period. Both sockeye and king salmon showed harvest trends similar to anticipated harvest during this time period. Harvest averaged 50,451 sockeye and 606 king salmon per fishing period, whereas anticipated harvest averages were 48,769 sockeye and 239 king salmon. Sockeye salmon harvest was relatively stable with 3 out of 4 fishing periods between 50,000 and 60,000 fish harvested, while king salmon harvest declined steadily from 950 fish harvested during the June 13 fishing period to 216 fish harvested during the June 23 fishing period. With the first port sample on June 13, GH enhanced sockeye salmon represented 13% of the overall sockeye salmon harvest. By the June 23 fishing period, the GH sockeye salmon component had grown to 38% of the harvest.

Supported by increasing numbers of GH sockeye salmon and based on higher than anticipated CRD sockeye salmon escapement indices, the duration of the Monday, June 27 and Thursday, June 30 fishing periods remained 36 hours. This decision was supported by historic run timing of wild and enhanced stocks and by increasing numbers of strontium-marked GH fish harvested in the commercial fishery. Participation and harvest in these fishing periods increased from the previous week, with 186 permit holders reporting 150,624 sockeye and 240 king salmon in the Monday period, and 247 permit holders reporting 132,304 sockeye and 113 king salmon in the Thursday period. GH sockeye salmon were close to peak abundance in the fishery during these fishing periods, representing 46% and 59% of the harvest, respectively. With sonar passage stable and increasing overlap with CRD sockeye salmon stocks, a 36-hour fishing period schedule was maintained despite indications that GH sockeye salmon could likely withstand higher exploitation in the commercial fishery. Fishing time and area was primarily driven by inseason indices of available wild stock surplus and secondarily, by abundance of GH sockeye salmon. The GH sockeye salmon fishery peaked during the following fishing period, July 4–5, with 217 permit holders harvesting 204,791 sockeye salmon. This harvest was nearly 4 times the anticipated harvest (55,687 fish), and more than double the previous peak midseason harvest of 96,007 sockeye salmon in 2002.

Miles Lake Sonar exhibited an increasing escapement trend beginning on Wednesday, July 6 when 15,589 salmon passed the sonar compared to an inriver goal for that day of 6,152. Copper River Delta sockeye salmon escapement continued ahead of anticipated inseason escapement targets, allowing for a regular fishing schedule. A 36-hour commercial period was announced for Thursday, July 7. Harvest from this period was 88,044 sockeye and 27 king salmon, with 241 permit holders reporting deliveries. The schedule of two 36-hour periods per week continued until the start of coho salmon management on August 15. Fleet participation declined in mid-to-late July and early August, from 220 permits on July 11 to 13 permits on August 5. Sockeye salmon harvest declined from 65,410 fish on July 11 to fewer than 4,000 fish per period after the August 1 fishing period. Low fleet participation in the fishery in late July and early August was largely the result of a combination of low harvest and high fuel prices.

Large daily sonar estimates continued from July 6 through July 24, remaining between 11,000 and 25,000 fish per day, with a total of 318,741 salmon counted during this period (Figure 2). This compares to a minimum inriver goal of 110,254 salmon for this period. Daily sonar passage at Miles Lake for the remainder of July was consistently above the minimum. The cumulative

sonar estimate on July 28 was 914,231 salmon, nearly 125,000 fish above the maximum inriver escapement objective of 789,340. The final escapement index value for CRD sockeye salmon stocks based on aerial surveys was 76,507, and was within the SEG range of 55,000 to 130,000 fish.

The overall commercial harvest of 2,023,763 sockeye salmon from the Copper River District was the third largest commercial harvest in the history of the fishery. The overall commercial harvest of king salmon was the eighth lowest since 1969.

### **2011 Coho Salmon Fishery Season Summary**

The coho salmon harvest of 120,123 was 59% below the projected harvest of 293,470. Escapement estimates of coho salmon were hampered by frequent storms and associated poor visibility in major index streams. Rough seas and inclement weather also likely had a negative impact on harvest levels of coho salmon.

Coho salmon season officially began at 7:00 a.m. on Monday, August 15 during statistical week 34 with a single 24-hour period. An aerial survey flown on August 11 produced a count of 965 coho salmon in index streams, which was below the SEG range for statistical week 33 of 2,025–4,240 fish. Harvest from the first coho salmon period was 15,059 fish, with 111 permit holders reporting deliveries. The second period on August 22 resulted in 12,430 coho salmon delivered by 208 permit holders. Given the decrease in harvest and catch per unit effort, one fishing period per week continued with a third 24-hour fishing period on Monday, August 29. During this period, 23,500 coho salmon were harvested by 189 permit holders. An aerial survey flown under poor observational conditions on Monday, August 29 documented 12,457 coho salmon in index streams. This was below the average SEG anticipated for this date. Consequently, a single 24-hour period was allowed in statistical week 37 on Monday, September 5. Harvest from this period was 849 coho salmon, with 9 permit holders reporting deliveries. Severe weather curtailed fishing effort during this period. An additional fishing period was announced for Thursday, September 8 due to the limited fishing effort and harvest in the Monday fishing period. Harvest from this fifth coho salmon period was 18,692 fish, with 89 permit holders reporting deliveries. An aerial survey was flown on Sunday, September 11 under excellent observational conditions with an index of 26,340. Counts in the neighboring Bering River District increased from 3,715, which was below the range in the previous week, to 18,840, which was within the SEG range of 8,803–22,345 coho salmon. Consequently, 2 fishing periods per week were allowed in the Copper River and Bering River districts starting Monday, September 12. The 24-hour periods on Monday, September 12 and Thursday, September 15 resulted in a harvest of 26,141 coho salmon. Participation increased to 132 permit holders in the Monday fishing period, but declined to 70 permit holders in the Thursday fishing period. Stormy conditions persisted in the Cordova area for the next several weeks, likely having a negative impact on harvest and participation for the remainder of the season. Harvest from the following week, September 18–24, was 760 coho salmon, with 2 permit holders reporting deliveries from the first period and 10 from the second. There were 1,179 coho salmon delivered during the next week, September 25–October 1, with 7 permit holders reporting deliveries from the first period and 5 from the second. There were no further deliveries in the remaining 3 fishing periods of the season. An aerial survey flown on October 9 documented levels of coho salmon in index streams above the SEG ranges for statistical week 42.

The final 2011 aerial escapement index value for CRD coho salmon stocks was 43,560 fish and was within the SEG range of 32,000–67,000 coho salmon for the Copper River District.

## GULKANA HATCHERY

Gulkana Hatchery (GH) is located on the Gulkana River approximately 6 miles north of Paxson Lake. The hatchery was built in 1973 and was operated by Alaska Department of Fish and Game (ADF&G), Division of Commercial Fisheries. In 1992, the hatchery was transferred to PWSAC. The donor stock for the facility was the local wild stock at the hatchery site on the Gulkana River. Gulkana Hatchery was expanded to two facilities in 1986. The 2 facilities combined have produced an average of 20.9 million fry annually over the last 10 years (Table 6). Gulkana Hatchery produces sockeye salmon for the common property fisheries, which include commercial, personal use, subsistence, and sport fisheries. In addition to common property harvest, hatchery returns meet broodstock needs and also create an additional surplus of enhanced sockeye salmon at the hatchery and Crosswind Lake remote release site. Since run timing of hatchery stocks coincides with that of delta wild and late upriver wild stocks, the harvest rate in the commercial fishery is determined by the strength of the wild stock escapement. Enhanced returns are, therefore, harvested at the rate that can be sustained by wild stocks. This is generally expected to be between 50% and 60% for wild stocks. This wild stock priority creates surpluses of enhanced sockeye salmon when hatchery returns are large and wild stocks are weak or less plentiful. These unharvested enhanced returns are designated as the hatchery surplus component of the inriver escapement goal in the *Copper River District Salmon Management Plan*. For planning purposes, the department annually estimates hatchery surplus in the pre-season forecast, but the actual surplus will depend upon the actual run strength of wild and enhanced stocks. Recently, because of increased survivals of sockeye salmon released in Crosswind Lake, the forecasted hatchery surplus has ranged from 11,169 fish in 2004 to 136,036 fish in 2010 (Table 1). In 2011, the forecasted hatchery surplus component was 84,524 sockeye salmon. Gulkana Hatchery stocks are intermixed with other sockeye salmon stocks and other salmon species to the extent that no targeted harvest can occur within either the commercial or inriver fisheries. Gulkana Hatchery broodstock needs are estimated annually and are also included in the Copper River inriver escapement goal. From 1986 through 2011, the broodstock escapement component past the sonar has been 20,000 sockeye salmon. Adequate fish should be available for broodstock needs at GH if the Copper River inriver escapement goal is attained at the Miles Lake sonar.

Historically, the GH operator has harvested only broodstock. Under ADF&G management, hatcheries were operated through general fund appropriations. Since PWSAC has operated the Gulkana facility, only broodstock was harvested until 1997. Primarily, facility operating and capital costs have been met through a 2% fishermen's assessment and through corporate revenues from the sale of Wally Noerenberg Hatchery and Main Bay Hatchery salmon. In an effort to avoid excess fish entering Crosswind Lake, a Special Harvest Area (SHA) has been designated to allow the hatchery operator the opportunity to harvest returning adults.

The Crosswind Lake SHA consists of the waters of Dog Creek west of approximately 145°52.83' W. Long. downstream to a weir located at approximately 62°34.70' N. Lat., 145°53.7' W. Long.

PWSAC is allowed to construct a weir or series of weirs to conduct a cost-recovery harvest. Seines or dip nets may be used to harvest cost-recovery fish in the SHA. PWSAC, or its contractor, harvests sockeye salmon during periods established by emergency order (EO). All other species must be allowed free upstream or downstream passage. In order to provide state residents with the opportunity to use excess production from Crosswind Lake, PWSAC, or its contractor, may at its discretion, give away up to 30 sockeye salmon per household to residents who come to the site and request the fish. Less than 3 permits per year have been issued and total harvests have been less than 200 fish annually. The average of actual sockeye salmon returns to Crosswind Lake from 2000 to 2010 is 48,417 fish. The 2010 return to Crosswind Lake was approximately 131,000 fish.

When PWSAC is unable to harvest surplus hatchery sockeye salmon in the SHA, they will, under authority of the ADF&G, destroy all sockeye salmon in excess of escapement needs. Disposal of these fish is undesirable; however, allowing them to escape into Crosswind Lake is also problematic. At a public meeting conducted by PWSAC during the winter of 1995/96, Crosswind Lake area landowners indicated that the increased escapement into the lake in recent years was unacceptable and that it would create a public nuisance if large numbers of fish continue to be allowed into the lake.

The intent for developing the SHA is to limit the return of surplus enhanced sockeye salmon into Crosswind Lake, provide local economic opportunity, and provide state residents with a source of salmon. There is negligible spawning habitat at Crosswind Lake and no natural production escapement goal has been established. This SHA prevents most of the returning sockeye salmon from migrating into the system while providing benefits to both PWSAC and state residents.

ADF&G and PWSAC created a Basic Management Plan (BMP) for GH that reduced historic release numbers and revised release strategies so that the size of the hatchery's adult returns will be within the ability of the department to manage the mixed stock fishery for sustained yield of wild stocks. Determining the strength and correctly managing for escapements of both delta and upriver wild sockeye salmon stocks is an ongoing challenge. The recent large hatchery surpluses are the combined result of high survival rates and conservative management in the commercial fishery.

Mass marking of enhanced stocks using strontium chloride began in the spring of 2000 as part of the cooperative effort between ADF&G and PWSAC. The ability to more accurately estimate enhanced sockeye salmon contributions to the various fisheries in the Copper River will further support the department's efforts to manage for the wild stock priority, while efficiently utilizing the enhanced sockeye salmon component of the return. A near-term reduction in GH production is considered by the department to be an important step towards addressing the mixed stock management difficulties created by the success of the enhancement program.

## **PERSONAL USE FISHERY**

There is only one personal use salmon fishery in the Upper Copper River. This occurs in the Chitina Subdistrict of the Upper Copper River District.

There are 8 proposals addressing the personal use fishery before the board this cycle:

- #54 - Requests the board to reconsider the C&T use determination for the Chitina Subdistrict,
- #55 - Requests the board to reconsider the C&T use determination for the Chitina Subdistrict,
- #56 - Seeks to add specific management language into the *Copper River King Salmon Management Plan* for the Chitina Subdistrict personal use salmon dip net fishery;
- #72 - Seeks to rescind a portion of the *Copper River Personal Use Dip Net Salmon Fishery Management Plan* that reduces the maximum allowable harvest in this fishery if the Copper River District commercial drift gillnet fishery is closed for 13 consecutive days;
- #73 - Seeks to increase the annual limit of personal use king salmon in the Chitina Subdistrict;
- #74 - Seeks to ensure 2–3 days of king salmon retention in the Chitina Subdistrict while the commercial and sport fisheries are allowed to retain king salmon;
- #75 - Seeks to increase the personal use bag limit for sockeye salmon when retention of king salmon is prohibited in the Chitina Subdistrict; and,
- #76 - Seeks to delay the opening of the Chitina Subdistrict personal use fishery until June 15.

Only Alaska residents may currently participate in the Copper River personal use salmon fishery. The entire mainstem Copper River between the downstream edge of the Chitina-McCarthy bridge and a department marker located about 200 yards upstream of Haley Creek (in Wood Canyon) is open to personal use fishing (Figure 7). Only dip nets may be used to harvest salmon. This fishery is opened by EO. Both a valid Alaska sport fishing license and a special permit are required to participate in the personal use fishery. Participants must record their harvest on their permit before leaving the fishing site and return the permit upon completion of fishing for the season. The limits are 15 salmon for a single person and 30 salmon for a household of 2 or more, only 1 of which may be a king salmon. The board has mandated that Alaskans can participate in either the subsistence or personal use fishery in the Upper Copper River drainage, but not both.

The board has authorized ADF&G to manage the commercial salmon fishery to provide the following inriver goal of salmon, measured at the Miles Lake Sonar (in 5 AAC 24.360; Table 1):

Spawning escapement (sockeye salmon)	300,000
Spawning escapement (other salmon)	17,500
Subsistence harvest (salmon)	61,000–82,500
Personal use harvest (salmon)	100,000–150,000
Sport fishery harvest (salmon)	15,000
Hatchery brood stock (sockeye salmon)	Estimated annually
Hatchery surplus (sockeye salmon)	Estimated annually
TOTAL	Announced annually

Hatchery broodstock and hatchery surplus are adjusted annually based on the anticipated return of wild and hatchery stocks. From 1997 to 1999, maximum harvest for the personal use fishery was 100,000 salmon, excluding fish provided in excess of the inriver goal and not including any salmon harvested after August 31. Prior to 1997, this amount was 60,000 salmon. In 1998, the board passed a proposal that allows permit holders, who have filled their original limit, to take 10 additional sockeye salmon in weeks when a harvestable surplus of 50,000 salmon or greater will be available in the Chitina Subdistrict. This supplemental harvest is exclusive of the maximum harvest level. From 2000 to 2002, as a subsistence fishery, the Chitina Subdistrict had an assumed harvest range of 100,000–150,000 salmon, of which 85,000–130,000 were wild salmon, based upon coded-wire-tag recoveries from the commercial fishery. This harvest range has remained in place, following the change of the Chitina Subdistrict back to a personal use fishery in 2003.

The personal use dip net fishery is managed under the *Copper River Personal Use Salmon Fishery Management Plan* (5 AAC 77.591). In the Chitina Subdistrict, weekly fishing periods and limits are established by emergency order and are based on the projected inriver returns. The first opening will occur between June 1 and on or before June 11, as mandated by the plan. Inriver returns are estimated by the sonar unit located at Miles Lake. Based upon previous migration studies, a 2-week travel period from the Miles Lake sonar to Wood Canyon is used for management purposes from June through mid-July and a 3-week travel period for mid-July until the sonar is removed. The management plan requires that the harvest be distributed throughout the season, based upon the projected sonar counts. The daily breakdown of salmon for the Chitina Subdistrict is determined pre-season based upon projected daily sonar counts. Weekly fishing periods are established from the recent 5-year average catch per hour applied to the weekly harvest allocation. Fishing period adjustments in-season are based upon actual sonar counts, and any salmon above the projected weekly salmon escapement are considered surplus. When an escapement of more or less than the inriver goal of salmon actually pass the sonar counter, the board has mandated that the department decrease or increase the fishing time by the corresponding percentage. The pre-season and actual fishing schedules for 2009–2011 are shown in tables 7–9.

Harvests in the Chitina Subdistrict personal use fishery prior to 2000 were determined weekly from permits, which were to be returned after each fishing trip. Permits were only issued from the ADF&G office in Chitina. Beginning in 2000, Chitina Subdistrict permits were available from ADF&G offices in Anchorage, Fairbanks, Glennallen, and Palmer to provide additional service to the dipnetting public, reduce fishery operating costs, and prevent excessive delays (up to 3 hours) at the Chitina ADF&G office for participants to receive permits. This was expanded in 2001 to include over 40 license vendors that issued permits throughout the Southcentral and Interior regions. Expanding the availability of permits has prevented the in-season estimation of weekly harvest and participation since 2000, but lack of this information has not influenced management decisions.

Harvest data have been collected since the fishery was established in 1984. Through 1988, harvests remained relatively stable. From 1988 to 1996 harvests increased (Figure 8). The harvest of approximately 154,000 fish in 1997 was the largest on record since the personal use fishery was created and had the fifth highest participation. Personal use permits with completed

harvest information are required to be returned to the department by October 15 of each year. As a result, this report contains no Chitina Personal Use fishery harvest data for 2011.

