

**Fishery Management Report No. 00-13**

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**Area Management Report for the Recreational  
Fisheries of the Upper Copper/Upper Susitna River  
Management Area, 1998**

by

**Thomas T. Taube**

November 2000

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Alaska Department of Fish and Game

Division of Sport Fish



## Symbols and Abbreviations

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

***FISHERY MANAGEMENT REPORT NO. 00-13***

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FISHERIES OF THE UPPER COPPER/UPPER SUSITNA RIVER  
MANAGEMENT AREA, 1998**

by  
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## INTRODUCTION

This Area Management Report provides information regarding the Upper Copper/Upper Susitna Management Area (UCUSMA) and its fisheries. It is organized in two primary sections: Management Area Overview, and Fisheries. The Fisheries section describes the major fisheries within the UCUSMA. Each fishery contains a background and historical perspective, recent fishery performance, management objectives, fishery management, fishery outlook, recent Board of Fisheries actions, current issues, and ongoing and recommended research and management activities.

### SECTION I: MANAGEMENT AREA OVERVIEW

#### MANAGEMENT AREA DESCRIPTION

The Upper Copper River-Upper Susitna River sport fish management area consists of all waters and drainages of the Copper River upstream from a line crossing the Copper River between the south bank of the mouth of Haley Creek and the south bank of the mouth of Canyon Creek in Wood Canyon, and all waters and drainages of the Upper Susitna River upstream from the confluence of the Oshetna River (Figure 1). Located within the UCUSMA are the communities of Glennallen, Gulkana, Gakona, Chitina, McCarthy, Kenny Lake, Copper Center, Paxson, Mentasta, Slana and Nabesna. Three of the state's major highways (Edgerton, Glenn and Richardson), together with numerous secondary roads and trails, provide good access to most of the area's sport fisheries. Float-equipped aircraft are commonly used during the summer to access the area's many remote lake and stream fisheries not accessible by road. Snowmachines are the popular mode of travel to remote fisheries in the winter. Principal land managers in the UCUSMA are the National Park Service (Wrangell-St. Elias National Park), Bureau of Land Management (Gulkana Wild River), Ahtna Incorporated, and the Alaska Department of Natural Resources.

Regulations governing the sport fisheries in the UCUSMA are found in Chapter 52 of Title 5 of the Alaska Administrative Code and regulations regarding the personal use fisheries are found in Chapter 77. Effort and harvest statistics for UCUSMA fisheries are reported in the statewide harvest survey (SWHS) by Mills (1979-1994) and Howe et al. (1995-1998, and *In prep.*), under the heading "Glennallen Area" (Area I). The SWHS is an annual postal survey of license holders conducted to estimate sport fishing participation (effort), harvest and catch statewide by fisheries, areas, regions, and species.

Management and research of UCUSMA sport and personal use fisheries are directed from the Fairbanks and Glennallen area offices of the Alaska Department of Fish and Game. In 1997, management responsibility of the UCUSMA was transferred from the South-central region, headquartered in Anchorage, to the Arctic-Yukon-Kuskokwim region, headquartered in Fairbanks. The Area Management Biologist (Thomas Taube) and Assistant Area Management Biologist (David Sarafin) are stationed in Glennallen. A permanent full-time field office assistant is also stationed in Glennallen. This assistant is shared with the Division of Wildlife Conservation. Research biologists based in Fairbanks conduct several research projects within the area. The professional staff is assisted by numerous seasonal technicians and biologists (based in Glennallen and Fairbanks) whose employment ranges from 2 to 10 months. Expertise on experimental design is provided to the area staff by the Division of Sport Fish, Research and Technical Services staff stationed in Fairbanks and Anchorage.

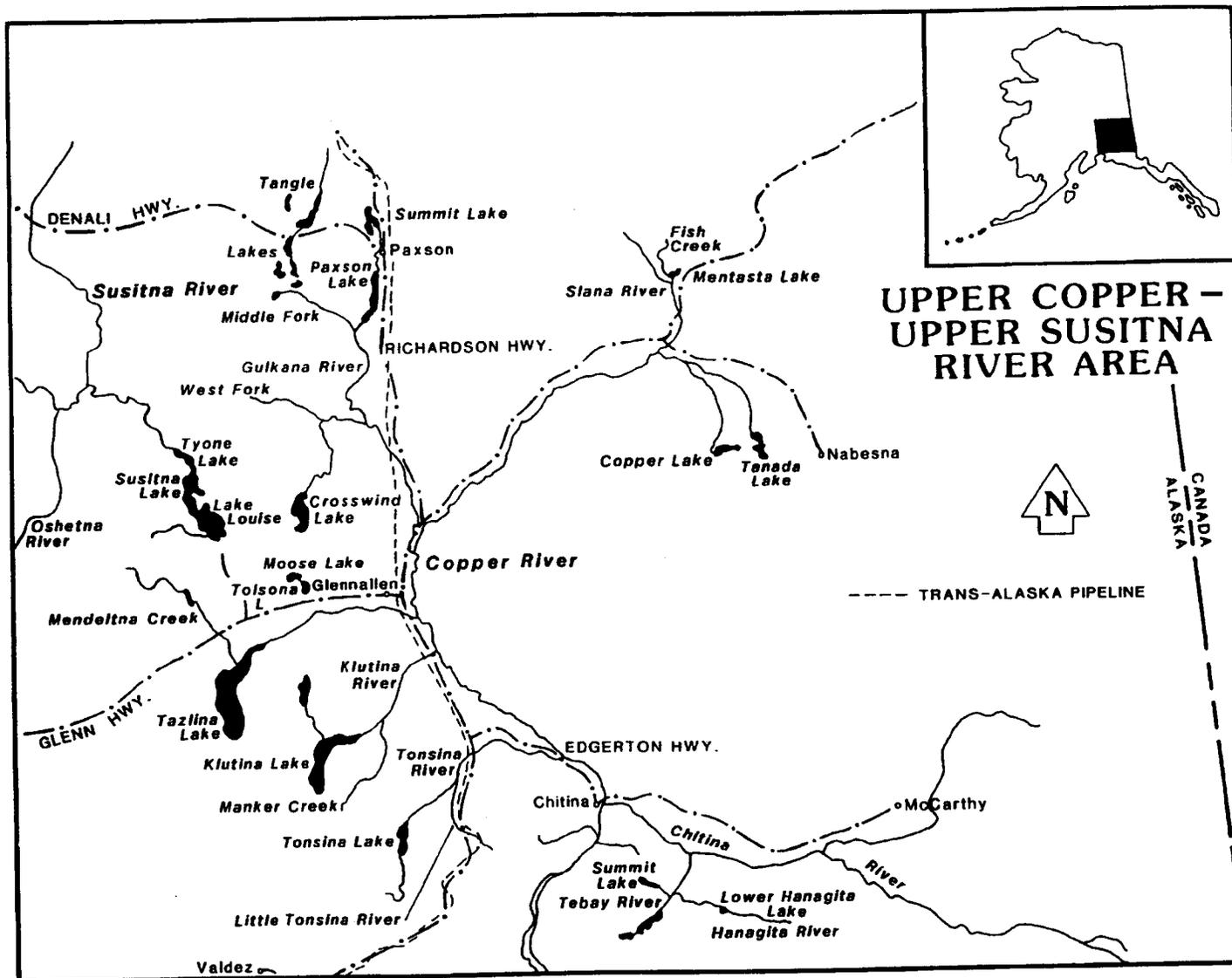


Figure 1.-The Upper Copper/Upper Susitna Management Area (UCUSMA).

## **FISHERIES RESOURCES**

The UCUSMA offers a unique blend of freshwater fishing opportunities to sport anglers, personal use, and subsistence participants. Three species of Pacific salmon (chinook *Oncorhynchus tshawytscha*, coho *O. kisutch*, and sockeye *O. nerka*) are available to anglers fishing upper Copper River drainage waters. The upper Susitna River drainage has no anadromous salmon. A velocity barrier in Devil's Canyon prevents upstream migration in the Susitna River. Anglers can also target coho salmon stocked in several landlocked lakes of the UCUSMA.

Popular fisheries also occur on the area's resident stocks of Arctic grayling *Thymallus arcticus*, burbot *Lota lota*, Dolly Varden *S. malma*, rainbow and steelhead trout *O. mykiss*, and lake trout *Salvelinus namaycush*. Smaller fisheries occur on the area's resident stocks of whitefish *Coregonus* and *Prosopium* spp.

Currently, twenty-nine lakes in the UCUSMA are stocked with Arctic grayling, rainbow trout, coho salmon, and Arctic char *S. alpinus*. The stocked fish are reared at state-owned hatcheries on Fort Richardson and Fort Elmendorf in Anchorage. The stocked-lake fisheries provide additional and diversified angling opportunity and reduce harvest pressure on wild fish stocks.

A sockeye salmon hatchery operated by Prince William Sound Aquaculture Corporation (PWSAC) is located in the upper Gulkana River near the community of Paxson. Egg-takes are conducted near the hatchery and overwinter rearing is accomplished at the hatchery. Fry are subsequently released at Crosswind, Paxson and Summit lakes. The returning adults are harvested by the commercial, subsistence, personal use and sport fisheries.

## **OTHER USER GROUPS**

Returns of salmon to the Copper River support commercial fisheries in the Copper River District. From 1993 through 1997 an average of 1,826,814 sockeye salmon and 49,876 chinook salmon were commercially harvested in the Copper River District (Morstad et al. 1999, Table 1). Within this period, both sockeye (1997) and chinook (1998) harvests were the highest on record.

A personal use and a subsistence salmon fishery have been established by the Board of Fisheries (BOF) in the upper Copper River. The Division of Commercial Fisheries has lead management authority for the subsistence fishery while the Division of Sport Fish has the lead management responsibility for the personal use fishery.

From 1993 through 1997, an average of over 164,845 salmon was harvested annually in these fisheries (Table 2). Sockeye salmon have comprised about 95% of the total catch. These fisheries are described in detail in a separate section of this report, and thus will not be described further here.

## **REGULATORY PROCESS**

The development of regulations for fisheries in the UCUSMA occurs within the established Alaska Board of Fisheries (BOF) process. The public provides their input concerning regulation changes and allocation by various means including testifying directly to the BOF, by participating in local fish and game advisory committee meetings, or by becoming members of local fish and game advisory committees. Advisory committees have been established throughout Alaska to assist the BOF in assessing the effects of fisheries issues and proposed regulations on communities local to the resource under consideration. Most active committees

**Table 1.-Commercial harvests of chinook and sockeye salmon in the Copper River District, 1977-1998.**

<b>Year</b>	<b>Chinook Harvest</b>	<b>Sockeye Harvest</b>
1977-1987 <sup>a</sup>	32,709	638,478
1988	30,741	576,950
1989	30,863	1,025,923
1990	21,702	844,778
1991	34,787	1,206,811
1992	39,810	970,938
1993	29,727	1,398,234
1994	47,061	1,152,220
1995	65,675	1,271,822
1996	55,646	2,356,365
1997	51,273	2,955,431
1998	68,827	1,341,692
<b>1988-1997<sup>a</sup></b>	<b>40,729</b>	<b>1,375,947</b>
<b>1993-1997<sup>a</sup></b>	<b>49,876</b>	<b>1,826,814</b>

<sup>a</sup> Average value for the years during the period.

**Table 2.-Reported subsistence and personal use harvests combined of chinook, sockeye, and coho salmon in the Copper River, 1977-1998.**

Year	Chinook	Sockeye	Coho	Total
1977-1987 <sup>a</sup>	2,607	54,250	803	<b>57,660</b>
1988	3,417	58,905	719	<b>63,041</b>
1989	2,913	80,557	890	<b>84,360</b>
1990	3,221	94,001	1,544	<b>98,766</b>
1991	5,164	111,788	3,477	<b>120,429</b>
1992	4,705	127,670	1,817	<b>134,192</b>
1993	4,037	138,211	1,428	<b>143,676</b>
1994	5,423	153,049	1,958	<b>160,430</b>
1995	6,330	125,573	5,547	<b>137,450</b>
1996	4,881	141,337	3,817	<b>150,035</b>
1997	7,798	224,499	334	<b>232,631</b>
1998 <sup>b</sup>	7,955	181,202	2,365	<b>191,522</b>
<b>1988-1997<sup>a</sup></b>	<b>4,789</b>	<b>125,559</b>	<b>2,153</b>	<b>132,501</b>
<b>1993-1997<sup>a</sup></b>	<b>5,694</b>	<b>156,534</b>	<b>2,617</b>	<b>164,845</b>

<sup>a</sup> Average value for the years during the period.

<sup>b</sup> Preliminary estimates.

meet at least once each year, usually in the fall prior to scheduled BOF meetings. Staff from the Division of Sport Fish and other divisions are often invited to attend the committee meetings. In this way, advisory committee meetings allow the public to interact with the staff involved with resource issues of local concern. Within the UCUSMA there are three advisory committees that serve resource users of the area, these are the Tok Cutoff/Nabesna Road, Copper Basin, and Paxson advisory committees.

Under the current operating schedule, the BOF meets on a 3-year cycle. Proposals regarding UCUSMA fisheries were last heard during the December 1996 BOF meeting in Cordova. Several major changes regarding the management of chinook salmon, resident species, and the personal use fisheries in the UCUSMA were passed by the BOF during this meeting. These included: 1) the development of the Copper River Chinook Management Plan, which developed an “insurance policy” to increase the number of chinook salmon on the spawning grounds; 2) changes in the values of the inriver escapement goal for the Copper River District Salmon Management Plan; 3) changes in the Copper River Personal Use Fishery Management Plan, including increased harvest level to 100,000 salmon, reduced harvest if the commercial fishery is closed more than 13 days, distributing the harvest throughout the season with an abundance-based schedule, and reducing the chinook bag limit from five to four; 4) closing of specific chinook spawning streams in the Gakona, Klutina, Tazlina, and Tonsina drainages and the Chokosna and Gilahina rivers, and reducing the chinook salmon season by 10 days on the Klutina River; 5) restriction of bait on the Tonsina River; 6) closure of steehead spawning areas to all fishing on the upper Gulkana River during the spawning period; 7) creation of a catch-and-release grayling fishery in the upper Gulkana River; and two burbot regulations passed in 1994 but nullified due to inadequate public notice, which 8) reopened Hudson Lake to burbot fishing; and 9) established of a personal use burbot fishery on the Copper River.

During the February 1998 BOF meeting in Anchorage an Agenda Change Request was passed that provided a permit for 10 additional sockeye salmon in the Personal Use fishery during weeks of surplus escapement. At the March 1999 BOF meeting in Anchorage an Agenda Change Request to permit bait with a hook gap no greater than three-eighths inch on the Tonsina River was passed to provide the opportunity to harvest Arctic grayling and Dolly Varden that was unintentionally eliminated with the bait restriction.

The next BOF meeting to address proposals regarding UCUSMA sport and personal use fisheries is scheduled for November 30 – December 6, 1999 in Valdez.

To address conservation concerns and to implement BOF adopted management plans, the department has emergency order authority (5 AAC 75.003) to modify time, area, and bag/possession limit regulations. Emergency orders issued under this authority during 1998 are summarized in Table 3.

On October 1, 1999 the Federal government assumed management responsibilities for subsistence fisheries on all non-navigable waters on public lands and navigable and non-navigable waters within and/or adjacent to the boundaries of the wild-designated portion of the Gulkana River, and Wrangell-St. Elias National Park. The Upper Copper River Subsistence Salmon Fishery is the fishery within the UCUSMA primarily effected by the change in management responsibilities. The development of regulations for subsistence fisheries under Federal management will be within the established Federal Subsistence Board (FSB) process. The public provides their input concerning regulation changes by testifying in Federal

Subsistence Regional Advisory Council meetings or by becoming Council members. Regional Advisory Councils have been established throughout Alaska to assist the FSB in determining local subsistence issues and providing recommendations on proposed fishing and hunting regulations on the fish and game populations under consideration. The UCUSMA fisheries fall under the purview of the Southcentral Regional Advisory Council. The Council meets twice each year, usually in the fall and late winter, the most recent meeting was held October 14-15 in Anchorage. At this meeting, the implementation plan regarding Federal management of subsistence fisheries was outlined. Staff from the Division of Sport Fish and other divisions are invited to attend the Council meetings and present data to the Council regarding wildlife and fisheries issues within the Councils responsibility.

### **STATEWIDE HARVEST SURVEY**

Sport fishing effort in the UCUSMA has been estimated since 1977 using a mail survey (Mills 1979-1994; Howe et al. 1995 – 1998 and *In prep.*). In recent years, two types of questionnaires are mailed to a stratified random sample of households containing at least one individual who purchased a sport fishing license (resident or non-resident) or possesses a valid permanent fishing license. Information gathered from the surveys include participation (number of anglers, trips, and days fished), number of fish caught and number harvested by species and site. These surveys estimate the number of angler-days of fishing effort expended by sport anglers fishing Alaskan waters as well as the sport harvest. Beginning in 1990, the survey was modified to include estimation of catch (release plus harvest) on a site-by-site basis. The survey is designed to provide estimates of effort and harvest on a site-by-site basis and, unfortunately, is not designed to provide estimates of effort directed towards a single species. The survey results for each year are not available until the following year, hence the results for 1999 are not available until 2000. Additionally, creel surveys have been selectively used to ground-truth the mail survey for fisheries of interest, or for fisheries that require more detailed information or inseason management.

The following guidelines (Mills and Howe 1992) have been provided to evaluate the utility of statewide survey estimates:

- Other than to document that sport fishing occurred, estimates based on fewer than 12 responses should not be used,
- Estimates based on 12 to 29 responses can be useful in indicating relative orders of magnitude and for assessing long-term trends,
- Estimates based on 20 or more responses are generally usable.

In general, estimates from smaller fisheries with low participation are less precise than those of larger fisheries with high participation.

### **ECONOMIC SURVEYS**

The economic value of specific management changes regarding the chinook salmon fishery on the Gulkana River were examined via survey in 1993 (Layman et al. 1996). The four management options surveyed were: 1) status quo, no regulatory change; 2) doubling the harvest; 3) double the daily bag limit; 4) seasonal bag limit of five chinook. The results of the survey suggest that the seasonal bag limit provided the greatest net economic benefit, followed by option 2, option 3 and option 1. In 1994, a seasonal bag limit of five chinook salmon was adopted by the BOF for the Upper Copper River drainages.

**Table 3.-Emergency orders issued for UCUSMA sport and personal use fisheries during 1998.**

Year	E. O. Number	Explanation
1998	3-BB-01-98	Closes Tolsona Lake to burbot fishing. All burbot captured at Tolsona Lake must be released immediately. The use of sport fishing gear for burbot is prohibited on Tolsona Lake. In addition, the bag and possession limit for burbot in Moose Lake is reduced from 5 per day, 5 in possession to 2 per day, 2 in possession.
1998	3-BB-02-98	This emergency order supersedes and corrects an error in Emergency Order No. 3-BB-01, which closes Tolsona Lake to burbot fishing. All burbot captured at Tolsona Lake must be released immediately. In addition, the bag and possession limit for burbot in Moose Lake is reduced from 5 per day, 5 in possession to 2 per day, 2 in possession.
1998	3-RS-03-98	Establishes the schedule for the personal use dip net salmon fishery in the Chitina Subdistrict of the Upper Copper River through August 31, 1998. The Chitina Subdistrict will be open from 8:00 A.M. Saturday June 6 through 8:00 P.M. Sunday June 7, will close Monday and Tuesday, June 8 and 9, and reopen at 12:00 P.M. Wednesday, June 10. The fishery will remain open through midnight, Sunday August 31.
1998	3-RS-04-98	Establishes the weekly period when a supplemental permit for 10 additional sockeye salmon will be issued for the personal use dip net salmon fishery in the Chitina Subdistrict of the Upper Copper River. Sonar counts at Miles Lake from 1-7 June exceeded the weekly escapement objective by over 66,000 fish. Based on migration timing studies, this surplus beyond escapement needs will be present within the Chitina Subdistrict from approximately 15-21 June. Supplemental permits for the personal use fishery will be issued at the Chitina Fish and Game office and valid from 8:00 A.M. 15 June to midnight 21 June.
1998	3-RS-05-98	Establishes the weekly period when a supplemental permit for 10 additional sockeye salmon will be issued for the personal use dip net salmon fishery in the Chitina Subdistrict of the Upper Copper River. Sonar counts at Miles Lake from 15-21 June exceeded the weekly escapement objective by over 50,600 fish. Based on migration timing studies, this surplus beyond escapement needs will be present within the Chitina Subdistrict from approximately 6-12 July. Supplemental permits for the personal use fishery will be issued at the Chitina Fish and Game office and valid from 8:00 A.M. 6 July to midnight 12 July.

## **SPORT FISHING EFFORT**

The following summary of sport angler effort in the UCUSMA is based on SWHS mail survey data. From 1988 through 1997 sport anglers have expended an average of 71,184 angler-days fishing UCUSMA waters, an average of 2.8% of the annual statewide sport angling effort and about 23% of the annual AYK (Region III) sport angling effort over this period (Table 4). This is a 27% increase compared to the 1977 – 1987 average. Recreational angler effort was relatively stable until 1991 when it began to increase and peaked in 1995 when 102,951 angler-days were expended in the UCUSMA (Figure 2). The upper Copper River drainage has supported approximately of 80% of the sport effort expended in the UCUSMA from 1988 through 1997 (Table 5). In this drainage, the Gulkana River drainage has supported the vast majority of the sport angling effort. The Klutina River is the other upper Copper River drainage, that supports a popular sport fishery (Table 5). The major sport fishery in the upper Susitna River drainage is located in the Tyone River drainage and includes Lake Louise and Susitna and Tyone lakes.

During 1998, sport anglers fishing UCUSMA waters expended approximately 66,579 angler-days (Tables 4 and 5). The decline in effort between 1997 and 1998 is due, at least in part, to an error in the 1995-1997 estimation process. Harvest estimates are unaffected by this error. If possible, the 1995-1997 effort estimates will be recalculated and corrected in future reports. The difference in effort between 1998 and 1997, and the 10-year average is assumed to be insignificant.

## **ESTABLISHED MANAGEMENT PLANS AND POLICIES**

Some UCUSMA fisheries have been the focus of allocative conflicts. These conflicts have led the BOF to establish several management plans and policies to guide the area's fisheries. The goal of these plans is to allocate fish resources among users and to provide managers with guidelines to maintain a sustained yield of the area's fish stocks. The following management plans and policies have been adopted by the BOF for UCUSMA fish stocks:

*Copper River District Salmon Management Plan (5 AAC 24.360).* This management plan contains spawning escapement goals for sockeye and other salmon, harvest guidelines for the subsistence, personal use, and sport fisheries in the drainage, and hatchery brood stock and hatchery surplus goals. The goals are met through regulation of the commercial fishery at the mouth of the river, and are measured at the sonar counter near Miles Lake.

*Copper River Chinook Salmon Fishery Management Plan (5 AAC 24.361).* This management plan provides escapement of chinook salmon in the Copper River drainage at or above historic levels through management of the commercial, personal use and sport fisheries to reduce the potential harvest by 5%. This reduction will be achieved in the commercial fishery through closure of statistical areas during statistical weeks 20 and 21; in the personal use fishery by reduction of the seasonal bag limit to four chinook, and in the sport fishery, by not allowing guides to operate on Tuesdays from May 15 to July 31 in the flowing waters of the Copper River drainage open to chinook salmon fishing.

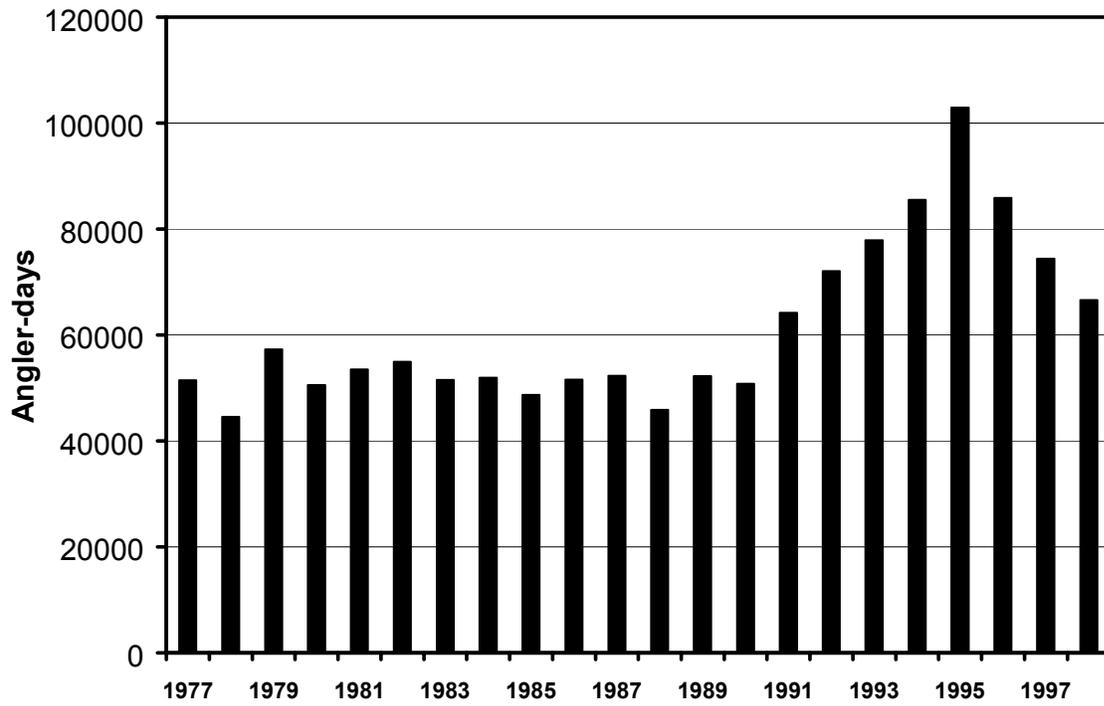
*Copper River Personal Use Salmon Fishery Management Plan (5 AAC 77.590).* This management plan establishes fishing season, open area, gear, bag limits, and seasonal harvest level for a personal use fishery in the Copper River. The harvest will be distributed throughout the season based on projected daily sonar counts from the Miles

**Table 4.-Number of angler-days of sport fishing effort expended by recreational anglers fishing UCUSMA waters, 1977-1998.**

Year	UCUSMA Effort	Alaska Effort	% by UCUSMA	Region III Effort <sup>b</sup>	% by UCUSMA
1977-1987 <sup>a</sup>	51,669	1,649,749	3.1	224,378	23.0
1988	45,867	2,311,291	2.0	279,426	16.4
1989	52,262	2,264,079	2.3	291,888	17.9
1990	50,791	2,453,284	2.1	296,420	17.1
1991	64,207	2,456,328	2.6	284,129	22.6
1992	72,052	2,540,374	2.8	253,904	28.4
1993	77,870	2,559,408	3.0	298,842	26.1
1994	85,520	2,719,911	3.1	295,507	28.9
1995	102,951	2,787,670	3.7	373,092	27.6
1996	85,905	2,733,008	3.1	360,471	23.8
1997	74,410	2,654,454	2.8	311,390	23.9
1998	66,579	2,154,868	3.1	272,574	24.4
<b>1988-1997<sup>a</sup></b>	<b>71,184</b>	<b>2,547,981</b>	<b>2.8%</b>	<b>304,507</b>	<b>23.3%</b>
<b>1993-1997<sup>a</sup></b>	<b>85,331</b>	<b>2,690,890</b>	<b>3.1%</b>	<b>327,860</b>	<b>26.1%</b>

<sup>a</sup> Average value for the years during the period.

<sup>b</sup> Values for Region III effort prior to 1997 are AYK and Glennallen totals combined.



**Figure 2.-Sport fish effort in the UCUSMA, 1977-1998.**

**Table 5.-Sport fishing effort (angler-days) in the UCUSMA by drainage, averaged for 1977 – 1987, and annually from 1988 - 1998.**

Areas	Year													1988-1997 <sup>c</sup>	1993-1997 <sup>c</sup>
	1977-87 <sup>c</sup>	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998			
<b>Gulkana River Drainage</b>															
Lakes	7,704	7,593	7,636	7,172	9,047	8,795	8,302	9,074	10,559	8,330	7,132	5,442	<b>8,364</b>	<b>8,679</b>	
Streams	15,841	11,330	15,769	19,112	21,285	26,039	27,543	25,581	33,415	34,958	31,957	32,303	<b>24,699</b>	<b>30,691</b>	
Total	23,545	18,923	23,405	26,284	30,332	34,834	35,845	34,655	43,974	43,288	39,089	37,745	<b>33,063</b>	<b>39,370</b>	
<b>Upper Susitna Drainage</b>															
Lakes	13,218	9,768	9,383	8,334	8,342	10,569	14,345	16,614	17,058	11,438	6,714	5,931	<b>11,257</b>	<b>13,234</b>	
Streams	409 <sup>b</sup>	454	330	992	1,376	1,408	2,491	2,027	3,716	1,839	1,298	608	<b>1,593</b>	<b>2,274</b>	
Total		10,222	9,713	9,326	9,718	11,977	16,836	18,641	20,774	13,277	8,012	6,539	<b>12,850</b>	<b>15,508</b>	
Klutina River Drainage	3,965 <sup>b</sup>	6,192	6,053	5,556	12,145	6,398	8,177	10,624	14,496	12,200	15,119	10,644	<b>9,696</b>	<b>12,123</b>	
Tazlina Drainage	1,177 <sup>b</sup>	1,907	1,564	2,082	2,295	3,507	3,112	3,837	4,165	4,008	1,983	2,043	<b>2,846</b>	<b>3,421</b>	
Tonsina Drainage	1,033 <sup>b</sup>	723	980	498	2,072	2,240	2,901	2,254	3,912	2,384	1,377	1,283	<b>1,934</b>	<b>2,566</b>	
<b>Copper River</b>															
Upstream of Gulkana	949 <sup>b</sup>	1,258	1,728	980	950	476	1,271	1,419	1,711	951	472	614	<b>1,122</b>	<b>1,165</b>	
<b>Copper River</b>															
Downstream of Klutina <sup>c</sup>	660	217	1,641	537	216	1,255	728	1,778	1,402	936	1,125	824	<b>984</b>	<b>1,194</b>	
Stocked Lakes/Streams	3,144	3,528	3,149	2,665	4,812	7,623	4,782	5,561	5,331	4,204	2,743	4,008	<b>4,440</b>	<b>4,524</b>	
<b>Other Sites</b>															
Lakes	1,674 <sup>b</sup>	1,796	2,345	1,738	544	1,645	2,222	3,350	3,555	1,915	2,016	1,477	<b>2,113</b>	<b>2,612</b>	
Streams	1,290 <sup>a</sup>	1,101	1,684	1,125	1,123	2,097	1,996	3,401	3,631	2,742	2,474	1,402	<b>2,137</b>	<b>2,849</b>	
Total	3,748 <sup>b</sup>	2,897	4,029	2,863	1,667	3,742	4,218	6,751	7,186	4,657	4,490	2,879	<b>4,250</b>	<b>5,460</b>	
<b>Area Total</b>	<b>51,669<sup>d</sup></b>	<b>45,867</b>	<b>52,262</b>	<b>50,791</b>	<b>64,207</b>	<b>72,052</b>	<b>77,870</b>	<b>85,520</b>	<b>102,951</b>	<b>85,905</b>	<b>74,410</b>	<b>66,579</b>	<b>71,184</b>	<b>85,331</b>	

<sup>a</sup> Includes all flowing waters, data not broken out by specific area prior to 1983.

