

Fishery Management Report No. 95-2

**1994 Area Management Report for the Recreational
Fisheries of the Southwest Alaska Sport Fish
Management Area**

by

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and

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May 1995

Alaska Department of Fish and Game

Division of Sport Fish



Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used in Division of Sport Fish Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications without definition. All others must be defined in the text at first mention, as well as in the titles or footnotes of tables and in figures or figure captions.

Weights and measures (metric)		General		Mathematics, statistics, fisheries	
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis	H_A
deciliter	dL	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
gram	g	and	&	catch per unit effort	CPUE
hectare	ha	at	@	coefficient of variation	CV
kilogram	kg	Compass directions:		common test statistics	F, t, χ^2 , etc.
kilometer	km	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#)	mid-eye-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. 95-2

**1994 AREA MANAGEMENT REPORT FOR THE RECREATIONAL
FISHERIES OF THE SOUTHWEST ALASKA SPORT FISH
MANAGEMENT AREA**

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The Fishery Management Reports series was established in 1989 for the publication of an overview of Division of Sport Fish management activities and goals in a specific geographic area. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Distribution is to state and local publication distribution centers, libraries and individuals and, on request, to other libraries, agencies, and individuals. This publication has undergone regional peer review.

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PREFACE

Data contained in this report represent the Division's most recent efforts to upgrade and update fishery statistics useful in describing Southwestern Alaska's sport fisheries. Data contained in this document were extracted from *Statewide Harvest Summaries*, *Survey and Inventory Reports*, and the *Fishery Data and Manuscript Series*. We consider this report to be the most comprehensive information source concerning effort and harvest statistics for the major Southwestern Alaska sport fisheries. Fisheries data in this report supersede information in previous reports and are intended for interdepartmental use only.

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SECTION I: MANAGEMENT AREA OVERVIEW

MANAGEMENT AREA DESCRIPTION

The Southwest Sport Fish Management Area (SWMA) is comprised of the Bristol Bay Sport Fishing Regulatory Area and the southwestern portion of the Arctic-Yukon-Kuskokwim Sport Fishing Regulatory Area. Included in the area are all waters and drainage's flowing into Bristol Bay north of Cape Menshikof, the eastern shores of Kuskokwim Bay, and the Kuskokwim River from Aniak River downstream to Kuskokwim Bay (Figure 1). Roughly the size of Washington state, the 54,700 square mile management area contains some of the most productive salmon, rainbow trout, grayling, Arctic char, and Dolly Varden waters in the world.

The sport fisheries of this large region are more easily discussed by dividing the management area into four geographic sections: Eastern, Central, Western, and Northwestern (Figure 1). The four sections are based on general habitat types and are somewhat arbitrary. However, for some species such as rainbow trout, the sections represent distinct differences in the character of the fisheries or biology of local stocks.

The Eastern section includes all drainages from the Kvichak River to the area's southern boundary at Cape Menshikof. Major federal jurisdictions in the eastern section include the Lake Clark National Park and Preserve, Katmai National Park, and the Becharof National Wildlife Refuge.

The Central section is composed of the drainages entering Nushagak Bay, and is dominated by the Nushagak and Wood River systems. The Wood-Tikchik State Park falls within the central section boundaries.

The Western section reaches from the drainage of the Kanektok River south to Cape Constantine on the Nushagak Peninsula and contains the Togiak National Wildlife Refuge.

The Northwestern section is formed by the northern boundary of the management area and includes the drainages flowing into the south side of Kuskokwim River from the Aniak River downstream to Kuskokwim Bay. The Kisaralik and Kwethluk rivers of the northwestern section also fall within the confines of the Yukon-Delta National Wildlife Refuge.

Major communities located within the region include Naknek, King Salmon, Dillingham, Togiak, Iliamna, Quinhagak, Aniak, and Bethel. The management area is not linked to the state's highway system although local roads do provide sport fishermen with limited access near the major communities. Float equipped aircraft are commonly used to access the area's many remote fisheries.

The Southwest Sport Fish Management Area includes portions of three areas for the purposes of effort and harvest reporting in the mail survey of Mills (1994). These are: the Nushagak area (Area T), the Kvichak area (Area S), and that portion of the Naknek River Drainage-Alaska Peninsula Area (Area R) less its saltwater fisheries and freshwater fisheries of Cold Bay and Adak Island.

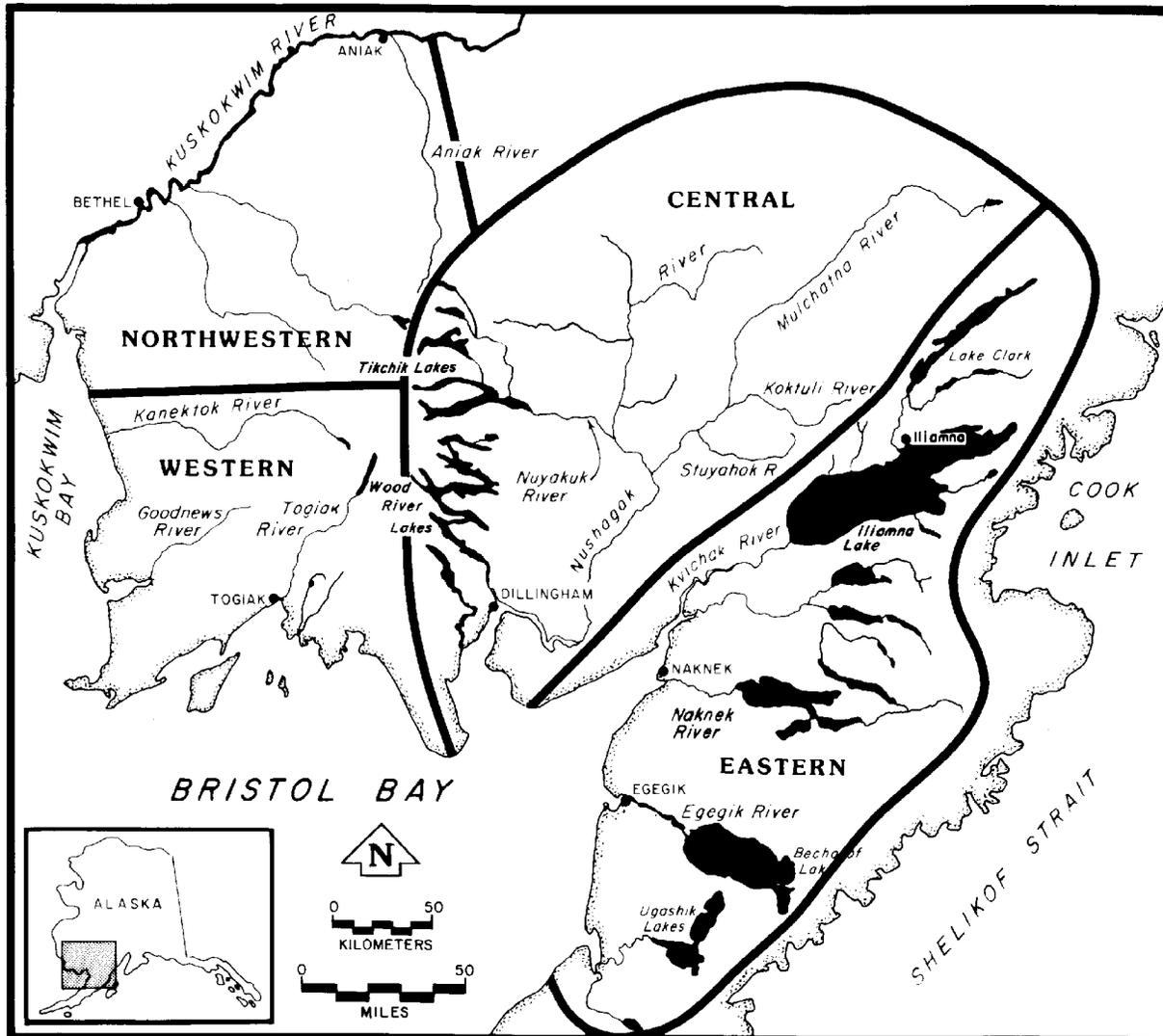


Figure 1.-Southwestern Alaska sport fish management area, showing the eastern, central, western, and northwestern sections.

REGULATORY PROCESS

The process of developing fishing regulations appropriate for fisheries in the SWMA occurs within the established Alaska Board of Fisheries process. Public input concerning regulation changes and allocation issues is provided for in this process through various means including direct testimony to the Board of Fisheries and through participation in local fish and game advisory committees. These advisory committees have been established throughout Alaska to assist the Boards of Fish and Game in assessing fisheries and wildlife issues and proposed regulation changes in areas that might be affected. Most active committees meet at least once each year, usually in the fall prior to the Board 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 for direct public interaction with staff involved with resource issues of local concern. Within the SWMA there are eight Fish and Game Advisory Committees: Lower Bristol Bay, Iliamna, Naknek/Kvichak, Togiak, Nushagak, Lower Kuskokwim, Central Bering Sea, and Central Kuskokwim.

Under the current operating schedule, the Board of Fisheries meets on a 3-year cycle. Proposals regarding the SWMA fisheries were last heard during 1991/1992 sessions. Regulation changes for the AYK region were considered by the Board in November 1994 in Anchorage. Regulations governing fisheries in Bristol Bay are to be considered by the Board in Dillingham starting January 17, 1995.

RECREATIONAL ANGLER EFFORT

Beginning in 1977, recreational angler effort in the SWMA has been estimated using a mail survey (Mills 1979-1994). This survey estimates the number of angler-days of sport fishing effort expended by recreational anglers fishing Alaskan waters as well as the harvest of important sport species. 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 toward 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 choice fisheries of interest or for fisheries that require more detailed information or inseason management. The following summary of recreational angler effort in the SWMA is based on the mail survey data. A more comprehensive and area-specific review of sport fishing effort for the SWMA can be found later in this report.

Recreational angler effort in the SWMA rose gradually from 1977 to 1982, increasing from 25,500 angler-days per year in 1977 to 41,300 angler-days per year in 1982 (Table 1, Figure 2). In 1983, recreational angler effort rose significantly to 66,500 angler-days, an increase of over 150% from 1982. A period of relative stability followed during which time recreational angler effort averaged 71,900 angler-days per year. Recreational angler effort again jumped in 1990 rising to over 104,500 angler-days. Since 1990, recreational fishing effort has averaged 109,275 angler-days per year. Effort for 1993 of 114,300 angler-days accounted for 4.5% and 6.1% of the statewide and southcentral region totals, respectively (Mills 1994). Recreational angler effort is expected to continue to increase at a modest rate for the foreseeable future.

Historically, most of the effort has occurred in the waters of the eastern section of the SWMA (Figure 3). This area accounted for 59% of the total effort from 1990-1993. The central section

Table 1.-Sport fishing effort for the Southwest Sport Fish Management Area by section, 1977-1993.

Year	<u>SWMA</u>		<u>Eastern</u>		<u>Central</u>		<u>Western</u>		<u>Northwestern</u>	
	Ang-days	Ang-days	Percent	Ang-days	Percent	Ang-days	Percent	Ang-days	Percent	
77	25,512	17,653	69%	7,184	28%	675	3%		0%	
78	26,451	18,912	71%	7,000	26%	539	2%		0%	
79	27,022	19,177	71%	6,179	23%	1,666	6%		0%	
80	35,358	24,948	71%	8,897	25%	1,513	4%		0%	
81	33,715	24,964	74%	7,819	23%	932	3%		0%	
82	41,318	30,385	74%	9,773	24%	1,160	3%		0%	
83	66,492	43,364	65%	16,942	25%	3,251	5%	2,935	4%	
84	63,818	39,394	62%	11,160	17%	11,732	18%	1,532	2%	
85	70,108	47,138	67%	11,812	17%	10,377	15%	781	1%	
86	74,892	50,724	68%	12,026	16%	10,232	14%	1,819	2%	
87	72,730	43,262	59%	14,132	19%	12,909	18%	2,427	3%	
88	82,408	40,987	50%	19,840	24%	18,767	23%	2,814	3%	
89	73,041	38,460	53%	19,677	27%	7,638	10%	7,266	10%	
90	104,699	60,371	58%	28,714	27%	10,807	10%	4,807	5%	
91	107,584	56,695	53%	38,690	36%	6,155	6%	6,044	6%	
92	110,517	69,310	63%	26,621	24%	7,842	7%	6,744	6%	
93	114,300	69,799	61%	30,497	27%	7,774	7%	6,230	5%	
<hr/>										
Average										
(77-82)	31,563	22,673	72%	7,809	25%	1,081	3%		0%	
Average										
(83-89)	71,927	43,333	60%	15,084	21%	10,701	15%	2,796	4%	
Average										
(90-93)	109,275	64,044	59%	31,131	28%	8,145	7%	5,956	5%	

Recreational Angler Effort: Southwest Alaska

Thousands

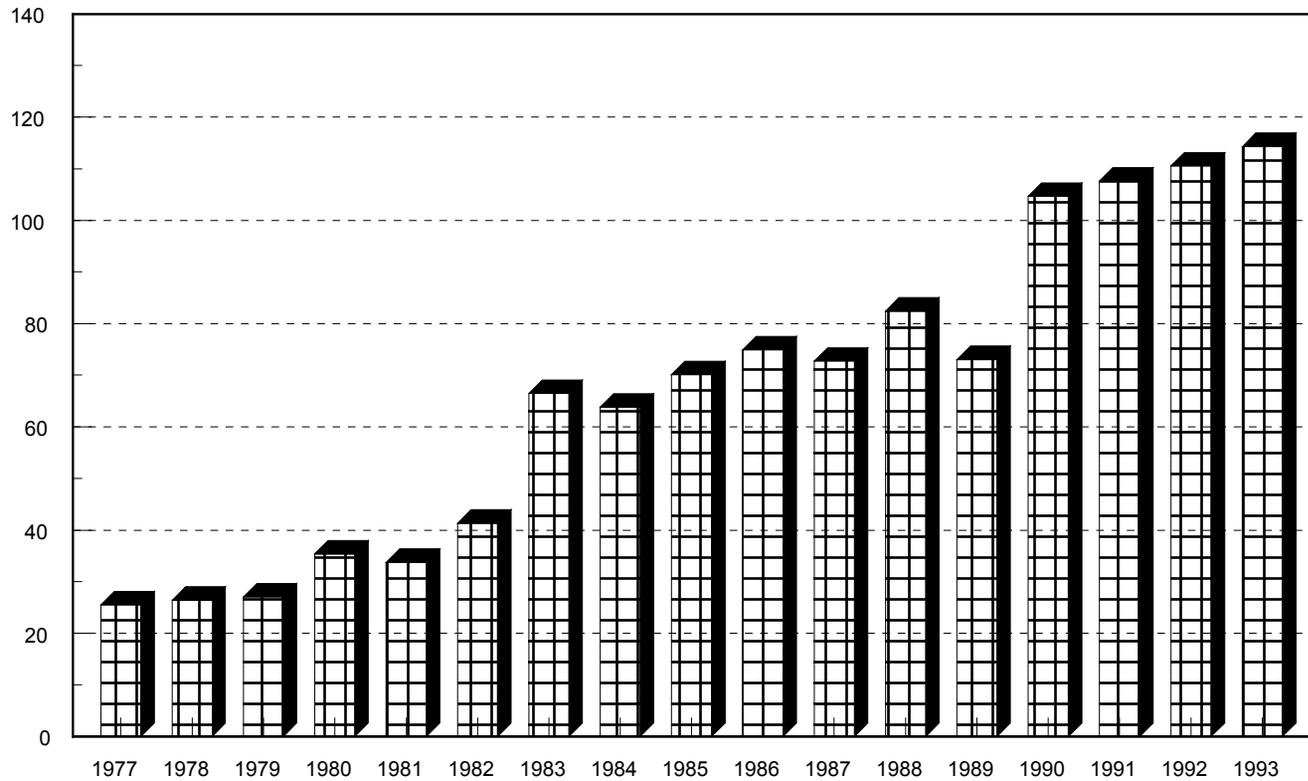
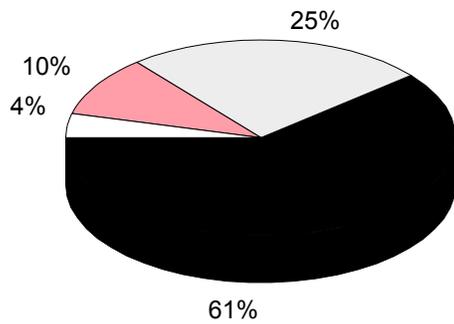
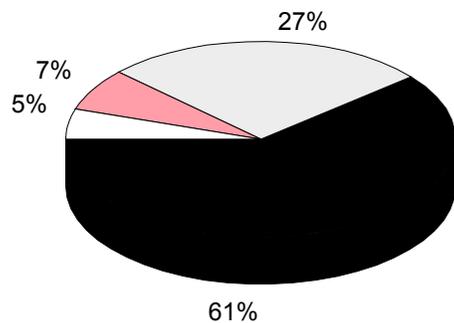


Figure 2.-Sport fishing effort in angler-days for the Southwest Alaska sport fish management area, 1977 to 1993.

*Recreational Angler Effort
Southwest Alaska*



Mean: 1977-1992



1993

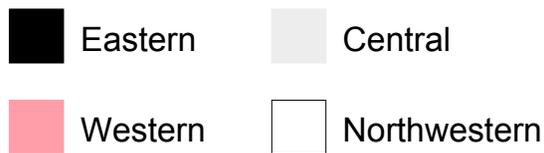


Figure 3.-Percentage of sport fishing effort for the eastern, central, western, and northwestern sections of the Southwest Alaska sport fish management area, 1977 to 1993.

has accounted for the second largest proportion of effort, accounting for about 28% of the total effort from 1990 through 1993. The western and northwestern sections have accounted for about 7% and 5% of the total effort from 1990 through 1993, respectively. Distribution of effort among sections during 1993 resembled the historic effort distribution (Figure 3).

SPORT HARVEST

Recreational harvests in the SWMA have risen gradually at a rate of approximately 16% per year, increasing from a harvest of 24,400 fish in 1977 to 70,300 fish in 1993 (Table 2).

In terms of numbers of fish harvested, smelt, which are not a highly sought after species in Southwest Alaska, have nevertheless dominated the historic recreational harvest (Figure 4). The recent 5-year average harvest of over 22,700 smelt is more likely a reflection of their abundance rather than their desirability as a sport species. Sockeye, chinook and coho salmon are clearly the most frequently harvested species, with lesser numbers of Dolly Varden/char, rainbow trout, and Arctic grayling being taken annually. The remaining species, pink salmon, lake trout, chum salmon, Northern pike, whitefish, and burbot are all harvested at relatively low levels.

Harvests for 1993 were on par with the recent 5-year averages. Smelt harvests were down substantially from previous years, however other species were harvested at average levels.

ECONOMIC VALUE OF THE SPORT FISHERY

Recreational fisheries in Southwest Alaska provide the angler with a unique combination of high quality salmon and rainbow trout fishing in a pristine wilderness setting. Although this area accounts for a relatively minor portion of the total statewide sport fishing effort, and even less of the statewide harvest, it is the combination of scenery and diverse fishing opportunities that allows this region of Alaska to compete with other world-class sport fisheries. Studies by the University of Alaska, Juneau, have placed the 1988 value of the area's recreational fishery at \$50 million (Ackley 1988).

The cost to the Division of Sport Fish to provide 1 day of angling opportunity averaged \$4.15 per day in the SWMA for the period 1992 to 1994 (ADF&G *In prep*). Given the average level of sport fishing effort for the same period (91,829 angler-days), that translates into a cost of \$386,000 annually to manage a \$50 million fishery. Put another way, for every dollar the Division spends on research and management of sport fisheries in Southwest Alaska, over \$130 are potentially added to the economy of the state.

MANAGEMENT PLANS AFFECTING FISHERIES

Nushagak Chinook Salmon Management Plan

Management of the Nushagak chinook salmon fisheries is governed by the Nushagak-Mulchatna Chinook Salmon Management Plan (5 AAC 06.361) which was adopted by the Alaska Board of Fisheries in January of 1992. The purpose of this management plan is to ensure an adequate spawning escapement of chinook salmon into the Nushagak-Mulchatna River systems. The plan directs the department to manage for an inriver return goal of 75,000 chinook salmon past the sonar site at Portage Creek. The inriver goal provides for: (1) 65,000 spawning fish, (2) a reasonable opportunity for subsistence harvest, and (3) a sport fishery harvest of not more than 5,000 fish. If the inriver chinook salmon return is between 75,000 and 95,000 fish, then the sport allocation increases to 6,000 fish.

Table 2.-Numbers of fish harvested, by species, by recreational anglers fishing within the Southwest Alaska Management Area waters, 1977-1993.

Species	1977	1978	1979	1980	1981	1982	1983	1984	1985
Smelt	12,064	1,834	65,238	30,764	5,778	14,547	3,902	7,859	18,095
Sockeye Salmon	3,204	4,345	4,403	3,126	3,479	6,417	7,909	7,367	8,445
Chinook Salmon	2,003	3,093	3,411	3,649	3,962	5,812	9,272	9,119	9,891
Coho Salmon	975	1,476	1,112	2,100	2,303	3,543	5,191	9,005	4,459
Dolly Varden/Arctic Char	1,421	2,731	2,465	4,374	4,481	4,745	10,309	10,666	8,622
Rainbow Trout	2,286	2,585	3,318	4,794	5,546	5,085	10,785	7,608	6,607
Arctic Grayling	1,963	2,938	3,017	3,952	3,467	5,043	9,029	6,266	5,720
Pink Salmon	0	3,286	0	1,299	0	1,142	388	3,253	67
Lake Trout	232	244	635	603	821	576	2,023	1,863	1,072
Chum Salmon	148	732	182	147	379	775	1,215	2,051	1,082
Northern Pike	123	379	362	276	433	807	2,758	2,848	980
Whitefish	8	25	0	17	183	168	376	287	1,330
Burbot	0	0	227	0	0	0	189	124	840
Other									
Total	24,427	23,668	84,370	55,101	30,832	48,660	63,346	68,316	67,210

Species	1986	1987	1988	1989	1990	1991	1992	1993	5-YR AVG
Smelt	1,284	88	30,600	57,611	5,640	21,165	22,078	7,458	22,790
Sockeye Salmon	5,047	10,443	8,171	32,962	15,996	17,613	15,912	24,889	21,474
Chinook Salmon	14,599	18,622	13,235	13,216	8,875	11,300	10,428	12,651	11,294
Coho Salmon	13,083	10,424	12,529	18,535	8,284	9,382	6,676	5,461	9,668
Dolly Varden/Arctic Char	5,993	7,979	6,228	7,482	5,964	7,635	5,717	5,934	6,546
Rainbow Trout	6,198	6,344	5,240	4,500	3,779	5,233	3,421	3,161	4,019
Arctic Grayling	5,493	7,242	4,212	4,225	3,905	6,750	4,042	4,858	4,756
Pink Salmon	3,629	150	5,224	827	1,351	625	1,198	251	850
Lake Trout	3,649	2,056	1,507	3,094	1,617	952	1,355	1,380	1,680
Chum Salmon	1,495	1,252	2,539	4,452	1,734	1,999	2,175	1,802	2,432
Northern Pike	835	2,431	561	2,133	904	2,500	1,960	1,639	1,827
Whitefish	958	247	217	231	1,538	734	635	557	739
Burbot	355	84	109	0	1,242	93	169	214	344
Other									
Total	62,618	67,362	90,372	149,268	60,829	85,981	75,766	70,255	88,420

Southwest Alaska Sport Fish Harvest By Species

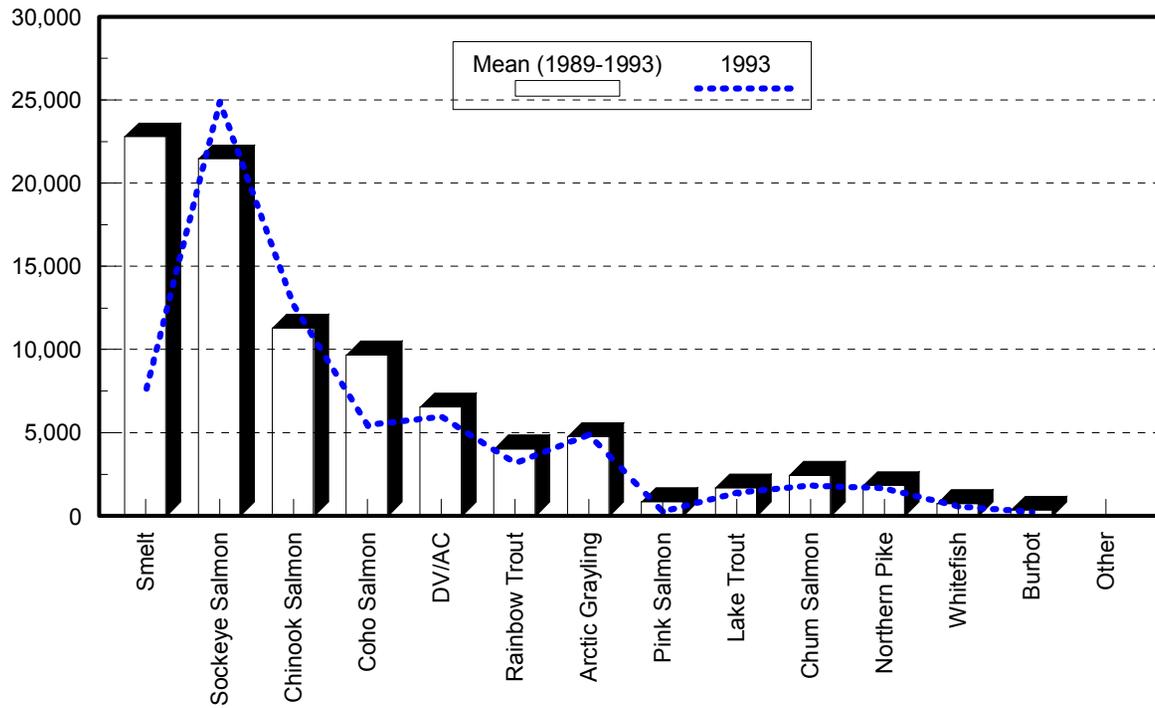


Figure 4.-Harvest by species of sport caught fishes in Southwest Alaska, 1977-1993.

The plan also addresses poor return scenarios. If the inriver return of chinook salmon is projected to be less than 65,000, restrictions on the sport fishery are mandated, and if the inriver return is projected to be less than 40,000 fish, the sport fishery is to be closed.

Southwest Alaska Rainbow Trout Management Plan

In February of 1990, the Alaska Board of Fisheries adopted a comprehensive management plan for rainbow trout in Southwest Alaska. The overriding philosophy of the *Southwest Alaska Rainbow Trout Management Plan* is one of conservative wild stock management (ADF&G 1990). Conservative wild stock management does not necessarily preclude limited harvest of rainbow trout for food or trophies. However, maximum yield principles which emphasize harvest are ruled out. Additionally, under a philosophy that emphasizes wild trout management, mitigating losses of wild stocks through enhancement or stocking is not considered a desirable management alternative.

The plan established three policies by which rainbow stocks are to be managed and provides guidance for the Board in developing future regulations.

Policy I states that native rainbow trout populations will be managed to maintain historic size and age compositions and at stock levels sufficient such that stocking is not needed to enhance or supplement the wild population.

Policy II states a diversity of sport fishing opportunities for wild rainbow trout should be provided through establishment of special management areas by regulation. Selection of areas for special management will be based on 11 criteria adopted by the Board of Fisheries. The 11 criteria include: stock status, abundance and size of rainbow trout, history of special management, proximity to local community, legal public access, overlap with freshwater net fisheries, water characteristics, clear geographic boundaries, importance to the sport fishing industry, geographical distribution of special management areas, and unique considerations such as education or research.

Policy III states management strategies should be consistent with the prudent economic development of the state's recreational sport fishing industry while at the same time acknowledging the intrinsic value of this fishery resource to the people of Alaska.

U.S. Fish and Wildlife Service Fisheries Management Plans

For each of the four National Wildlife Refuges (Togiak, Becharof, Alaska Peninsula, Yukon Delta) that are within the SWMA, there exists a Fisheries Management Plan (FMP). These plans generally acknowledge the state's authority for management of the sport fisheries and are of little direct affect on the day to day management of the areas fisheries. Department staff have worked with Service personnel to develop these plans which are essentially a list of fishery related issues and concerns, and a laundry list of projects to address those concerns. Each plan covers a 5-year period, after which the plan is to be reviewed. The individual plans, along with their adoption and revision dates, are listed below:

<u>Refuge</u>	<u>Status</u>	<u>Effective Date</u>
Togiak	Adopted	5/90 - 5/94
Yukon Delta	Adopted	1/92 - 1/96
Alaska Pen/Becharof	Draft	3/94 - 3/98

The FMP for Togiak National Wildlife Refuge is being reviewed at this time. Department and Service staff have met to discuss necessary changes to this plan. At the time of this writing, no schedule for reprinting of the FMP is planned.