Sockeye salmon dominate the harvest until the second week in September. Harvests typically peak in the second and third week of June with a smaller peak in the second to third week of July. Sockeye salmon comprise 94 percent of the Chitina Subdistrict harvest, on average (Figure 8). They have ranged from 41,054 in 1986 to 148,727 in 1997. Fluctuations in sockeye salmon harvests reflect changes in return strength between years and participation in the fishery. It appears participation is increasing in this fishery and therefore, sockeye salmon harvests should remain relatively high barring significant decreases in the strength of the sockeye salmon returns. King salmon harvests peak the second week in June and are present in the harvest in small numbers through August. King salmon comprise about 4% of the Chitina Subdistrict harvest. Harvests generally increased through 1999, with the largest harvest of 6,723 occurring in 1998. King salmon annual harvests declined to approximately 3,000 due to the bag limit reduction to one king salmon in 2000. King salmon returns were below average and retention of king salmon in Chitina Subdistrict was restricted after the second fishing period in 2009, the fourth fishing period in 2010, and the sixth fishing period in 2011. Coho salmon appear in harvests in late August and dominate the catch by the second week of September. Coho salmon comprise less than 3% of the harvest. Coho salmon harvests have fluctuated from a low of 160 in 1997 to a high of 4,870 in 1995. The large harvest in 1995 occurred because closure of the personal use fishery in August shifted pressure into September when coho salmon are more prevalent. The low coho salmon harvest in 1997 was a result of an EO prohibiting retention of coho salmon due to poor returns.

Annual harvest has generally followed the trend in the number of permits issued or more recently, the number of permits fished (Figure 8). Number of participants increased dramatically in 1997 when 9,086 permits were issued. Participation peaked in 1998 when 10,006 permits were issued and 9,492 of those reported fishing. Participation declined through 2003 and then increased through 2010 when 10,062 permits were issued and 6,113 of those reported fishing. Increased participation in specific years usually reflects a strong sockeye salmon return and media coverage of the fishery, but participation is also influenced by changes in access to the fishery, increases in access fees previously required for the fishery, and removal of those fees. In 2004, there was a sharp increase (6,560 in 2003 to 8,495 in 2004) in the number of permits issued for the Chitina Subdistrict personal use fishery (Figure 8). This increased participation likely resulted from removal of the \$25 fee associated with the permit prior to the 2004 season.

In 2009, the Chitina Subdistrict personal use fishery season was opened by EO on June 1 for a 156-hour fishing period (Table 7). Actual salmon numbers past the Miles Lake sonar during the week of May 18–24 were above projected counts by over 17,000 fish. This justified increasing the preseason schedule by 8 hours for the first fishing period. Salmon numbers past the Miles Lake sonar for the week of May 25–31 remained above the projected salmon counts for this period by 9,509 fish, allowing the second fishing period (June 8–14) to remain at 168 hours. As of May 28, a total of 5,445 king salmon of a projected 17,553 king salmon were harvested in the CRD commercial drift gillnet fishery and inriver assessment projects were also observing below average king salmon numbers indicating a weak king salmon run. Migratory timing and 5-year average harvest rates indicated insufficient numbers of king salmon to sustain a fishery and still attain the SEG of  $\geq 24,000$  king salmon to the Copper River. Beginning with the second period

opening, on June 8, the Chitina Subdistrict was closed to retention of king salmon for the remainder of the 2009 season. The third period from June 15–21 was reduced from the preseason schedule of 168 to 150 hours. Actual salmon numbers past the Miles Lake sonar during the week of June 1–7 were below projected counts by over 47,000 fish. The fishery remained open during the fourth and fifth periods (June 22–July 5) as actual sonar counts were near or above projected counts from June 8–21. Fishing time was increased from the preseason schedule during periods 6 and 7. Salmon passage by the Miles Lake sonar was 9,171 salmon above projection from June 22–28 and 17,577 salmon above projection for June 22–July 5. Fishing time was extended by 22 and 46 hours for periods 6 and 7, extending both periods to 150 hours' duration. Based on weekly surpluses past the Miles Lake sonar from July 6 until the sonar was removed August 2, continuous fishing occurred for the remainder of July and August. The fishery remained open September 1–30 by regulation.

The 2010 Chitina Subdistrict personal use fishery opened on June 5, two days later than the preseason schedule. Salmon passage at the Miles Lake sonar was 25,063 salmon below projected from May 17–23, warranting a reduction in fishing time from 90 to 16 hours during the first fishing period. (Table 8). The second period was a 168-hour opening on June 7 and due to Miles Lake sonar passage at or above projected counts, the fishery remained open continuously for periods 3, 4, and 5. As of June 10, a total of 7,813 king salmon of a projected 15,502 king salmon were harvested in the CRD commercial drift gillnet fishery and inriver assessment projects were also observing below average king salmon numbers, indicating a weak king salmon run. Migratory timing and 5-year average harvest rates indicated insufficient numbers of king salmon to sustain a fishery and still attain the SEG of 24,000 or more king salmon to the Copper River. Beginning with the fourth period, on June 21, the Chitina Subdistrict was closed to retention of king salmon for the remainder of the 2010 season. Salmon numbers past the Miles Lake sonar from June 21–27 were below the projected salmon counts by 4,346 fish, and resulted in a reduction of 14 hours from the 148-hour preseason schedule for the sixth fishing period. Salmon numbers past the sonar from June 21 to July 4 were above the projected salmon counts by 15,103 fish, justifying an increase of 39 hours over the preseason projection of 112 hours during the seventh period. Fishing hours were also increased for the eighth period by 60 hours from a preseason schedule of 108 hours to 168 hours based on a surplus of 34,552 salmon past the Miles Lake sonar during the week of June 28–July 4. The fishery remained open during the ninth and tenth periods. Due to a greater than 50,000 salmon surplus above the weekly salmon escapement objective, the ninth and tenth periods were also supplemental periods. The fishery was open to continuous fishing from August 9 to 31 and remained open by regulation through September 30.

In 2011, the Chitina Subdistrict personal use fishery opened on June 4 (Table 9). Actual salmon numbers past the Miles Lake sonar during the week of May 16–22 were below projected counts by 12,713 fish. This resulted in reducing the preseason schedule by 33 hours for the first fishing period. Actual salmon numbers past the Miles Lake sonar during the week of May 23–29 were above projected counts by over 128,000 fish, allowing the second fishing period to open for the preseason schedule of 168 hours. Due to a greater than 50,000 salmon surplus above the weekly salmon escapement objective, the second period was also a supplemental period. Salmon numbers past the sonar from May 30 to June 5 were below the projected salmon counts for this period by 10,754 fish, but based upon historic harvest and participation levels, the third fishing



period (June 9–15) remained at 168 hours. Based upon historic harvest and participation levels, the fishery remained open continuously during the fourth through the seventh periods although actual sonar counts were at or below projected sonar counts from June 6 to 26. As of June 23, a total of about 18,000 king salmon were harvested in the CRD commercial drift gillnet fishery, 11,000 fish below the 10-year average. Secondly, the Gulkana River king salmon counting tower counts were about 66% of average for this date and cumulative counts at the NVE sampling wheels were the second lowest on record. Migratory timing and 5-year average harvest rates indicated insufficient numbers of king salmon to sustain a fishery and still attain the SEG of 24,000 or more king salmon to the Copper River. Beginning with the fifth period, on June 27, the Chitina Subdistrict was closed to retention of king salmon for the remainder of the 2011 season. Salmon numbers past the Miles Lake sonar from June 20–July 3 were above the projected salmon counts for this period and resulted in an increase of 26 hours from the 125-hour preseason schedule for the seventh fishing period and 39 hours from the 96-hour preseason schedule for the eighth fishing period. Salmon numbers past the Miles Lake sonar from July 4–24 exceeded preseason projections in each of the 3 weeks by 72,538; 73,506; and 66,354 salmon, respectively. Therefore, the fishery remained open continuously and due to a greater than 50,000 salmon surplus above the weekly salmon escapement objective, the ninth through eleventh periods were also supplemental periods. The sonar counter was removed on July 28. The fishery remained open through August 31 based on projected sonar counts and remained open through September 30 by regulation.

## **SUBSISTENCE FISHERIES**

Subsistence fishing is restricted to 3 areas on the Copper River: 1) the Copper River commercial fishing district; 2) the Upper Copper River District (Glennallen Subdistrict); and, 3) the Batzulnetas area (Figure 9). Of the 3 subsistence areas, the Upper Copper River District has the highest effort and harvest. There are 3 proposals dealing with Upper Copper River District subsistence issues before the board this year:

- #54 - Requests the board to reconsider the C&T use determination for the Chitina Subdistrict;
- #55 - Requests the board to reconsider the C&T use determination for the Chitina Subdistrict; and,
- #56 - Seeks to add specific management language into the *Copper River King Salmon Management Plan* for the Glennallen Subdistrict subsistence salmon fishery.

## **UPPER COPPER RIVER DISTRICT SUBSISTENCE FISHERIES**

Under State of Alaska regulations there is currently one subsistence fishery in the Upper Copper River District which occurs in the Glennallen Subdistrict. The Glennallen Subdistrict subsistence fishery is managed by ADF&G under the *Copper River Subsistence Salmon Fisheries Management Plans* (5 AAC 01.647). Currently, all Alaskans are eligible to participate in this subsistence fishery based on the McDowell decision in 1989. Harvest permits are required for this fishery, which must be returned to ADF&G following the end of the fishing season. Alaskans can participate in either the Glennallen Subdistrict subsistence fishery or the Chitina Subdistrict personal use fishery in the Copper River drainage. There is a second

subsistence fishery upstream of the Upper Copper River District which occurs near the traditional Native village site of Batzulnetas at the confluence of Tanada Creek and the Copper River. A household can only receive 1 Upper Copper River District subsistence salmon fishing permit per year; therefore, a household cannot participate in both the Batzulnetas and Glennallen Subdistrict subsistence fisheries in the same year.

### **Glennallen Subdistrict Subsistence Fishery**

The Glennallen Subdistrict of the Upper Copper River District opens June 1 through September 30 for continuous fishing in all waters of the mainstem Copper River upstream of the Chitina-McCarthy Bridge to the mouth of the Slana River (Figure 10). During the 1996 board meeting, the *Copper River District Salmon Fishery Management Plan* was modified and established a harvest range of 60,000–75,000 subsistence salmon to accommodate variability in harvest levels and allow for increased harvests between board cycles. Prior to 1997, this amount was 35,000 salmon. During the 2005 board meeting, the *Copper River District Salmon Fishery Management Plan* was modified and established a range of 61,000–82,500 subsistence salmon to accommodate the combined amounts necessary for subsistence (ANS) in three subareas of the Glennallen Subdistrict. An ANS of 25,500–39,000 salmon was set for that portion of the Glennallen Subdistrict from the downstream edge of the Chitina-McCarthy Bridge to the mouth of the Tonsina River; 23,500–31,000 reported salmon for that portion between the mouth of the Tonsina River to the mouth of the Gakona River; and 12,000–12,500 reported salmon for that portion upstream of the mouth of the Gakona River to the mouth of the Slana River. Fish wheels and dip nets are legal gear, only 1 of which may be specified on the permit for the season. Participants are allowed 1 permit per household and the permit identifies the gear type to be used. The limits are 30 salmon for a household of 1, 60 salmon for a household of 2, and 10 salmon for each additional person in a household of more than 2 people. Individuals may request additional salmon up to a maximum of 200 salmon and households may request up to 500 salmon. For participants using dip nets, only 5 of the salmon may be king salmon. Upper Copper River and Copper River District subsistence fishery participants must clip the tips of the caudal fin from all salmon that are harvested. In addition, Upper Copper River District subsistence users must record their harvests before leaving the fishing site.

Harvests by the Upper Copper River subsistence fisheries have been estimated since 1965. Prior to 1980, the fisheries' harvest and participation remained relatively stable. The fishery experienced rapid growth from 1980 through 1983, when a peak harvest of about 119,000 salmon were taken (Table 10). Under the subsistence fishery management plan, which established the Chitina Subdistrict personal use fishery, Glennallen Subdistrict harvests decreased substantially in 1984 to about 29,000 salmon. Since 1990, participation in the Glennallen Subdistrict subsistence fishery has gradually increased to 1,591 permits issued in 2010 (Figure 10). Harvests have also increased since 1990; the 88,578 salmon harvested in 2001 was the highest since 1983 (when Chitina and Glennallen Subdistrict harvests were combined) (Figure 10). The harvest in 2010 was 87,908 salmon. From 2001 to 2005, the number of permits issued averaged 1,248 and harvest was 76,765. State subsistence permits with completed harvest information are required to be returned to the department by October 31 of each year. As a result, this report contains incomplete and preliminary data for 2011.

Fish wheel permits have traditionally been the majority of permits issued for the fishery. However, since 1990, the number of dip net permits has increased and comprised 47% of the total permits issued in 2011 (Table 10). The decline in state fish wheel permits in 2002 can be partly attributed to the fact that this was the first year permits were issued by the National Park Service (NPS) for the federal subsistence fishery in the Glennallen Subdistrict. The majority of federal permit holders use fish wheels. The increase in dip net permits over the last 6 years may reflect a shift of dipnetters from the Chitina fishery to the subsistence fishery due to restricted access in the Chitina Subdistrict following the landslides in the fall of 2006, a 5-fish bag limit for king salmon in the subsistence fishery, and personal use restrictions on king salmon retention in 2009–2011.

In 1999, federal regulations were adopted for Copper River subsistence fishing, but as federal and state regulations were identical, both federal and state subsistence users participated in the fisheries under the state subsistence permit in 1999–2001. In 2001, as a result of Federal Subsistence Board (FSB) actions, federally-qualified subsistence users were able to begin fishing on May 15 in the Glennallen Subdistrict; and as federal subsistence limits remained identical to state limits, federal subsistence users still fished under state subsistence permits. In 2002, the FSB established a federal subsistence fishery in the Chitina Subdistrict with a cumulative limit of 200 salmon for a household of 1 and 500 salmon for a household of 2 or more for both the Chitina and Glennallen subdistricts. Federal subsistence users are able to participate in both fisheries, while state subsistence users must select either the Chitina Subdistrict or Glennallen Subdistrict in which to participate. The National Park Service (NPS) issued separate federal subsistence fishing permits to federal subsistence users beginning in 2002. The number of federal permits issued for the Glennallen Subdistrict increased from 201 to 262 from 2002 to 2003 and have since stabilized, averaging of 270 permits between 2006 and 2010.

In 2005, the NPS - Wrangell-St. Elias National Park and Preserve (WRST-NPS) enforced NPS regulation 36 CFR 2.3 that allows fishing to be conducted within national park boundaries only with closely-attended rod and reel. Part 13 of the NPS regulations does allow subsistence uses by rural resident zone community residents within national park boundaries. Enforcement of these regulations prohibited subsistence fishing by nonrural residents in that portion of the Copper River upstream of Indian River (which includes approximately 15 river miles of the Glennallen Subdistrict and the Batzulnetas fishery) and required a federal subsistence fishing permit to use a fish wheel or dip net within the boundaries of WRST-NPS. Only those rural residents that qualified for federal subsistence salmon harvest in the Glennallen Subdistrict were issued permits to fish in this area. As a result, no state subsistence fishing permits have been issued for this portion of the Glennallen Subdistrict since 2004. This action excluded approximately 10 Alaska resident households, which were not federally-qualified, from using fish wheels in this area and required these households to use fish wheels elsewhere in the Glennallen Subdistrict.

### **Batzulnetas Subsistence Fishery**

A third state subsistence fishery is also allowed in a portion of Tanada Creek, near the traditional Native fishing site of Batzulnetas, with spears and dip nets, and with fish wheels and dip nets 1/2-mile downstream of the mouth of Tanada Creek in the Copper River. The Batzulnetas fishery encompasses all waters from the regulatory markers near the mouth of Tanada Creek and

approximately 1/2-mile downstream from the mouth and in Tanada Creek between ADF&G regulatory markers identifying the open water of the creek. The fishery may begin after June 1. Fishing periods during June are one 48-hour period per week. Beginning in July, fishing periods are 84 hours per week until September 1 when the fishery closes.

In 1987, an interim subsistence fishery was provided for by emergency regulation at Batzulnetas to settle the U.S. District Court case of *John vs. Alaska*. The fishery was conducted near the mouth of Tanada Creek near the historical village site of Batzulnetas. Eight permits were issued in that year to individuals or family groups from Mentasta and Dot Lake, and the fishery was conducted during July and early August. A total harvest of 22 sockeye salmon was reported in 1987. The board reviewed the fishery before the 1988 season and set seasons, eliminated the quota, and provided for additional gear types. Permits can be issued throughout the season and must be completed and returned to ADF&G by September 30. No permits were issued for this fishery between 1988 and 1992. However, in 1993 1 permit was issued and 160 sockeye salmon were harvested. In 1994, 5 permits harvested 997 sockeye. In 1995, 4 permits were issued and 16 sockeye were harvested. No permits were issued in 1996. In 1997, 3 permits were issued. One household reported fishing and harvested 176 sockeye salmon. In 1998, 1 permit was issued and a harvest of 386 sockeye salmon was reported. In 1999, 1 permit was issued and a harvest of 55 sockeye salmon was reported. No permit was issued in 2000. In 1999 and 2000, the U.S. District Court issued a preliminary injunction against the State of Alaska from enforcing 5 AAC 01.647(i)(5) which established fishing periods through EO authority. The injunction allowed subsistence fishing 7 days per week from June 1 through September 1 or until 1,000 sockeye salmon were taken. No more than 250 sockeye salmon could be taken in any 1 week. Since 2001, permits for this fishery have been issued under the federal subsistence fishery program, and during these years, no state permits have been issued. Action taken by WRST-NPS in the spring of 2005 has precluded issuance of state permits for this fishery at this time. Since 2001, 1 federal permit has been issued each year, except in 2006, 2007, and 2009, when no permits were issued. A total of 3 federal permits were issued in 2010 and all 3 reported fishing. Reported harvests averaged 185 salmon from 2001 to 2004. One sockeye was reported harvested in 2008 and 106 were harvested in 2010.

## **COPPER RIVER DISTRICT SUBSISTENCE FISHERIES**

Boundary lines for Copper River District subsistence fishing are the same as for the commercial gillnet fishery. Subsistence fishing is allowed from May 15 until September 30. From May 15 until 2 days before the commercial opening of Copper River District, subsistence fishing is allowed 7 days per week. Once the commercial season has commenced, subsistence fishing is allowed only during commercial fishing periods or by EO. Within Copper River District, drift gillnets are the only legal gear and may have a maximum length of 50 fathoms, with a maximum mesh size of 6 inches prior to July 15. The legal limit for king salmon is no more than 5 per household (5AAC 01.645(b)). From 2001 to 2010, an average of 226 subsistence permit holders have reported an average harvest of 3 king salmon harvested per year (Table 11). In addition to the subsistence fishery, commercial fishermen may withhold a portion of their catch for home use. Any commercially-caught finfish not sold must be reported on a fish ticket. From 2001 to 2010, an average of 265 permit holders per year have reported retaining 3 king salmon on average from their commercial harvest (Table 11).

