

Fishery Management Report No. 00-4

**Area Management Report for the Recreational
Fisheries of the Upper Copper/Upper Susitna River
Management Area, 1996-1997**

by

Thomas T. Taube

May 2000

Alaska Department of Fish and Game

Division of Sport Fish



Symbols and Abbreviations

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Weights and measures (metric)		General		Mathematics, statistics, fisheries	
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis	H_A
deciliter	dL	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
gram	g	and	&	catch per unit effort	CPUE
hectare	ha	at	@	coefficient of variation	CV
kilogram	kg	Compass directions:		common test statistics	F, t, χ^2 , etc.
kilometer	km	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
Weights and measures (English)		Company	Co.	divided by	÷ or / (in equations)
cubic feet per second	ft ³ /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
Time and temperature		number (before a number)	# (e.g., #10)	logarithm (specify base)	log ₂ , 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
Physics and chemistry				probability of a type I error (rejection of the null hypothesis when true)	α
all atomic symbols				probability of a type II error (acceptance of the null hypothesis when false)	β
alternating current	AC			second (angular)	"
ampere	A			standard deviation	SD
calorie	cal			standard error	SE
direct current	DC			standard length	SL
hertz	Hz			total length	TL
horsepower	hp			variance	Var
hydrogen ion activity	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

FISHERY MANAGEMENT REPORT NO. 00-4

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FISHERIES OF THE UPPER COPPER/UPPER SUSITNA RIVER
MANAGEMENT AREA, 1996 - 1997**

by
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May 2000

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SECTION I: MANAGEMENT AREA OVERVIEW

MANAGEMENT AREA DESCRIPTION

The Upper Copper River-Upper Susitna River sport fish management area (UCUSMA) 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 relatively 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. Snow machines are the popular mode of travel to remote fisheries in the winter. Principal land managers in the UCUSMA are the National Park Service, Bureau of Land Management, 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), under the heading "Glennallen Area" (Area I).

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. The Area Management Biologist (Thomas Taube) and Assistant Area Management Biologist (currently vacant) 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 staff are 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.

FISHERIES RESOURCES

The UCUSMA offers a unique blend of freshwater fishing opportunities to sport anglers, personal use and subsistence participants. Three species of North 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 into various 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 *Salvelinus 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*.

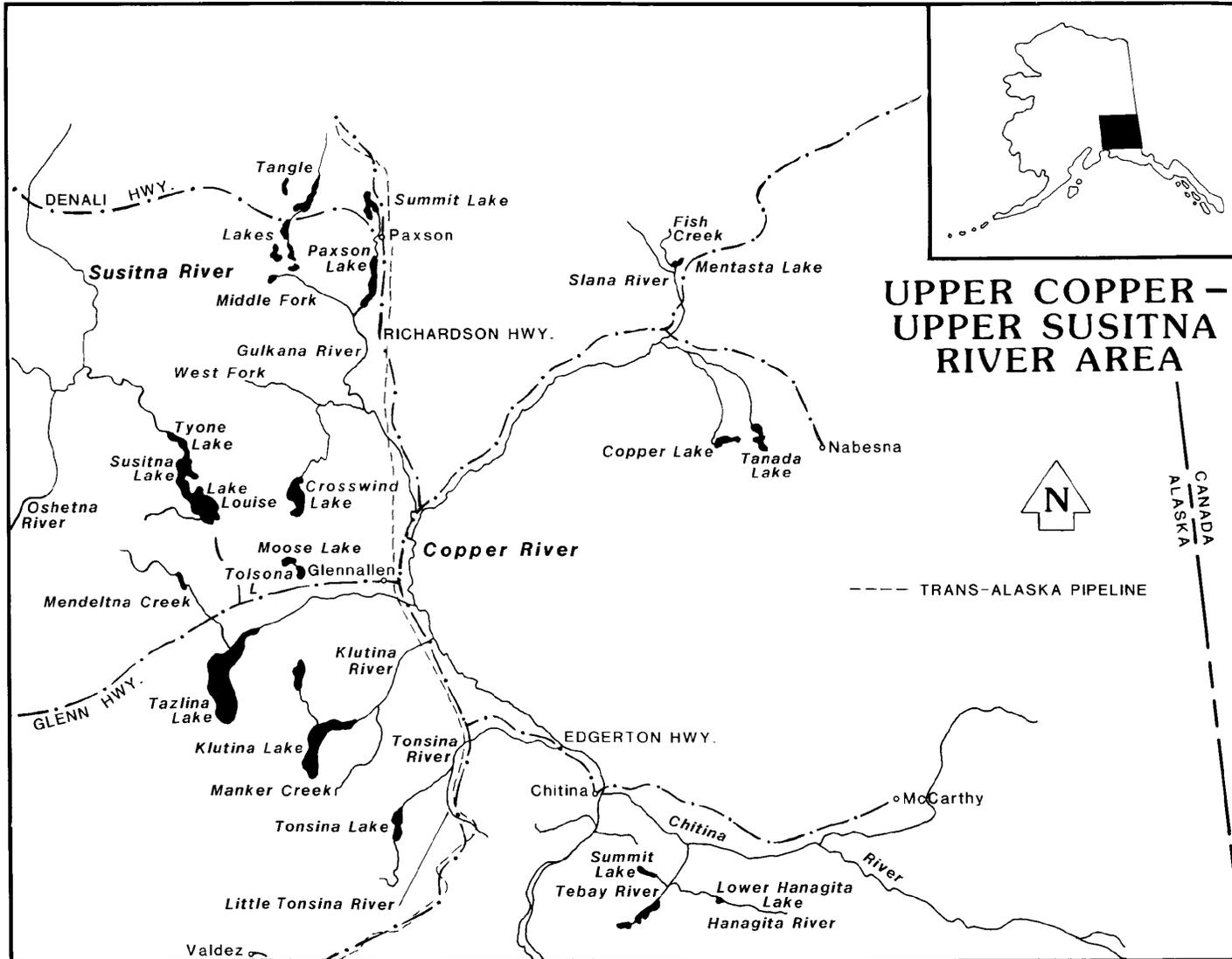


Figure 1.-The Upper Copper-Upper Susitna Management Area (UCUSMA).

ALASKA BOARD OF FISHERIES ACTIVITIES

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 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 include 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. 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” in order to increase the number of chinook on the spawning grounds; 2) changes in the values of the inriver 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) the restriction of bait on the Tonsina River; 6) closure of steelhead 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 1997 BOF meeting an Agenda Change Request was accepted that provided a permit for 10 additional sockeye salmon during weeks when a surplus escapement occurs. In March 1999 the BOF will address another Agenda Change Request re-allowing bait on the Tonsina River for harvesting grayling and Dolly Varden.

The next BOF meeting to address proposals regarding UCUSMA sport and personal use fisheries is scheduled for November 1999. The deadline for submission of proposals for this BOF meeting is April 9, 1999.

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 1996 and 1997 are summarized in Table 1.

Table 1.-Emergency orders issued for UCUSMA sport and personal use fisheries during 1996 and 1997.

Year	E. O. Number	Explanation
1996	2-BB-3-02-96	Opens the mainstem of the Copper River to the use of unattended lines for burbot and establishes a bag and possession limit of five burbot per day from 12:01 a.m. Tuesday, January 9, 1996 until further notice.
1996	2-BB-3-03-96	Reopens Hudson Lake to the harvesting of burbot using closely attended lines from 12:01 a.m. Tuesday January 9, 1996 until further notice. The bag and possession limits are two burbot per day.
1996	2-BB-3-04-96	This rescinds Emergency Order 2-BB-3-02-96 which was issued in error. Legalization of unattended lines for burbot and liberalization of the daily burbot bag and possession limits in the Copper River mainstem exceeds the emergency order authority granted to designees of the Commissioner of Fish and Game under 5 AAC 75.003 and 16.05.060.
1996	2-RS-3-11-96	Opens the personal use dip net salmon fishery in the Chitina Subdistrict of the Upper Copper River area from noon on June 1 and will close at noon on June 2.
1996	2-RS-3-13-96	Changes the personal use dip net salmon fishery schedule in the Chitina Subdistrict of the Upper Copper River area for the first opening in June. It will open at 8:00 a.m. on June 1 and will close at 8:00 p.m. on June 1. It will also open at 8:00 a.m. on June 2 and will close at 8:00 p.m. on June 2.
1996	2-RS-3-16-96	Opens the personal use dip net fishery in the Chitina Subdistrict of the Upper Copper River area from noon on June 8 to 8:00 p.m. on June 16.
1996	2-RS-3-18-96	Increases the personal use dip net fishery schedule in the Chitina Subdistrict of the Upper Copper River area for the period from June 16 to June 23. The fishery will remain open through 8:00 p.m. June 23.
1996	2-RS-3-22-96	Increases the personal use dip net fishery schedule in the Chitina Subdistrict of the Upper Copper River area for the period from June 23 to June 30. The fishery will remain open through midnight, June 30.
1996	2-RS-3-25-96	Increases the personal use dip net fishery schedule in the Chitina Subdistrict of the Upper Copper River area for the period from June 30 to July 7. The fishery will remain open through midnight, July 7.
1996	2-RS-3-26-96	Increases the personal use dip net fishery schedule in the Chitina Subdistrict of the Upper Copper River area for the period from July 7 to July 14. The fishery will remain open through 8:00 p.m., Sunday, July 14.
1996	2-RS-3-29-96	Increases the personal use dip net fishery schedule in the Chitina Subdistrict of the Upper Copper River area for the period from July 14 to July 28. The fishery will remain open through 8:00 p.m., Sunday, July 28.
1996	2-RS-3-32-96	Increases the personal use dip net fishery schedule in the Chitina Subdistrict of the Upper Copper River area for the period from July 28 to August 4. The fishery will remain open through 8:00 p.m., Sunday, August 4.

-continued-

Table 1.-Page 2 of 2.

Year	E. O. Number	Explanation
1996	2-RS-3-34-96	Increases the personal use dip net fishery schedule in the Chitina Subdistrict of the Upper Copper River area for the period from August 4 to August 11. The fishery will remain open through 8:00 p.m., Sunday, August 11.
1996	2-RS-3-37-96	Increases the personal use dip net fishery schedule in the Chitina Subdistrict of the Upper Copper River area for the period from August 11 to August 18. The fishery will remain open through 8:00 p.m., Sunday, August 18.
1996	2-RS-3-39-96	This supersedes the news release issued August 14 and increases the personal use dip net salmon fishery opening in the Chitina Subdistrict of the Upper Copper River area from August 18 to August 25. The fishery will remain open through 8:00 p.m., Sunday, August 25.
1996	2-RS-3-40-96	Increases the personal use dip net salmon fishery opening in the Chitina Subdistrict of the Upper Copper River area from August 18 to September 30. The fishery will remain open through 11:59 p.m., Monday, September 30.
1997	2-RS-3-09-97	Opens the personal use dip net fishery in the Chitina Subdistrict at 8:00 a.m. June 7 through 8:00 p.m. June 8. The fishery will reopen 12:01 a.m. June 10 and remain open through midnight August 31.
1997	2-RS-3-11-97	Supersedes 2-RS-3-09-97 and establishes expanded salmon fishery schedule for the personal use fishery in the Chitina Subdistrict. The fishery will open at 8:00 a.m. June 6 and remain open through midnight August 31.
1997	2-SS-3-38-97	Prohibits the retention of coho salmon in the Copper River personal use fishery in the Chitina Subdistrict.
1997	2-SS-3-39-97	Reduces the bag and possession limit for coho salmon in all waters of the Copper River to 1 per day and 1 in possession. In addition, only unbaited artificial lures may be used in all flowing fresh waters of the Copper River.