<sup>b</sup> Includes 1983-1987 average only. Prior to 1983, harvest included in "other waters".

<sup>c</sup> Not including the Tonsina drainage.

<sup>d</sup> Average of the total annual area harvest for the period from 1977-1987.

<sup>e</sup> Average value for the years during the period.

Lake sonar counter. Harvest will be adjusted, based on actual sonar counts, through reduction or increase of fishing times by emergency order. The permit limit may be increased during weeks of harvestable surplus determined from actual sonar counts.

*Copper River Subsistence Salmon Fisheries Management Plan (5 AAC 01.647).* This management plan ensures that adequate escapement of salmon pass the sonar in the lower Copper River and that subsistence needs are met. It also establishes the open area, gear, season, bag and possession limits, and permit requirements for a subsistence fishery near the traditional fishing village of Batzulnetas along a portion Tanada Creek and its confluence with the Copper River.

*Lake Burbot Management Plan (5 AAC 52.045).* This management plan stipulates that the burbot fisheries in lakes of the UCUSMA be managed to ensure maximum sustainable harvests, and provides the department the authority to use emergency orders to reduce the time or areas open to fishing and/or prohibit set lines to accomplish this management objective.

*Personal Use Burbot Fishery (5 AAC 77.561).* This management plan establishes fishing season, open area, gear and bag limits for a personal use fishery in the Copper River mainstem.

*Cook Inlet & Copper River Basin Rainbow/Steelhead Trout Management Policy.* This management policy was adopted by the BOF to provide future Boards, fisheries managers, and the sport fishing public with: (1) management policies and implementation directives for area rainbow and steelhead trout fisheries; (2) a systematic approach to developing sport fishing regulations that includes a process for rational selection of waters for special management; and (3) recommended research objectives. This management policy was never adopted as regulation.

## **MAJOR ISSUES**

The major issues associated with UCUSMA sport and personal use fisheries are summarized below:

*Copper River Chinook Salmon:* Under the *Copper River District Salmon Management Plan (5 AAC 24.360)*, the department is directed to manage the Copper River District commercial salmon fishery to attain a biological (spawning) escapement goal of 300,000 sockeye salmon and 17,500 other salmon (species not defined). In addition to the biological escapement goal, the commercial fishery is to be managed to achieve an inriver escapement goal of 60-75,000 salmon for the subsistence fishery, 100,000 for the personal use fishery, and 15,000 salmon for the sport fishery, and a amount of sockeye salmon determined annually for the Gulkana hatchery brood and surplus stocks. Unfortunately, there is a lack of spawner-recruit data to assess the long-term productivity of the Copper River chinook salmon return or the validity of establishing a chinook salmon spawning escapement goal. To assure that harvest of Copper River chinook salmon does not exceed sustainable levels, the department has been directed by BOF to develop a revised *Copper River Chinook Salmon Fishery Management Plan (5 AAC 24.361)* by the 2002 BOF meeting. Commercial harvests, the largest component of the annual harvest, have increased in the past five years as well as harvests in the area's subsistence, personal use, and sport fisheries. Based upon proposals submitted for BOF

review at the 1999 BOF meeting and the continued increases in harvest, it is likely that revisions to the current plan will need to be considered during the 1999 meeting.

*Copper River Personal Use & Subsistence Salmon Fisheries:* Since 1990, harvest and participation in the Copper River subsistence and personal use salmon fisheries have doubled. Both fisheries are managed under BOF-adopted management plans. Under these management plans, an escapement goal of 60,000 – 75,000 salmon for the subsistence fishery and an escapement goal of 100,000 salmon for the personal use fishery have been set. In 1998, harvests in the personal use fishery exceeded the harvest guidelines, and participation was the highest on record. Continued strong returns of sockeye salmon to the Copper River during the past 3 years, as well as increased media attention, are partly responsible for the record participation. If the participation continues at the same level as 1998 or increases and sockeye returns decline, allocation issues will become a concern at the 1999 BOF meetings as they did at 1996 BOF meetings.

*Land Access:* In 1998, Ahtna Native Corporation initiated a access fee program for native-owned uplands adjacent to the Klutina River upstream of the new Richardson Highway bridge. This encompassed nearly the entire river with the exception of the lower two river miles. There is a public easement (managed by the Bureau of Land Management (BLM)) that runs parallel to the river and provides access to Klutina Lake, but it provides little or no direct river access. Non-shareholders were required to pay a day use fee to access the river from the easement and also pay camping fees to camp at sites off the easement. This angered many of the sport fishing public that used the easement and native lands to access the river and resulted in some users avoiding this access point. Ahtna Native Corporation initiated a similar access fee program at Gulkana River access points in 1999.

*Burbot:* The lakes of the UCUSMA have historically supported some of the largest sport fisheries for burbot in Alaska. Stock assessment work indicated that many of the larger burbot stocks in lakes were depressed due to overfishing in the early 1980s. Based on these findings, the BOF adopted a management plan for burbot stocks in UCUSMA lakes. Under this management plan, the Board has adopted a more conservative management regime for UCUSMA burbot fisheries which allows previously overfished stocks to recover enough to permit sustainable fisheries, and which protects healthy stocks from overharvest. Part of the current regulatory regime is the elimination of unattended setlines from the fishery. Many local anglers are not supportive of this action and have submitted proposals to the Board to have unattended set lines reintroduced to the fishery. Currently, ADF&G staff does not support reintroduction of unattended setline use in lakes. This gear question will likely continue to remain an issue into the future. Lake Louise remains closed to burbot fishing due to depressed burbot stocks. Lake Louise will be reopened to burbot fishing when stock assessment work shows that the burbot stocks have recovered enough to permit a sustainable fishery. Local advisory committees are supportive of this closure. The department has allowed use of unattended setlines for the mainstem Copper River through a personal use burbot fishery. Stock assessment in Tolsona Lake during 1996 and 1997 indicated a decline in abundance to levels below any previous estimate, and resulted in an emergency order closure of this lake to burbot fishing in 1998. This population will be discussed in detail in a later section.

*Lake Trout:* Lakes in the UCUSMA have historically supported some of the largest sport fisheries for lake trout in Alaska, with lakes of the Tyone River drainage (Lake Louise and Susitna and Tyone lakes) and Gulkana River drainage (Paxson, Summit, and Crosswind lakes) having supported the largest fisheries. Concern was raised in the late 1980s that sport harvests in some of these lakes may have been exceeding sustainable levels. As a result, an 18 in minimum size limit was enacted for the above lakes to assure that fish could spawn at least once prior to being subject to harvest. Subsequent stock assessment work suggested that an 18 in size limit does not protect first-time spawners from harvest in these lakes. A 24 in minimum size limit for these lakes was implemented in 1994. The lake trout bag and possession limit was also reduced to one in some lakes. The local advisory committees supported these actions.

## **CURRENT MANAGEMENT AND RESEARCH ACTIVITIES**

During 1998 several research and management projects were initiated or continued.

*Research projects:* On the Copper River mainstem, downstream of Haley Creek, a pilot study was initiated to determine the feasibility of capturing chinook salmon with dipnets or seines for implantation with radio transmitters to gather distribution, migratory timing and abundance data. This pilot study proved successful and in 1999 the full study was implemented.

Two Arctic grayling studies were conducted in the UCUSMA in 1998. The first was to characterize the Arctic grayling population on Mendeltna Creek through collection of length and age data during three sampling events throughout the open water period. In addition, migration and seasonal use of the creek was to be determined through the implantation of radio transmitters in grayling spawners. Unfortunately, no grayling large enough to implant transmitters were captured. Prior to this study, there had been no directed assessment of the Mendeltna Creek Arctic grayling population. Sampling was continued in July 1999 to estimate abundance of Arctic grayling in an 8-mile section of Mendeltna Creek between the two major access points. The second project was to collect length and age data from the Arctic grayling population in the upper Gulkana River mainstem to compare to data collected from 1990 – 1992 (Bosch 1995). This was conducted in July during an eight-day float trip from Paxson Lake to Sourdough. During this sampling event over 400 grayling were sampled for length and age data.

One rainbow trout/steelhead project was conducted in 1998 on the Gulkana River. This was the first directed study on rainbow trout/steelhead on the Gulkana River conducted by the Department. Two sampling events were conducted, the first in late May on the known spawning areas on the Middle Fork to sample resident rainbow trout and steelhead spawners for length and age data, and genetic samples. The second event was conducted in July and sampled the mainstem Gulkana River from Paxson Lake to Sourdough to collect length and age data on resident rainbow trout. There was limited baseline data on the rainbow trout/steelhead populations in the Gulkana River until this study. Sampling was continued in May 1999 at the Middle Fork spawning areas to estimate abundance of spawners.

A project to estimate abundance and length and age composition of rainbow trout in Summit Lake (Tebay River drainage) was conducted in June and July 1999. Current regulations (1 trout over 32 in per day) are believed ineffective, angler reports indicate few large fish remain in the population.

The burbot research program was resumed in 1998 with stock assessment conducted on Tolsona, Moose and Hudson lakes. Tolsona Lake had been assessed as a management project in 1996 and

1997, after the research program was discontinued in 1995. Estimates of abundance, CPUE and length composition were collected at the three lakes. Sampling in Tolsona and Moose lakes occurred in May, while Hudson Lake was sampled in July.

*Management projects:* Two management projects were continued in 1998: 1) biological catch sampling of the Copper River Personal Use Fishery and 2) aerial surveys of the nine chinook salmon spawning escapement index streams. Sampling of the personal use fishery occurred from the opening of the fishery in June through the majority of the sockeye run ending in mid-late August. Length and age data of sockeye and chinook salmon harvested in the fishery were collected. All sockeye salmon sampled were examined for missing adipose fins, indicating the presence of a coded-wire tag implanted as the fry were released from the Gulkana River hatchery. The heads of these salmon are collected, scanned at the Coded-Wire Tag Lab in Juneau and used to estimate hatchery contribution to the Copper River sockeye salmon run.

Aerial surveys were conducted beginning in June on the Gulkana River to provide an index of chinook salmon returns in 1998. The Gulkana River surveys were conducted weekly beginning in mid-June to monitor what appeared to be a low return of chinook salmon to the river. Low water conditions delayed chinook salmon from entering the Gulkana River. Aerial surveys on the nine index streams including the Gulkana River were flown in late July for comparison to historic survey indices as a measure of chinook salmon run strength.

## **ACCESS PROGRAMS**

The Wallop-Breaux amendment to the Federal Aid in Sport Fish Restoration Act mandates that at least 12.5% of the federal funds collected from taxes on sport fishing equipment be used by the states for the development and maintenance of boating access facilities. A broad range of access facilities can be approved for funding if they are constructed to achieve a state fishery management objective. These facilities can include boat ramps and lifts, docking and marina facilities, breakwaters, fish cleaning stations, rest rooms, and parking areas. In spite of the large land base in the UCUSMA, access to sport fishing is restricted near most popular fisheries. The causes for limited access are several: much of the land in the area is private, few roads and trails exist, and suitable launches for boats are scarce. Various small access projects were completed in 1998 in the UCUSMA, which entailed improving existing trails and replacing or installing signs for local roadside lakes.

## **INFORMATION AND EDUCATION**

Information regarding regulations, publications, stocking and fishing reports, news releases and emergency orders for the UCUSMA can be found at the Department of Fish and Game website ([www.state.ak.us/local/akpages/FISH.GAME](http://www.state.ak.us/local/akpages/FISH.GAME)). In addition, many of these publications as well as some additional publications regarding fishing opportunities in the UCUSMA can be found at the area ADF&G office in Glennallen and the regional ADF&G office in Fairbanks. Information regarding the Gulkana Wild River (BLM) and Wrangell-St. Elias National Park (USNPS) can be obtained from the respective agency offices in Glennallen and Copper Center. Ahtna Native Corporation has its headquarters located in Glennallen and can be visited for information regarding access to native lands. The Greater Copper Valley Chamber of Commerce can be a source for commercial operators located in the UCUSMA. A listing of the addresses and contact numbers for these information sources can be found in Appendix A.

## SECTION II: FISHERIES

The following text discusses, by species, the major sport fisheries in the UCUSMA. Discussion of recent performance of the fishery will center around harvest and catch during the 1998 season, as the major source of data for most sport fisheries in the area is the Statewide Harvest Survey (SWHS) (Howe et al. *In prep.*), which will not have 1999 results until the summer of 2000. However, observations or research data regarding the fisheries in 1999 will also be presented when available. A summary of the historical harvest of fish in the UCUSMA by species is presented in Table 6.

### CHINOOK SALMON SPORT FISHERIES

In the UCUSMA, only the Copper River drainage supports anadromous runs of chinook salmon. No anadromous runs of chinook salmon return to the upper Susitna River drainage. Devil's Canyon is a hydraulic barrier, which prevents upstream salmon migration in this drainage.

Chinook salmon returning to the Copper River drainage begin passing through the Copper River Delta and entering the Copper River during early May. Inriver returns of all salmon are estimated by the sonar unit located at Miles Lake. The peak migration into the river is generally from mid-May to mid-June, with the return essentially complete by July 1. However, small numbers of chinook salmon continue to enter the Copper River through August. Chinook salmon make their way to spawning areas in Copper River tributaries primarily through June and July, with spawning beginning in mid-July and continuing through August.

Chinook salmon are broadly distributed throughout the Copper River basin, having been observed in approximately 40 tributaries. Aerial escapement surveys have been conducted in 35 of these systems, but only nine of these systems have been surveyed consistently since 1966 (Roberson and Whitmore 1991). In general, chinook salmon runs to these nine Copper River tributaries have been above historical averages since 1982 (Table 7). In 1992 and 1995 escapement surveys in both years were flown outside the peak dates and are considered tenuous at best (Figure 3). During 1995, heavy rains throughout the summer caused high siltation, which obscured visibility in the lower Gulkana River. Flights to the index streams east of the Gulkana were later than normal and may have missed the bulk of the chinook return. Many of the nine streams were not surveyed in 1993, so comparison to historical means during 1992, 1993, and 1995 is not advisable. During 1996 and 1997, chinook salmon counts of many index streams were at or near record levels. The count for index streams between 1996 and 1998 constituted the three highest index counts since 1977. In 1999, aerial surveys were conducted after the July 17 – 31 peak survey period due to cloud cover and rainy conditions. Unfortunately, assessment of chinook salmon spawning escapements through aerial survey evaluation of key index areas does *not* provide an estimate of the total spawning return. This is because not all spawning areas are surveyed and not all spawners are counted in surveyed areas.

Copper River chinook salmon stocks are harvested in a variety of fisheries including: (1) a commercial gillnet fishery on the Copper River delta, (2) a personal use dip net fishery in the Copper River near Chitina, (3) a subsistence dip net and fishwheel fishery in the Copper River between the Chitina and Slana River confluence, and (4) sport fisheries that occur in various spawning tributaries. The total harvest of chinook salmon in these fisheries has been estimated since 1966 (Donaldson et al. 1995, Roberson and Whitmore 1991). Since 1982, the total harvest of chinook salmon in these fisheries has ranged from 27,000 to over 86,000 (Table 8). The total chinook harvest in 1998 was the highest on record. Unfortunately, the contribution to the catch

**Table 6.-Number of fish harvested, by species, within UCUSMA waters, 1977-1998.**

Year	Chinook Salmon	Sockeye Salmon	Coho Salmon	Steelhead Trout	Rainbow Trout	Dolly Varden	Lake Trout	Arctic Grayling	Burbot	Whitefish	Landlocked Salmon	Other Fish
1977-87 <sup>a</sup>	2,092	3,045	263	89	5,282	3,402	7,386	28,982	8,590	2,801	2,171	299
1988	1,562	3,038	291	91	6,695	5,185	6,277	21,937	3,747	2,474	109	0
1989	2,356	4,509	18	84	5,835	3,979	7,147	16,629	3,396	2,991	281	0
1990	2,302	3,569	0	34	3,924	3,159	5,503	13,775	1,836	1,784	17	0
1991	4,884	5,511	69	114	6,868	2,140	4,864	13,278	793	717	111	47
1992	4,412	4,560	113	8	9,373	1,997	4,251	11,125	1,495	1,150	433	11
1993	8,217	5,288	249	0	7,245	3,173	4,569	12,504	1,694	815	56	9
1994	6,431	6,533	209	7	5,808	1,598	4,058	14,066	2,869	1,149	134	128
1995	6,709	6,068	160	10	4,671	1,695	2,934	14,289	995	898	42	30
1996	7,113	14,170	160	0	5,208	1,248	2,107	8,509	1,039	370	225	7
1997	8,868	12,807	107	12	2,861	620	1,741	7,483	829	71	88	285
1998	8,946	12,615	366	0	5,219	1,581	1,944	8,439	1,493	584	473	0
<b>1988-1997<sup>a</sup></b>	<b>5,285</b>	<b>6,605</b>	<b>138</b>	<b>36</b>	<b>5,849</b>	<b>2,479</b>	<b>4,345</b>	<b>13,360</b>	<b>1,869</b>	<b>1,242</b>	<b>150</b>	<b>52</b>
<b>1993-1997<sup>a</sup></b>	<b>7,468</b>	<b>8,973</b>	<b>177</b>	<b>6</b>	<b>5,159</b>	<b>1,667</b>	<b>3,082</b>	<b>11,370</b>	<b>1,485</b>	<b>661</b>	<b>109</b>	<b>92</b>

<sup>a</sup> Average value for the years during the period.

**Table 7.-Upper Copper River chinook salmon aerial escapement index counts, 1977-1999.**

Year	Copper R. Upstream of Gulkana <sup>a</sup>	Tazlina Drainage <sup>a</sup>		Klutina Drainage		Tonsina Drainage <sup>a</sup>		Total		
		Gulkana R.	E. Fork Chistochina R.	Indian River	Mendeltna Creek	Kiana Creek	St. Anne Creek		Manker Creek	Little Tonsina River
1977	1,090	132	20	73	91	10	15	35	48 <sup>b</sup>	1,514
1978	921	137	9	52 <sup>e</sup>	125 <sup>e</sup>	24 <sup>e</sup>	20 <sup>e</sup>	285 <sup>e</sup>	92 <sup>e</sup>	1,665
1979	1,380	810	29	5 <sup>e</sup>	279 <sup>e</sup>	16 <sup>e</sup>	16 <sup>e</sup>	285 <sup>e</sup>	153 <sup>e</sup>	2,973
1980	718	575	24	3 <sup>e</sup>	247	8 <sup>e</sup>	35 <sup>e</sup>	70 <sup>e</sup>	66 <sup>e</sup>	1,746
1981	754 <sup>b</sup>	120	20 <sup>b</sup>	51	191	19	33	191	107	1,486
1982	1,656	1,260	179	70	200	35 <sup>e</sup>	49 <sup>e</sup>	440 <sup>e</sup>	124 <sup>e</sup>	4,013
1983	931	575	41	12	166	87	141	330	287	2,570
1984	2,189	577	17	2 <sup>e</sup>	382	89	264	568	279	4,367
1985	321	316	14	26 <sup>e</sup>	91 <sup>e</sup>	15 <sup>e</sup>	22 <sup>e</sup>	203 <sup>e</sup>	58 <sup>e</sup>	1,066
1986	3,182	618	29 <sup>b</sup>	76	327	182	251	424	224	5,313
1987	1,228	764	32	10	80	192	141	247	112	2,806
1988	967	709	0	17	249	64	119	78	167	2,370
1989	1,993	750	7	187	345	90	165	68 <sup>e</sup>	78	3,683
1990	1,356	645	15	323 <sup>e</sup>	414 <sup>e</sup>	43 <sup>e</sup>	43	57	48	2,944
1991	1,303	925	18	310	522	130	107	59	159	3,533
1992	656	88	1	83 <sup>e</sup>	79 <sup>e</sup>	12 <sup>e</sup>	14 <sup>e</sup>	107	17 <sup>e</sup>	1,057
1993	1,156	<sup>c</sup>	<sup>c</sup>	126	65	<sup>c</sup>	<sup>c</sup>	<sup>c</sup>	<sup>c</sup>	1,347
1994	1,682	508	47	120	430	250	75	4 <sup>e</sup>	2 <sup>e</sup>	3,118
1995	720 <sup>d</sup>	37 <sup>e</sup>	2 <sup>e</sup>	41 <sup>e</sup>	110 <sup>e</sup>	26 <sup>e</sup>	8 <sup>e</sup>	25 <sup>e</sup>	26 <sup>e</sup>	995
1996 <sup>f</sup>	4,542	2,071 <sup>e</sup>	207	370	510	117	194	30 <sup>h</sup>	163	8,204
1997	3,772	2,245	270	350	455	900	206	55	330	8,583
1998	1,619	1,040	48	280	700	515	843	60	527	5,632
1999	1,047 <sup>e</sup>	82 <sup>e</sup>	2 <sup>e</sup>	38 <sup>e</sup>	216 <sup>e</sup>	486 <sup>e</sup>	69 <sup>e</sup>	93 <sup>e</sup>	88 <sup>e</sup>	2,121 <sup>e</sup>
<b>1977-1987<sup>g</sup></b>	<b>1,362</b>	<b>535</b>	<b>41</b>	<b>49</b>	<b>212</b>	<b>97</b>	<b>141</b>	<b>299</b>	<b>202</b>	<b>2,684</b>
<b>1988-1997<sup>g</sup></b>	<b>1,936</b>	<b>839</b>	<b>71</b>	<b>211</b>	<b>368</b>	<b>259</b>	<b>130</b>	<b>64</b>	<b>158</b>	<b>3,583</b>
<b>1993-1997<sup>g</sup></b>	<b>2,788</b>	<b>1,377</b>	<b>175</b>	<b>242</b>	<b>365</b>	<b>422</b>	<b>158</b>	<b>43</b>	<b>247</b>	<b>4,449</b>
<b>BEG</b>	<b>1,200</b>	<b>500</b>	<b>-</b>	<b>350</b>		<b>250</b>		<b>350</b>		<b>2,650</b>

<sup>a</sup> Select data published in Brady et al. 1991, remainder is unpublished.

<sup>b</sup> Estimated.

<sup>c</sup> No aerial surveys conducted in 1993.

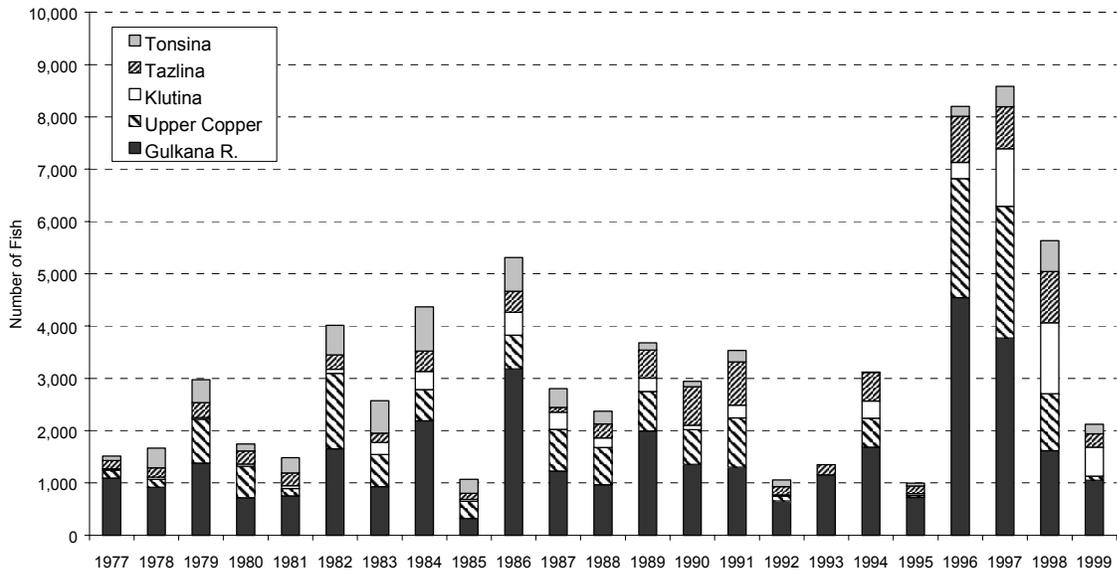
<sup>d</sup> Visibility poor, carcass count only downstream of West Fork.

<sup>e</sup> Surveys flown outside of July 17 - 31.

<sup>f</sup> Counts determined by two surveyors. In years where more than one surveyor was used, counts from the most experienced surveyor are listed.

<sup>g</sup> Averages exclude years when surveys were flown outside July 17-31, or counts were estimated.

<sup>h</sup> More chinook were seen entering the system at later survey, but not counted.



**Figure 3.-Upper River chinook salmon aerial survey index escapement counts by drainage, 1977-1999.**

**Table 8.-Copper River chinook salmon harvest and escapement index estimates, 1977-1999.**

Year	Commercial Harvest <sup>a</sup>	Sport Harvest	Subsistence Harvest <sup>b</sup>	Personal Use Harvest <sup>b</sup>	Total Harvest	Aerial Escapement Index
1977	21,722	532	2,555	<sup>c</sup>	25,176	1,514
1978	29,062	641	2,239	<sup>c</sup>	31,942	1,665
1979	17,678	2,948	3,416	<sup>c</sup>	23,672	2,973
1980	8,454	2,101	3,035	<sup>c</sup>	13,585	1,746
1981	20,178	1,717	2,410	<sup>c</sup>	24,305	1,486
1982	47,362	1,802	2,764	<sup>c</sup>	51,928	4,013
1983	52,500	2,579	5,950	<sup>c</sup>	58,551	2,570
1984	38,957	2,787	509	1,760	44,011	4,367
1985	42,214	1,939	629	1,329	46,230	1,066
1986	40,670	3,663	686	2,367	47,385	5,313
1987	41,001	2,301	813	2,968	47,083	2,803
1988	30,741	1,562	992	2,994	37,289	2,370
1989	30,863	2,356	787	2,251	36,267	3,683
1990	21,702	2,302	647	2,708	27,359	2,944
1991	34,787	4,846	1,328	4,056	45,017	3,533
1992	39,810	4,404	1,449	3,405	49,078	1,057
1993	29,727	8,217	1,434	2,846	42,213	NA
1994	47,061	6,431	1,989	3,743	59,224	3,118
1995	65,675	6,709	1,892	4,707	78,983	995
1996	55,646	7,113	1,482	3,584	67,754	8,204
1997	51,273	8,868	2,583	5,447	68,171	8,583
1998	68,827	8,946	1,842	6,723	86,338	5,632
1999	62,337	7,500 <sup>d</sup>	2,000 <sup>d</sup>	6,047 <sup>e</sup>	77,884	2,121
<b>1977-1987<sup>f</sup></b>	<b>32,709</b>	<b>2,092</b>	<b>2,273</b>	<b>2,106</b>	<b>37,624</b>	<b>2,683</b>
<b>1988-1997<sup>f</sup></b>	<b>40,729</b>	<b>5,281</b>	<b>1,458</b>	<b>3,574</b>	<b>51,136</b>	<b>3,832</b>
<b>1993-1997<sup>f</sup></b>	<b>49,876</b>	<b>7,468</b>	<b>1,876</b>	<b>4,065</b>	<b>63,269</b>	<b>5,225</b>

<sup>a</sup> Morstad et al. 1999.

<sup>b</sup> These figures are expanded to reflect unreported permits. See Table 2 for reported harvests.

<sup>c</sup> Copper River Personal Use Fishery was created by the Board of Fisheries in 1984.

<sup>d</sup> Estimated.

<sup>e</sup> Preliminary.

<sup>f</sup> Average value for the years during the period.

by each spawning stock for these mixed stock fisheries cannot be quantified at present (Brady et al. 1991, Roberson and Whitmore 1991). Thus, it is not currently possible to assess the productivity of each stock using spawner-recruit databases.

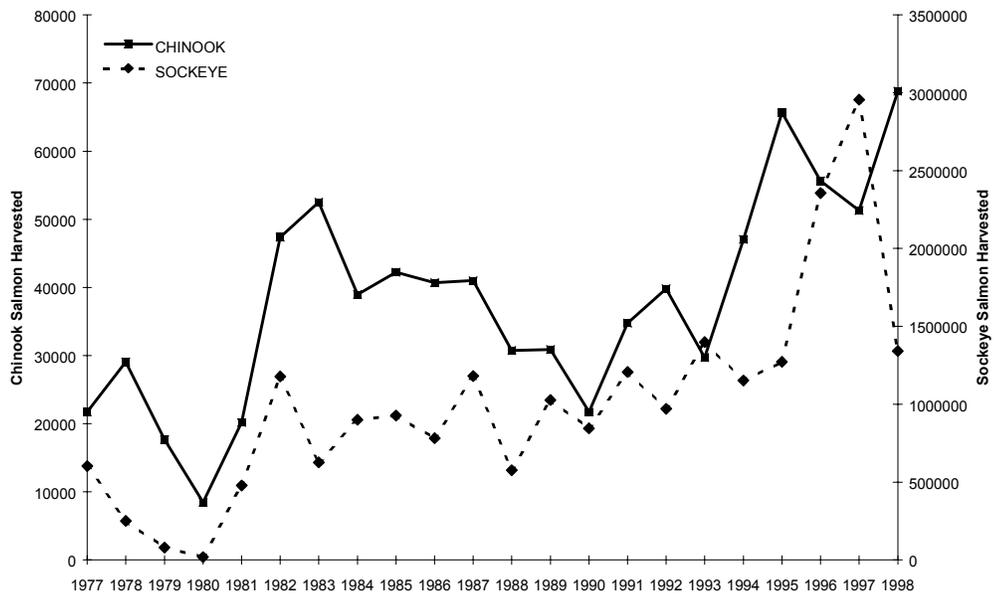
The Copper River Delta District commercial fishery management strategy provides for two, 24-hour periods per week commencing during the second or third week of May, with adjustments in the fishing schedule being made through emergency order. Early season management, when chinook salmon are of consequence in the fishery, is based on actual catches compared to anticipated catches. Under the *Copper Chinook Salmon Fishery Management Plan*, by emergency order, the department has the authority to open and close the season within the inside statistical areas of the Copper River District, during the first two weeks of the fishing season. Since 1994, chinook salmon harvest in the Copper River District Delta commercial fishery has averaged over 57,000 fish (Table 8, Figure 4), with harvests remaining relatively stable through 1993. Since then, record or near record harvests have occurred each year.

Subsistence and personal use harvests of Copper River chinook salmon have averaged approximately 6,798 fish since 1994, with harvests having generally increased in recent years (Table 9). The subsistence fishery occurs from June 1 through September 30 in the mainstem Copper River from the upstream edge of the Chitina-McCarthy Highway bridge upstream to Slana. Fishwheels and dip nets are legal gear. Permits are a requirement of this fishery. The maximum harvest limit for a household of one person is 200 fish and for a household of two or more is 500 fish. There is no limit as to the number of chinook salmon within the annual permit limit for people using fishwheels, while a five chinook salmon limit is imposed on subsistence fishermen using dip nets. Chinook salmon are present in the fishery on June 1 and, on average, 80% of the chinook salmon harvest is taken by July 12 (Roberson and Whitmore 1991).

The personal use fishery is restricted to mainstem waters of the Copper River from the downstream edge of the Chitina-McCarthy Highway bridge, downstream to a Department marker located approximately 200 yards upstream of Haley Creek. The season is from June 1 through September 30. Fishing periods are established by emergency order. A schedule of fishery openings is published prior to the season. The schedule is designed to allow a total harvest of 100,000 sockeye salmon, based on the weekly forecasted return. Adjustments to the schedule are made inseason based on actual sonar counts compared to projected counts; fishing times are increased or decreased if actual counts are greater or less than projected counts. Participants in this fishery must be residents of Alaska and have a current sport fishing license. Permits are a requirement of this fishery, daily harvest by species must be recorded and permits must be returned to the Department office in Chitina following each fishing trip.