Currently, there are 2 proposals before the board that concern subsistence fisheries and homepacks of salmon from commercial deliveries in the Copper River District:

- #51 - Review the Copper River District salmon subsistence fishery C&T and reclassify fishery as a personal use fishery;
- #52 - Specify open periods in the Copper River District subsistence fishery; and,
- #116 - Add restrictions on homepack from commercial fishing.

## **SPORT FISHERIES**

Sport fisheries targeting salmon in the Upper Copper River drainage occur mainly on tributaries of the Copper River (Figure 11). From 2005 through 2009, sport anglers have expended an average of 40,052 angler-days in the Upper Copper River drainage. Recreational angler effort was relatively stable until 1991 when it began to increase, and peaked in 1995 when 102,951 angler-days were expended. Since 2000, angler effort has declined to levels slightly lower than those observed prior to 1990. The majority of fishing effort is believed to be directed towards king salmon in the Gulkana and Klutina rivers.

Sport fisheries for salmon in the Copper River target primarily king and sockeye salmon. The fisheries occur in various tributaries to the Copper River with the largest harvest occurring in the Gulkana and Klutina rivers (Figures 12, 13, and 14). The king salmon fishery is the most important recreational salmon fishery in the Copper River in terms of effort and economic value. Sport harvest and effort has been estimated annually since 1977 by a mail survey. The survey does not separate effort by species, but most effort in the major salmon streams is likely directed at salmon, primarily king salmon. The sport harvest of king salmon from Upper Copper River drainage, as reported in the survey, increased through 1996 when the harvest peaked at 9,116 king salmon (Figure 12). Since 1996, sport harvest of king salmon from the Upper Copper River drainage has declined to a low of 1,355 fish in 2009. In 2010, the sport harvest of king salmon was 2,409 fish. Approximately 95% of the estimated sport harvest of king salmon taken from the Upper Copper River drainage comes from the Gulkana and Klutina river drainages.

Since 1970, sport harvest of king salmon over 20 inches in length in the sport fisheries of the Copper River Basin have been limited by a bag limit of 1 per day. Beginning in 1989, any king salmon removed from Upper Copper-Upper Susitna Management Area (UCUSMA) waters becomes part of the bag limit of the person who hooked the fish. During 1991, sport fishing for king salmon was closed in Fish, Indian, Bernard, Ahtell, and Natat creeks, and the Little Tonsina River. This action was taken in an effort to bolster escapements to these small clearwater tributaries, which had shown a decline in king salmon returns. In 1994, an annual limit of 5 king salmon was authorized for the Copper River drainage. In 1997, following the 1996 board meeting, sport fishing for king salmon was closed in Manker Creek, Klutina Lake and all flowing waters entering Klutina Lake, all tributaries to the Tonsina River, Tonsina Lake and all flowing waters entering Tonsina Lake, the Chokosna and Gilahina rivers and all clearwater tributaries of the Gakona River, Tazlina Lake and all flowing waters entering Tazlina Lake, except a ¼-mile radius around the mouth of Kaina Creek. In addition, the season closure date in the Klutina River, for king salmon, was moved from August 10 to August 1 for the flowing waters downstream of the department markers located at mile 19.2 on the Klutina Lake Road. These

measures were taken to protect spawning king salmon. Due to increasing harvests in the 1990s and limited escapement data on king salmon returns, the use of bait was restricted and only unbaited, single-hook, artificial lures were permitted on the Tonsina River. With the exception of the Klutina River, the sport king salmon fisheries throughout the Copper River drainage closed to fishing after July 19 to protect spawning king salmon.

At its' 2008 meeting, the board adopted proposals to close the Slana River drainage to sport fishing for king salmon and extended king salmon closures in Sinona Creek, the Chokosna and Gilahina Rivers, and clearwater tributaries of the Gakona River to protect these small discrete stocks from exploitation. Also in 2008, the board altered the king salmon season in the Klutina, Tonsina, and Copper River drainage below the Klutina River to July 1–July 30, with specific earlier closures in the Klutina River above mile 19.2 of the Klutina Lake Road (July 19), above mile 13 (July 30), and in the Tonsina River above the Alyeska pipeline bridge (July 19) to protect spawning king salmon.

During the 1996 board meeting, the *Copper River King Salmon Management Plan* (5 AAC 24.361) was adopted. The purpose of this plan was to ensure that escapement of king salmon into the Copper River drainage was provided for at or above historic levels by reducing the harvest potential of the commercial, sport, and personal use fisheries by 5%. This was done through inside statistical area closures in the commercial fishery during statistical weeks 20 and 21, in the personal use fishery through an annual limit reduction of king salmon from 5 to 4, and in the sport fishery through a sport fish guiding closure on Tuesdays. At the 1999 board meeting, the plan was amended to direct the department to manage the commercial, personal use, and sport fisheries to achieve a spawning escapement range of 28,000–55,000 king salmon. Additional means were provided the department to manage these fisheries to achieve this spawning escapement range. The sport fish guiding restriction was replaced with a sport fish annual limit reduction from 5 to 4 king salmon. The portion of the plan directed at the personal use fishery was also removed, following reclassification of the Chitina Subdistrict as a subsistence fishery. At the 2003 board meeting, the *Copper River King Salmon Management Plan* was revised and the department was directed to manage the commercial and sport fisheries to achieve a sustainable escapement goal of 24,000 king salmon or more. Also at the 2003 meeting, the Tonsina River bait restriction was lifted after the department's radiotelemetry study indicated that the king salmon return was larger than originally believed.

There are 2 proposals to the board addressing the Upper Copper River salmon sport fisheries:

- #126 - Allow king salmon fishing on the Gulkana River 5 days per week from June 10–August 10; and,
- #127 - Restrict guided sport fisheries when the Copper River District commercial fishery is restricted.

## **GULKANA RIVER KING SALMON FISHERY**

The Gulkana River drainage has historically supported the largest sport fishery for king salmon in the Copper River. King salmon begin entering the Gulkana River in early June. The sport fishery typically peaks during late June, but limited fishing for king salmon continues until the season closes on July 19. Spawning begins in mid-July and continues through late August. Most spawning occurs upstream of the confluence of the West Fork, primarily in the reach between the

confluence of the West and Middle forks, but also in the Middle Fork and a few tributaries of the West Fork.

Under current regulations, the Gulkana River is open from January 1 through July 19. The closure is intended to offer protection to spawning fish. The Gulkana River downstream from the Richardson Highway Bridge to the confluence of the Copper River is designated as single-hook, artificial flies only from June 1 through July 31. In all waters upstream of a marker 7.5 miles upstream from the West Fork confluence, only unbaited, artificial lures may be used. This regulation is intended to protect rainbow trout stocks.

The sport harvest of king salmon in the Gulkana River peaked in 1993 and has declined since. Sport harvest of king salmon in the Gulkana River averaged 3,206 fish annually from 2000–2004, and 2,167 fish annually from 2005–2009 (Figure 12). The 1993 harvest of 5,892 king salmon was the largest on record and accounted for 72% of the sport harvest of king salmon in the Copper River. Harvest in 2010 was 1,445 king salmon and accounted for 60% of the sport harvest of king salmon in the Copper River. Sport fishing effort has also declined on the Gulkana River, averaging 24,199 angler-days annually from 2000 to 2004, and 19,233 angler-days from 2005 to 2009. Angler effort was 16,708 angler-days in 2010 and was the second lowest effort since 1979.

The majority of effort and harvest of king salmon occurs from the Richardson Highway Bridge upstream to the confluence of the West Fork. There are 5 developed access points to the Gulkana River. The most heavily used are at the Richardson Highway Bridge, 4 miles upstream from the confluence with the Copper River; Sailor's Pit, 4 miles upstream from the Richardson Highway Bridge; Poplar Grove, 12 miles upstream from Sailor's Pit; and the Sourdough boat launch 17 miles from Poplar Grove.

Some salmon fishing occurs upstream of the West Fork confluence from rafters floating down from Paxson Lake (about 35 miles). Access in the Upper Gulkana River occurs from the boat ramp on Paxson Lake and is limited to nonmotorized boats (rafts, canoes) due to river conditions. Two all-terrain vehicle trails also access the river: one about 2 miles downstream of Paxson Lake and another about 16 miles from Paxson Lake at the Canyon.

In 2005, 2009, 2010, and 2011, based on the low tower counts and anecdotal reports of poor king salmon harvests in the sport, subsistence, personal use, and commercial fisheries, and poor capture rates in NVE sampling wheels, restriction of the king salmon sport harvest was implemented on the Gulkana River. These restrictions were implemented to provide additional king salmon for the Gulkana River drainage spawning escapement.

## **KLUTINA RIVER KING SALMON FISHERY**

The Klutina River supports the second largest sport fishery for king salmon in the UCUSMA. The river has considerable stretches of whitewater and is considered to be very challenging to jet riverboat operators. The fast water of the Klutina River limits the number of resting pools for king salmon; therefore, there are less than 2 dozen good fishing sites in the lower portion of the river accessible to most anglers.

King salmon typically begin entering the Klutina River in late June, with the run continuing well into August. The sport fishery typically peaks during the third week of July; however, fishing for

king salmon continues until the season closes on August 10. Peak spawning occurs from late July through August. The king salmon season runs from July 1 through July 19 upstream of Mile 19.2 of the Klutina River Road, from July 1 through July 31 upstream of Mile 13 of the Klutina Lake Road, and July 1 through August 10 downstream from this point. The upper reaches have shorter seasons to protect spawning fish.

The Klutina River sport fishery for king salmon rapidly increased in popularity during the 1990s. Sport harvest of king salmon from the Klutina River drainage has been estimated using the mail survey since 1983. Based on this survey, harvests remained relatively stable from 1983 to 1990. Despite a 10-day reduction of the king salmon sport fishery season in 1997, king salmon harvest more than doubled from 1990 through 1999 when harvest peaked at 3,489 fish. Harvest greatly declined in 2000, coincident with a reduction in the annual king salmon limit from 5 to 4, and has remained comparatively low since. The sport harvest of king salmon from the Klutina River drainage averaged 1,551 fish annually from 2000 to 2004, and 1,198 fish annually from 2005 to 2009 (Figure 12). Due to poor overall returns of king salmon to the Copper River drainage, the Klutina king salmon fishery has opened with a 1-fish annual limit in 2009, 2010, and 2011, and the fishery was further restricted to catch and release from July 21 to August 10 in 2009. The 2010 sport harvest of king salmon from the Klutina River was 863 fish.

Sport fishing effort on the Klutina River has been increasing over the last several years, averaging 9,713 angler-days annually from 2000 to 2004, and 13,531 angler-days from 2005 to 2009. Angler effort for the Klutina River in 2010 was 16,532 angler-days, the highest ever recorded for this river. Due to the nature of the mail survey, we do not know how much of this effort was directed towards king salmon versus other species. Sport fishery observations, however, suggest that a majority of the effort is directed towards king salmon with the possible exception of 2006 and 2007 when a substantial amount of effort appeared directed at the large returns of sockeye salmon those two years.

## **OTHER COPPER RIVER KING SALMON FISHERIES**

Less than 10% of the harvest of king salmon in the UCUSMA occurs in systems other than the Gulkana and Klutina rivers (Figure 12). The majority of this harvest occurs in the Tonsina River. King salmon run timing to the Tonsina River drainage is in late June through August, similar to that of the Klutina River.

The Tonsina River king salmon sport fishery harvest increased annually from 1988 to 1995, peaking at 539 in 1995. Following the elimination of bait in 1997, king salmon sport harvests dropped off significantly. With the use of bait allowed in 2003, king salmon harvests have gradually increased and averaged 74 king salmon from 2005 to 2009.

Current regulations allow sport fishing for king salmon in the Tonsina River from July 1 through July 19 upstream of the Alyeska pipeline bridge and from July 1 through August 10 downstream of this point. The July 19 closure date allows king salmon to spawn undisturbed. The Little Tonsina River, Bernard Creek, and all flowing waters within a ¼-mile radius of their confluence with the Tonsina River are closed to king salmon fishing to protect spawning fish. The current bag limit for king salmon over 20 inches in this drainage is 1 and is included in the annual limit of 4 for the Copper River drainage.



A limited fishery for king salmon also occurs on Kaina Creek in the Tazlina River drainage. Harvests in this fishery have averaged 35 fish from 1990 to 1998, the peak harvest of 63 king salmon occurred in 1998. No harvests have been reported since 1998. Fishing is only permitted within a ¼ mile radius around the mouth of Kaina Creek.

## **COPPER RIVER SOCKEYE AND COHO SALMON FISHERIES**

Sockeye salmon sport harvests have generally increased since 1977. A significant increase in harvests occurred from 1996 through 2000, during which harvests averaged over 11,000 salmon, the majority of harvest from the Gulkana River (Figure 13). From 2001 to 2005, harvests reduced to more historic levels and averaged about 7,500 sockeye salmon. Harvests dramatically increased in 2006 and have averaged 15,543 through 2009. Increased harvests since 2006 are attributed to very large returns of sockeye salmon to the Klutina River, which accounted for an average of 90% of the total sockeye salmon sport harvest. In 2010, a total of 14,743 sockeye salmon were harvested in the Upper Copper River sport fisheries with 83% of these from the Klutina River.

The sport fisheries for coho salmon in the Upper Copper River are very minor. Average annual coho harvest from 2000 to 2004 was 385 (Figure 14). Since 2004, fewer than 100 coho salmon have been harvested in Upper Copper River sport fisheries in any given year. The majority of the coho salmon harvest occurs in the Tonsina River drainage.

The bag limits for sockeye and coho salmon are three salmon for all drainages in the Upper Copper River other than the West Fork of the Gulkana upstream of a department marker where the bag limit is 6 for sockeye salmon from August 1 to December 31. This higher bag limit for sockeye in the West Fork allows for a higher exploitation of hatchery-produced fish.

## **UPPER COPPER RIVER ESCAPEMENT AND RESEARCH**

Based on results of the radiotelemetry study conducted by the department from 1999 to 2004, it has been determined that the minority of the king salmon run to the Klutina (45%) and Tonsina (16%) rivers spawn in the index streams, the remainder spawn in the glacial mainstem of those rivers. As a result, in 2005, the department discontinued aerial surveys on 5 of the 9 index streams. Only the Gulkana River, East Fork Chistochina River, and St. Anne and Manker creeks in the Klutina River drainage have been flown since 2005. The revised aerial survey program no longer provides an index of total escapement for the Copper River king salmon run. The radiotelemetry study indicated that the 9 index streams represented approximately 24%–40% of the total escapement, and due to the variability between years, were not a reliable index of escapement. The current aerial survey streams provide an inseason index of run strength in the major sport fishery systems, prior to the availability of the total escapement estimates postseason.

## **NVE KING SALMON ESCAPEMENT MONITORING**

From 2003–2011, NVE conducted a king salmon escapement monitoring study on the Copper River. The overall objectives of the study were to estimate the annual, systemwide escapement of king salmon in the Copper River and to further develop an ongoing, long-term monitoring program to ensure continued involvement of NVE in the active management of Copper River fisheries. The estimates were germane to Baird Canyon (just upriver from Miles Lake and before

any inriver fisheries) and were generated using 2-event mark-recapture techniques such that the estimates were within 25% of the actual inriver abundance, 95% of the time.

NVE has successfully overcome many of the challenges associated with this study, which has proved to be a success. The study has generated unbiased and reasonably precise inriver abundance estimates for 2003–2010 (Table 12), and it's expected the 2011 results will also satisfy the established objective criteria.

### **Total Escapement Estimates**

Estimates of total king salmon escapement were determined by subtracting the subsistence, personal use, and sport harvests from the inriver abundance estimates. The resulting escapement estimates were 32,487 in 2008; 27,786 in 2009; and 16,771 in 2010 (Table 4). Total run size was the inriver abundance, plus the harvest from the commercial and commercial homepack fisheries, and estimates were 53,836 in 2008; 42,896 in 2009; and 33,090 in 2010. Total exploitation rates for 2008, 2009, and 2010 were 39%, 35%, and 49% respectively.

### **GULKANA RIVER KING SALMON COUNTING TOWER**

In 2009–2011, ADF&G along with the Bureau of Land Management continued to operate a counting tower on the Gulkana River above the West Fork to estimate escapement of king salmon. The counting tower has been in operation since 2002. Counts at this location do not provide an enumeration of total inriver escapement, but do provide a reliable estimate of escapement to the area upstream of the counting tower. Counts are conducted from late May to mid-August. Personnel conducted counts for 10 minutes of each hour every day. The 10-minute counts are expanded to provide an estimate of passage for each hour.

King salmon tower counts have generally declined from 2002 (6,355 fish) through 2010 (2,267) (Figure 15). From 2002 to 2010, the average expanded count past the tower has been 4,070 king salmon. This average includes years (2005, 2009, and 2010) in which management actions were taken that restricted the Gulkana River king salmon fishery. The annual limit for king salmon greater than 20 inches in length was reduced from 4 fish to 1 from the Gulkana River on July 2, 2005; June 15, 2009; and June 21, 2010. On June 29, 2009, the king salmon fishery was closed on the Gulkana River. In 2011, 3,804 king salmon were counted past the Gulkana tower. This count was above those observed during the previous 3 years, but was achieved only through a management action which restricted the king salmon fishery in the Gulkana River to catch and release beginning June 25.

### **SOCKEYE SALMON RESEARCH**

In 2009, NVE conducted the last year of a 5-year radiotelemetry study to determine spawning distribution and define migratory timing patterns of sockeye salmon in the Copper River.