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 seasons, open areas, gear and bag limits, and seasonal harvest levels 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 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 of 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 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.

RECREATIONAL ANGLER EFFORT

Recreational angler effort in the UCUSMA has been estimated since 1977 using a mail out survey (Mills 1979-1994; Howe et al. 1995 - 1998). The survey results for each year are not available until the following year, hence the results for 1998 will not be available until 1999. This survey estimates the number of angler-days of fishing effort expended by sport anglers fishing Alaskan waters as well as the sport harvested catch. 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. Beginning in 1990, the survey was modified to include estimation of catch (release plus harvest) on a site-by-site basis. 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 summary of sport angler effort in the UCUSMA is based on mail survey data.

From 1987 through 1997 sport anglers have expended an average of 69,469 angler-days fishing UCUSMA waters, an average of 2.7% of the annual statewide sport angling effort and about 23% of the annual AYK (Region III) sport angling effort over this period (Table 2). This is a 25% increase compared to the previous 10-year period (1977 – 1986). 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. The upper Copper River drainage has supported an average of 76.7% of the sport effort expended in the UCUSMA from 1987 through 1997 (Table 3). In this area, the Gulkana River drainage has supported the vast majority of the sport angling effort. The Klutina River is the other upper Copper River drainage which supports a popular sport fishery (Table 4). 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 1996 and 1997, approximately 85,905 and 74,410 angler-days were expended by sport anglers fishing UCUSMA waters, respectively (Table 2). This represents a decline in angling effort of 17% in 1996 and 28% in 1997 from effort in 1995. Effort in 1996 and 1997 was still greater than the average effort from 1987 - 1997 (Table 2).

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 (S. Morstad, Alaska Department of Fish and Game, Cordova, personal communication; Table 5). During this period, both sockeye (1997) and chinook (1995) harvests were the highest on record. The 1998 harvest of chinook salmon exceeded the previous high in 1995 of 65,675.

Table 2.-Number of angler-days of sport fishing effort expended by recreational anglers fishing UCUSMA waters, 1977-1997.

Year	UCUSMA Effort	Alaska Effort	% by UCUSMA	Region III Effort ^b	% by UCUSMA
1977-1986 ^a	51,580	1,599,436	3.2%	219,849	23.5%
1987	52,324	2,152,886	2.4%	269,433	19.4%
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%
1987-1997^a	69,469	2,512,063	2.7%	301,318	22.9%
1993-1997^a	85,331	2,690,890	3.2%	327,860	26.0%

^a Average value for the years during the period.

^b Values for Region III effort prior to 1996 are AYK and Glennallen totals combined.

Table 3.-Number of angler-days of sport fishing effort expended by recreational anglers fishing upper Copper River and upper Susitna River drainage waters in the UCUSMA, 1977-1997.

Year	Upper Copper River									
	Upper Susitna River		Gulkana River		Klutina River		Other		Total	
	Number	Percent ^a	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1977-1986 ^c	13,785	26.7%	20,794	40.3%	3,358 ^b	6.5%	4,232	8.2%	26,369	51.1%
1987	9,638	18.4%	25,467	48.7%	6,394	12.2%	9,235	17.6%	41,096	78.5%
1988	10,222	22.3%	18,923	41.3%	6,192	13.5%	7,633	16.6%	32,748	71.4%
1989	9,713	18.6%	23,405	44.8%	6,053	11.6%	9,175	17.6%	38,633	73.9%
1990	9,411	18.5%	26,284	51.7%	5,556	10.9%	6,677	13.1%	38,517	75.8%
1991	9,752	15.2%	30,366	47.3%	12,145	18.9%	10,277	16.0%	52,788	82.2%
1992	12,041	16.7%	34,834	48.3%	6,398	8.9%	15,442	21.4%	56,674	78.7%
1993	16,836	21.6%	35,845	46.0%	8,177	10.5%	13,088	16.8%	57,110	73.3%
1994	18,654	21.8%	34,695	40.6%	10,624	12.4%	16,496	19.3%	61,815	72.3%
1995	20,904	20.3%	44,046	42.8%	14,496	14.1%	16,861	16.4%	75,403	73.2%
1996	13,390	15.6%	43,288	50.4%	12,200	14.2%	12,864	15.0%	68,352	79.6%
1997	8,012	10.8%	39,089	52.5%	15,119	20.3%	8,831	11.9%	63,039	84.7%
1987-1997^c	12,598	18.1%	32,386	46.6%	9,396	13.5%	11,507	16.6%	53,289	76.7%
1993-1997^c	15,559	18.2%	39,393	46.2%	12,123	14.2%	13,628	16.0%	65,144	76.3%

^a Percent of total effort expended in the UCUSMA during each year.

^b Average for the years 1983-1986 only. Prior to 1983, harvest included in "other waters".

^c Average value for the years during the period.

Table 4.-Sport fishing effort (angler-days) in the UCUSMA by drainage, averaged for 1977 - 1986 and annually from 1987 - 1997.

Areas	1977-86 ^e	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1987-1997 ^e	1993-1997 ^e
Gulkana River Drainage														
Lakes	7,630	7,578	7,593	7,636	7,172	9,047	8,795	8,302	9,074	10,559	8,330	7,132	8,293	8,679
Streams	13,166	17,755	11,330	15,769	19,112	21,285	26,039	27,543	25,581	33,415	34,958	31,957	24,068	30,691
Total	20,796	25,333	18,923	23,405	26,284	30,332	34,834	35,845	34,655	43,974	43,288	39,089	32,360	39,370
Upper Susitna Drainage														
Lakes	13,600	9,399	9,768	9,383	8,334	8,342	10,569	14,345	16,614	17,058	11,438	6,714	11,088	13,234
Streams	464 ^b	188	454	330	992	1,376	1,408	2,491	2,027	3,716	1,839	1,298	1,465	2,274
Total		9,587	10,222	9,713	9,326	9,718	11,977	16,836	18,641	20,774	13,277	8,012	12,553	15,508
Klutina River Drainage														
Lakes	3,358 ^b	6,394	6,192	6,053	5,556	12,145	6,398	8,177	10,624	14,496	12,200	15,119	9,396	12,123
Tazlina Drainage														
Lakes	1,476 ^b	2,489	1,907	1,564	2,082	2,295	3,507	3,112	3,837	4,165	4,008	1,983	2,814	3,421
Tonsina Drainage														
Lakes	1,050 ^b	621	723	980	498	2,072	2,240	2,901	2,254	3,912	2,384	1,377	1,815	2,566
Copper River														
Upstream of Gulkana	993 ^b	772	1,258	1,728	980	950	476	1,271	1,419	1,711	951	472	1,090	1,165
Copper River														
Downstream of Klutina ^c	450 ^b	193	217	1,641	537	216	1,255	728	1,778	1,402	936	1,125	912	1,194
Stocked Lakes/Streams														
Lakes	2,401	5,122	3,528	3,149	2,665	4,812	7,623	4,782	5,561	5,331	4,204	2,743	4,502	4,524
Other Sites														
Lakes	1,722 ^b	1,080	1,796	2,345	1,738	544	1,645	2,222	3,350	3,555	1,915	2,016	2,019	2,612
Streams	10,965 ^a	733	1,101	1,684	1,125	1,123	2,097	1,996	3,401	3,631	2,742	2,474	2,010	2,849
Total	3,748^b	1,813	2,897	4,029	2,863	1,667	3,742	4,218	6,751	7,186	4,657	4,490	4,028	5,460
Area Total	51,603^d	52,324	45,867	52,262	50,791	64,207	72,052	77,870	85,520	102,951	85,905	74,410	69,469	85,331

^a Includes all flowing waters, data not broken out by specific area prior to 1983.

^b Includes 1983-1986 average only. Prior to 1983, harvest included in "other waters".

^c Not including the Tonsina drainage.

^d Average of the total annual area harvest for the period from 1977-1986.

^e Average value for the years during the period.

Table 5.-Commercial harvests of chinook and sockeye salmon in the Copper River District, 1977-1998.

Year	Chinook Harvest	Sockeye Harvest
1977-1986 ^a	31,880	584,248
1987	41,001	1,180,782
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
1987-1997^a	40,753	1,358,205
1993-1997^a	49,876	1,826,814

^a Average value for the years during the period.

A personal use and a subsistence salmon fishery have been established by the 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 1987 through 1997, an average of over 126,427 salmon were harvested annually in these fisheries (Table 6). Sockeye salmon have comprised the largest portion of this catch, accounting for about 95% of the total. These fisheries are described in detail in a separate chapter of Section II of this report, and thus will not be described further here.

ECONOMIC VALUE OF RECREATIONAL FISHERIES

The economic value of the Gulkana River fisheries and winter fisheries of the Tyone drainage were estimated for 1986 by Jones and Stokes Associates, Inc. This report (Jones and Stokes Associates 1987) is summarized in previous management reports (Szarzi 1995, 1996) and will not be discussed.

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 suggest that the seasonal bag limit provided the greatest net 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.

ISSUES

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

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 set lines from the fishery. Many local anglers are not supportive of this action and have submitted proposals to the Board to reintroduce set lines to the fishery. Staff do not support reintroduction of unattended set line 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 indicate a decline in abundance to levels below any previous estimate, this population will be discussed in detail in a later chapter.

Table 6.-Reported subsistence and personal use harvests of chinook, sockeye, and coho salmon in the Copper River, 1977-1998.

Year	Chinook	Sockeye	Coho	Total
1977-1986 ^a	2,539	53,485	834	56,858
1987	3,280	61,900	498	65,678
1988	3,417	58,905	719	63,041
1989	2,913	80,557	890	84,360
1990	3,221	94,001	1,544	98,766
1991	5,164	111,788	3,477	120,429
1992	4,705	127,670	1,817	134,192
1993	4,037	138,211	1,428	143,676
1994	5,423	153,049	1,958	160,430
1995	6,330	125,573	5,547	137,450
1996	4,881	141,337	3,817	150,035
1997	7,798	224,499	334	232,631
1998 ^b	7,955	181,202	2,365	191,609
1987-1997^a	4,652	119,772	2,003	126,427
1993-1997^a	5,694	156,534	2,617	164,845

^a Average value for the years during the period.

^b Preliminary estimates.

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.

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 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 from the Gulkana hatchery surplus. 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. Commercial harvests, the largest component of the annual harvest, have increased in the past five years. Participation in the area's subsistence, personal use, and sport fisheries have also resulted in increased chinook harvests. To assure that harvests of Copper River chinook salmon do not exceed sustainable levels, the department has been directed by the BOF to develop a revised Copper River Chinook Salmon Fishery Management Plan by the 2002 BOF meeting.