Permits limit households of one individual to 15 salmon of which no more than **four** can be chinook salmon and households of more than one person to 30 salmon of which no more than **four** can be chinook salmon. Chinook salmon are present in the catch when the fishery is opened. On average, 80% of the chinook salmon harvest is taken by July 1 and 95% by July 17 (Roberson and Whitmore 1991).

The average sport harvest of chinook salmon from Copper River tributaries more than doubled between 1978 - 1987 and 1988 - 1997, with the 1998 harvest of 8,946 being the highest on record (Table 9, Figure 5). Since 1988, the average harvest of chinook salmon by sport anglers fishing UCUSMA waters has been about 5,000 fish. Sport harvests of chinook salmon in the

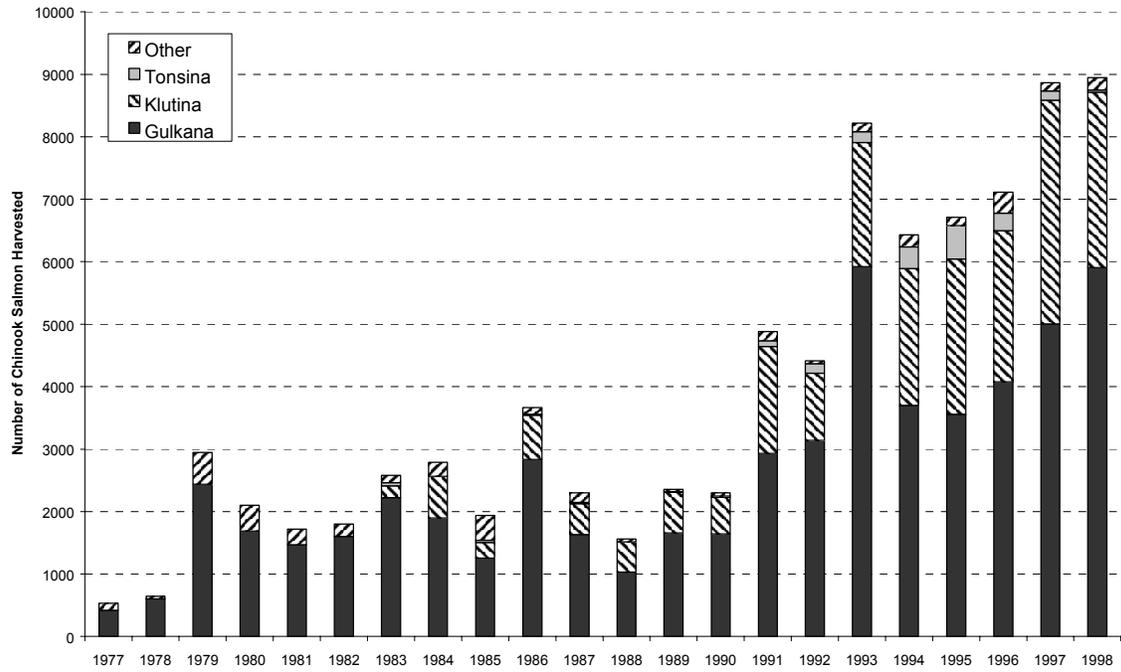


**Figure 4.-Copper River district commercial harvest of chinook and sockeye salmon, 1977-1998.**

**Table 9.-Harvest of chinook salmon by recreational anglers fishing UCUSMA waters, 1977-1998.**

Year	Copper River		Alaska		Region III	
	Drainage	Harvest	Harvest	Percent	Harvest	Percent
1977-1987 <sup>a</sup>		2,092	44,966	5	4,117	51
1988		1,562	89,805	2	5,380	29
1989		2,350	78,371	3	5,763	41
1990		2,302	59,911	4	4,107	56
1991		4,884	76,758	6	6,847	71
1992		4,403	91,629	5	6,092	72
1993		8,207	128,769	6	12,171	67
1994		6,431	109,545	6	11,460	56
1995		6,709	81,562	8	11,000	61
1996		7,113	64,741	11	12,977	55
1997		8,868	90,676	10	14,689	60
1998		8,946	153,073	6	14,298	63
<b>1988-1997<sup>a</sup></b>		<b>5,283</b>	<b>87,177</b>	<b>6</b>	<b>9,049</b>	<b>57</b>
<b>1993-1997<sup>a</sup></b>		<b>7,466</b>	<b>95,059</b>	<b>8</b>	<b>12,459</b>	<b>60</b>

<sup>a</sup> Average value for the years during the period.



**Figure 5.-Upper Copper River chinook salmon sport harvest by drainage, 1977-1998.**

UCUSMA during 1998 accounted for 6% of the statewide, and 63% of the AYK region chinook sport harvests (Table 9). The fishery occurs in various tributaries to the Copper River with the largest fisheries occurring in the Gulkana and Klutina rivers (Table 10). Approximately 93% of the estimated sport harvest of chinook salmon taken from the Copper River drainage since 1993 has been taken from these two drainages. Since 1970, the sport harvest of chinook salmon over 20 inches in length in the sport fishery of the Copper River Basin has been limited by a bag and possession limit of one per day and one in possession. Further protection was afforded area chinook salmon stocks through spawning season closures beginning in 1989. Beginning in 1989, to reduce catch-and-release mortality, any chinook salmon removed from UCUSMA waters becomes part of the daily bag and possession limit of the person who hooked the fish. During 1991, sport chinook salmon fishing was closed in Fish, Indian, Bernard, Ahtel and Natat creeks and the Little Tonsina River. This action was taken in an effort to bolster escapements to these small clear water tributaries, which have showed decline in chinook salmon returns in recent years. Also during 1991, the portion of the Gulkana River 7.5 miles upstream of the confluence of the West Fork was designated as an area where only unbaited, single-hook artificial lures may be used. This action was taken as a conservation measure for rainbow trout and has had little or no effect on the chinook salmon fishery. In 1994, a seasonal bag limit of five chinook was instituted for the Copper River drainage. In 1997, following the 1996 BOF meeting, sport chinook salmon fishing 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 ¼ mile radius around the mouth of Kiana Creek. In addition, the season closure date for chinook 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 chinook salmon. To reduce harvests in the Tonsina River the use of bait was restricted and only unbaited, single hook, artificial lures were permitted.

Under the *Copper River District Salmon Management Plan* (5 AAC 24.360), the Department is directed to manage the commercial fishery to achieve a inriver goal of 15,000 salmon, annually, for the sport fishery in the Copper River tributaries. This sport harvest allocation has been exceeded from 1996-1998, primarily due to the doubling of the sockeye sport harvest during those three years due to strong sockeye runs and an increased development in the sockeye fishery. Given the increase in the popularity of the sport chinook and sockeye salmon fishery in the Copper River basin, it is likely that the allocation will continue to be exceeded into the future unless actions are taken to reduce harvest or the inriver escapement goal is raised to accommodate the growth in the fishery.

Conflicts among users and concerns over chinook salmon resources have been a contentious issue in previous Board of Fisheries meetings, and will likely continue to be in future meetings. The department is moving forward in improving escapement estimates in index spawning streams through conducting surveys during peak counting periods, as well as estimating contribution of spawning streams to total chinook escapement through radio-telemetry studies. In addition, future studies may include enumeration of escapement in the Gulkana River and clearwater spawning tributaries of the Klutina River to provide data for development of the Copper River Chinook Fishery Management plan for the BOF meeting in 2002.

**Table 10.-Harvest of chinook salmon by recreational anglers fishing in the UCUSMA by drainage, averaged for 1977 – 1987 and annually from 1988-1998.**

Areas	1977-87	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-1997 <sup>c</sup>	1993-1997 <sup>c</sup>
<b>Gulkana River Drainage</b>														
Upper River		881	1,211	1,102	1,670	1,676	3,998	1,548	1,269	1,393	2,115	1,668	<b>1,686</b>	<b>2,065</b>
Lower River		152	419	525	1,321	1,395	1,894	2,154	2,287	2,685	2,890	4,236	<b>1,572</b>	<b>2,382</b>
<b>Total</b>	<b>1,630</b>	<b>1,033</b>	<b>1,630</b>	<b>1,627</b>	<b>2,991</b>	<b>3,071</b>	<b>5,892</b>	<b>3,702</b>	<b>3,556</b>	<b>4,078</b>	<b>5,005</b>	<b>5,904</b>	<b>3,259</b>	<b>4,447</b>
<b>Klutina River Drainage</b>	462 <sup>a</sup>	483	652	583	1,709	1,075	1,989	2,189	2,485	2,417	3,581	2,807	<b>1,716</b>	<b>2,532</b>
<b>Tonsina River Drainage</b>	25	0	11	23	89	152	172	349	539	283	145	39	<b>176</b>	<b>298</b>
<b>Tazlina Drainage</b>	17 <sup>a</sup>	9	40	17	32	8	0	105	0	60	31	64	<b>30</b>	<b>39</b>
<b>Copper River</b>														
Upstream of Gulkana	12 <sup>a</sup>	9	0	17	0	18	47	16	0	0	0	0	<b>11</b>	<b>13</b>
Downstream of Klutina <sup>b</sup>	18 <sup>a</sup>	28	11	0	25	55	64	20	0	59	23	15	<b>29</b>	<b>33</b>
<b>Other Waters</b>	365	0	6	35	38	24	43	50	129	216	83	117	<b>62</b>	<b>104</b>
<b>AREA TOTAL</b>	<b>2,092<sup>c</sup></b>	<b>1,562</b>	<b>2,350</b>	<b>2,302</b>	<b>4,884</b>	<b>4,403</b>	<b>8,207</b>	<b>6,431</b>	<b>6,709</b>	<b>7,113</b>	<b>8,868</b>	<b>8,946</b>	<b>5,283</b>	<b>7,466</b>

<sup>a</sup> Includes 1983-1986 average only. Prior to 1983, this harvest was included in “other waters” in the SWHS report.

<sup>b</sup> Does not include Tonsina River drainage.

<sup>c</sup> Average of total annual harvest for the years during the period.

In the past, Copper River chinook salmon stocks have been considered healthy (Roberson and Whitmore 1991). Increasing harvests over the past decade have been supported by above average returns (Table 8). Strong returns of chinook salmon are unlikely to continue indefinitely, while participation in upriver fisheries is likely to increase. To more accurately assess chinook abundance, research was initiated during 1995 to estimate the timing and contribution of chinook salmon stocks from major tributaries to the Copper River. Following initial feasibility studies in 1995 and 1996, capture and coded wire tagging of juvenile chinook salmon began in 1997 in the Gulkana, Klutina, and Tonsina rivers; continued in 1998 with tagging on the Gulkana, Tonsina and Chistochina rivers; and finished in 1999 with tagging on the Gulkana, Klutina and Chistochina rivers. Recovery of tagged chinook salmon will occur in the commercial fishery beginning 2001. A weir was operated successfully in the Gulkana River from June 11 to July 31 in 1996, a total of 11,684 chinook and 183,461 sockeye were enumerated (LaFlamme 1997). In 1999, a radio-telemetry study was conducted on the Copper River that deployed radio-transmitters in chinook salmon captured downstream of Haley Creek. The radio-tagged chinook salmon were tracked via remote tracking stations located at the lower and upper ends of the personal use fishery, the mouths of the Chitina, Tonsina, Klutina, Tazlina, and Gulkana rivers, and upstream of the Gulkana River on the mainstem Copper River. These stations recorded the signal of tagged chinook that passed stations equipped with two antennas, to determine if the salmon were moving into the tributary or continuing up the Copper River. From this data, distribution of chinook salmon in the spawning tributaries of the Copper River was determined, as well as timing of entry into the spawning streams and through the personal use fishery.

## **Gulkana River Chinook Salmon Sport Fishery**

### **Background and Historic Perspective**

The Gulkana River drainage has historically supported the largest sport fishery for chinook salmon in the UCUSMA. This drainage originates in the Alaska Range and flows south to join the Copper River near the community of Gulkana (Figure 6). The section of the Gulkana River upstream from Sourdough has been designated by the U.S. Congress as “wild” under the Wild and Scenic Rivers Act of 1968. Access to the river is available from various secondary roads and trails off the Richardson Highway, which parallel much of the river. Anglers use rafts, canoes, and powerboats to gain access to the more remote sections of the river. Raft and canoe anglers frequent the various sections of the river from Paxson Lake downstream to the Richardson Highway Bridge. Powerboat operators generally launch at Sourdough and use the river from approximately 2 miles below Sourdough upstream to the confluence of the West Fork. More recently powerboat operators have begun launching from the Richardson Highway Bridge and fishing the 5-mile reach of the river above the bridge. Powerboat operators access the mouth of the Gulkana River using powerboats launched from Gakona and the Richardson Highway Bridge.

Chinook salmon typically begin entering the Gulkana River in early to mid-June. The sport fishery typically peaks during late June, but limited fishing for chinook salmon continues until the season closes in mid July. Spawning begins in mid-July and continues through late August. Most spawning occurs upstream of the confluence of the West Fork.

Under current regulations, anglers fishing the Gulkana River are allowed one chinook salmon over 20 inches daily and in possession and a total of five per year. All waters above the Middle Fork confluence with the mainstem Gulkana River are closed to fishing for chinook salmon year-

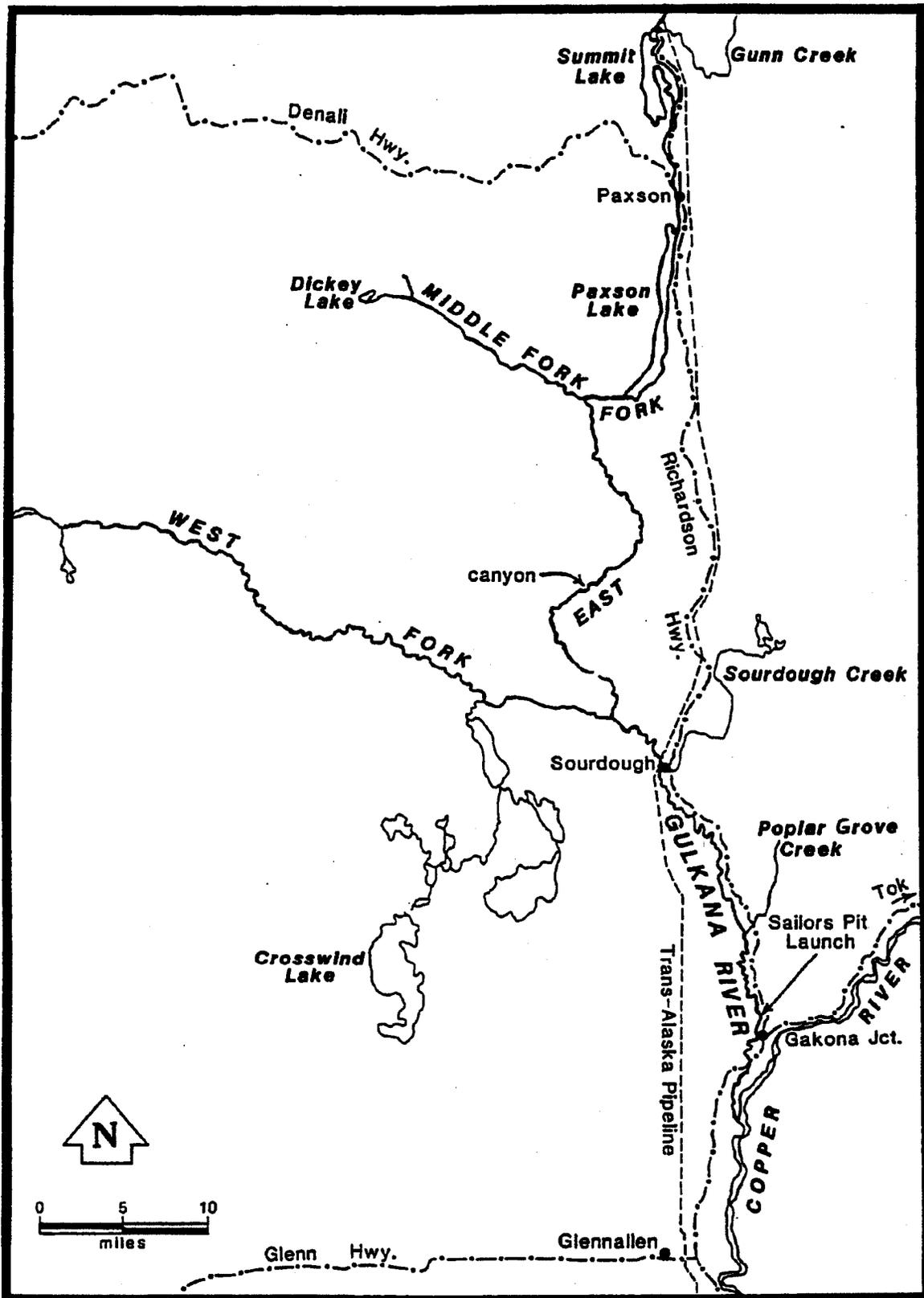


Figure 6.-Map depicting the Gulkana River drainage.

round to protect spawning fish. The rest of the river is open to chinook salmon fishing from January 1 through July 19. The closure date is intended to offer protection to spawning fish. The Gulkana River from the Richardson Highway bridge downstream to a department marker 500 yards downstream of its confluence with the Copper River is an area where only single-hook, artificial flies may be used from June 1 through July 31. In all waters of the Gulkana River drainage upstream of a marker 7.5 miles upstream of the West Fork confluence with the mainstem only unbaited, artificial lures may be used. This regulation is intended to protect rainbow trout stocks that inhabit this area.

The primary source of information regarding the sport fishery is the statewide mail survey (Mills 1979-1994, Howe et al. 1995-1998 and *In prep.*). Based on this survey, the sport harvest of chinook salmon in the Gulkana River averaged 3,259 fish annually from 1988-1997, and 4,447 fish annually from 1993-1997 (Table 11). The 1998 harvest of 5,904 chinook salmon was the largest on record and accounted for 66% of the sport harvest of chinook salmon in the UCUSMA. Sport fishing effort on the Gulkana River averaged 33,063 angler-days annually from 1988-1997, and 39,370 angler-days from 1993-1997 (Table 5). Due to the nature of the mail survey, effort is not assigned to individual species, but observations suggest that the majority of effort is directed towards chinook salmon. Sport fishing effort in 1998 was slightly less than it had been in the last two years. The decline in effort in 1998 may be due to reports of poor fishing caused by low water conditions. The majority of effort and harvest of chinook salmon occurs from the Richardson Highway Bridge upstream to the confluence of the West Fork. In 1998, based on aerial survey observations, the majority of the run was not available to the fishery in this area until late in the season. This is reflected in the record high harvest of chinook in the lower river (below the Richardson Highway Bridge) in 1998.

A roving creel survey was conducted in 1989 to estimate the catch and harvest of and effort directed toward chinook salmon. Results of this survey (Potterville and Webster 1990) indicated that sport anglers expended 29,103 angler-hours to catch 2,398 chinook salmon. Sixty-one percent (1,461 fish) of the catch was estimated to be harvested. This estimate of harvest is close to that estimated from the mail survey (1,630 fish), indicating that the mail survey appears to accurately estimate the harvest of chinook salmon in this fishery. Approximately 50% of the harvest was estimated to have occurred on weekends. The majority of the sport harvest occurred in the 5-mile reach directly upstream of the Richardson Highway bridge and the 10-mile reach near the Bureau of Land Management campground and boat launch at Sourdough. Few anglers fished the single-hook, artificial fly-fishing-only area and, although many anglers floated the upper river, the harvest of chinook salmon was minimal in this reach due to the July 19 spawning season closure.

A second access-point creel survey was conducted in 1996. Results of this survey (LaFlamme 1997) indicated that 35,080 angler-hours were expended to catch 4,920 chinook salmon, 50% (2,441 chinook) of the catch was harvested. The estimated harvest and catch reported in the 1996 mail survey was 4,078 and 9,871, respectively. The large discrepancy in estimates between creel and mail survey, 40% and 50% less for harvest and catch, was attributed to access sites used by anglers that were not surveyed in the onsite creel survey, resulting in biased harvest and catch estimates. As in 1989 the majority of harvest occurred at the Richardson Highway bridge and Sourdough access points. Anglers that were guided or used bait had a higher harvest and catch rate than those that did not. Shore anglers caught as many chinook salmon as boat anglers, but harvested more and expended greater effort to catch a chinook.

**Table 11.-Sport harvest and spawning escapement indices of chinook salmon in the Gulkana River drainage from 1977-1998.**

Year	Sport Harvest	Aerial Survey Indexed Escapement
1977-1987	1,630	1,362
1988	1,033	967
1989	1,630	1,993
1990	1,627	1,356
1991	2,991	1,303
1992	3,071	656
1993	5,892	1,156
1994	3,702	1,682
1995	3,556	720 <sup>a</sup>
1996	4,078	4,542
1997	5,005	3,772
1998	5,904	1,619
<b>1988-1997<sup>b</sup></b>	<b>3,259</b>	<b>1,936</b>
<b>1993-1997<sup>b</sup></b>	<b>4,447</b>	<b>2,788</b>

<sup>a</sup> Visibility poor, carcass count only downstream of West Fork.

<sup>b</sup> Average value for the years during the period

The spawning escapement of chinook salmon in the Gulkana River upstream of the West Fork has been documented since 1966 by aerial surveys of index sites in the drainage (Brady et al. 1991, Roberson and Whitmore 1991). From 1977 - 1999, escapement counts have increased (Table 11). Average escapement from 1977-1987 was 1,362, while from 1988-1997 escapement averaged 1,936. The average escapement for 1993-1997 is 2,788. High and low escapements during this 23-year period range from 4,542 fish in 1996 to 321 fish in 1985 (Table 7). With the exceptions of a low escapement during 1985 and 1992 and high escapement during 1996 and 1997, escapements have remained relatively stable since 1977 (Figure 7).

As part of a drainage-wide chinook salmon research project, a weir was operated on the Gulkana River in 1996 to provide a count of chinook escapement. The access-point creel survey was conducted concurrently to estimate the harvest of chinook. Based on the final weir counts and creel survey harvest estimates the estimated total inriver run in 1996 was 13,840 and estimated spawning escapement was 11,399 (LaFlamme 1997). The aerial survey spawning escapement count in 1996 was 4,542.

### **Recent Fishery Performance**

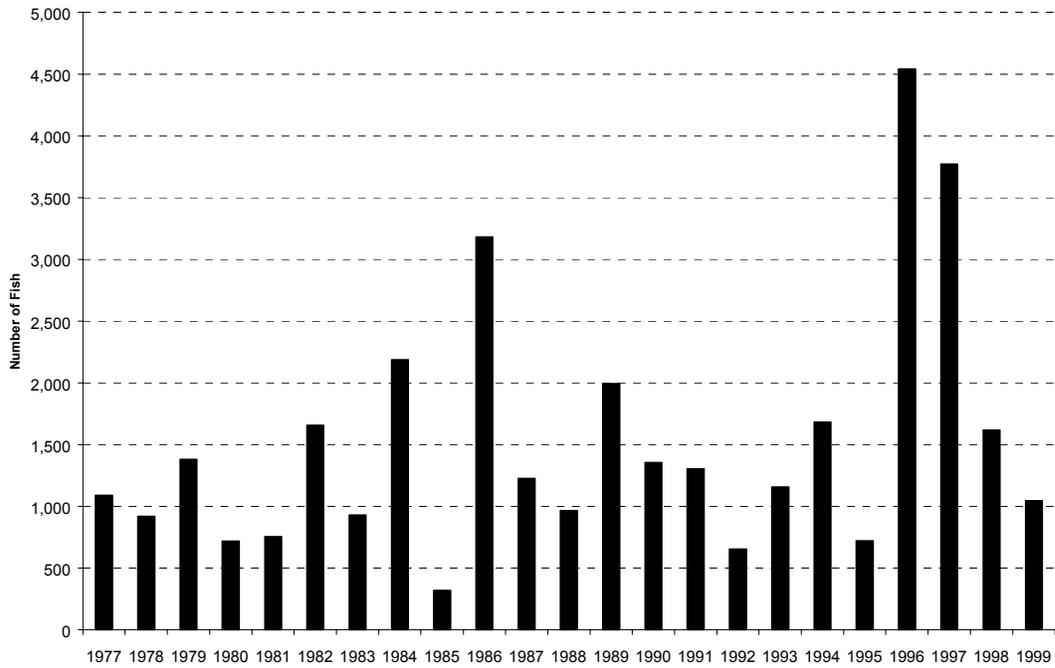
During 1998, 5,904 chinook salmon were harvested by sport anglers fishing the Gulkana River drainage (Table 11). Observed chinook salmon spawning escapement during 1998 (1,619) was less than 1997 and 1996. The low water level may have delayed chinook salmon from migrating upstream, but many salmon appeared to be holding at the confluence of the Gulkana River and Copper River. A large number of guided and unguided anglers were reported to be accessing this area and catching daily limits of chinook consistently. This is reflected in the large lower river harvest estimates in the SWHS (Table 10).

In 1999, cool temperatures and late ice breakup appeared to delay the return of chinook salmon to the Copper River. Significant chinook salmon catches were not reported in the Gulkana River until mid-June, approximately two weeks later than normal. Rain in the upper Gulkana and West Fork resulted in high water and siltation in the lower river and reduced fishing success. Anglers that reported success were fishing primarily above the West Fork. Based upon river observations there were only approximately 10 – 14 days of favorable fishing conditions for chinook in 1999. It is anticipated that harvests of chinook salmon in the Gulkana River for 1999 will be close to the 5-year average of 4,500 fish.

Since 1991 there has been a significant increase in the use of powerboats from the Richardson Highway Bridge upstream for about 5 miles. Also, a notable increase in the number of guides specializing in guiding anglers targeting chinook salmon has occurred on the lower river (below the West Fork confluence) over the past several years. Prior to the 1986 season, only one individual specialized in guiding anglers targeting chinook salmon on this section of the river. During the 1987 and 1988 seasons, a minimum of eight guides operated on the lower portions of the river, while the number increased to at least ten guides during 1989 and 1990. At least 12 guides (registered with BLM) were operating on the lower Gulkana in 1999 (K.J. Mushovic, BLM, personal communication). Available data indicate that guided anglers are more successful than unguided anglers.

### **Management Objectives**

The underlying goal of past and current management has been to assure sustained yield. An annual spawning escapement objective of 1,200 fish has been established, based on enumeration of spawning fish by aerial surveys. During years in which water clarity has been good enough to



**Figure 7.-Gulkana River chinook salmon aerial survey index escapement counts, 1977-1999.**

conduct area surveys, no action has been taken to restrict the fishery if spawning escapement counts of 1,000 fish are achieved in the area between the mouth of the Gulkana River and the confluence with the West Fork during the week following the Fourth of July weekend. Unfortunately, water clarity often results in poor aerial survey indices during this period and no restrictive measures have been taken. The *Copper River Chinook Salmon Fishery Management Plan* was developed to provide for chinook salmon escapement at or above average historic levels. This was to be achieved through a five-percent reduction in harvests of chinook in the commercial, personal use, and sport fisheries. In all three years since the plan was implemented, escapement counts have been above the 1977-1987 average of 1,362 salmon.

### **Fishery Management**

In 1998, with concern of few fish upriver, weekly aerial surveys of the lower Gulkana River began in early June. These surveys indicated few fish (< 1,000 observed) prior to July 1. The confluence of the Gulkana and Copper rivers has poor visibility due to tannic coloration and water depth, making it difficult to observe chinook salmon unless they are near the surface or in shallow water. Due to this fact, it is unclear how many chinook were holding in this area due to low water condition in the Gulkana River. Angler and Fish and Wildlife Protection reports indicated a large number of guided and unguided anglers fishing in the area. Unfortunately, there is not a historic aerial survey index or escapement for June in the Gulkana River and no creel survey was conducted in 1998, so no inseason action was taken to reduce harvests. When the aerial survey was flown for the spawning escapement count, the count was near the 10-year average.

Due to poor river conditions, no June aerial surveys were flown on the Gulkana River in 1999. The spawning escapement aerial survey was flown outside the optimum period due to weather conditions and resulted in a spawning escapement index below the historic escapement objective of 1,200. Had the survey been flown within the optimum period, it is believed that the escapement objective would have been met.

In 1999, Ahtna Native Corporation began an access fee program for access to the Gulkana River across corporation lands (\$5 per day per person, or a \$20 individual seasonal or \$50 seasonal family pass). Access to the Gulkana River downstream of Sourdough was limited to the Richardson Highway Bridge and the easement trail at mile 141 Richardson Highway if no access fee was paid. If a day or seasonal use fee was paid, access to the river included the uplands adjacent to the river and access points at Sailors Pit and Poplar Grove. In addition, Ahtna Heritage Foundation initiated a chinook salmon derby with \$15,000 in prize money on the Gulkana River in 1999. Initial concern of increased fishing effort and harvest of chinook due to the derby were not realized, due to lack of participation in the access fee program and poor fishing conditions on the Gulkana River in 1999. Access to the lower Gulkana will continue to be an issue, as will increasing harvests of chinook, though effort appears to be stable.

### **Fishery Outlook**

It is anticipated that effort and harvests of chinook in the Gulkana River will remain at current levels in the near future. The increased effort and harvests that resulted in the early 1990's may have been a result of restrictions on the Cook Inlet fisheries (Kenai, Susitna catch-and-release and closures). As these restrictions have been lifted effort has declined in recent years. The recent data indicates the potential for overharvest of the Gulkana River chinook stocks if river conditions such as water clarity and water level are conducive to fishing success. The Copper

River drainage harvest trends and aerial survey indices indicate strong chinook salmon returns in recent years, however it is realistic to assume runs will decrease over the next several years.

### **Recent Board of Fisheries Actions**

During 1994, a seasonal bag limit of five chinook was imposed on the UCUSMA fisheries and guides were restricted from fishing while accompanying paid clients. Both restrictions were implemented to reduce the harvest potential on chinook salmon stocks in the area that are considered fully utilized.

During 1996, as part of the *Copper River Chinook Salmon Fishery Management Plan*, guides were restricted from operating in the flowing waters of the Copper River drainage on Tuesdays. No other proposals were passed during the 1996 BOF meeting regarding chinook salmon sport fishing in the Gulkana River.

### **Current Issues**

Increased use by float and powerboat operators on the Gulkana River is intensifying conflicts between users. Float-boat operators fish primarily from the bank casting and drifting lures through the holes while power boats hover in the holes and back troll. Additionally, reports have been made by float-boat operators that powerboats have bumped into them. The Bureau of Land Management initiated the process of updating the management plan for the Wild portion of the Gulkana River upstream of Sourdough. A private consulting firm has been awarded the contract and will gather management recommendations through a process called Limits of Acceptable Change. The final recommendations are scheduled to be completed in two years. There are two proposals submitted for the 1999 BOF meeting regarding motorized use on the Gulkana River.

The majority of the land adjacent to the Gulkana River downstream of Sourdough is owned by the Ahtna Native Corporation. Beginning during the 1991 season, this corporation prohibited trespass across its lands for the purpose of hunting or fishing because it felt its customary and traditional lifestyle has been jeopardized by elimination of the rural preference in the subsistence law. Ahtna Corporation, in conjunction with the Department of Transportation, is planning the development of a public use area on its lands near the Richardson Highway Bridge, a popular fishing and camping site where land ownership is in dispute. As previously mentioned, an access fee was initiated in 1999 for access to the Gulkana River across Corporation lands. Many anglers voiced dissatisfaction with the fee and shifted their efforts to the non-fee areas (Richardson Highway Bridge and upstream of Sourdough). Some of this animosity toward the fee may have resulted in less participation in the fishing derby sponsored by Ahtna Heritage Foundation.