#### **NVE Sockeye Salmon Radiotelemetry**

From 2005–2009, a radiotelemetry study was conducted by NVE to determine spawning distribution and define migratory timing patterns of sockeye salmon in the Copper River. Spawning distribution of sockeye in the major drainages was highest in the Klutina River all 5 years and averaged 40.2% of the overall proportion of radio-tagged sockeye (Figure 16).

Stock-specific run timing varied among stocks in each of the years 2005–2009, but showed a consistent pattern of upriver stocks, such as the Upper Copper drainage and Gulkana River

stocks, entering first and lower river stocks, such as the Klutina and Tonsina stocks, entering last (Table 13).

### **NVE Sockeye Inriver Abundance Estimate**

From 2007 to 2009, NVE conducted a mark-recapture study to estimate abundance of sockeye salmon that passed the Mile Lake sonar and compare that estimate to the sonar count for those years. The overall objective of the study was to provide an independent confirmation of the sonar counter used to manage the Copper River fisheries. This consisted of marking sockeye salmon collected at the Baird Canyon fishwheel site. Sockeye salmon were marked with yellow spaghetti tags embedded with a PIT tag. The tags were inserted in the fish and scanned at the marking site prior to the fish being released. The recapture site was located below Wood Canyon where sockeye were again collected via fish wheels. All captured sockeye were recorded, marked fish had their tags rescanned and the proportion of marked fish was compared to the unmarked portion to estimate the total number of sockeye salmon above Miles Lake.

NVE's mark-recapture inriver abundance estimate of sockeye salmon in the Upper Copper River was 1,259,000 (CV=7.2%) in 2007; 739,883 (S.E. = 32,962) in 2008; and 751,133 (S.E. = 36,623) in 2009. This compares to final sonar counts of 926,438 salmon in 2007; 726,858 salmon in 2008; and 709,330 salmon in 2009 (Table 12).

## **TABLES AND FIGURES**

Table 1.—Apportionment of the inriver salmon escapement goal for the Copper River, 2001–2011.

Category	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Sockeye Spawning Escapement	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Other Salmon Spawning Escapement	17,500	17,500	17,500	17,500	17,500	17,500	17,500	17,500	17,500	17,500	17,500
Glennallen Subsistence Harvest	75,000	75,000	68,000	68,000	68,500	68,500	70,000	75,710	70,365	70,747	72,407
Chitina Personal Use Harvest <sup>a</sup>	110,000	125,000	120,000	120,000	110,000	82,500	82,500	122,825	110,948	108,295	112,950
Sport Harvest	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Hatchery Broodstock	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Hatchery Surplus	185,500	99,000	76,879	11,169	47,859	107,718	44,096	63,570	58,238	136,036	84,524
Minimum inriver goal	723,000	651,500	497,379	431,669	468,859	611,218	549,096	614,605	592,000	668,000	622,000

<sup>a</sup> During 2001–2002 the Chitina dipnet fishery was classified as a subsistence fishery rather than personal use.

Table 2.—Average harvest by species and fishery in 5-year increments in the Copper River from 1971–2010, and the 2011 harvests.

Year	Species	Fishery			
		Commercial	Chitina Subdistrict	Glennallen Subdistrict	UCUSMA Sport
1971–1975	King	19,475	ND	1,517	ND
	Sockeye	523,982	ND	25,567	ND
	Coho	108,966	ND	165	ND
1976–1980	King	21,679	ND	2,136	1,556
	Sockeye	363,448	ND	24,946	2,244
	Coho	176,756	ND	491	243
1981–1985	King	40,242	ND	2,391	2,165
	Sockeye	821,925	ND	64,458	3,101
	Coho	393,961	ND	279	278
1986–1990	King	32,995	2,504	635	2,437
	Sockeye	881,848	47,182	24,586	4,026
	Coho	232,880	767	197	168
1991–1995	King	43,412	3,503	1,470	6,131
	Sockeye	1,200,005	82,064	49,457	5,592
	Coho	435,695	2,628	320	160
1996–2000	King	53,868	4,967	2,762	7,596
	Sockeye	1,843,276	126,082	67,238	11,758
	Coho	155,587	2,303	586	185
2001–2005 <sup>a</sup>	King	39,759	2,337	3,492	4,649
	Sockeye	1,227,960	106,231	72,480	7,527
	Coho	370,102	2,401	689	191
2006–2010 <sup>a</sup>	King	19,899	1,673	3,169	3,186
	Sockeye	1,049,198	113,002	70,708	15,383
	Coho	211,257	2,219	379	41
2011	Chinook	18,407	N/A	N/A	N/A
	Sockeye	2,023,746	N/A	N/A	N/A
	Coho	120,123	N/A	N/A	N/A

<sup>a</sup> Expanded state harvest data, plus federal subsistence reported harvest from 2002–2004 and federal subsistence expanded harvest after 2004.

Table 3.—Total disposition of sockeye salmon returns to the Copper River, 2001–2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10-year Average
Commercial harvest <sup>a</sup>	1,323,577	1,248,503	1,188,052	1,048,004	1,331,664	1,496,754	1,901,773	320,835	896,621	636,214	1,139,198
Commercial, homepack <sup>a</sup>	2,113	1,138	4,077	525	1,785	1,598	2,023	2,172	6,528	2,023	2,398
Commercial, donated <sup>a</sup>	0	128	35	74	83	114	0	80	47	0	56
Educational <sup>a</sup>	0	151	0	0	42	16	62	29	8	62	37
Subsistence (Cordova, drift gillnet) <sup>b</sup>	3,072	3,067	1,607	1,822	728	4,355	6,148	3,969	1,764	6,148	3,268
Federal Subsistence (PWS/Copper River)	0	0	0	0	109	150	36	32	46	36	41
Subsistence (Batzulnetas) <sup>c</sup>	62	208	164	182	0	0	1	1	0	106	72
Subsistence (Glennallen Subdistrict) <sup>b</sup>	83,787	50,850	47,007	55,510	64,213	57,710	65,714	43,157	46,849	70,719	58,552
Federal Subsistence (Glennallen Subdistrict) <sup>c</sup>	0	7,950	13,616	17,704	21,927	18,346	17,624	14,475	13,668	14,137	13,945
Personal Use (Chitina Subdistrict) <sup>b</sup>	132,108	85,968	80,796	107,312	120,013	123,261	125,126	81,359	90,035	138,487	108,447
Federal Subsistence (Chitina Subdistrict) <sup>c</sup>	0	575	717	1,215	2,450	1,549	1,028	959	882	2,324	1,170
Upriver sport harvest	8,169	7,761	7,108	6,464	8,135	14,297	23,028	11,431	13,415	14,743	11,455
Delta sport harvest	298	798	631	952	656	113	1,704	1,225	1,014	1,314	871
Upriver spawning escapement <sup>d</sup>	538,047	582,230	508,122	448,639	518,181	580,202	613,130	477,953	469,123	491,300	522,693
Delta spawning escapement <sup>e</sup>	142,130	151,470	146,300	138,770	116,812	197,792	176,570	135,900	137,244	166,570	150,956
Hatchery brood stock/Excess <sup>f</sup>	75,620	62,361	45,024	6,618	92,455	97,192	28,648	44,865	43,409	176,123	67,232
Total estimated sockeye salmon run size	2,237,918	2,127,423	1,970,106	1,764,406	2,220,847	2,492,648	2,874,330	1,070,492	1,652,031	1,637,021	2,004,722

<sup>a</sup> Numbers are from fish ticket data. Homepack numbers for sockeye are voluntarily reported.

<sup>b</sup> Data represent expanded state permit harvests.

<sup>c</sup> Data are reported harvest from federal permits from 2002–2004 and expanded federal harvests from 2005–2010.

<sup>d</sup> Wild spawning escapements after 1977 were estimated as the adjusted Miles Lake sonar index minus subsistence, personal use, and sport harvests in addition to the Gulkana Hatchery broodstock and excess brood escapement.

<sup>e</sup> Delta spawning escapement estimated by doubling the peak aerial survey index.

<sup>f</sup> Hatchery broodstock and onsite excess are from the PWSAC annual reports.

Table 4.–Total disposition of king salmon returns to the Copper River, 2001–2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10-year Average
Commercial harvest <sup>a</sup>	39,524	38,734	47,721	38,191	34,624	30,278	39,095	11,437	9,457	9,645	29,871
Commercial, homepack <sup>a</sup>	935	773	1,073	539	760	779	1,016	537	876	906	819
Commercial, donated <sup>a</sup>	0	4	3	5	11	3	0	4	0	0	3
Educational <sup>a</sup>	0	25	0	0	92	11	70	47	50	31	33
Subsistence (Cordova, drift gillnet) <sup>b</sup>	826	549	710	1,106	219	779	1,145	470	212	276	629
Subsistence (Batzulnetas) <sup>c</sup>	0	0	0	0	0	0	0	0	0	0	0
Subsistence (Glennallen Subdistrict) <sup>b</sup>	3,553	3,653	2,538	3,346	2,229	2,769	3,276	2,381	2,493	2,099	2,834
Federal Subsistence (Glennallen subdistrict) <sup>c</sup>	ND	564	554	653	389	460	596	837	543	326	552
Personal Use harvests (Chitina Subdistrict) <sup>b</sup>	3,113	2,023	1,903	2,495	2,043	2,663	2,694	1,999	214	700	1,985
Federal Subsistence (Chitna subdistrict) <sup>c</sup>	ND	33	18	7	51	18	28	23	9	18	23
Sport harvest	4,904	5,098	5,717	3,435	4,093	3,425	5,123	3,616	1,355	2,409	3,918
Upriver spawning escapement <sup>d</sup>	28,208	21,502	34,034	30,628	21,528	58,454	34,565	32,487	27,786	16,771	30,596
Total estimated king salmon run size	81,063	72,958	94,271	80,405	66,039	99,639	87,675	53,836	42,896	33,090	71,187

<sup>a</sup> Numbers are from fish ticket data.

<sup>b</sup> Data represent expanded state permit harvests.

<sup>c</sup> Data are reported harvest from federal permits from 2002–2004 and expanded federal harvests from 2005–2010.

<sup>d</sup> Spawning escapements were determined by subtracting Glennallen Subdistrict subsistence, Chitina Subdistrict personal use, and Upper Copper River sport harvests from the estimated inriver abundance of king salmon.



Table 5.–Total disposition of coho salmon returns to the Copper River, 2001–2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10-year Average
Commercial harvest <sup>a</sup>	251,473	504,223	363,489	467,859	263,465	318,285	117,182	202,261	207,776	117,182	290,699
Commercial, homepack <sup>a</sup>	24	187	0	2	119	137	340	423	767	1,026	303
Commercial, donated <sup>a</sup>	5,141	0	0	5,141	0	0	0	154	0	0	530
Educational drift gillnet permit <sup>a</sup>	0	0	0	0	0	0	0	0	0	0	0
Subsistence (Cordova, drift gillnet) <sup>b</sup>	70	28	36	46	15	1	15	53	22	27	31
Federal Subsistence (PWS/Copper River)	0	0	0	0	141	100	68	119	185	68	68
Subsistence (Batzulnetas) <sup>c</sup>	0	0	0	0	0	0	0	0	0	0	0
Subsistence (Glennallen Subdistrict) <sup>b</sup>	1,101	524	487	76	280	212	231	482	194	293	388
Federal Subsistence (Glennallen subdistrict) <sup>c</sup>	0	81	152	152	70	28	34	156	34	64	77
Personal Use (Chitina Subdistrict) <sup>b</sup>	2,385	1,712	2,409	2,304	1,869	2,715	1,492	2,346	1,452	2,195	2,088
Federal Subsistence (Chitina subdistrict) <sup>c</sup>	0	0	70	18	0	20	40	74	11	33	27
Delta sport harvest	12,052	6,525	14,166	14,512	10,168	5,745	10,223	7,706	14,384	9,822	10,530
Upriver sport harvest	92	384	277	131	72	54	184	57	36	31	132
Upriver spawning escapement	–	–	–	–	–	–	–	–	–	–	–
Delta spawning escapement <sup>d</sup>	82,192	179,630	144,630	199,960	202,164	178,540	107,640	153,784	82,588	112,934	144,379
Total estimated coho salmon run size	195,534	693,294	525,446	685,060	478,363	505,837	237,449	367,975	307,449	337,114	449,252

<sup>a</sup> Numbers are from fish ticket data.

<sup>b</sup> Data represent expanded state permit harvests.

<sup>c</sup> Data are reported harvest from federal permits.

<sup>d</sup> Delta spawning escapement estimated by doubling the peak aerial survey index.

Table 6.—Number of sockeye salmon fry released at the Gulkana Hatchery (Paxson Lake) and remote releases at Summit and Crosswind lakes, 1974–2010.

Release Year	Gulkana (I & II) (Paxson Lake)	Summit Lake	Crosswind Lake	Total
1974	79,691	ND	ND	79,691
1975	785,110	ND	ND	785,110
1976	627,080	ND	ND	627,080
1977	514,922	ND	ND	514,922
1978	477,219	ND	ND	477,219
1979	940,974	ND	ND	940,974
1980	1,105,397	ND	ND	1,105,397
1981	3,368,642	1,340,660	ND	4,709,302
1982	5,985,270	1,860,491	ND	7,845,761
1983	5,470,056	2,047,947	ND	7,518,003
1984	6,162,450	4,312,628	ND	10,475,078
1985	9,261,785	4,741,759	ND	14,003,544
1986	8,586,509	8,451,782	1,287,042	18,325,333
1987	9,905,907	14,999,085	ND	24,904,992
1988	6,204,332	12,491,926	2,487,396	21,183,654
1989	10,105,238	12,026,642	3,130,373	25,262,253
1990	13,288,695	12,004,491	4,906,005	30,199,191
1991	10,522,819	6,455,011	5,469,759	22,447,589
1992	10,553,621	7,048,536	5,420,351	23,022,508
1993	5,295,017	2,651,542	4,495,966	12,442,525
1994	9,405,449	7,637,009	9,144,382	26,186,840
1995	10,317,116	7,418,311	9,973,600	27,709,027
1996	13,900,000	8,400,148	9,732,911	28,850,917
1997	11,589,845	10,162,655	10,512,299	32,264,799
1998	12,286,366	8,987,213	10,516,107	31,789,686
1999	10,198,541	9,191,217	9,984,392	29,374,150
2000	10,705,795	3,300,504	8,331,080	22,337,379
2001	7,870,334	493,516	5,585,665	13,949,515
2002	11,922,685	5,805,231	8,174,754	25,902,670
2003	11,284,330	6,599,519	8,360,966	26,244,815
2004	12,408,512	6,574,962	8,359,115	27,342,589
2005	3,308,065	n/a	3,703,295	7,011,360
2006	5,523,920	4,681,325	10,017,211	20,222,456
2007	6,000,000	6,000,000	10,000,000	22,000,000
2008	6,000,000	6,000,000	9,980,000	21,980,000
2009	6,000,000	6,000,000	10,000,000	22,000,000
2010	6,010,000	6,000,000	10,000,000	22,010,000

Table 7.–2009 Chitina Subdistrict fishing schedule (hours in bold indicate supplemental periods).

Week Ending	PU Week	Preseason Opening Schedule	Hours	Actual Opening Schedule	Hours
7-Jun	1	Monday, June 01, 8:00 PM - Sunday, June 07, 11:59 PM	148	Monday, June 01, 12:00 PM - Sunday, June 07, 11:59 PM	156
14-Jun	2	Monday, June 08, 12:01 AM - Sunday, June 14, 11:59 PM	168	Monday, June 08, 12:01 AM - Sunday, June 14, 11:59 PM	168
21-Jun	3	Monday, June 15, 12:01 AM - Sunday, June 21, 11:59 PM	168	Monday, June 15, 6:01 PM - Sunday, June 21, 11:59 PM	150
28-Jun	4	Monday, June 22, 12:01 AM - Sunday, June 28, 11:59 PM	168	Monday, June 22, 12:01 AM - Sunday, June 28, 11:59 PM	168
5-Jul	5	Monday, June 29, 12:01 AM - Sunday, July 05, 11:59 PM	168	Monday, June 29, 12:01 AM - Sunday, July 05, 11:59 PM	168
12-Jul	6	Tuesday, July 07, 12:00 PM - Sunday, July 12, 8:00 PM	128	Monday, July 06, 6:00 PM - Sunday, July 12, 11:59 PM	150
19-Jul		Wednesday, July 15, 12:00 PM - Sunday, July 19, 8:00 PM	104	Monday, July 13, 6:00 PM - Sunday, July 19, 11:59 PM	150
26-Jul	7	Wednesday, July 22, 8:00 AM - Sunday, July 26, 8:00 PM	108	Monday, July 20, 12:01 AM - Sunday, July 26, 11:59 PM	168
02-Aug	8	Monday, July 27, 12:01 AM - Sunday, August 02, 11:59 PM	168	Monday, July 27, 12:01 AM - Sunday, August 02, 11:59 PM	168
09-Aug	9	continuous	168	continuous	168
16-Aug	10	continuous	168	continuous	168
23-Aug	11	continuous	168	continuous	168
30-Aug	12	continuous	168	continuous	168

Table 8.–2010 Chitina Subdistrict fishing schedule (hours in bold indicate supplemental periods).