Copper River Personal Use & Subsistence Salmon Fisheries: Since 1990, harvest and participation in the Copper River subsistence and personal-use salmon fisheries has 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 a escapement goal of 100,000 salmon for the personal use fishery have been set. In 1997, harvests in both personal use and subsistence fisheries exceeded the harvest guidelines and participation in both fisheries were the highest on record. During that year over 1.1 million salmon passed the Miles Lake sonar. If the participation stabilizes at the same 1997 level or increases, and sockeye returns decline, allocation issues could become a concern at future BOF meetings as they did at the 1996 BOF meeting.

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 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. There is one completed large scale access project in the UCUSMA, the boat launch along the Gulkana River at the Bureau of Land Management (BLM) campground at Sourdough. The Gulkana River is the most popular sport fishery for chinook salmon in the area and supports one of the largest Arctic grayling fisheries in the state. 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. Locations where boat launch facilities would be appropriate follow, in order of priority:

The Gulkana River at the Richardson Highway Bridge crossing is privately owned by the Gulkana Village Native Townsite. Although access across native lands for hunting and fishing is expressly prohibited by all local Alaska Native landowners, the public routinely fishes, launches and camps at this site. The Department of Transportation is in the process of developing a plan for a boat launch, parking area and camping area. They are coordinating site location with Gulkana Village and Ahtna Corporation. Though this site is a high priority item for DOT, no work will be conducted at the site in the next year.

There is currently no public access to the Klutina River suitable for launching a power boat. Private launches at several private campgrounds are available for a fee between the new Richardson and old Richardson highways. A user developed launch within the

highway right-of-way is currently being used by the public, but does not offer adequate parking. Land status of accessible sites needs to be determined.

The Lake Louise system (Lake Louise, Susitna, and Tyone) is a popular recreational destination for both fishing and hunting. Numerous cabins are on all three lakes and four lodges operate at Lake Louise, as well as a state recreation site. Low water has made launching boats difficult at the state recreation site and some of the lodges. Redesign of the recreation site camping area has made parking inconvenient for users looking for boat launch only. The Department of Natural Resources, Division of Parks has approached the Sport Fish Division for funding to improve the recreation site boat launch. The Matanuska-Susitna Borough is in the planning stage of developing a boat launch site at the end of the Lake Louise Road, and is interested in supporting funding from the Sport Fish Division. Support for either of the projects by local residents, recreational users and lodge owners is not united, which will confound any final decisions regarding boating access.

Various smaller access projects were completed in 1996 and 1997 in the UCUSMA which entail development of parking for several small but popular roadside lakes: Tex Smith, Strelna, and Silver/Van; and signs for local roadside lakes. Many more sites for foot access and improvement of existing trails to local fisheries are needed.

SECTION II: FISHERIES

The following section discusses, by species, the major sport fisheries in the UCUSMA. For each major fishery, a discussion is presented with respect to: (1) a historical perspective of the fishery, (2) fishery objectives, (3) inseason management approaches, (4) actions taken by the BOF during its last meeting, (5) the recent performance and status of the fishery, (6) any current biological and social issues related to the management of the fishery, and (7) recommended research and management activities. Discussion of recent performance of the fishery will center around harvest and catch during the 1996 and 1997 season, as the major source of data for most sport fisheries in the area is the Statewide Harvest Survey (SWHS) (Howe et al. 1997, 1998). However, observations or research data regarding the fisheries in 1998 will also be presented when available. A summary of the historical harvest of fish in the UCUSMA by species is presented in Table 7.

ARCTIC GRAYLING SPORT FISHERIES

From 1977 through 1995, more grayling have been harvested by sport anglers fishing UCUSMA waters than any other fish. Harvests remained relatively stable from 1977 through 1986, averaging about 29,145 grayling. However, since 1987, harvests have been lower, with the 1997 harvest of 7,483 grayling being the lowest on record (Table 8). This has primarily been the result of more restrictive regulations adopted to assure the sustained yield of the area's grayling stocks. The 1997 harvest accounted for about 28% and 20% 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 9). From 1987 through 1997, this drainage accounted for about 37% of the grayling harvest from UCUSMA waters (Table 10). 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 a 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 and 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, from 255 to 867 grayling, and peaked in 1995 at 1,041 (Table 8). There is little baseline data on the grayling population in Mendeltna Creek; stock assessment is planned for this system in 1998.

Table 7.-Number of fish harvested, by species, by recreational anglers fishing UCUSMA waters, 1977-1997.

Year	Arctic Grayling	Lake Trout	Burbot	Rainbow Trout	Sockeye Salmon	Dolly Varden	Chinook Salmon	Whitefish	Landlocked Salmon	Coho Salmon	Steelhead Trout	Other Fish
1977-86 ^a	29,145	7,453	9,010	5,026	2,862	3,540	2,071	2,872	2,388	256	85	321
1987	27,359	6,721	4,386	7,838	4,876	2,023	2,301	2,096	0	330	134	76
1988	21,937	6,277	3,747	6,695	3,038	5,185	1,562	2,474	109	291	91	0
1989	16,629	7,147	3,396	5,835	4,509	3,979	2,356	2,991	281	18	84	0
1990	13,775	5,503	1,836	3,924	3,569	3,159	2,302	1,784	17	0	34	0
1991	13,278	4,864	793	6,868	5,511	2,140	4,884	717	111	69	114	47
1992	11,125	4,251	1,495	9,373	4,560	1,997	4,412	1,150	433	113	8	11
1993	12,504	4,569	1,694	7,245	5,288	3,173	8,217	815	56	249	0	9
1994	14,066	4,058	2,869	5,808	6,533	1,598	6,431	1,149	134	209	7	128
1995	14,289	2,934	995	4,671	6,068	1,695	6,709	898	42	160	10	30
1996	8,509	2,107	1,039	5,208	14,170	1,248	7,113	370	225	160	0	7
1997	7,483	1,741	829	2,861	12,807	620	8,868	71	88	107	12	285
1987-1997^a	14,632	4,561	2,098	6,030	6,448	2,438	4,862	1,320	136	155	45	54
1993-1997^a	11,370	3,082	1,485	5,159	8,973	1,667	7,348	661	109	177	6	92

^a Average value for the years during the period.

Table 8.-Harvest of Arctic grayling by recreational anglers fishing UCUSMA waters, 1977-1997.

Year	UCUSA Harvest	Alaska Harvest	Percent	Region III Harvest	Percent
1977-1986 ^a	29,145	150,186	19	121,743	24
1987	27,359	110,714	25	85,315	32
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
1987-1997^a	14,632	68,982	21	53,890	29
1993-1997^a	11,370	46,740	24	35,593	32

^a Average value for the years during the period.

Table 9.-Harvest of Arctic grayling by recreational anglers fishing UCUSMA by drainage, averaged for 1977 – 1986 and annually from 1987-1997.

Areas	1977-1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1987-1997 ^c	1993-1997 ^c
Gulkana R. Drainage														
Lakes	3,439	3,538	2,382	1,520	1,461	1,977	902	1,483	1,545	1,241	688	658	1,567	1,112
Upper River	8,796 ^a	8,921	5,748	4,746	3,429	4,355	2,901	2,231	2,357	2,347	1,852	1,787	3,698	2,115
Lower River		1,621	455	394	493	171	188	114	384	483	179	503	453	333
Total	12,235	14,080	8,585	6,660	5,383	6,503	3,991	3,828	4,286	4,071	2,719	2,948	5,718	3,559
Upper Susitna Drainage														
Lake Louise		1,086	1,855	1,576	1,613	875	481	994	1,239	1,040	570	242	1,052	817
Susitna/Tyone Lk		1,190	455	300	119	330	639	661	949	1,273	289	197	582	674
Other Lakes		208	0	683	646	125	218	93	301	254	626	49	291	265
Streams		580	473	497	866	693	706	1,082	1,157	1,485	920	539	818	1,037
Total	3,916^b	3,064	2,783	3,056	3,244	2,023	2,044	2,830	3,646	4,052	2,405	1,027	2,743	2,792
Klutina R. Drainage	1,113 ^c	729	1,673	1,041	544	1,092	346	681	363	285	149	127	639	321
Tazlina R. Drainage														
Mendeltna Creek	246 ^c	387	1,037	272	170	102	255	867	906	1,041	439	337	528	718
Other Lakes	893 ^c	1,531	91	122	374	353	347	206	734	733	491	333	483	499
Other Streams	243 ^c	551	819	760	204	842	128	518	274	581	383	14	461	354
Total	1,256^c	2,469	1,947	1,154	748	1,297	730	1,591	1,914	2,355	1,313	684	1,473	1,571
Tonsina Drainage	447 ^c	1,056	345	629	289	296	811	814	363	261	163	59	462	332

-continued-

Table 9.-Page 2 of 2.

Areas	1977-1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1987-1997 ^c	1993-1997 ^c
Copper R Upstream of Gulkana														
Lakes	367 ^c	1,843	909	413	883	216	113	378	234	321	84	88	498	221
Streams	523 ^c	967	674	375	119	466	30	356	125	210	118	143	326	190
Total	890^c	2,810	1,583	788	1,002	682	143	734	359	531	202	231	824	411
Copper R Downstream of Klutina^d														
Lakes	43 ^c	446	327	666	136	11	15	317	82	166	93	191	223	170
Streams	152 ^c	0	146	0	0	34	0	19	41	0	56	171	42	57
Total	195^c	446	473	666	136	45	15	336	123	166	149	362	265	227
Other Sites														
Stocked Lakes	517 ^c	639	1,401	881	935	726	1,623	852	1,167	749	412	478	897	732
Other Lakes	1,195 ^c	341	1,346	928	1,035	68	767	334	1,238	665	487	899	737	725
Other Stream	1,510 ^c	1,784	1,801	826	459	591	655	504	664	1,154	510	668	874	700
Total	3,222^c	2,764	4,548	2,635	2,429	1,385	3,045	1,690	3,069	2,568	1409	2045	2,508	2,156
Area Total	29,145	27,359	21,937	16,629	13,775	13,278	11,125	12,504	14,066	14,289	8,509	7,483	14,632	11,370

^a Includes lower river estimated harvest.

^b Includes all upper Susitna lakes and streams.

^c Includes 1983-1986 average only. Prior to 1983, harvest included in “other waters”.

^d Does not include the Tonsina River drainage.

^e Average value for the years during the period.

Table 10.-Harvest and catch of Arctic grayling by recreational anglers fishing the Gulkana River drainage, 1977-1997.

Year	Gulkana River Drainage Harvest			Percent total UCUS harvest	Number Caught	Percent Released
	Rivers & Streams	Lakes	Total			
1977-1986	8,796	3,491	12,288	42%		
1987	10,542	3,538	14,080	51%		
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%
1987-1997^a	4,151	1,581	5,732	37%	31,786	82%
1993-1997^a	2,447	1,123	3,570	32%	35,633	90%

^a Average value for the years during the period.

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 2). 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-mi below Sourdough upstream to the confluence of the West Fork. More recently, power boat operators have begun launching from the Richardson Highway Bridge and fishing the 5-mile reach of the river above the bridge. Powerboat operators also access the confluence of the Gulkana River with the Copper River, using boats launched from Gakona. 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.

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 (Table 10). 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 near Fairbanks became severely depressed when subjected to similar harvest rates. Regulations were therefore adopted in 1988 that reduced the bag and possession limit to five fish per day. Also, past research 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, a study has been conducted in conjunction with the University of Alaska and formed the basis of an M.S. thesis for a graduate student (Dan Bosch). 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 May of 1995 (Bosch 1995).