The allocation of Copper River drainage chinook salmon between personal use, sport, and commercial uses remains a controversial issue. The *Copper River Chinook Salmon Management Plan* was developed during the BOF meeting in 1996. The plan has an “insurance plan” that reduces harvest by commercial, personal use, and sport fisheries to allow more chinook on the spawning grounds. The plan was written with a sunset clause of December 31, 2002 to allow the Department to further research the Copper River chinook populations. There are several proposals submitted for the 1999 BOF meeting that address the modification or repeal of the current management plan. There is some question to the effectiveness of the “insurance plan” as harvests have continued to increase.

### **Ongoing and Recommended Research and Management Activities**

The department has determined that the mail survey accurately estimates the harvest of chinook salmon in this drainage, therefore we do not recommend that creel surveys be conducted on an annual basis.

Managers depend on aerial surveys to estimate the escapement of chinook. These are, at best, indicators of relative spawning abundance due to their dependence on survey conditions, surveyor, and the residence of fish in the survey area. In 1996, a weir was operated in the Gulkana to count returning adult chinook and verify aerial counts. The weir project was discontinued after one year and does not provide a reliable expansion factor with a single data point.

Coded wire tagging of chinook smolts was begun in 1997 with the purpose of determining the contribution of various stocks to the total chinook run in the Copper River. Coded wire tag returns in the commercial fishery will also indicate the run timing of different Copper River chinook stocks and whether one stock (the Gulkana River stock) can serve as a gauge of the abundance of other chinook stocks. Aerial surveys will be continued to index numbers of spawning salmon, and the results compared to future weir or tower counts. In 1999, a radio-telemetry study on the Copper River was initiated and resulted in an estimate of total upriver escapement, as well as migratory timing through the personal use fishery, timing into the spawning tributaries, and distribution and proportion of chinook in spawning tributaries (Evenson and Wuttig, *in prep*).

Recommended research projects are the completion of the coded-wire tag recovery and continuation of the radio-telemetry projects. Several additional years of radio-telemetry escapement abundance estimates would provide data to compare to aerial survey indices. In addition, estimates of the proportion of contribution of spawning escapements in index streams (including the Gulkana River) to total escapement would clarify if the index streams were actually representative of the total return. Management projects should include continued aerial survey data collection and, if possible, establish aerial survey escapement count data for June for the Gulkana River.

### **Klutina River Chinook Salmon Sport Fishery**

#### **Background and Historical Perspective**

The Klutina River supports the second largest sport fishery for chinook salmon in the UCUSMA. This semi-glacial river drops rapidly out of Klutina Lake to enter the Copper River at the community of Copper Center. Access to the river is available along the Richardson Highway and from the Klutina Lake Road (also called the Brenwick-Craig Road) which parallels the river. Shore anglers participate in the fishery adjacent to the Richardson Highway and the Klutina River Road. The distance between the Klutina River Road and the river varies along the course of the road, with the road running along the ridge above the river. Much of the land between the road and the river belongs to the Ahtna Native Corporation and beginning in 1998, an access permit is required to be purchased prior to crossing Corporation lands. Fees in 1998 were \$5 per day per person for an day use access permit and \$10-\$30 per night for camping. Jet riverboats are used by experienced operators to access the upstream portions of the river. Jet boats are launched from private land adjacent to the highway or from a site along the new Richardson Highway Bridge. 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 chinook salmon, therefore there are less than two dozen good fishing sites in the lower portion of the river accessible to most anglers.

Chinook salmon typically begin entering the Klutina River in late June, with the run continuing well into August. The sport fishery typically peaks during the second week of July, but fishing for chinook salmon continues until the season closes on August 1. Peak spawning occurs from late July through August. Most spawning occurs upstream of a point adjacent to mile 19.2 on the Klutina Lake Road.

Chinook salmon spawning season closures were established in the UCUSMA during the 1989 BOF meeting to allow chinook salmon to spawn unperturbed. On the Klutina River upstream of a Department marker located adjacent to Mile 19.2 of the Klutina Lake Road, chinook salmon may be taken only from January 1 through July 19. Downstream of this marker, the chinook salmon season is from January 1 through July 31. The current bag and possession limits governing the sport fishery for chinook salmon over 20 inches is one fish. The Copper River drainage-wide bag limit of five chinook salmon per year includes the Klutina River.

Sport harvest of chinook salmon from the Klutina River drainage has been estimated using the mail survey Mills (1979-1994) and Howe et al. (1995-1998 and *In prep.*) since 1983. Based on this survey, the sport harvest of chinook salmon from the Klutina River drainage averaged 1,716 fish from 1988 through 1997, ranging from a low of 483 fish in 1988 to a high of 3,581 fish in 1997 (Table 12, Figure 8). Harvests remained relatively stable from 1983 to 1990. From 1988-1997, sport effort on the Klutina River averaged approximately 9,696 angler-days, ranging from 5,556 in 1990 to 15,119 in 1997 (Table 5). Due to the nature of the mail survey, we do not know how much of this effort was directed towards chinook salmon versus other species. Observations in recent years, however, suggest that a majority of the recent effort is directed towards chinook salmon.

During 1988 and 1989, creel surveys of the sport fishery targeting chinook salmon in the Klutina River drainage were conducted. High water reduced effort and catch during a significant portion of the 1988 season, whereas river conditions remained favorable throughout the 1989 season. Results of the 1988 survey (Roth and Delaney 1989) indicated that sport anglers caught a total of 1,048 chinook salmon of which 43% were retained. The estimated harvest (450) was close to that reported in the mail survey for 1988 (483), indicating that the mail survey fairly accurately estimates sport harvest in this fishery. In 1989 the creel survey estimate was 1,587 chinook salmon caught of which 65% were retained (Potterville and Webster 1990). The estimated harvest (1,031 fish) was again reasonably close to that reported in the mail survey for 1989 (652 fish). The 1988 creel survey showed that guided boat anglers accounted for nearly 90% of the catch and 80% of the harvest of chinook salmon. During the 1989 survey, boat anglers accounted for 88% of the estimated total catch and exhibited significantly higher catch (3.3 fish per hour) and harvest (2.1 fish per hour) rates than did shore anglers (0.5 and 0.4 fish per hour, respectively). The vast majority of boat anglers that participated in the fishery were guided and therefore insufficient data were available to determine if guided boat anglers had different catch or harvest rates than unguided boat anglers. Daily estimates of CPUE from the 1988 survey were used to estimate the timing of chinook salmon into the fishery. These data indicate that CPUE peaks during mid-July, with 50% of the run having entered the river by late July. Approximately 12 guides operated on the Klutina River during 1989 and 1990, all of which conducted boat trips. The vast majority of shore anglers fished that portion of the river downstream from the Richardson Highway Bridge.

The spawning escapement of chinook salmon to the Klutina River has been documented by aerial surveys of St. Anne and Manker Creeks since 1966 (Table 7). Spawning escapement has averaged 238 fish during 1977-1987, ranging from a high of 433 in 1986 to a low of 25 in 1977. Since 1987, observed escapements to this drainage have remained stable, the average escapement for 1988-1997 being 285 (Table 12). The observed escapements in 1997 and 1998 were the highest on record with an average in those two years of 1,233. No escapements surveys were flown on the Klutina River index areas in 1993. The 2-mile stretch of the river just below the lake is known to support chinook salmon spawning, but due to the turbid water conditions in this area, it is not possible to assess abundance of spawning fish.

### **Recent Fishery Performance**

The 1998 sport harvest of 2,807 chinook salmon was the second largest on record and accounted for about 31% of the estimated total sport harvest of chinook salmon in the UCUSMA. The harvest in 1998 exceeded the 1988 – 1997 average by 39%, yet the effort during the same period was only 9% higher. The aerial escapement count for index streams in the Klutina River drainage in 1998 was 1,358. The 1998 escapement of chinook salmon to index sites in the Klutina River drainage, was the highest on record (Table 7) supporting evidence of a large return to the Copper River. The relatively high harvest and average effort may also be a reflection of a strong 1998 return of chinook salmon to the Klutina River.

In 1999, as on the Gulkana River, the chinook return to the Klutina River was later than normal. Both guides and anglers reported low catch rates until mid-July, after which fishing success appeared to be typical for the second half of July. Ahtna Heritage Foundation initiated a chinook salmon derby with \$15,000 in prize money on the Klutina River in 1999. Unlike the Gulkana River chinook derby it appeared effort might have increased somewhat on the Klutina River in part as a result of the derby. Based upon anecdotal information from several guides there was an increase in transporting of anglers to upriver fishing holes and, during July, a majority of the prime fishing areas were filled. It is likely that in 1999 harvests and effort towards chinook on the Klutina River were near the 1993 - 1997 average.

### **Management Objectives**

No specific fishery objectives have been established for this stock. An underlying goal of past and current management, however, has been to assure sustained yield. Aerial survey index evaluation does not appear to represent the majority of spawning fish in this system and has been used as a post season escapement index, with the realization that the majority of spawning occurs in the glacially-occluded mainstem Klutina. In 1999, data gathered from the radio-telemetry study will provide the first estimate of the proportion of spawning occurring in the Klutina River mainstem. As additional years of data are collected, it can be determined whether the two escapement index streams are representative of the entire Klutina River escapement.

### **Fishery Management**

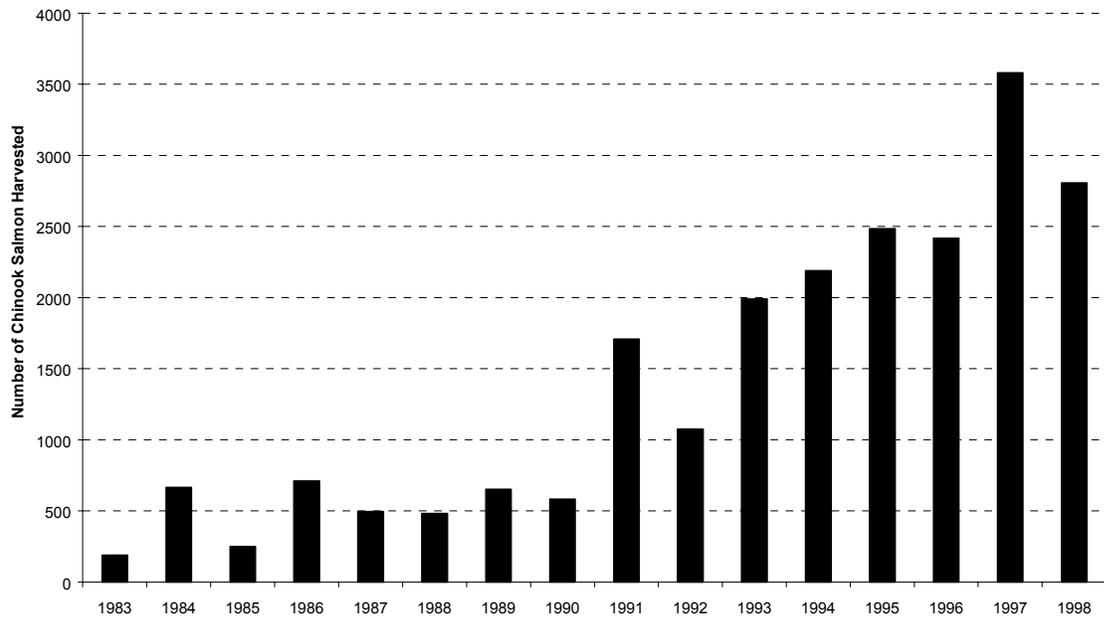
In 1998, no inseason management assessment was conducted on the Klutina River. Harvest and catch data for the Klutina River chinook stocks are obtained from the SWHS. Aerial surveys were flown within the peak period and indicated a strong return. Survey counts (1,358) were over five times the escapement objective (250). There are several proposals submitted to the 1999 BOF meeting requesting extending the fishing season to August 10, in response to the strong chinook returns in 1998. At issue in 1998 was the seasonal closing date on the Copper River of July 19 and the lower Klutina River of July 31. The confluence of the Copper and Klutina rivers is a large holding area for chinook salmon and many shore based anglers now

**Table 12.-Sport harvest and spawning escapement indices of chinook salmon in the Klutina River drainage from 1983-1998.**

Year	Sport Harvest	Aerial Survey Indexed Escapement
1983	189	228
1984	667	353
1985	249	37
1986	710	433
1987	495	333
1988	483	183
1989	652	255
1990	583	86
1991	1,709	237
1992	1,075	26
1993	1,989	<sup>a</sup>
1994	2,189	325
1995	2,485	34
1996	2,417	311
1997	3,581	1,106
1998	2,807	1,358
<b>1988-1997<sup>b</sup></b>	<b>1,716</b>	<b>285</b>
<b>1993-1997<sup>b</sup></b>	<b>2,532</b>	<b>444</b>

<sup>a</sup> No aerial survey conducted in 1993.

<sup>b</sup> Average value for the years during the period.



**Figure 8.-Klutina River chinook salmon sport harvest, 1977-1998.**

walk the mile downstream to access this site. Fish and Wildlife Protection officers made a concerted effort to patrol this area following the July 19 Copper River closure. Many anglers were confused in the interpretation of the regulations of where the Klutina River mouth and the Copper River mainstem actually occurred. To alleviate this confusion, in 1999 the Department placed signage at the Klutina River mouth to delineate where anglers could fish after the Copper River closure.

In 1999, aerial surveys were flown on the index streams after the peak period, due to poor weather conditions. The escapement index was above the biological escapement objective of 250, but the majority of chinook salmon were observed in St. Anne Creek. The number of chinook observed in Manker Creek was less than the historic average. As in the Gulkana River, chinook returned later than normal to the Klutina River. Many guides and anglers did not report catches of chinook until after the first week of July. After mid-July, reports of catch rates appeared to be consistent with historic reports. There were some user conflicts on the Klutina River in 1999. Many guides reported abuse of the daily and seasonal bag limits by shore-based anglers fishing the mouth of the Klutina. In addition, several transporters were placing clients on upriver fishing holes before the guides took their clients upriver to fish, creating a conflict between transporters and guides. There are limited chinook holding areas on the Klutina River and it is anticipated that these conflicts will not diminish, particularly if effort increases.

Ahtna Native Corporation continued the access fee program for the Klutina River Road in 1999. There appeared to be fewer complaints regarding the fee in 1999 than in 1998, as users became accustomed to the program and the Corporation publicized the program. As on the Gulkana River, the Ahtna Heritage Foundation sponsored a chinook salmon derby on the Klutina River. Based on anecdotal reports, much of the effort on the Klutina River in the latter half of the season was directed at catching large chinook for entry into the derby. The guides on the Klutina River have approached the Ahtna Heritage Foundation to switch the derby to sockeye salmon in place of chinook as a result of concern over the Klutina River chinook stocks.

### **Fishery Outlook**

It is anticipated that effort and harvests of chinook in the Klutina River will remain at current levels in the near future. The increased effort and harvests that resulted in the early 1990's may have been a result of restrictions on the Cook Inlet fisheries (Kenai, Susitna catch-and-release and closures). As these restrictions have been lifted, effort has declined slightly in recent years. The recent data indicates the potential for overharvest of the Klutina River chinook stocks, particularly if fishing conditions on the Gulkana River are poor and effort is shifted to the Klutina River where water conditions do not impact chinook fishing as significantly as the Gulkana River. The Copper River drainage harvest trends and aerial survey indices indicate strong chinook salmon returns in recent years, however it is realistic to assume runs will return to near average levels over the next several years.

### **Recent Board of Fisheries Actions**

During the 1996 BOF meeting, as part of the *Copper River Chinook Salmon Fishery Management Plan* guides were restricted from operating in the flowing waters of the Copper River drainage on Tuesdays. Other actions during the 1996 BOF meeting included, closure of sport chinook salmon fishing in Manker Creek, Klutina Lake and all flowing waters entering Klutina Lake. In addition, the season date closure for chinook 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 chinook salmon.

### **Current Issues**

The sport fishery for chinook salmon in the Klutina River has, in recent years, taken a higher proportion of chinook salmon returning to the upper Copper River (Table 10). This has resulted from an increase in the number of guides operating in the fishery, increased angler access to salmon holding areas, and a general increase in angler proficiency. Greater exploitation rates increase the risk of overharvest during years of low production and high angler effort. Further harvest increases may make further restrictions to the fishery necessary.

The majority of the land adjacent to the Klutina River upstream of the Richardson Highway is owned by Ahtna Native Corporation. Beginning during the 1991 season, this corporation prohibited trespass across its lands for the purpose of hunting or fishing. The corporation is not allowing free access for hunting or fishing purposes because it feels its customary and traditional lifestyle has been jeopardized by elimination of the rural preference in the state subsistence law. It has conducted an access fee program since 1998 to allow access to the upper Klutina River. If fees increase without increased access this may result in conflicts between fishery users and the Corporation or increased congestion in areas of the Klutina River that is not Corporation lands.

Increasing use of the swift Klutina River by powerboats and limited use by rafts creates a greater hazard to users. Many sections of the river are not wide enough to allow boats to pass and results in conflicts between the two user groups.

### **Ongoing and Recommended Research and Management Activities**

The department has determined that the mail survey accurately estimates the harvest of chinook salmon in this drainage; therefore, we do not recommend that creel surveys be conducted on an annual basis. However, the nature of the chinook fishery has changed since the last creel survey was conducted (1989), effort has doubled and harvests have averaged three times higher. The fishery should be examined through a creel survey to determine if angler efficiency has increased, and if distribution of effort has shifted.

Managers depend on aerial surveys to index the escapement of chinook. These are, at best, indicators of relative spawning abundance rather than absolute abundance due to their dependence on survey conditions, surveyor, and the residence of fish in the survey area. Aerial survey index counts do not appear to evaluate the majority of spawning fish in this system. A proportion of the spawning occurs in the glacial waters of the mainstem Klutina River, with the actual proportion being unknown. If this could be determined, the index stream counts would provide a better indication of total chinook escapement for the Klutina drainage.

Coded wire tagging of chinook salmon smolts was instituted in 1997 with the purpose of determining the contribution of various stocks to the total chinook run in the Copper River. Coded wire tag returns in the commercial fishery will also indicate the relative run timing of different Copper River chinook stocks and whether one stock can serve as a gauge of the abundance of other chinook stocks. In 1999, a radio-telemetry study on the Copper River was initiated and resulted in an estimate of upriver escapement, as well as migratory timing through the personal use fishery, timing into the spawning tributaries, and distribution and proportion of chinook in spawning tributaries (Evenson and Wuttig, *in prep*).

Recommended research projects are the completion of the coded-wire tag recovery and continuation of the radio-telemetry projects. Several additional years of radio-telemetry escapement abundance estimates would provide data to compare to aerial survey indices. In addition, estimates of the proportion of spawning escapements in index streams to total escapement would clarify if the index streams were representative of the total return. A portion of the chinook salmon hooked in the Klutina River are lost in the fast water before they can be landed. It is suspected that many of these fish may not survive to spawn. The hooking mortality of these fish needs to be evaluated.

## **Other Copper Basin Chinook Salmon Sport Fisheries**

### **Background and Historical Perspective**

Less than 10% of the harvest of chinook salmon in the UCUSMA occurs in systems other than the Gulkana and Klutina rivers. The majority of this harvest occurs in the Tonsina River. The glacial Tonsina River flows from Tonsina Lake into the Copper River downstream of the Klutina River confluence. The Tonsina River crosses under the Richardson Highway at mile 79 and the Edgerton Highway at mile 19. Shore anglers participate in the fishery adjacent to the Edgerton Highway; some angling is conducted by raft between the Richardson and Edgerton highways; and some angling is conducted by fly-in anglers fishing the outlet of the Tonsina River at Tonsina Lake. Chinook salmon run-timing to the Tonsina River drainage is thought to be late-June through August, similar to that of the Klutina River.

The Tonsina River chinook salmon sport fishery harvest increased annually from 1988-1995 (Table 10). Harvests averaged 25 fish from 1977-1987 and 176 fish from 1988 – 1997. The recent 5-year average (1993-1997) is 298. Creel surveys or fishery monitoring of catch or catch rates have not been conducted on the Tonsina River due to low fishing effort and low chinook salmon catches within this drainage. Fish and Wildlife Protection and Department of Fish and Game personnel do, however, conduct enforcement monitoring of this fishery on a sporadic basis.

The spawning escapement of chinook salmon to the Tonsina River has been documented by aerial surveys of the Little Tonsina River and Greyling Creek since 1966 (Table 7). The spawning escapement to these index sites averaged 501 fish from 1977 – 1987, but the average index count for 1988 – 1997 declined to 222.

Current regulations allow sport fishing for chinook salmon in the Tonsina River from January 1 through July 19. The July 19 closure date was established in 1989 to allow chinook salmon to spawn unimpeded. Current daily bag and possession limits for chinook salmon over 20 inches in this drainage river are one and one, respectively, with a seasonal bag limit of five for the Copper River drainage.

A limited fishery for chinook salmon also occurs on Kiana Creek in the Tazlina River drainage. The average escapement from 1977 – 1987 was 212 salmon and for 1988 -1997 was 368 (Table 7). The returns to Kiana Creek in 1998 were above the 1988 – 1997 average. Harvests in this fishery have averaged less than 60 fish since 1989.

### **Management and Fishery Objectives**

No specific fishery objectives have been established for this stock. An underlying goal of past and current management, however, has been to assure sustained yield. It is uncertain whether aerial survey index evaluation represents the majority of spawning fish in these systems and it has been used as a post-season escapement index with the realization that the majority of

spawning may occur in the glacially-occluded mainstem of the Tonsina and Tazlina rivers. In 1999, data gathered from the radio-telemetry study will provide information regarding the contribution to the upper Copper River chinook stock these systems represent. As additional years of data is collected, it can be determined whether the two escapement index streams are representative of the entire system's escapement.

### **Recent Board of Fisheries Actions**

During the 1996 BOF meeting, sport chinook salmon fishing was closed in all tributaries to the Tonsina River, Tonsina Lake and all flowing waters entering the lake. Additionally, the Chokosna and Gilahina rivers and all clearwater tributaries of the Gakona River, Tazlina Lake and all flowing waters entering Tazlina Lake except ¼ mile radius around the mouth of Kiana Creek.

The primary biological concern regarding the Tonsina River chinook salmon stock in recent years is the extremely low chinook salmon escapements in the Little Tonsina River. The trend in harvest does not match the trend in escapement within this drainage (Figure 9). The problem, therefore, is reduced production, overharvest within one of several other mixed-stock fisheries, or the result of illegal fishing activities within the Tonsina River drainage. In response to this concern, the use of bait was restricted and only unbaited, single hook, artificial lures were permitted following the 1996 BOF meeting. In addition, all tributaries to the Tonsina River, Tonsina Lake and all flowing waters entering Tonsina Lake were closed to sport fishing to protect spawning chinook salmon. As a result of these restrictions, harvest and effort in 1997 and 1998 were both below the ten-year average. At the March 1999 BOF meeting, the bait restriction was modified to allow bait to be used with a hook gap of 3/8 inch or less. This regulatory modification was made to permit fisheries for Dolly Varden and Arctic grayling in the Tonsina River using traditional gear to harvest these species, while still reducing the harvest of chinook salmon.

### **Current Issues**

Recent increases in harvests in the Copper River drainage may be attributed to poor chinook salmon returns on the Kenai and Susitna rivers. Media coverage of strong returns to the Copper River may also be responsible. In the near future, it is anticipated that effort will continue to remain at current levels or increase further, depending on the previously mentioned factors. The recent strong chinook salmon returns to the Copper River have prevented the overexploitation of chinook salmon stocks. If the Copper River experiences below normal chinook salmon returns, managers will need to take inseason action to prevent potential overexploitation.

### **Ongoing and Recommended Research and Management Activities**

The level of responses to the SWHS for these systems (less than 20 in 1998) does not provide useable estimates of harvest, but do provide indications of harvest trends. If effort and harvest on these systems did increase significantly, it would be reflected in the SWHS. In these smaller chinook salmon fisheries (Tonsina River and Kiana Creek), harvests at current levels appear sustainable. Any increase in current harvests, may not be sustainable.

Managers depend on aerial surveys to index the escapement of chinook. These are, at best, indicators of relative spawning abundance, rather than absolute abundance estimates, due to their dependence on survey conditions, surveyor, and the residence time of fish in the survey area. Aerial survey index counts do not appear to evaluate the majority of spawning fish in this system. A proportion of the spawning occurs in the glacial waters of the mainstem Tonsina and

Tazlina rivers, but what proportion is not known. If this could be determined, the index stream counts would provide a better indication of total chinook escapement for these drainages.

Coded wire tagging of chinook smolts was begun in 1997 on the Tonsina River with the purpose of determining the contribution of various stocks to the total chinook run in the Copper River. Coded wire tag returns in the commercial fishery will also indicate the run timing of different Copper River chinook stocks and whether one stock can serve as a gauge of the abundance of other chinook stocks. In 1999, a radio-telemetry study on the Copper River was initiated and resulted in an estimate of upriver escapement, as well as migratory timing through the personal use fishery, timing into the spawning tributaries, and distribution and proportion of chinook in spawning tributaries (Evenson and Wuttig, *in prep*).

Recommended research projects are the completion of the coded-wire tag recovery and continuation of the radio-telemetry projects. Several additional years of radio-telemetry escapement abundance estimates would provide data to compare to aerial survey indices. In addition, estimates of the proportion of spawning escapements in index streams to total escapement would clarify if the index streams were representative of the total return.

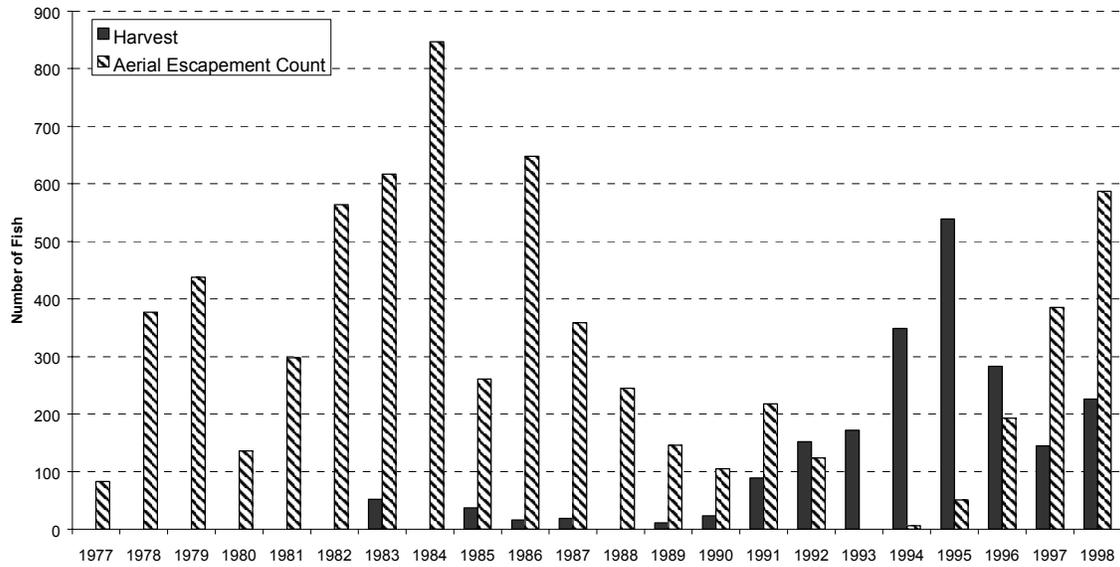
## **Copper River Personal Use and Subsistence Salmon Fisheries**

### **Background and Historical Perspective**

There is a long history of salmon harvest for consumption as food or use as bait in the Copper River drainage. Prior to white settlement, Ahtna natives took salmon, mostly chinook and sockeye, with funnel traps and spears in clearwater tributaries. Weirs, gillnets, and dip nets were used in the turbid mainstem Copper River and at its delta. Haley Creek was the site of one of the many traditional fishing camps along the Copper River. With white settlement, fishwheels were introduced to the Copper River. By 1920, fishwheels and dip nets took over as the means of capturing salmon for personal needs in this river. Also, the popularity of the fishery increased substantially with the introduction of this gear.

Historically, the taking of salmon for consumption as food or use as bait in the Copper River drainage was governed under subsistence regulations. In 1978, Alaska passed its first subsistence law. This legislation guaranteed the "customary and traditional use" of fish and game harvest in Alaska and gave this harvest a priority in terms of allocation. Under this law, the Board of Fisheries adopted the *Copper River Subsistence Salmon Fisheries Management Plan* (5 AAC 01.647). 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 the department to manage the Copper River commercial salmon fishery to assure that an adequate escapement reaches the spawning areas and to provide for subsistence harvest.

In 1980, with the passage of the Alaska National Interest Lands Conservation Act (ANILCA), the federal government mandated subsistence hunting and fishing preference for "rural" residents on federal lands. Subsequent rulings by the federal government stated that if the state failed to meet this requirement, the federal government would take over management of fish and game on all federal lands. To comply with this requirement and prevent federal takeover, the joint Boards of Fish and Game adopted a regulation in 1982 stating that only "rural" residents had "customary and traditional use" of fish and game and established eight criteria for identifying "customary and traditional uses." Under this plan, subsistence fishers were given one of four classes of permits depending upon their locality to the fishery, income, age, and past use. During times of



**Figure 9.-Tonsina River chinook salmon sport harvest and aerial survey index escapement counts, 1977-1998.**

low escapement, Copper River basin residents received priority over nonbasin residents. Due to growth in the fishery, the Board eliminated nonbasin residents from the Copper River subsistence fishery based on analyses of the eight-point criteria in 1984.

This decision precluded many individuals from participating in the Copper River subsistence fisheries, thereby precluding them from harvesting fish for their personal use. This led the Board of Fisheries to establish a new category of fisheries, personal use fisheries (5 AAC 77.001), in 1982. These fisheries were created to provide Alaskans who became ineligible to harvest fish under new subsistence regulations the opportunity to harvest fish for consumption as food or use as bait. Personal use fisheries, like commercial and sport fisheries, were not given a "priority" in terms of allocation as were subsistence fisheries. In 1984 the Board of Fisheries created a personal use salmon fishery in the Copper River drainage under the *Copper River Personal Use Dip Net Salmon Fishery Management Plan* (5 AAC 77.590).

Personal use fisheries differ from sport fisheries in both their objective and management. Both fisheries provide Alaskans the opportunity to harvest fish for personal consumption (in either fishery fish cannot be sold or bartered), but personal use fisheries are managed to maximize harvest potential whereby sport fisheries are managed to provide diversity of opportunity and to maximize economic benefit to Alaska. Also, whereas anyone can participate in Alaska's sport fisheries (provided they have a license), only Alaska *residents* may participate in personal use fisheries. The personal use fishery is managed by the Division of Sport Fish. The Division of Commercial Fisheries manages the subsistence fishery.