U.S. Fish and Wildlife Service Public Use Management Plans

For each of the four refuges, the U.S. Fish and Wildlife Service (USFWS) has adopted or drafted Public Use Management Plans (PUMP) which are to address allowable activities. Of significance are the portions of these plans which address commercial sport fishing services. Since most of the sport fishing effort that occurs within refuge boundaries is guided, plans that affect guided activities directly affect opportunity to participate in recreational fishing. Generally, these plans establish levels of allowable commercial use on a river by river basis. Unguided use levels are not presently limited. The Togiak PUMP is the most complex of the group, requiring operators to submit prospectus applications and essentially bid for the privilege to provide services on these waters.

<u>Plan</u>	<u>Status</u>
Togiak PUMP	Adopted
Alaska Pen/Becharof PUMP	Draft 12/93

Nushagak & Mulchatna Rivers Recreation Management Plan

The Nushagak & Mulchatna Recreation Management Plan was adopted in August of 1990. The plan is the result of a joint effort between Department of Natural Resources, Bristol Bay Coastal Resource Service Area staff, and the Department of Fish and Game. The plan identifies goals and management intent and public use sites for 25 management units in the planning area. Additionally, management policies for long-term uses are identified as are guidelines for specific management direction for the 25 management units which constitute the planning area.

Limits on use levels and number of camps were not addressed, however, much of the policy contained in the plan directly affects commercial sport fish operators who provide services within the area, which therefore affects sport fishing opportunity in an indirect but nevertheless measurable way.

This plan is not scheduled for review or revision at this time. Implementation continues through the DNR process and compliance with the permit stipulations required by the plan is considered good to excellent for the sport fishing industry.

MAJOR ISSUES

Issues affecting management of the sport fisheries in Southwest Alaska can be both biological and social in nature. With the growth of any resource-based activity comes concern for resource conservation and the competition for those resources between user groups. Significant conservation concerns exist for the following fisheries:

Naknek River Rainbow Trout

Rainbow trout in the Naknek River have undergone a decline in the abundance of larger, older fish of the catchable population. Research in the late 1980s confirmed comments made by the angling public that the average size of the catchable population has declined and the number of spawning-sized fish was down as well (Minard 1990). The department advised the Board of Fisheries and recommended regulation changes intended to provide protection to the larger, older fish through bag and size limit manipulations. Recent studies indicate a positive population response to those actions. Staff will continue to monitor the population and report to the Board on changes in stock status.

Ugashik Grayling

The department completed a 2-year study concerning Arctic grayling in the Ugashik system in 1989, data and results were reported by Meyer (1990). Results of that work indicated that a decline of several orders of magnitude had occurred in abundance of grayling at the outlet of Lower Ugashik Lake. The decline appears to have manifested itself in a low abundance of younger age and size classes of fish, as older fish were still evident in the population. Abundance dropped from 1,000 to 2,000 fish from 1969 to 1979, and to less than 100 in 1988 and 1989. The cause of the decline is not known. Sport harvests at the time of the decline averaged less than 200 annually and were thought to be sustainable. Reaction by the Board of Fisheries was to close the entire drainage to fishing for grayling, a move staff advised was overly conservative. Since the closure, first effective during the 1990 season, there is circumstantial evidence that some recovery has occurred. Villegas and Maughan (1993) reported increased abundance of younger age classes at Ugashik Narrows. Although they did no sampling at the Outlet, it is conceivable that conditions that allowed for increased recruitment at one location might also benefit another site proximally located.

In 1994 biometric staff combined the data sets collected by Meyer and Villegas and Maughan and ran a series of Jolly-Seber estimates of abundance for grayling at the Narrows. Results indicated the population had increased over the 5-year period and demonstrated stable overwinter survival. Overwinter survival was variable and appears to be the major element affecting stock size. Based on these combined results department staff proposed expanding sport fishing opportunity in the Ugashik drainage by creation of a catch-and-release fishery for grayling at the Narrows. Under the proposal the Outlet area would remain closed and the tributaries would return to the normal bag limit, the Board of Fisheries is scheduled to consider this proposal in January of 1995.

Nushagak Coho Salmon

1994 marked the fourth year of poor returns of coho salmon to the Nushagak River. Forecasts for the 1995 season are not encouraging. Although sport harvests are considered negligible in most years, the waters of the Nushagak drainage were closed for a short period to sport fishing for coho salmon in 1994 to protect a very weak return. Management action may again be

necessary in 1995. The Alaska Board of Fisheries will be considering a management plan for Nushagak coho salmon at the upcoming meeting in January of 1995.

Agulowak Arctic Char

Results of a study conducted in 1993 indicated the abundance of Arctic char at the mouth of the Agulowak River has declined from 12,000 to 5,000 fish over a 10-year period (Minard and Hasbrouck 1994). Sport harvests during the period of decline are thought to be excessive. Regulatory proposals addressing this fishery were prepared and will be presented to the Board of Fisheries in January of 1995. Recommended management action includes the reduction in bag limit from 10 per day and in possession to 2 per day and in possession, as well as requiring the use of single-hook artificial lures. These restrictions were set in place during the 1994 season by emergency order. Public acceptance was good as was compliance.

OTHER ISSUES

Significant social issues concerning sport fisheries in the SWMA generally involve preservation of sport fishing opportunity in the face of greater competition between user groups for limited resources, increasingly complex land ownership patterns and coordination with other federal and state agencies. Of particular concern has been securing access to public lands and waters through negotiated easements across private and corporation lands. Limited Department of Natural Resources staff time available for working on these issues necessitates Sport Fish staff remain deeply involved if a desirable outcome is to be achieved. Approximately 30% of the area management biologist's time is spent on land and access issues.

ONGOING RESEARCH AND MANAGEMENT ACTIVITIES

There were three significant research programs conducted in 1994 in the SWMA:

(1) Bristol Bay Rainbow Trout Studies

This program provided funding for: (a) a fishery survey of the Bay of Islands rainbow trout fishery. Objectives included documenting the timing and geographic extent of the fishery, the success rate of anglers that participated in the fishery, documenting the terminal tackle used and the frequency with which anglers landed rainbow trout in excess of 18 inches in length. Results indicated a very minor fishery exists and that numbers of rainbow trout landed on deep water troll gear is very small. Detailed documentation of techniques and results will be published in a Division of Sport Fish Fishery Data Series report.

Funding was also provided for continued monitoring and estimation of population level statistics of rainbow trout stocks of the Kvichak River. Results to date indicate the stock is stable or slightly increasing. Estimates of recruitment and survival appear sound. Consideration is being given to publishing results of this project in the professional literature.

A third project funded this year included the ongoing volunteer program at Lower Talarik Creek. Data on effort, catch and demographics are routinely collected. Age and size information is also collected from sport caught fish. Results of these surveys are reported in the Annual Management Report series.

(2) Bristol Bay Chinook and Coho Salmon

This project provided funding for monitoring the chinook and coho salmon sport fishery on the lower Kanektok, Nushagak, and Mulchatna rivers. Fishery demographics, timing and location, and effectiveness of current management strategies will be reported in a formal Fishery Data Series report for publication in 1995.

(3) Resident Species Studies (Lake Trout Studies of Southwest Alaska).

This project entailed measurement of thermal habitat volume for some twenty different lakes in Southwest Alaska. Based on the estimates of thermal habitat volume and average size of lake trout harvested by the sport fishery, an estimate of the maximum sustainable yield (MSY) can be made. Estimation of MSY will allow evaluation of the current regulation package for lake trout and provide forewarning of where stock conservation problems may be forthcoming. This was a joint project between the Alaska Department of Fish and Game, National Park Service, and the U.S. Fish and Wildlife Service. Interim results will be presented in a Fishery Data Series report which will also meet the reporting requirements of the National Park Service.

Management activities in 1994 included participation with local advisory committees in the Board of Fisheries process, public contacts, dissemination of information, fisheries monitoring, coordination with staff from other resource management agencies, and habitat monitoring and permit review. Working toward resolution of easements at Ugashik Narrows and native allotment claims at Lower Talarik Creek consumed significant staff time as did working with the Nushagak Advisory Committee on drafting a Nushagak Coho Salmon Management Plan.

ACCESS PROGRAM

Management of the sport fisheries in Southwest Alaska goes beyond ensuring the conservation of fisheries resources and providing a diversity of recreational fishing opportunities. Among other things it includes the rational development of access projects that promotes access for the angling public to common property resources. Between 10% and 20% of the annual Sport Fish Division budget is dedicated to the acquisition, development and maintenance of public use facilities. Access projects that benefit sport fishermen may be as simple as a dumpster for collection of refuse or as complex as the development of a boat launch with parking and picnic facilities.

The Division has a fairly well defined process for the selection and prioritization of projects that are being considered for funding. There are essentially seven steps in the process: (1) proposed by Area Management Biologist, (2) Regional Access Coordinator Review, (3) Statewide Access Coordinator Review, (4) Acquisition, (5) Development, (6) Maintenance and (7) Management. All proposed projects must go through the same review process and be assigned a priority based on their individual merit. The following is a list of projects presently being considered in Southwest Alaska.

Aleknagik Lake

This project is located in the central portion of the management area on the south shore of Lake Aleknagik. This site is the common launching point for traffic heading into or returning from the Wood/Tikchik State Park. Popular sport fishing waters accessed from this point will be the Wood River, Agulowak and Agulukpak rivers and the many bay and tributary streams to the Wood River lake system. The project entails the acquisition of property sufficient for the

construction of a boat launch, parking for up to 60 vehicles with trailers, an outhouse facility and garbage service. Total project cost is estimated to be \$300,000.

As of December 1993, steps 1 through 3 had been completed. Land acquisition (step 4) was not completed as the entire project was challenged by local interests that delayed forward progress. As of December of 1994, appraisals have been updated and agreed upon by all parties. Land transfer will follow land surveys which are to be completed in the spring of 1995. The development phase (step 5) will be delayed until the summer of 1996.

Lake Camp

The outlet of Naknek Lake is commonly referred to as Lake Camp, and is frequently used by sport fishermen as an access point for the upper Naknek River and Naknek Lake. The upper reach of the Naknek River supports the largest rainbow trout fishery in Bristol Bay. Over 20,000 angler days are expended by recreational fishermen on the Naknek River each year. Presently, access to the upper river is limited to an undeveloped launch site on private land. Technically, any use of this site constitutes trespass.

This project would entail the acquisition and development of a site for a public launch. Facilities should include a launch ramp, outhouse, picnic area and refuse containers. To date, the Access Project Data Sheet (step 1) has been filled out (February 1992) and the project is now on hold pending review by the regional access coordinator (step 2). Complicated land ownership and unwilling sellers confound resolution of this project.

Newhalen River

This project is located at a trailhead near the transient parking ramp at the Iliamna airport which leads to the Newhalen River falls. Sport fishermen utilize this location heavily in late June and July while fishing sockeye salmon and to a lesser extent during the months of August and September while fishing rainbow trout. The installation of outhouse and refuse containers, as well as a garbage collection and maintenance contract were completed in the spring of 1993. Additional outhouses are scheduled for installation at the trail terminus in the spring of 1995. Overall reaction, on the part of local residents and the angling public, has been highly favorable.

SECTION II: SPORT FISHING EFFORT

Comprehensive estimates of sport fishing effort for the SWMA were first made in 1977 and published in the Statewide Harvest Report (Mills 1979). Since that time, substantial increases in sport fishing effort have taken place in the SWMA, with the increases being best described as stair-stepped (Figure 2).

From 1977 to 1982, effort averaged 31,563 angler-days in Southwest Alaska (Table 1). During this period, sport fishing effort was increasing at a rate of 3,161 angler-days per year, and the SWMA was accounting for 2.3% of the statewide total. Growth during this period was about 10% per year; about half the rate observed statewide.

A significant increase in effort was estimated for the period 1983 to 1989 when sport fishing effort more than doubled to an average 71,927 angler-days per year. During this period, effort grew at approximately 936 angler-days per year, contributing 3.5% to the total sport fishing effort statewide.

Most recently, a third leap in effort appears to have occurred and effort has averaged 109,275 angler-days for the 1990 through 1993 seasons. During this short period, the SWMA has provided roughly 4.3% of the total effort statewide.

Why effort has demonstrated the tendency for stair-stepped growth is not understood. Some of the growth may be a response to the increased publicity associated with the creation of several National Wildlife Refuges in the early 1980s. It is apparent that interest in sport fishing in Southwest Alaska has grown steadily, and the area is accounting for an increasing portion of the total sport fishing effort statewide. Sport fishing effort in the SWMA is expected to continue to increase during the next few years.

Sport fishing effort for some of the more popular locations is summarized in the following section of this report. To warrant special recognition in this chapter, a fishery had to sustain an average 2,500 angler-days during the last 5 years, or demonstrate a radical departure from historic performance.

ALAGNAK RIVER

The Alagnak River, known locally as the Branch River, is located approximately 40 miles north of King Salmon in the Kvichak River drainage (Figure 1). Effort estimates for this fishery were first made in 1981 (Table 3). Since 1981, recreational fishing effort has demonstrated an erratic pattern, peaking in 1986 at 7,628 angler-days, and bottoming out in 1988 at 1,182 angler-days. The recent 5-year average (1988 to 1992) has been 5,774 angler-days. Estimated use in 1992 was a record setting 12,323 angler-days, making it the second most popular fishing destination in Southwest Alaska. In 1993, sport fishing effort remained high, totaling 12,440 angler-days. Guided anglers utilizing several river-based lodges or daily fly-in services account for over three-quarters of the sport effort on the Alagnak River (Dunaway 1994a). The Alagnak River enjoys Wild and Scenic River status and hosts significant recreational fisheries for chinook, chum, and coho salmon as well as for rainbow trout, Dolly Varden/Arctic char, Arctic grayling, and northern pike. For the near term, sport fishing effort on the Alagnak River is expected to remain above 12,400 angler-days per year.

Table 3.-Sport fishing effort in angler-days by fishery, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	707	2,477	1,399	472	671	870	769	1,609	954 ^b
Egegik/Becharof	403	883	314	386	360	239	405	1,147 ^b	954 ^b
Naknek R.	4,675	5,600	5,691	9,967	10,863	11,393	14,786	14,914	15,311
Naknek L.	872	646	770	1,542	1,472	1,777	1,052	574	121 ^b
Bay of Islands							1,012	1,197	971
Brooks R.	1,195	1,464	1,163	1,971	1,391	2,423	2,976	1,821	1,474
Brooks L.									
American Cr.							61 ^b	175 ^b	364 ^b
King Salmon R.									
Kvichak R.	1,509	948	2,044	2,056	1,865	1,877	2,206	2,576	2,533
Copper R.	1,686	1,120	723	1,200	916	2,491	2,429	251 ^b	222 ^b
Alagnak R.					1,947	2,252	2,348	5,119	2,473
Newhalen R.	1,686	1,572	2,672	4,013	1,832	3,054	2,834	3,664	8,871
L Talarik Cr	749	646	927	585	458	972	688	1,288 ^b	666
Lake Clark	3,748	2,910	3,128	2,342	2,519	2,286	4,777	1,322	1,511
Lake Iliamna							142 ^b	485 ^b	548 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other	423	646	346	414	670	751	6,879	3,252	10,165
Subtotal	17,653	18,912	19,177	24,948	24,964	30,385	43,364	39,394	47,138
Central									
Nushagak	1,380	1,206	2,421	1,885	2,732	3,992	4,615	3,212	3,750
Mulchatna	1,296	1,486	1,431	1,057	1,145	1,228	2,672	2,175	3,266
Wood River L.	3,549	2,843	1,745	3,884	1,701	3,139	5,040	3,497	2,460
Tikchik L.	959	1,465	582	2,071	2,241	1,058	1,579	1,171	1,693
Koktuli R.									
Other					0	356	3,036	1,105	643
Subtotal	7,184	7,000	6,179	8,897	7,819	9,773	16,942	11,160	11,812
Western									
Togiak	675	539	1,666	1,513	932	1,160	972	3,497	1,290 ^b
Goodnews							742	1,010 ^b	4,214
Kanektok							1,517	6,881	4,630
Other							20	344	243
Subtotal	675	539	1,666	1,513	932	1,160	3,251	11,732	10,377
Northwestern									
Aniak							253 ^b	383 ^b	87 ^b
Kwethluk									
Other							2,682	1,149	694
Subtotal							2,935	1,532	781
Total	25,512	26,451	27,022	35,358	33,715	41,318	66,492	63,818	70,108

-continued-

Table 3.-Page 2 of 2.

Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	627 ^b	1,682	528 ^b	998	1,383	1,627	2,001	1,918	1,585
Egegik/Becharof	367 ^b	335 ^b	1,037 ^b	779	1,193	1,033	1,634	888	1,105
Naknek R.	18,057	17,152	18,372	14,120	12,572	15,918	14,436	13,674	14,144
Naknek L.	1,590	762	1,710 ^b	914	2,148	981	2,411	844	1,460
Bay of Islands	1,131 ^b	1,005	564 ^b	1,527	2,620	2,259	2,838	1,160	2,081
Brooks R.	2,752	2,784	4,602	1,839	8,162	3,305	6,605	5,565	5,095
Brooks L.					680	813	2,262	900	931
American Cr.	122 ^b	335 ^b	31 ^b	343	1,550	491 ^b	939	1,659	996
King Salmon R.							918	190	222
Kvichak R.	2,379	2,544	1,346	2,616	6,107	3,047	4,716	5,475	4,392
Copper R.	1,699 ^b	1,012 ^b	146 ^b	384	1,036	1,791	2,518	4,088	1,963
Alagnak R.	7,628	4,786	1,182 ^b	2,717	6,571	6,079	12,323	12,440	8,026
Newhalen R.	4,475	5,087	3,365	5,646	4,370	7,567	4,225	6,428	5,647
L Talarik Cr	623 ^b	137 ^b	1,619 ^b	172 ^b	1,975	549	1,184	491	874
Lake Clark	4,248	824	255 ^b	2,697	3,377	3,292	1,803	2,596	2,753
Lake Iliamna	3,700	1,641	891	1,151	1,220	1,097	1,291	2,184	1,389
Kulik R.							886	1,555	488
Tazimina R.							437	343	156
Moraine Cr.							405	689	219
Other	1,326	3,176	5,339	2,557	5,407	6,846	5,478	6,712	5,400
Subtotal	50,724	43,262	40,987	38,460	60,371	56,695	69,310	69,799	58,927
Central									
Nushagak	4,557	4,677	5,039	3,980	7,978	11,351	10,031	14,168	9,502
Mulchatna	2,920	2,735	4,711	1,974	6,070	7,449	4,705	4,729	4,985
Wood River L.	3,012	2,325	4,457	10,272	7,618	10,853	6,647	6,482	8,374
Tikchik L.	292 ^b	684 ^b	4,147	1,569	2,424	4,996	3,051	3,678	3,144
Koktuli R.							1,323	342	333
Other	1,245	3,711	1,486	1,882	4,624	4,041	864	1,098	2,502
Subtotal	12,026	14,132	19,840	19,677	28,714	38,690	26,621	30,497	28,840
Western									
Togiak	1,208	848 ^b	1,055 ^b	1,174	1,638	1,729	1,419	1,647	1,521
Goodnews	229 ^b	2,372 ^b	1,219 ^b	1,315	4,578 ^b	1,328	1,387	2,276	2,177
Kanektok	8,825	9,689	12,697	4,382	4,525	3,078	4,972	3,791	4,150
Other	61		3,796	767	66	20	64	60	195
Subtotal	10,323	12,909	18,767	7,638	10,807	6,155	7,842	7,774	8,043
Northwestern									
Aniak	1,116 ^b	507 ^b	2,437 ^b	4,035	1,964	3,078	2,604	2,056	2,747
Kwethluk							640	554	239
Other	703	1,920	377	3,231	2,843	2,966	3,500	3,620	3,232
Subtotal	1,819	2,427	2,814	7,266	4,807	6,044	6,744	6,230	6,218
Total	74,892	72,730	82,408	73,041	104,699	107,584	110,517	114,300	102,028

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

BROOKS RIVER

The Brooks River, located in the heart of Katmai National Park and Preserve, had been a popular destination for sport fishermen long before estimates of sport fishing effort were first made in 1977. The Brooks River has long been recognized for its rainbow trout, sockeye and coho salmon, and Arctic grayling fisheries. During the recent 5-year period, Brooks River has supported an average of 5,095 angler-days of effort, making it one of the more popular fisheries in Southwest Alaska. Mile for mile, the Brooks River supports more fishing pressure than any other water in Southwest Alaska. Effort in 1993 (5,565 angler-days), although not a record, was the third highest observed since 1977.

Although effort is growing on the Brooks River, recent management actions on the part of the National Park Service have likely reduced growth in the fishery from what would have occurred if left unchecked. Effort levels can be expected to remain between 4,000 and 7,000 angler-days per year.

BAY OF ISLANDS

The Bay of Islands, located in Naknek Lake, is becoming an increasingly popular destination for sport anglers. Estimates of effort for this location first appeared in the statewide harvest survey in 1983 and remained relatively low through 1989 (Table 3). In 1990, effort for this fishery jumped to 2,620 angler-days and in 1992 was estimated to be 2,838 angler-days. Recreational fishing effort in 1993 dropped to 1,160 angler-days. Results of an onsite fishery survey conducted this season suggest even less effort occurred in 1994 than in the recent past.

Anglers fishing the Bay of Islands are reportedly targeting large rainbow trout, lake trout, pike and Dolly Varden. The fishery is reported to be a deep water troll fishery.

Growth in this fishery has been coincident with conservative measures enacted by the Board of fisheries to help protect declining rainbow trout stocks of the Naknek River. Previous studies indicate Naknek River rainbow trout stocks migrate to the Bay of Islands in June and July where they summer (Berger and Gwartney 1986). Staff conducted an onsite fishery survey of this area in 1994. Results of the 1994 survey will be published in the Fishery Data Series.

KVICHAK RIVER

The Kvichak River drains an extensive portion of the Bristol Bay watershed, most notably Lake Iliamna (Figure 1). Known primarily as the world's largest producer of sockeye salmon, the Kvichak drainage also supports significant recreational fisheries for rainbow trout, Dolly Varden/Arctic char, and Arctic grayling. Minor fisheries for coho salmon and lake trout also occur.

Since 1989, the Kvichak River has accounted for an average of 4,392 angler-days of recreational fishing effort (Table 3). Annual increases in effort have been noted since 1991. Observations in 1994 suggest effort was greater than that observed in 1993. Expansion of the village airfield at Igiugig was completed in 1994. Improved aircraft access and parking will likely result in increased demand for fishing opportunity. Sport fishing effort is expected to increase substantially in the near future. Staff have begun discussions with village leaders and access program personnel to find ways to accommodate expected growth in a planned manner.

LAKE CLARK

Lake Clark is located in the Eastern section of the management area and forms a major watershed for the Iliamna drainage. Waters from Lake Clark flow generally south into Sixmile Lake which is drained by the Newhalen River. Lake Clark is within the confines of the Lake Clark National Park and preserve. Fjord-like bays and glacial colored waters are the signature of this area.

Sport fishing effort in Lake Clark has been estimated since 1977 (Table 3) and with few exceptions has remained relatively stable. Since 1989 effort has averaged 2,753 angler-days per year. Most effort targets northern pike, grayling, lake trout and sockeye salmon. Rainbow trout are found very infrequently, if at all in the glacial waters of Lake Clark. Because of its proximity to Anchorage, it is likely that Lake Clark will continue to grow as a fishing destination.

NAKNEK RIVER

The Naknek River, located on the east side of Bristol Bay (Figure 1), supports the most popular sport fisheries within the SWMA, accounting for nearly one-fifth of the total recreational angler effort expended in the SWMA each year. Effort is split between the upper river, where anglers target rainbow trout, Arctic grayling, and sockeye salmon, and the lower river, where they fish primarily for chinook and coho salmon.

Sport fishing effort on the Naknek River has increased steadily for the last 12 years, from an average of approximately 5,000 angler-days annually during the late 1970s to the record 18,372 angler-days observed in 1988 (Table 3). Since 1988 there has been a significant reduction in sport fishing effort, reversing the previous 12-year trend. Effort dropped to 14,120 angler-days in 1989, then to 12,572 angler-days in 1990, and in 1991 and 1992 was estimated to be 15,918 and 14,436, respectively. The recent decline in sport fishing effort on the Naknek River is likely the result of angler response to more conservative regulations, the issuance of emergency order restrictions inseason, and a growing desire on the part of some fishermen to fish less crowded waters. Since 1989 sport fishing effort has averaged 14,144 angler-days per year and is expected to increase slowly over the next several years.

NEWHALEN RIVER

The Newhalen River connects Six-Mile Lake to Lake Iliamna (Figure 1) and is the third most popular fishing destination in the eastern section of the SWMA. Estimates of sport fishing effort were first made for the Newhalen River in 1977 and have been made annually since (Table 3). During the period 1988 to 1992, sport fishing effort averaged 5,035 angler-days per year. Record effort was estimated in 1985 at 8,871 angler-days. Effort in 1993, at 6,428 angler-days, is the second highest level documented. Observations in 1994 suggest efforts last year were equal or greater than that observed in 1993.

The attraction for most anglers is the opportunity to fish for abundant sockeye salmon which ascend the Newhalen River each summer. The bulk of the fishery occurs during a 4-week period starting in late June and continuing until late July. In addition to sockeye, there is excellent rainbow trout fishing opportunity available in the upper reach of the Newhalen River as well as the tail water below the area known as the falls.

Sport fishing opportunity can be significantly enhanced through development of an improved camping area and trail. Staff are working with local community leaders to improve access to the

Newhalen River. When that project is completed, participation in the recreational fishery on the Newhalen can be expected to significantly increase.

NUSHAGAK AND MULCHATNA RIVERS

The Nushagak and Mulchatna rivers are located in the central portion of the SWMA (Figure 1) and together are the greatest producers of chinook, chum, coho, and pink salmon in Bristol Bay. Sport fishing effort has increased steadily since 1977 and in 1991 accounted for 18,800 angler-days, or about 1.5 times the recent 5-year average (Table 3). Most (60%) of the effort occurs in the Nushagak River, and together the two rivers account for about 13% of the total sport fishing effort in the SWMA. Primary species of interest to sport fisherman include chinook, chum, and coho salmon as well as rainbow trout, Dolly Varden/Arctic char and Arctic grayling.

Approximately 30 commercial guiding services utilize the Nushagak/Mulchatna drainage and operate spike camps or store boats within the area. Recreational activity within the drainage was the focus of a major planning effort completed in July 1990, which resulted in the *Nushagak and Mulchatna Rivers Recreation Management Plan*. Additionally, village corporations now maintain a vigorous, and profitable, recreational land management program on corporation lands.

Recreational fishing effort in the Nushagak River has averaged 9,502 angler-days per year since 1989. The 1993 estimate of 14,168 is a new record for this fishery and likely the result of strong chinook salmon returns to the system. The Mulchatna averages almost 5,000 angler-days per year and since 1988 has remained relatively stable.

WOOD RIVER LAKES

The Wood River Lakes system, a series of six large lakes connected by relatively swift short rivers, is located within the confines of the Wood-Tikchik State Park (Figure 1). Sport fishing opportunities have attracted anglers in ever-increasing numbers. Anglers target rainbow trout, Arctic char, Arctic grayling and a variety of salmon species. Because of the diverse fishery resources, sport fishing continues throughout most of the open water season. During the recent 5-year period (1989 to 1993) effort has averaged 8,374 angler-days per year or about 8% of the area-wide total (Table 3). Two rivers, the Agulukpak and Agulowak, support most of the sport fishing activity that occurs within the drainage.

As a state park, the area receives a great deal of publicity and unguided use of the fishery resources is on the rise. The area is also the base for several major fishing lodges which offer fly-out fishing trips, often to remote reaches of the Wood River Lakes system. Taken together, the guided and unguided components are significant in these waters and effort is expected to increase substantially in the future.