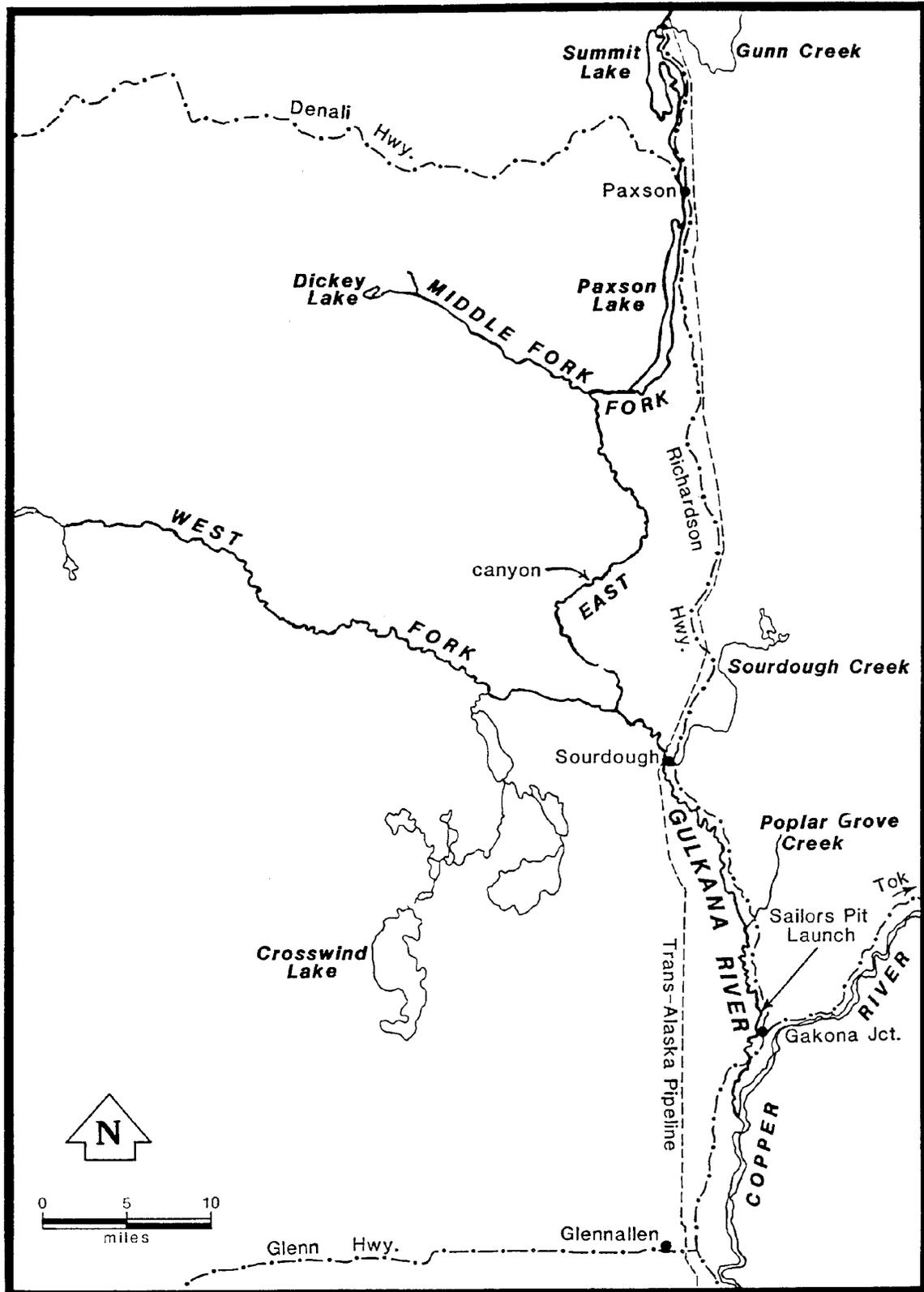


Figure 2.-The Gulkana River drainage.

Fishery Objectives

Grayling fisheries in the Gulkana River drainage are managed to assure maintenance of historic age and size composition and stock abundance.

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.

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 9). 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.

Current Issues

Overall, Gulkana River drainage grayling stocks appear healthy. The ADF&G is developing 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. 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 the average since 1990 (Table 9). Assuming a 5% release mortality rate, this appears acceptable given current harvest and abundance levels.

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 is planned in the mainstem for 1998, to determine age and length composition.

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. Nowhere else in Alaska can lake trout be taken in such quantities and range of sizes along the road system. From 1977 through 1986, an average of 7,450 lake trout were harvested from UCUSMA lakes and streams annually, accounting for 42% of the statewide lake trout harvest and 70% of the AYK region harvests over this period (Table 11). Since 1987, lakes and streams of the UCUSMA have accounted for over 38% of the annual statewide harvest of lake trout and 69% of the AYK region harvests.

Most of the lake trout harvest in the UCUSMA has come from lakes of the Tyone River (Lake Louise and Susitna and Tyone lakes) and Gulkana River (Paxson, Susitna, and Crosswind lakes) drainages (Table 12). From 1987-1997, these two drainages have accounted for 88% 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 49% of the UCUSMA lake trout harvest and an average of 19% of the annual statewide harvest of lake trout since 1987. 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; Figure 3).

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 11). 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.

Fishery Objectives

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

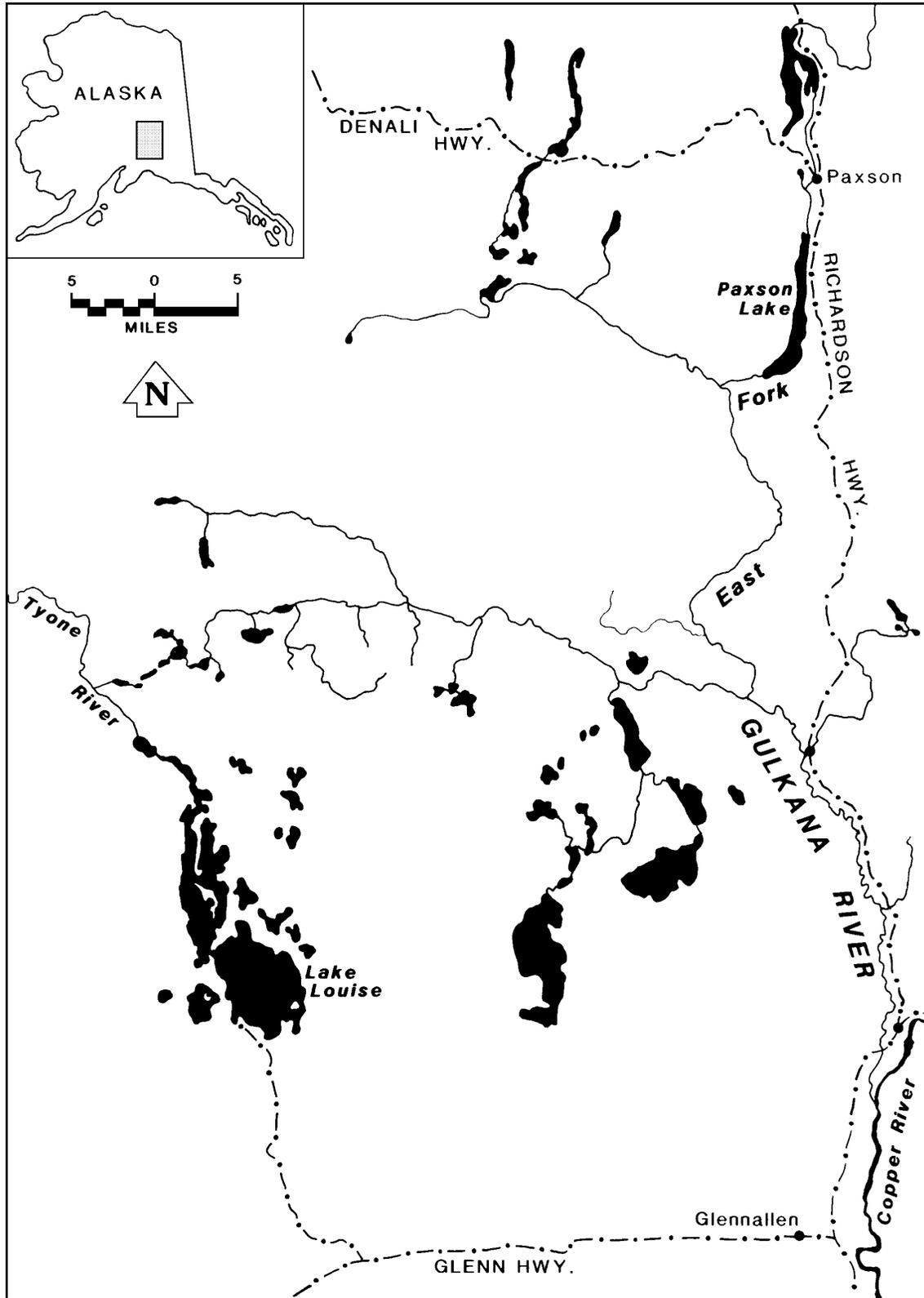


Figure 3.-Lakes supporting major lake trout fisheries in the UCUSMA.

Table 11.-Harvest of lake trout by recreational anglers fishing UCUSMA waters, 1977-1997.

Year	UCUSA Harvest	Alaska Harvest	Percent	Region III Harvest	Percent
1977-1986 ^a	7,450	17,903	42	10,602	70
1987	6,721	15,209	44	7,834	86
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
1987-1997^a	4,561	12,107	38	6,587	69
1993-1997^a	3,082	8,962	34	4,656	66

^a Average value for the years during the period.

Table 12.-Harvest of lake trout by recreational anglers fishing UCUSMA waters by drainage, averaged for 1977 – 1986 and annually from 1987-1997.

Areas	1977-86	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1987-1997 ^f	1993-1997 ^f
Gulkana Drainage														
Paxson Lake	1,934 ^a	1,457	1,310	1,557	2,139	1,248	1,118	778	262	507	259	437	1,007	449
Summit Lake		1,368	528	863	968	981	524	344	353	224	102	135	581	232
Crosswind Lake	529	401	382	272	306	463	378	311	429	94	295	81	310	242
Other Lakes	98 ^b	119	365	9	68	28	85	256	66	0	28	0	93	70
Upper River	115 ^c	402	782	159	102	70	155	20	44	90	46	135	182	67
Lower River		0	0	19	0	0	0	0	0	0	0	0	2	0
Total	2,618	3,747	3,367	2,879	3,583	2,790	2,260	1,709	1,154	915	730	788	2,175	1,059
Upper Susitna Drainage														
Lake Louise	3,125 ^d	1,636	1,801	1,979	1,036	1,332	1,033	1,316	1,463	946	562	498	1,237	957
Susitna Lake		401	418	441	187	308	324	669	426	200	324	44	340	333
Other Lakes	156	75	55	761	119	182	348	295	308	173	232	103	241	222
Streams	0	0	0	0	0	14	0	19	140	199	37	0	37	79
Total	3,282	2,112	2,274	3,181	1,342	1,836	1,705	2,299	2,337	1,518	1,155	645	1,855	1,591
Klutina Drainage	234 ^b	134	163	150	68	84	39	28	74	71	19	31	78	45
Tazlina Drainage	65 ^b	149	55	0	51	42	62	0	15	0	9	27	37	10
Copper River Drainage														
Upstream of Gulkana	111 ^b	104	400	506	102	42	23	145	309	164	83	86	179	157
Downstream of Klutina	77 ^b	0	0	103	238	14	0	133	22	20	0	0	48	35
Other Sites	590 ^b	475	18	328	119	56	162	255	147	246	111	164	189	185
AREA TOTAL	7,453^e	6,721	6,277	7,147	5,503	4,864	4,251	4,569	4,058	2,934	2,107	1,741	4,561	3,082

^a Includes Paxson and Summit lake harvests during 1977-1983.