Both the subsistence and personal use salmon fisheries in the Copper River drainage have undergone changes since their establishment. Currently, all Alaskans are eligible to participate in the subsistence fishery based on the McDowell decision in 1989. The subsistence fishery occurs upstream of the Chitina-McCarthy bridge to Slana and can be prosecuted with fishwheels and dip nets. The season is from June 1 through September 30, unless closed by emergency order. Only Alaska residents can participate in this subsistence fishery. A special permit, which is free, is required to participate in the fishery. The permit can only be obtained at Fish and Game offices in Glennallen, Tok or Chitina, and at the National Park Service office in Slana. Beginning in 1997, permits were also issued from the Chistochina Village and the Copper River Native Association (Copper Center) offices. Anglers must record their harvest on their permit and return the permit upon completing fishing. The limits are 30 salmon for a household of one, 60 salmon for a household of two, and 10 salmon for each additional person in a household of more than two people. Individuals may request additional salmon up to a maximum of 200 salmon and households may request up to 500 salmon. For people using dip nets, only 5 of the salmon may be chinook salmon. There is also a requirement that all anglers, upon landing a salmon while subsistence fishing, must immediately remove both tips of the tail from the salmon. A subsistence fishery is also allowed in a portion of Tanada Creek with spears and dip nets.

As is the case for the subsistence fishery, only Alaska residents can currently participate in the Copper River personal use salmon fishery. This fishery is opened by emergency order. Both a valid Alaska sport fishing license and a special permit are required to participate in the personal use fishery. The permit costs \$10 and can be obtained at the Fish and Game offices in Chitina, Fairbanks and Glennallen. Anglers must record their harvest on their permit and return the permit upon completing fishing. The limits are 15 salmon for a single person and 30 salmon for a household of two or more, only four of which may be chinook salmon. Only dip nets may be used to harvest salmon. 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. The Board has mandated that Alaskans can participate in either the subsistence or personal use fishery in the Copper River drainage, but not both.

The Board of Fisheries has authorized the Department 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):

Spawning escapement (sockeye salmon)	300,000
Spawning escapement (other salmon)	17,500
Subsistence harvest (salmon)	60,000 – 75,000
Personal use harvest (salmon)	100,000
Sport fishery harvest (salmon)	15,000
Hatchery brood stock (sockeye salmon)	Estimated annually
Hatchery surplus (sockeye salmon)	Estimated annually
TOTAL	Announced annually

The subsistence guideline is adjusted annually in order to accommodate the anticipated subsistence harvest. The hatchery brood stock and hatchery surplus are also adjusted annually based on the anticipated return of wild and hatchery stocks.

Since 1997, the maximum harvest for the personal use fishery has been 100,000 salmon, excluding fish provided in excess of the inriver goal and not including any salmon harvested after August 31. When an escapement greater or less than the inriver goal actually pass the sonar counter, the Board has remanded the department increase or decrease the fishing times by the corresponding percentage.

Harvests by the subsistence fishery have been estimated since 1965. From 1977 through 1987, harvests in the subsistence fishery have averaged approximately 52,000 salmon (Table 13). The fishery experienced rapid growth from 1980 through 1983, when a peak harvest of about 119,000 salmon were taken. Under the subsistence fishery management plan, harvests decreased substantially in 1984 to about 29,000 salmon. Since 1984, subsistence harvests have gradually increased, with the 1997 permits and harvest of 1,133 and 85,578, respectively, the highest since 1983 (Figure 10). The percentage of non-Copper River basin participants has increased from less than 20% prior to 1991 to an average of 56% from 1991-1997. This increase can be attributed to those participants from the Anchorage (23%), Fairbanks (6%) and Mat-Su Borough (10%) communities that entered the fishery following the McDowell decision. Concern has been expressed regarding significant under-reporting of salmon harvest in this fishery, especially over the past decade. Trends in the number of permits issued to participate in this fishery closely resemble harvest trends (Table 13).

Harvests in the personal use fishery have been estimated since establishment in 1984 (Table 14). From 1984 through 1988, harvests remained relatively stable, averaging about 47,000 salmon annually. After 1988, harvests in the personal use fishery increased annually until 1998 (Figure 11). Trends in the number of permits issued to participate in this fishery closely resemble harvest trends (Table 14).

Harvests in both the subsistence and personal use fisheries are dominated by sockeye salmon (Table 2). Chinook salmon comprise the second largest harvest, while a nominal coho harvest also occurs.

### **Recent Fishery Performance**

The number of permits issued and salmon harvests in both the subsistence and personal use fisheries have increased in recent years. In 1998, the subsistence fishery participation and harvest declined slightly from 1997, with 1,010 permits issued and 66,951 salmon harvested (Table 13). The number of permits issued in 1999 were approximately 1,100 with harvests falling within the anticipated harvest range (60 – 75,000 salmon). In 1998, 10,006 personal use permits were issued and 146,075 salmon harvested, participation in the 1998 personal use fishery were the highest since its inception in 1984 (Table 14). Both fisheries benefited from a strong return of sockeye salmon; nearly 862,000 salmon passed the Miles Lake sonar in 1998. The number of participants in both fisheries is not anticipated to decline; preliminary estimates in 1999 for the personal use and subsistence fisheries are 9,944 and 1,100, respectively. The preliminary estimated harvest (expanded to account for 10% of the harvest reports which are unreturned) for the personal use fishery in 1999 is 152,444 salmon. The 1999 subsistence harvest estimates are expected to fall within the anticipated harvest of 60,000 – 75,000. A total of nearly 849,000 salmon passed the Miles Lake sonar in 1999. Large harvests in 1998 and 1999 are most likely due to the strong sockeye and chinook salmon returns experienced.

### **Management Objectives**

Both fisheries are managed under Board of Fisheries adopted management plans. The subsistence fishery is managed under the *Copper River Subsistence Salmon Management Plan* (5 AAC 01.647). The personal use fishery is managed under the *Copper River Personal Use Dip Net Salmon Fishery Management Plan* (5 AAC 77.590). Both plans stipulate management objectives and guidelines, with allocations for each fishery outlined in the *Copper River District Salmon Management Plan* (5 AAC 24.360).

The inseason management of the personal use fishery follows the objectives and guidelines in the *Copper River Personal Use Salmon Management Plan* (5 AAC 77.590). Prior to 1996, the BOF established weekly harvest quotas and also allocated 25% of any escapement in excess of the optimum escapement goal of 560,000 to the personal use fishery. The weekly fishing periods and limits established by emergency order are based on the projected inriver returns. Inriver returns are estimated by sonar located at Miles Lake. The management plan was revised during the 1996 BOF meeting such that the harvest will be distributed throughout the season, based upon on the projected sonar counts. Adjustments will be made to the preseason schedule based on the actual sonar counts, by increasing or decreasing fishing time.

### **Fishery Management**

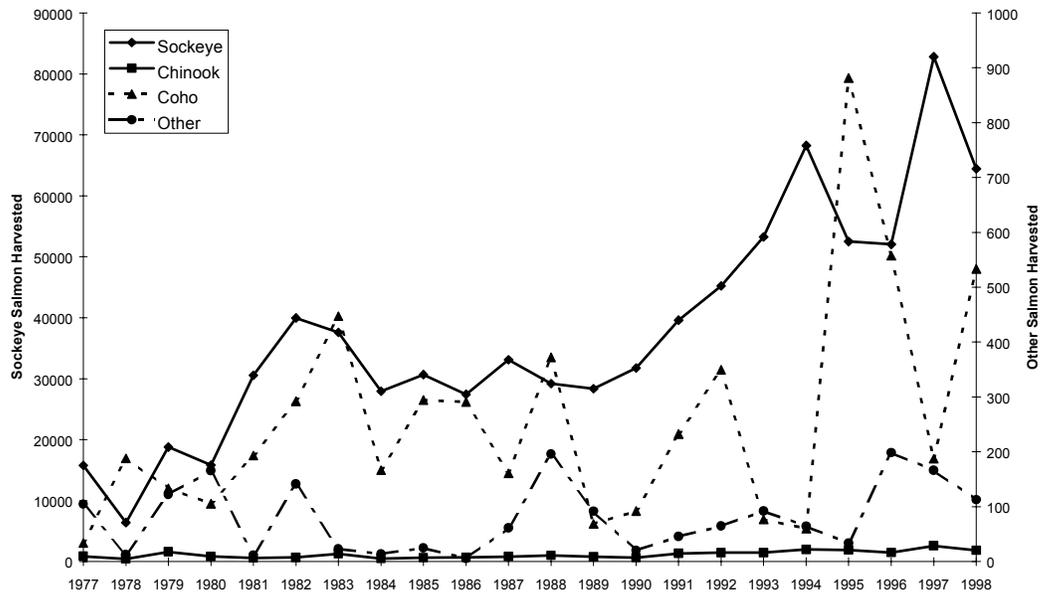
In 1998, the personal use fishery was opened by emergency order on June 6 for a 36-hour fishing period. Numbers of salmon passing the Miles Lake sonar began to exceed the daily escapement objectives at the sonar counter on May 26 and did not drop below the weekly escapement

**Table 13.-Number of permits issued and salmon harvests during the subsistence salmon fishery in the Copper River, 1977-1998.**

Year	Number Permits	Estimated Salmon Harvest			
	Issued	Chinook	Sockeye	Coho	Total <sup>b</sup>
1977	4,066	857	15,790	34	41,815
1978	3,705	453	6,406	188	22,029
1979	3,200	1,596	18,795	134	30,963
1980	3,203	845	15,811	105	35,081
1981	4,078	585	30,545	193	68,746
1982	6,090	681	39,968	292	110,006
1983	7,541	1,275	37,596	447	118,728
1984	475	509	27,941	167	28,617
1985	-a	629	30,666	294	-a
1986	405	686	27,441	291	28,417
1987	445	813	33,106	161	34,080
1988	417	992	29,194	372	30,558
1989	386	787	28,360	69	29,216
1990	406	647	31,765	92	32,504
1991	712	1,328	39,599	232	41,159
1992	655	1,449	45,232	350	47,031
1993	773	1,434	53,252	77	54,762
1994	970	1,989	68,278	60	70,326
1995	858	1,892	52,516	882	55,290
1996	850	1,482	52,052	557	54,092
1997	1,133	2,583	82,807	187	85,578
1998	1,010	1,842	64,463	533	66,951
<b>1977-1987</b>	<b>3,321</b>	<b>812</b>	<b>25,824</b>	<b>210</b>	<b>51,848</b>
<b>1988-1997</b>	<b>716</b>	<b>1,458</b>	<b>48,306</b>	<b>288</b>	<b>50,052</b>
<b>1993-1997</b>	<b>917</b>	<b>1,876</b>	<b>61,781</b>	<b>353</b>	<b>64,010</b>

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

<sup>b</sup> Total harvest includes steelhead and other species.



**Figure 10.-Copper River subsistence harvest by species, 1977-1998.**

**Table 14.-Number of permits issued and salmon harvested during the personal use salmon fishery in the Copper River, 1984-1999.**

Year	Number Permits Issued	Estimated Salmon Harvest			
		Chinook	Sockeye	Coho	Total <sup>c</sup>
1984	5,415	1,760	48,236	717	50,734
1985	--- <sup>a</sup>	1,329	30,885	361	--- <sup>a</sup>
1986	4,031	2,367	41,054	538	44,047
1987	4,245	2,968	43,492	424	46,908
1988	4,251	2,994	42,331	504	45,855
1989	4,582	2,251	55,778	857	58,941
1990	5,689	2,708	66,432	1,511	70,812
1991	6,222	4,056	77,590	3,354	85,059
1992	6,385	3,405	86,724	1,517	91,683
1993	7,914	2,846	93,472	1,416	97,767
1994	7,061	3,743	94,024	1,981	99,822
1995	6,760	4,707	79,006	4,870	88,617
1996	7,198	3,584	95,007	3,381	102,108
1997	9,086	5,447	148,727	160	154,349
1998	10,006	6,723	137,161	2,145	146,075
1999 <sup>b</sup>	9,944	6,047	144,241	2,128	152,444
<b>1988-1997</b>	<b>6,031</b>	<b>3,574</b>	<b>83,909</b>	<b>1,955</b>	<b>89,501</b>
<b>1993-1997</b>	<b>7,064</b>	<b>5,835</b>	<b>102,047</b>	<b>2,362</b>	<b>108,533</b>

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

<sup>b</sup> Preliminary estimates.

<sup>c</sup> Total estimate includes unidentified salmon.

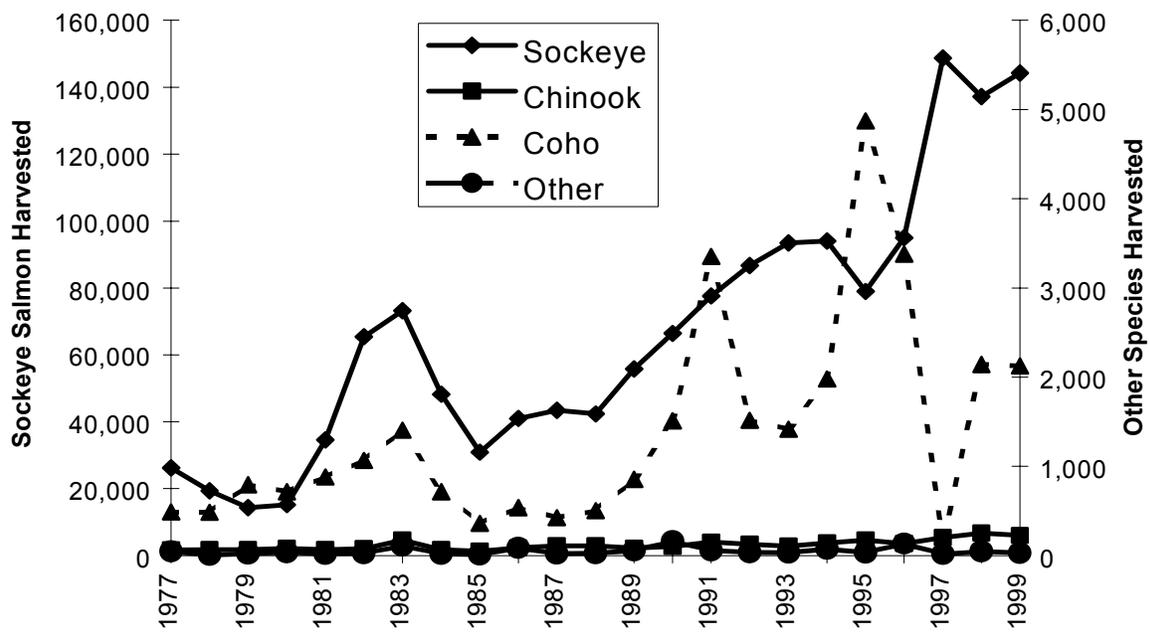


Figure 11.-Copper River personal use harvest by species, 1977-1998.

objective for the remaining time the sonar was operational. In response to the additional fishing opportunity the fishery was re-opened by emergency order on June 10 and remained open for the duration of the season. The daily allocation of salmon for the personal use fishery is determined pre-season based upon the projected sonar counts. The 100,000 salmon allocation is then distributed throughout the season based upon the projected sonar counts with adjustments made based upon actual sonar counts; any salmon above the projected daily salmon escapement are considered excess. The existing *Copper River Personal Use Salmon Management Plan* does not allocate a percentage of the excess above the optimum escapement objective. Based upon previous migration studies, a two-week travel time from the Miles Lake sonar to the personal use fishery is used to determine when the salmon will be available to the fishery. Harvests exceeded the weekly allocation during the first four weeks of the fishing season, but only during the first week did the harvest exceed the available surplus (Table 15).

In 1998, there were surplus salmon in excess of 50,000 salmon during two weekly periods. This permitted a supplemental permit to be issued in the weeks the surplus salmon would be available to the personal use fishery. These two periods occurred June 15-21 and July 6 –12 within the Chitina subdistrict. Eighty-one permits were issued during the first period resulting in a harvest of 591 additional sockeye salmon and 92 permits were issued the second period with a harvest of 688 sockeye salmon.

In 1999, the personal use fishery was opened by emergency order on June 11 for a 36-hour fishing period. The *Copper River Personal Use Salmon Management Plan* requires the fishery to be opened between June 1 – 11. Due to low salmon numbers the second period beginning June 19 was also a 36-hour fishing period. The third period (June 23-27) was reduced to 104-hours, based upon actual sonar counts. Beginning June 11, actual counts past the Miles Lake sonar were double the projected counts and, in response to the weekly escapement objectives being met, the personal use fishery opened to continuous fishing on June 30. During the week of June 21 – 27, an excess of 50,000 salmon passed the Miles Lake sonar and resulted in a supplemental permit issued in the fishery the week of July 12 – 18 (an additional week of migration time was allowed due to higher water levels). Ninety-seven supplemental permits were issued during the week resulting in a harvest of 780 additional sockeye salmon. Harvests exceeded the weekly allocation seven of the first eight weeks of the fishing season, but only during the second and seventh weeks did the harvest exceed the available surplus (Table 16).

Several proposals have been submitted regarding the personal use fishery for the 1999 BOF meeting. These proposals address allocation of 25% of excess salmon past the Miles Lake sonar to the personal fishery, increasing the total allocation of salmon for the personal use fishery from 100,000 to 160,000, and reducing chinook salmon harvests within the personal use fishery.

### **Fishery Outlook**

It is anticipated that participation and harvest in the personal use fishery will continue at current levels. It is uncertain if some non-rural subsistence fishery users will move into the personal use fishery or remain in the subsistence fishery under state jurisdiction. Harvests of sockeye salmon will be dependent upon salmon run strength, if the allocation to the personal use fishery is increased and escapement objectives are met, the fishery will likely have a greater period open to continuous fishing. There have been observations that many participants in the Cook Inlet personal use fishery also participate in the Copper River personal use fishery. Cook Inlet permits have been returned to the Chitina and Glennallen offices in past years. If the Cook Inlet fishery

**Table 15.- Projected versus actual salmon harvests in the Copper River Personal Use Fishery, 1998.**

Week Ending	Projected Sonar counts <sup>a</sup>	Actual sonar counts <sup>a</sup>	Available Surplus	Weekly allocation <sup>b</sup>	Estimated PU harvest	Difference
May 31	1,509	0	-1,509			
June 7	23,174	8,248	-14,926	1,350	6,078	-4,728
June 14	56,128	83,431	27,303	13,651	26,616	-12,965
<b>June 21<sup>c</sup></b>	81,882	148,567	66,685	24,309	28,079	-3,770
June 28	83,581	117,689	34,108	19,256	20,234	- 978
July 5	62,219	112,820	50,601	18,460	10,372	8,088
<b>July 12<sup>c</sup></b>	50,844	82,978	32,134	13,577	11,968	1,609
July 19	52,075	84,820	32,745	13,878	11,955	1,923
July 26	57,521	88,437	30,916	14,470	13,165	1,305
August 2	54,709	64,552	9,843	10,562	8,393	2,169
August 9	41,778	41,964	186	6,866	4,197	2,669
August 16	29,338	28,473	- 865	4,659	3,683	976
August 23	13,237		-13,237	2,166	2,066	100
<b>Total</b>	<b>607,995</b>	<b>861,979</b>		<b>143,204</b>	<b>146,806</b>	

<sup>a</sup> Sonar counts are adjusted forward two weeks to correspond to the week fish would be available to the Personal Use fishery. Projected sonar counts represent the weekly escapement objectives.

<sup>b</sup> Based on actual sonar counts, with the exception of the week ending August 23 which is based on projected sonar counts.

<sup>c</sup> Week ending in bold indicates weeks in which supplemental permits were issued.

is poor, then there is potential for an increase of participation in the Copper River fishery from the Cook Inlet users.

### **Recent Board of Fisheries Actions**

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 BOF meeting. The revised plan distributes 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. During the December 1997 BOF meeting an agenda change request was addressed by the board that would allow personal use permit holders to harvest additional fish in years of surplus escapement. A decision on this proposal was deferred until the February 1998 meeting to allow the advisory committee to review and comment on the amended proposal. At the February meeting, the BOF passed the proposal that allows personal use permit holders, who have filled their original limit, to be issued a supplemental permit for 10 additional fish in weeks when a harvestable surplus of 50,000 salmon or greater will be available in the Chitina Subdistrict.

Actual harvest numbers resulting from the issuance of supplement permits are relatively low. The supplemental period is also a likely attractant to participants who anticipate high catch rates owing to the escapement surplus; the potential increased effort and catch however, are currently immeasurable.

The “insurance policy” in the *Copper River Chinook Salmon Plan* resulted in a reduction of chinook bag limit from five to four salmon. Chinook harvests continue to increase following this bag limit reduction with record harvests of chinook in 1997 (5,447) and 1998 (6,723) and the 1999 preliminary harvest of over 6,000 chinook. This plan has been relatively ineffective in reducing chinook harvest due to increased participation in the fishery. Only 7,198 permits were issued in 1996, since then in excess of 9,000 permits have been issued each year. The increased participation is likely one of the reasons the chinook harvests have not declined. A proposal has been submitted to the 1999 BOF meeting to address the need for reduction of the chinook harvest in the personal use fishery.

### **Current Issues**

The issue of increasing the allocation for the personal use fishery was addressed at the 1996 BOF meeting. Since that meeting, salmon escapement past the Miles Lake sonar has exceeded 800,000 salmon each year from 1997-1999. The record number of salmon passing the Miles Lake sonar in 1997 and attention the media gave the fishery may have been responsible for the increase in participants. Since the fishery continues to grow the allocation for the fishery will again need to be addressed at the 1999 BOF meeting. In addition, with the amendment to the management plan for a supplemental permit, the current management plan does not address any allocation of the surplus salmon above the escapement goal and below the 50,000 excess at which supplemental permits are instituted. In 1998, the projected personal use harvest was exceeded in the first four weeks of the season. The fishery was opened June 6-7, reopened June 10 and remained opened until September 30. The large harvests were probably the result of higher than projected counts past the sonar; over 27,000 fish above projected counts occurred in three of the four corresponding weeks in personal use fishery (Table 15). In 1999, the projected personal use harvest was exceeded in seven of the first eight weeks of the season, as in 1998 the overage was a factor of surplus past the sonar (Table 16). Over 28,000 fish above projected

**Table 16.-Projected versus actual salmon harvests in the Copper River Personal Use Fishery, 1999.**

Week Ending	Projected Sonar counts <sup>a</sup>	Actual sonar counts <sup>a</sup>	Available Surplus	Weekly allocation <sup>b</sup>	Estimated PU harvest	Difference
June 6	9,470	960	-8,510	128	0	128
June 13	41,277	13,610	-27,667	1,815	1,575	240
June 20	80,824	17,464	-63,360	2,329	4,485	-2,156
June 27	87,951	116,272	28,321	15,505	29,194	-13,689
July 4	62,519	110,004	47,485	14,669	19,209	-4,540
July 11	51,180	105,056	53,876	14,009	17,102	-3,093
<b>July 18<sup>c</sup></b>	64,150	95,071	30,921	12,677	16,229	-3,552
July 25	98,212	86,211	-12,001	11,496	15,996	-4,500
August 1	102,193	103,858	1,665	13,849	14,733	- 884
August 8	71,852	108,596	36,744	14,481	8,423	6,058
August 15	45,825	77,175	31,350	10,291	6,018	4,273
August 22	22,312	29,795	7,483	3,973	8,350	-4,377
Total	737,765	864,072		115,222	141,314	

<sup>a</sup> Sonar counts are adjusted forward two weeks to correspond to the week fish would be available to the Personal Use fishery. Projected sonar counts represent the weekly escapement objectives.

<sup>b</sup> Based on actual sonar counts, with the exception of the week ending August 22 of which 5 days are based on projected sonar counts.

<sup>c</sup> Week ending in bold indicates weeks in which supplemental permits were issued.

counts occurred in four of the first seven weeks. If the total allocation is increased during the BOF meeting this may eliminate some of the current problems with the projected harvests being exceeded, but under current participation levels, reduction of fishing periods will need to occur.

As access to Chitina improves and media coverage of the personal use fishery increases, it is anticipated that participation will continue to increase and allocation of salmon to the fishery will continue to be an issue. The Chitina Village Council initiated a personal use chinook salmon derby in 1999. This derby did not begin until the fourth week of the fishery, after the majority of chinook had passed the fishery and did not result in an increase harvest of chinook.

Another issue regarding this fishery relates to access. Much of the land in the area open to subsistence and personal use fishing is privately owned. In 1985 and 1986, the Chitina Native Corporation blocked the road to O'Brien Creek and charged a fee for access. In 1987 the State of Alaska negotiated a \$15,000 contract with the Chitina Native Corporation for access and to build and maintain outhouses and collect and remove garbage. The contract was renewed in 1988. The legislature refused to appropriate funds for access in 1989 after roadwork done on the road in the fall of 1988 eliminated areas where the road passed on private land. In response, the Chitina Native Corporation refused dipnetters access to O'Brien Creek during the 1989 season. The legislature again appropriated funds for access to O'Brien Creek in 1991. Also in 1991, at the urging of the Chitina Dipnetter's Association, the legislature instituted a \$10 fee for the personal use fishery. The fee was to be used to develop a long-term lease. During 1994, a 5-year lease was negotiated with the Chitina Corporation. In 1995, a 4-year lease was negotiated with Ahtna Corporation for use of lands surrounding Haley Creek. Trespass on lands not included in the lease agreement remains an issue. During work group meetings in the fall and winter of 1995-1996, native groups from the Chitina area expressed discontent with the adequacy of the negotiated leases. The current lease agreements both expired December 31, 1998. Meetings with both corporations occurred during 1998 and 1999 and resulted in a one-year extension of the existing contract and monthly meetings throughout the fishing season in 1999 to address current issues. These meetings have provided input for developing the new contracts and addressing issues in the previous contracts. Primary concerns from the corporations include operation of the commercial charter operators at O'Brien Creek, trespass on both east and west banks of Copper River where access was not provided by contract, and lack of enforcement for fishing and trespass violations. Negotiations for a new contract are to continue during fall 1999 with hopes for a new contract developed by the end of 1999.

### **Ongoing and Recommended Research and Management**

At present, the Division of Sport Fish conducts a program to issue permits, monitor the fishery, and estimate harvests during the Copper River personal use salmon fishery. During 1995, a program was initiated to estimate the proportion and timing of sockeye salmon produced by the Gulkana Hatchery from coded wire tag (CWT) recoveries in the personal use fishery. In time, this will allow managers to better target hatchery stocks while protecting wild fish. The chinook radio-telemetry study initiated by the Department in 1999 has provided information regarding chinook passage through the fishery.

Continued refinement of the criteria for opening and closing the fishery is needed. The relationship between the sonar count and fish passage rate through the personal use fishing area is poorly understood. Comparison of sonar counts to harvest rates was attempted with poor success. Time series analysis of the factors affecting fish passage is necessary. Difficulties in

shifting effort from the early sockeye stocks continue and results in less fishing time in the early portion of the season as participation increases.

Examination of the permitting process was begun in 1999 and a pilot study to determine the feasibility of conducting an exit survey as a means of estimating harvest will be initiated in 2000.

### **ARCTIC GRAYLING SPORT FISHERIES**

From 1977 through 1995, more grayling were harvested by sport anglers fishing UCUSMA waters than any other fish (Table 6). Harvests remained relatively stable from 1977 through 1987, averaging about 28,982 grayling. Since 1988, however, harvests have been lower, with the 1997 harvest of 7,483 grayling being the lowest on record (Table 17, Figure 12). This has been primarily the result of more restrictive regulations adopted to assure the sustained yield of the area's grayling stocks. The 1998 harvest accounted for about 26% and 21% of the AYK and statewide harvest of grayling, respectively.

The largest grayling fishery in the UCUSMA has historically occurred in the Gulkana River drainage (Table 18). From 1988 through 1997, this drainage accounted for about 36% of the grayling harvest from UCUSMA waters (Table 19). In recent years, harvests from the drainage have declined; 32% of the grayling harvest came from the drainage during the period 1993-1997. A discussion of the Arctic grayling fishery in the Gulkana River drainage follows this area-wide summary. Other UCUSMA drainages that have supported significant grayling fisheries include the Klutina and Tazlina drainages and various upper Susitna River drainage lakes and streams. Various lakes stocked with grayling fingerling also provide fishing opportunity for this species.

To assure sustainable yield of grayling, daily bag and possession limits for grayling in all flowing waters in the UCUSMA were reduced from 15 daily and 30 in possession to 10 fish daily and in possession in 1988. In 1989, the bag and possession limit for grayling in rivers was further reduced to five grayling. For the Gulkana River, anglers were permitted five grayling but only one grayling per day over 14 inches. This action was taken to maintain historic size compositions in this drainage. The bag and possession limits in stocked lakes and those lakes without management concern remained at 10 per day and in possession. Under these regulations, most grayling stocks in the UCUSMA are currently considered healthy.

Mendeltna Creek is a small stream in the Tazlina drainage located west of Glennallen that drains into Tazlina Lake. Main access points are at the Glenn Highway wayside and a single lane gravel road (Oil Well Road) off the Lake Louise Road. Harvests increased significantly between 1992 and 1993, 255 to 867 grayling, and peaked in 1995 at 1,041 (Table 18). There is little baseline data on the grayling population in Mendeltna Creek, stock assessment began on this system in 1998. Harvests of grayling in 1998 were below the 1993-1997 average.

Management of the grayling population in Mendeltna Creek has been limited to evaluation of the SWHS. Arctic grayling populations can sustain exploitation rates of approximately 10%. Stock assessment conducted on Mendeltna Creek estimated the population at less than 900 grayling, with few fish greater than 12 inches (Scanlon and Roach, *in prep*). At the current population level, only 80 grayling could be harvested annually. Based upon examination of the SWHS statistics, bag limits reductions would not reduce the harvest sufficiently to provide for sustainable yield. The department has submitted a proposal for the 1999 BOF meeting to reduce the daily bag limit to 2 fish over 12" total length and to protect larger spawning grayling, the open season be June 1 through March 31.

Little is known about the distribution of Arctic grayling in the UCUSMA. Many of the roadside-accessible streams are located in the Tazlina drainage. Tagging or telemetry studies could provide information regarding timing of grayling through the fisheries, spawning and rearing streams and distributions throughout the drainage.

## **Gulkana River Arctic Grayling Sport Fishery**

### **Background and Historical Perspective**

The Gulkana River drainage supports the largest grayling population in the UCUSMA. This clearwater drainage originates in the Alaska Range and flows south to join the Copper River near the community of Gulkana (Figure 6). Access to the river is available from various secondary roads and trails off the Richardson Highway, which parallels much of the river. Anglers use rafts, canoes, and power boats to gain access to the more remote sections of the river. Raft and canoe anglers frequent the various sections of the river from Paxson Lake downstream to the Richardson Highway bridge. Power boat operators generally launch at Sourdough and use the river from approximately 2 miles below Sourdough upstream to the confluence of the West Fork. Recently power boat operators have begun launching from the Richardson Highway bridge and fishing the 5-mile reach of the river above the bridge. The section of the Gulkana River upstream from Sourdough has been designated by the U.S. Congress as “wild” as part of the Wild and Scenic Rivers Act of 1968. The Gulkana River from the Richardson Highway bridge downstream to a department marker 500 yards downstream of its confluence with the Copper River is an area in which only single hook, artificial flies may be used from June 1 to July 31. This area has low use, except near the Richardson Highway, and is used primarily by walk-in anglers from the Richardson Highway, but power boat operators occasionally access the confluence of the Gulkana River with the Copper River after launching from Gakona or from the Richardson Highway Bridge.

The Gulkana River drainage has historically supported the largest sport fishery for grayling in the UCUSMA. From 1977 through 1985, harvests of grayling from the Gulkana River drainage generally increased. A peak harvest of 20,165 fish occurred in 1985 and accounted for 62% and 35% of the total harvest in the UCUSMA and Southcentral region, respectively (Mills 1986).