GOODNEWS RIVER

The Goodnews River is located in the western section of the management area and is within the Togiak National Wildlife Refuge. The Goodnews River consists of three river forks which drain approximately 1,000 square miles (Figure 1). The Goodnews River (North Fork) drains Goodnews Lake and flows approximately 25 miles before leaving the refuge, and continues another 22 miles to Goodnews Bay. The Middle Fork is a 42-mile-long tributary which parallels the North Fork, joining near the mouth. The upper 27 miles are located on the refuge. The South Fork is the smallest of the three tributaries and is approximately 25 miles in length, 10 miles of which are within the refuge. The waters of the Goodnews drainage support abundant Dolly

Varden/Arctic char, rainbow trout, Arctic grayling, and all five species of Pacific salmon. Of the salmon species, coho salmon are the most popular with recreational anglers fishing these waters.

Estimates of sport fishing effort were first available in 1983 and since that time have been made in statistically valid manner (based on 12 or more responses to the statewide harvest surveys) during 1985, 1989, 1991, and 1992. For the remaining 5 years, estimates of sport effort have been made but are based on less than the desired level of responses, making these estimates less precise. For the period 1989 to 1993, sport fishing effort on the Goodnews River has averaged 2,177 angler-days accounting for about 2.5% of the total effort in Southwest Alaska, and about 20% of the effort in the western section of the management area. According to USFWS staff, about 66% of the effort occurs in the lower portion of the Goodnews River, below the wilderness boundary and outside the refuge.

In May of 1991, a Public Use Management Plan was adopted by the U.S. Fish and Wildlife Service for the Goodnews River (USFWS 1991). That plan allowed 10 sport fishing operators to provide commercial services within the wilderness portion of the drainage. Commercial activities below the wilderness area are not controlled by the Service under this plan. The intent of this plan is to maintain the current level of guided sport fishing effort through the 1995 season. Under this plan, private recreational effort throughout the system and professional guided effort below the refuge boundary is currently unlimited.

KANEKTOK RIVER

The Kanektok River, located south of Bethel and within the Togiak National Wildlife Refuge (Figure 1), is a 93-mile clearwater river that became popular with sport fishermen starting about 1983. Since 1983, sport fishing effort increased significantly until it peaked in 1988 at 12,697 angler-days (Table 3). Fishing effort has since declined, and since 1989 has averaged 4,150 angler-days, or about 8% of the effort within the SWMA area (Table 3). Approximately 60% of the total effort occurs on the lower 20 miles of the river, where fishermen target chinook, chum, and coho salmon. The upper 73 miles support primarily rainbow trout, Arctic grayling, and Dolly Varden fisheries.

In May of 1991, a Public Use Management Plan was adopted by the U.S. Fish and Wildlife Service for the Kanektok River (USFWS 1991). That plan established maximum daily use levels for commercially guided visitors within the wilderness section of the Refuge. This plan is not likely to result in significant changes in sport fishing effort on the Kanektok River. Under this plan, private recreational effort throughout the system and professional guided effort in the lower 20 miles of the river are currently unlimited.

TOGIAC RIVER

The Togiak River, within the confines of the Togiak National Wildlife Refuge on the western side of Bristol Bay (Figure 1), supports significant runs of chinook and coho salmon as well as abundant Dolly Varden/Arctic char and rainbow trout stocks. The river is fished primarily by fly-in and float-trip anglers. Angler effort on the Togiak River has been relatively stable with the exception of 1984 when effort peaked at 3,497 angler-days. Since 1989, effort has averaged 1,521 angler-days per year or only 1.5% of the area's total recreational fishing effort (Table 3). Under a new Public Use Management Plan adopted in 1991 by the U.S. Fish and Wildlife Service (USFWS 1991), sport fishing effort, particularly guided effort in the wilderness section

of the Refuge, will be limited to moderate growth during the next several years by increasing the number of client days allocated to each guide.

NORTHWESTERN FISHERIES

The least developed fisheries in the SWMA are found in the northwestern section. The waters in this section are extremely remote with few facilities catering to sport fishermen. Estimates of effort were first calculated for the waters of the northwestern section in 1983 (Table 3). During the last 5 years, effort has averaged 6,218 angler-days per year or barely 5% of the effort for the whole management area. The most popular river in this section is the Aniak River which accounts for over 40% of the Northwestern section total. Chinook salmon, rainbow trout, Dolly Varden/Arctic char and Arctic grayling are the most commonly harvested species in the northwestern section sport fisheries.

SECTION III: CHINOOK SALMON FISHERIES

The following discussions focus on six significant recreational chinook salmon fisheries found in the SWMA. A significant fishery refers to a particular drainage, river, or portion of a waterway where a large proportion of the area's total effort and/or harvest for a species occurs. Fisheries requiring particular management attention or which have been designated as special management areas are generally regarded as significant fisheries.

The peak of the recreational chinook salmon fishery occurs from mid June to mid July in the lower reaches of the Alagnak, Nushagak, Naknek, Togiak, and Kanektok rivers, as well as several smaller waters (Figure 5). Chinook salmon stocks throughout the management area significantly increased in abundance from the late 1970s through the early 1980s. Then, from about 1984 to 1990, chinook salmon stocks in western Alaska returned to more normal levels.

Harvests of chinook salmon have loosely followed the trends in abundance, peaking in 1987 at 18,622 fish and then declining through 1990 (Figure 6). Chinook salmon typically account for about 30% of the recreational salmon harvest in Southwest Alaska. The 1993 sport harvest for the area was 12,651, which is close to the recent 5-year average harvest of 11,294 chinook salmon (Table 4). Approximately 7% of all the chinook salmon killed in the SWMA are taken by sport fishermen.

The chinook salmon sport fisheries of the area, like the sport fisheries for most species, are fished primarily by guided fishermen. With few exceptions, the guided to unguided ratio is about 3 to 1, and the retention rates, the number of fish kept in relation to the total caught, are usually 50% or less.

Since 1960, bag limits for chinook salmon have become increasingly conservative. The following is a chronology of regulatory changes affecting chinook salmon sport fisheries in Southwest Alaska:

- 1965. Bristol Bay bag and possession limit was 10 salmon (all species combined) daily; the Kuskokwim chinook salmon limit was set at 15 per day.
- 1972. Bag limits for the Bristol Bay area were dropped to 5 chinook salmon per day and in possession, of which only 2 could be over 26 inches in length; Kuskokwim Bay limits remained at 15 chinook salmon per day, no size limit.
- 1987. Bag and possession limits for chinook salmon were dropped in Bristol Bay from 5 to 3 per day, of which only 2 could be over 28 inches in length; Kuskokwim Bay area bag limits were reduced from 15 chinook salmon to 5 chinook salmon with no size limit.
- 1989. Kuskokwim Bay area limit was again dropped to the current limit of 3 chinook per day, of which only 2 can be 28 inches or larger.
- 1994. Kuskokwim Bay area limit increased from 1 per day and in possession to 3 chinook per day, of which only 2 can be 28 inches or larger

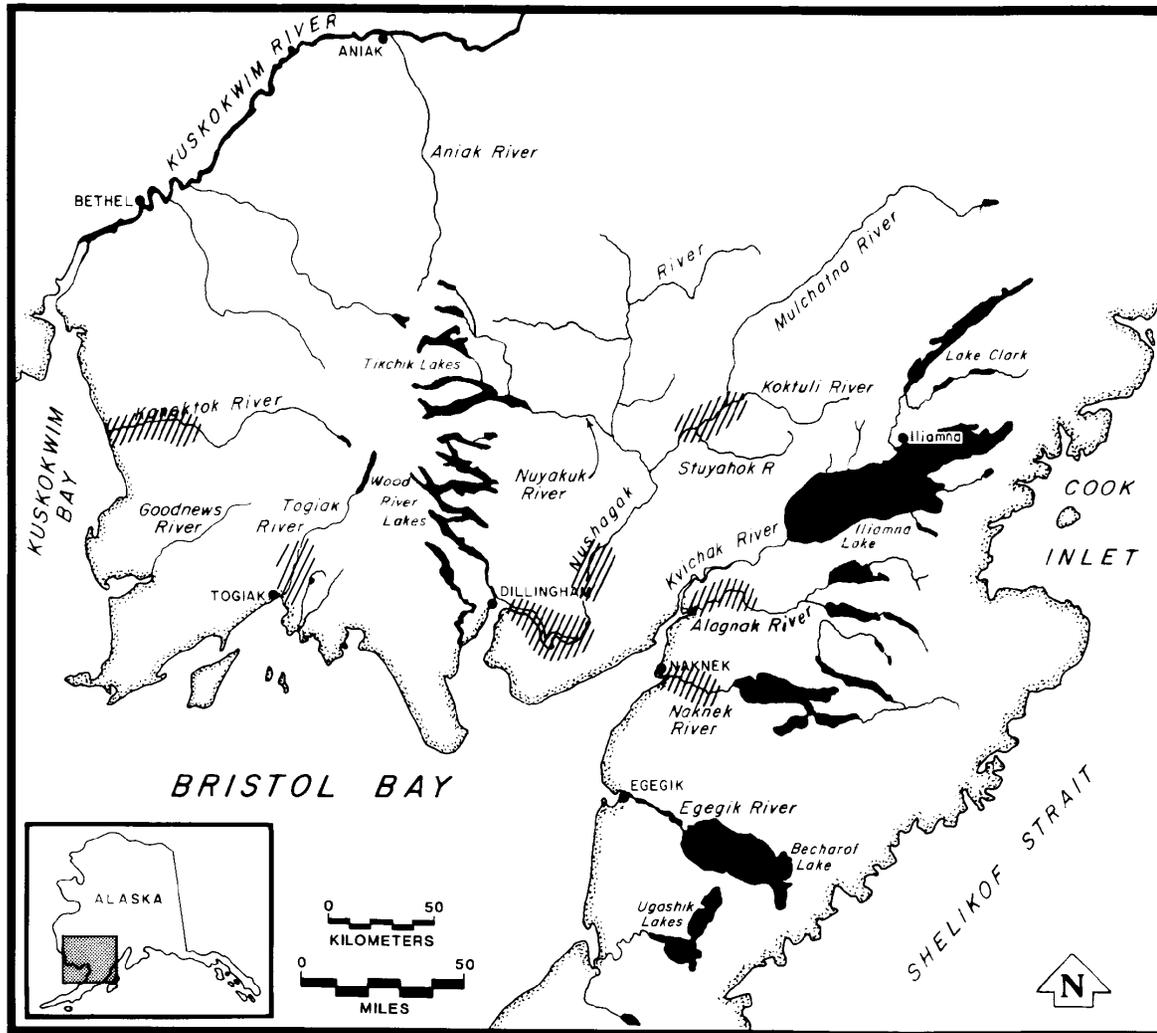


Figure 5.-Popular chinook salmon sport fisheries in Southwest Alaska.

SPORT HARVEST OF CHINOOK SALMON

SOUTHWEST ALASKA (1977-1993)

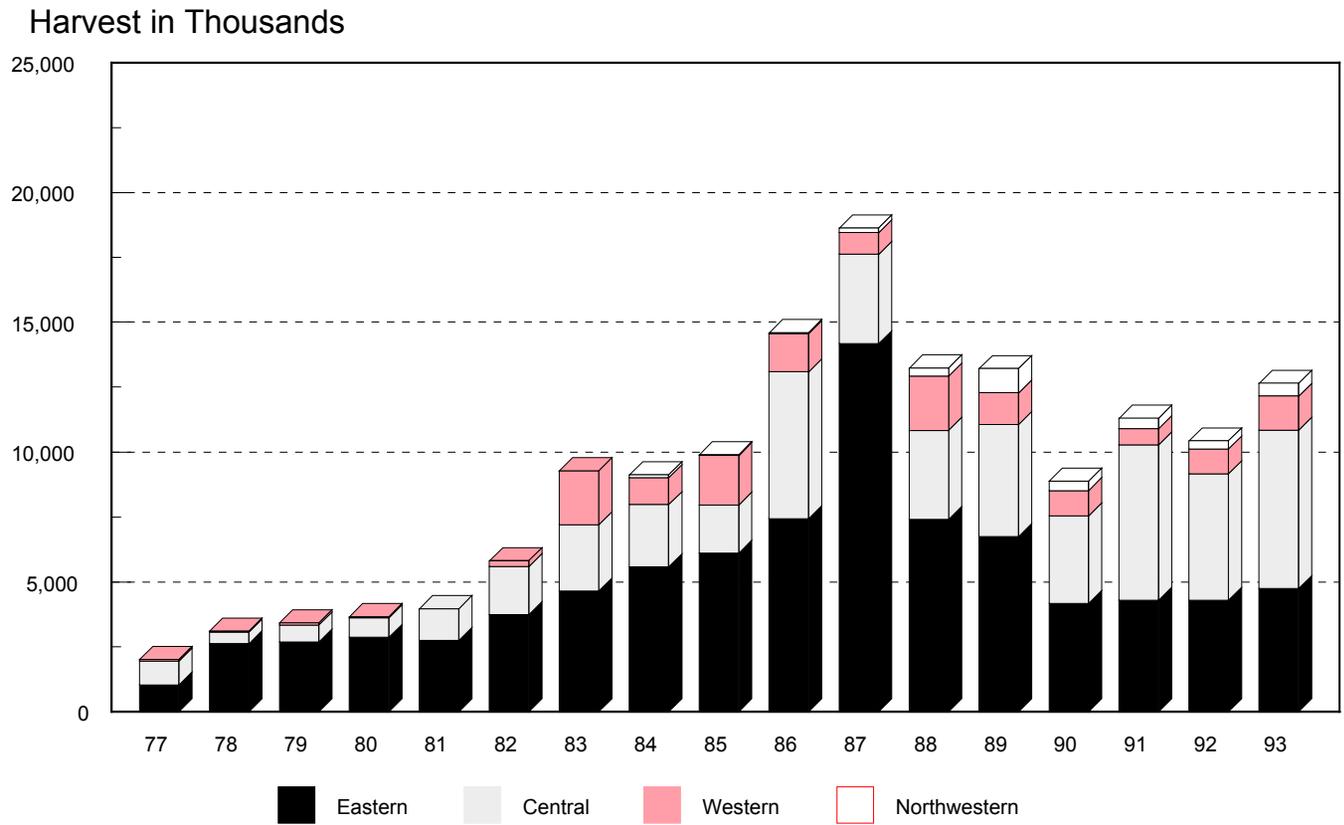


Figure 6.-Sport harvest of chinook salmon from the eastern, central, western, and northwestern sections of the Southwest Alaska sport fish management area, 1977 to 1993.

Table 4.-Sport harvest of chinook salmon from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	0	0	0	0	0	0	0	64	0 ^b
Egegik/Becharof	4	0	0	0	0	0	0	148 ^b	0 ^b
Naknek R.	1,005	2,406 ^c	2,669 ^c	2,729	2,581	3,264	3,545	4,524	5,038
Naknek L.	0	0	0	0	0	0	0	0	0 ^b
Bay of Islands							0	0	62
Brooks R.	0	0	0	0	0	0	0	42	25
Brooks L.									
American Cr.							0 ^b	0 ^b	0 ^b
King Salmon R.									
Kvichak R.	9	210	10	129	64	252	420	100	57
Copper R.	0	0	0	0	0	0	0	37 ^b	0 ^b
Alagnak R.					97	220	252	661	757
Newhalen R.	0	0	0	0	0	0	0	0	0
L Talarik Cr	0	0	0	0	0	0	0	0 ^b	0
Lake Clark	0	0	0	0	0	0	0	0	0
Lake Iliamna							0 ^b	0 ^b	0 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other							430	0	161
Subtotal	1,018	2,616	2,679	2,858	2,742	3,736	4,647	5,576	6,100
Central									
Nushagak	402	151	312	611	929	1,436	1,615	1,534	1,517
Mulchatna	521	291	342	146	291	367	388	786	292
Wood River L.	0	0	0	0	0	0	0	62	14
Tikchik L.	0	0	0	0	0	0	0	0	29
Koktuli R.									
Other					0	42	545	12	0
Subtotal	923	442	654	757	1,220	1,845	2,548	2,394	1,852
Western									
Togiak	62	35	78	34	0	231	535	46 ^c	925 ^c
Goodnews							31	52 ^b	323
Kanektok							1,511	922	667 ^c
Other							0	12	0
Subtotal	62	35	78	34	0	231	2,077	1,032	1,915
Northwestern									
Aniak							0 ^b	39 ^b	12 ^b
Kwethluk									
Other							0	78	12
Subtotal	0	0	0	0	0	0	0	117	24
Total	2,003	3,093	3,411	3,649	3,962	5,812	9,272	9,119	9,891

-continued-

Table 4.-Page 2 of 2.

Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	0 ^b	322	0 ^b	52	120	113	72	150	101
Egegik/Becharof	37 ^b	0 ^b	588 ^b	78	80	0	16	9	37
Naknek R.	6,462 ^c	11,419 ^c	5,380 ^c	3,879 ^c	3,250 ^c	3,115	2,633	2,603	3,096
Naknek L.	15	0	62 ^b	26	0	9	69	0	21
Bay of Islands	0 ^b	0	0 ^b	0	0	18	25	18	12
Brooks R.	0	64	0	0	0	0	44	0	9
Brooks L.						0	0	0	0
American Cr.	0 ^b	0 ^b	0 ^b	0	0	0 ^b	0	0	0
King Salmon R.							182	19	40
Kvichak R.	68	191	0	681	143	44	16	250	227
Copper R.	0 ^b	0 ^b	0 ^b	277	0	22	0	0	60
Alagnak R.	680	1,969	1,243 ^c	1,333 ^c	474	790	1,160	1,515	1,054
Newhalen R.	0	0	0	25	0	22	0	0	9
L Talarik Cr	0 ^b	0 ^b	0 ^b	0 ^b	0	0	0	0	0
Lake Clark	0	0	0 ^b	0	0	0	0	0	0
Lake Iliamna	34	54	0	50	55	11	17	0	27
Kulik R.							0	0	0
Tazimina R.							0	0	0
Moraine Cr.							0	0	0
Other	128	149	124	338	31	142	57	173	148
Subtotal	7,424	14,168	7,397	6,739	4,153	4,286	4,291	4,737	4,841
Central									
Nushagak	1,780 ^c	1,371 ^c	2,383	2,807	1,594	3,586	3,688	4,815	3,298
Mulchatna	3,534	1,860	403	754	1,409 ^c	1,894	813	965	1,167
Wood River L.	0	0	557	104	160	173	80	97	123
Tikchik L.	0 ^b	27 ^b	31	52	80	71	178	101	96
Koktuli R.							76	18	19
Other	350	191	62	598	137	263	39	106	229
Subtotal	5,664	3,449	3,436	4,315	3,380	5,987	4,874	6,102	4,932
Western									
Togiak	618 ^c	338 ^c	0 ^b	234	445 ^c	284	271	225	292
Goodnews	0 ^b	125 ^b	91 ^b	68	27 ^b	26	23	81	45
Kanektok	844 ^c	375 ^c	1,910	884	503	316	656	1,006	673
Other	0		91	37	0	0	0	0	7
Subtotal	1,462	838	2,092	1,223	975	626	950	1,312	1,017
Northwestern									
Aniak	49 ^b	49 ^b	164 ^b	738	285	214	172	300	342
Kwethluk							31	0	6
Other	0	118	146	201	82	187	110	200	156
Subtotal	49	167	310	939	367	401	313	500	504
Total	14,599	18,622	13,235	13,216	8,875	11,300	10,428	12,651	11,294

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

^c Estimates from intensive onsite creel survey.

ALAGNAK RIVER

Fishery Description

The chinook salmon fishery in the Alagnak River occurs in the lower 12 miles of the river and peaks in mid to late July, roughly 2 weeks later than other chinook salmon fisheries in the area (Dunaway 1994). Chinook salmon returning to the Alagnak are typically larger than those found in other systems. Effort is primarily a guided (83%), nonresident venture. Most anglers either fly in with float equipped aircraft for 1-day trips, or base out of one of the several lodges located along the river. Retention rates average approximately 20%, typical of most of the area's chinook fisheries.

Historical Performance

Chinook salmon harvest in the Alagnak River sport fishery has generally increased (Table 4). The average harvest from 1989 to 1993 was 1,054 fish with a high of 1,969 being harvested in 1987, and a low of 474 being harvested in 1990.

The bag and possession limits for chinook salmon in the Alagnak River were dropped in 1987 from 5 per day and in possession, 2 over 28 inches in length, to 3 fish, of which only 2 may be greater than 28 inches in length; terminal tackle is restricted to single-hook artificial lures only.

Management

Sport harvests and effort are estimated through the statewide harvest survey and reported by Mills (1979-1994). Commercial and subsistence harvests are monitored by the Division of Commercial Fisheries Management and Development and are reported in their Annual Management Report series (ADF&G 1994b). Sport Fish Division has conducted significant monitoring and stock assessment projects on the Alagnak River in the recent past (Brookover 1989a, Dunaway 1990a and 1994).

A chinook salmon escapement goal has not been established for Alagnak River stocks. Escapement of chinook salmon in the Alagnak drainage has been indexed by the use of fixed-wing aerial surveys each year since 1970, with the exception of 1978 and 1979 (Table 5). Unexpanded counts of chinook salmon, called index counts, average 3,735 fish (1970 to 1993). Escapements for 3 of the last 6 years have been below the long-term average, however, the 1993 and 1994 escapement indices are the largest documented for this system (Table 5).

Management concerns for chinook stocks of the Alagnak drainage center on the inability to estimate exploitation rates. Allocation of commercial catches from the Naknek/Kvichak district to the river of origin are not possible, and the lack of inseason assessment of escapement makes it impossible to effectively manage this stock. Run timing of chinook stocks to the Alagnak coincide with peak periods of commercial sockeye salmon fishing in the Naknek/Kvichak district. With sockeye runs expected to be sufficient to allow for liberal fishing schedules in 1995, the potential for substantial incidental harvest of the Alagnak chinook stocks exists.

Bag and possession limits for Alagnak chinook salmon are currently 3 per day, 2 of which may be over 28 inches (ADF&G 1994a).

1994 Season

The 1994 chinook salmon return was the product of escapements observed in 1987 through 1990. Two of the parent year escapements (1988 and 1989) were above average and two were below.

Table 5.-Unexpanded escapement counts for chinook salmon in the Alagnak River, 1970 to 1994.

Year	Index
1970	5,250
71	1,420
72	2,256
73	824
74	1,596
75	6,620
76	7,593
77	3,634
78	
79	
1980	2,930
81	2,430
82	3,400
83	2,980
84	6,090
85	3,920
86	3,090
87	2,420
88	4,600
89	3,650
1990	1,720
91	2,531
92	3,042
93	10,170
All Years Average	3,735
1994	8,480

Since parental escapements for the 5 and 6 year-old components of the run appeared adequate, we anticipated a better than average return in 1994. Fishery performance inseason and post season surveys of the spawning grounds indicated our forecast was correct. Excellent fishing was reported during the last 2 weeks of July. The estimated escapement index of 8,480 (Table 5) is the second largest reported for the system since 1970. Big fish, predominantly 6 years of age, were abundant, and the 5-year-old component was strong as well.

The Alagnak River drainage is managed as a single-hook artificial lure only area. The current definition of artificial lure as presented in the regulation book is not clear regarding the use of scents. The use of scents on artificial lures has raised questions among those who participate in this fishery as to what the intent of this regulation is. Success rates in the fishery are reported to be greater with the use of scents. The Alaska Board of Fisheries is scheduled to address the definition of artificial lures at its statewide meeting in March. It is anticipated that the legality of the use of scents will be addressed at that time.

Management Objectives

Explicit management objectives have not yet been developed for this fishery. Aerial survey data exist to develop a goal and it is likely that a biological escapement goal (BEG) will be developed for this fishery within the next several years.

1994 Outlook

The 1995 return will be the product of escapements observed between 1988 through 1991. Two of the parental escapements were above average and two were below. Of the years of low escapement, only 1990 was considered to be poor (1,720 fish). It appears that the spawning stock is sufficient to provide a normal sport fishery in 1995. We anticipate a good showing of large fish this year since the 1988 and 1989 escapements were strong. The forecasted return of sockeye to the Kvichak River is 25 million. The commercial fishery will be managed to allow a range of escapement of 7 to 10 million spawners. Management for the high end of the range will result in more chinook salmon entering the Alagnak River.

Sport fishing effort on the lower Alagnak River in 1992 and 1993 was estimated to be higher than ever previously reported. Observations in 1994 indicated that effort was similar to that reported the previous 2 years. It is anticipated that effort in 1995 will again be high.

NAKNEK RIVER

Fishery Description

The Naknek River chinook salmon sport fishery commences May 1 and continues through July 31 when it closes by regulation to protect spawning fish. The peak 3 weeks are from June 22 to July 14. Effort is concentrated in a 12-mile stretch of the Naknek River adjacent to the community of King Salmon (Figure 5). This fishery is the most popular sport fishery in the area, and accounts for over 30% of all the chinook salmon harvested by sport fishermen in the SWMA. This fishery can be characterized as one that has a significant amount of unguided effort, reasonably good catch rates, and a high retention rate. In 1991, for example, 76% of the fishermen interviewed were unguided, and of the estimated catch of 3,617 chinook salmon, 3,115 or 86% were kept (Coggins 1992).

Historical Performance

A period of significantly increasing sport effort resulted in increased harvests of chinook salmon from 1977 to 1987 (Table 6). Since 1988, harvest of chinook salmon by the recreational fishery has declined. For the period 1989 to 1993, sport harvest of chinook salmon has averaged 3,096 fish. Distribution of the harvest between user groups has remained relatively stable over the last 22 years. During the recent 5 years, 32% of the harvest has been taken by sport fishermen, and the remainder of the harvest was split between commercial (57%) and subsistence (11%) users (Table 6).

Management

Sport harvests and effort are estimated through the statewide harvest survey and reported by Mills (1979-1994). Commercial and subsistence harvests are monitored by the Division of Commercial Fisheries Management and Development and are reported in their Annual Management Report series (ADF&G 1994b). Sport Fish division has conducted significant monitoring and stock assessment projects in the recent past (Coggins 1992, Coggins and Bingham 1993, Dunaway and Bingham 1991, Minard 1987a and 1989a, Minard and Brookover 1988a). Commercial, subsistence, and sport harvest data along with escapement information are reported under one cover in ADF&G 1994d.

Since 1986 the sport fishery has been managed to achieve a 5,000 chinook salmon index on the spawning grounds, the average escapement observed since 1970 (Table 6). Escapement of chinook salmon is estimated by fixed-wing aerial surveys of the four primary spawning areas (Paul's Creek, King Salmon Creek, mainstem of the Naknek River, and Big Creek) during the presumed peak of spawning. Aerial counts are left unexpanded and are considered minimum estimates of escapement. Results of the escapement surveys are presented in Table 7. The mainstem of the Naknek River, along with Big Creek, comprises 88% of the observed escapement. Escapements have generally been within biological limits, with the exception of the trends observed in the smaller systems of Paul's Creek and King Salmon Creek.

Concern over low escapements and increasing sport harvest prompted the Alaska Board of Fisheries in 1987 to adopt a regulation package addressing Naknek River chinook salmon. The key elements of that package included:

- establishing a season for chinook salmon (May 1 to July 31),
- artificial-lure-only designation, and
- reduction in bag and possession limits.

Bag and possession limits for Naknek chinook salmon are currently 3 per day, 1 of which may be over 28 inches (ADF&G 1994a).

Management Objectives

The Naknek River chinook salmon sport fishery is managed for a biological escapement goal (BEG) of 5,000 spawners indexed by aerial survey. While managing for the BEG, consideration is also given to maintaining the historical distribution of spawners within the four major spawning areas.

Table 6.-Chinook salmon commercial, subsistence, and sport harvest plus escapement for the Naknek River fishery, 1970-1994.

Year	Harvest				Escapement Index ^b
	Commercial ^a	Subsistence	Sport	Total	
1970	19,037	300	2,730	22,067	4,145
1971	10,254	200	2,417	12,871	2,885
1972	2,262	400	1,668	4,330	2,791
1973	951	600	1,000	2,551	2,536
1974	480	1,000	1,700	3,180	
1975	964	700	427	2,091	3,452
1976	4,064	900	800	5,764	7,131
1977	4,373	1,300	1,005	6,678	
1978	6,930	1,200	2,406	10,536	
1979	10,415	1,200	2,669	14,284	
1980	7,517	1,500	2,729	11,746	
1981	11,048	1,000	2,581	14,629	4,271
1982	12,425	1,100	3,264	16,789	8,610
1983	8,955	1,000	3,545	13,500	7,830
1984	8,972	900	4,524	14,396	4,995
1985	5,697	1,179	5,038	11,914	
1986	3,188	1,295	6,462	10,945	3,917
1987	5,175	1,289	11,419	17,883	4,450
1988	6,538	1,057	5,380	12,975	11,730
1989	6,611	970	3,879	11,460	2,710
1990	5,068	985	3,250	9,303	7,000
1991	3,584	1,009	3,115	7,708	4,391
1992	5,724	1,039	2,633	9,396	2,691
1993	7,088	1,361	2,603	11,052	8,016
All Year Average	6,555	979	3,219	10,752	5,031
Percent	61%	9%	30%		
1989-93 5 Year Average	5,615	1,073	3,096	9,784	4,962
Percent	57%	11%	32%		
1994 ^c Average	6,127	1,660	3,000	10,787	9,678
Percent	57%	15%	28%		

^a Naknek/Kvichak district harvests likely consisting of Naknek, Alagnak, and Kvichak River stocks. The above reported harvests of Naknek River stocks are therefore considered maximums.