^b Includes 1983-1986 average only. Prior to 1983, harvest included in “other waters”.

^c Includes lower river harvest.

^d Includes Susitna and Tyone lake harvest estimates.

^e Includes harvest for entire area 1977-1986.

^f Average value for the years during the period.

resource is not exceeded. It is likely that as fishery objectives are defined for specific lake trout fisheries, they will center around 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.

Recent Board of Fisheries Action

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

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 1996 and 1997 harvests of 2,107 and 1,741 lake trout was the lowest on record since 1977 (Table 12). In general, harvests from both the Gulkana River and Tyone River drainages have declined since 1994.

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 $0.5 \text{ kg ha}^{-1} \text{ y}^{-1}$. Estimates of the average weight of lake trout from most lakes in the UCUSMA are unavailable, therefore 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 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° to 12°C), termed the thermal habitat volume (THV), are 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, harvests of lake trout appear to be below sustainable levels.

Research indicates that strong and weak year classes are present in Paxson Lake while the population in Lake Louise exhibits a more uniform distribution. Exploitation may be the cause of variable recruitment in Paxson Lake; the age distributions of unexploited populations have been found to be more stable (Martin and Olver 1980). Reduction of the harvest from the recent

regulation changes should produce a stable lake trout population in Paxson Lake, which will support sustainable harvests into the future. Estimates of abundance of mature lake trout determined from sampling in 1997 indicate that the lake trout population in Paxson Lake has responded to the regulation changes in 1987 and 1994 (Szarzi et al. *In prep*), abundance of mature lake trout has increased since 1992.

Current Issues

The present regulatory regime should protect all UCUSMA lake trout stocks from overharvest and allow abundance to increase. Angler preferences for small lake trout to eat and trophies to admire are not being met, however. A protected slot limit could 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. *In prep*). 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 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 4) support some of the largest populations of burbot in Alaska and prior to 1986 supported up to 70% of the statewide sport harvest of this species (Table 13). The largest fishery has historically occurred in the Lake Louise complex (consisting of Lake Louise, Susitna and Tyone lakes) (Table 14). Other significant fisheries occur in the various lakes of the Gulkana River drainage (e.g., Paxson, Summit, and Crosswind

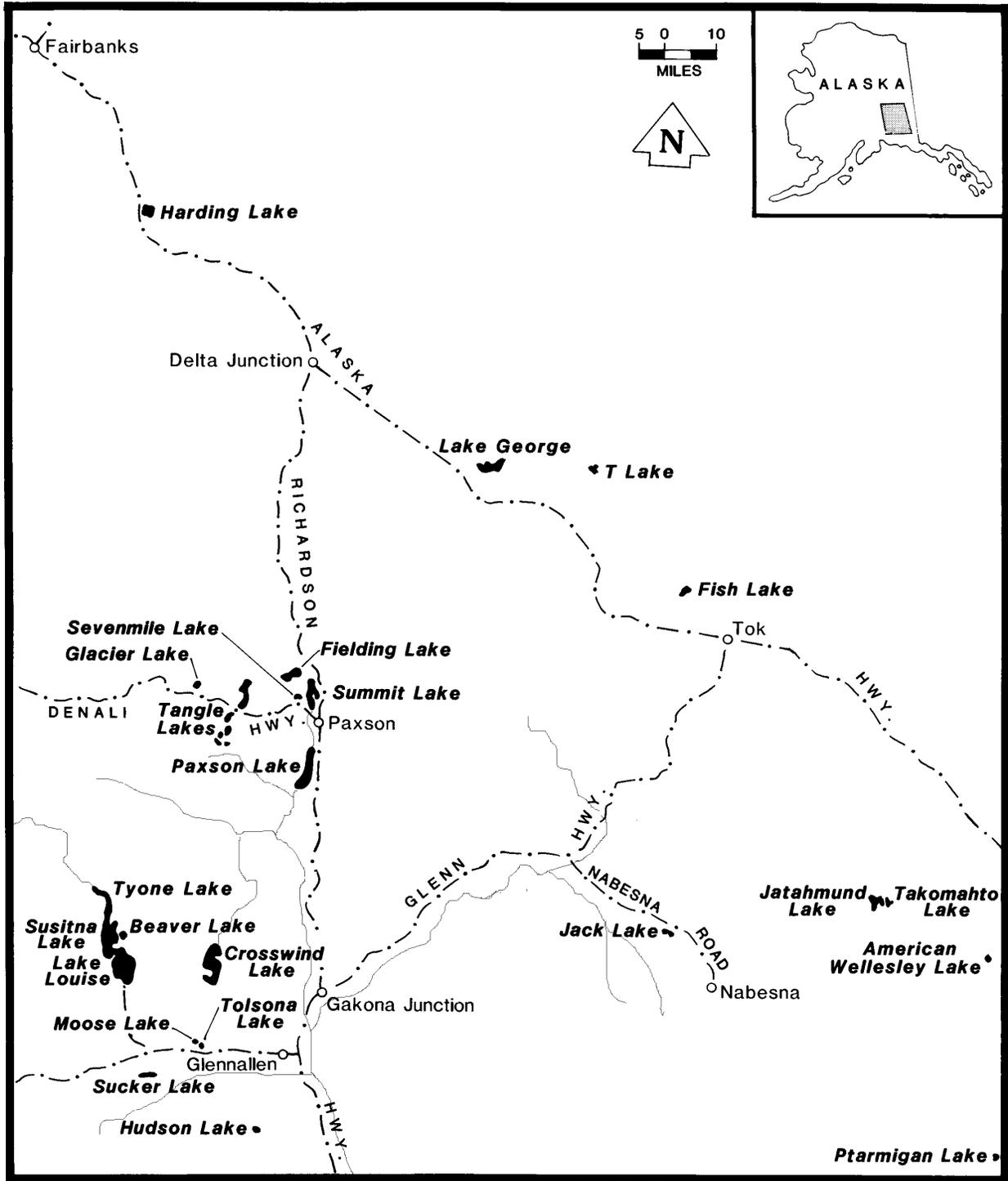


Figure 4.-Lakes supporting major burbot fisheries in the UCUSMA.

Table 13.-Harvest of burbot by recreational anglers fishing UCUSMA waters, 1977-1997.

Year	UCUSA Harvest	Alaska Harvest	Percent	Region III Harvest	Percent
1977-1986 ^a	9,010	15,016	60	13,217	68
1987	4,386	13,543	32	8,403	52
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
1987-1997^a	2,098	8,463	24	6,589	30
1993-1997^a	1,485	7,620	19	6,249	24

^a Average value for the years during the period.

Table 14.-Harvest of burbot caught by recreational anglers fishing in the UCUSMA by drainage, averaged for 1977 – 1986 and annually from 1987-1997.

Areas	1977-86	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1987-1997 ^d	1993-1997 ^d
Gulkana River Drainage														
Lakes	857	550	637	413	561	343	304	257	629	340	171	443	423	368
Streams	82	45	18	19	17	27	127	0	0	7	54	50	33	22
Total	998	595	655	432	578	370	431	257	629	347	225	493	456	390
Upper Susitna Drainage														
Lake Louise	5,040 ^a	506	655	976	255	0	0	0	0	0	0	0	217	0
Susitna/Tyone Lakes		684	273	656	323	45	533	172	766	137	195	211	363	296
Other Waters	105 ^b	30	200	66	0	54	8	0	145	46	53	42	59	57
Total	6,141^c	1,220	1,128	1,698	578	99	541	172	911	183	248	253	639	353
Klutina River Drainage	13 ^c	0	36	0	0	0	0	0	0	0	0	0	3	0
Tazlina Drainage														
Moose/Tolsona	2,223 ^c	684	73	94	408	108	127	21	93	23	88	0	156	45
Hudson	360	446	327	0	0	0	0	0	31	103	0	0	82	27
Other	190 ^c	862	546	403	0	81	245	86	114	0	9	21	215	46
Total	3,180^c	1,992	946	497	408	189	372	107	238	126	97	21	454	118
Copper River														
Upstream of Gulkana	92 ^c	0	746	459	238	0	8	611	799	122	80	0	278	322
Downstream of Klutina	12 ^b	0	0	113	0	0	0	0	42	34	44	0	21	24
Other Sites	1,144 ^c	579	236	197	34	135	143	493	250	183	345	62	242	267
Area Total	9,010^d	4,386	3,747	3,396	1,836	793	1,495	1,640	2,869	995	1,039	829	2,093	1,474

^a Includes Susitna and Tyone lake harvest estimates.

^b Harvest from 1986 only.

^c Includes 1983-1986 average harvest estimate only. Prior to 1983, harvest included in “other waters”.

^d Average of total annual harvest for the years during the period.

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 was taken (Table 13).

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 burbot stock had been severely overexploited and was depressed.

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 for the public 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.

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 at the BOF meeting in December 1996.

Fishery Objectives

Based on the lake burbot management plan (5 AAC 52.045), the lake burbot fisheries 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.

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 setlines 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.

Recent Fishery Performance

With the adoption of the more conservative regulations, harvests of burbot from UCUSMA waters decreased (Table 13). 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. 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.

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, anglers continue to be reluctant. 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 remain 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 control 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.

Recommended Research and Management

The stock assessment program was discontinued following sampling of Lake Louise and Tolsona Lake in the spring of 1995. A monitoring program is 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 continue to be sampled for abundance and length composition on a yearly basis, as well as water quality. If participation in the personal use fishery continues to be non-existent, stock assessment of the Copper River mainstem and glacial tributaries (Chistochina, Tazlina, Klutina, Tonsina) should be conducted to determine abundance and whether the river populations of burbot could sustain a sport fishery with unattended set lines. Staff will continue to try to educate the angling public and seek their input to managing these important ice fisheries.

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 a sonar 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; however, only nine of these systems have been surveyed consistently since 1966 (Roberson and Whitmore 1991). In general, chinook salmon returns to these nine Copper River tributaries have been above historical averages since 1982 (Table 15). In 1992 and 1995 escapement to these nine streams was the lowest observed since 1969. The reasons for the low escapement counts in 1992 are unknown. 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 for the Copper River is not possible. However, the 1993 escapement count of 1,156 chinook salmon in the Gulkana River is above the historical mean for that system and nearly twice the 1992 and 1995 counts. During 1996, chinook counts of many index streams were records or near records. 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 fish wheel fishery in the Copper River between Chitina and the Slana River confluence, and (4) a sport fishery that occurs in various

Table 15.-Upper Copper River chinook salmon aerial escapement index counts, 1977-1998^a.