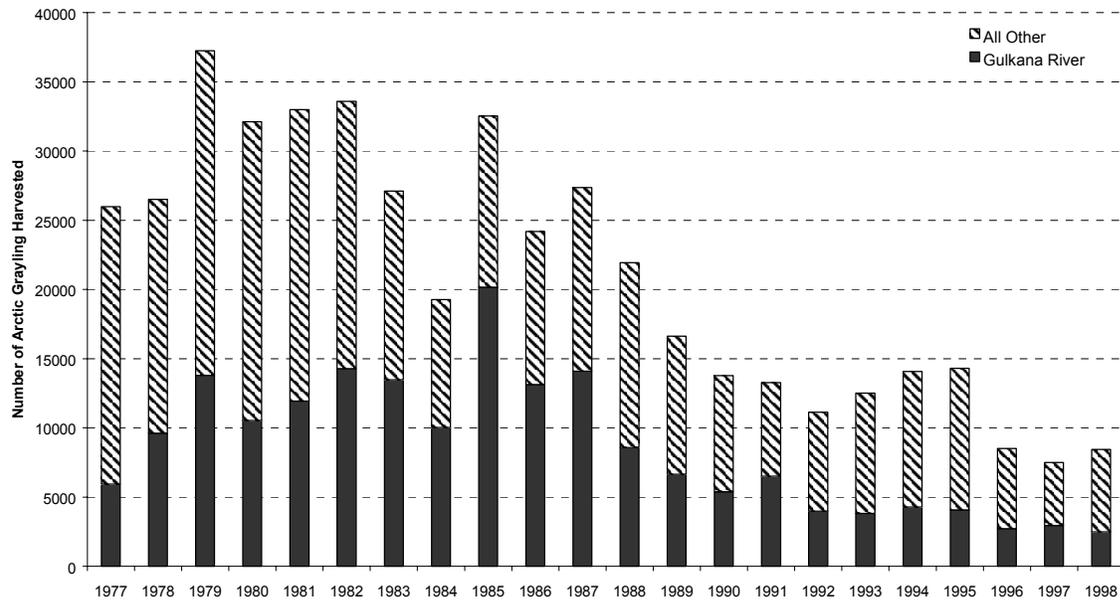
The peak harvest experienced in 1985 raised concern that the grayling stocks in the drainage were in danger of overharvest, given that grayling stocks in several interior Alaska streams were depressed when subjected to similar harvest rates. Regulations were adopted in 1988 that reduced the bag and possession limit to five fish per day. Also, past research data indicated that the maximum size of grayling observed in the Gulkana River drainage was decreasing as the result of anglers targeting larger fish (Williams and Potterville 1983). In an attempt to maintain historic size compositions, regulations were also adopted in 1988 that restricted anglers to only one grayling over 14 inches.

A research program was initiated by the Division of Sport Fish in 1986 to assess the status of the various grayling stocks of the Gulkana River drainage. Beginning in 1988, the study was conducted in conjunction with the University of Alaska and formed the basis of an M.S. thesis. Objectives of the research program were to determine stock structure, growth, annual abundance, survival, and recruitment; sustainable yields under a variety of management scenarios; and future monitoring strategies. This project was completed in June 1993 and the final report/thesis was completed in 1995 (Bosch 1995).

**Table 17.-Harvest of Arctic grayling by recreational anglers fishing UCUSMA waters, 1977-1998.**

Year	UCUS Harvest	Alaska Harvest	Percent	Region III Harvest	Percent
1977-1987 <sup>a</sup>	28,982	146,598	20	118,431	24
1988	21,937	116,324	19	90,898	24
1989	16,629	105,353	16	88,266	19
1990	13,775	64,814	21	51,281	27
1991	13,278	82,831	16	65,632	20
1992	11,125	45,073	25	33,429	33
1993	12,504	49,721	25	38,363	33
1994	14,066	63,302	22	47,183	30
1995	14,289	46,168	31	37,574	38
1996	8,509	37,238	23	28,113	30
1997	7,483	37,269	20	26,731	28
1998	8,439	39,789	21	32,054	26
<b>1988-1997<sup>a</sup></b>	<b>13,360</b>	<b>64,809</b>	<b>22%</b>	<b>50,747</b>	<b>28%</b>
<b>1993-1997<sup>a</sup></b>	<b>11,370</b>	<b>46,740</b>	<b>24%</b>	<b>35,593</b>	<b>32%</b>

<sup>a</sup> Average value for the years during the period.



**Figure 12.-Upper Copper/Upper Susitna Area Arctic grayling harvest, 1977-1998.**

**Table 18.-Harvest of Arctic grayling by recreational anglers fishing UCUSMA by drainage, averaged for 1977 – 1987 and annually from 1988-1998.**

Areas	1977-1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-1997 <sup>e</sup>	1993-1997 <sup>e</sup>
<b>Gulkana R. Drainage</b>														
Lakes	3,448	2,382	1,520	1,461	1,977	902	1,483	1,545	1,241	688	658	513	<b>1,386</b>	<b>1,123</b>
Upper River	8,955 <sup>a</sup>	5,748	4,746	3,429	4,355	2,901	2,231	2,357	2,347	1,852	1,787	1,620	<b>3,175</b>	<b>2,115</b>
Lower River		455	394	493	171	188	114	384	483	179	503	903	<b>336</b>	<b>333</b>
<b>Total</b>	<b>12,403</b>	<b>8,585</b>	<b>6,660</b>	<b>5,383</b>	<b>6,503</b>	<b>3,991</b>	<b>3,828</b>	<b>4,286</b>	<b>4,071</b>	<b>2,719</b>	<b>2,948</b>	<b>3,036</b>	<b>4,897</b>	<b>3,570</b>
<b>Upper Susitna Drainage</b>														
Lake Louise		1,855	1,576	1,613	875	481	994	1,239	1,040	570	242	993	<b>1,049</b>	<b>817</b>
Susitna/Tyone Lk		455	300	119	330	639	661	949	1,273	289	197	254	<b>521</b>	<b>674</b>
Other Lakes		0	683	646	125	218	93	301	254	626	49	34	<b>300</b>	<b>265</b>
Streams		473	497	866	693	706	1,082	1,157	1,485	920	539	232	<b>842</b>	<b>1,037</b>
<b>Total</b>	<b>4,205<sup>b</sup></b>	<b>2,783</b>	<b>3,056</b>	<b>3,244</b>	<b>2,023</b>	<b>2,044</b>	<b>2,830</b>	<b>3,646</b>	<b>4,052</b>	<b>2,405</b>	<b>1,027</b>	<b>1,513</b>	<b>2,711</b>	<b>2,792</b>
<b>Klutina R. Drainage</b>	1,037 <sup>c</sup>	1,673	1,041	544	1,092	346	681	363	285	149	127	525	<b>630</b>	<b>321</b>
<b>Tazlina R. Drainage</b>														
Mendeltna Creek	274 <sup>c</sup>	1,037	272	170	102	255	867	906	1,041	439	337	596	<b>543</b>	<b>718</b>
Other Lakes	920 <sup>c</sup>	91	122	374	353	347	206	734	733	491	333	751	<b>378</b>	<b>499</b>
Other Streams	305 <sup>c</sup>	819	760	204	842	128	518	274	581	383	14	50	<b>452</b>	<b>354</b>
<b>Total</b>	<b>1,499<sup>c</sup></b>	<b>1,947</b>	<b>1,154</b>	<b>748</b>	<b>1,297</b>	<b>730</b>	<b>1,591</b>	<b>1,914</b>	<b>2,355</b>	<b>1,313</b>	<b>684</b>	<b>1,397</b>	<b>1,373</b>	
<b>Tonsina Drainage</b>	572 <sup>c</sup>	345	629	289	296	811	814	363	261	163	59	510	<b>403</b>	<b>332</b>

-continued-

**Table 18.-Page 2 of 2.**

Areas	1977-1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-1997 <sup>c</sup>	1993-1997 <sup>c</sup>
<b>Copper R Upstream of Gulkana</b>														
Lakes	662 <sup>c</sup>	909	413	883	216	113	378	234	321	84	88	150	364	221
Streams	612 <sup>c</sup>	674	375	119	466	30	356	125	210	118	143	204	262	190
<b>Total</b>	<b>1,274<sup>c</sup></b>	<b>1,583</b>	<b>788</b>	<b>1,002</b>	<b>682</b>	<b>143</b>	<b>734</b>	<b>359</b>	<b>531</b>	<b>202</b>	<b>231</b>	<b>354</b>	<b>626</b>	<b>411</b>
<b>Copper R Downstream of Klutina<sup>d</sup></b>														
Lakes	292 <sup>c</sup>	327	666	136	11	15	317	82	166	93	191	159	200	170
Streams	122 <sup>c</sup>	146	0	0	34	0	19	41	0	56	171	0	47	57
<b>Total</b>	<b>271<sup>c</sup></b>	<b>473</b>	<b>666</b>	<b>136</b>	<b>45</b>	<b>15</b>	<b>336</b>	<b>123</b>	<b>166</b>	<b>149</b>	<b>362</b>	<b>159</b>	<b>247</b>	<b>192</b>
<b>Other Sites</b>														
Stocked Lakes	366 <sup>c</sup>	1,401	881	935	726	1,623	852	1,167	749	412	478	224	922	732
Other Lakes	1,035 <sup>c</sup>	1,346	928	1,035	68	767	334	1,238	665	487	899	272	777	725
Other Stream	1,502 <sup>c</sup>	1,801	826	459	591	655	504	664	1,154	510	668	449	783	700
<b>Total</b>	<b>3,903<sup>c</sup></b>	<b>4,548</b>	<b>2,635</b>	<b>2,429</b>	<b>1,385</b>	<b>3,045</b>	<b>1,690</b>	<b>3,069</b>	<b>2,568</b>	<b>1409</b>	<b>2045</b>	<b>945</b>	<b>2,482</b>	<b>2,156</b>
<b>Area Total</b>	<b>28,982</b>	<b>21,937</b>	<b>16,629</b>	<b>13,775</b>	<b>13,278</b>	<b>11,125</b>	<b>12,504</b>	<b>14,066</b>	<b>14,289</b>	<b>8,509</b>	<b>7,483</b>	<b>8,439</b>	<b>13,360</b>	<b>11,370</b>

<sup>a</sup> Includes lower river estimated harvest.

<sup>b</sup> Includes all upper Susitna lakes and streams.

<sup>c</sup> Includes 1983-1986 average only. Prior to 1983, this harvest was included in "other waters" in the SWHS report.

<sup>d</sup> Does not include the Tonsina River drainage.

<sup>e</sup> Average value for the years during the period.

**Table 19.-Harvest and catch of Arctic grayling by recreational anglers fishing the Gulkana River drainage, 1977-1998.**

Year	Gulkana River Drainage Harvest			Percent total UCUS harvest	Number Caught	Percent Released
	Rivers & Streams	Lakes	Total			
1977-1987	8,955	3,448	12,403	43%		
1988	6,203	2,382	8,585	39%		
1989	5,140	1,520	6,660	40%		
1990	3,922	1,461	5,383	40%	40,768	87%
1991	4,526	1,977	6,503	49%	34,827	81%
1992	3,089	902	3,991	32%	32,316	88%
1993	2,345	1,483	3,828	31%	45,865	92%
1994	2,741	1,545	4,286	30%	37,991	89%
1995	2,830	1,241	4,071	28%	29,102	86%
1996	2,031	688	2,719	32%	33,051	92%
1997	2,290	658	2,948	39%	32,155	91%
1998	2,523	513	3,036	36%	43,543	93%
<b>1988-1997<sup>a</sup></b>	<b>3,512</b>	<b>1,386</b>	<b>4,897</b>	<b>36%</b>	<b>2,972</b>	<b>88%</b>
<b>1993-1997<sup>a</sup></b>	<b>2,447</b>	<b>1,123</b>	<b>3,570</b>	<b>32%</b>	<b>2,447</b>	<b>90%</b>

<sup>a</sup> Average value for the years during the period.

### **Recent Fishery Performance**

The restrictions placed on the fishery during 1988 have significantly reduced the total harvest of grayling in the Gulkana River drainage (Table 18). The 1998 grayling harvests were slightly higher than those of 1996 and 1997 (Figure 12). No assessment was conducted on the Gulkana River in 1999, it is assumed that grayling harvest remained stable.

Estimates of abundance indicate that current exploitation rates on the major stock units of grayling in the Gulkana River drainage appear sustainable given current harvest levels. Data from the research program also indicate that the restriction limiting anglers to only one grayling over 14 inches is allowing the population to reach and maintain historic levels.

### **Management Objectives**

Grayling fisheries in the Gulkana River drainage are managed to assure maintenance of historic age and size composition and stock abundance. Harvest and catch of Arctic grayling are monitored by the SWHS. In 1998, stock assessment was conducted for comparison of age and size composition to previous assessment studies conducted in the early 1990's (Bosch 1995).

### **Fishery Outlook**

It is anticipated that harvest levels of Arctic grayling will remain at recent levels. The current regulations appear to be maintaining the population at historic levels.

### **Recent Board of Fisheries Actions**

During the 1996 meetings the BOF passed a proposal submitted by the department to establish a catch and release grayling fishery in the upper Gulkana River drainage (upstream of Paxson Lake). The intent of this regulation is to protect a small population of large sized grayling (> 18 inches) in the Gunn and Fish Creek drainages. The upper Gulkana River above Paxson Lake is easily accessible from the Richardson Highway by foot and ATV. The research conducted by Bosch (1995) indicated that the upper Gulkana grayling population was separate from the Middle Fork and mainstem populations, and that though the population is small, the fish are of large size. The department determined that this population would be a candidate for a trophy catch and release fishery in order to preserve the current size composition of the population. This regulation has not affected the overall harvest of grayling in the Gulkana drainage, it may be that the majority of grayling caught in the upper Gulkana River were released prior to the regulation.

### **Current Issues**

Overall, Gulkana River drainage grayling stocks appear healthy. The ADF&G is planning to develop a management plan for grayling in the Gulkana River drainage. The plan will strive to provide a diversity of fishing opportunities for grayling in the Gulkana River drainage under sustained yield management. This plan will be distributed for public comment and after completion will be forwarded to the BOF at a future scheduled meeting dealing with UCUSMA issues, likely the fall of 2002. Until completion of this management plan, continuation of the current management strategy and regulatory regime is recommended.

Data collected through the statewide mail survey suggest that many anglers fishing grayling in the Gulkana River drainage are practicing catch and release. Anglers have released over 90% of their catch on average since 1990 (Table 19). Assuming a 5% release mortality rate, this appears acceptable given current harvest and abundance levels.

## **Ongoing and Recommended Research and Management**

An objective of the research program was to develop a plan for monitoring the status of grayling stocks in the Gulkana River drainage. It is recommended that the following monitoring program be conducted to assure the sustained yield of the fishery. This consisted of annual monitoring of the mainstem stock for age composition and monitoring every three to five years for the upper reaches (upstream of Paxson Lake). The middle fork stock should be monitored by an abundance estimate and age composition every three to five years. Stock assessment was conducted in the mainstem for 1998, to determine age and length composition. Similar assessment should be conducted in the near future on the upper reaches to determine the impacts of the recent regulatory change.

## **LAKE TROUT SPORT FISHERIES**

### **Background and Historical Perspective**

Lake trout stocks of the UCUSMA provide significant fishing opportunities and economic benefit to the people of Alaska (Figure 13). This is the only area in Alaska where lake trout can be taken in such quantities and range of sizes along the road system. From 1977 through 1987, an average of 7,386 lake trout were harvested from UCUSMA lakes and streams annually, accounting for 42% of the statewide lake trout harvest and 71% of the AYK region harvests over this period (Table 20). From 1988-1997, lakes and streams of the UCUSMA have accounted for over 36% of the annual statewide harvest of lake trout and 67% of the AYK region harvests.

Most of the lake trout harvest in the UCUSMA has come from lakes within the Tyone River (Lake Louise and Susitna and Tyone lakes) and Gulkana River (Paxson, Susitna, and Crosswind lakes) drainages (Table 21). From 1988-1997, these two drainages have accounted for 89% of the UCUSMA lake trout harvest and an average of 33% of the statewide lake trout harvest. Paxson Lake and Lake Louise have supported the largest fisheries for lake trout in the UCUSMA and Alaska. Together, these two lakes have accounted for 50% of the UCUSMA lake trout harvest and an average of 18% of the annual statewide harvest of lake trout from 1988-1997. Other major sport fisheries for lake trout in the UCUSMA occur in Summit and Crosswind lakes (in the Gulkana River drainage) and in Susitna Lake (in the Tyone River drainage).

Prior to 1987, anglers fishing UCUSMA waters were allowed a daily take of two lake trout over 20 inches and 10 lake trout under 20 inches. Under these regulations, lake trout harvests from UCUSMA waters were relatively stable, averaging about 7,500 (Table 20). A study conducted in 1986, however, suggested that eight of nine lake populations in the upper Copper and Delta river drainages were being harvested well over the annual harvest estimated to be sustainable based on lake trout populations in Canada and the Great Lakes (Burr 1987). As a result of these research findings, the daily bag limit for UCUSMA waters was reduced to two fish and a minimum size limit of 18 inches was adopted for Summit and Paxson lakes, Lake Louise, and the remainder of the Tyone River drainage in 1987. The minimum size limit was imposed to allow female lake trout to spawn once before reaching harvestable size.

A research program was initiated in 1990 to evaluate the status of lake trout fisheries in the UCUSMA. The goal of the research program was to determine appropriate management strategies that assure the sustained yield of lake trout in UCUSMA lakes. The study was conducted primarily in Paxson Lake and Lake Louise.

In 1994, the minimum size limit for lake trout was increased from 18 to 24 inches in the Tyone drainage, Crosswind, Paxson and Summit lakes; the bag limit was reduced from two to one lake

trout in the Tyone drainage and Crosswind Lake. The minimum size limit was increased to better protect female lake trout spawning for the first time in the Tyone drainage and Crosswind Lake and to reduce the harvest to a sustainable level in Paxson and Summit lakes. The bag limit reduction was imposed on lakes with lake trout of greater than average length to prevent effort from being concentrated on these size classes.

### **Recent Fishery Performance**

Since adoption of the new regulations in 1987 and further restrictions in 1994, lake trout harvests from UCUSMA lakes and streams have fallen. The 1998 harvest of 1,944 lake trout was approximately the same as the 1996 and 1997 harvests (Table 21). In general, harvests from both the Gulkana River and Tyone River drainages have declined since 1994.

### **Management Objectives**

Two methods are available to assess the current status of lake trout fisheries in the UCUSMA. The first involves estimating the level of sustainable harvests for lakes based on an observed lake trout production-lake surface area relationship for northern latitude lakes (Healy 1970). Healy found that northern latitude lakes could sustain harvests at a rate of approximately  $0.5 \text{ kg ha}^{-1} \text{ y}^{-1}$ . Because estimates of the average weight of lake trout from most lakes in the UCUSMA are unavailable, the sustainable harvest of lake trout has been estimated based on the probable range of lake trout weights: 1.0 to 3.5 kg. Based on Healy's approach and these assumed weights, lakes in the UCUSMA which are less than 500 ha appear capable of sustaining harvests of 70 to 250 lake trout annually depending, in part, upon their elevation, depth, acreage, and available spawning habitat. Based on these estimates, the harvest of lake trout from lakes smaller than 500 ha appears to be slightly below estimates of sustainable yield. For lakes larger than 500 ha which are not road accessible (e.g., Crosswind, Tanada, and Copper lakes), harvests also appear below estimates of sustainable yield. These larger lakes appear capable of sustaining annual harvests from about 250 to 700 lake trout.

For lakes larger than 500 ha which are road accessible (e.g., Paxson, Summit, Susitna lakes and Lake Louise), Healy's methods plus an alternate approach based on the volume of water in the preferred temperature range for lake trout ( $8^{\circ}$  to  $12^{\circ}\text{C}$ ), termed the thermal habitat volume (THV), could be used to estimate the current status of lake trout stocks in these lakes. Based on the THV approach, the sustainable yield for Paxson Lake is  $0.92 \text{ kg ha}^{-1} \text{ y}^{-1}$ , for Lake Louise  $0.89 \text{ kg ha}^{-1} \text{ y}^{-1}$ , and for Susitna Lake  $0.90 \text{ kg ha}^{-1} \text{ y}^{-1}$ . Thermal habitat volume information is not available for Summit Lake. Using the average weight of lake trout harvested in each lake to convert yields to numbers of fish, the sustainable harvest from Paxson Lake is approximately 800 trout, Lake Louise 2,123 trout, and Susitna Lake 1,191 trout. These yields compare to yields based on Healy's approach of 430 trout from Paxson Lake, 1,740 trout from Lake Louise, 660 trout from Susitna Lake, and 440 trout from Summit Lake. Based on these estimates, current harvests of lake trout appear to be below sustainable levels.

Estimates of maximum sustainable yield based on a Lake Area model (Healy) and the THV model have the potential for overestimating sustainable harvests. Both models were developed in Ontario, Canada. These lakes have greater productivity than Alaskan lakes, and as a result the estimates of sustainable yield are erroneously high for UCUSMA lakes, and must be used only as a signal for regulatory adjustments or stock assessment. Lake trout are slow to mature and have low reproductive potential, overexploitation could result in population declines that would take multiple years for recovery. Based upon this information, a conservative management strategy is

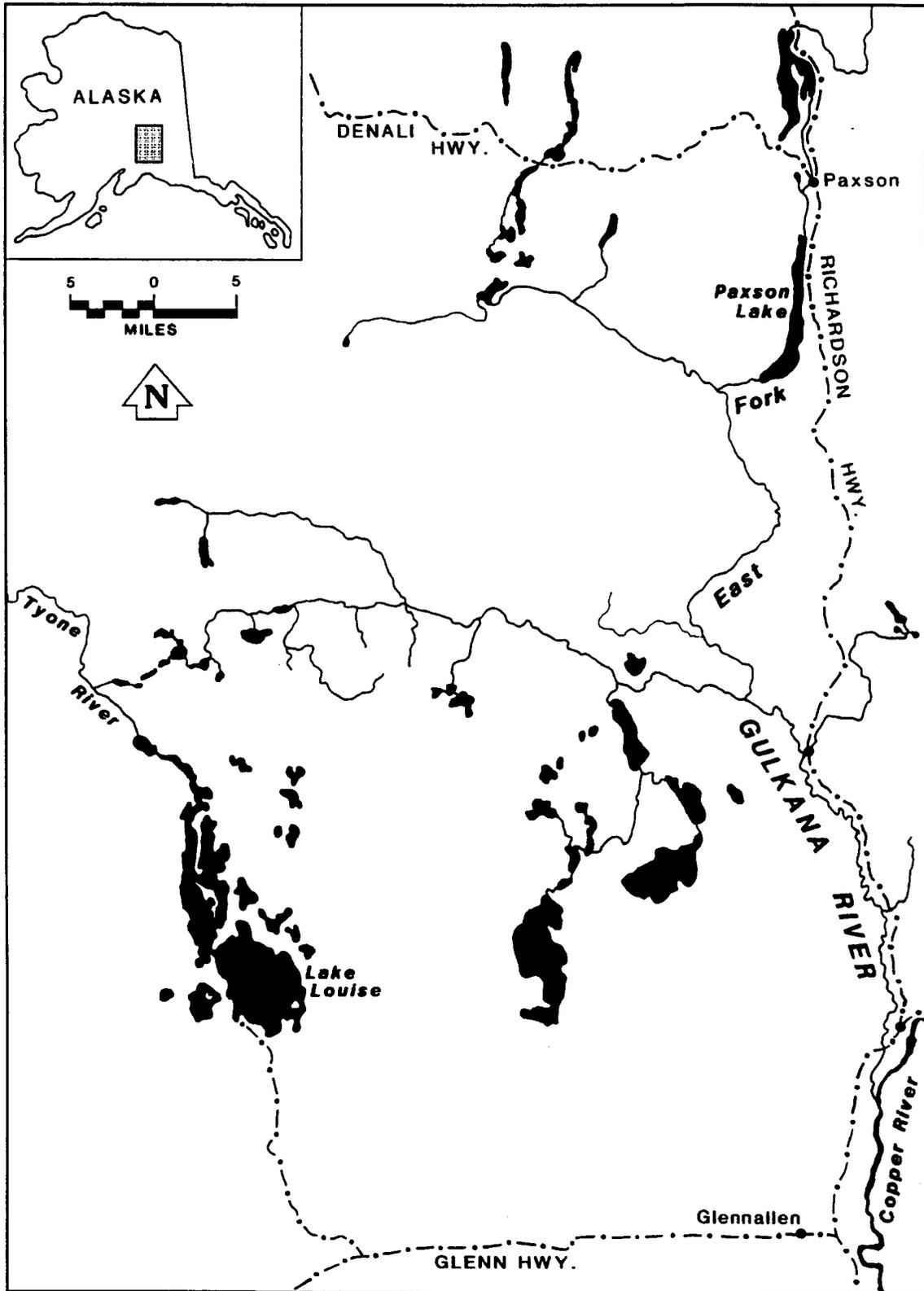


Figure 13.-Map of major lake trout fisheries in the UCUSMA.

**Table 20.-Harvest of lake trout by recreational anglers fishing UCUSMA waters, 1977-1998.**

Year	UCUS Harvest	Alaska Harvest	Percent	Region III Harvest	Percent
1977-1987 <sup>a</sup>	7,386	17,658	42	10,354	71
1988	6,277	17,193	36	9,007	70
1989	7,147	17,070	42	10,752	66
1990	5,503	12,602	44	7,246	76
1991	4,864	13,772	35	7,897	62
1992	4,251	12,525	34	6,442	66
1993	4,569	13,094	35	7,167	64
1994	4,058	11,374	36	5,889	69
1995	2,934	8,412	35	4,266	69
1996	2,107	5,852	36	2,951	71
1997	1,741	6,079	29	3,005	58
1998	1,944	6,770	29	3,062	63
<b>1988-1997<sup>a</sup></b>	<b>4,345</b>	<b>11,797</b>	<b>36%</b>	<b>6,462</b>	<b>67%</b>
<b>1993-1997<sup>a</sup></b>	<b>3,082</b>	<b>8,962</b>	<b>34%</b>	<b>4,656</b>	<b>66%</b>

<sup>a</sup> Average value for the years during the period.

**Table 21.-Harvest of lake trout by recreational anglers fishing UCUSMA waters by drainage, averaged for 1977 – 1987 and annually from 1988-1998.**

Areas	1977-87	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-1997 <sup>f</sup>	1993-1997 <sup>f</sup>
<b>Gulkana Drainage</b>														
Paxson Lake	1,248 <sup>a</sup>	1,310	1,557	2,139	1,248	1,118	778	262	507	259	437	231	<b>962</b>	<b>449</b>
Summit Lake	724 <sup>a</sup>	528	863	968	981	524	344	353	224	102	135	67	<b>502</b>	<b>232</b>
Crosswind Lake	467	382	272	306	463	378	311	429	94	295	81	269	<b>301</b>	<b>242</b>
Other Lakes	98 <sup>b</sup>	365	9	68	28	85	256	66	0	28	0	26	<b>91</b>	<b>70</b>
Upper River	115 <sup>c</sup>	782	159	102	70	155	20	44	90	46	135	17	<b>160</b>	<b>67</b>
Lower River		0	19	0	0	0	0	0	0	0	0	0	<b>2</b>	<b>0</b>
<b>Total</b>	<b>2,716</b>	<b>3,367</b>	<b>2,879</b>	<b>3,583</b>	<b>2,790</b>	<b>2,260</b>	<b>1,709</b>	<b>1,154</b>	<b>915</b>	<b>730</b>	<b>788</b>	<b>610</b>	<b>2,018</b>	<b>1,059</b>
<b>Upper Susitna Drainage</b>														
Lake Louise	2,696 <sup>d</sup>	1,801	1979	1,036	1,332	1,033	1,316	1,463	946	562	498	709	<b>1,197</b>	<b>957</b>
Susitna Lake		418	441	187	308	324	669	426	200	324	44	146	<b>334</b>	<b>333</b>
Other Lakes	156	55	761	119	182	348	295	308	173	232	103	109	<b>258</b>	<b>222</b>
Streams	0	0	0	0	14	0	19	140	199	37	0	0	<b>41</b>	<b>79</b>
<b>Total</b>	<b>3,176</b>	<b>2,274</b>	<b>3,181</b>	<b>1,342</b>	<b>1,836</b>	<b>1,705</b>	<b>2,299</b>	<b>2,337</b>	<b>1,518</b>	<b>1,155</b>	<b>645</b>	<b>964</b>	<b>1,829</b>	<b>1,591</b>
<b>Klutina Drainage</b>	217 <sup>b</sup>	163	150	68	84	39	28	74	71	19	31	13	<b>73</b>	<b>45</b>
<b>Tazlina Drainage</b>	41 <sup>b</sup>	55	0	51	42	62	0	15	0	9	27	107	<b>26</b>	<b>10</b>
<b>Copper River Drainage</b>														
Upstream of Gulkana	136 <sup>b</sup>	400	506	102	42	23	145	309	164	83	86	106	<b>186</b>	<b>157</b>
Downstream of Klutina	17 <sup>b</sup>	0	103	238	14	0	133	22	20	0	0	0	<b>53</b>	<b>35</b>
<b>Other Sites</b>	592 <sup>b</sup>	18	328	119	56	162	255	147	246	111	164	144	<b>161</b>	<b>185</b>
<b>AREA TOTAL</b>	<b>7,386<sup>e</sup></b>	<b>6,277</b>	<b>7,147</b>	<b>5,503</b>	<b>4,864</b>	<b>4,251</b>	<b>4,569</b>	<b>4,058</b>	<b>2,934</b>	<b>2,107</b>	<b>1,741</b>	<b>1,944</b>	<b>4,345</b>	<b>3,082</b>

<sup>a</sup> Includes 1984-1987 average only. Prior to 1984 Paxson and Summit lake harvests were combined.

<sup>b</sup> Includes 1983-1987 average only. Prior to 1983, this harvest was included in “other waters” in the SWHS report.

<sup>c</sup> Includes lower river harvest.

<sup>d</sup> Includes Susitna and Tyone lake harvest estimates.

<sup>e</sup> Includes harvest for entire area 1977-1986.

<sup>f</sup> Average value for the years during the period.

desired for the UCUSMA lakes, maintaining harvest levels below the lowest estimates of maximum sustainable yield determined by the methods described above.

Fishery objectives have yet to be defined for specific UCUSMA lake trout fisheries. To date, regulations have been written to assure that maximum sustained yield of the UCUSMA lake trout resource is not exceeded. It is likely that as fishery objectives are defined for specific lake trout fisheries, they will center on assuring for optimal, rather than maximal, sustained yield. For some lakes, optimal sustained yield will equal maximum sustained yield; for other lakes, however, optimal sustained yield will be lower than maximum sustained yield to accommodate angler's wishes for trophy or other types of special fisheries.

### **Fishery Management**

Under a conservative management strategy many of the regulations in the UCUSMA area have conservative bag limits and size restrictions. The size restrictions provide an opportunity for the majority of lake trout to spawn at least once prior to harvest. Bag limits in the Tyone River drainage are limited to one fish per day; any increase in harvest opportunity could potentially result in a doubling of harvests. Assessment of lake trout stock status is currently based on evaluation of the SWHS. Stock assessment was discontinued in 1995 and information regarding the 1999 fishery will not be available until 2000. One proposal regarding lake trout was submitted to the 1999 BOF meeting requesting an increased bag limit to two lake trout on Crosswind Lake.