^b Actual raw count made from fixed-wing aerial surveys.

^c 1994 estimates are preliminary.

Table 7.-Unexpanded aerial escapement counts for chinook salmon in the Naknek River and drainage, 1970-1994.

Data Source ^a	Year	Mainstream Naknek	Paul's Creek	King Salmon Creek	Big Creek	Total
A	1970	3,060		260	825	4,145
A	1971	1,639	52	704	490	2,885
A	1972	351	156	1,224	1,060	2,791
A	1973	1,315		115	1,106	2,536
A	1974		91	495	860	
A	1975	2,250	144	279	779	3,452
A	1976	5,950	31	180	970	7,131
A	1977	4,830		1,860		
A	1978					
A	1979					
A	1980	300	17		30	
A	1981	2,890		591	790	4,271
A	1982	5,360	340	980	1,930	8,610
A	1983	2,860	290	460	4,220	7,830
A	1984	790	400	385	3,420	4,995
B	1985	590				
C	1986	2,200	73	102	1,542	3,917
C	1987	2,800	7	290	1,353	4,450
C	1988	7,380	150	600	3,600	11,730
C	1989	1,700	50	100	860	2,710
C	1990	4,500	150	350	2,000	7,000
C	1991	1,655	121	275	2,340	4,391
C	1992	1,550	88	158	895	2,691
C	1993	5,520	86	700	1,710	8,016
<hr/>						
	All Year Average	2,833	132	505	1,539	5,009
	Percent	57%	3%	10%	31%	
C	1994	5,970	203	974	2,531	9,678
	Percent	62%	2%	10%	26%	

^a Data sources:

- A Russell, R. B. 1985 summary of historical escapement data for king, chum, pink, and coho salmon in the Naknek/Kvichak, Egegik, and Ugashik drainages, 1926-1984. ADF&G Bristol Bay Data Report No. 85-4.
- B ADF&G. 1986. 1985 Bristol Bay annual management report. Division of Commercial Fisheries.
- C ADF&G, Divisions of Commercial and Sport Fish aerial surveys, 1986 through 1993.

1994 Season

The 1994 chinook salmon return was the product of escapements observed in 1987 through 1990. Three of the parent year escapements were above average and resulted in an above average return in 1994. The 1988 escapement, a record of 11,730 spawners, produced a strong 6-year component this year. The 5-year component was reported to be weaker than normal, however the abundance of jacks indicated the 4-year return, a product of a 7,000 fish escapement in 1990, was stronger than normal.

No formal estimate of harvest is available for the 1994 sport fishery. Observations inseason indicate sport harvests were likely average (3,000 fish). Commercial catches were about average for the fishery and totaled 6,127, slightly above the previous 5-year average of 5,369 fish (Table 6). Subsistence catches were estimated to be up from past years, accounting for an additional 1,660 fish.

The escapement index of 9,678 chinook salmon was well above that observed in recent years (Table 7). Escapement in all four primary escapement areas was above average.

Continued concern for the low observed escapement in Paul's and King Salmon creeks will result in the issuance of an emergency order closing the mouths of these streams again in 1995. Sport Fish Division staff will be submitting a regulation proposal to the Board of Fish that addresses these closures during its winter meeting scheduled for January 1995.

1995 Outlook

The 1995 chinook salmon return will be the product of escapements observed in 1988 through 1991. Two of the four parent year escapements are above average suggesting an average to above average return. The 6-year-old component of the return will be produced by the 1989 escapement of only 2,710 spawners, and is not expected to be very strong in 1995. However a strong 5-year component is expected given the large parental escapement of 7,000 fish in 1990. The 4-year component is expected to be average, a product of a 4,391 fish escapement in 1991.

Continued concern for the low observed escapement in Paul's and King Salmon creeks will result in the issuance of an emergency order closing the mouths of these streams again in 1995. Sport Fish Division staff authored a regulation proposal addressing closures at the mouths of King Salmon and Paul's Creeks. The proposal, which will be heard by the Board of Fisheries during its January 1995 meeting, has the support of the local Fish and Game Advisory Committee. If the Board adopts the proposal there would be no need for issuance of a preseason emergency order closing these waters since the closure would be included in the regulation book. The Board of Fisheries is also expected to take action on a proposal that would allow commercial fishing in the Naknek River more frequently. To what extent that action may impact the chinook salmon inriver return is unknown.

Given the anticipated return for 1995, and the likely actions of the Board of Fisheries, no inseason adjustments to the fishery are anticipated.

NUSHAGAK AND MULCHATNA RIVERS

Fishery Description

The Nushagak and Mulchatna rivers support significant recreational, commercial, and subsistence chinook salmon fisheries. Within the drainage, three areas of concentrated sport effort exist: the lower 12 miles of the Nushagak River near the village of Portage Creek, the

middle section of the Nushagak River in the vicinity of the village of Ekwok, and the mid section of the Mulchatna River between the Stuyahok and Koktuli rivers (Figure 5). Although sport fishing for chinook salmon does occur in some of the tributaries of the drainage, the overall impact of that activity in terms of harvest is considered slight.

Historical Performance

Nushagak/Mulchatna chinook salmon stocks averaged 135,000 total return during the period 1966 to 1977. During the next 7 years (1978 to 1983), returns averaged an unprecedented 293,500 fish. Since 1985, returns have declined to normal levels of production, averaging approximately 125,000 fish. Chinook salmon stocks in the Nushagak/Mulchatna drainage are considered to be stable at average, or slightly above average, levels.

Harvest of chinook salmon by the recreational fishery has averaged 2,686 fish since 1977, and for the period 1989 to 1993 averaged 4,480 fish (Table 8). Sport harvest first exceeded 5,000 fish in 1986 and then again in 1991, 1993 and likely in 1994. Distribution of the harvest between user groups, as shown in Table 8, indicated the majority (86%) of the kill has historically been taken by commercial fishermen, with an additional 11% taken by subsistence fishermen, and 3% by sport fishermen. By comparison, the recent 5-year average suggests a redistribution of the harvest has occurred, with subsistence fishermen taking 26% (an increase of 15%) and the sport harvest up 6% to a total of 9% (Table 8).

Management

Sport harvest and effort are estimated through the statewide harvest survey and reported by Mills (1979-1994). Commercial and subsistence harvests are monitored by the Division of Commercial Fisheries Management and Development and are reported in their Annual Management Report series (ADF&G 1994b). Sport Fish division has conducted significant monitoring and stock assessment projects in the recent past (Dunaway et al. 1991, Dunaway and Bingham 1992a, Dunaway *In prep a*).

Under the Board of Fisheries adopted *Nushagak and Mulchatna Chinook Salmon Management Plan* (5 AAC 06.361, adopted 1/92) chinook salmon are managed to attain an inriver abundance of 75,000 fish which provides 65,000 spawning fish, a reasonable opportunity to harvest chinook salmon in the inriver subsistence fishery, and a 5,000 fish allocation to the sport fishery. If the inriver abundance exceeds 75,000, but is less than 95,000, then the plan allows for a sport harvest of 6,000 fish.

Chinook salmon escapement into the Nushagak and Mulchatna rivers was first estimated by aerial survey from 1966 through 1986. Starting in 1987, side scan sonar was used to estimate chinook salmon escapement into the Nushagak drainage. The sonar is considered a marked improvement over the aerial survey program since it gives real-time estimates of escapement on which management decisions can be based. In the recent 5 years (1989-1993), escapements have averaged 85,454 chinook (Table 8), very close to the desired 75,000 inriver run goal.

Declining stock abundance and increasing sport effort prompted restrictive actions on the inshore commercial and sport fisheries. A chronology of significant regulation changes follows:

- 1965. Bristol Bay bag and possession limit was 10 salmon (all species combined) daily.

Table 8.-Chinook salmon commercial, subsistence, and sport harvest plus escapement for the Nushagak drainage, 1966-1994.

Year	Harvest					Total	Escapement	Total Run
	Commercial ^a	Subsistence ^b	Sport ^c					
			Nush	Mul	Total			
1966	58,184	3,700				61,884	40,000	101,884
1967	96,240	3,700				99,940	65,000	164,940
1968	78,201	6,600				84,801	70,000	154,801
1969	80,803	7,100				87,903	35,000	122,903
1970	87,547	6,300				93,847	50,000	143,847
1971	82,769	4,400				87,169	40,000	127,169
1972	46,045	4,000				50,045	25,000	75,045
1973	30,470	6,600				37,070	35,000	72,070
1974	32,053	7,900				39,953	70,000	109,953
1975	21,454	7,100				28,554	70,000	98,554
1976	60,684	6,900				67,584	100,000	167,584
1977	85,074	5,200	402	521	923	91,197	65,000	156,197
1978	118,548	6,600	151	291	442	125,590	130,000	255,590
1979	157,321	8,900	312	342	654	166,875	95,000	261,875
1980	64,958	11,800	611	146	757	77,515	141,000	218,515
1981	193,461	11,500	929	291	1,220	206,181	150,000	356,181
1982	195,287	12,100	1,436	367	1,803	209,190	147,000	356,190
1983	137,123	11,800	1,615	388	2,003	150,926	161,730	312,656
1984	61,378	9,800	1,534	786	2,320	73,498	80,940	154,438
1985	67,783	7,900	1,517	292	1,809	77,492	115,720	193,212
1986	65,783	12,600	1,780	3,534	5,314	83,697	43,434	127,131
1987	45,983	12,200	1,371	1,860	3,231	61,414	84,309	145,723
1988	16,648	10,079	2,383	403	2,786	29,513	56,905	86,418
1989	17,637	8,122	2,807	754	3,561	29,320	78,302	107,622
1990	14,812	12,407	1,594	1,409	3,003	30,222	63,955	94,177
1991	19,718	13,627	3,586	1,894	5,480	38,825	104,351	143,176
1992	47,897	13,588	3,688	889	4,577	66,062	82,848	148,910
1993	62,294	17,709	4,815	965	5,780	85,783	97,812	183,595
All Years								
Average	73,077	8,937	1,796	890	2,686	84,700	82,082	166,782
Percent	86%	11%			3%			
1989-93								
5 Yr Avg	32,472	13,091	3,298	1,182	4,480	50,042	85,454	135,496
Percent	65%	26%			9%			
1994								
	118,643	14,868			6,000	139,511	95,954	235,465
Percent	85%	11%			4%			

^a Commercial catches from 1993-1994 are preliminary.

^b Subsistence harvest estimate for 1994 is preliminary.

^c Sport harvest estimate for 1994 is preliminary.

- 1972. Bag limits for the Bristol Bay area were dropped to 5 chinook salmon per day and in possession, of which only 2 could be over 26 inches in length.
- 1987. Bag and possession limits dropped to 3 per day, only 2 over 28 inches in length.
- 1990. Sport season established from January 1 to July 25. Spawning season closure adopted to afford drainage-wide protection to spawning chinook salmon stocks.
- 1992. Gear restricted to single-hook artificial lures for the portion of the Mulchatna River between the Koktuli and Stuyahok rivers.
- 1992. *Nushagak and Mulchatna Chinook Salmon Management Plan* (5 AAC 06.361) is adopted capping the sport harvest at 5,000 fish.

Bag and possession limits for Nushagak chinook salmon are currently 3 per day, 2 of which may be over 28 inches (ADF&G 1994a).

Uplands in the vicinity of Portage Creek are privately owned. A recreational land management program is administered by the Land Department of Choggiung Limited, a Native-owned corporation. Since its inception in the mid-1980s, this program has grown into a sound and profitable venture for the corporation. Private and commercial land use permits sold by the corporation allow anglers access to desirable camp sites while engaged in recreational fishing. Sales and estimates of camper nights are useful indicators of sport effort. Overnight use has risen from 1,365 camper nights in 1989 to 3,361 camper nights in 1994 (LeClair 1994).

Management Objectives

The Nushagak/Mulchatna chinook salmon fishery is managed in accordance with the *Nushagak and Mulchatna Chinook Salmon Management Plan*. Specific objectives are to: (1) manage the commercial fishery to ensure an inriver return of 75,000 fish, (2) manage the inriver fisheries for a biological escapement goal of 65,000 spawners, and (3) maintain a sport harvest less than 5,000 fish.

1994 Season

The 1994 Nushagak district chinook salmon forecast was 151,000. The actual return of chinook salmon to the Nushagak drainage in 1994 was approximately 235,500 fish, nearly 60% greater than forecast and the largest return documented since 1983 (Table 8). Over 118,600 chinook salmon were taken in the commercial fishery, the best since 1983. The subsistence harvest of 14,900 chinook salmon is the second largest recorded. Roughly 6,000 chinook salmon are thought to have been taken by sport fishermen during the season, but accurate estimates of sport effort, catch, and harvest will not be available until fall 1995. Fishery surveys of the chinook salmon sport fishery in the Lower Nushagak and middle section of the Mulchatna were conducted in 1994. Results will be completely reported by Dunaway *In prep* a.

Commercial fishing time was allowed early based on the strength of the forecast. The first period on June 8 totaled 9,500 chinook, approximately 2,000 fish greater than the previous high for the date. A second period was permitted on June 17 after significant movement of chinook salmon were observed hitting the subsistence nets on the beaches near Dillingham. The period on June 17 resulted in a harvest of 51,000 chinook salmon, one of the largest harvests documented in the Nushagak district for a single day. Commercial fishing time was allowed on

June 23, 24, 26, 27 and 28, in an effort to harvest surplus chinook salmon. After the second period, prices paid in the commercial fishery dropped as did the interest by the commercial fleet. In the periods from June 26 to June 28 less than half the registered fleet participated in the open periods.

The first significant push of chinook salmon into the river was documented on June 16 and totaled 6,600 fish for the day. Daily passage on June 17 was 13,555, and was the peak daily for the season. Passage by the sonar continued to remain in the low to mid thousands until mid July. The inriver goal of 75,000 chinook salmon past the sonar was realized on July 5.

Inseason observations suggest that sport effort targeting chinook salmon increased substantially throughout the drainage, particularly in the vicinity of Portage Creek. Overnight use of Choggiung land is reported to have set a new record, totaling 3,361 camper nights, roughly equivalent to the 3,282 reported in 1993, but nearly twice that reported in 1992 (LeClair 1993). Strong returns to the Nushagak coupled with weak production in some of the other chinook fisheries within the state likely drew anglers to the Nushagak from other areas.

The increased effort and strong run is presumed to have resulted in a greater than average sport harvest. Preliminary estimates, based on past performance, place the sport harvest for the drainage over 6,000 fish in 1994.

Escapement was estimated to be 95,954 chinook salmon; nearly 21,000 fish more than the inriver return goal of 75,000. Allowable sport harvest under the management plan was 6,000 fish. It is likely that 9,000 (3,000 subsistence and 6,000 sport) chinook salmon were harvested upriver of the sonar, leaving nearly 86,000 fish to spawn.

1995 Outlook

The forecasted chinook salmon return to the Nushagak/Mulchatna drainage is 177,000 fish. If the run materializes as forecast, it will be 30% greater than the average return for the previous 5 years. Age composition of the return is expected to be predominantly age 5 (31%) and age 6 (52%). Age 4 (12%) and age 7 (4%) will make up most of the remaining return. Based on the strength of the forecast we are anticipating an excellent return of large chinook salmon to this system in 1994.

Given the strength of the forecasted 1994 return, it is likely the department will be able to meet the 75,000 fish inriver goal. Normal sport and subsistence fisheries will not jeopardize the department's ability to manage for sustained yield. Chinook salmon surplus to the inriver run goal of 75,000 fish will likely be harvested by the subsistence fishery occurring in Nushagak Bay and at Lewis Point, and by the commercial fishery. Since the inriver run goal is likely to be met this season, no management actions are anticipated for the 1994 Nushagak River chinook salmon sport fishery; seasons, bag limits and methods and means as published in the regulation booklet will apply.

KANEKTOK RIVER

Fishery Description

The chinook salmon fishery on the Kanektok River occurs in the lower 12 miles of the river in the vicinity of the village of Quinhagak (Figure 5). The fishery peaks in late June and early July, slightly earlier than the fisheries further to the east. Because of its relatively small size, clear

water, and consistent returns of chinook salmon, the Kanektok River is considered one of the finest chinook salmon sport fisheries in western Alaska.

Historical Performance

Harvest estimates for the Kanektok River sport fishery date back to 1983 and range from a high of 1,910 fish in 1988 to a low of 316 fish in 1991. The average harvest for the recent 5 years (1989 to 1993) is 673 fish (Table 9). Distribution of the harvest between user groups has been relatively unchanged over the past 30 years. The commercial fishery accounts for over 80% of the harvest, with the subsistence fishery taking an additional 14%, and the recreational fishery harvesting 5% (Table 9). The sport fishery is characterized by a relatively low retention rate (43% in 1986, 20% in 1987, 25% in 1991), a high proportion of guided anglers (60% or more), and a low incidence of bait as terminal tackle (Minard 1987b, Minard and Brookover 1988b, Dunaway and Bingham 1992b, Dunaway *In prep b*).

Management

Sport harvest and effort are estimated through the statewide harvest survey and reported by Mills (1979-1994). Commercial and subsistence harvests are monitored by the Division of Commercial Fisheries Management and Development and are reported in their Annual Management Report series (ADF&G 1994c). Sport Fish division has conducted significant monitoring and stock assessment projects in the recent past (Minard 1987b, Minard and Brookover 1988b, Dunaway and Bingham 1992b, Dunaway *In prep b*).

Escapement of chinook salmon into the Kanektok River is estimated by aerial survey from fixed-wing aircraft. Counts are left unexpanded and represent minimum escapement estimates. Since 1960, the escapement goal of 5,800 chinook salmon has been reached or exceeded in most years. However, in 4 of the last 6 years, the department has failed to manage harvests such that the escapement goal was reached. The recent series of poor escapements has been accompanied with average or above average commercial catches. Low escapement is therefore a function of overfishing rather than a function of poor total returns.

A chronology of significant regulation changes follows:

- 1965. Kuskokwim drainage chinook salmon limit was set at 15 per day, 30 in possession.
- 1987. Bag and possession limits for chinook salmon were dropped to 5 chinook salmon with no size limit.
- 1989. Bag and possession limits were again dropped to the current limit of 3 chinook per day, of which only 2 can be 28 inches or larger.

Bag and possession limits for Kanektok chinook salmon are currently 3 per day, 2 of which may be over 28 inches (ADF&G 1994a).

Management Objectives

The Kanektok River chinook salmon fishery is managed to achieve escapement of 5,500 chinook salmon indexed by aerial survey.

Table 9.-Chinook salmon commercial, subsistence, and sport harvest plus escapement for the Kanektok River, 1960 to 1994.

Year	Harvest			Total	Escapement ^d Index	Total ^e Run
	Commercial ^a	Subsistence ^b	Sport ^c			
1960	0			0	6,047	6,047
1961	4,328			4,328		4,328
1962	5,526			5,526	935	6,461
1963	6,555			6,555		6,555
1964	4,081			4,081		4,081
1965	2,976			2,976		2,976
1966	278			278	3,718	3,996
1967	0	1,349		1,349		1,349
1968	8,879	2,756		11,635	4,170	15,805
1969	16,802			16,802		16,802
1970	18,269			18,269	4,112	22,381
1971	4,185			4,185		4,185
1972	15,880			15,880		15,880
1973	14,993			14,993	814	15,807
1974	8,704			8,704		8,704
1975	3,928			3,928		3,928
1976	14,110			14,110		14,110
1977	19,090	2,012		21,102	5,787	26,889
1978	12,335	2,328		14,663	19,180	33,843
1979	11,144	1,420		12,564		12,564
1980	10,387	1,940		12,327	6,172	18,499
1981	24,524	2,562		27,086	15,900	42,986
1982	22,106	2,402		24,508	8,142	32,650
1983	46,385	2,542	1,511	50,438	8,890	59,328
1984	33,652	3,109	922	37,683	12,182	49,865
1985	30,401	2,341	667	33,409	13,465	46,874
1986	22,835	2,682	844	26,361	3,643	30,004
1987	26,022	2,663	375	29,060	4,223	33,283
1988	13,872	2,508	1,910	18,290	11,140	29,430
1989	20,820	3,048	884	24,752	7,914	32,666
1990	27,644	5,050	503	33,197	2,563	35,760
1991	9,480	3,536	316	13,332	2,100	15,432
1992	17,197	2,545	656	20,398	3,856	24,254
1993	15,784	2,726	1,006	19,516	4,670	24,186
All Years						
Average	14,505	2,606	872	17,984	6,801	24,785
Percent	81%	14%	5%			
1989 to 1993						
5 Year Avg	18,185	3,381	673	22,239	4,221	26,460
Percent	82%	15%	3%			
1994	8,564	3,000	600	12,164	7,386	19,550
Percent	70%	25%	5%			

^a 1990-1994 estimates are preliminary.

^b 1994 estimate is preliminary.

^c 1994 estimate is preliminary.

^d Unexpanded raw counts made from fixed-wing aircraft (July 20 to August 5).

^e Considered a minimum number since escapement estimates are unexpanded.

1994 Season

The 1994 return to the Kanektok River totaled 19,550 chinook salmon, below average for this system (Table 9). Commercial fishing periods on June 15 and June 20 resulted in record low harvests for those dates indicating the 1994 return to the Kanektok River was weaker than expected. On June 21 the department announced that bag and possession limits for chinook salmon would be reduced from 3 per day and in possession to 1 fish, no size limit. That action became effective June 23 and remained in effect through the remainder of the season.

Restrictions in the sport fishery, coupled with restrictions in the commercial fishery, were successful in keeping harvest within biological limits. The commercial harvest of 8,564 is well below the recent 5-year average harvest of 18,185 (Table 9). Subsistence harvests were believed to have been normal, totaling approximately 3,000 fish. Sport harvest is not known, but likely accounted for approximately 600 fish. Escapement, estimated to be 7,386, was the best recorded since 1989 and above the goal of 5,800.

An onsite survey of the sport fishery indicated that effort in the recreational fishery was approximately equal to that observed in the recent 3 years. Results of this study will be reported in a Sport Fish Division Fishery Data Series report.

1995 Outlook

The 1995 return will be the product of escapements observed in 1988 through 1991. Of the 4 years contributing to the 1995 return, escapements in 2 years (1990 and 1991) were below desired levels and in the other 2 (1988 and 1989) were well above desired levels (Table 9). A good showing of age 6 fish and an excellent showing of age 7 fish are expected based on parental run strength. Below average returns of age 4 and 5 fish are anticipated. Since only one of the primary age groups (5- and 6-year-olds) is expected to be strong, we anticipate an average or below average return in 1995. Based on parental escapement it may be necessary to restrict the sport fishery in 1995 to assure adequate escapement. Performance of the commercial fishery will be assessed to determine run strength as will the performance of the subsistence and sport fisheries. If adjustments to the sport fishery are warranted, we will attempt to implement them early enough such that continued sport fishing opportunity will be preserved throughout the season albeit at a reduced level.

TOGIK RIVER

Fishery Description

The Togiak River is one of three major river systems within the Togiak National Wildlife Refuge (Figure 5). The relatively small chinook salmon sport fishery on the Togiak River is concentrated along the lower 10 miles of the river and runs from mid-June through the month of July. The Togiak River historically supported the second largest chinook salmon run in Bristol Bay, but its remote location, refuge regulations on guides, recent declines in run strength, and a controversy between user groups have limited development of the fishery.

Historical Performance

Commercial harvests of Togiak River chinook salmon have averaged 20,354 fish for the period 1969 to 1993, but in the recent 5 years have averaged only 9,541 (Table 10). Subsistence harvests have remained relatively stable, averaging 622 fish since 1974, and 722 fish in the

Table 10.-Escapement and commercial, subsistence, and sport harvests of chinook salmon on the Togiak River, 1969-1994.

Year	Harvest				Escapement ^c	Total Run
	Commercial ^a	Subsistence ^b	Sport ^b	Total		
1969	20,092					
1970	28,618					
1971	26,105					
1972	17,099					
1973	9,225					
1974	9,284	1,200				
1975	7,206	800				
1976	28,513	500				
1977	33,827	400	62	34,289		
1978	53,460	300	35	53,795		
1979	27,744	200	78	28,022		
1980	10,858	900	34	11,792	8,045	19,837
1981	22,744	400			12,435	
1982	33,607	400	231	34,238	6,800	41,038
1983	35,669	700	535	36,904	10,975	47,879
1984	19,958	600	46	20,604	19,085	39,689
1985	33,110	600	925	34,635	12,010	46,645
1986	16,267	700	618	17,585		
1987	14,555	700	338	15,593	7,170	22,763
1988	13,205	429			6,390	
1989	9,049	551	234	9,834	6,640	16,474
1990	9,651	480	445	10,576	6,473	17,049
1991	6,472	470	284	7,226	8,380	15,606
1992	11,764	1,361	271	13,396	7,410	20,806
1993	10,769	749	225	11,743	10,210	21,953
<hr/>						
All Years						
Average	20,354	622	291	21,267	9,386	30,653
Percent	96%	3%	1%			
<hr/>						
1989 to 1993						
5 Year Avg	9,541	722	292	10,555	7,823	18,378
Percent	90%	7%	3%			
<hr/>						
1994	10,629	800	300	11,729	15,115	26,844
Percent	91%	7%	3%			

^a Commercial harvest estimates for 1991-1994 are preliminary.

^b Sport and subsistence estimates for 1994 are preliminary.

^c Estimated by aerial survey and expanded for missed fish.

recent 5 years (Table 10). Sport harvest of Togiak River chinook salmon was estimated to be less than 100 fish per year until the early 1980s, then ranged as high as 925 chinook salmon in 1985. During the last 5 years sport harvests have averaged less than 300 fish. Distribution of the harvest between user groups has remained stable over the history of the fishery. Commercial harvest accounts for over 90%, subsistence harvest about 7% and sport harvest about 3% of the total harvest. Total run estimates were first made in 1980, coincident with high abundance of western Alaska chinook stocks. Total run declined from the mid-1980s, dropping to almost half that previously observed. Given the performance of other chinook salmon fisheries in the area, this was likely a shift to more normal levels of production. In the recent 5 years, total runs have averaged 18,378 fish.

Management

Sport harvest and effort are estimated through the statewide harvest survey and reported by Mills (1979-1994). Commercial and subsistence harvests are monitored by the Division of Commercial Fisheries Management and Development and are reported in their Annual Management Report series (ADF&G 1994b). Sport Fish Division has conducted significant monitoring and stock assessment projects in the recent past (Minard and Lisac 1984, Dunaway 1990b).

Escapement of chinook salmon into the Togiak River has been estimated by aerial survey from fixed-wing aircraft since 1980. Aerial counts are expanded to account for missed fish and therefore represent total escapement estimates. The escapement goal of 10,000 chinook salmon has been reached or exceeded in 5 of the last 13 years (Table 10). From 1987 to 1992, the department managers failed to manage harvests such that the escapement goal was reached.

Bag and possession limits for Togiak chinook salmon are currently 3 per day, 2 of which may be over 28 inches (ADF&G 1994a).

Management Objectives

The Togiak River chinook salmon sport fishery is managed to achieve a biological escapement (BEG) of 10,000 chinook salmon estimated by expanded aerial survey counts.

1994 Season

Continued concern for the poor level of escapement observed in the Togiak River since 1987 prompted the department to impose restrictions on fishing time for the commercial fishery. During the last 2 weeks of June, commercial fishing in the Togiak section of the Togiak District was not allowed, and when the fishery reopened, the use of large mesh nets was prohibited. Both actions were intended to reduce commercial chinook salmon harvests, increase escapement, and yet still allow the prosecution of a normal sockeye salmon fishery in July. No inseason restrictions were placed on the sport fishery because of the minor biological effect of the sport fishery on the stock. The normal bag limit of 3 per day and in possession persisted throughout the season.