Year	Copper R. Upstream of Gulkana ^b			Tazlina Drainage ^b		Klutina Drainage		Tonsina Drainage ^b		Total
	E. Fork			Mendeltna Creek	Kiana Creek	St. Anne Creek	Manker Creek	Little		
	Gulkana River	Chistochina River	Indian River					Tonsina River	Grayling Creek	
1977	1,090	132	20	73	91	10	15	35	48 ^c	1,514
1978	921	137	9	52 ^f	125 ^f	24 ^f	20 ^f	285 ^f	92 ^f	1,665
1979	1,380	810	29	5 ^f	279 ^f	16 ^f	16 ^f	285 ^f	153 ^f	2,973
1980	718	575	24	3 ^f	247	8 ^f	35 ^f	70 ^f	66 ^f	1,746
1981	754 ^c	120	20 ^c	51	191	19	33	191	107	1,486
1982	1,656	1,260	179	70	200 ^f	35 ^f	49 ^f	440 ^f	124 ^f	4,013
1983	931	575	41	12	166	87	141	330	287	2,570
1984	2,189	577	17	2 ^f	382	89	264	568	279	4,367
1985	321	316	14	26 ^f	91 ^f	15 ^f	22 ^f	203 ^f	58 ^f	1,066
1986	3,182	618	29 ^c	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 ^f	78	3,683
1990	1,356	645	15	323 ^f	414 ^f	43 ^f	43	57	48	2,944
1991	1,303	925	18	310	522	130	107	59	159	3,533
1992	656	88	1	83 ^f	79 ^f	12 ^f	14 ^f	107	17 ^f	1,057
1993	1,156	-- ^d	-- ^d	126	65	-- ^d	-- ^d	-- ^d	-- ^d	-- ^d
1994	1,682	508	47	120	430	250	75	4 ^f	2 ^f	3,118
1995	720 ^e	37 ^f	2 ^f	41 ^f	110 ^f	26 ^f	8 ^f	25 ^f	26 ^f	995
1996 ^g	4,542	2,071 ^f	207	370	510	117	194	30 ⁱ	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
1977-1986	1,134	512	38	37	210	49	85	283	144	2,671
1987-1997	1,761	874	60	176	296	182	107	73	110	3,641
1993-1997	2,374	1,215^h	132^h	201	314	323^h	121^h	29^h	130^h	4,839^h

^a In years where more than one surveyor was used, counts from the most experienced surveyor are listed.

^b Some data published in Brady et al. 1991, remainder is unpublished.

^c Estimated.

^d No aerial surveys conducted in 1993.

^e Visibility poor, carcass count only downstream of West Fork.

^f Surveys flown outside of July 17 - 31.

^g Counts determined by two surveyors.

^h Average of surveys conducted during 1966-1992, 1994 and 1995.

ⁱ More chinook were seen entering the system at later survey, but not counted.

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 almost 79,000 (Table 16). Unfortunately, the contribution to the catch 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 1987, chinook salmon harvest in the Copper River District Delta commercial fishery has averaged nearly 41,000 fish (Table 16), 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 4,900 fish since 1987, with harvests having generally increased in recent years (Table 16). 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. Fish wheels 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 fish wheels, while a five chinook salmon limit is imposed on subsistence fishermen using dip nets. Chinook salmon are present in the fishery when the fishery is opened and, on average, 80% of the chinook salmon harvest is achieved 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 will be 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%

Table 16.-Copper River chinook salmon harvest and escapement index estimates, 1977-1998.

Year	Commercial Harvest ^a	Sport Harvest	Subsistence/ Personal Use Harvest ^b	Total Harvest	Aerial Escapement Index
1977	22,089	532	2,555	25,176	1,514
1978	29,062	641	2,239	31,942	1,665
1979	17,308	2,948	3,416	23,672	2,973
1980	8,449	2,101	3,035	13,585	1,746
1981	20,178	1,717	2,410	24,305	1,486
1982	47,362	1,802	2,764	51,928	4,013
1983	50,022	2,579	5,950	58,551	2,570
1984	38,955	2,787	2,269	44,011	4,367
1985	42,333	1,939	1,958	46,230	1,066
1986	40,670	3,663	3,052	47,385	5,313
1987	41,001	2,301	3,781	47,083	2,803
1988	31,741	1,562	3,986	37,289	2,370
1989	30,873	2,356	3,038	36,267	3,683
1990	21,702	2,302	3,355	27,359	2,944
1991	34,787	4,846	5,384	45,017	3,533
1992	39,819	4,404	4,855	49,078	1,057
1993	29,716	8,217	4,280	42,213	NA
1994	47,061	6,431	5,732	59,224	3,118
1995	65,675	6,709	6,599	78,983	995
1996	55,646	7,113	5,066	67,754	8,204
1997	51,273	8,868	8,031	68,172	8,583
1998	68,827	7,500 ^c	8,764 ^d	85,091	5,632
1977-1986^e	31,643	2,071	2,965	36,679	2,671
1987-1997^e	40,845	5,010	4,919	46,106	3,729
1993-1997^e	49,874	7,468	5,942	53,015	5,225

^a Some data published in Donaldson et al. 1993, the rest is unpublished.

^b These figures are expanded to reflect unreported permits. See Table 6 for reported harvests.

^c Estimated.

^d Preliminary.

^e Average value for the years during the period.

of the chinook salmon harvest is completed by July 1 and 95% by July 17 (Roberson and Whitmore 1991).

The average sport harvest of chinook salmon from Copper River tributaries has more than doubled between 1977 - 1986 and 1987 - 1997, with the 1997 harvest of 8,868 being the highest on record (Table 17). Since 1987, the average harvest of chinook salmon by sport anglers fishing UCUSMA waters has been about 5,000 fish, since 1993 this has increased to nearly 7,500. Sport harvests of chinook salmon in the UCUSMA during 1996 and 1997 accounted for 11% and 10% of the statewide, and 55% and 60% of the AYK region chinook sport harvests (Table 17). The fishery primarily occurs in various tributaries to the Copper River with the largest fisheries occurring in the Gulkana and Klutina rivers (Table 18). Approximately 94% of the estimated sport harvest of chinook salmon taken from the Copper River drainage since 1987 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 mi 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 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 for chinook salmon was reduced 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 allocation has been exceeded in 1996 and 1997, primarily due to the doubling of the sockeye sport harvest during those two years due to strong sockeye runs (Table 7). 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.

Overall, Copper River chinook salmon stocks are considered healthy (Roberson and Whitmore 1991). Increasing harvests over the past decade have been compensated by above average

Table 17.-Harvest of chinook salmon by recreational anglers fishing UCUSMA waters, 1977-1997.

Year	UCUSA Harvest	Alaska Harvest	Percent	Region III Harvest	Percent
1977-1986 ^a	2,071	41,174	5	4,079	51
1987	2,301	82,892	3	4,499	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
1987-1997^a	5,012	86,787	6	8,635	56
1993-1997^a	7,466	95,059	8	12,459	60

^a Average value for the years during the period.

Table 18.-Harvest of chinook salmon by recreational anglers fishing in the UCUSMA by drainage, averaged for 1977 – 1986 and annually from 1987-1997.

Areas	1977-86	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1987-1997 ^d	1993-1997 ^d
Gulkana River Drainage														
Upper River	1,644 ^a	1,301	881	1,211	1,102	1,670	1,676	3,998	1,548	1,269	1,393	2,115	1,651	2,065
Lower River		330	152	419	525	1,321	1,395	1,894	2,154	2,287	2,685	2,890	1,459	2,382
Total	1,644	1,631	1,033	1,630	1,627	2,991	3,071	5,892	3,702	3,556	4,078	5,005	3,111	4,447
Klutina River Drainage														
	454 ^b	495	483	652	583	1,709	1,075	1,989	2,189	2,485	2,417	3,581	1,605	2,532
Tonsina River Drainage														
	26	19	0	11	23	89	152	172	349	539	283	145	162	298
Tazlina Drainage														
	31 ^b	49	9	40	17	32	8	0	105	0	60	31	32	39
Copper River														
Upstream of Gulkana	15 ^b	0	9	0	17	0	18	47	16	0	0	0	10	13
Downstream of Klutina ^c	49 ^b	0	28	11	0	25	55	64	20	0	59	23	26	33
Other Waters														
	115	107	0	6	35	38	24	43	50	129	216	83	66	104
AREA TOTAL	2,071^d	2,301	1,562	2,350	2,302	4,884	4,403	8,207	6,431	6,709	7,113	8,868	5,012	7,466

^a Includes upper and lower river harvests.

^b Includes 1983-1986 average only. Prior to 1983, harvest included in “other waters”.

^c Does not include Tonsina drainage.

^d Average of total annual harvest for the years during the period.

returns (Table 16). 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 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 will finish in 1999 with tagging on the Gulkana, Klutina and Chistochina rivers. Recovery of returning chinook salmon will occur in the commercial fishery in the Copper River delta. 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). The weir will be used in the future to count returning adults and determine the fraction of the return with coded wire tags.

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.

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 2). 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 parallels 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 mi below Sourdough upstream to the confluence of the West Fork. More recently power boat operators have begun launching from the Richardson Highway Bridge and fishing the 5-mile reach of the river above the bridge. Powerboat operators occasionally access the confluence of the Gulkana River with the Copper River using powerboats launched from Gakona.

Chinook salmon typically begin entering the Gulkana River in early to mid-June. The sport fishery typically peaks during late June; however, 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-

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 mi 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). Based on this survey, the sport harvest of chinook salmon in the Gulkana River has averaged about 3,111 fish annually since 1987 (Table 19). The 1993 harvest of 5,892 chinook salmon was the largest on record and accounted for nearly 72% of the sport harvest of chinook salmon in the UCUSMA. Sport fishing effort on the Gulkana River has averaged 32,386 angler-days annually since 1987 (Table 3). 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.

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 20 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, and 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, and resulted 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 as boat anglers, but harvested more and had to expend greater effort.

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 - 1997, escapement indices have increased, average escapement from 1977-1986 was 1,314, and from 1987-1997 escapement averaged 1,761. The average escapement for the past five years (1993-1997) is 2,374. High and low

Table 19.-Sport harvest and observed spawning escapements of chinook salmon in the Gulkana River drainage from 1977-1997.

Year	Sport Harvest	Observed Spawning Escapement
1977-1986	1,644	1,314
1987	1,631	1,228
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 ^a
1996	4,078	4,542
1997	5,005	3,772
1987-1997^b	3,111	1,761
1993-1997^b	4,447	2,374

^a Visibility poor, carcass count only downstream of West Fork.

^b Age value for the years during the period.

escapements during this 21-year period range from 4,542 fish in 1996 to 656 fish in 1992 (Table 19). 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.

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 chinook return in 1996 was 13,840 and estimated spawning escapement was 11,399.

Fishery Objectives

The underlying goal of past and current management has been to assure sustained yield. An annual 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 conduct area surveys, no action has been taken to restrict the fishery if spawning escapements 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.

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.

Recreational harvests are estimated through the mail survey, personal use and subsistence harvests are recorded through permits, and the commercial harvest is enumerated through fish tickets. Beginning in 1994, commercial fishermen were required to record their take of chinook salmon for personal use on ADF&G fish tickets to allow managers to estimate the total harvest of Copper River-bound chinook.

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.