Week Ending	PU Week	Preseason Opening Schedule	Hours	Actual Opening Schedule	Hours
6-Jun	1	Thursday, June 03, 12:01 AM - Sunday, June 06, 6:00 PM	90	Saturday, June 05, 8:00 AM - Saturday, June 05, 11:59 PM	16
13-Jun	2	Monday, June 07, 12:01 AM - Sunday, June 13, 11:59 PM	168	Monday, June 07, 12:01 AM - Sunday, June 13, 11:59 PM	168
20-Jun	3	Monday, June 14, 12:01 AM - Sunday, June 20, 11:59 PM	168	Monday, June 14, 12:01 AM - Sunday, June 20, 11:59 PM	168
27-Jun	4	Monday, June 21, 12:01 AM - Sunday, June 27, 11:59 PM	168	Monday, June 21, 12:01 AM - Sunday, June 27, 11:59 PM	168
4-Jul	5	Monday, June 28, 12:01 AM - Sunday, July 04, 11:59 PM	168	Monday, June 28, 12:01 AM - Sunday, July 04, 11:59 PM	168
11-Jul	6	Monday, July 05, 8:00 PM - Sunday, July 11, 11:59 PM	148	Monday, July 05, 12:01 AM - Monday, July 11, 11:59 PM	134
18-Jul	7	Wednesday, July 14, 8:00 AM - Sunday, July 18, 11:59 PM	112	Monday, July 12, 5:00 PM - Sunday, July 18, 11:59 PM	151
25-Jul	8	Wednesday, July 21, 8:00 AM - Sunday, July 25, 8:00 PM	108	Monday, July 19, 12:01 AM - Sunday, July 25, 11:59 PM	168
01-Aug	9	Monday, July 26, 12:01 AM - Sunday, August 01, 11:59 PM	168	<b>Monday, July 26, 12:01 AM - Sunday, August 01, 11:59 PM</b>	<b>168</b>
8-Aug	10	Continuous	168	<b>Monday, August 02, 12:01 AM - Sunday, August 08, 11:59 PM</b>	<b>168</b>
15-Aug	11	Continuous	168	Continuous	168
22-Aug	12	Continuous	168	Continuous	168
29-Aug	13	Continuous	168	Continuous	168

Table 9.–2011 Chitina Subdistrict fishing schedule (hours in bold indicate supplemental periods).

Week Ending	PU Week	Preseason Opening Schedule	Hours	Actual Opening Schedule	Hours
5-Jun	1	Friday, June 03, 6:00 AM - Sunday, June 05, 11:59 PM	66	Saturday, June 04, 8:00 AM - Sunday, June 05, 5:00 PM	33
12-Jun	2	Monday, June 06, 12:01 AM - Sunday, June 12, 11:59 PM	168	<b>Monday, June 06, 12:01 AM - Sunday, June 12, 11:59 PM</b>	<b>168</b>
19-Jun	3	Monday, June 13, 12:01 AM - Sunday, June 19, 11:59 PM	168	Monday, June 13, 12:01 AM - Sunday, June 19, 11:59 PM	168
26-Jun	4	Monday, June 20, 12:01 AM - Sunday, June 26, 11:59 PM	168	Monday, June 20, 12:01 AM - Sunday, June 26, 11:59 PM	168
03-Jul	5	Monday, June 27, 12:01 AM - Sunday, July 03, 11:59 PM	168	Monday, June 27, 12:01 AM - Sunday, July 03, 11:59 PM	168
10-Jul	6	Monday, July 04, 12:01 AM - Sunday, July 10, 11:59 PM	168	Monday, July 04, 12:01 AM - Sunday, July 10, 11:59 PM	168
17-Jul	7	Tuesday, July 12, 12:00 PM - Sunday, July 17, 5:00 PM	125	Monday, July 11, 5:00 PM - Sunday, July 17, 11:59 PM	151
24-Jul	8	Thursday, July 21, 12:01 AM - Sunday, July 24, 11:59 PM	96	Tuesday, July 19, 12:00 PM - Sunday, July 24, 11:59 PM	132
31-Jul	9	Monday, July 25, 6:00 AM - Sunday, July 31, 11:59 PM	162	<b>Monday, July 25, 12:01 AM - Sunday, July 31, 11:59 PM</b>	<b>168</b>
7-Aug	10	Continuous	168	<b>Monday, August 01, 12:01 AM - Sunday, August 07, 11:59 PM</b>	<b>168</b>
14-Aug	12	Continuous	168	<b>Monday, August 08, 12:01 AM - Sunday, August 14, 11:59 PM</b>	<b>168</b>
21-Aug	13	Continuous	168	Continuous	168

Table 10.—Number of permits issued and salmon harvested in the Glennallen Subdistrict subsistence salmon fishery, 1980–2011 (includes federal subsistence permits and harvest since 2002).

Year	Number Permits Issued				Estimated Salmon Harvest <sup>b</sup>
	Total	Dip nets	Fish wheels	Federal <sup>a</sup>	
1980 <sup>d</sup>	3,203	2,804	399	ND	35,081
1981 <sup>d</sup>	4,078	3,555	523	ND	68,746
1982 <sup>d</sup>	6,090	5,475	615	ND	110,006
1983	7,541	6,911	630	ND	118,728
1984	562	104	458	ND	28,617
1985	533	<sup>c</sup>	<sup>c</sup>	ND	31,614
1986	405	39	336	ND	28,423
1987	431	59	372	ND	34,142
1988	409	70	339	ND	30,755
1989	386	78	308	ND	29,308
1990	406	95	311	ND	32,524
1991	711	293	418	ND	41,205
1992	655	151	504	ND	47,095
1993	772	193	579	ND	54,855
1994	970	267	703	ND	70,391
1995	858	191	667	ND	55,323
1996	850	219	631	ND	54,290
1997	1,133	286	847	ND	85,743
1998	1,010	272	738	ND	66,951
1999	1,101	336	765	ND	82,119
2000	1,251	464	787	ND	64,885
2001	1,239	407	832	ND	88,568
2002	1,322	469	652	201	55,058
2003	1,233	399	613	221	64,382
2004	1,218	330	626	262	78,001
2005	1,228	363	598	267	87,008
2006	1,238	338	646	254	79,694
2007	1,455	467	707	281	87,759
2008	1,456	536	650	270	61,725
2009	1,367	469	621	277	64,017
2010	1,591	620	701	270	87,908
2011		617	689	274	ND
2001-2005	1,248	394	664	238	76,765
2006-2010	1,421	486	665	270	76,221

<sup>a</sup>Federal permits are not limited to a single gear type and allow use of fish wheel, dip net, or rod and reel.

<sup>b</sup>Expanded state harvest data plus federal reported harvest from 2002–2004 and federal expanded harvest after 2004

<sup>c</sup>Data not available.

<sup>d</sup>The Chitina Subdistrict was a subsistence fishery from 1980–1983 and data for the Glennallen and Chitina subdistricts were combined for those years.

Table 11.—King salmon reported harvest and effort in the Copper River District subsistence drift gillnet fishery, and reported harvest of homepack king salmon from the Copper River commercial drift gillnet fishery, 2001–2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10-year average
Number of subsistence permits fished	288	199	225	321	121	300	295	248	128	139	226
Number of subsistence king salmon harvested	826	549	710	1,106	260	779	1,145	470	212	276	633
Average number of king salmon harvested per subsistence permit holder	2.9	2.8	3.2	3.4	2.1	2.6	3.9	1.9	1.7	2.0	2.7
Number of commercial permit holders reporting personal use harvests	289	247	287	174	228	264	280	223	328	333	265
Number of king salmon retained for personal use	935	773	1,073	539	760	779	1,019	537	876	906	820
Average number of king salmon harvested for homepack per permit holder reporting retention	3.2	3.1	3.7	3.1	3.3	2.9	3.6	2.4	2.7	2.7	3.1
Combined Lower Copper River subsistence and personal use harvests	1,761	1,322	1,783	1,645	1,020	1,558	2,164	1,007	1,088	1,182	1,453

Table 12.—Estimates of inriver abundance for king and sockeye salmon in the Copper River, 2001–2010 (numbers in bold designate final estimates used for management purposes).

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
King (ADF&G)	<b>39,778</b>	<b>32,873</b>	33,488	33,793	-	-	-	-	-	-
Standard Error	8,262	8,863	8,389	11,038	-	-	-	-	-	-
King (M-R) <sup>b</sup>	-	-	<b>44,764</b>	<b>40,564</b>	<b>30,333</b>	<b>67,789</b>	<b>46,349</b>	<b>41,343</b>	<b>32,400</b>	<b>22,323</b>
Standard Error	-	-	12,385	4,650	1,529	4,779	3,391	2,166	2,365	2,492
Sockeye (Sonar) <sup>a</sup>	<b>833,569</b>	<b>819,794</b>	<b>700,543</b>	<b>669,514</b>	<b>855,125</b>	<b>959,706</b>	<b>919,600</b>	<b>718,344</b>	<b>709,749</b>	<b>923,811</b>
Standard Error	-	-	-	-	-	-	-	-	-	-
Sockeye (M-R) <sup>b</sup>	-	-	-	-	-	-	1,259,00	739,833	-	-
Standard Error	-	-	-	-	-	-	90,648	32,962	-	-

<sup>a</sup> Sonar counts represent all salmon passing sonar site without differentiation between species.

<sup>b</sup> Estimates from Native Village of Eyak Petersen mark-recapture project.



Table 13.—Run-timing statistics past the tagging site at Baird Canyon for major sockeye salmon spawning stocks in the Copper River, 2005–2008.

Stocking Group	Duration (d) <sup>a</sup>				Mean Date of Passage <sup>b</sup>			
	2005	2006	2007	2008	2005	2006	2007	2008
Lower Copper	46	61	63	44	6-Jul	28-Jun	24-Jun	3-Jul
Chitina	68	63	45	51	30-Jun	13-Jul	19-Jun	13-Jun
Tonsina	56	54	46	23	13-Jul	17-Jul	22-Jul	19-Jul
Klutina	75	60	69	45	13-Jun	20-Jun	16-Jun	15-Jun
Tazlina	52	64	70	43	31-May	11-Jun	5-Jun	5-Jun
Gulkana	73	65	62	58	4-Jul	7-Jul	2-Jul	29-Jun
Upper Copper	51	28	40	54	2-Jun	7-Jun	11-Jun	12-Jun

Source: *Spawning Distribution and Run Timing of Copper River Sockeye Salmon, 2008 Annual Report*.

<sup>a</sup> Duration refers to the average amount of days it took radio-tagged fish to travel to their upriver destinations following the tagging event near Baird Canyon.

<sup>b</sup> Mean date of passage is germane to the capture site near Baird Canyon.

# COPPER RIVER DRAINAGE

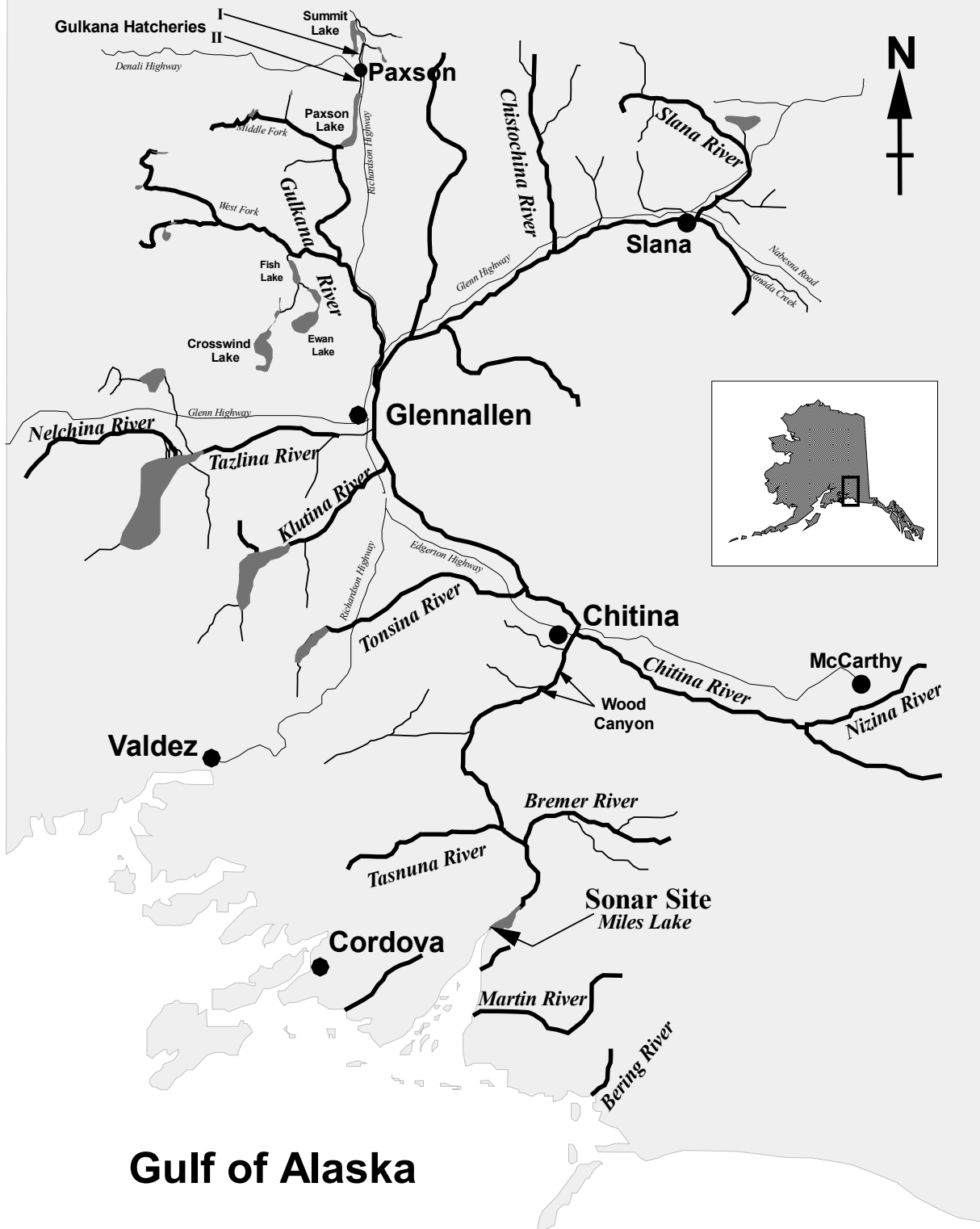


Figure 1.—The Copper River and Copper River Delta Area.

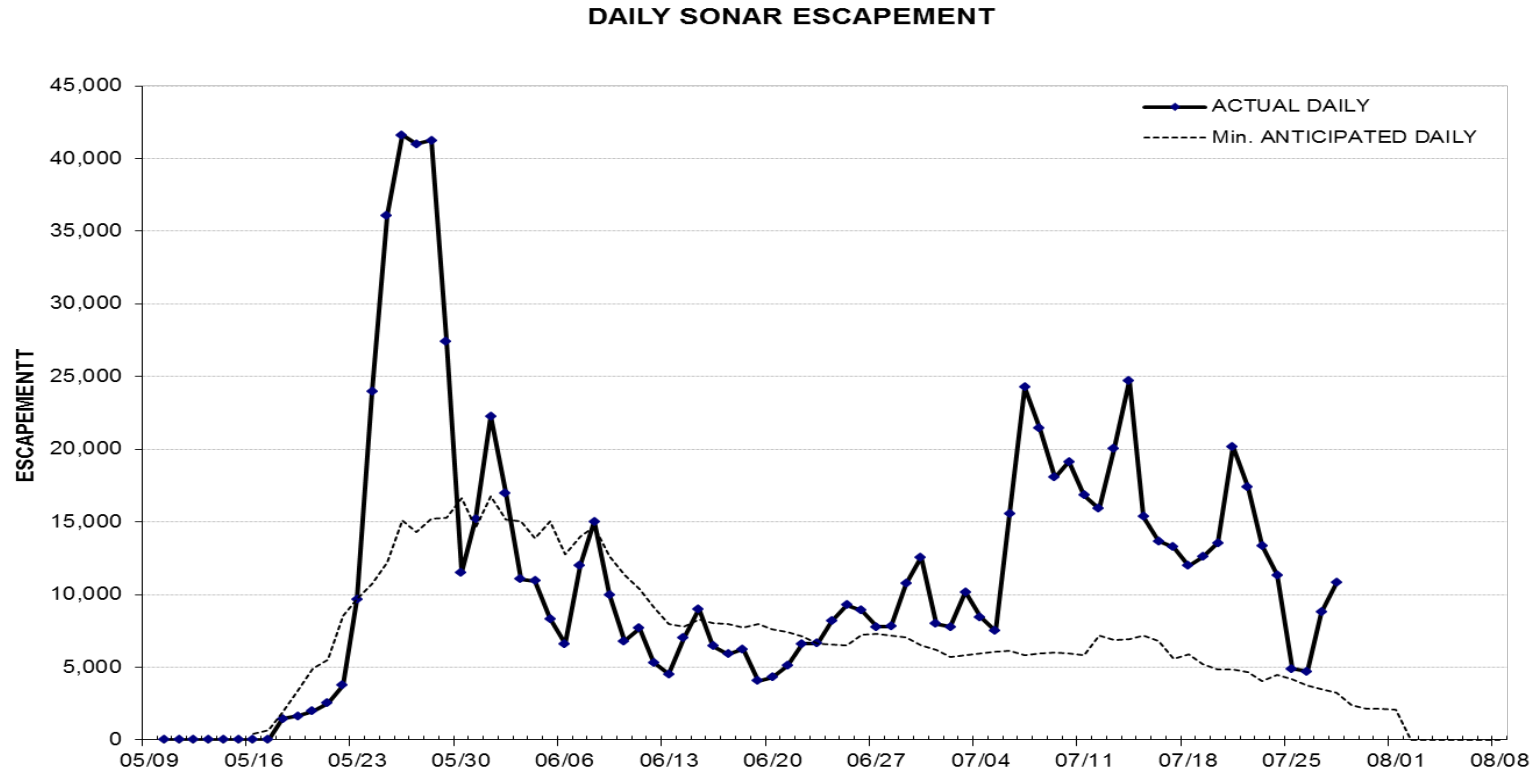


Figure 2.—Anticipated components of the Copper River salmon escapement versus actual escapement past the Miles Lake sonar, 2011.