Restrictions on the commercial fishery, along with a stronger than average recent-year return, resulted in an escapement of 15,115 chinook salmon, the second largest ever documented. Escapement in 1994 marked the second time in 7 years that the desired goal was reached (Table 10). The 1994 commercial harvest was slightly above the recent 5-year average and totaled 10,629 chinook salmon, very similar to that observed in 1993. Sport fishing effort was not

notably different from recent years and a sport harvest of some 300 chinook salmon likely occurred. The total run of 26,844 is the best record since 1985.

1995 Outlook

Since 1989, the total return of chinook salmon has averaged 18,378 fish, and the 1994 return is expected to be similar. Parent escapements for all the major age classes were below the biological escapement requirement for optimum returns (average 7,059). Based on the parental escapements (1988-1991) a balanced return of both 5- and 6-year-old fish during the 1995 season is expected. Continued restrictions on the commercial fishery in June are expected, followed by normal fishing for sockeye. Sport harvests at this time do not jeopardize the department's ability to manage for sustained yield and do not pose a significant threat to the Togiak River chinook salmon stocks. No inseason management actions on the sport fishery are anticipated.

NORTHWESTERN CHINOOK SALMON FISHERIES

The Kuskokwim River and its tributaries host large runs of chinook salmon but the broad muddy waters of the main river and limited access to the tributaries within the management area attract few sport anglers. No estimates of sport harvest are available before 1983 and since 1984 most of the chinook salmon harvest has come from the Aniak River (Table 4). In recent years, roughly 2% to 5% of the SWMA chinook salmon harvest has come from the northwestern section.

In response to conservation concerns, bag limits for Kuskokwim River chinook salmon were reduced from 5 per day and in possession, no size limit to 1 per day and in possession, no size limit in 1988. It is apparent that chinook stocks have recovered sufficiently to allow normal subsistence and above average commercial fisheries to occur, therefore staff recommended to the Board of Fisheries that the bag and possession limits for these waters be returned to the normal level of 3 per day and in possession of which only 2 may be greater than 28 inches in length. In November of 1994, the Board adopted those recommended changes to the sport fishery.

SECTION IV: COHO SALMON FISHERIES

Coho, or silver, salmon is a very popular sport fish species to Southwest Alaska's recreational fishing industry. Coho salmon fisheries occur from August through September with some isolated pockets of fish available into October. Significant fisheries occur in the Naknek, Alagnak, Nushagak, Mulchatna, Togiak, and Kanektok rivers as well as a host of smaller, less popular waters (Figure 7).

Coho salmon account for approximately 30% of all the salmon harvested by sport fishermen in the SWMA. Harvest increased along with sport fishing effort from 1977 to 1989, increasing from 1,000 fish to 19,000 fish (Figure 8). Since 1989, the average harvest has been 9,668 fish areawide (Table 11). The 1993 harvest of 5,461 fish by sport fishermen represents less than 4% of all coho salmon harvested by all users in the area. Commercial catches took the greatest share at 88%, followed by 8% killed for subsistence purposes. The lack of escapement data on which to judge the health of the stocks or base reasonable escapement and harvest goals for all segments of the coho salmon fisheries has become a major concern. The declines observed in some of the area's runs may be the result of excessive harvests in previous years.

Most anglers pursue coho salmon with the assistance of a guide. Annual estimates of harvest indicate that despite the more liberal, 5 fish daily bag limit, coho salmon are harvested in approximately the same total numbers as chinook salmon. The mail survey also indicates that considerable numbers of coho salmon are caught and released.

The bag and possession limits for coho salmon are 5 salmon per day, no size limit; the same regionwide limit that has been in effect since 1972. Some coho salmon runs, particularly in the central and western sections, have declined in recent years, precipitating occasional closures or reductions in bag limits for the sport anglers. Except for rare instances, however, limitations on sportsmen have been of little consequence to the health of the runs which are more heavily impacted by commercial harvests.

NAKNEK RIVER

Fishery Description

In the Naknek River, the coho salmon sport fishery develops in late July and continues well into September. The peak period is normally from August 7 to August 21. Effort is concentrated along a 12-mile stretch of the Naknek River adjacent to the community of King Salmon, however, significant effort occurs above Rapids Camp as well. This fishery is the most popular coho salmon fishery in the area and provides significant recreational opportunity and economic benefit for the community of King Salmon.

Historical Performance

Harvests of coho salmon by the recreational fishery have averaged 2,827 fish during the recent 5 years (Table 12) and account for approximately 31% of all the sport caught coho taken in Southwest Alaska. Annual harvests of sport caught coho from the Naknek River have increased steadily since 1977, but showed a significant increase in 1988. Commercial catches of coho salmon have also increased substantially in recent years. The development of a Fall Fishing Cooperative, a local venture engineered by local commercial fishermen to ensure markets for

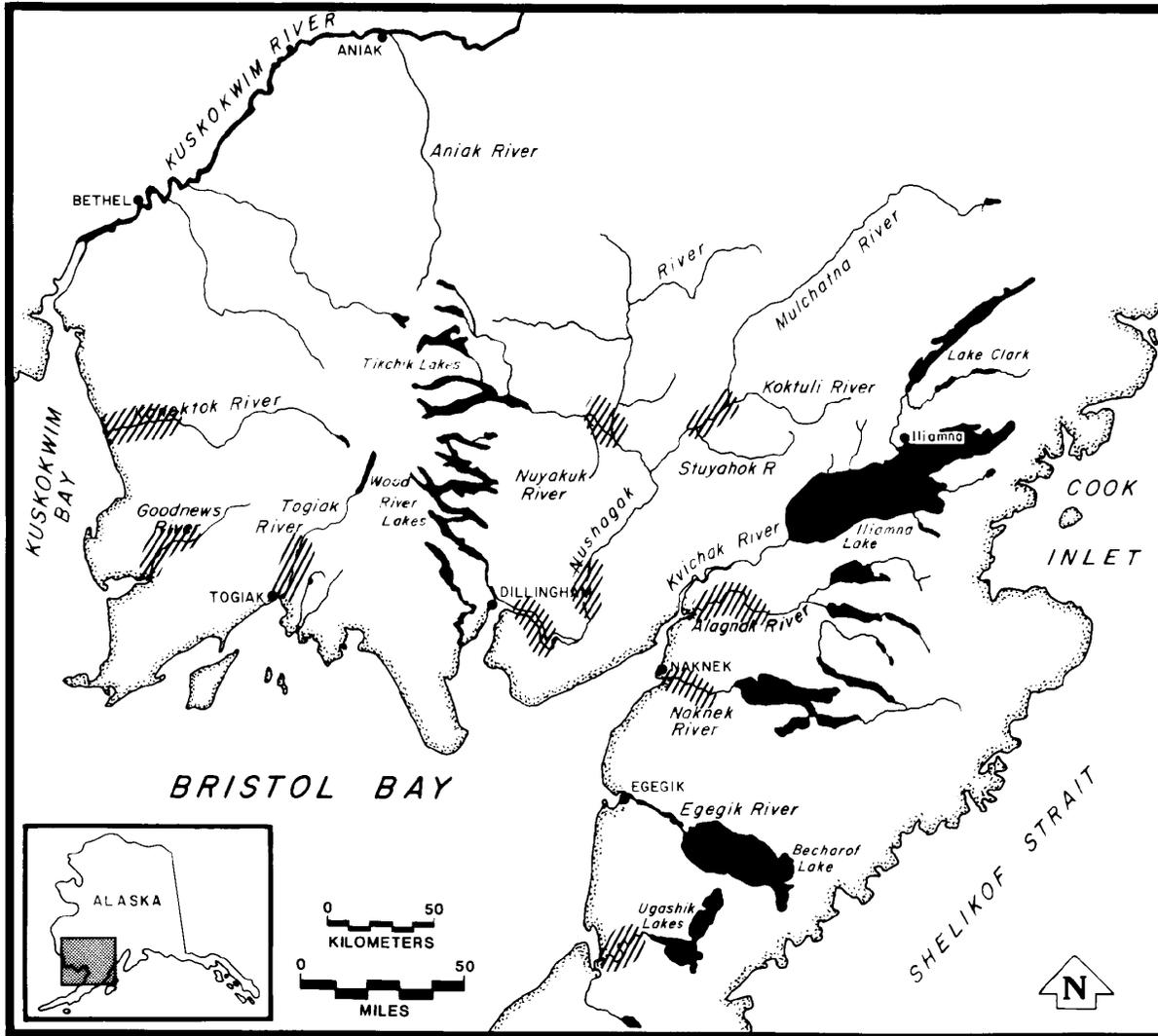


Figure 7.-Popular coho salmon sport fisheries in Southwest Alaska.

SPORT HARVEST OF COHO SALMON
SOUTHWEST ALASKA (1977-1993)

Harvest in Thousands

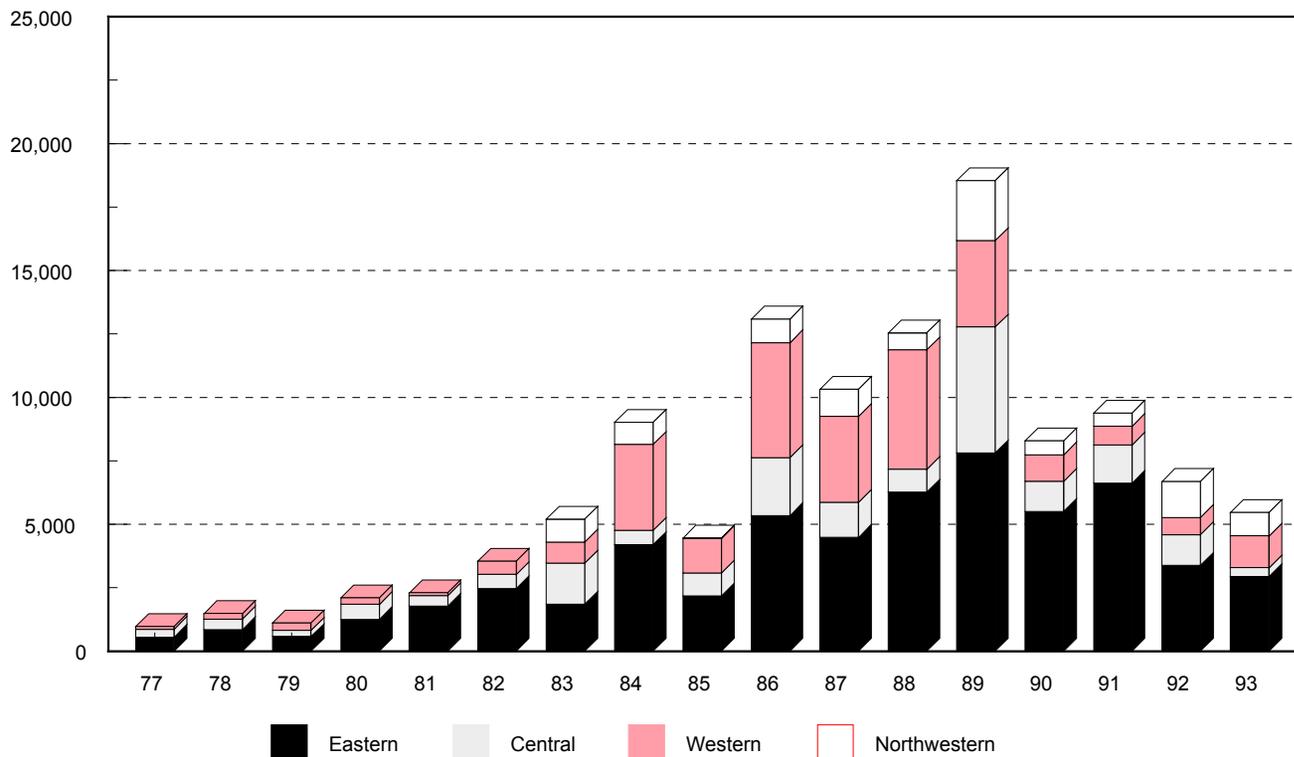


Figure 8.-Sport harvest of coho salmon from the eastern, central, western, and northwestern sections of the Southwest Alaska sport fish management area, 1977 to 1993.

Table 11.-Sport harvest of coho salmon from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	26	163	125	17	87	314	157	611	0 ^b
Egegik/Becharof	138	0	0	155	65	10	115	312 ^b	0 ^b
Naknek R.	297	646	300	818	1,156	1,676	1,385	2,332	1,281
Naknek L.	0	0	0	0	0	0	0	0	0 ^b
Bay of Islands							0	0	37
Brooks R.	0	0	0	0	0	0	0	62	37
Brooks L.									
American Cr.							0 ^b	0 ^b	0 ^b
King Salmon R.									
Kvichak R.	86	38	150	258	65	42	42	100	0
Copper R.	0	0	0	0	0	0	0	0 ^b	0 ^b
Alagnak R.					400	422	147	599	11
Newhalen R.	0	0	0	0	0	0	0	50	404
L Talarik Cr	5	0	0	0	0	0	0	75 ^b	0
Lake Clark	0	0	0	0	0	0	0	0	11
Lake Iliamna							0 ^b	0 ^b	212 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other							0	49	181
Subtotal	552	847	575	1,248	1,773	2,464	1,846	4,190	2,174
Central									
Nushagak	65	126	212	379	216	451	849	399	0
Mulchatna	90	113	0	129	173	52	524	37	130
Wood River L.	61	25	25	43	22	52	126	100	781
Tikchik L.	93	151	0	43	0	0	31	0	0
Koktuli R.									
Other					0	0	94	37	0
Subtotal	309	415	237	594	411	555	1,624	573	911
Western									
Togiak	114	214	300	258	119	524	294	1,295 ^c	342 ^c
Goodnews							168	195 ^b	386
Kanektok							367	1,895	622
Other							0	0	0
Subtotal	114	214	300	258	119	524	829	3,385	1,350
Northwestern									
Aniak							42 ^b	0 ^b	12 ^b
Kwethluk									
Other							850	857	12
Subtotal	0	0	0	0	0	0	892	857	24
Total	975	1,476	1,112	2,100	2,303	3,543	5,191	9,005	4,459

-continued-

Table 11.-Page 2 of 2.

Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	31 ^b	215	186 ^b	234	840	97	445	92	342
Egegik/Becharof	0 ^b	0 ^b	217 ^b	104	300	97	275	48	165
Naknek R.	1,942	2,187 ^c	4,065 ^c	4,801 ^c	2,179	4,475	1,579	1,034	2,814
Naknek L.	92	0	217 ^b	78	0	32	73	0	37
Bay of Islands	153 ^b	0	0 ^b	26	0	11	32	19	18
Brooks R.	46	215	0	52	200	65	24	36	75
Brooks L.					420	0	0	10	86
American Cr.	0 ^b	107 ^b	0 ^b	26	0	0 ^b	0	0	5
King Salmon R.							24	38	12
Kvichak R.	850	0	31	227	444	329	162	370	306
Copper R.	0 ^b	0 ^b	0 ^b	0	0	0	0	0	0
Alagnak R.	1,699	46	588 ^b	403	194	602	324	246	354
Newhalen R.	238	687	248	1,160	467	261	81	444	483
L Talarik Cr	0 ^b	0 ^b	93 ^b	0 ^b	0	0	0	19	4
Lake Clark	0	0	0 ^b	0	0	102	32	120	51
Lake Iliamna	204	962	62	302	57	114	0	93	113
Kulik R.							0	0	0
Tazimina R.							0	0	0
Moraine Cr.							0	0	0
Other	91	64	558	390	400	424	316	363	379
Subtotal	5,346	4,483	6,265	7,803	5,501	6,609	3,367	2,932	5,242
Central									
Nushagak	934	595	124	1,586	331	415	445	124	580
Mulchatna	496	0	371	364	95	437	275	53	245
Wood River L.	701	366	341	2,417	131	394	275	100	663
Tikchik L.	0 ^b	366 ^b	31	442	12	22	32	17	105
Koktuli R.							0	0	0
Other	146	46	31	156	622	241	185	57	252
Subtotal	2,277	1,373	898	4,965	1,191	1,509	1,212	351	1,846
Western									
Togiak	2,851	409 ^c	1,238 ^b	1,976 ^c	367	87	251	330	602
Goodnews	0 ^b	685 ^b	0 ^b	224	36 ^b	297	138	189	177
Kanektok	1,680 ^c	2,300	1,837	1,096	644	358	275	734	621
Other	0		1,637	112	0	0	16	0	26
Subtotal	4,531	3,394	4,712	3,408	1,047	742	680	1,253	1,426
Northwestern									
Aniak	905 ^b	254 ^b	618 ^b	939	182	327	235	213	379
Kwethluk							624	313	187
Other	24	815	36	1,420	363	195	558	399	587
Subtotal	929	1,069	654	2,359	545	522	1,417	925	1,154
Total	13,083	10,319	12,529	18,535	8,284	9,382	6,676	5,461	9,668

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

^c Estimates from intensive onsite creel survey.

Table 12.-Coho salmon commercial, subsistence, and sport harvest from the Naknek River, 1971 to 1994.

Year	Harvest			Total
	Commercial ^a	Subsistence ^b	Sport ^c	
1971	89	100		
1972	402	100		
1973	255	500		
1974	916	200		
1975	43	200		
1976	1,195	600		
1977	2,883	300	297	3,480
1978	913	300	646	1,859
1979	12,355	1,200	300	13,855
1980	7,802	800	818	9,420
1981	1,229	1,100	1,156	3,485
1982	10,586	1,000	1,676	13,262
1983	7,282	900	1,385	9,567
1984	3,209	600	2,332	6,141
1985	10,474	1,103	1,281	12,858
1986	5,824	650	1,942	8,416
1987	5,274	1,106	2,292	8,672
1988	29,988	813	4,065	34,866
1989	22,668	1,927	4,801	29,396
1990	16,091	726	2,179	18,996
1991	17,527	1,056	4,475	23,058
1992	18,536	831	1,579	20,946
1993	1,798	1,572	1,099	4,469
<hr/>				
All Years				
Average	7,710	769	1,901	10,381
Percent	74%	7%	18%	
1989 to				
5 Year	15,324	1,222	2,827	19,373
Percent	79%	6%	15%	
1994	6,841	1,361	2,500	10,702
Percent	64%	13%	23%	

^a Commercial catches are for the Naknek-Kvichak district and therefore include stocks destined for the Kvichak, Alagnak, and Naknek rivers.

^b Subsistence harvest estimate for 1994 is preliminary.

^c Sport harvest estimate for 1994 is preliminary.

salmon beyond the normal sockeye season, has resulted in substantial increases in fishing effort in August and September. Since 1989, commercial coho harvests have averaged over 15,324 fish each year (Table 12). In 1988 and 1989, under relatively liberal fishing schedules, 29,988 and 22,668 coho salmon were harvested in the Naknek/Kvichak district by the commercial fishing fleet. Subsistence harvests of coho salmon have increased as well and now account for about 1,200 fish annually (Table 12). Although harvests have increased in recent years, the distribution of the harvest between the user groups has not changed significantly during the last 20 years; commercial fishermen account for about three-quarters of the harvest, with sport and subsistence fishermen taking 18% and 7%, respectively (Table 12).

Management

Sport harvest and effort are estimated through the statewide harvest survey and reported by Mills (1979-1994). Commercial and subsistence harvests are monitored by the Division of Commercial Fisheries Management and Development and are reported in their Annual Management Report series (ADF&G 1994b). Sport Fish Division has conducted significant monitoring and stock assessment projects in the recent past (Minard and Brookover 1988a, Minard 1989a, Coggins 1992).

No biological escapement requirement (BEG) has been established for Naknek River coho salmon stocks. There is no escapement assessment program in place or planned for these stocks, making it impossible to assess fishery impacts on total run.

The present bag and possession limit for coho salmon on the Naknek River is 5 fish per day, no size limit; the same regionwide limit has been in effect since 1972. Prior to 1993, no adjustments to the Naknek River coho salmon fishery bag and possession limits have ever occurred by inseason emergency order.

Management concerns for this fishery center on the lack of escapement data, the department's inability to assess fishery impacts, and the lack of a management goal or target for this growing fishery. Without a clearer management target, justification for adjusting fishing time in the various fisheries is tenuous.

Management Objectives

No explicit management objectives exist for this fishery.

1994 Season

The estimated 1994 harvest of 10,702 fish by all user groups is approximately half the average for the recent 5-year period, but very similar to the long term average (Table 12). Reduced commercial harvests were a function of market conditions and demand rather than a poor return. It is estimated that the sport fishery accounted for 2,500 fish, and the commercial and subsistence fisheries another 6,841 and 1,361 fish, respectively (Table 12).

1995 Outlook

The lack of stock assessment data makes it difficult to generate a forecast for the 1995 coho salmon return to the Naknek River. Harvests from 1991, the parent year for the 1995 return, were well above the long-term average. Presuming the 1991 run produced an above average escapement in addition to the harvests, the 1995 Naknek River coho salmon return is expected to be stronger than 1993 and 1994. The reduced sport fishing effort observed on the Naknek River

in recent years, along with the likelihood of an above average return, make inseason actions unlikely.

NUSHAGAK AND MULCHATNA RIVERS

Fishery Description

The Nushagak and Mulchatna rivers produce the largest return of coho salmon in the SWMA. Within the drainage, four areas of concentrated recreational effort exist: the lower 12 miles of the Nushagak River, near the village of Portage Creek; the middle section of the Nushagak River, in the vicinity of the village of Ekwok; the mid section of the Mulchatna River, between the Stuyahok and Koktuli rivers; and the Nuyakuk River at its confluence with the Nushagak River (Figure 7). Although sport fishing for coho salmon does occur in some of the tributaries of the drainage, the overall harvest resulting from that activity is considered slight. Of the areas mentioned above, the lower portion of the Nushagak River and the mouth of the Nuyakuk River are the most significant. The lower Nushagak River provides fishing opportunity for early coho salmon in late July and early August, a time when other fisheries have not yet begun.

Historical Performance

The sport harvest of coho salmon in the Nushagak and Mulchatna drainages has never exceeded 2,000 fish in a year, and since 1989 has averaged 825 fish, or about 8% of the area's total sport harvest (Table 13). The total annual harvest of Nushagak/Mulchatna coho salmon since 1989 is split between commercial (82%), subsistence (16%), and sport fishermen (2%) (Table 13). The only shift in the distribution of the harvest since 1971 is a growing subsistence component. At this time, and at these levels, the coho salmon sport fishery is considered to have negligible impact on the overall productivity of Nushagak and Mulchatna drainage coho stocks.

The Nushagak coho salmon stocks are considered to be depressed but in stable condition. A chronic inability to hit escapement targets despite significant management actions in recent years attests to the department's assessment of stock status. In only 1 of the last 4 years has the escapement goal been reached. Significant restrictions have been placed on all fisheries, including closure of the subsistence fishery in 1993, to reduce exploitation on this stock.

Management

Sport harvest and effort is estimated through the statewide harvest survey and reported by Mills (1979-1994). Commercial and subsistence harvests are monitored by the Division of Commercial Fisheries Management and Development and are reported in their Annual Management Report series (ADF&G 1994b).

From 1984 to 1992, Nushagak coho salmon stocks were managed to achieve a biological escapement (BEG) of 150,000 fish, estimated by sonar at Portage Creek. Escapements during that period consistently fell short of the goal, averaging 120,026 fish for all years. Recent spawner-recruit analysis suggests the 150,000 fish goal is higher than necessary to manage for maximum sustained yield. In 1992, based on its findings, the department lowered the BEG to 90,000 spawners (ADF&G 1992). To achieve 90,000 spawners necessitated managing the commercial fishery to achieve an inriver abundance of 100,000 fish. The additional 10,000 coho salmon provided for subsistence and sport harvests above the sonar site at Portage Creek.

Table 13.-Coho salmon commercial, subsistence, and sport harvest plus escapement for the Nushagak drainage, 1971 to 1994.

Year	Harvest					Total	Escapement ^d	Total Run
	Commercial ^a	Subsistence ^b	Sport ^c					
			Nush	Mul	Total			
1971	8,036	2,300				10,336		
1972	3,654	1,000				4,654		
1973	28,709	2,200				30,909		
1974	12,569	4,700				17,269		
1975	7,342	4,300				11,642		
1976	6,778	2,100				8,878		
1977	52,562	4,500	65	90	155	57,217		
1978	44,740	2,500	126	113	239	47,479		
1979	129,607	5,200	212	0	212	135,019		
1980	147,726	5,100	379	129	508	153,334	232,000	385,334
1981	220,290	8,700	216	173	389	229,379		229,379
1982	349,669	8,900	451	52	503	359,072	234,000	593,072
1983	81,338	5,200	849	524	1,373	87,911	51,000	138,911
1984	260,310	8,100	399	37	436	268,846	171,000	439,846
1985	20,230	6,100	0	130	130	26,460	89,500	115,960
1986	68,568	9,400	934	496	1,430	79,398	42,772	122,170
1987	13,263	6,200	595	0	595	20,058	20,220	40,278
1988	52,698	5,223	124	371	495	58,416	131,101	189,517
1989	77,077	8,679	1,586	364	1,950	87,706	84,707	172,413
1990	7,733	5,919	331	95	426	14,078	162,853	176,931
1991	5,399	10,784	415	437	852	17,035	39,595	56,630
1992	84,898	7,103	445	275	720	92,721		
1993	14,244	5,038	124	53	177	19,459	42,742	62,201
All Years Average	73,802	5,619	427	196	623	80,044	108,458	188,502
Percent	92%	7%			1%			
1989-93 5-Yr Avg	37,870	7,505	580	245	825	46,200	82,474	128,674
Percent	82%	16%			2%			
1994	6,814	5,093			200	12,107	82,019	94,126
Percent	56%	42%			2%			

^a 1990-1994 estimates are preliminary.

^b 1994 estimates are preliminary.

^c 1994 estimates are preliminary.

^d Escapement is estimated by sonar at Portage Creek.

The present bag and possession limit for coho salmon on the Nushagak and Mulchatna drainage is 5 fish per day, no size limit. That is the same limit for the region, and has been in effect since 1972. The first adjustment to that limit occurred in 1991 when the daily bag and possession limit was reduced from 5 to 2 by emergency order.

Management Objectives

Nushagak and Mulchatna coho salmon stocks are managed to achieve a biological escapement goal (BEG) of 90,000 spawners. To meet the BEG the commercial fishery is managed to allow for an inriver return of 100,000 coho salmon as estimated by sonar at Portage Creek.

1994 Season

Preseason projections for coho salmon returning to the Nushagak ranged from 15,000 to 137,000 depending on the method used. Given the uncertainty in the forecast, we entered the season cautiously. Fishing time in the commercial fishery was reduced and then eliminated as coho numbers increased. The sport fishery was closed and then reopened at a reduced level in response to changes in the inriver abundance. The subsistence fishery was restricted early in the season and allowed to continue at a reduced level throughout the year.

The 1994 total return of coho salmon to the Nushagak River was approximately 94,126 fish, and is below the long term and recent 5-year averages for the system (Table 13). Early closure of the commercial fishery kept harvests down to 6,814 fish, one of the lowest harvests on record. Subsistence harvests were estimated to be 5,093 fish, or about average, despite a restriction of fishing time from 7 days per week to 3 days per week. The sport fishery was monitored closely and on August 8, when escapement projections fell below 50,000, the sport fishery in the Nushagak drainage was closed by emergency order. Following an increase in passage by the sonar the fishery was reopened on August 12. Bag limits were restricted from 5 to 3 for the remainder of the season. It is likely the sport fishery harvested no more than 500 fish in 1994 (Table 13). No creel surveys were conducted during the Nushagak River coho sport fishery. Inriver passage by the sonar totaled 82,019 fish for the season, or approximately 82% of the inriver goal. What initially appeared to be a very poor return resulted in a relatively good escapement due to the responsive management actions of the department.

1995 Outlook

The 1995 coho salmon return to the Nushagak drainage will be primarily the product of the 1991 parental escapement. Escapement in 1991 totaled approximately 40,000 coho salmon. Combined harvests across all user groups was approximately 17,000 fish, far below the long and short term averages (Table 13). Based on parental run strength it is not likely the 1995 return will be sufficient to sustain normal commercial nor sport fisheries. In addition, the poor returns of 1991 to 1994 argue for extreme caution if all user groups are to avoid extended closed periods or severe seasonal limitations on Nushagak coho salmon.

Management action in the sport fishery will likely be dictated to some degree by the Board of Fisheries in the form of a Nushagak/Mulchatna coho salmon management plan. The Board is scheduled to consider a draft plan at the January meeting in Dillingham. Management of the sport fishery will strive to ensure continued opportunity through the season at a reduced level rather than abrupt closures.