Recent Fishery Performance

During 1996 and 1997, 4,078 and 5,005 chinook salmon were harvested by sport anglers fishing the Gulkana River drainage (Table 19). Observed chinook salmon spawning escapement during 1996 (4,542) and 1997 (3,772) were the highest on record and likely reflect an exceptionally large return to the Copper River (Table 16). The harvest estimate of 2,441 from the 1996 creel survey is less than the estimate from the mail survey (Howe et al. 1997) but should be considered a minimum estimate due to some anglers being missed at access points. Future creel surveys should include the missed access points or be of roving creel design.

During 1996 and 1997, there was a significant increase in the number of shore anglers by the Richardson Highway Bridge. Extremely low water resulting from almost no precipitation during much of June and July and large numbers of sockeye and chinook salmon holding in the area may have created better than average fishing opportunity at this location.

Since 1991 there has been a significant increase in the use of powerboats from the Richardson Highway Bridge upstream for about 5 mi. 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. Available data indicate that the guided anglers are more successful than unguided anglers. During 1990, back-trolling techniques similar to those used in the Kenai River were introduced on the Gulkana River. It is generally believed this technique has further increased catch rates for chinook salmon.

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.

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. It may, if requested, allow access for camping, hiking, or other nonconsumptive resource uses. 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.

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 a “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.

Proposed 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 rather than absolute 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. 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.

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 permission to cross its land is required. 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 Copper River. 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 Board meeting to allow chinook salmon to spawn unmolested. 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. Current bag and possession limits governing the sport fishery for chinook salmon over 20 inches are one and one, respectively. The area-wide bag limit of five chinook 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) since 1983. Based on this survey, the sport harvest of chinook salmon from the Klutina River drainage averaged 1,605 fish from 1987 through 1997, ranging from a low of 483 fish in 1988 to a high of 3,581 fish in 1997 (Table 20). Harvests remained relatively stable from 1983 to 1990. Since 1987, sport effort on the Klutina River averaged approximately 9,396 angler-days, ranging from 5,556 in 1990 to 15,119 in 1997. 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.

Table 20.-Sport harvest and observed spawning escapements of chinook salmon in the Klutina River drainage from 1983-1997.

Year	Sport Harvest	Observed Spawning Escapement
1983	189	228
1984	667	353
1985	249	37
1986	710	433
1987	495	333
1988	483	183
1989	652	255
1990	583	69
1991	1,709	237
1992	1,075	26
1993	1,989	a
1994	2,189	325
1995	2,485	34
1996	2,417	311
1997	3,581	1,106
1987-1997^b	1,605	288
1993-1997^b	2,532	444

^a No aerial survey conducted in 1993.

^b Average value for the years during the period.

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 15). Spawning escapement has averaged 134 fish during 1977-1986, ranging from a high of 433 in 1986 to a low of 25 in 1977. Since 1986, observed escapements to this drainage have declined, though the average escapement for 1987-1997 was 288 (Table 20). This average is inflated due to extremely high counts in 1997 (1,106). 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; however, due to the turbid water conditions in this area, it is not possible to assess abundance of spawning fish.

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. Aerial survey index evaluation does not appear to evaluate the majority of spawning fish in this system and has not been used to manage this fishery.

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 closure for chinook salmon was reduced 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.

Recent Fishery Performance

The 1996 sport harvest of 2,417 chinook salmon was the third largest on record and accounted for about 34% of the estimated total sport harvest of chinook salmon in the UCUSMA. The 1997 sport harvest of 3,581 chinook salmon was the largest on record and accounted for about 40% of the estimated total sport harvest of chinook salmon in the UCUSMA. The aerial escapement count for index streams in the Klutina River drainage in 1996 and 1997 was 311 and 1,106, respectively. The 1997 escapement of chinook salmon to index sites in the Klutina River drainage, was the highest on record (Table 15) supporting evidence of a large return to the Copper River.

Current Issues

The sport fishery for chinook salmon in the Klutina River has, in recent years, taken a higher proportion of returning fish (Table 18). 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 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 may, if asked, allow access for camping, hiking, or other nonconsumptive resource uses.

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.

Proposed Research and Management Activities

Coded wire tagging of chinook smolts was determined to be feasible in 1996 and began 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 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, what proportion is not known. If this could be determined, the index stream counts would provide a better indication of total chinook escapement for the Klutina drainage.

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

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 and Grayling Creek, a tributary which flows into Tonsina Lake. Chinook salmon run timing to the Tonsina River drainage is thought to be similar to that of the Klutina River; late June through August.

The Tonsina River chinook salmon sport fishery harvest increased annually from 1988-1995 (Table 18). 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 Grayling Creek since 1966 (Table 15). The spawning escapement to these index sites has averaged 427 fish from 1977 – 1986, but the average index count for the period 1987 – 1997 has declined to 183.

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 unmolested. Current daily bag and possession limits for chinook salmon over 20 inches in this drainage river are one and one, respectively, and a seasonal bag limit of five for the Copper River drainage.

The primary biological concern regarding the Tonsina River drainage chinook salmon in recent years is the extremely low chinook salmon escapements. While the return to Grayling Creek in 1996 and 1997 were greater than average, returns to the Little Tonsina River continued to be poor. The yearly trend in harvest does not match the yearly trend in escapement within this drainage. 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 chinook salmon fishing to protect spawning chinook salmon.

A limited fishery for chinook salmon also occurs on Kiana Creek in the Tazlina River drainage. Harvests have averaged less than 40 fish per year since 1977. The average escapement from 1977 – 1986 was 210 salmon and for 1987 -1997 was 296 (Table 15). The returns to Kiana Creek in 1996 and 1997 were above 1987 – 1997 average.

WILD RAINBOW AND STEELHEAD TROUT SPORT FISHERIES

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 this drainage's trout stocks 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 mi 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 for trout 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 (Tables 21 and 22). To further protect rainbow/steelhead stocks, in 1997 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.

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 should be conducted before the next board cycle.

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

Table 21.-Harvest of wild rainbow trout by sport anglers fishing UCUSMA waters by drainage, averaged for 1977 – 1986 and annually from 1987-1997.

Areas	1977-86	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1987-1997 ^f	1993-1997 ^f
Gulkana River Drainage^a														
Upper River	1,379 ^b	1,309	1,273	656	204	14	0	40	0	0	0	0	349	8
Lower River		238	36	0	221	150	8	0	0	0	0	0	28	0
Total	1,379^b	1,547	1,309	656	425	164	8	40	0	0	0	0	377	8
Klutina River Drainage	107 ^c	208	18	56	17	96	63	108	8	37	0	10	56	33
Tazlina Drainage	53 ^c	15	146	9	170	0	24	0	8	47	293	30	67	76
Tonsina Drainage	17 ^c	595	18	38	17	14	103	40	87	28	24	0	88	36
Copper River														
Upstream of Gulkana	4 ^c	178	0	0	68	68	0	0	0	0	0	0	29	0
Downstream of Klutina ^d	4 ^c	149	0	1,051	17	109	214	0	515	94	448	110	246	233
Other Sites	1,280 ^e	506	273	366	662	177	681	730	981	225	1,090	983	607	802
	2,735^f	3,198	1,764	2,176	1,376	628	1,093	918	1,599	431	1,855	1,133	1,470	1,187

^a In 1991, the river was closed to the harvest of rainbow trout.

^b Includes average of entire drainage.

^c Includes 1983-1986 average harvest only. Prior to 1983, harvest included in the listing for “Other waters”

^d Not including Tonsina drainage.

^e Average harvest for years 1983-1986.

^f Average of total annual harvest.

Table 22.-Harvest of steelhead trout by sport anglers fishing UCUSMA waters by drainage, averaged for 1977 – 1986 and annually from 1987-1997.

Areas	1977-86	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1987-1997 ^c	1993-1997 ^c
Gulkana River Drainage^a	23	89	18	47	34	0	8	0	0	10	0	0	19	2
Tazlina Drainage	0 ^b	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper River														
Upstream of Gulkana	0 ^b	0	0	0	0	0	0	0	0	0	0	0	0	0
Downstream of Tonsina	0 ^b	0	0	0	0	0	0	0	0	0	0	12	1	2
Other Sites	51 ^b	30	0	37	0	114	0	0	7	0	0	0	17	1
Total	85^c	119	18	84	34	114	8	0	7	10	0	12	37	6

^a In 1991, the river was closed to the harvest of steelhead trout.

^b Includes 1983-1986 average harvest only. Prior to 1983, harvest included in “Other waters.”

^c Average of total annual harvest.

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, fish wheels were introduced to the Copper River. By 1920, fish wheels and dip nets took over as the traditional 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. At times of 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 an analyses of the eight-point criteria in 1984.

This decision precluded many individuals from participating in the Copper River subsistence fisheries, thereby efficiently 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); however, 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 whereby 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 fish wheels 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 the Fish and Game office in Glennallen, Tok or Chitina, and at the National Park Service office in Slana. 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 its caudal fin. 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 only be obtained at the department trailer at Chitina or Glennallen, when office hours at the Chitina office are reduced in August and September. 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 five 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 is 100,000 salmon, given a total return of the inriver goal announced prior to the season, not including any salmon harvested after August 31. When an escapement of more or less than the inriver goal of salmon actually pass the sonar counter, the Board has mandated that the department decrease or increase the fishing times by the corresponding percentage.

Harvests by the subsistence fishery have been estimated since 1965. From 1977 through 1986, harvests in the subsistence fisheries have averaged about 54,000 salmon (Table 23). 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 28,000 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. 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 23).

Harvests in the personal use fisheries have been estimated since their establishment in 1984 (Table 24). From 1984 through 1988, harvests remained relatively stable, averaging about 47,000 salmon annually. Since 1988, harvests in the personal use fishery have increased annually until 1995. Trends in the number of permits issued to participate in this fishery closely resemble harvest trends (Table 24).

Harvests in both the subsistence and personal use fisheries are dominated by sockeye salmon (Table 6). Chinook salmon comprise the second largest harvest. The remaining harvest is made up of coho salmon.

Fishery 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 management plans stipulate

Table 23.-Number of permits issued and salmon harvests during the subsistence salmon fishery in the Copper River, 1977-1998.

Year	Number Permits Issued	Estimated Salmon Harvest
1977	4,066	41,815
1978	3,705	22,029
1979	3,200	30,963
1980	3,203	35,081
1981	4,078	68,746
1982	6,090	110,006
1983	7,541	118,728
1984	475	28,617
1985	-a	-a
1986	405	28,417
1987	445	34,080
1988	417	30,558
1989	386	29,216
1990	406	32,504
1991	712	41,159
1992	655	47,031
1993	773	54,762
1994	970	70,326
1995	858	55,290
1996	850	54,092
1997	1,133	85,578
1998 ^b	1,008	69,614
1977-1986	3,640	53,822
1987-1997	691	48,600
1993-1997	917	64,010

^a Data not available.

^b Preliminary estimates.

Table 24.-Number of permits issued and salmon harvested during the personal use salmon fishery in the Copper River, 1984-1998.

Year	Number Permits Issued	Estimated Salmon Harvest
1984	5,415	50,734
1985	--- ^a	--- ^a
1986	4,031	44,047
1987	4,245	46,908
1988	4,251	45,855
1989	4,582	58,941
1990	5,689	70,812
1991	6,222	85,059
1992	6,385	91,683
1993	7,914	97,767
1994	7,061	99,822
1995	6,760	88,617
1996	7,198	102,108
1997	9,086	154,349
1998 ^b	10,007	147,488
1987-1997	6,308	85,629
1993-1997	7,604	108,533

^a Data not available.