### **Fishery Outlook**

Under the current regulations, it is anticipated that harvests of lake trout will remain stable. Harvests have declined with the 1994 regulation changes, particularly in the Gulkana drainage where the 5-year average is half of the 10-year average. The upper Susitna drainage has not seen as large a decline, though bag limits were reduced from two to one fish in 1994. The lake trout populations in the Tyone drainage and Crosswind Lake are larger on average than Gulkana drainage trout populations and the 24-inch minimum size restriction would have a greater impact on those lakes. This is likely the reason the Gulkana drainage lakes saw a larger decline in harvests.

### **Recent Board of Fisheries Action**

No proposals regarding lake trout were considered by the Board of Fisheries during the 1996 meeting.

### **Current Issues**

The present regulatory regime should protect all UCUSMA lake trout stocks from overharvest and allow increase abundance. Angler preferences for small lake trout to eat and trophies to admire are not being met in the larger lakes in the UCUSMA, however. A protected slot limit would achieve such an end.

Protected slot limits increase abundance by protecting the most productive fish while allowing a harvest of abundant small fish and less abundant but larger trophy-sized fish. Protected slot limits are in use on lake trout fisheries in Ontario but, to date, their effect has not been determined (Hicks and Quinn 1990). Inappropriate application of slot limits was found to crop off larger fish and create a stockpile of small fish in a brown trout population studied by Barnhart and Engstrom-Heg (1984).

Slot limits are supported by anglers at Lake Louise and Susitna lakes; but managers feel that a slot limit is not appropriate for Paxson Lake at this time as the abundance of immature lake trout has not been estimated. Increasing effort on this element of the population might reduce abundance by removing too much of the potential spawning stock needed to rebuild or sustain the population.

### **Recommended Research and Management**

Research on lake trout has been discontinued. Fall sampling at Lake Louise and Paxson Lake ended in 1995, a final spring/summer sampling event occurred in 1997 (Szarzi 1995, Szarzi and Bernard 1997, Szarzi et al. 1999). The applicability of thermal habitat models to Alaskan lake trout populations has not been verified. The feasibility of slot limits needs to be examined in select fisheries (Tyone drainage lakes, Crosswind Lake), in conjunction with a monitoring program to determine length and age composition changes. More information is needed regarding the characteristics of the life history and harvest of other lake trout stocks which have the potential to be overexploited including: size and age structure, maturity schedules, abundance and yield, and the contribution of the winter fishery to the lake trout harvests. Lakes of particular interest for stock assessment are Copper and Tanada lakes, accessed from the Nabesna Road via a 12-mile trail, Kimball Pass Lake, accessed on a 16-mile trail from the Richardson Highway, and Klutina Lake accessed from the Richardson Highway by the Klutina River Road (Brenwick-Craig Road).

## **BURBOT SPORT FISHERIES**

### **Background and Historical Perspective**

The many lakes and rivers of the UCUSMA (Figure 14) support some of the largest populations of burbot in Alaska and, prior to 1987, supported an average of 58% of the statewide sport harvest of this species (Table 22). The largest fishery has historically occurred in the Lake Louise complex (consisting of Lake Louise, Susitna and Tyone lakes; Table 23). Other significant fisheries occur in the various lakes of the Gulkana River drainage (e.g., Paxson, Summit, and Crosswind lakes), Tolsona and Moose lakes, and various smaller remote lakes scattered throughout the UCUSMA. The fishery occurs primarily during the winter months from November to April using closely attended set or hand jig lines.

Prior to 1979, there were no daily bag or possession limits or gear restrictions governing the harvest of burbot in the UCUSMA. In recognition of burbot as an important sport species to be managed for sustained yield, a daily bag and possession limit of 15 burbot was enacted prior to the 1979 winter fishery. Anglers were allowed to harvest burbot by fishing multiple hand lines and unattended set lines with no more than a total of 15 hooks plus two hand-held jig hooks. Under these regulations, the sport harvest of burbot from UCUSMA waters increased dramatically, peaking in 1985 when a record harvest of 19,355 burbot were taken.

The rapid growth in the fishery raised concern that several UCUSMA burbot stocks were either being, or in imminent danger of becoming, overexploited. In response, in 1987 daily bag limits and the number of hooks an angler could fish in area lakes were reduced to five, whether fished on unattended set-lines or hand held jig-lines. In several road accessible lakes (Lake Louise, Tyone, Susitna, Tolsona, Moose, and Summit lakes), the daily bag and possession limits were further reduced to two fish and anglers were restricted to using only two hooks. Also, the sport fishery for burbot in Hudson Lake was closed by emergency order based on findings that this

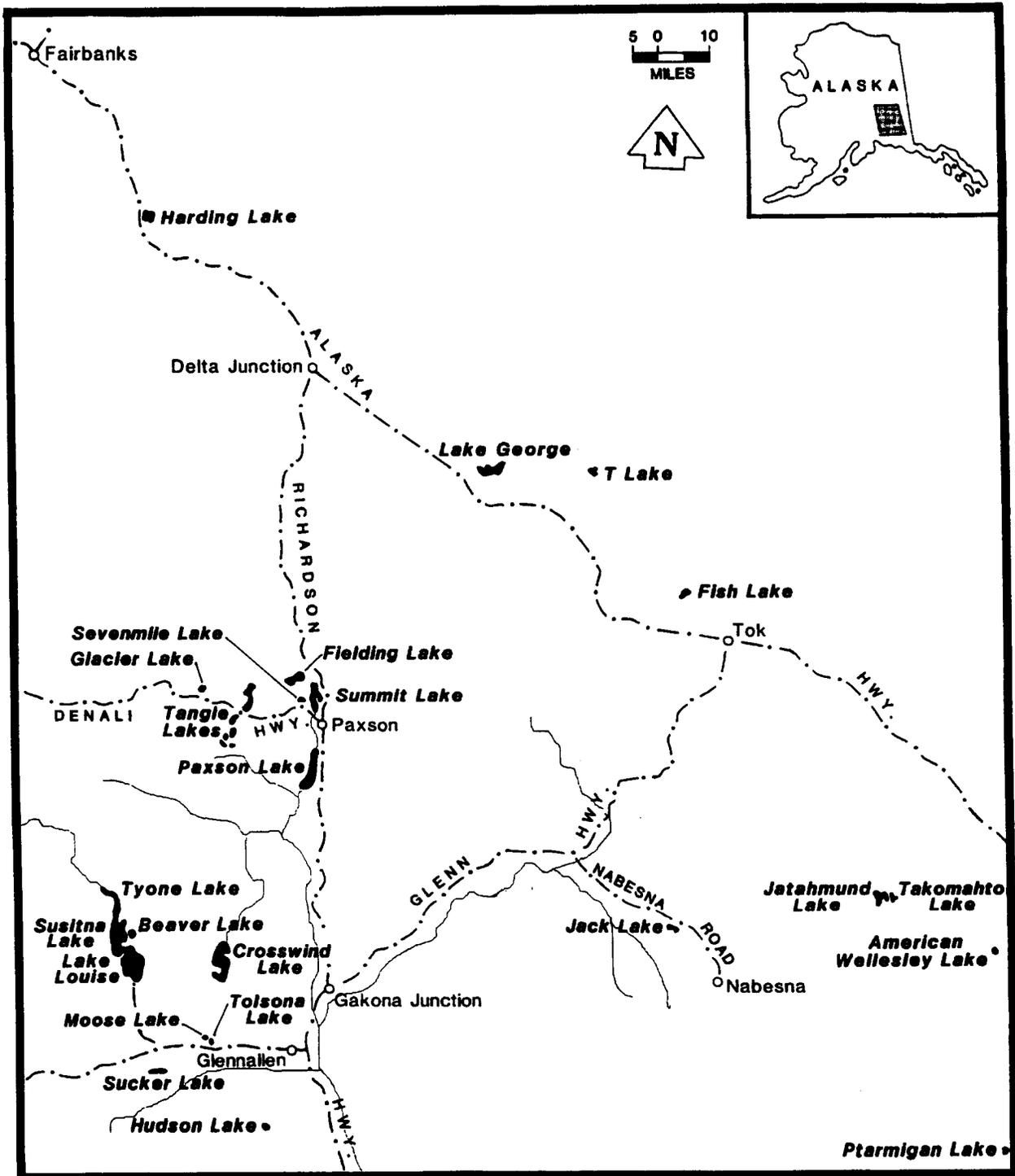


Figure 14.-Lakes supporting major burbot fisheries in the UCUSMA.

**Table 22.-Harvest of burbot by recreational anglers fishing UCUSMA waters, 1977-1998.**

Year	UCUS Harvest	Alaska Harvest	Percent	Region III Harvest	Percent
1977-1987 <sup>a</sup>	8,590	14,882	58	12,779	67
1988	3,747	9,478	40	7,625	49
1989	3,396	9,268	37	8,290	41
1990	1,836	10,577	17	7,319	25
1991	793	4,882	16	3,848	21
1992	1,495	7,245	21	5,748	26
1993	1,694	9,858	17	8,160	21
1994	2,869	10,868	26	8,572	33
1995	995	7,128	14	6,270	16
1996	1,039	3,796	27	3,168	33
1997	829	6,452	13	5,075	16
1998	1,493	6,965	21	5,365	28
<b>1988-1997<sup>a</sup></b>	<b>1,869</b>	<b>7,955</b>	<b>23</b>	<b>6,408</b>	<b>28</b>
<b>1993-1997<sup>a</sup></b>	<b>1,485</b>	<b>7,620</b>	<b>19</b>	<b>6,249</b>	<b>24</b>

<sup>a</sup> Average value for the years during the period.

**Table 23.-Harvest of burbot caught by recreational anglers fishing in the UCUSMA by drainage, averaged for 1977 – 1987 and annually from 1988-1998.**

Areas	1977-87	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-1997 <sup>d</sup>	1993-1997 <sup>d</sup>
<b>Gulkana River Drainage</b>														
Lakes	857	637	413	561	343	304	257	629	340	171	443	682	410	368
Streams	82	18	19	17	27	127	0	0	7	54	50	17	32	22
<b>Total</b>	<b>998</b>	<b>655</b>	<b>432</b>	<b>578</b>	<b>370</b>	<b>431</b>	<b>257</b>	<b>629</b>	<b>347</b>	<b>225</b>	<b>493</b>	<b>699</b>	<b>442</b>	<b>390</b>
<b>Upper Susitna Drainage</b>														
Lake Louise	4,214 <sup>a</sup>	655	976	255	0	0	0	0	0	0	0	0	189	0
Susitna/Tyone Lakes		273	656	323	45	533	172	766	137	195	211	149	331	296
Other Waters	105 <sup>b</sup>	200	66	0	54	8	0	145	46	53	42	118	61	57
<b>Total</b>	<b>5,157<sup>c</sup></b>	<b>1,128</b>	<b>1,698</b>	<b>578</b>	<b>99</b>	<b>541</b>	<b>172</b>	<b>911</b>	<b>183</b>	<b>248</b>	<b>253</b>	<b>267</b>	<b>581</b>	<b>353</b>
<b>Klutina River Drainage</b>	10 <sup>c</sup>	36	0	0	0	0	0	0	0	0	0	0	4	0
<b>Tazlina Drainage</b>														
Moose/Tolsona	1,915 <sup>c</sup>	73	94	408	108	127	21	93	23	88	0	0	104	45
Hudson	450	327	0	0	0	0	0	31	103	0	0	59	46	27
Other	414 <sup>c</sup>	546	403	0	81	245	86	114	0	9	21	401	151	46
<b>Total</b>	<b>2,942<sup>c</sup></b>	<b>946</b>	<b>497</b>	<b>408</b>	<b>189</b>	<b>372</b>	<b>107</b>	<b>238</b>	<b>126</b>	<b>97</b>	<b>21</b>	<b>460</b>	<b>300</b>	<b>118</b>
<b>Copper River</b>														
Upstream of Gulkana	74 <sup>c</sup>	746	459	238	0	8	611	799	122	80	0	50	306	322
Downstream of Klutina	10 <sup>b</sup>	0	113	0	0	0	0	42	34	44	0	0	23	24
<b>Other Sites</b>	1,144 <sup>c</sup>	236	197	34	135	143	493	250	183	345	62	17	208	267
<b>Area Total</b>	<b>8,590<sup>d</sup></b>	<b>3,747</b>	<b>3,396</b>	<b>1,836</b>	<b>793</b>	<b>1,495</b>	<b>1,640</b>	<b>2,869</b>	<b>995</b>	<b>1,039</b>	<b>829</b>	<b>1,493</b>	<b>1,864</b>	<b>1,474</b>

<sup>a</sup> Includes Susitna and Tyone lake harvest estimates.

<sup>b</sup> Harvest from 1986 only.

<sup>c</sup> Includes 1983-1987 average harvest estimate only. Prior to 1983, this harvest was included in “other waters” in the SWHS report.

<sup>d</sup> Average of total annual harvest for the years during the period.

burbot stock had been severely overexploited and was depressed (Lafferty and Vincent-Lang 1991).

During its 1988 meeting, the Board of Fisheries adopted a management plan for the burbot fisheries in lakes of the UCUSMA. The plan was adopted as regulation (5 AAC 52.045) to insure that the department had the necessary tools through which to manage the area's lake burbot fishery for *maximum sustained yield and opportunity to participate*. In order to achieve this management objective, the plan gave the department the authority to use time and area closures *and* method and means restrictions to manage the area's lake burbot sport fisheries. In adopting the plan, the BOF stated its desire to not have the bag limits for burbot reduced to less than two for road accessible lakes and five for remote lakes, as it was considered unreasonable by Board members to participate in these fisheries at lower bag limits.

Further actions were implemented during 1989 under the newly adopted management plan. An emergency order was issued that closed the burbot fishery in Lake Louise based on research findings that showed the lake's burbot stocks had become severely depressed due to overfishing. In addition, an emergency order was issued to keep the burbot fishery in Hudson Lake closed, as research showed that burbot in this lake remained depleted. Emergency regulations were also enacted that eliminated set-lines from the sport fishery in all remaining lakes of the Tyone River drainage, given that anglers had begun to seek out previously unexploited lakes in the Tyone River drainage in response to restrictions and closures placed on other area lakes (Lafferty and Vincent-Lang 1991).

A research program was initiated in 1986 to evaluate the life history of interior Alaska burbot and to determine stock status and sustained yields of burbot fisheries in the UCUSMA. The goal of the research program has been to determine appropriate management strategies that assure the maximum sustained yield of burbot from UCUSMA lakes. The study has been conducted in a variety of lakes. Results to date have provided managers with the tools to determine stock status using a variety of assessment methods and an estimate of the productivity of the area's burbot fisheries. Annual results of the research project are summarized in Lafferty et al. (1990-1992), Lafferty and Bernard (1993), Taube et al. (1993), and Taube and Bernard (1994).

Although the more restrictive regulations greatly reduced harvest in the burbot fisheries of the UCUSMA, managers remained faced with a number of biological and social concerns regarding the management of the area's burbot fisheries. For this reason, managers supported a new approach to the administration of the UCUSMA lake burbot fisheries. Various options were considered; however, managers submitted a proposal to the Board at its 1991 meeting calling for the elimination of *unattended* set lines from all burbot fisheries in the UCUSMA. This proposal was intended to reduce angler efficiency, thereby providing protection from overexploitation to small burbot stocks in the area. Managers believe this action should assure the long-term opportunity to fish for and harvest burbot in the UCUSMA.

Lake Louise and Hudson Lake were also closed to burbot fishing at the 1991 Board meeting. Both lakes had been closed through emergency orders for the past several years and were expected to be closed through additional emergency orders into the future. A decision was therefore made to close these fisheries through regulation.

Following stock assessment in 1993, the burbot population in Hudson Lake had recovered sufficiently to open the lake to harvest. In the fall, of 1993 Hudson Lake was opened by

emergency order, with a bag limit of two burbot. During the 1994 BOF meeting, the department submitted a proposal to reopen Hudson Lake to burbot through regulation. In addition, a proposal to allow limited use of unattended setlines in the Copper River was submitted jointly by ADF&G and the Copper Basin Advisory Committee. The Board of Fisheries approved both recommendations but they could not be implemented due to improper notification of the regulation proposal. The proposals were resubmitted and approved at the BOF meeting in December 1996.

### **Recent Fishery Performance**

With the adoption of the more conservative regulations, harvests of burbot from UCUSMA waters decreased (Table 22). The harvest of 793 burbot during 1991 was the lowest on record. The reduction in harvest has allowed some of the previously overexploited burbot stocks in smaller lakes (e.g., Tolsona, Moose and Hudson lakes) and moderately sized lakes (e.g., Susitna and Paxson lakes) to recover to permit sustainable fisheries. For some lakes, however, these sustainable yields are substantially lower than maximum sustained yields the fisheries are capable of supporting. Larger lakes which were severely overexploited (e.g., Lake Louise) in the early to mid 1980s remain depressed. Stocks in larger lakes take longer to recover from overexploitation than do smaller and moderately-sized lakes. In Lake Louise, historically the largest burbot fishery in Alaska, the burbot stock remains low. The number of mature burbot in this lake, however, has leveled off at 4,000 in recent years (Taube and Bernard 1994). The current level of burbot abundance in this lake, although stable, remains less than the minimal abundance level of 7,000 established by managers to open the fishery. Once opened, only limited fishing will be allowed so that the stock can rebuild to permit a fishery capable of maximum sustained yield. Unfortunately, a lack of recruitment into the Lake Louise burbot population continues to slow the recovery process.

Stock assessment on Tolsona Lake has continued on a yearly basis. Sampling in 1997 indicated a drastic decline in abundance between 1996 and 1997. This was attributed to environmental conditions, summer kill in 1990 and 1991, and possibly in 1992, 1994, 1995, and not a result of overfishing. Closure of the fishery by emergency order occurred in early 1998 (Taube and Bernard *in prep*). Stock assessment will continue in Tolsona Lake and the fishery will reopen when the population rebuilds to 1,200 mature burbot.

The harvest of 1,493 burbot in 1998 was the highest since 1994. The 1998 harvest was below the 10-year average and near the 5-year average harvest. Harvests from 1999 are expected to be at or near the 5-year average.

### **Management Objectives**

Based on the lake burbot management plan (5 AAC 52.045), the burbot fisheries in lakes of the UCUSMA are to be managed for *maximum sustained yield and opportunity to participate*. In order to achieve this fishery objective, the plan gives the department the authority to use time and area closures *and* method and means restrictions to manage the area's burbot sport fisheries. Healthy stocks are managed to permit maximum sustained yield while depressed stocks are managed to allow the stocks to rebuild. Fishing is permitted on some depressed stocks, however exploitation levels allow the stocks to rebuild to permit a fishery capable of maximum sustained yield.

The management goal is to develop an orderly fishery. As these fisheries rebuild, it is hoped to provide between 10,000 to 15,000 angler days of ice fishing opportunity with a harvest of about 5,000 burbot on an annual basis in the UCUSMA.

### **Fishery Management**

The majority of burbot fisheries in the UCUSMA are assessed through the SWHS. Several lakes of concern are sampled on a yearly or 3-year rotation. These lakes currently include Tolsona, Hudson, and Lake Louise. Assessment includes estimation of abundance, catch per unit effort (CPUE), and length composition. Tolsona Lake has been assessed annually since 1986, following the population decline in 1996 and 1997 the population is slowly rebuilding, but will remain closed by emergency order until historic population levels are attained. Lake Louise remains closed by regulation and assessment was conducted in 1999. No results are currently available but sampling through 1996 indicated that the population had stabilized, but was not increasing. Hudson Lake was re-opened to burbot fishing in 1993 and was scheduled to be sampled in 1999, but do to staff shortages and lack of access permission from Ahtna Native Corporation, sampling was postponed.

### **Fishery Outlook**

Based upon current regulations the harvest of burbot in the UCUSMA should remain stable. There may be a slight increase in harvest from the mainstem Copper River if the BOF passes the Department submitted proposal to eliminate the Personal Use burbot fishery and allow for unattended setlines year round on the Copper River.

### **Recent Board of Fisheries Actions**

At the BOF meeting in December 1996 the two proposals that had been passed at the 1994 meeting, but nullified due to inadequate public notice, were resubmitted. The first established a personal use fishery for burbot in the mainstem Copper River. Under the authority of the personal use permit, burbot may be taken with unattended set lines from November 1 through April 30. The daily bag and possession limit is 5 burbot. The department also has the authority to specify in the permit that the carcass be deposited in a collection container or the nearest department office with the harvest data. The second, reopened Hudson Lake to burbot fishing with a bag and possession limit of two burbot.

The Copper River Personal Use Burbot Fishery adopted in 1996 during the BOF meeting has seen no participation since its inception. The lack of participation may be a result of limited access to the Copper River and unsafe ice conditions during the open season (November 1 – April 15). The Department has submitted a proposal for the 1999 BOF meeting to repeal the Personal Use fishery and allow a sport fishery that permits unattended setlines year round on the mainstem Copper River.

The Department has submitted a second proposal for the 1999 BOF meeting that reduces the bag and possession limit of burbot from five to two on Tolsona and Moose lakes. This proposal is a result of the recent population declines in Tolsona Lake. A third proposal has been submitted to the 1999 BOF meeting which addresses the definition of closely attended setlines.

### **Current Issues**

Many anglers have been averse to what they perceive as rapid and drastic changes made to the burbot fisheries of the UCUSMA, and some remain convinced that the actions were unduly restrictive and unfair. This is particularly true with the action taken to eliminate *unattended* set lines from the burbot fisheries of the UCUSMA. Many anglers do not support this action and are

choosing to not participate in this fishery because they cannot use this gear type. This reduces participation in fisheries capable of supporting effort and harvest. To promote participation, staff have encouraged anglers to shift to alternative gear types that are legal (attended set lines or tip ups); however, angler participation continues to remain low. The use of unattended setlines in the mainstem of the Copper River was legalized during 1996 but to this date no permits have been issued. Staff remains opposed to the reintroduction of unattended setlines to lakes. Historically, a few anglers using unattended setlines overharvested several UCUSMA burbot populations within a short period of time. Once overexploited, these fisheries needed to be restricted or closed. Given life history characteristics of burbot, recovery of a depressed stock is slow, often taking many years to rebuild to a condition capable of sustaining a fishery. Creation of the lake burbot management plan gave managers the necessary tools to arrest a fishery that had overexploited a burbot stock. However, actions taken under this management plan promote reactive management where the department bears the burden of detecting overexploited stocks with costly assessment programs. This fragments the burbot fisheries of the UCUSMA and leads to regulations that can be confusing due to superseding emergency orders.

### **Ongoing and Recommended Research and Management**

The burbot stock assessment program has resumed on a limited scale. A monitoring program has been proposed that will alternate between Lake Louise and Hudson Lake on a 3-year schedule. Catch-per unit-effort will be estimated with baited hoop traps to monitor population trends. Tolsona Lake should continued to be sampled for abundance and length composition on a yearly basis, as well as for water quality. The lakes that were assessed during the mid-late 1980's should be revisited to determine if the populations have recovered to historic levels. If this has occurred, the potential of allowing minimal number of setlines should be visited to try to increase participation in the burbot fishery. Staff will continue to try to educate the angling public and seek their input to managing these important ice fisheries.

## **WILD RAINBOW AND STEELHEAD TROUT SPORT FISHERIES**

### **Background and Historical Perspective**

The UCUSMA is the northernmost extent of the natural range of rainbow and steelhead trout in North America. Given this, the area's widely distributed stocks of wild rainbow and steelhead trout stocks display generally low and variable production. To assure that these stocks are not overexploited, a conservative regulation package has been developed to manage the fisheries targeting these stocks. This package has been guided by the *Upper Cook Inlet and Copper River Basin Rainbow/Steelhead Trout Management Policy*. This policy was adopted by the Board of Fisheries during 1986 and provides the department with:

1. management policies and implementation directives for Copper River basin rainbow and steelhead trout fisheries;
2. a systematic approach to developing sport fishing regulations that includes a process for rational selection of waters for special management such as catch and release, trophy areas, or high yield fisheries; and
3. recommended research activities needed to meet these goals.

Under this policy, the entire Gulkana River drainage has been managed as a catch-and-release fishery for rainbow and steelhead trout since 1990. Managers believe that the abundance of trout in this drainage is low and that the stocks are incapable of supporting any level of long-term

sustainable harvest. Additional protection was afforded in 1990 through the establishment of an unbaited, artificial lure only area in all flowing waters of the Gulkana River drainage upstream from an unnamed creek flowing into the Gulkana River 7.5 miles upstream from the confluence of the West Fork.

The policy has also guided the development of regulations for the Tebay River drainage. In Summit Lake and Bridge Creek in the Tebay drainage, rainbow/steelhead trout less than 32 inches in length may not be possessed or retained and the daily bag and possession limit for trout over 32 inches is one. This trophy fishery was established in 1988 to provide anglers the opportunity to harvest a "trophy trout" in the UCUSMA. Research has shown that these waters contain the largest nonanadromous rainbow trout in the Copper River drainage, with individual fish measuring over 32 inches in length and weighing up to 20 pounds. Also, the waters of Lower Hanagita Lake and the Hanagita River from Lower Hanagita Lake to the Tebay River have been managed as a catch-and-release fishery since 1988. In all these waters, only unbaited, artificial lures may be used. This special regulation was adopted in 1988 to afford additional protection to these trout stocks.

All other waters supporting wild rainbow/steelhead trout stocks are managed under a two fish daily and two fish possession limit of which only one trout may be over 20 inches. The season is year-round with the exception of Our Creek (a tributary to Moose Lake) which is closed from May 5 through June 15 to protect spawning grayling. Under this regulation package, the harvest of wild rainbow and steelhead trout has been lowered.

### **Recent Fishery Performance**

The 458 wild rainbow trout harvested in 1998 was the second lowest harvest since 1977 (Table 24). No steelhead trout were reported harvested in 1998 (Table 25). This was the third year since 1993 in which no steelhead trout were reported harvested.

### **Management Objectives**

The wild rainbow trout and steelhead populations are managed under the guidelines outlined in the *Upper Cook Inlet and Copper River Basin Rainbow/Steelhead Trout Management Policy*.

### **Fishery Management**

In 1998, the first directed assessment by the Department of wild rainbow trout and steelhead trout was conducted on the Gulkana River. Length, age and genetic data were gathered from both rainbow trout and steelhead on the spawning area on the Middle Fork and mainstem Gulkana. In 1999, the Middle Fork spawning areas were sampled again and aerial surveys of the West Fork were conducted to locate other spawning areas. In addition, Summit Lake in the Tebay drainage was sampled for abundance, and age and length composition, and water quality. These studies were conducted to provide data regarding proposals submitted by the Department for the 1999 BOF meeting. These proposals address several fishery regulations and offer replacement language so the UCUSMA regulations regarding rainbow and steelhead trout will comply with the *Upper Cook Inlet and Copper River Basin Rainbow/Steelhead Trout Management Policy*.

### **Fishery Outlook**

If the Department submitted proposals are passed, it is anticipated that the harvests of rainbow and steelhead trout will remain stable or decline slightly from the historic average. These proposals will not reduce the opportunity to catch rainbow and steelhead trout, but protect existing stocks and allow those that may be depleted to recover.

### **Recent Board of Fisheries Actions**

To further protect rainbow/steelhead stocks, during the 1996 BOF meeting the identified rainbow trout/steelhead spawning areas on the Middle Fork of the Gulkana River were closed to all sport fishing during the adult spawning and egg incubation periods, April 15 – June 15. In addition, the retention of rainbow or steelhead trout incidentally taken in the Copper River Personal Use Fishery was prohibited.

### **Current Issues**

Public concern over poor stock condition and no trout greater than 20 inches in the trophy fishery at Summit Lake has increased during recent years. Stock assessment in this system to determine if this is the case was conducted in 1999 and two proposals have been submitted to be address before the BOF during the 1999 meeting.

### **Ongoing and Recommended Research and Management Activities**

The existing assessment program should be continued, with direction towards estimating abundance of rainbow trout and steelhead in the Gulkana River. A follow up assessment at Summit Lake should be conducted if the BOF passes the increased bag limit, to determine if the new regulations are effective in restoring the trophy fishery. A research plan should be developed for assessment of new areas of potential concern or creating and/or expanding existing databases on rainbow/steelhead trout populations in the UCUSMA. A steelhead trout distribution study could be conducted coincidentally with the current chinook salmon study to collect distribution data.

### **STOCKED LAKES**

The Alaska Department of Fish and Game stocks game fish in about 29 lakes in the Copper River/Upper Susitna River drainages (Glennallen management area). The stocking program is designed to provide additional fishing opportunities near communities where fish resources and angling opportunity are limited and popular recreational destinations where fishing effort and harvest are highest. Lakes in the stocking program range in size from a few acres to several hundred acres and are accessible by road or trail. The majority of the fisheries are year-round, but several are seasonal, based on access or high use periods. The stocking program also generates an important conservation benefit because it diverts harvest away from wild populations.

In 1998, an estimated 20,907 anglers fished in the Glennallen area and they generated an estimated 66,579 angler-days of effort. About 4,697 angler-days of effort were directed toward stocked fish in area lakes (Table 26). The harvest and catch in these stocked lakes were estimated at 5,671 and 18,497 fish (Table 27). Since 1990 stocked fish represent 8 to 26% of the estimated annual harvest, 7 to 16% of the estimated annual catch, and about 5 to 12% of the total estimated fishing effort on game fish in the Glennallen area.

Currently stocked lakes provide diverse year-round sport fishing in the Glennallen area for rainbow trout, coho salmon, Arctic grayling, and Arctic char. Objectives of the fish stocking program in Region III are:

1. reduce harvest pressure on wild stocks;
2. provide angling opportunity for increasing numbers of anglers;
3. diversify angling opportunity (species, location, and access); and,
4. rehabilitate depleted wild stocks.

**Table 24.-Harvest of wild rainbow trout by sport anglers fishing UCUSMA waters by drainage, averaged for 1977 – 1987 and annually from 1988-1998.**

Areas	1977-87	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-1997 <sup>f</sup>	1993-1997 <sup>f</sup>
<b>Gulkana River Drainage<sup>a</sup></b>														
Upper River	1,394 <sup>b</sup>	1,273	656	204	14	0	40	0	0	0	0	0	219	8
Lower River		36	0	221	150	8	0	0	0	0	0	0	42	0
<b>Total</b>	<b>1,394<sup>b</sup></b>	<b>1,309</b>	<b>656</b>	<b>425</b>	<b>164</b>	<b>8</b>	<b>40</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>260</b>	<b>8</b>
<b>Klutina River Drainage</b>	127 <sup>c</sup>	18	56	17	96	63	108	8	37	0	10	8	41	33
<b>Tazlina Drainage</b>	45 <sup>c</sup>	146	9	170	0	24	0	8	47	293	30	48	73	76
<b>Tonsina Drainage</b>	133 <sup>c</sup>	18	38	17	14	103	40	87	28	24	0	8	37	36
<b>Copper River</b>														
Upstream of Gulkana	39 <sup>c</sup>	0	0	68	68	0	0	0	0	0	0	0	14	0
Downstream of Klutina <sup>d</sup>	38 <sup>c</sup>	0	1,051	17	109	214	0	515	94	448	110	192	256	233
<b>Other Sites</b>	1,207	273	366	662	177	681	730	981	225	1,090	983	202	617	802
	<b>2,735<sup>e</sup></b>	<b>1,764</b>	<b>2,176</b>	<b>1,376</b>	<b>628</b>	<b>1,093</b>	<b>918</b>	<b>1,599</b>	<b>431</b>	<b>1,855</b>	<b>1,133</b>	<b>458</b>	<b>1,297</b>	<b>1,187</b>

<sup>a</sup> In 1991, the river was closed to the harvest of rainbow trout.