## Copper River King Salmon Harvests

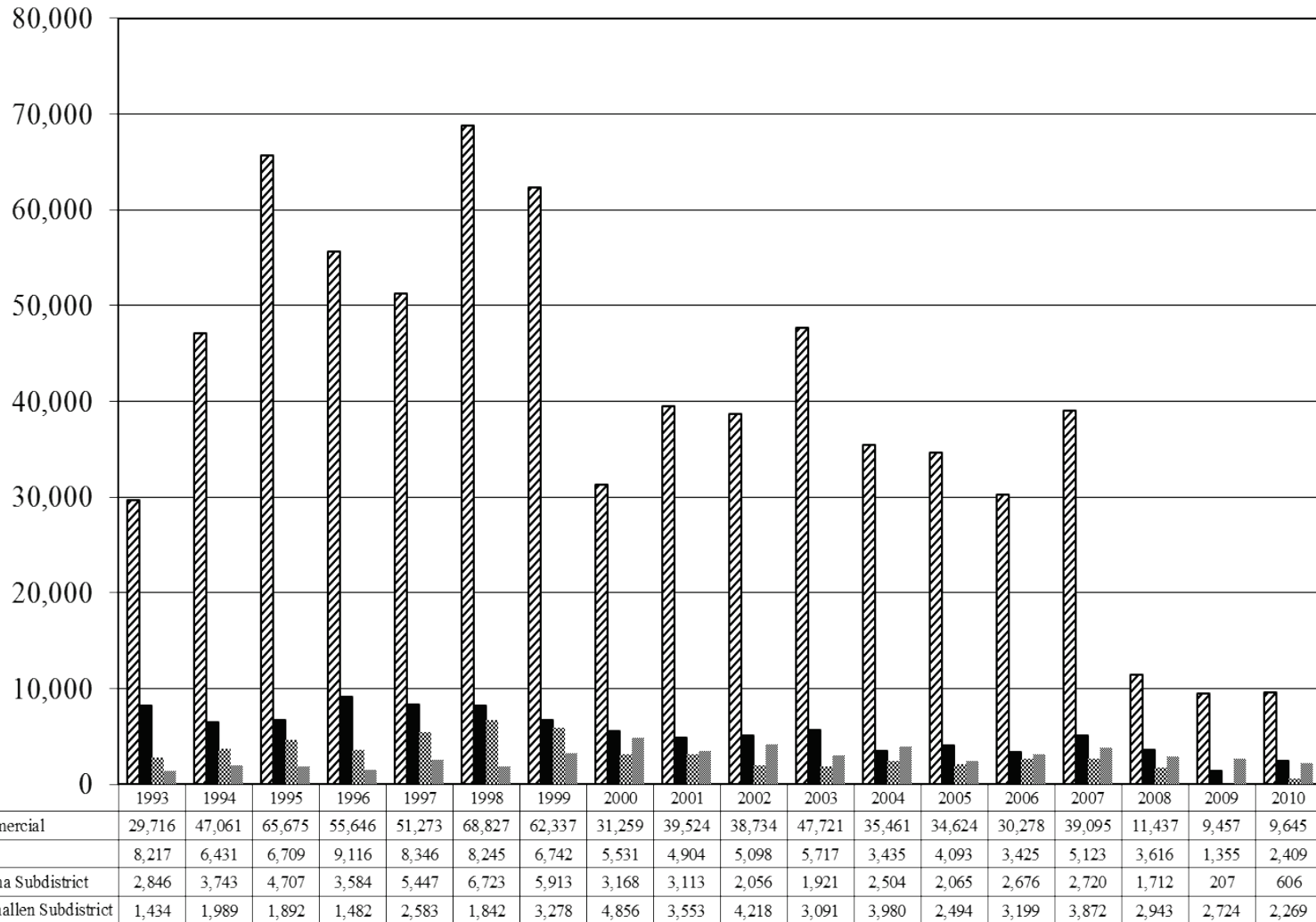


Figure 3.—King salmon harvest in the Copper River by fishery, 1993–2010.

# Copper River Sockeye Salmon Harvests

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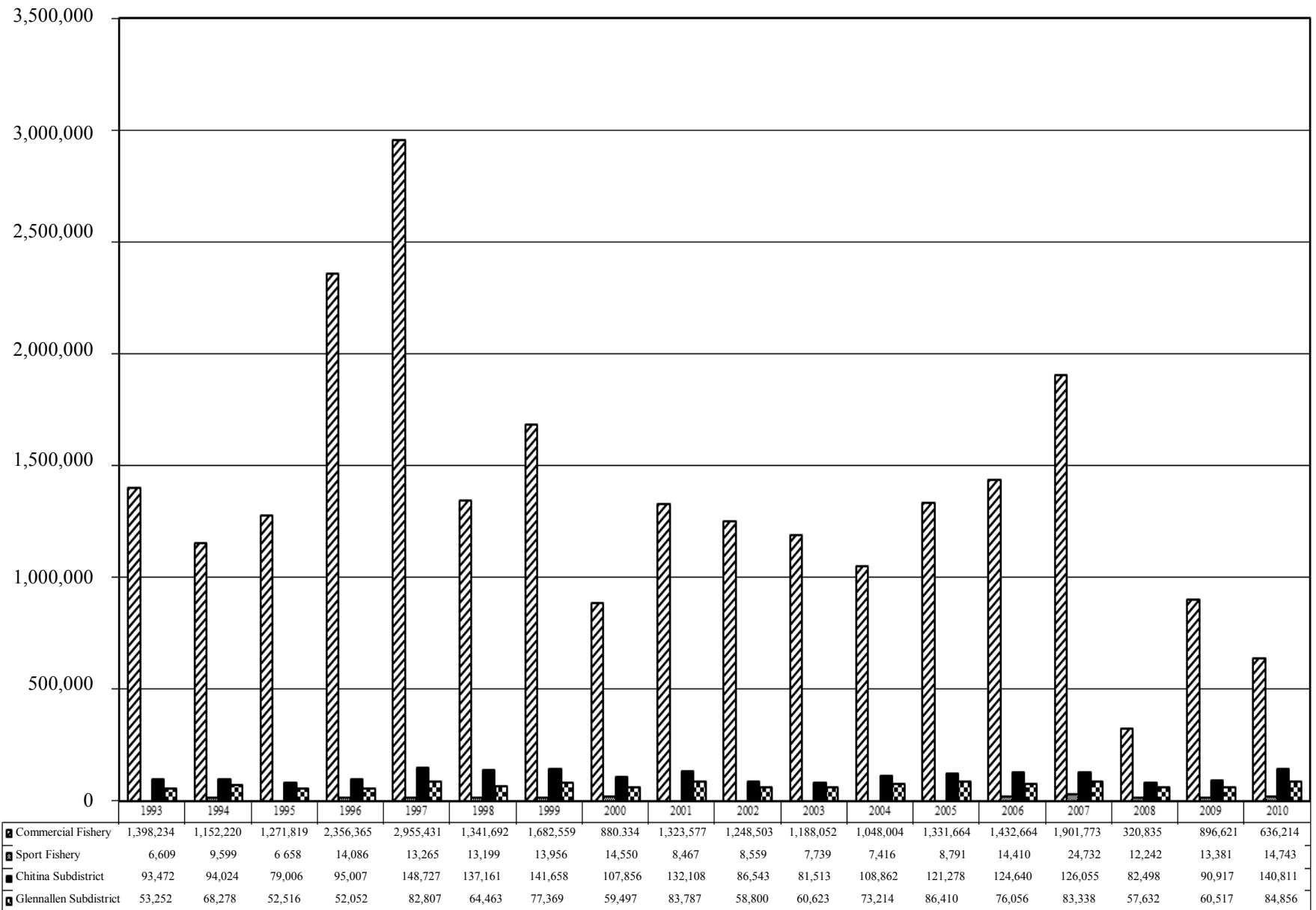


Figure 4.—Sockeye salmon harvest in the Copper River by fishery, 1993–2010.

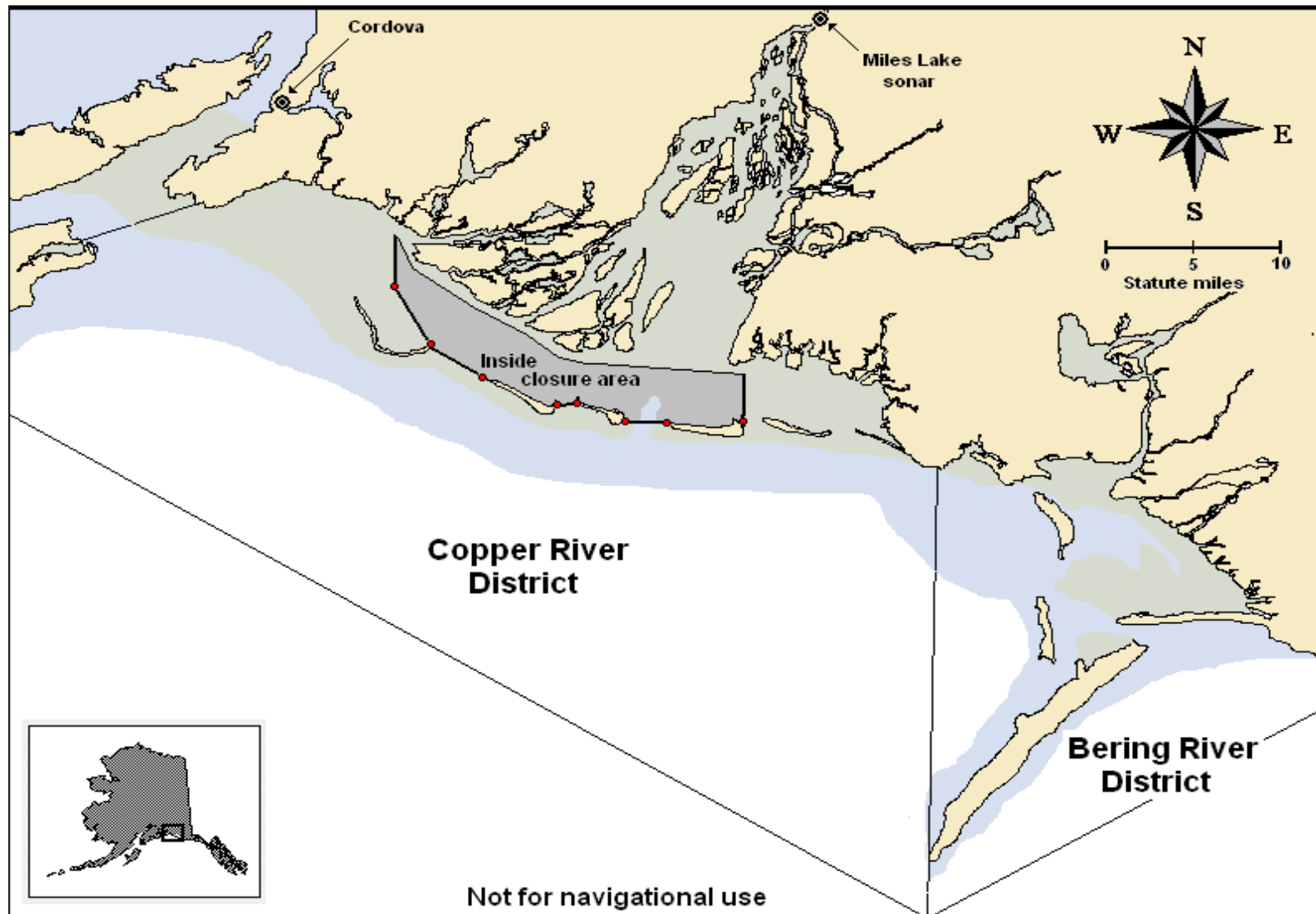


Figure 5.—Map of Copper River and Bering River districts showing inside closure area.

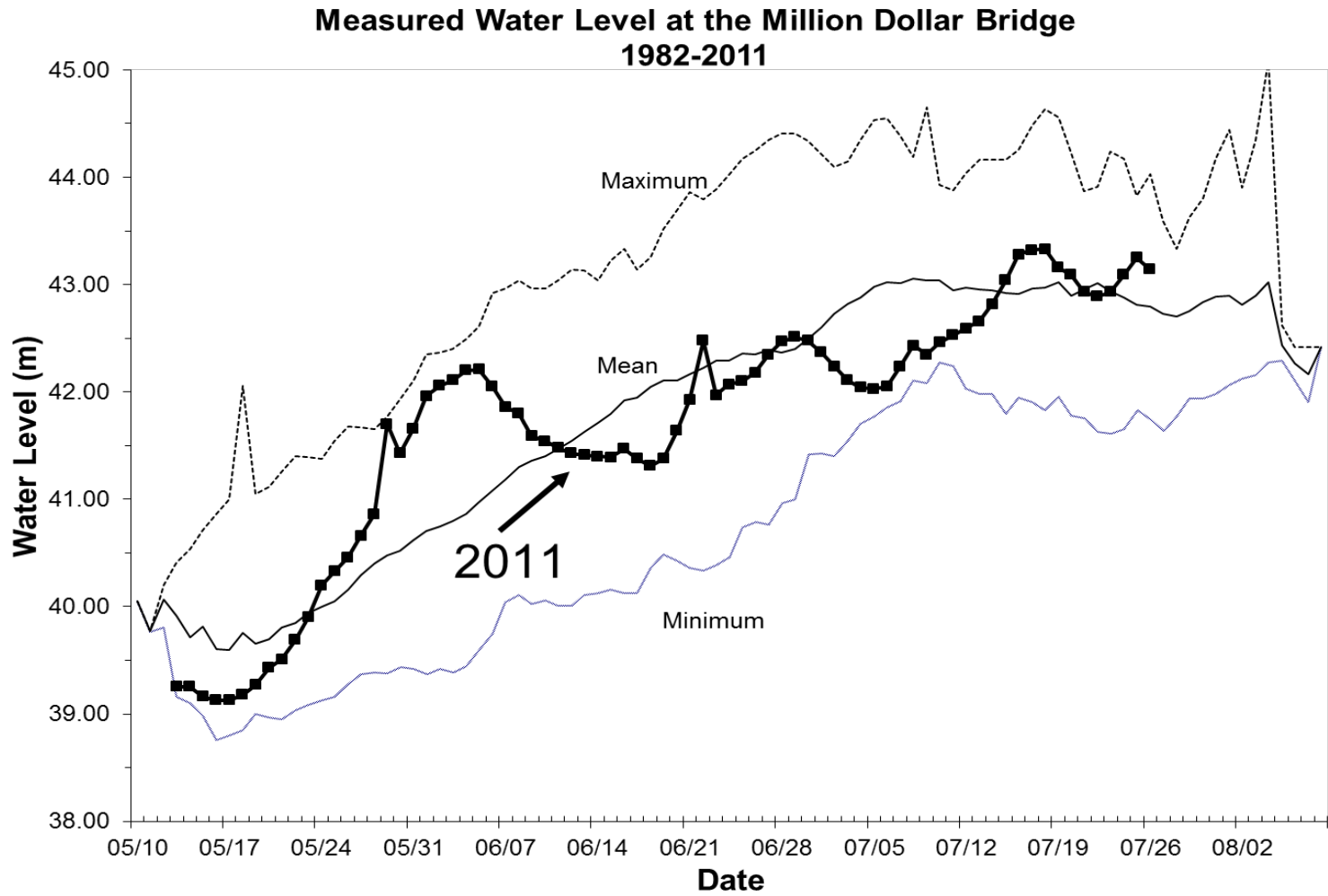


Figure 6.—Measured water level at the Million Dollar Bridge.

# PERSONAL USE FISHERIES in the Copper River drainage

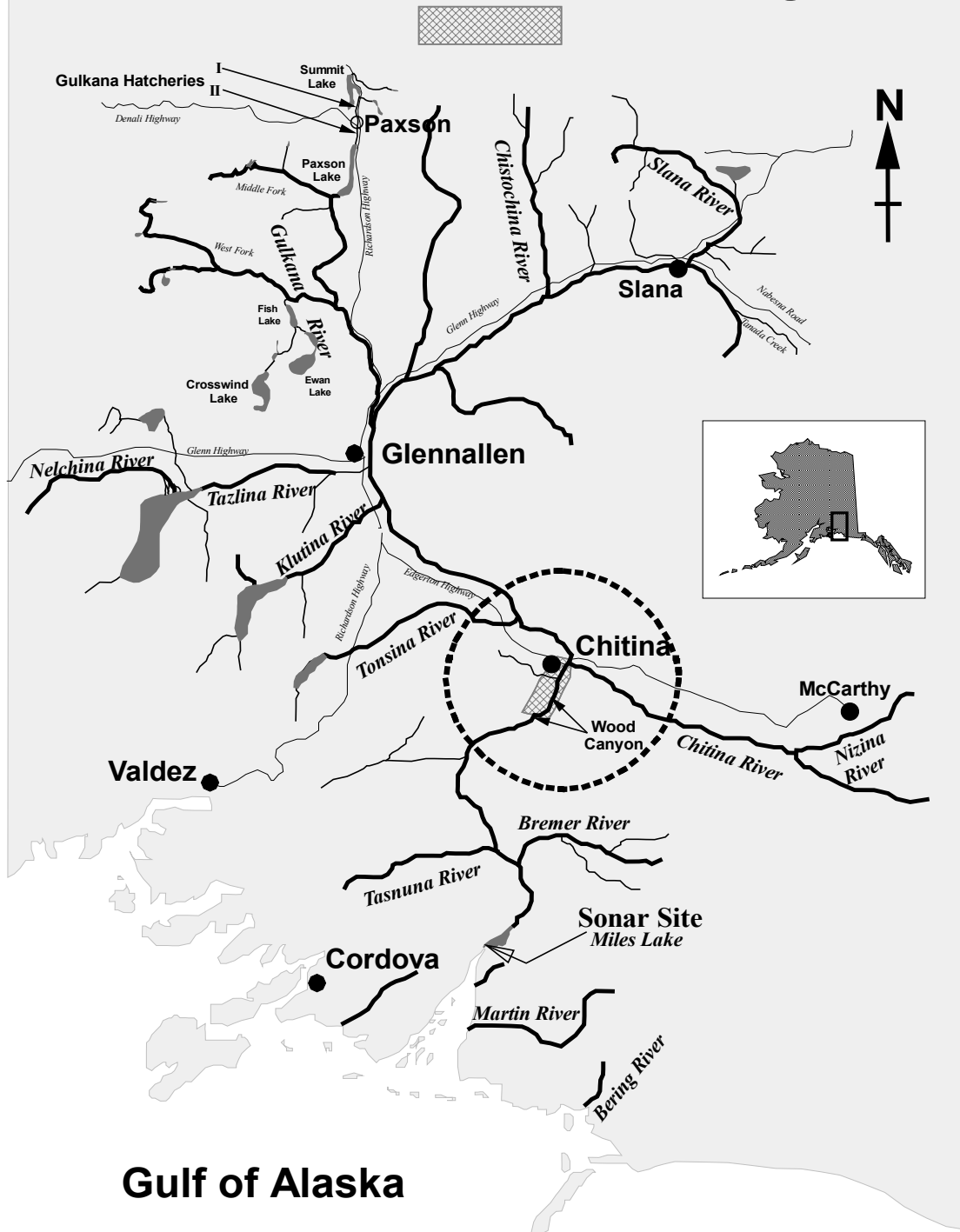


Figure 7.—Map of the personal use fisheries on the Copper River.