^b Preliminary estimates.

management objectives and guidelines, with allocations for each fishery outlined in the *Copper River District Salmon Management Plan* (5 AAC 24.360).

Inseason Management Approach

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 Board 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 based on the projected inriver returns. Inriver returns are estimated by the sonar unit 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.

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.

Recent Fishery Performance

The number of permits issued to participate in, and salmon harvests in both the subsistence and personal-use fisheries have increased in recent years. The 1,133 permits issued and harvest of 85,578 salmon in the 1997 subsistence fishery was the highest on record since the fishery has been managed under the subsistence fishery management plan (Table 23). The 9,086 permits issued and 154,334 salmon harvested in the 1997 personal use fishery were the highest since it's inception in 1984 (Table 24). Both fisheries benefited from an extremely strong return of sockeye salmon, over 1.1 million salmon passed the Miles Lake sonar in 1997. The number of participants in both fisheries will likely continue to increase, preliminary estimates in 1998 for the personal use and subsistence fisheries 10,007 and 1,008, respectively. The preliminary estimated harvest (expanded to account for 6% of the harvest reports which are unreturned) for the personal use fishery in 1998 is 147,530 salmon. The subsistence harvest estimates for 1998 are 69,614 with remaining 33% of the harvest reports yet to be returned.

Current Issues

Salmon harvests in the personal use fishery exceeded Board-allowed allocations during the 1991, 1992 and 1995 seasons. The 1991 harvest exceeded the allowable harvest by 4,805 salmon, the 1992 harvest exceeded the allowable harvest by 8,194 salmon and the 1995 harvest exceeded the

allowable harvest by almost 13,000 salmon (Table 25). 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 have exceeded 800,000 salmon during 1997 and 1998. 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. If the fishery continues to grow the allocation for the fishery will again need to be addressed at future 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. In 1997, the projected personal use harvest was exceeded in nine of the first eleven weeks of the season. The fishery was opened June 6, and remained opened until September 30. The overage was more a factor of the surplus passing the sonar, over 10,000 above projected counts in nine of the eleven corresponding weeks in personal use fishery (Table 26).

The State of Alaska is currently involved in a dispute with the Federal government, which has dictated that the State provide a rural preference for subsistence fisheries. This is in conflict with the State constitution that allows all Alaskans equal access to the state's fish and game resources. The Federal government currently manages game on federal lands. If the State does not comply by having a constitutional amendment for rural preference placed on the voting ballot in 2000, the Federal government would take over management of fisheries in navigable waters in Alaska. If this does occur, it is likely the participation in the subsistence fishery would decrease, while the participation in the personal use fishery would increase. 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 expire December 31, 1998. Preliminary meetings with both corporations have occurred during spring and summer 1998. 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.

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. Continued

Table 25.-Allowable versus observed salmon harvests during the personal use salmon fishery in the Copper River, 1984-1996.

Year	Sonar Goal	Estimated Sonar	Difference	Allowable Harvest ^{a,b}	Estimated Total Harvest	Estimated Harvest through August 31	Difference Between Estimated ^a and Allowable Harvest
1984	411,000	536,806	125,806	91,452	50,734 ^c	48,956	-42,496
1985	411,000	436,313	25,313	66,328	^d	^d	^d
1986	411,000	509,275	98,275	84,959	44,047	42,303	-42,656
1987	411,000	483,478	72,478	78,120	46,908 ^c	45,926	-32,194
1988	411,000	488,398	77,341	79,350	45,855 ^c	45,227	-34,123
1989	411,000	607,797	196,797	109,199	58,941	57,210	-51,989
1990	516,000	581,859	65,859	76,465	70,812	67,958	-8,507
1991	516,000	579,435	63,435	75,859	85,059	80,664	4,805
1992	516,000	601,952	85,952	81,488	91,683	89,682	8,194
1993	516,000	797,902	271,902	127,976	97,767	95,824	-32,152
1994	516,000	715,181	191,481	109,795	99,822	95,685	-14,110
1995	560,000	599,267	39,267	69,817	88,617	82,632	12,815
1996	560,000	906,867	346,867	146,717	102,108	101,577	-45,140

^a Through 1996, if sonar difference greater than 0, then guideline harvest equals 60,000 + (0.25 X sonar difference).

^b Through 1996, if sonar difference less than 0, then guideline harvest equals 60,000.

^c Personal use and subsistence dip net harvest.

^d Data not available.

Table 26.-Projected versus actual salmon harvests in the Copper River Personal Use Fishery, 1997.

Week Ending	Projected Sonar Counts ^a	Actual Sonar Counts ^a	Difference	Projected PU Harvest	Estimated PU Harvest	Difference
June 1	3,498	288	-3,210	616	0	616
June 8	25,544	44,723	19,179	4,495	12,071	-7,576
June 15	58,101	267,396	209,295	10,225	28,578	-18,353
June 22	80,848	159,138	78,290	14,228	23,730	-9,502
June 29	78,188	173,982	95,794	13,760	16,287	-2,527
July 6	54,790	107,379	52,589	9,642	13,204	-3,562
July 13	46,932	59,307	12,375	8,259	13,629	-5,370
July 20	45,436	94,551	49,115	7,996	16,974	-8,978
July 27	54,995	83,010	28,015	9,678	11,007	-1,329
August 3	54,765	90,232	35,467	9,638	7,257	2,381
August 10	39,424	40,314	890	6,938	7,221	- 283
August 17	29,002	27,759	-1,243	5,104	1,151	3,953
August 24					2,626	
August 31					3,838	
Total	571,523	1,148,079		100,579	157,573	

^a Sonar counts are adjusted two weeks to correspond to week fish would be available to the Personal Use fishery.

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. 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 exploit hatchery stocks while protecting wild fish.

STOCKED FISHERIES

The sport fish stocking program in the UCUSMA dates to 1965. At present 29 lakes in the UCUSMA are stocked (Table 27). Stocked species include rainbow trout, Arctic grayling, Arctic char and coho salmon. Since 1987, stocked lakes, on the average, have accounted for approximately 4,500 angler-days of effort spent in the UCUSMA. The majority of this effort from 1987-1997 (45%) occurred at Silver Lake off the McCarthy Road.

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Table 27.-Number and species of fish stocked (actual and planned) in UCUSMA waters, 1993-1999.

	1993 Actual	1994 Actual	1995 Actual	1996 Actual	1997 Actual	1998 Actual	1999 Planned
Coho Salmon							
Landlocked Fingerling							
Strelna Lake	0	17,812	0	33,928	15,066	14,960	30,000
Peanut Lake	2,000	0	0	Dropped			
South Jan Lake	20,400	13,000	20,259	15,151	20,079	19,947	20,000
Kettle Lake	3,500	0	Dropped				
Total	25,900	30,812	20,259	49,079	35,145	34,907	50,000
Chinook Salmon							
Catchables							
Meiers Lake	0	0	0	Dropped			
Tolsona Lake	25,061	0	0	Dropped			
Total	25,061	0	0	0			
Arctic Char							
Catchables							
Dick Lake	0	0	0	0	0	1,000	0
Total	0	0	0	0	0	1,000	0
Rainbow Trout							
Catchables							
Squirrel Cr. Pit	486	516	1,032	1,027	750 ^b	836	
Buffalo Lake	400	500	504	510	500	434	
Ryan ^a Lake	0	500	500	603	500	505	
Round Lake	400	250	250	261	500	244	
Old Road Lake	400	250	250	252	500	250	
Tex Smith Lake	388	550	506	0	574	500	
Tolsona Lake						3,185	
Total	2,101	2,404	2,500	3,000		3,000	
Landlocked Fingerling							
Sculpin Lake	28,000	19,000	19,046	28,036	10,000	0	
Ryan Lake	0	9,000	9,116	9,119	9,108	8,128	
Buffalo Lake	800	800	817	800	800	806	
Tolsona Lake	Dropped						
Tex Smith Lake	0	1,607	0	3,422	0	0	
Squirrel Cr. Pit	0	2,000	0	Dropped			
Crater Lake	0	1,600	0	3,200	0	0	
Three Mile Lake	0	4,000	0	4,000	0	0	
Silver Lake	0	80,036	0	80,375	0	0	
Two Mile Lake	3,400	3,400	3,429	0	2,601	0	
14 Mile Lake (Den)	0	7027	0	Dropped			
Kettle Lake	0	0	0	Dropped			
D-J Lake	0	400	0	400	0	0	
Little Crater Lake	0	400	0	400	0	0	
North Jan Lake	0	11,600	0	11,639	0	0	
Old Road Lake	0	300	0	300	0	0	
Round Lake	0	200	0	400	0	0	
Gergie Lake	0	9000	0	9,000	0	0	
Tiny Lake	500	0	0	0	0	Dropped	
Peanut Lake	2,400	0	2,429	0	2,009	0	
Tolsona Mt. Lake	15,000	0	15,596	0	14,900	0	
South Jan Lake	20,000	0	20,741	0	19,906	0	
Strelna Lake					15,000	0	
Meiers Lake	0	0	19,552	0	0	0	
Total	87,100	158,695	103,700	150,500		98,600	

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Table 27.-Page 2 of 2.

	1993 Actual	1994 Actual	1995 Actual	1996 Actual	1997 Actual	1998 Actual	1999 Planned
Arctic Gravlning							
Fingerling							
Arizona Lake							1,000
Caribou Lake	0	8,000	0	8,000		0	800
Connor Lake							1,500
Dick Lake	0	0	0	4,000		0	1,000
Elbow Lake	0	0	0				500
Forgotten Lake	0	0	0				1,000
Junction Lake	0	0	0				350
Little Junction Lake	0	0	0				500
Meiers Lake	0	0	0	10,000		0	10,000
Moose Cr.(Taz)	0	5,000	Dropped				
Squirrel Creek Pit	0	0	0	2,000		2,000	2,000
Tolsona Lake	10,000	Dropped					
Total	10,000	13,000	0	12,000		2,000	18,650
Fry							
Tolsona Lake	80,000	80,000	Dropped				
Moose Cr. (Taz)	50,000	50,000	Dropped				
Two Mile Lake	0	5,000	0	5,000	Dropped		
Three Mile Lake	0	8,000	0	8,000	Dropped		
Junction Lake	3,500	0	3,000	3,500	Dropped		
Squirrel Cr. Pit	5,000	0	5,000	Dropped			
Lower Twin Lake	0	Dropped					
Little Junction Lake	0	5,000	0	5,000	Dropped		
Arizona Lake	0	10,000	0	10,000	Dropped		
Connor Lake	0	15,000	0	15,000	Dropped		
Dick Lake	0	10,000	0	10,000	Dropped		
Elbow Lake	0	5,000	0	5,000	Dropped		
Bearcub Lake	0	10,000	0	Dropped			
Meiers Lake	0	40,000	0	40,000	Dropped		
Forgotten Lake	0	10,000	0	10,000	Dropped		
Caribou Lake	0	8,000	0	8,000	Dropped		
Total	138,500	256,000	8,000	116,000	0		

^a Previously known as Mirror Lake.

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