WOOD RIVER LAKES

Fishery Description

The Wood River Lakes is a series of six, large, deep-water lakes connected by short swift rivers within the Wood-Tikchik State Park. Known for a variety of fishery resources including Arctic char/Dolly Varden, rainbow trout, and sockeye salmon, the Wood River system also supports significant coho salmon stocks. The majority of the sport fishing effort directed toward Wood River drainage coho salmon occurs at the confluence of Silver Salmon Creek and the Wood River and the mouths of Ice, Youth, and Sunshine creeks on Lake Aleknagik. Sport fishing effort directed toward coho salmon has grown substantially in recent years and has come primarily from greater numbers of local residents pursuing sport fishing as a leisure activity.

Historical Performance

Harvest data for coho salmon in the Wood River Lake system (Table 11) date back to 1977. From 1977 through 1984, the drainage harvest never exceeded 500 fish, consistently producing 100 to 400 sport caught coho salmon. Since 1985, however, the harvest levels have increased and become somewhat more erratic. The recent 5-year average harvest of sport caught coho salmon is 663 fish, roughly equivalent in size to the Nushagak and Mulchatna rivers combined. Driving the high 5-year average is the 1989 peak harvest when an estimated 2,105 coho salmon were taken by sport fishermen. Estimates of sport harvest noted in the statewide harvest survey are obviously not without error. All things considered, it is safe to say that the coho salmon sport fishery in the Wood River Lake system is growing, probably accounting for about 500 to 1,000 fish annually, and is primarily used by local residents as a form of recreation.

Management

No biological escapement goal (BEG) has been established for Wood River drainage coho salmon stocks. There is no escapement assessment program in place or planned for these stocks, making it impossible to assess fishery impacts on total run.

Sport harvests are limited to 5 per day and in possession with no size limit. Terminal tackle is not restricted in any manner beyond the normal methods and means generally allowed in fresh waters.

Management concerns for this stock focus primarily on the effect commercial and subsistence harvests may be having on Wood River stocks. The driving force behind management is the Nushagak coho salmon escapement. Presumably, a fishing schedule in the commercial fishery that allows achievement of the desired escapement in one system will allow sufficient numbers into the other, but there is no way to measure this. A full stock assessment program is needed to better describe the extent to which Wood River drainage coho stocks are impacted by the commercial fishery, what order of magnitude the escapements are, and to what degree the Nushagak and Wood River stocks are mingled in the commercial district.

Management Objectives

No explicit management objectives exist for this fishery.

1994 Season

No data are available to address the 1994 season other than that reports from village residents in Aleknagik indicated "fair numbers" of coho salmon off the mouths of Ice and Sunshine creeks this fall.

1994 Outlook

No data are available to make a projection.

KANEKTOK RIVER

Fishery Description

Coho salmon play a major role in the Kanektok River sport fishery and are caught primarily in the lower 12 miles of the river in the vicinity of the village of Quinhagak (Figure 7). The fishery peaks in mid August, slightly earlier than the fisheries further to the east. Because of its relatively small size, clear water, and consistent returns of coho salmon, the Kanektok River is one of the finest silver salmon sport fisheries in western Alaska.

Historical Performance

Run size in the Kanektok River is comparable to that of the Togiak River, producing an average total harvest of approximately 60,000 fish annually. Over 90% of the harvest is taken by the commercial fishery which has averaged 51,265 coho salmon per year since 1989 (Table 14). The recreational fishery harvest has averaged 621 fish recently and accounts for 1% of the total harvest. Subsistence harvests average 2,662 per year and account for 5% of the total harvest (Table 14).

Management

Sport harvest and effort are estimated through the statewide harvest survey and reported by Mills (1979-1994). Commercial and subsistence harvests are monitored by the Division of Commercial Fisheries Management and Development and are reported in their Annual Management Report series (ADF&G 1994c). Sport Fish Division has conducted significant monitoring and stock assessment projects in the recent past (Alt 1986, Minard 1987b, Dunaway and Bingham 1992b, Dunaway *In prep* b).

Escapement of coho salmon into the Kanektok River is estimated by aerial survey. Counts, made between August 20 and September 5, are left unexpanded and represent only minimum escapement estimates. Since 1984, the observed escapement of coho salmon into the Kanektok River has ranged from 1,755 to 46,830. No formal escapement goal has been established for Kanektok River coho salmon. Poor weather and lack of funding contribute to the erratic string of escapement estimates.

Bag limits for coho salmon were very liberal, allowing 15 fish per day, 30 in possession until 1986. In 1987, the Board recognized the significance of the harvest potential of this fishery and reduced bag and possession limits to 5 fish daily, the standard limit for the area. Interestingly, the bag limit of 5 fish per day is seldom taken by sport fishermen on the Kanektok River. In 1991, only 7% of the anglers interviewed left the river with a full limit of 5 fish. Most (61%) interviewed anglers elected to take no fish, even though over 90% of them had caught and released at least one fish (Dunaway and Bingham 1992b).

Harvests, which appear relatively minor, do not totally reflect the importance of this species to the recreational fishery. In 1986, over 22,500 coho salmon were landed of which only 1,680 (7%) were harvested (Minard 1987b). In 1990, approximately 14% of the coho salmon caught were retained, and in 1991 the retention rate was estimated to be approximately 25% (Mills 1992

Table 14.-Coho salmon commercial, subsistence, and sport harvest plus escapement for the Kanektok River, 1983 to 1994.

Year	Harvest				Escapement Index	Total Run
	Commercial	Subsistence	Sport	Total		
1983	32,442		367	32,809		
1984	135,342		1,895	137,237	46,830	184,067
1985	29,992		622	30,614		
1986	57,544		1,680	59,224		
1987	50,070		2,300	52,370	20,056	72,426
1988	68,591	2,933	1,837	73,361		
1989	44,607	3,346	1,096	49,049	1,755	50,804
1990	26,926	3,510	644	31,080		
1991	42,571	2,901	358	45,830	4,330	50,160
1992	86,404	2,172	275	88,851		
1993	55,817	1,381	734	57,932		
<hr/>						
All Years						
Average	57,301	2,707	1,073	61,081	18,243	79,324
Percent	94%	4%	2%			
<hr/>						
1989 to 1993						
5 Year Avg	51,265	2,662	621	54,548	3,043	57,591
Percent	94%	5%	1%			
<hr/>						
1994 ^a	83,912	3,000	1,000	87,912	No Estimate	
Percent	95%	3%	1%			

^a Commercial, subsistence, and sport harvests for 1994 are preliminary.

and 1993). Concern over hook-induced mortality, given previous department studies (Vincent-Lang et al. 1993), prompted staff to evaluate the potential hook-and-release mortality. The department concluded that although the released proportion of the catch was large, the resulting mortality was small and has minor impact to the overall health of the stocks. The conclusion was based on the fact that the fishery occurs upstream of the intertidal area where catch-and-release mortality was not found to be large in other department studies (Vincent-Lang et al. 1993).

Management Objectives

No explicit management objectives exist for this fishery.

1994 Season

The 1994 outlook for the Kanektok coho salmon return was for a weak return based upon harvest performance during the parental return. The actual return, however, appeared to be much better than expected. The commercial fishery landed nearly 84,000 coho salmon, well above the long-term average for the fishery. Subsistence and sport harvests were considered to be good as well. Weather precluded a survey of the spawning grounds, however, indications are that good numbers of coho salmon entered the river. The department conducted a survey of the sport fishery in the lower Kanektok River from August 5 through August 23 this year. Final results will be reported in a Fishery Data Series report, however preliminary results indicate that effort and angling success were up from previous surveys. Of the 589 anglers interviewed, most were guided nonresident anglers. Catch rates were high (2.32 fish/hour), and retention rates low (7% of fish caught were retained) for interviewed anglers.

1994 Outlook

The 1991 coho salmon return, parent year for the 1994 return, produced below average commercial and sport catches. Escapement estimates for the parent year were indexed at 4,330 fish. Considering the performance of the fishery in 1991, and the modest parental escapement index, we are expecting an average to below average coho salmon return to the Kanektok River in 1994. The performance of the commercial fishery will be closely watched to detect any conservation problems as early as possible and staff will be prepared to make inseason changes to regulations if warranted.

TOGIK RIVER

Fishery Description

The bulk of the Togiak River coho salmon fishery occurs in the lower 20 miles of the Togiak River below the Wilderness boundary of the Togiak National Wildlife Refuge (Figure 7). The sport fishery occurs from early August to the middle of September, usually peaking between August 21 and September 7. Angler effort is largely nonresident guided anglers who access the river by flying out from nearby lodges to fish for the day. In addition, there are a couple of river-based camps that cater to nonresident anglers, the largest of which is owned by the local native corporation of Togiak Natives Limited.

Historical Performance

Sport harvest of coho salmon from the Togiak River has averaged 685 fish annually since 1989, or about 7% of the areawide harvest (Table 15). Harvest peaked in 1986 with 2,851 sport caught coho being taken, but has since declined. A high degree of voluntary catch and release has been

Table 15.-Coho salmon commercial, subsistence, and sport harvest plus escapement for the Togiak River, 1977-1994.

Year	Harvest			Total	Escapement ^d	Total Run
	Commercial ^a	Subsistence ^b	Sport ^c			
1977	33,824	1,100	114	35,038		
1978	36,959	500	214	37,673		
1979	80,073	700	300	81,073		
1980	111,829	1,200	258	113,287	65,130	178,417
1981	19,504	2,200	119	21,823	43,500	65,323
1982	108,000	1,300	524	109,824	69,900	179,724
1983	4,978	800	294	6,072		
1984	111,631	3,800	1,295	116,726	60,840	177,566
1985	35,765	1,500	342	37,607	33,210	70,817
1986	28,030	500	2,851	31,381	21,400	52,781
1987	1,284	1,600	409	3,293	60,000	63,293
1988	7,956	792	1,238	9,986	65,000	74,986
1989	35,814	976	1,976	38,766		
1990	2,296	1,111	367	3,774	21,390	25,164
1991	4,262	1,238	500	6,000	25,560	31,560
1992	3,918	1,231	251	5,400	80,100	85,500
1993	12,704	743	330	13,777		
<hr/>						
All Years						
Average	37,578	1,252	670	39,500	49,639	89,139
Percent	95%	3%	2%			
<hr/>						
1989 to 1993						
5 Year Avg	11,799	1,060	685	13,543	42,350	55,893
Percent	87%	8%	5%			
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1994	96,606	985	1,000	98,591		
Percent	98%	1%	1%			

^a 1992-94 estimates are preliminary.

^b 1994 subsistence harvest estimate is preliminary.

^c 1994 sport harvest estimate is preliminary.

^d Escapement estimates are based on fixed wing aerial surveys and are expanded to account for missed fish, except 1987 and 1988 which are based on sonar.

documented for this fishery and ranges from 40% to 60% of the catch. Concern over hook-induced mortality, given previous department studies (Vincent-Lang et al. 1993), prompted staff to evaluate the potential hook-and-release mortality. The department concluded that although the released proportion of the catch was large, the total number of fish caught is small in terms of the total run. Therefore, the potential impact of catch and release affects a small number of fish and has minor impact to the overall health of the stocks. In addition, these studies have demonstrated that the mortality of released coho salmon is low when catches are made above the intertidal area, as in the case of most of the Togiak River fishery.

Commercial catches have been erratic, ranging from a high of 111,829 fish in 1980 to a low of 1,284 in 1987. Average harvest since 1989 has been 11,799, accounting for 87% of the Togiak harvest (Table 15). In recent years the commercial harvests have dropped from previously observed levels.

Subsistence harvests have remained relatively stable, averaging 1,000 fish per year and accounting for 3% to 8% of the Togiak harvest (Table 15).

Management

Sport harvest and effort is estimated through the statewide harvest survey and reported by Mills (1979-1994). Commercial and subsistence harvests are monitored by the Division of Commercial Fisheries Management and Development and are reported in their Annual Management Report series (ADF&G 1994b). Sport Fish Division has conducted significant monitoring and stock assessment projects in the recent past (Minard and Lisac 1984, Dunaway 1990b).

The escapement goal for the Togiak River drainage is 50,000 coho salmon and is estimated by expanding aerial survey counts for missed fish. The 1980 to 1992 average escapement of 49,639 is very close to the established goal.

The bag and possession limit for coho salmon on the Togiak River is 5 per day with no size limit. The limit has been adjusted three times in recent years in response to conservation concerns. In 1987, when it appeared the escapement goal for coho salmon would not be achieved, the fishery was restricted to catch and release. In 1990 and 1991, the bag limit was dropped to 1 per day and in possession. For years when adequate parental escapements have been realized, the current bag limit of 5 has been satisfactory, but in poor years the department has responded with emergency order authority to reduce overall harvest.

Management Objectives

Togiak coho salmon stocks are managed to achieve a biological escapement of 50,000 spawners estimated by expanding aerial survey counts for missed fish.

1994 Season

The 1994 Togiak coho salmon return was expected to be below average based upon parental escapement and fishery performance. After the harvests were accumulated it was evident that a much stronger than anticipated run had occurred. The commercial harvest of 96,606 coho salmon was the largest harvest recorded in 10 years. Subsistence harvests were normal, accounting for approximately 1,000 fish. The sport harvest may have equaled the subsistence take. Overall approximately 98,600 coho salmon were harvested from the Togiak River in 1994.

Escapement was not estimated due to poor weather conditions and high water. Inseason observations indicated that a good number of coho entered the river. Sport fishing success was reported to have been fair to good all season.

1995 Outlook

The 1991 coho salmon escapement into the Togiak River was estimated to be approximately 25,560, or about half the desired goal. Commercial, subsistence and sport harvests during the parent year were below average. Based on parent year escapement and fishery performance, the 1995 return of coho salmon to the Togiak River is expected to be below average. If the return materializes as anticipated, sport fish management will strive to maintain opportunity to sport fish in a limited manner all season by going to reduced bag limits early in the season as was done in 1993. Keeping sport harvests below 500 fish will not jeopardize management for sustained yield. Given the performance of the 1990 brood year and the subsequent return last year, it is just as likely that the 1995 return could be stronger than anticipated. We intend to watch closely the performance in the commercial fishery to ensure adequate escapement is achieved.

NORTHWESTERN COHO SALMON FISHERIES

The Kuskokwim River and its tributaries sustain one of the largest coho salmon returns in Alaska, producing a combined commercial and subsistence harvest of 200,000 to over 600,000 fish annually. This run passes through the northwestern section of the SWMA, but at present is only lightly exploited by sport anglers, contributing 6% to 12% of the SWMA's total sport harvest (Table 11). The few services catering to recreational anglers and the difficulty of access limits fisheries for all species in this section. Average sport harvest in this section totals 1,100 fish annually since 1989.

SECTION V: SOCKEYE SALMON FISHERIES

Sockeye salmon is the most numerous species of Pacific salmon to spawn in Bristol Bay, the world's largest producer of sockeye salmon. Their prized eating qualities make sockeye salmon the most popular species of salmon on the commercial market. Traditionally, sockeye salmon have not enjoyed the popularity sportsmen have granted to other species. Since the late 1960s however, anglers have discovered innovative ways to legally catch sockeye salmon with customary sport gear, and the species has gained favor as a delectable and hard fighting game fish. Popular fisheries exist in the Naknek and Iliamna drainages (Figure 9).

Harvests of sockeye salmon in the SWMA were stable at 3,000 to 4,000 fish from 1977 through 1981; then increased from 6,000 to 10,000 fish starting from 1982 to 1988 (Table 16, Figure 10). After 1988, the sport harvest of sockeye salmon increased substantially in number and variability with a peak estimate of nearly 33,000 fish taken in 1989 and subsequently dropping to 16,010 in 1990. Even with the elevated harvests of recent years, the sport harvest is a minute 0.09% of the millions of sockeye salmon returning to spawn in the area. Roughly 60% of the annual Bristol Bay sockeye run has been taken in the commercial fishery since 1980, and 139,000 fish, or less than 1% of the run, have been harvested by subsistence fishermen.

Sockeye salmon share the same bag and possession limit with all salmon except chinook: 5 salmon per day, no size limit. This regionwide limit has been in effect since 1972. The department's ability to manage for sustained yield is essentially unaffected by the recreational harvest of sockeye salmon. No adjustments have been made to the bag and possession limits in the past and none are anticipated in 1994. Sockeye salmon are expected to play an increasingly important role in the development and expansion of the recreational fishery in Southwest Alaska.

BROOKS RIVER

Fishery Description

Brooks River, which drains Brooks Lake into Naknek Lake, is a 2-mile long stretch of water located within the boundaries of the Katmai National Park and Preserve (Figure 9). Brooks Camp, located on Naknek Lake, was established in 1960 by Northern Consolidated Airlines as primarily a sport fishing facility, but in recent years has also become popular with tourists for hiking and bear viewing opportunities. Access to Brooks River and Brooks Camp is by float equipped aircraft or boat. Beside guest cabins, overnight visitors may also use a campground facility. At the lower end of Brooks River is a foot bridge which allows visitors to cross between the south and north shores without wading. The sport fishery for sockeye salmon generally takes place below the bridge in the lower quarter mile of the river where it empties into Naknek Lake. The sockeye salmon fishery begins in late June when the first salmon arrive and peaks over the Fourth of July weekend. The recreational fishery overlaps waters utilized by brown bears fishing for salmon. This overlap has caused obvious management problems and conflicts for the Department of Fish and Game and the National Park Service. At issue is the safety of visitors and the priority that the different user groups (bear viewers, sport fishermen, and hikers) should have. Based on the recent actions of the National Park Service, department staff firmly believe the Park Service agenda is to significantly curtail or restrict sport fishing opportunity on the Brooks River, particularly as it applies to the sockeye salmon fishery downstream from the bridge.

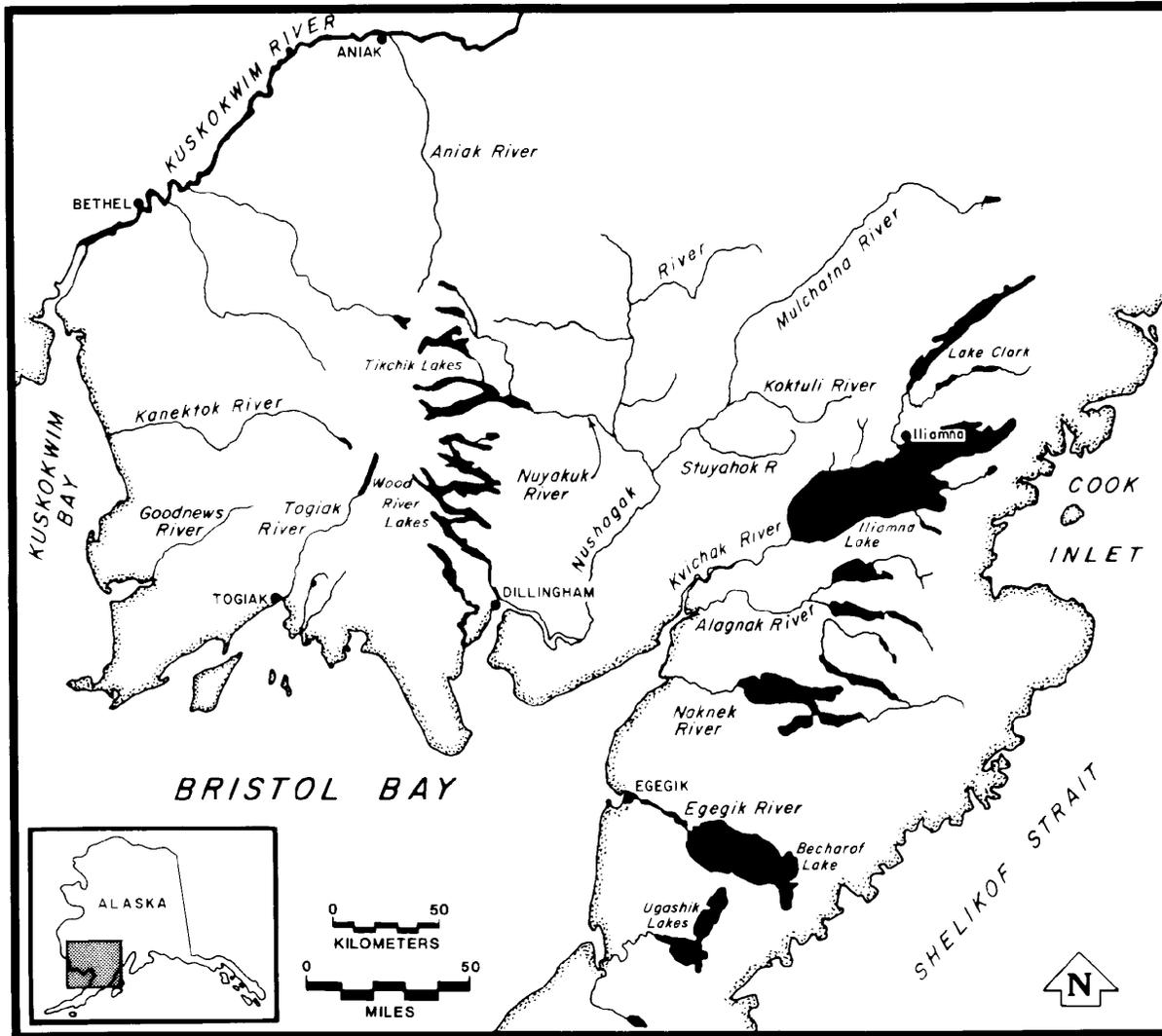


Figure 9.-Popular sockeye salmon sport fisheries in Southwest Alaska.

Table 16.-Sport harvest of sockeye salmon from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	213	127	189	379	11	126	55	100	12 ^b
Egegik/Becharof	144	56	31	34	0	42	137	37 ^b	25 ^b
Naknek R.	78	345	236	542	184	534	644	436	1,157
Naknek L.	165	42	299	112	140	73	137	37	50 ^b
Bay of Islands							0	75	0
Brooks R.	135	113	79	121	43	157	284 ^c	449	299
Brooks L.									
American Cr.							0 ^b	0 ^b	50 ^b
King Salmon R.									
Kvichak R.	583	380	283	654	400	639	603	898	1,827
Copper R.	62	183	252	122	281	1,038	1,206	75 ^b	127 ^b
Alagnak R.					11	0	21	100	127
Newhalen R.	805	1,479	1,163	715	1,490	1,786	1,671	2,581	2,623
L Talarik Cr	58	0	47	0	22	0	0	187 ^b	53
Lake Clark	420	648	1,022	155	292	220	603	449	106
Lake Iliamna							41 ^b	474 ^b	382 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other	8	113			22		247	74	612
Subtotal	2,671	3,486	3,601	2,834	2,896	4,615	5,649	5,972	7,450
Central									
Nushagak	94	310	204	60	140	796	1,123	236	260
Mulchatna	280	56	79	17	0	199	397	536	14
Wood River L.	129	211	110	112	270	461	466	100	506
Tikchik L.	16	99	16	34	65	105	123	25	0
Koktuli									
Other					0	0	68	124	0
Subtotal	519	676	409	223	475	1,561	2,177	1,021	780
Western									
Togiak	14	183	393	69	108	241	69	75	116 ^b
Goodnews							14	156 ^b	75
Kanektok							0	143	12
Other							0	0	0
Subtotal	14	183	393	69	108	241	83	374	203
Northwestern									
Aniak							0 ^b	0 ^b	0 ^b
Kwethluk									
Other							0	0	12
Subtotal	0	0	0	0	0	0	0	0	12
Total	3,204	4,345	4,403	3,126	3,479	6,417	7,909	7,367	8,445

-continued-

Table 16.-Page 2 of 2.

Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	0 ^b	370	340 ^b	884	20	77	8	174	233
Egegik/Becharof	92 ^b	173 ^b	0 ^b	1,040	183	96	485	149	391
Naknek R.	107	69	1,082	598	835	979	641	946	800
Naknek L.	0 ^b	173	62 ^b	286	10	163	90	106	131
Bay of Islands	15 ^b	23	31 ^b	364	0	106	41	0	102
Brooks R.	566	1,097	557	702	1,181	624	904	586	799
Brooks L.					753	134	123	101	222
American Cr.	15 ^b	23 ^b	0 ^b	26	51	0 ^b	0	0	15
King Salmon R.							0	0	0
Kvichak R.	102	1,805	526	4,769	2,988	1,249	1,964	2,923	2,779
Copper R.	0 ^b	82 ^b	93 ^b	378	246	707	148	818	459
Alagnak R.	544	54	124 ^b	479	562	502	608	3,179	1,066
Newhalen R.	238	4,185	2,414	14,508	6,093	9,523	6,509	9,889	9,304
L Talarik Cr	0 ^b	0 ^b	186 ^b	151 ^b	0	82	329	78	128
Lake Clark	0	110	0 ^b	252	246	143	510	297	290
Lake Iliamna	272	602	619	1,741	474	788	1,011	1,431	1,089
Kulik R.							0	0	0
Tazimina R.							197	58	51
Moraine Cr.							0	0	0
Other	0	421	589	1,404	167	301	536	836	649
Subtotal	1,951	9,187	6,623	27,582	13,809	15,474	14,104	21,571	18,508
Central									
Nushagak	88	274	279	338	184	480	608	521	426
Mulchatna	1,548	301	433	390	532	280	288	568	412
Wood River L.	876	109	93	2,105	522	840	526	505	900
Tikchik L.	58 ^b	27 ^b	31	598	20	150	58	557	277
Koktuli R.							156	95	50
Other	204	246	31	1,141	346	120	0	391	400
Subtotal	2,774	957	867	4,572	1,604	1,870	1,636	2,637	2,464
Western									
Togiak	0	27 ^b	62 ^b	416	10	80	16	61	117
Goodnews	24 ^b	49 ^b	164 ^b	146	62 ^b	63	8	53	66
Kanektok	200	153	109	101	462	88	66	331	210
Other	0		182	112	0	0	0	0	22
Subtotal	224	229	517	775	534	231	90	445	415
Northwestern									
Aniak	0 ^b	28 ^b	164 ^b	22	49	38	25	17	30
Kwethluk							0	19	4
Other	98	42	0	11	0	0	57	200	54
Subtotal	98	70	164	33	49	38	82	236	88
Total	5,047	10,443	8,171	32,962	15,996	17,613	15,912	24,889	21,474

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

^c Estimates from intensive onsite creel survey.

SPORT HARVEST OF SOCKEYE SALMON
SOUTHWEST ALASKA (1977-1993)

Harvest in Thousands

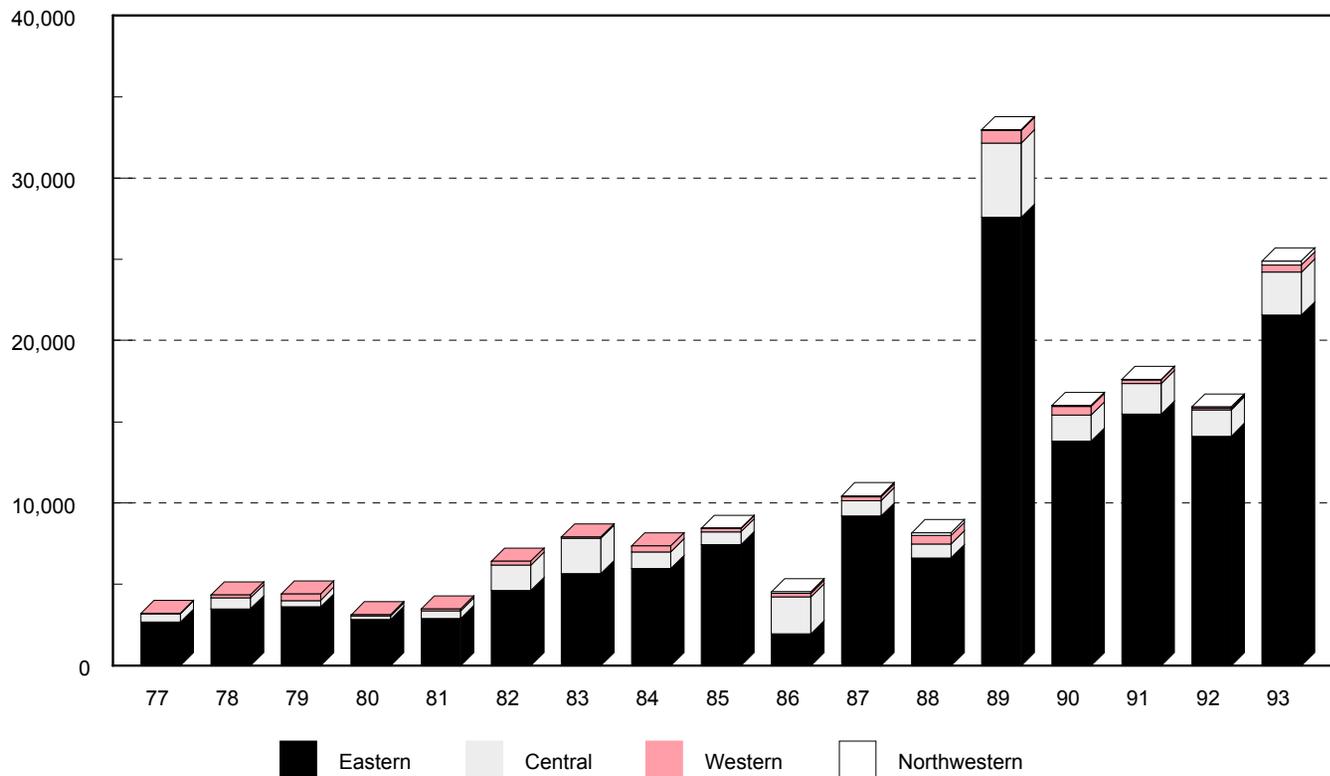


Figure 10.-Sport harvest of sockeye salmon from the eastern, central, western, and northwestern sections of the Southwest Alaska sport fish management area, 1977 to 1993.