<sup>b</sup> Includes average of entire drainage.

<sup>c</sup> Includes 1983-1986 average harvest only. Prior to 1983, this harvest was included in the listing for “Other waters” in the SWHS report.

<sup>d</sup> Not including Tonsina drainage.

<sup>e</sup> Average of total annual harvest.

**Table 25.-Harvest of steelhead trout by sport anglers fishing UCUSMA waters by drainage, averaged for 1977 – 1987 and annually from 1988-1998.**

Areas	1977-87	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-1997 <sup>c</sup>	1993-1997 <sup>c</sup>
<b>Gulkana River Drainage<sup>a</sup></b>	32	18	47	34	0	8	0	0	10	0	0	0	12	2
<b>Tazlina Drainage</b>	0 <sup>b</sup>	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Copper River</b>														
Upstream of Gulkana	0 <sup>b</sup>	0	0	0	0	0	0	0	0	0	0	0	0	0
Downstream of Tonsina	0 <sup>b</sup>	0	0	0	0	0	0	0	0	0	12	0	1	2
<b>Other Sites</b>	116	0	37	0	114	0	0	7	0	0	0	0	16	1
<b>Total</b>	<b>89<sup>c</sup></b>	<b>18</b>	<b>84</b>	<b>34</b>	<b>114</b>	<b>8</b>	<b>0</b>	<b>7</b>	<b>10</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>29</b>	<b>6</b>

<sup>a</sup> In 1991, the river was closed to the harvest of steelhead trout.

<sup>b</sup> Includes 1983-1986 average harvest only. Prior to 1983, this harvest was included in “Other waters” in the SWHS report.

<sup>c</sup> Average of total annual harvest.

Meeting public demand for recreational fishing opportunities in Alaska while at the same time maintaining and protecting the fishery resources has become increasingly complex. Today, Alaska is experiencing increased tourism and continued forest, mineral, petroleum, and associated development. A growing recreation-oriented population accompanies this growing economy. Accessible sport fisheries have become crowded, new fisheries have developed, and pressure from a large mobile population is expanding ever farther afield. Stocking serves to divert angling pressure away from fragile stocks and maintain angling opportunities. Consequently, stocking has become a vital component of the statewide sport fish program.

Funding for the recreational fish stocking comes primarily from two sources. The first is the Sport Fish Account of the state Fish and Game fund, which includes revenues from sales of fishing licenses. The second, and larger funding component for this program, is comprised of federal funds. The Federal Aid in Sport Fisheries Restoration program, through the Dingell Johnson (D-J) Fund and the Wallop-Breaux Amendment (W-B), provides money from federal taxes on specific sporting goods, marine motor fuels, etc.

### **Program Objectives Specific to the Glennallen Management Area**

1. Provide 5,000 angler-days of sport fishing effort on Glennallen area stocked lakes.
2. Publicize available fishing opportunities.
3. Improve public access to stocked lakes where necessary.

### **Specific Activities**

1. Sport fishing effort and harvest is determined through the Statewide Harvest Survey.
2. Stock 29 lakes with Arctic char, Arctic grayling, rainbow trout, and coho salmon (stocking history and projections are summarized in Table 28 and 29).
3. Evaluate all stocked lakes on a 5-year rotation.
4. Investigate new lakes as candidates to the stocking program.
5. Conduct Arctic grayling eggtakes and provide support with fish stockings.
6. Conduct net-catch sampling on 4 to 6 lakes.
7. Construct bathymetric maps and obtain basic limnological information for new lakes.
8. Update Statewide Stocking Plan (SWSP) for Region III.
9. Submit new Fish Transport Permits (FTP) and cross check with SWSP for valid FTPs.
10. Review hatchery management and operational plans.
11. Update pamphlets with current stocking and evaluation information.
12. Inspect fish barriers every two years.

### **Glennallen Area Stocked Lake Fishery Statistics, 1990-1998**

From 1990-1998, the average level of fishing effort on the 29 stocked lakes in the Glennallen management area was 5,533 angler days. Nearly 37% (2,038 angler days) of this effort occurs on Silver Lake, a popular rainbow trout fishery along the McCarthy Road. Since 1990, effort has not been reported on nine of the 29 stocked lakes. We know that anglers fish these lakes but the effort is not detected by the annual mail survey. We have also dropped eight lakes or creeks from the stocking program because they had open systems or contained populations of wild fish,

**Table 26.-Summary of fishery statistics for the Glennallen area stocked lakes, 1990-1998.**

	Objective	1990	1991	1992	1993	1994	1995	1996	1997	1998
Days fished (effort)	5,000	3,412	5,292	8,329	5,750	6,850	6,900	4,992	3,580	4,697
Harvest		4,060	7,404	10,790	7,764	6,512	5,538	4,474	3,190	5,671
Catch		11,463	14,059	27,182	21,876	20,886	16,815	12,798	10,760	18,497
Mean catch rate (catch / effort)		3.36	2.66	3.26	3.80	3.05	2.44	2.56	3.01	3.94
Stocking cost <sup>a</sup>		\$27,380	\$16,513	\$54,304	\$37,840	\$18,527	\$15,325	\$12,766	\$12,508	\$52,086
Cost-per-day of fishing		\$8.02	\$3.12	\$6.52	\$6.58	\$2.70	\$2.22	\$2.56	\$3.49	\$11.09
Management & Research cost										\$15,972
Cost/Benefit <sup>b</sup> (wo/Mgt&Res cost)									\$1.16	\$2.82
Cost/Benefit <sup>b</sup> (w/Mgt&Res cost)										\$3.68

<sup>a</sup> The method used to calculate annual stocking costs changed in 1998. Prior to 1998, stocking costs include only costs directly associated with hatchery operations. Not included are costs for regional hatchery supervision and eggtakes or regional management and research work. Stocking costs in 1998 include the costs of hatchery operations, regional hatchery supervision, and eggtakes. Listed separately are regional management and research costs.

<sup>b</sup> Cost/Benefit is calculated as Stocking Cost / Catch.

**Table 27.-Effort, harvest, and catch statistics for stocked fisheries in the Glennallen area 1990-1998.**

	1990	1991	1992	1993	1994	1995	1996	1997	1998
<b>Effort</b>									
Number of Anglers	2,786	3,876	5,591	3,750	3,586	3,442	2,774	2,316	2,274
Number of Trips	2,259	3,638	4,411	3,532	3,918	4,037	2,547	2,030	2,374
Number of Days Fished (effort)	3,412	5,292	8,329	5,750	6,850	6,900	4,992	3,580	4,697
<b>Harvest</b>									
Landlocked Silvers	17	90	406	56	107	42	225	63	401
Rainbow Trout	2,845	6,315	8,557	6,561	4,659	4,259	3,626	2,204	4,894
Arctic Grayling	1,198	999	1,827	1,147	1,746	1,238	623	923	376
Total Fish	4,060	7,404	10,790	7,764	6,512	5,538	4,474	3,190	5,671
<b>Catch</b>									
Landlocked Silvers	51	368	589	56	523	109	558	139	838
Rainbow Trout	6,997	11,237	21,629	17,047	13,744	10,284	7,110	6,340	12,617
Arctic Grayling	4,416	2,455	4,964	4,773	6,619	6,422	5,131	4,281	5,043
Total Fish	11,463	14,059	27,182	21,876	20,886	16,815	12,798	10,760	18,497

the lakes were within a national park, or fish had poor survival or growth. To maintain effort at or above the objective of 5,000 angler-days, evaluation of the stocked lakes in the Glennallen area is necessary. We will continue to stock lakes that provide fishing opportunities and where the stocked fish exhibit good survival and growth. We will evaluate new lakes as candidates in the stocking program based on public requests for new fisheries.

## **Description of Activities**

### **Stocking**

Our strategy is to stock species most suited to a particular lake's physical characteristics and at a size to account for lake productivity and harvest pressure. Rainbow trout and Arctic grayling do well in most of lakes and support summer fisheries. Coho salmon also do well in most lakes and provide an aggressive fish during the winter fishing season when other species are less active. We often stock more than one species in our lakes to provide diversity and to take advantage of different seasonal behavior. Rainbow trout and coho salmon are the most popular combination.

The state hatcheries are able to provide different size fish from sac-fry (1 inch) to catchables (6-10 inches), and even excess brood stock (12-18 inches). Because lakes have different capabilities for producing catchable fish we request different size fish to meet certain stocking objectives. We stock fingerling rainbow trout and coho salmon in Silver Lake because it can produce sufficient numbers of catchable fish from fingerling stockings. In small road side lakes like Buffalo Lake and Tex-Smith Lake we stock catchable rainbow trout and Arctic grayling. These lakes are small and receive a lot of fishing pressure relative to their size. As a result, they can't produce sufficient numbers of catchable fish (from stockings of fingerlings) to meet angler demand. We also stock these high use lakes early in the spring and again one or more times during the summer to provide sufficient numbers of fish through out the year. Prior to altering our stocking strategy, anglers expressed frustration with these fisheries because by spring there were too few large fish.

We generally stock our remote and larger rural lakes with fingerlings because smaller fish are easier and less expensive to transport than larger fish. All of these lakes can produce sufficient numbers of catchable fish from fingerling stockings to sustain the existing fisheries. Because these lakes are more difficult to reach the level of effort and harvest is less than that for comparable size lakes near the road system. Generally, these lakes produce larger fish and more of them for the same reasons.

Recently we have started stocking catchable rainbow trout in lakes near Fairbanks that don't usually support fish through winter. We are looking to do the same in the Glennallen area. By stocking such lakes with catchable size fish we have created instant and popular fisheries. We try to stock only enough fish to support the spring and summer fishing season because any fish left in the lake may not survive the winter. This recent change to our stocking program in Fairbanks has increased the number of lakes that we can stock and increased angler opportunity.

### **Stocking Products**

The state fish hatcheries at Ft. Richardson and Elmendorf Air Force Base near Anchorage produce rainbow trout, Arctic grayling, Arctic char, coho and chinook salmon, and lake trout. Only the first four species are stocked in the Glennallen area. Fish are transported by truck to the stocking location or they are transferred to off road vehicles or aircraft for transport to more remote locations.

**Table 28.-Stocking schedule for stocked lakes in the Glennallen area.**

Area (Access) Lake	Lake Size in Acres	Species	Stocking Years
<b>GLENN HIGHWAY</b>			
Arizona	25	Grayling	Alternate
Buffalo	4	Rainbow	Annual
DJ	4	Rainbow	Alternate
Gergie	60	Rainbow	Alternate
Little Junction	5	Grayling	Alternate
Ryan	45	Rainbow	Annual
Tex Smith	15	Rainbow	Annual
Tolsona	500	Rainbow	Annual
<b>RICHARDSON HIGHWAY</b>			
Dick	40	Char, Grayling	Alternate, Alternate
Meiers	6-10	Grayling	Annual
Squirrel Creek Pit	5	Grayling, Rainbow	Annual, Annual
<b>LAKE LOUISE ROAD</b>			
Caribou	13	Grayling	Alternate
Connor	18	Grayling	Alternate
Crater	16	Rainbow	Alternate
Elbow	6	Grayling	Alternate
Forgotten	18	Grayling	Alternate
Junction	18	Grayling	Alternate
Little Crater	2	Rainbow	Alternate
Old Road	1.5	Rainbow	Annual
Peanut	12	Rainbow	Alternate
Round	2	Rainbow	Annual
<b>Edgerton Highway</b>			
Three Mile	20	Rainbow	Alternate
Two Mile	17	Rainbow	Alternate
<b>McCarthy Road</b>			
Sculpin	190	Rainbow	Annual
Silver	500	Rainbow	Annual
Strelna	290	Coho, Rainbow	Annual, Alternate
<b>Fly-in Lakes</b>			
North Jans	58	Rainbow	Alternate
South Jans	6-10	Coho, Rainbow	Annual, Alternate
Tolsona Mt.	75	Rainbow	Alternate

**Table 29.-Summary of projected game fish stockings for Glennallen area lakes, 2000-2001.**

Number of Lakes 2000/2001	Species	Lifestage	Target Size (in)	2000 Projected	2001 Projected
1/1	Arctic Char	Catchable	6-10	2,000	0
2/2	Coho Salmon	Fingerling	3-5	50,000	50,000
9/2	Arctic Grayling	Catchable	6-10	7,450	4,800
7/7	Rainbow Trout	Catchable	6-10	7,250	7,250
1/10	Rainbow Trout	Fingerling	2-4	28,000	195,800

### **Rainbow Trout**

Rainbow trout are the primary hatchery product used in lake stocking. All rainbow trout are from a captive brood stock maintained at Fort Richardson Hatchery. The brood stock is descended from wild Swanson River rainbow trout. We stock two genetic types of rainbow trout: 1) mixed sex diploid fish which are normal fish capable of reproduction; and 2) all-female triploid fish which are not capable of reproduction.

We generally stock three sizes of rainbow trout. Catchable rainbow trout are 1 year old and are about 6-10 inches. Subcatchable rainbow trout are 6 months to 1 year old and are 4-6 inches. Fingerling rainbow trout are usually 2 to 4 months old and are 2-3 inches. Rainbow trout fry are less than 2 months old and usually weigh less than a gram.

### **Arctic Grayling**

All stocked Arctic grayling are from eggs taken from two wild stocks (Tanana River and Moose Lake-Gulkana River). Only the Moose Lake –Gulkana River stock is used for stocking in the Glennallen area. No captive brood stock is maintained in the hatchery. We produce four sizes of Arctic grayling for stocking. Catchable Arctic grayling are 1 year old and are 6-9 inches. Subcatchable Arctic grayling are 6 months to 1 year old and weigh between 4-6 inches. Fingerling Arctic grayling are usually 2 to 4 months old and are 2-3 inches. Arctic grayling fry are less than 2 months old and usually weigh less than a gram. Arctic grayling sac-fry are newly hatched and are about 1 inch.

### **Arctic Char**

All stocked Arctic char are from eggs taken from a wild stock of fish. The brood stock currently used is from the Bristol Bay Area. No captive brood stock is maintained in the hatchery. Due to the difficulty of conducting a wild eggtake and the longevity of this species, eggs are only taken every other year. Generally we stock three sizes of Arctic char. Catchable Arctic char are 1 ½ years old and are 6-10 inches. Subcatchable Arctic char are 6 months old and are 5-7 inches. Fingerling Arctic char are usually 4 to 6 months old and are 4-5 inches.

### **Coho Salmon**

All coho salmon used for lake stocking are from eggs taken from hatchery produced adults. Brood stock used may vary depending on availability. Two sizes of coho salmon are stocked. Subcatchable coho salmon are 1 year old and are 4-6 inches. Fingerling coho salmon are 2 to 4 months old and are 2-4 inches.

### **Egg Takes**

The Region III stocking program currently assists the hatcheries with eggtakes by capturing and holding fish until they are ready for spawning. When Clear Hatchery was closed in 1997 we assumed responsibility for conducting eggtakes in the Tanana drainage and the Upper Copper/Susitna drainages. Other assumed responsibilities include locating wild donor stocks, evaluating their population status, and collecting and holding adults until ready for artificial spawning. To fulfill these new responsibilities a new budget separate from other stocked water evaluation work was given to Region III.

Since 1965, we have collected eggs from wild stocks of Arctic grayling for stocking in lakes. We currently take eggs from Arctic grayling populations at Moose Lake/Our Creek near Glennallen and the Chena River near Fairbanks. These two stocks are used because some stocking locations are not landlocked. To reduce genetic impact to wild stocks we stock Chena

River progeny in the Tanana River drainage and Moose Lake progeny in the Upper Copper/Susitna drainages. Exceptions are made when the stocking location is landlocked.

### **Net-Catch Sampling**

We have numerous requests from anglers for current information on the species and size of fish in our lakes in the Glennallen area. Anglers use this information to plan fishing trips. Each year we attempt to sample the fish populations in 4 to 6 lakes in the Glennallen management area. Most of these lakes are stocked so there is usually no conservation concerns driving the need for information on these fish populations. However, anglers are interested in the species and the size of the fish in these lakes. We use this information to update our *Guide to Stocked Waters*, internet web site, and informational leaflets. An additional benefit is that biologists are able to observe the fish populations in several lakes and get a rough idea of their status. From these observations the biologist can judge if a fish population needs further investigation and plan a study to address a specific concern.

### **Lake Mapping and Limnology**

Each year we list a number of lakes that we want to map or inspect. The actual number of lakes that we visit depends on the time available, the priority of other projects and for some lakes if aircraft or ATVs are available. We map lakes to obtain depth data for producing bathometric maps for anglers and to describe morphology and other lake characteristics for fishery managers. While we are at these lakes we often combine this activity with other activities such as net sampling (described above), water chemistry assays, D.O. and temperature profiles, and evaluate land lock status.

### **Statewide Stocking Plan: Region III Update**

The five year stocking plan for Region III is updated each year in response to public comment, changes in Fishery Management Plans and hatchery production, and to comply with current policies. Comments received from the public and current policies are reviewed to determine what changes will be required to update the stocking plan each year. The updated stocking plan for Region III is submitted to Sport Fish Headquarters in November for inclusion into the draft Five Year Statewide Stocking Plan for Recreational Fishing. After a comment period the finalized plan is usually published and available by 1 February.

### **Fish Transport Permits**

Each fish stocking and eggtake requires a Fish Transport Permit (FTP). The Five Year Stocking Plan, regional management plans, and active FTPs are cross checked prior to stocking or taking eggs to determine if an active FTP exists. Any FTP needed for stocking or for an eggtake is submitted for approval. For Region III in 1998-99 we addressed 143 FTP related issues that dealt with changes in hatchery production, brood source, number and size of fish to be stocked, and expiration dates. This required 27 new FTPs and 32 amendments to existing FTPs. A list of active, expired, and pending FTPs is maintained at the Fairbanks office.

### **Hatchery Review**

Fish hatchery management and operational plans for Ft. Richardson and Eielson Air Force Base hatcheries are reviewed to ensure the plans account for the correct number, size, species, brood stock, and other special requirements for fish requested through the Five Year Stocking Plan and regional management plans. Requests from the various regions are checked against hatchery production capabilities to determine if requests are feasible. Hatchery and stocking managers discuss options to decrease impact of eggtakes on wild donor stocks and to make the stocking

program more efficient. In November 1999 we will review the Arctic char and chinook salmon programs.

### **Pamphlets**

Pamphlets about stocked waters in the Glennallen management area are updated each year with information collected on fish populations such as the species present and their size. Other information includes recent stocking histories, location and bathometric maps, and available facilities.

### **Fish Barriers**

Several lakes in the Glennallen area have barriers that prevent the passage of fish into or out of stocked lakes. In 1998 we examined the barriers on several lakes and found some of the barriers inadequate. In 1999 we need to inspect the status of the barriers on lakes not yet inspected. Fish barriers are inspected every two years.

## **Summary of Field Activities During 1998 and Preliminary Results From 1999**

### **Stocking**

In 1998 we stocked 10 lakes with rainbow trout, Arctic char, and coho salmon (Table 30). No Arctic grayling were stocked due to poor survival at Ft. Richardson Hatchery. We are now stocking Tolsona Lake with sterile rainbow trout to support a highly desired local fishery. This action was undertaken to provide an alternative fishery because we closed the burbot fishery to allow it to rebuild. The rainbow trout fishery will be valuable to local lodge owners and anglers and divert fishing pressure from wild populations. In 1999, 20 lakes were stocked with rainbow trout, Arctic char, Arctic grayling, and coho salmon (Table 30). To reduce stocking costs we are now transporting coho salmon fingerlings to Strelna Lake by truck instead of using aircraft. This change will save \$2,000 to \$3,000 in 1999.

In 2000 and 2001 we intend to stock 29 lakes with rainbow trout, Arctic char, Arctic grayling, and coho salmon (Table 31). Some lakes will be stocked more than once during the year, other lakes will be stocked with more than one species. Some of the 29 lakes will be stocked every year while others will be stocked every other year. A detailed stocking strategy is summarized in Table 31.

### **Eggtakes**

In 1998, we collected approximately 76,900 fertilized eggs from 15 female and 15 male Arctic grayling at Our Creek / Moose Lake. In 1999, about 152,200 fertilized eggs were collected from 30 female and 30 male Arctic grayling. In 2000, we will take about 21,000 fertilized eggs from 10 female and 10 male Arctic grayling at Our Creek.

### **Barrier Inspections and Inlet/Outlet Status**

During 1998 we surveyed a number of lakes in the Glennallen area to determine the status of structures to prevent the passage of fish into or out of lakes. Other lakes were examined for inlets and outlets. Results are summarized in Table 32.

**Table 30.-Stocking records for Glennallen area lakes, 1998-1999.**

Location	Species	Date	Number Stocked	Average Length (in)	Size
Buffalo L	Rainbow Trout	Jun 08, 1998	434	7	Catchable
Buffalo L	Rainbow Trout	Aug 13, 1998	806	2	Fingerling
Dick L	Arctic Char	Jun 05, 1998	1,000	8	Catchable
Old Road L	Rainbow Trout	Jun 05, 1998	250	6	Catchable
Round L	Rainbow Trout	Jun 08, 1998	244	7	Catchable
Ryan L	Rainbow Trout	Jun 08, 1998	505	7	Catchable
Ryan L	Rainbow Trout	Aug 13, 1998	8,128	2	Fingerling
South Jans L	Coho Salmon	Sep 27, 1998	19,947	3	Fingerling
Squirrel Ck Pit	Rainbow Trout	Jun 08, 1998	836	7	Catchable
Strelna L	Coho Salmon	Sep 27, 1998	14,960	3	Fingerling
Tex Smith L	Rainbow Trout	Jun 05, 1998	500	6	Catchable
Tolsona L	Rainbow Trout	Jul 29, 1998	3,185	8	Catchable
Buffalo L	Rainbow Trout	May 26, 1999	499	9	Catchable
Crater L	Rainbow Trout	Aug 05, 1999	3,600	2	Fingerling
D-J L	Rainbow Trout	Aug 18, 1999	433	2	Fingerling
Gergie L	Rainbow Trout	Aug 12, 1999	9,400	2	Fingerling
Little Crater L	Rainbow Trout	Aug 18, 1999	420	2	Fingerling
North Jans L	Rainbow Trout	Aug 20, 1999	11,587	2	Fingerling
Old Road L	Rainbow Trout	May 26, 1999	125	8	Catchable
Old Road L	Rainbow Trout	Jun 28, 1999	240	8	Catchable
Peanut L	Rainbow Trout	Aug 05, 1999	2,400	2	Fingerling
Round L	Rainbow Trout	May 26, 1999	125	8	Catchable
Round L	Rainbow Trout	Jun 28, 1999	240	8	Catchable
Ryan L	Rainbow Trout	Jun 29, 1999	468	8	Catchable
Sculpin L	Rainbow Trout	Jul 29, 1999	28,000	2	Fingerling
Silver L	Rainbow Trout	Jun 06, 1999	3,685	6	Catchable
Silver L	Rainbow Trout	Jul 29, 1999	80,517	2	Fingerling
South Jans L	Rainbow Trout	Aug 20, 1999	20,000	2	Fingerling
South Jans L	Coho Salmon	Jun 13, 1999	20,238	3	Fingerling
Squirrel Ck Pit	Grayling	Jun 26, 1999	512	8	Catchable
Squirrel Ck Pit	Rainbow Trout	May 26, 1999	505	9	Catchable
Squirrel Ck Pit	Rainbow Trout	Jun 29, 1999	429	8	Catchable
Strelna L	Coho Salmon	Jun 13, 1999	33,190	3	Fingerling
Strelna L	Rainbow Trout	Jul 29, 1999	15,101	2	Fingerling
Tex Smith L	Rainbow Trout	May 26, 1999	487	8	Catchable

**Table 30.—Page 2 of 2.**

Location	Species	Date	Number Stocked	Average Length (in)	Size
Tex Smith L	Rainbow Trout	Jun 28, 1999	500	8	Catchable
Tex Smith L	Rainbow Trout	Aug 05, 1999	4,246	2	Fingerling
Three Mile L	Rainbow Trout	Jul 29, 1999	4,000	2	Fingerling
Tolsona L	Rainbow Trout	Jun 06, 1999	3,997	6	Sub-catchable
Tolsona Mt. L	Rainbow Trout	Aug 20, 1999	15,000	2	Fingerling
Two Mile L	Rainbow Trout	Jul 29, 1999	3,400	2	Fingerling

**Table 31.-Projected game fish stockings for Glennallen area lakes, 2000-2001.**

	Species	Lifestage	Target Size (in)	2000 Projected	2001 Projected
Dick L	Arctic Char	Catchable	6-10	2,000	0
South Jans L	Coho Salmon	Fingerling	3-5	20,000	20,000
Strelna L	Coho Salmon	Fingerling	3-5	30,000	30,000
Arizona L	Grayling	Catchable	6-10	400	0
Caribou L	Grayling	Catchable	6-10	350	0
Connor L	Grayling	Catchable	6-10	600	0
Dick L	Grayling	Catchable	6-10	400	0
Elbow L	Grayling	Catchable	6-10	200	0
Forgotten L	Grayling	Catchable	6-10	400	0
Junction L	Grayling	Catchable	6-10	100	0
Little Junction L	Grayling	Catchable	6-10	200	0
Meiers L	Grayling	Catchable	6-10	4,000	4,000
Squirrel Ck Pit	Grayling	Catchable	6-10	800	800
Buffalo L	Rainbow Trout	Catchable	6-10	750	750
Old Road L	Rainbow Trout	Catchable	6-10	500	500
Round L	Rainbow Trout	Catchable	6-10	500	500
Ryan L (Mirror)	Rainbow Trout	Catchable	6-10	500	500
Squirrel Ck Pit	Rainbow Trout	Catchable	6-10	1,000	1,000
Tex Smith L	Rainbow Trout	Catchable	6-10	1,000	1,000
Tolsona L	Rainbow Trout	Catchable	6-10	3,000	3,000
Crater L	Rainbow Trout	Fingerling	2-4	0	3,200
D-J Lake	Rainbow Trout	Fingerling	2-4	0	400
Gergie L	Rainbow Trout	Fingerling	2-4	0	9,000
Little Crater L	Rainbow Trout	Fingerling	2-4	0	400
North Jan L	Rainbow Trout	Fingerling	2-4	0	11,600
Peanut L	Rainbow Trout	Fingerling	2-4	0	2,400
Sculpin L	Rainbow Trout	Fingerling	2-4	28,000	28,000
Silver L	Rainbow Trout	Fingerling	2-4	0	80,000
South Jans L	Rainbow Trout	Fingerling	2-4	0	20,000
Strelna L	Rainbow Trout	Fingerling	2-4	0	15,000
Tex Smith L	Rainbow Trout	Fingerling	2-4	0	3,400
Three Mile L	Rainbow Trout	Fingerling	2-4	0	4,000
Tolsona Mt. L	Rainbow Trout	Fingerling	2-4	0	15,000
Two Mile L	Rainbow Trout	Fingerling	2-4	0	3,400

**Table 32.– UCUSMA stocked lakes barrier inspections and inlet/outlet status.**

Lake	Date	Inlet/Outlet Status	Comments
Pippin Lake	11 Aug	None.	Needs improved access.
Three Mile Lake	11 Aug	None.	
Two Mile Lake	11 Aug	None.	
One Mile Lake	11 Aug	Open.	
Strelna Lake	11 Aug	Check.	Inspect in 1999.
Silver Lake	11 Aug	Intermittent.	Lake level is ~6in below outlet. Outlet flows into Van Lake.
Sculpin Lake	11 Aug	Intermittent.	Check outlet. Test net.
Tex-Smith Lake	12 Aug	Culvert with screened outlet.	Repair screen on stand pipe.
Crater Lake	12 Aug	Flows into Little Crater Lake.	Hardware cloth needs replaced.
Little Crater Lake	12 Aug	Outlet blocked but not functional.	Barrier needs repair. Check on outlet destination.
Round Lake	12 Aug	No outlet.	Possible inlet from Old Road Lake during high water.
Old Road Lake	12 Aug	No Inlet.	Possible outlet to Round Lake.
Forty Foot Lake	12 Aug	Flowing outlet.	
Peanut Lake	12 Aug	Possible outlet during high water years.	Identify outlet destination.
Caribou Lake	13 Aug	Outlet.	Barrier not functional.
Elbow Lake	13 Aug	Inlet and outlet.	Outlet barrier not functional
Forgotten Lake	13 Aug	Outlet.	Existing beaver dam is not a barrier to fish exiting the lake.

## Net-Catch Sampling

In 1999, we evaluated fish populations in the following 11 lakes. Information from this project will be used to update informational pamphlets and provide managers with basic population information.

Silver Lake

Crater Lake

Forty Foot Lake

Squirrel Creek Pit

Peanut Lake

Junction Lake

Little Crater Lake

Three Mile Lake

Two Mile Lake

Buffalo Lake

Ryan Lake

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## **APPENDIX A**

**Appendix A.-Listing of the addresses and contact numbers for information sources regarding UCUSMA information.**

<b>Organization</b>	<b>Address</b>	<b>Phone</b>	<b>Internet address</b>
<b>Alaska Department of Fish and Game</b> - <b>Glennallen Area office</b>	<b>PO Box 47 Glennallen, AK 99588-0047</b>	<b>(907) 822-3309</b>	<b>www.state.ak.us/local/akpages/FISH.GAME</b>
- <b>Fairbanks Regional office</b>	<b>1300 College Road Fairbanks, AK 99701-1599</b>	<b>(907) 459-7207</b>	
<b>U.S. Bureau of Land Management</b>	<b>PO Box 147 Glennallen, AK 99588-0147</b>	<b>(907) 822-3217</b>	<a href="http://www.glennallen.ak.blm.gov">www.glennallen.ak.blm.gov</a>
<b>Wrangell-St. Elias National Park &amp; Preserve</b>	<b>PO Box 439 Copper Center, AK 99573</b>	<b>(907) 822-5234</b>	<a href="http://www.nps.gov/wrst">www.nps.gov/wrst</a>
<b>Ahtna, Inc</b>	<b>PO Box 649 Glennallen, AK 99588-0649</b>	<b>(907) 822-3476</b>	
<b>Chitina Native Corporation</b>	<b>PO Box 3 Chitina, AK 99566</b>	<b>(907) 823-2223</b>	
<b>Greater Copper Valley Chamber of Commerce</b>	<b>PO Box 469 Glennallen, AK 99588-0469</b>	<b>(907) 822-5555</b>	

- Figure 1. Map of the UCUS Management Area.
- Figure 2. Sport fish effort in the UCUSMA, 1977-1998.
- Figure 3. Upper River chinook salmon aerial survey index escapement counts by drainage, 1977-1999.
- Figure 4. Copper River District commercial harvest of chinook and sockeye salmon, 1977-1998.
- Figure 5. Upper Copper River chinook salmon sport harvest by drainage, 1977-1998.
- Figure 6. Map of the Gulkana River drainage.
- Figure 7. Gulkana River chinook salmon aerial survey index escapement counts, 1977-1999.
- Figure 8. Klutina River chinook salmon sport harvest, 1977-1998.
- Figure 9. Tonsina River chinook salmon sport harvest and aerial survey index escapement counts, 1977-1998.
- Figure 10. Copper River subsistence harvest by species, 1977-1998.
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- Figure 12. Upper Copper/Upper Susitna Area arctic grayling harvest, 1977-1998.
- Figure 13. Map of major lake trout fisheries in the UCUSMA.
- Figure 14. Map of major burbot fisheries in the UCUSMA.