### Chitina Subdistrict Personal Use Fishery

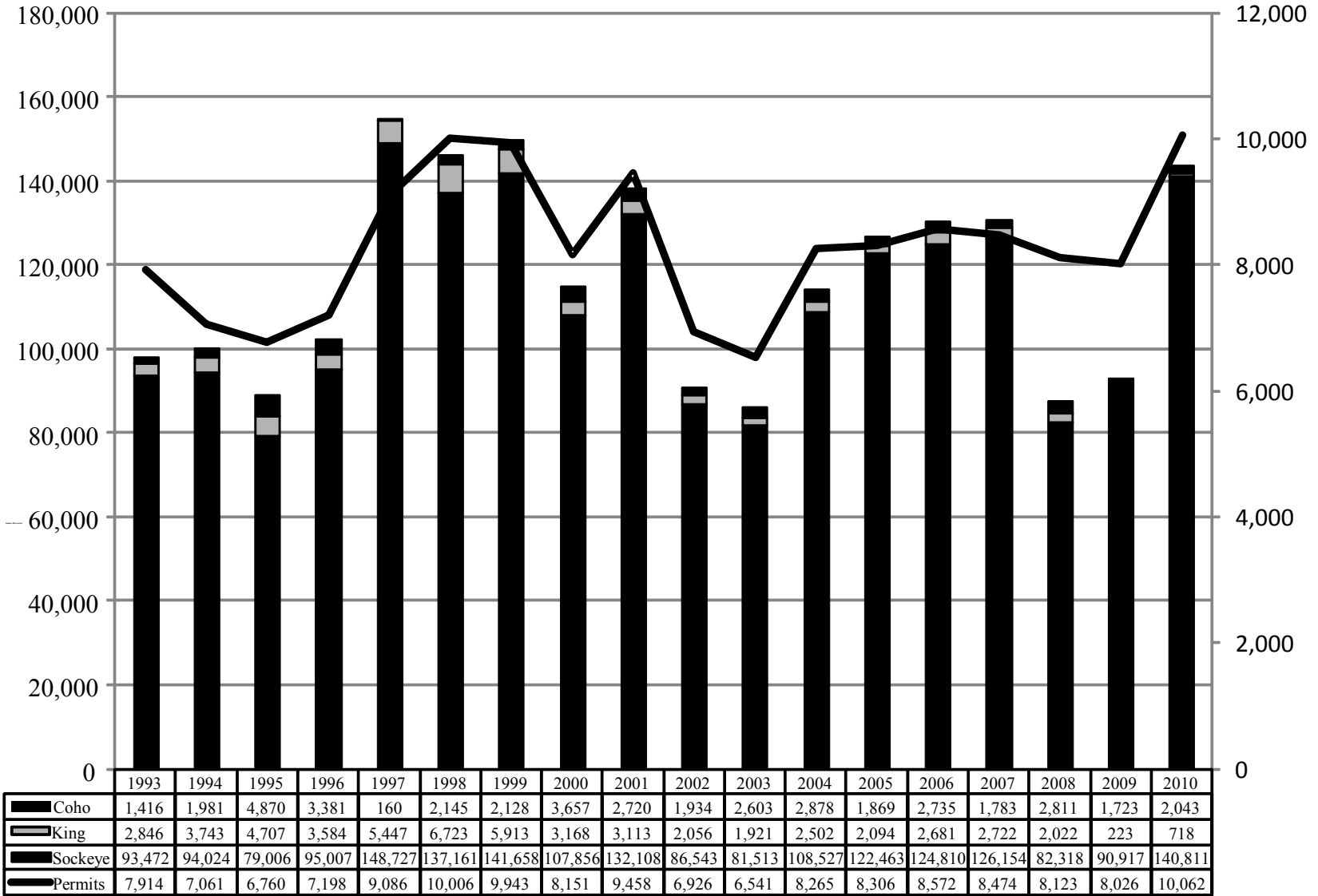


Figure 8.—Chitina Subdistrict personal use salmon harvest by species, 1993–2010.

# SUBSISTENCE FISHERIES in the Copper River drainage

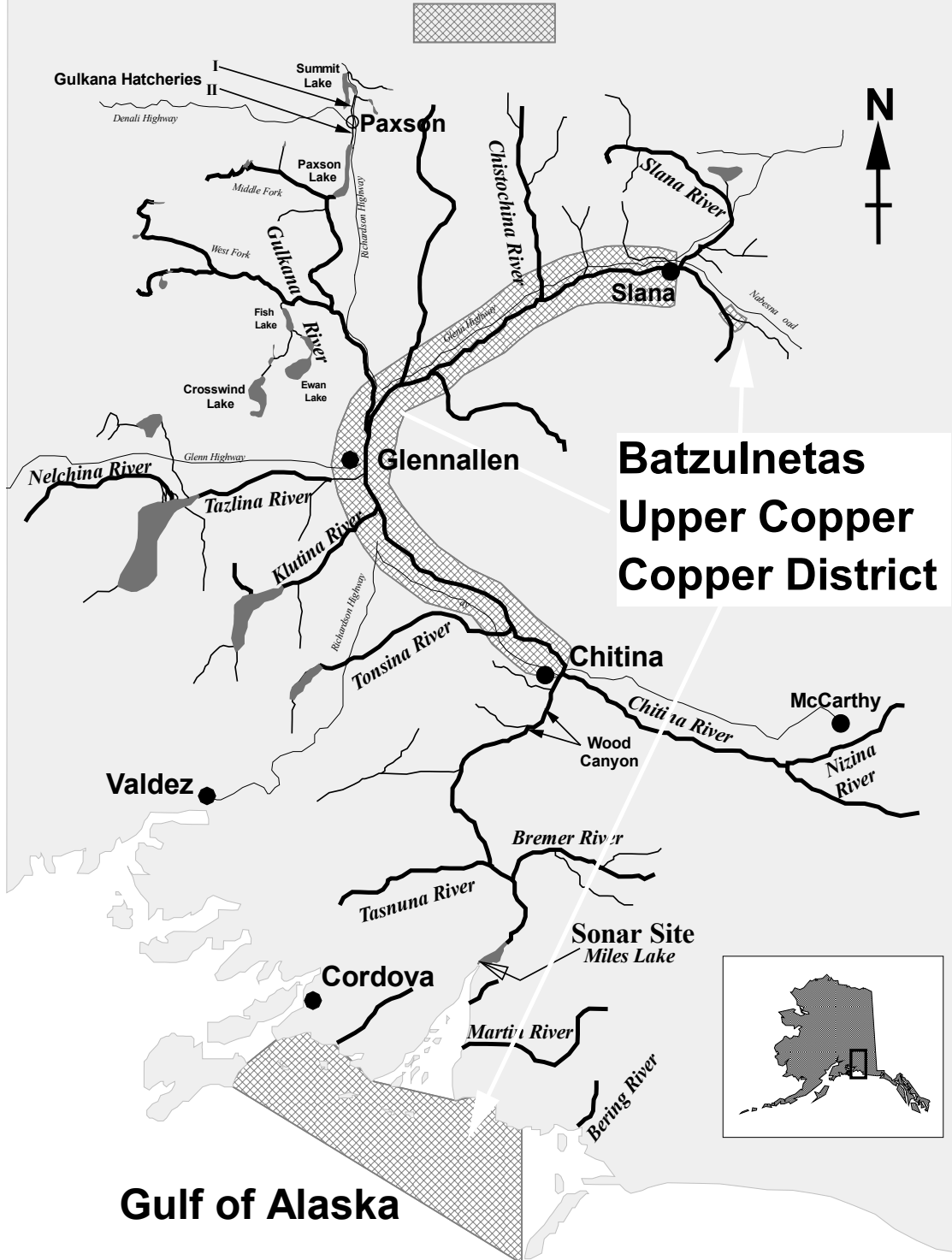
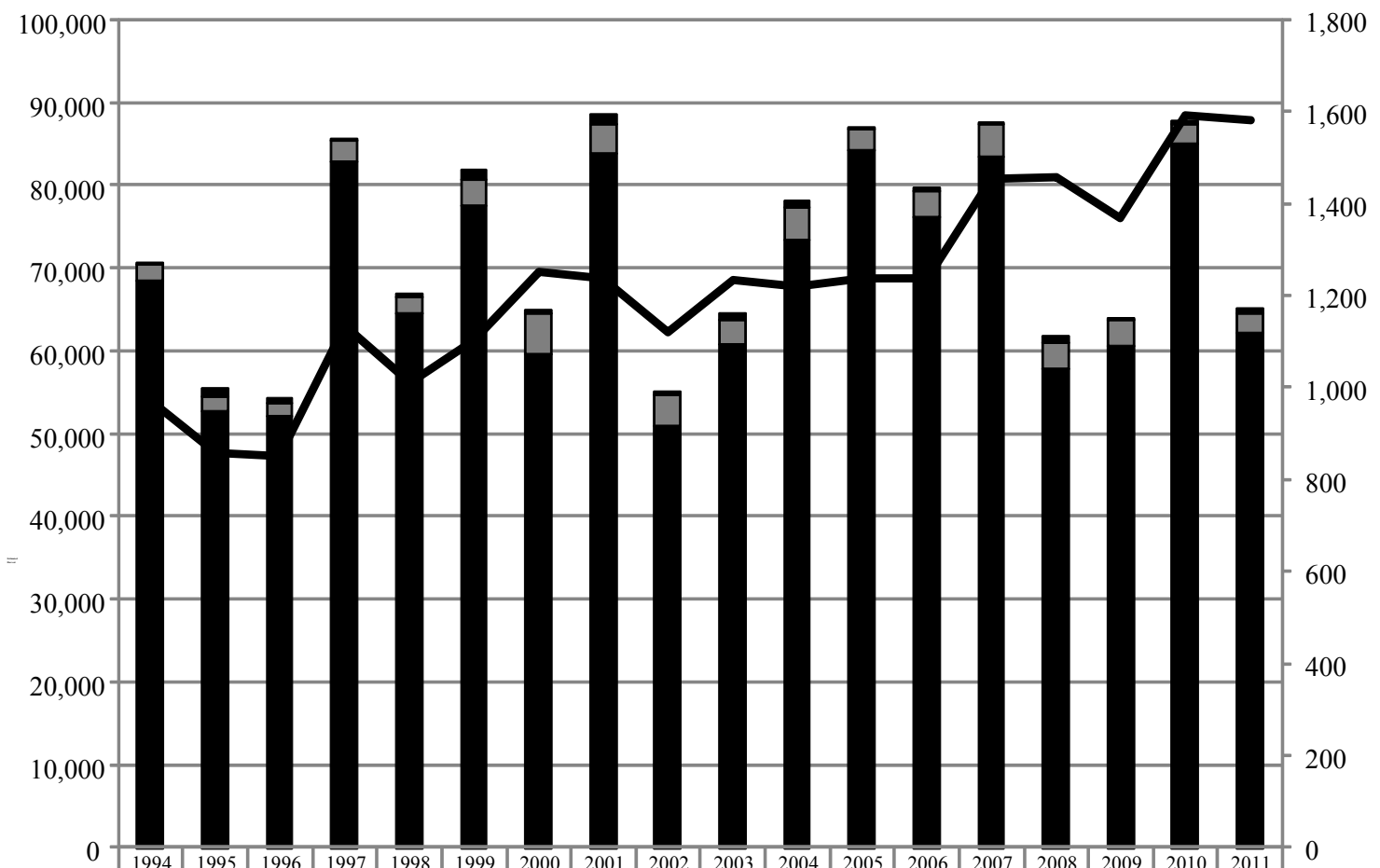


Figure 9.—Map of the subsistence fisheries on the Copper River.

### Glennallen Subdistrict Subsistence Fishery



	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<b>Coho</b>	60	882	557	187	533	1,121	532	1,144	530	619	729	224	240	295	722	262	374	440
<b>King</b>	1,989	1,892	1,482	2,583	1,842	3,278	4,856	3,553	3,653	3,092	3,982	2,574	3,229	3,939	3,218	3,036	2,425	2,562
<b>Sockeye</b>	68,278	52,516	52,052	82,807	64,463	77,369	59,497	83,787	50,850	60,623	73,214	84,186	76,056	83,338	57,632	60,517	84,856	61,955
<b>Permits</b>	970	858	850	1,133	1,010	1,101	1,251	1,239	1,121	1,233	1,218	1,236	1,238	1,455	1,456	1,367	1,591	1,580

Figure 10.—Glennallen Subdistrict salmon harvest by species (state estimated and federal reported (2002–2004) and federal estimated (2005–2010) harvest), 1994–2011.

# SPORT FISHERIES in the Copper River drainage

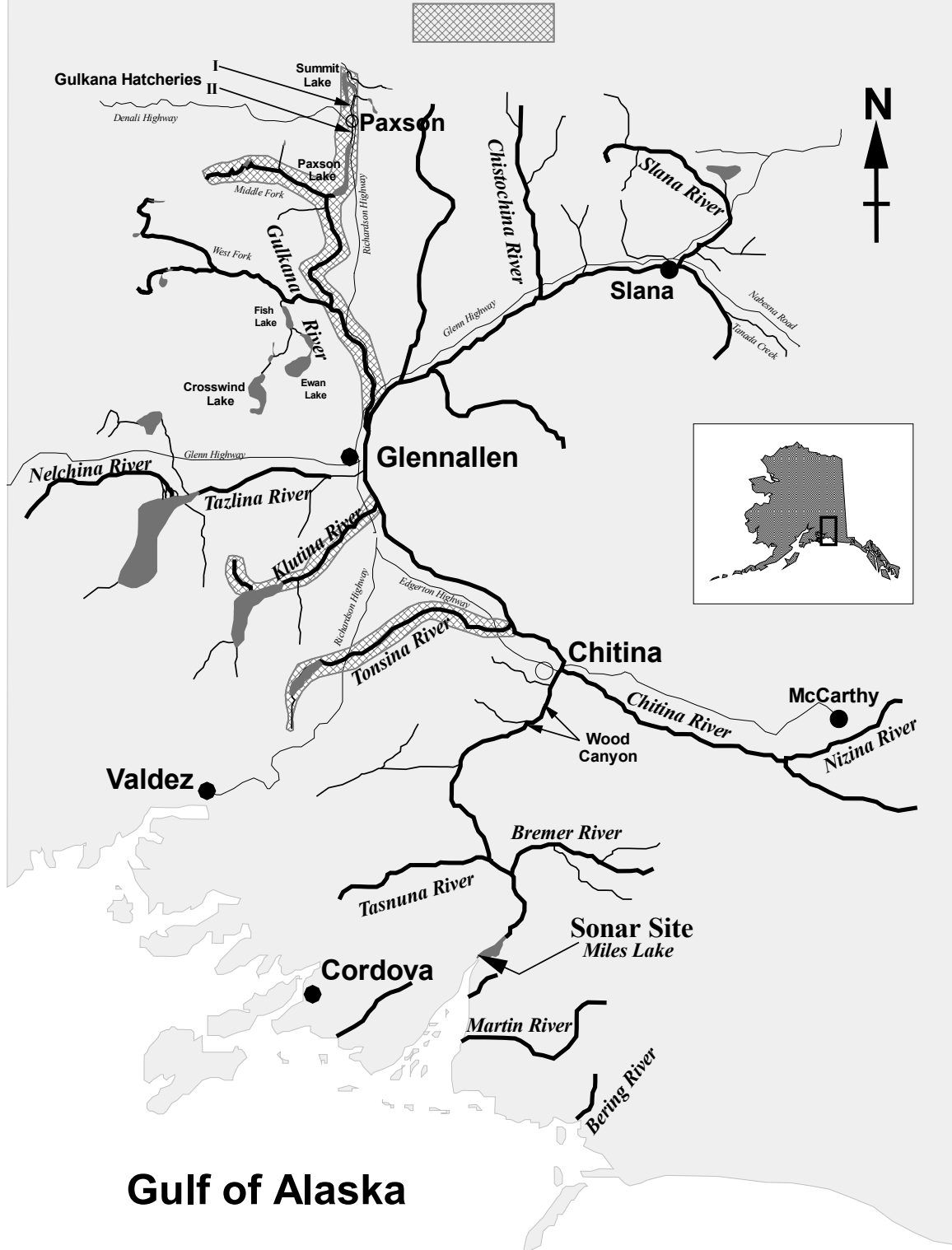


Figure 11.—Map of the sport fisheries on the Copper River

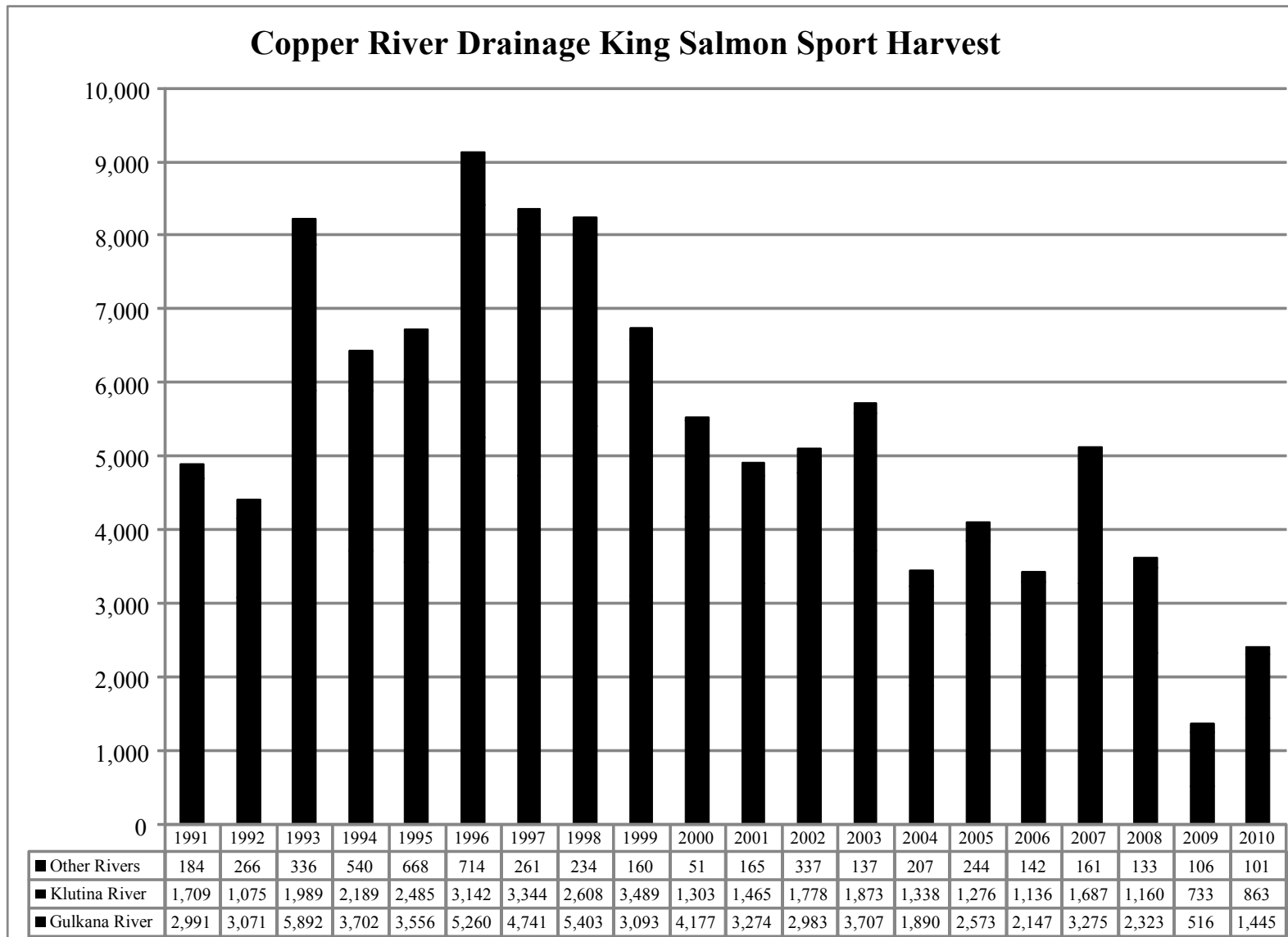


Figure 12.—Copper River king salmon sport harvest, 1991–2010.