Historical Performance

The abundance of sockeye salmon at Brooks River is a function of the escapement into the Naknek River. The Naknek drainage escapement goal is 1.0 million sockeye salmon. The magnitude of the escapement dwarfs the historical harvest by the sport fishery so that variations in inriver abundance have little affect on fishery performance at Brooks River. Harvests of sport caught sockeye salmon at Brooks River have ranged from a low of 43 in 1981 to a high of 1,181 in 1990 (Table 16). The recent 5-year average (1989-1993) is 799. There is clearly room for increased sport harvest of sockeye salmon from these waters.

Management

Sport harvest and effort are estimated through the statewide harvest survey and reported by Mills (1979-1994). Commercial and subsistence harvests are monitored by the Division of Commercial Fisheries Management and Development and are reported in their Annual Management Report series (ADF&G 1994b). Sport Fish Division has not conducted any significant monitoring or stock assessment projects for this fishery in the recent past. Forecasts of next season's return are provided by the Division of Commercial Fisheries Management and Development and are reported in a statewide salmon forecast summary (Geiger *In prep*).

The memorandum of agreement between the Department of Fish and Game and the National Park Service clearly places management authority for fishery resources of Brooks River with the Department of Fish and Game, and management of use levels and habitat protection with the National Park Service. This management structure has lead to a complicated history of regulation regarding the sport fishery. Current regulations for Brooks River allow the keeping of 1 fish per day and in possession except rainbow trout which are managed for catch-and-release fishing. Anglers are restricted to single-hook artificial lures below the foot bridge and artificial flies above the bridge. This most current set of regulations is the result of a total revamping of the regulations in 1990 as part of the development of a rainbow trout management plan for the area. Over the years, significant concessions of sport fishing opportunity have been made under the premise of ensuring the safety of sport anglers using the river. These concessions include reductions in bag limits from 5 sockeye salmon to 1, restrictions in terminal tackle to include single-hook artificial lures below the bridge, and fly-fishing-only above the bridge. Additionally, the Park Service has implemented several regulations concerning the manner in which fish are to be disposed of by sport anglers once they are harvested. Specifically, anglers are required to immediately place the harvested fish in a plastic bag and proceed to the cleaning house with the fish for cleaning and storage. The objective is to avoid conditioning bears to link fish harvested by sport fishermen with an easy meal.

There is an obvious need to develop a long range management plan for management of the sockeye salmon sport fishery in the Brooks River. Without a firm and agreed upon plan between the National Park Service and the Department of Fish and Game, sockeye salmon sport fishing opportunity on the Brooks River will be eroded and replaced with other activities.

Management Objectives

Naknek River sockeye salmon stocks are managed to achieve a biological escapement of 1 million. The Brooks River is managed to provide an average of 5,000 angler-days per year and a diversity of angling opportunity by providing single-hook and fly-fishing-only areas.

1994 Season

Escapement of sockeye salmon into the Naknek drainage totaled 990,810, essentially equal to the goal of 1-million fish. As a result of the large escapement into the system, abundance of sockeye at Brooks River was also very high.

On July 12, Park Service staff contacted Sport Fish staff and expressed concern over two bears that had begun to associate fishes caught by sport fishermen an easy meal. Park Service strengthened the orientation lecture given to visitors, assigned additional staff to problem areas on the river to monitor compliance, and maintained frequent contact with ADF&G Sport Fish staff. No successful steals were reported during the season.

Sport fishing success was reported to have been excellent for sockeye salmon this season.

1995 Outlook

The 1995 forecasted sockeye salmon return to the Naknek River is 5.3 million, meeting the 1.0 million escapement goal will leave some 4.3 million to be harvested by commercial fishermen (Table 17). Given the expected level of escapement into the Naknek drainage, there should be an abundance of sockeye salmon at Brooks River this season. Excellent sport fishing opportunity is expected from late June through July 20. Park Service and ADF&G staff will continue to monitor human use and may take steps to ensure the safety of visitors/fishermen if necessary.

KVICHAK RIVER

Fishery Description

The Kvichak River drainage hosts the single largest sockeye salmon run in the world and the river itself is a popular destination for anglers targeting this species (Figure 9). Sockeye salmon first appear in the Kvichak River during the last week of June. The run peaks in the first week of July, then declines steadily until late July or early August.

Anglers prefer to fish this medium-sized river's clear waters during the first half of the run when the salmon are more readily taken on sport gear. A modern airstrip in the village of Igiugig provides easy access to the river where it drains out of Lake Iliamna and float planes can land on the lake or on the river. Although much of the sport effort is from nonresident guided anglers, a growing component is the resident unguided angler arriving from Anchorage in private aircraft.

Since most of the uplands along the upper Kvichak River are owned by the Igiugig Native Corporation, anglers may expect to pay modest daily fees for access and commercial operators are expected to pay more substantial fees for annual leases.

Historical Performance

The Bristol Bay commercial salmon fleet harvests roughly 50% of the annual Kvichak River sockeye salmon run, and the subsistence fishery takes 86,000 fish, less than 6% of the run. Kvichak River sockeye salmon sport harvests ranged between 300 and 600 fish until 1984 when nearly 900 fish were taken (Table 16). After 1984, estimates of the sport harvest have been wildly erratic, ranging from 102 sockeye salmon in 1986 to 4,700 in 1989. The recent 5-year average harvest taken by the sport fishery is 2,779 sockeye salmon. Even the highest estimates of sport harvest amount to less than 1% of the average Kvichak River sockeye salmon run and do not jeopardize the department's ability to manage for sustained yield.

Table 17.-1995 Bristol Bay sockeye salmon forecast.

District River	Numbers of Sockeye Salmon (thousands)		
	Bristol Bay Inshore Run		
	Total Run	Spawning Goal	Estimated Harvest
NAKNEK-			
Kvichak	25,060	10,000	15,060
Branch	484	185	299
Naknek	5,283	1,000	4,283
Total	30,827	11,185	19,642
EGEGIK	13,061	1,000	12,061
UGASHIK	5,405	700	4,705
NUSHAG			
Wood	2,927	1,000	1,927
Igushik	1,125	200	925
Nushagak/ Mulchatna	1,219	550	669
Total	5,271	1,750	3,521
TOGIAK	506	150	356
TOTAL BRISTOL BAY	55,070	14,785	40,285

Management

Sport harvest and effort are estimated through the statewide harvest survey and reported by Mills (1979-1994). Commercial and subsistence harvests are monitored by the Division of Commercial Fisheries Management and Development and are reported in their Annual Management Report series (ADF&G 1994b). Sport Fish Division has not conducted any significant monitoring or stock assessment projects for this fishery in the recent past. Escapement is estimated by counts made from towers as the salmon migrate up the Kvichak River. Forecasts of next season's return are provided by the Division of Commercial Fisheries Management and Development and are reported in a statewide salmon forecast summary (Geiger *In prep*).

Kvichak River sockeye salmon stocks are managed to achieve a biological escapement goal (BEG) of between 4 and 10 million fish, depending on the cycle year. For high-cycle years the point goal is set between 7 and 10 million. During off-cycle years the point goal is set between 4 and 6 million. The specific point goal is established preseason and published. Management is attempting to moderate the cyclic performance of this fishery by increasing the off-cycle escapements and decreasing the high-cycle escapements.

Growth in the sport fishery is virtually inevitable. Increased effort in recent years has brought to the surface potential conflicts between the long-existing subsistence net fishery near Igiugig and sport anglers. A challenge to management of this fishery will be to provide for increased opportunity while ensuring that gear and user conflicts are addressed.

The sport fishery is being actively managed to provide increased opportunity. Presently, an average of 3,500 angler-days are expended by anglers seeking rainbow trout and sockeye salmon each year. Sport Fish staff believe this level of opportunity could be doubled in 4 years by improving access to desirable fishing sites, promoting this fishery as a destination, and working to see necessary facilities are provided to accommodate this growth in a responsible manner. To this end the department has worked closely with the Igiugig City Council on a project that would entail building trails to desirable fishing locations proximal to the village airfield. It is anticipated that the project would be completed by the end of the summer of 1995.

Management Objectives

The Kvichak River sockeye salmon stocks are managed to achieve a biological escapement goal (BEG) of 5 to 10 million depending on the cycle year. In 1994, the BEG is 10 million. The sport fishery is being managed to provide 7,000 angler-days of opportunity by 1997.

1994 Season

Escapement into the Kvichak River totaled 8.3 million sockeye in 1994, slightly exceeding the goal of 8.0 million. Meeting the BEG provided excellent fishing opportunity from late June through mid July.

The sport fishery at Igiugig was reported to have significantly increased in size this season. No monitoring program was in place and estimates of effort, catch and harvest are therefore not available.

1995 Outlook

The 1995 forecast projects a total return of over 25 million sockeye salmon for the Kvichak River of which 10 million are expected to escape the commercial fishery (Table 17). The above

average projection and 10 million fish escapement goal assures sportsmen that plenty of sockeye salmon will be available to them. The optimum fishing time will be from late June through July 21. Spotty fishing success can be expected before and after these dates.

NEWHALEN RIVER

Fishery Description

The Newhalen River, a major tributary in the Kvichak River drainage, flows from Lake Clark into the north side of Lake Iliamna near the communities of Iliamna and Newhalen (Figure 9). Since it is further inland, sockeye salmon reach the Newhalen River a few days later than the Kvichak River and the best angling usually occurs during the middle 2 weeks of July.

The Newhalen River is more easily accessed than the Kvichak River and supports a large run of sockeye salmon. Several businesses and lodges in the town of Iliamna cater to anglers' needs and a large runway serviced by regularly scheduled commercial airlines provides economical access from Anchorage. From the runway, a mile-long trail leads to the river. The trail ends near a series of cascades where large numbers of sockeye salmon congregate on their way to spawning grounds in the Lake Clark drainage.

Historical Performance

The sockeye salmon entering the Newhalen River are one segment of the huge Kvichak River run. Hence, comments on the character of the commercial and subsistence harvests for the Kvichak River apply equally for the Newhalen River stocks. On the other hand, the sport fishery on the Newhalen River is unique for its large component of unguided anglers and for its history of regularly producing 25% to over 40% of the entire area's annual sport harvest of sockeye salmon (Table 16). For the period 1989 to 1993, the sport fish harvest averaged 9,304 sockeye salmon.

Management

Sport harvest and effort are estimated through the statewide harvest survey and reported by Mills (1979-1994). Commercial and subsistence harvests are monitored by the Division of Commercial Fisheries Management and Development and are reported in their Annual Management Report series (ADF&G 1994b). Sport Fish Division has not conducted any significant monitoring or stock assessment projects for this fishery in the recent past. Escapement is estimated by counts made from towers as the salmon migrate up the Kvichak River. Forecasts of next season's return are provided by the Division of Commercial Fisheries Management and Development and are reported in a statewide salmon forecast summary (Geiger *In prep*).

In response to the growth exhibited by the sport fishery in the Newhalen River, the Sport Fish Division provided funds through the Small Projects Access program to install several portable toilets and bear-proof garbage facilities along the trail. These modest improvements have been received very well by the angling public and the adjacent land owners.

Management Objectives

The Newhalen River sockeye salmon sport fishery is managed to provide an average of 5,000 angler-days of effort and an average harvest of 8,000 sockeye salmon per year. Escapement is addressed by achieving the biological escapement goal (BEG) for the Kvichak River.

1994 Season

Escapement into the Kvichak River totaled 8.3 million sockeye in 1994, slightly exceeding the goal of 8.0 million. As a result of the excellent escapement into the Kvichak River, abundance in the Newhalen River was considered excellent. Good weather over the fourth of July weekend and the following weekend resulted in a large number of anglers visiting the fishery. One instantaneous count on July 8 totaled 212 anglers along a three-quarter mile stretch of the river. Fishing success was generally good. The harvest of sockeye likely exceeded the 9,900 fish reported in 1993.

Access along the trail to the Newhalen River occurred without interruption this season. Facilities provided by the department access program continued to be used heavily by the visiting public.

1995 Outlook

The 1995 forecasted total return to the Kvichak system is 25.1 million, of which 10 million are expected to escape into the Iliamna system (Table 17). The Newhalen component is expected to total about 13% of the total escapement or about 1.0 million fish in 1995. Although significantly weaker than the 1994 return, 1.0 million fish passing through the Newhalen fishery will provide excellent fishing opportunity in 1995. The optimum fishing time will be from late June through July 21. Spotty fishing success can be expected before and after these dates.

CENTRAL SOCKEYE SALMON FISHERIES

About 15% of Bristol Bay sockeye salmon return to the central section. This section is not heavily fished for sockeye salmon and typically produces sport harvests of 800 to 2,000 fish, or 10% to 16% of the total annual sport harvest (Table 16). Harvest of sockeye in 1993 totaled 2,637, and was the second highest reported for the section. It appears that interest in harvesting sockeye is growing. The stocks are generally healthy and virtually unaffected by the harvest impact of recreational anglers. Commercial fishermen take as much as 58% of the sockeye salmon run and subsistence harvests are usually less than 1% of the run. The waters most commonly used by sport anglers are the Nushagak River, Mulchatna River, and the Wood River Lakes system.

Bag and possession limits are 5 per day, no size limit (ADF&G 1994a).

SECTION VI: RAINBOW TROUT FISHERIES

Wild rainbow trout stocks of the SWMA are cornerstone to a multimillion dollar recreational fishing industry. Sport fishing opportunity for both guided and unguided anglers is primarily during the ice-free season, generally from June through October. Popular waters include tributaries of the Kvichak River drainage, the Naknek River drainage, portions of the Nushagak/Mulchatna River drainages, streams of the Wood River Lake system, the Kanektok, Goodnews, and Aniak rivers (Figure 11).

The rainbow trout fisheries within the SWMA underwent rapid growth from the late 1970s to mid 1980s. Annual harvests climbed as high as 10,785 fish in 1983, but have averaged only 5,216 fish per year from 1986 through 1991 (Table 18 and Figure 12). The species' importance to the recreational fisheries is not adequately described by estimates of harvest. Studies indicate that during the last 10 years, the retention rate, or the number of fish kept from the total catch, has declined steadily while the total effort and catch remained stable or increased (Minard 1989b and 1990, Brookover 1989b, Dunaway 1993). It is evident the angling public has embraced the concept of catch and release for rainbow trout, and has voluntarily reduced their harvests throughout the area.

The status of rainbow trout as a subsistence species is changing under the direction of the Alaska Board of Fisheries. In 1993, the Board ruled that rainbow trout, caught incidental to other species, may be retained by subsistence users. This is a change from previous years where rainbow trout were explicitly excluded from harvest under the subsistence priority. The taking of rainbow trout from nonnavigable waters located within federal land holdings (Refuges and National Parks) has been allowed since December of 1991. Since there are few, if any, significant subsistence fisheries for rainbow trout occurring on nonnavigable waters, the federal regulations do little to affect legal fishing opportunity. Although the Alaska Board of Fisheries does not recognize targeted subsistence use of rainbow trout, it has provided seasonal opportunities for harvesting rainbow trout by liberalizing bag limits during the winter months, the time when most local residents pursue rainbow trout for food. For example, in most waters of the SWMA, the summer bag limit is 2 rainbow trout per day, but in the winter months the limit increases to 5 rainbow trout per day. Seasonal changes in the bag limits accommodate the winter harvest needs of the few local residents but do little to jeopardize the health of local rainbow trout stocks.

SOUTHWEST ALASKA RAINBOW TROUT MANAGEMENT PLAN

In February of 1990, the Alaska Board of Fisheries adopted a comprehensive management plan for rainbow trout in Southwest Alaska (ADF&G 1990). That plan provides guidance in the form of policy that gives the Board and the public a clear understanding of the underlying principles by which rainbow stocks are to be managed and provide guidance for the Board in developing future regulations.

Philosophy of the Plan

The overriding philosophy of the *Southwest Alaska Rainbow Trout Management Plan* is one of conservative wild stock management. Conservative wild stock management does not necessarily preclude limited harvest of rainbow trout for food or trophies. However, maximum yield

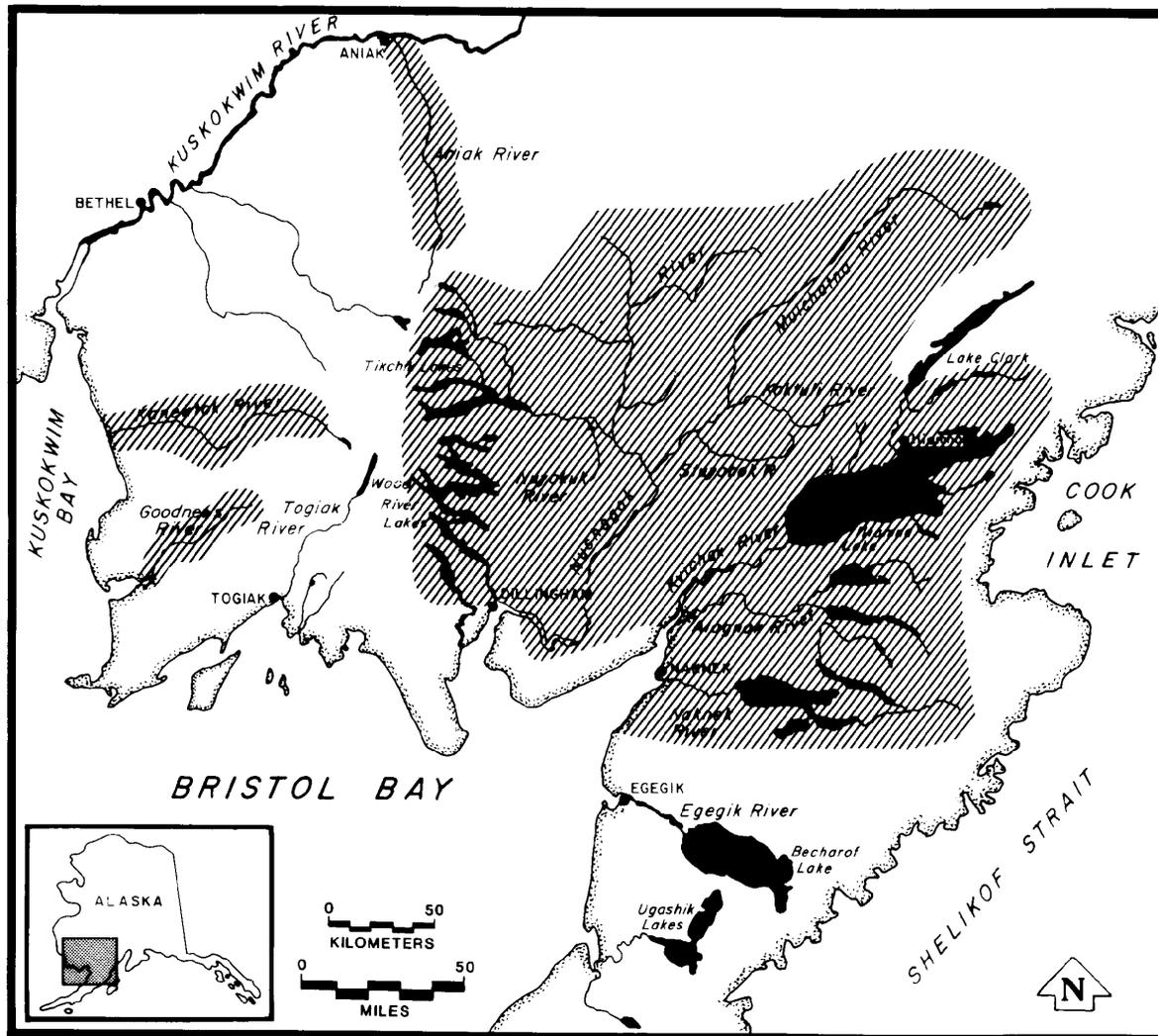


Figure 11.-Popular rainbow trout sport fisheries in Southwest Alaska.

Table 18.-Sport harvest of rainbow trout from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	0	0	0	0	0	0	0	0	69 ^b
Egegik/Becharof	0	0	136	0	0	0	0	50 ^b	520 ^b
Naknek R.	586	371	954	1,705	2,184 ^c	975	2,398 ^c	2,881 ^k	1,561
Naknek L.	37	63	109	198	216	555	126	150	0 ^b
Bay of Islands							105	237	312
Brooks R.	173	181	227	224	227	42	136 ^c	50	69
Brooks L.									
American Cr.							0 ^b	25 ^b	17 ^b
King Salmon R.									
Kvichak R.	672	226	355	637	421	398	283	175	578
Copper R.	14	325	55	34	119	514	294	12 ^b	89 ^b
Alagnak R.					76	157	178	187	518
Newhalen R.	122	190	255	629	250	430	283	187	459
L Talarik Cr	57	81	91	69	97	84	63	0 ^b	74
Lake Clark	0	0	0	0	0	0	0	25	44
Lake Iliamna							0 ^b	312 ^b	0 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other	62	127	82	17	184	210	376	298	553
Subtotal	1,723	1,564	2,264	3,513	3,774	3,365	4,242	4,589	4,863
Central									
Nushagak	31	108	191	387	670	252	346	599	87
Mulchatna	116	497	236	189	281	409	1,018	611	607
Wood River L.	252	217	409	258	475	461	944	1,060	304
Tikchik L.	62	145	136	232	216	220	178	25	58
Koktuli R.									
Other					0	210	2,137	124	29
Subtotal	461	967	972	1,066	1,642	1,552	4,623	2,419	1,085
Western									
Togiak	102	54	82	215	130	168	336	32 ^c	0 ^c
Goodnews							52	104 ^b	451 ^b
Kanektok							640	312	156
Other							0	100	0
Subtotal	102	54	82	215	130	168	1,028	548	607
Northwestern									
Aniak							336 ^b	52 ^b	0 ^b
Kwethluk									
Other							556	0	52
Subtotal	0	0	0	0	0	0	892	52	52
Total	2,286	2,585	3,318	4,794	5,546	5,085	10,785	7,608	6,607

-continued-

Table 18.-Page 2 of 2.

Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	0 ^b	0	0 ^b	52	22	0	0	0	15
Egegik/Becharof	153 ^b	21 ^b	0 ^b	20	22	32	32	18	25
Naknek R.	2,425	1,167 ^c	1,187 ^c	997 ^c	491	720	705	842	751
Naknek L.	381	215	418 ^b	62	44	160	63	18	69
Bay of Islands	186 ^b	43	237 ^b	177	109	240	222	10	152
Brooks R.	79	86	127	31	33	112	0	0	35
Brooks L.					240	80	40	9	74
American Cr.	0 ^b	64 ^b	0 ^b	21	22	32 ^b	0	0	15
King Salmon R.							0	0	0
Kvichak R.	136	275	91	50	254	37	356	269	193
Copper R.	0 ^b	92 ^b	18 ^b	30	42	56	0	0	26
Alagnak R.	340	824	18 ^b	343	423	243	111	312	286
Newhalen R.	102	92	73	81	53	693	55	89	194
L Talarik Cr	20 ^c	2 ^c	36 ^b	4 ^c	0	37	16	0	11
Lake Clark	0	92	18 ^b	10	32	37	0	20	20
Lake Iliamna	578	92	18	91	53	75	24	122	73
Kulik R.							0	0	0
Tazimina R.							0	0	0
Moraine Cr.							0	0	0
Other	170	581	163	293	290	665	8	148	281
Subtotal	4,570	3,646	2,404	2,262	2,130	3,219	1,632	1,857	2,220
Central									
Nushagak	263	92	272	135	55	200	190	122	140
Mulchatna	496	412	145	229	273	444	515	375	367
Wood River L.	262	595	601	478	593	215	547	306	428
Tikchik L.	0 ^b	137 ^b	164	20	11	43	0	10	17
Koktuli R.							55	36	18
Other	234	824	36	182	220	339	55	28	165
Subtotal	1,255	2,060	1,218	1,044	1,152	1,241	1,362	877	1,135
Western									
Togiak	58	46 ^c	91 ^c	437	22	14	0	0	95
Goodnews	0 ^b	111 ^b	127 ^b	316	141 ^b	258	0	145	172
Kanektok	70 ^c	132	400	126	281	182	55	130	155
Other	0		982	0	0	0	47	0	9
Subtotal	128	289	1,600	879	444	454	102	275	431
Northwestern									
Aniak	221 ^b	56 ^b	18 ^b	101	35	76	32	10	51
Kwethluk							71	58	26
Other	24	293	0	214	18	243	222	84	156
Subtotal	245	349	18	315	53	319	325	152	233
Total	6,198	6,344	5,240	4,500	3,779	5,233	3,421	3,161	4,019

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

^c Estimates from intensive onsite creel survey.

SPORT HARVEST OF RAINBOW TROUT

SOUTHWEST ALASKA (1977-1993)

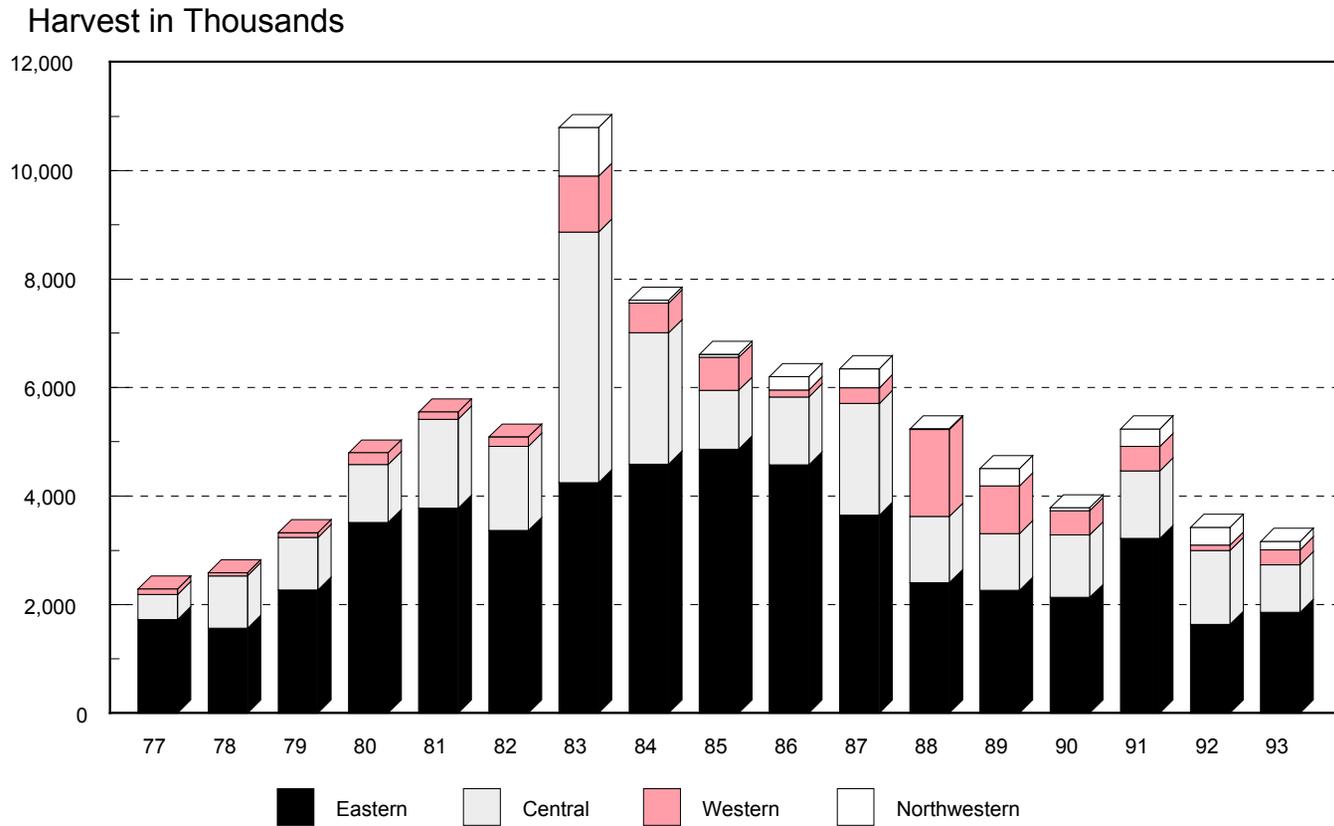


Figure 12.-Sport harvest of rainbow trout from the eastern, central, western, and northwestern sections of the Southwest Alaska sport fish management area, 1977 to 1993.

principles which emphasize harvest are ruled out. Additionally, under a philosophy that emphasizes wild trout management, mitigating losses of wild stocks through enhancement or stocking is not considered a desirable management alternative.