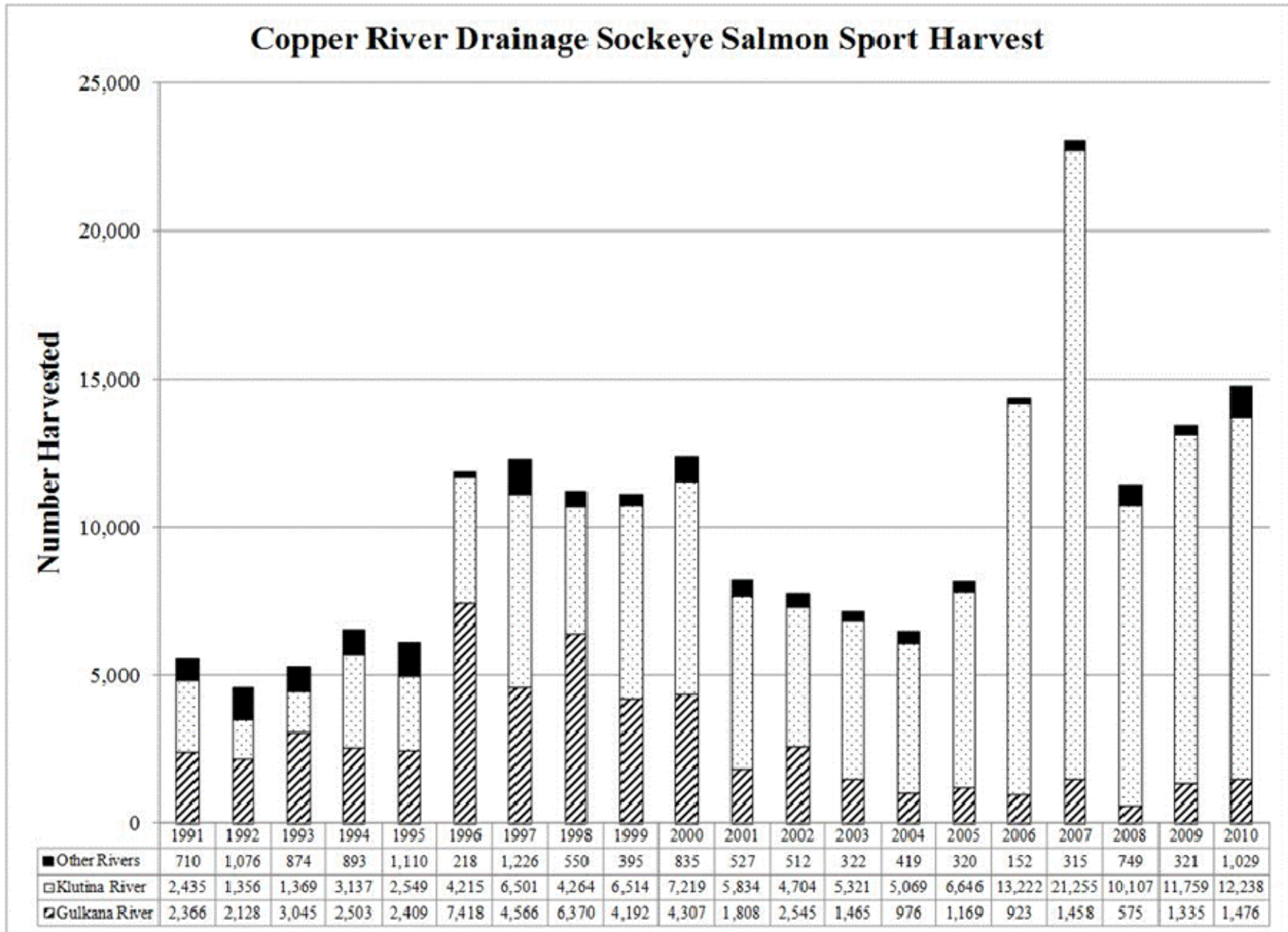


Figure 13.—Copper River sockeye salmon sport harvest, 1991–2010.

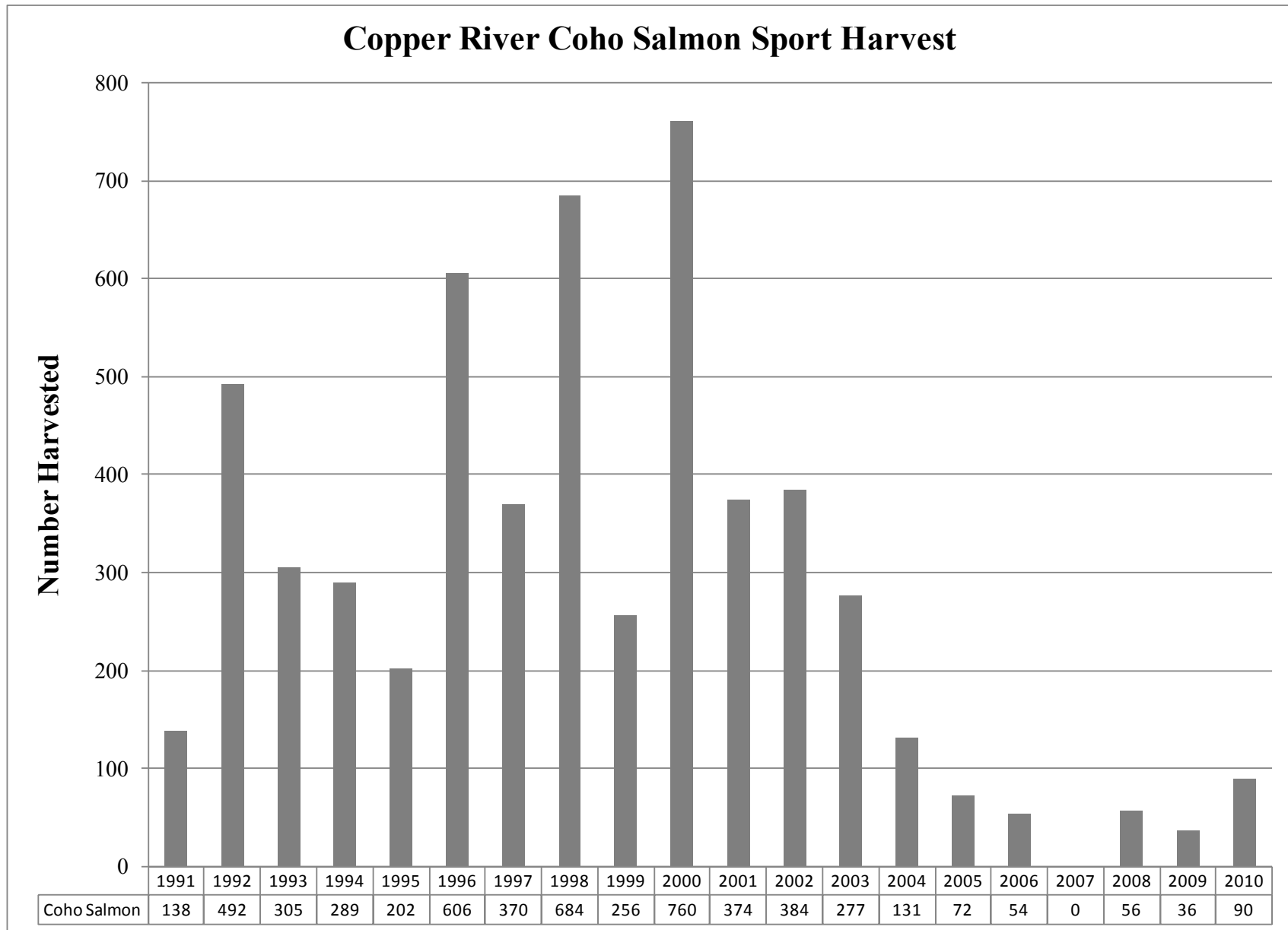


Figure 14.—Copper River coho salmon sport harvest, 1991–2010.

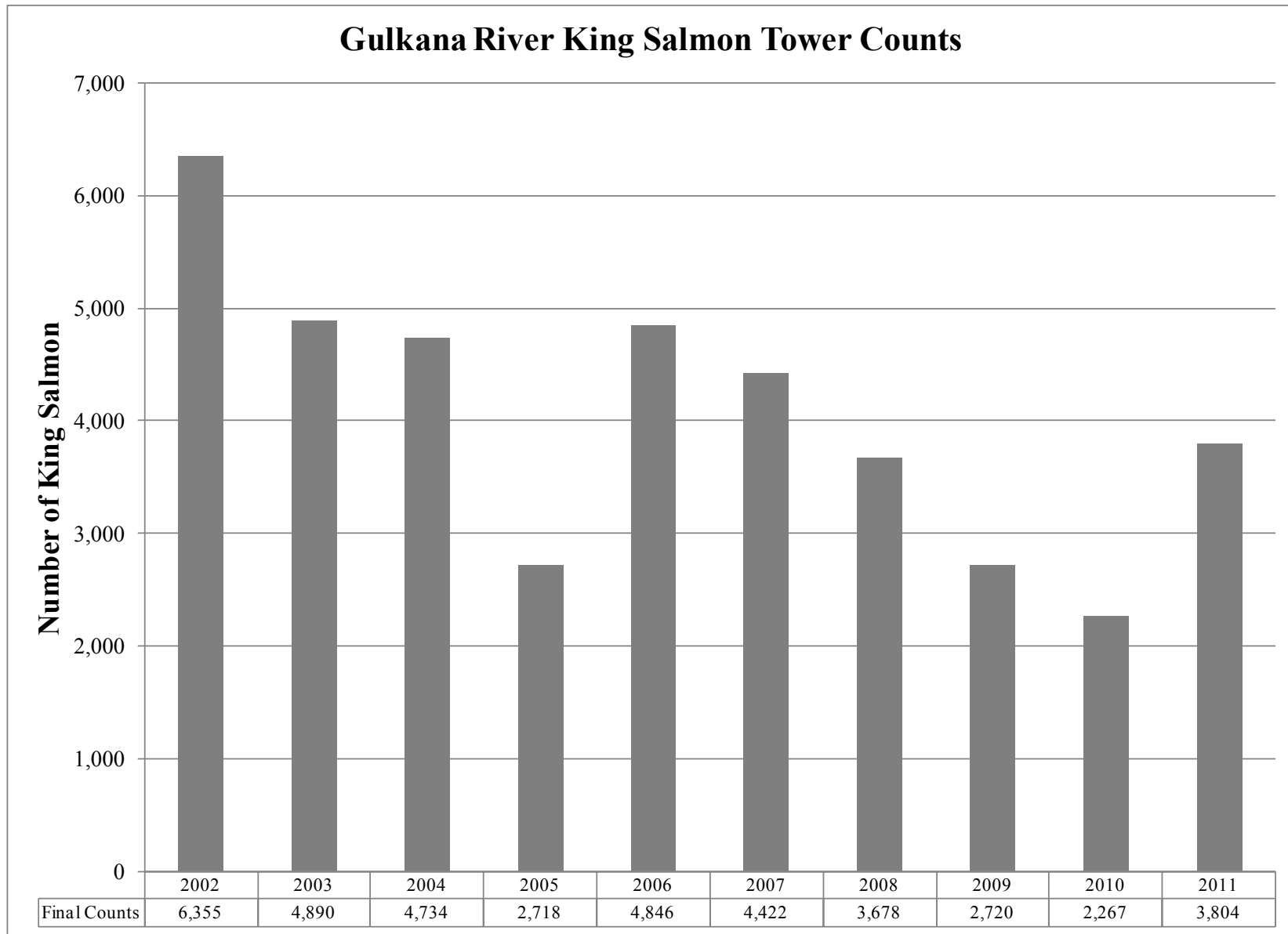


Figure 15.—Expanded cumulative escapement of king salmon past the Gulkana River counting tower, 2002–2011.



### Copper River Sockeye Return Distribution

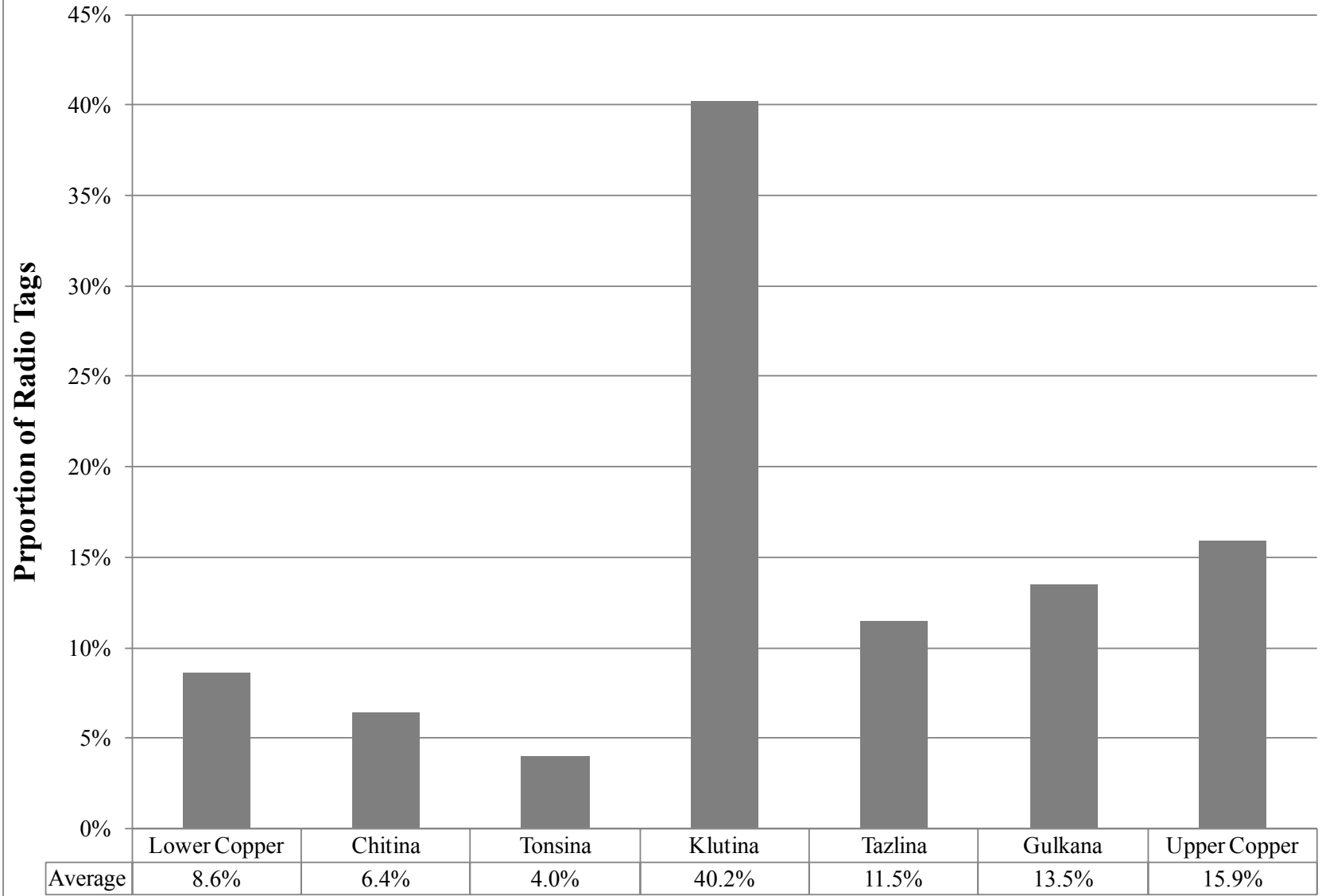


Figure 16.—Average percentage of radio-tagged sockeye located within portions of the Copper River drainage, 2005–2009.