Conservative wild stock management is predicated on both biological considerations and social concerns. Growth in the region's rainbow trout sport fisheries is inevitable, and by managing the area's wild rainbow trout stocks conservatively, the potential for serious long-term resource problems is minimized. From a social perspective, conservative wild stock management is consistent with the wishes and desires of most of the angling public presently utilizing the resource.

The Southwest Alaska Rainbow Trout Management Plan contains policies which are intended to protect the biological integrity of the region's wild trout stocks and maximize their recreational benefit and economic potential. The policies provide management biologists within the Department of Fish and Game, Board of Fisheries members, and the public with clear policies to govern management of rainbow trout fisheries in the SWMA and guide the development of sport fishing regulations designed to implement these policies.

Policy I
Native rainbow trout populations will be managed to maintain historic size and age compositions and at stock levels sufficient such that stocking is not needed to enhance or supplement the wild population.

This policy addresses the department's primary responsibility to ensure that resources are being managed on a sustained yield basis. Adherence to this policy ensures that management practices do not alter the historic size and age compositions of rainbow trout stocks within the management area. Additionally, this policy addresses the desire to maintain wild rainbow trout throughout the area and that mitigating loss of wild stocks through enhancement or stocking is not a desirable management alternative.

Policy I is realized by managing rainbow trout stocks in a biologically sound manner under a conservative yield philosophy. Consistent with this philosophy, the general bag and possession limits for rainbow trout within the area do not exceed 2 per day of which only 1 may be greater than 20 inches. More restrictive limits may be applied to satisfy the goals associated with waters designated for special management or to address a biological problem.

Policy II
A diversity of sport fishing opportunities for wild rainbow trout should be provided through establishment of special management areas by regulation. Selection of areas for special management will be based on criteria to be adopted by the Board of Fisheries.

Under this policy, special management areas are established to provide the sport fishing public with a variety of angling opportunities. Selection of waters for special management is based on criteria established by the Board of Fisheries designed to ensure the most suitable waters are selected.

Policy II has been implemented by establishing special management areas that provide the sport fishing public with a range of desirable angling opportunities. In Southwest Alaska, special management may be designated as either Catch and Release or Trophy. To complement these harvest strategies, in waters designated as Catch and Release or Trophy areas, only unbaited, single-hook artificial lures may be used. Catch and Release or Trophy areas may further be designated as fly-fishing-only. In waters not designated for special trout management, but during times when directed wild trout fisheries occur, the use of artificial lures (no single-hook restriction) can be considered depending on current harvest and effort levels.

Waters designated through regulation for special management are to be selected according to a process that addresses stock status, location, historical use patterns, accessibility, aesthetics, geographical distribution of angling opportunities, and the economic return in terms of commerce generated and jobs created. Each candidate water is ranked according to 11 criteria to determine its suitability for special management. These criteria include:

1. **STOCK STATUS.** To be considered for Catch and Release or Trophy designation, a candidate water must meet the biological objectives of conservative yield, which call for the maintenance of the historical size and age composition and stock levels of the rainbow trout population(s). Historical fisheries statistics are used to make this determination. Any candidate water that meets the conservative yield objectives are considered by the Board against criteria 2-11.
2. **HISTORY OF SPECIAL MANAGEMENT.** This is a subjective category that considers the public's perception of the history of rainbow trout fishing in the candidate water. It is assumed that a water which people associate with having provided "quality" trout fishing can more easily be managed for that purpose than a water with no history of fine trout fishing.
3. **PROXIMITY TO LOCAL COMMUNITY.** A water is preferred if it is not located near enough to a permanent community to be commonly used and/or visited by local residents. The intent of this criteria is to avoid conflict with traditional consumptive use patterns of local residents.
4. **LEGAL ACCESS.** This refers to public ownership of the adjacent lands or the water being classified as navigable. A water with over 50% of its banks publicly owned, or a navigable designation, would be preferred.
5. **OVERLAP WITH FRESHWATER NET FISHERIES.** Special management areas should be seasonally and/or specially segregated from subsistence and freshwater commercial net fisheries.
6. **ABUNDANCE AND SIZE OF RAINBOW TROUT.** This refers to the number and average size of the catchable rainbow trout seasonally present in a candidate water. Waters with relatively high numbers of rainbow trout and waters with uniquely large rainbow trout would be favored for special management.

7. WATER CHARACTERISTICS. This refers to the habitat characteristics and appearances of a water. A stream with clear water and riffle-pool configuration with a gravel bottom would be preferred.
8. CLEAR GEOGRAPHICAL BOUNDARIES. This refers to the angling public's ability to clearly distinguish the legal regulatory boundary of a candidate special management area.
9. RELATIVE IMPORTANCE OF RAINBOW FISHERY TO SPORT FISHING INDUSTRY. A candidate water of high economic value to the sport fishing industry would be favored as an area for special management.
10. GEOGRAPHICAL DISTRIBUTION OF SPECIAL MANAGEMENT WATERS. The designation of a candidate water for special trout management should take into consideration its proximity to other special management waters and the availability of alternative locations not designated for special management.
11. RESEARCH, EDUCATIONAL, OR UNIQUE CONSIDERATIONS. Where necessary, waters may be designated for special management for research or educational reasons. This category recognizes unusual situations which would further diversify angling opportunity, such as the potential for a catch-and-release water near a rural community if local support is expressed.

Policy III
Management strategies should be consistent with the prudent economic development of the state's recreational sport fishing industry while at the same time acknowledging the intrinsic value of this fishery resource to the people of Alaska.

This policy acknowledges that Southwest Alaska's wild rainbow trout are of vital importance to the state's recreational industry and that wise development of commercial recreation is to the economic benefit of the region and the state. Management practices that maintain or enhance the marketability of high quality recreation are favored under this policy.

Consideration of the economic impact to the recreational industry, of both the local area and the state in general, should be given in all regulatory actions regarding rainbow trout within the management area. Whenever possible, emergency orders and regulations should be structured to foster the prudent economic development of the industry.

To implement Policy III, department managers are asked to recognize that due to the remoteness and logistical difficulty of travel in southwestern Alaska, fishery closures may severely impact angling opportunity and the related recreational industry.

To assist the department with implementing Policy III, the Board of Fisheries has expanded the department's emergency order authority to include not only the ability to effect time and area closures, but to also adjust bag limits and methods and means that if employed inseason could avoid disruptive closures.

Plan Implementation

Regulations based on the *Southwest Alaska Rainbow Trout Management Plan* were adopted by the Alaska Board of Fisheries in February of 1990. These regulations were designed to implement the three management policies contained in the rainbow trout management plan. Specifically, the Board:

- Expanded the Wild Trout Zone from the Iliamna drainage to include the drainages of Bristol Bay and Kuskokwim Bay and the Kuskokwim River from Aniak River downstream.
- Established eight catch-and-release areas (Figure 13).
- Established six fly-fishing/catch-and-release-only areas (Figure 14).
- Established 11 unbaited single-hook artificial lure only areas to protect rainbow trout stocks (Figure 15).

Adoption of regulations implementing the management policies contained in this plan is not expected to be a one-time effort. Rather, the implementation of these policies is a repetitive process, using the policies contained in this plan as the framework for development of a very important and unique resource.

LOWER TALARIK CREEK

Fishery Description

Lower Talarik Creek, located at the northwest corner of Lake Iliamna, is renowned for its high quality rainbow trout sport fishery. The creek is relatively small and most anglers only fish along the first 2 miles above its entrance into Lake Iliamna. The large fish, for which Lower Talarik Creek is so famous, enter the creek from Iliamna Lake to feed on salmon spawn and salmon carcasses in the fall. The sport fishery takes advantage of this migration and is most active from mid-August until freeze-up in late September or October. Most anglers fishing Lower Talarik Creek are guided, nonresidents who make daily fly-in trips from the many lodges operating in the Lake Iliamna area. From 10 to 20 anglers can be accommodated at any given time in the lower portion of the creek that is commonly fished.

Historical Performance

Fisheries managers first estimated angler effort and harvest on Lower Talarik Creek rainbow trout with onsite creel surveys from 1970 through 1976 (Table 19). Annual effort averaged 1,362 angler-hours while the harvest ranged from a high of 433 fish in 1971 to 73 fish in 1974. Since 1977, effort has been estimated from the Statewide Harvest Survey and has been measured in angler-days, and effort on Lower Talarik Creek appears to be relatively constant at 600 to 900 angler-days per year with a few excursions outside this range (Table 3). Onsite creel surveys conducted during the fall fisheries of 1989, 1990, and 1991 found effort has been at the upper range of, but not significantly different from, the levels observed in the 1970s (Table 19).

Harvests of Lower Talarik Creek rainbow trout have been less than 100 fish annually since 1977 and have been virtually nonexistent since 1985 (Table 19). Catches, estimated from onsite surveys, show a significant increase from an average 1,072 fish per year in the 1970s to an average 2,204 rainbow trout per year from 1989 to 1993 (Table 19).

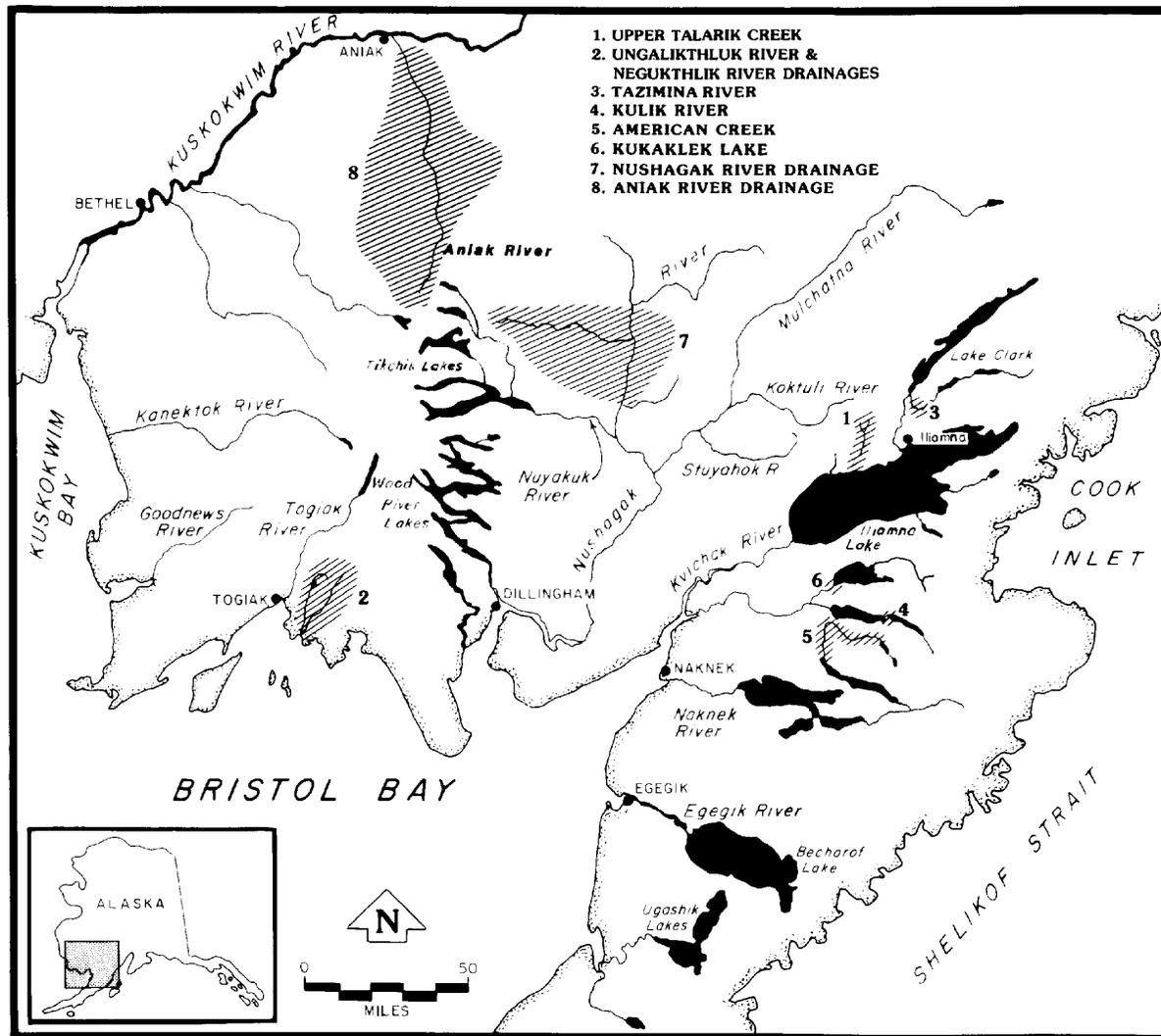


Figure 13.-Catch-and-release special management areas.

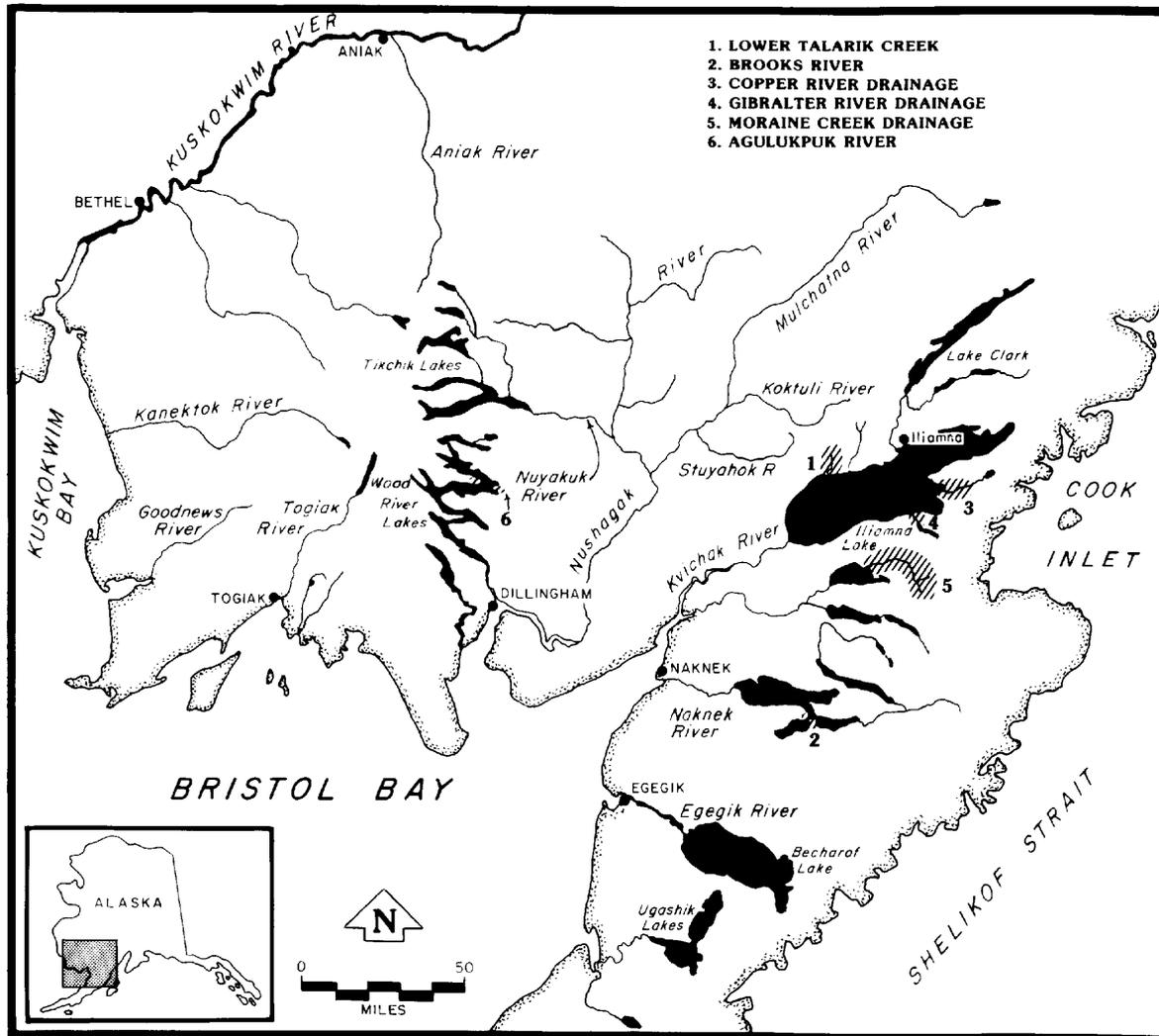


Figure 14.-Fly fishing catch-and-release special management areas.

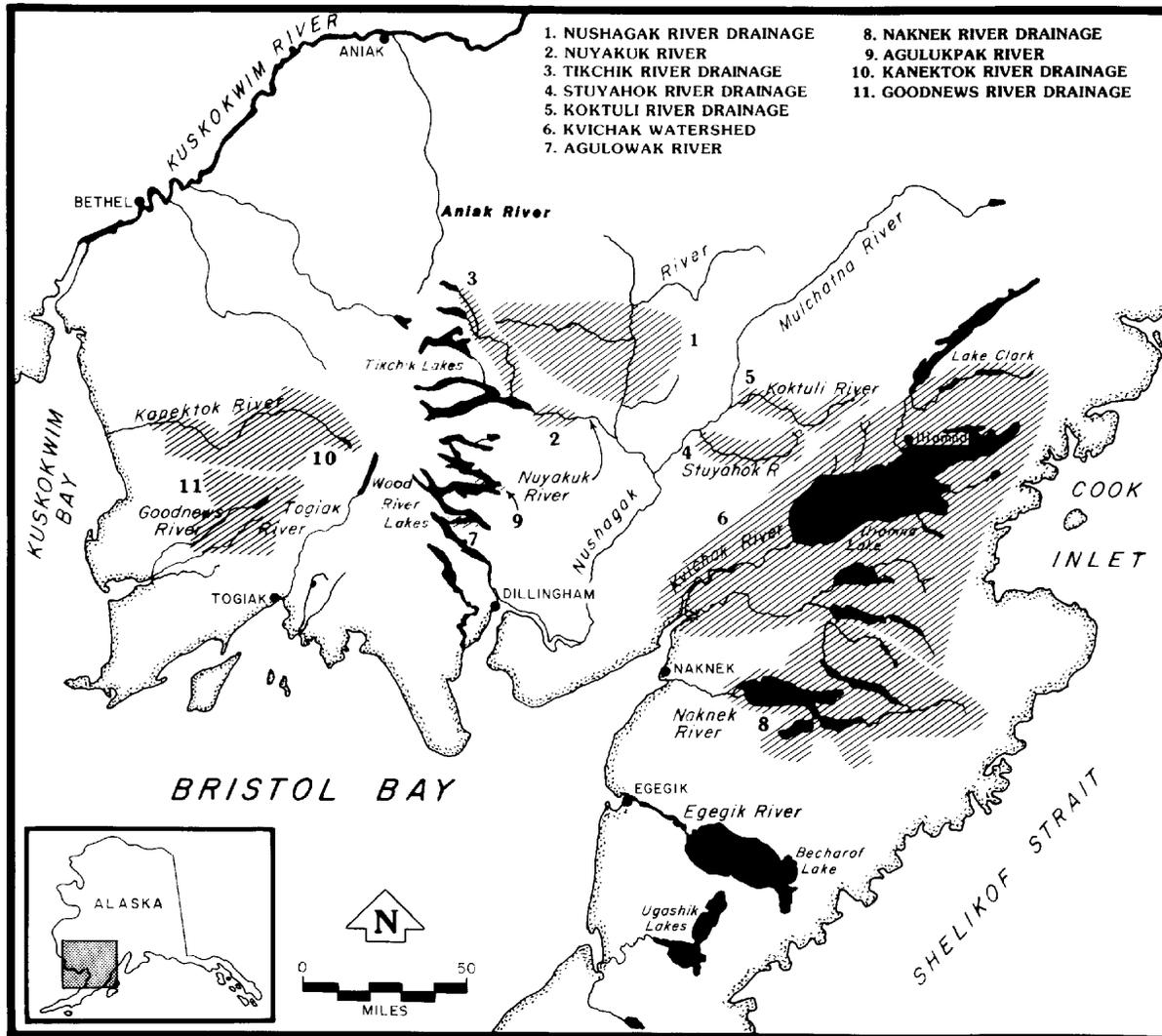


Figure 15.-Unbaited single-hook artificial lure areas.

Table 19.-Angler effort, catch, harvest, retention rate, and catch per angler-hour for rainbow trout, Lower Talarik Creek, 1970-1976, 1986, 1989-1991, 1993 and 1994.

Year	Angler-Hours	Catch	Catch per Hour	Harvest	Percent Retained	Survey Dates
1970	1,315	600	0.46	119	20%	8/26-10/11
1971	2,604	2,300	0.88	433	19%	6/8-9/30
1972	1,718	834	0.49	141	17%	6/8-9/30
1973	1,376	780	0.57	113	14%	6/8-9/30
1974	1,037	498	0.48	73	15%	6/8-9/30
1975	1,048	1,648	1.57	127	8%	6/8-9/30
1976	438	843	1.92	92	11%	6/8-6/15; 9/12-9/23
1986	2,063	2,389	1.16	16	1%	6/8-6/15; 8/15-10/9
1989	1,893	2,844	1.50	4	1%	8/22-9/22
1990	2,086	2,910	1.40	0	NA	9/1-9/27
1991	1,729	2,363	1.37	0	NA	8/30-9/25
1993	1,080	699	0.65	0	NA	9/10-9/20
All Year Average	1,532	1,559	1.02			
1989 to 1993 5-Yr Average	1,697	2,204	1.30			
1994	2,462	3,273	1.33	0	NA	9/2-9/29

Management

Lower Talarik Creek is managed as a fly-fishing-only catch-and-release fishery. A spawning season closure provides protection during this critical season. Sport effort, catch, and harvest are estimated via the statewide harvest survey. Subsistence harvests are not well monitored and are the responsibility of the Commercial Fisheries Management and Development Division. Onsite surveys yield detailed estimates of angler use and success. Biological information and demographic information are also collected. Significant stock assessment and creel survey results are reported by Russell 1977, Minard 1990, Minard et al. 1992.

Lower Talarik Creek's small size, accessibility, and abundant large rainbow trout garnered early regulatory attention. A synopsis for significant regulation changes follow:

- 1965. Spawning season closure imposed on Lower Talarik Creek. Lower Talarik Creek closed to all fishing from April 10 to June 8.
- 1968. Lower Talarik Creek was included in the "Bristol Bay Trophy Fish Area."
- 1969. Bag and possession limits reduced to 5 trout, only 1 over 20 inches in length. Helicopter access was forbidden, single hooks were required on tackle.
- 1974. The use of bait was prohibited during the summer months.
- 1977. Trophy Fish Area renamed the Bristol Bay Wild Trout Area, retaining the regulations accumulated since 1965.
- 1981. Gear was limited to single-hook artificial flies from June through October.
- 1984. Reduced the bag and possession limit to 2 rainbow trout, 1 over 20 inches.
- 1985. Reduced the bag limit to 1 rainbow trout during the summer.
- 1990. Adopted the *Southwest Alaska Rainbow Trout Management Plan*. Lower Talarik Creek was designated as a special management area, to be managed under fly-fishing-only, catch-and-release restrictions.

Of management concern is the disposition of the lands around Lower Talarik Creek. Although the state owns much of the land in the vicinity of Lower Talarik Creek, there exists a pending Native Allotment claim that could jeopardize long standing public access to this important fishery. The lands under state management are also deserving of attention as Department of Natural Resources, Division of Lands, considers the best blend of land uses for the area. Resolving land status issues, and preserving public access to the recreational fishery at Lower Talarik Creek, will very likely consume more time in the next several years than will the actual management of the sport fishery.

Management Objectives

The Lower Talarik Creek rainbow trout fishery is managed to maintain historical age and size composition and a diversity of angling opportunity by maintaining special management designation; fly-fishing-only catch and release.

1994 Season

Creel survey activities in 1994 covered the period September 2 to September 29. Results suggest sport fishing effort (2,462 angler hours) was up substantially from that observed in previous years

and well above the average (1,697 angler hours) for the recent 5 years (Table 19). Catch rates, typical for the fishery, were documented with anglers landing a seasonal average of 1.33 fish per hour (Table 19). The catch of 3,273 rainbow trout in 1994 was a new record for the fishery. Size composition of the catchable population appeared normal, many fish over 10 pounds were reported to have been landed.

1995 Outlook

Sport fishing opportunity at Lower Talarik Creek is expected to slow during the first weeks of the season in June. By late August and on through until freeze-up in early October fishing should be excellent. The number of large fish (in excess of 8 pounds) caught each season appears to be stable and overall catch rates are high for experienced anglers. The Division of Sport Fish will continue a fishery monitoring program using volunteer staff. No inseason changes to the regulations are anticipated for the 1995 season.

NAKNEK RIVER

Fishery Description

The Naknek River supports the largest rainbow trout sport fishery in the SWMA. The first significant recreational utilization of Naknek River stocks occurred in the mid-1950s when two recreational camps were constructed by the military for use by military personnel. The camps, one located at the outlet of Naknek Lake (Lake Camp) and one at the lower reach of the rapids (Rapids Camp) provided a base for significant sport fishing opportunity until 1974. Within that time period, civilians discovered the bountiful resources and effort continued to grow. By the mid 1980s there were approximately 12 guiding services working the river regularly with others less frequently. Boat rental and lodging services, available in King Salmon, provided the necessary support needed by the unguided angler.

The rainbow trout sport fishery takes place in the upper reach of the river upstream from Rapids Camp to the outlet of Naknek Lake and has three periods of activity associated with this fishery: March to April 10, June 8 to June 30, and August 15 to freeze-up in October.

Historical Performance

Estimates of harvest for rainbow trout from the Naknek River were first available in 1977 from the Statewide Harvest Survey (Table 18). These data suggest that harvest increased from about 600 in 1977 to a peak of 2,800 in 1984. Since 1984, harvest of Naknek River rainbow trout has declined to levels first observed in 1977. The recent 5-year average harvest of rainbow trout from the Naknek River is 751 and appears stable. Harvest alone, however, is not considered a reliable indicator of fishery performance for rainbow trout fisheries in Southwest Alaska. The combination of effort, catch, harvest, and size information derived from onsite surveys provides a much more comprehensive evaluation of fishery performance. Since 1978, the Division of Sport Fish has conducted surveys in the upper reach of the Naknek River during the fall (Table 20). These data demonstrate a clear and significant increase in effort and catch occurred over the 10-year study period, along with a significant drop in the proportion retained (Minard 1989a). Somewhat alarming was a declining trend in average size of the spawning stock and catchable population. It was apparent from the combination of creel survey and biological data available that the sport fishery was overharvesting the larger, older segment of the population. Comments received from the angling public were consistent with the department's findings.

Table 20.-Effort, harvest, catch, and catch rate statistics for anglers fishing the upper Naknek River during the period 15 August through 15 October 1978, 1981, 1983, 1984, 1987, 1988, and 1989. Length statistics of harvested rainbow trout during these years are also presented.

Year	Effort Ang-Hrs	Catch	Catch/ Hour	Harvest	Proportion Retained	Length (mm)		
						Mean	SE	SS
1978	1,896	847	0.45	248	0.29	484	20.2	55
1981	3,025	4,322	1.43	860	0.20	444	6.2	218
1983	6,755	4,182	0.62	1,452	0.35	430	5.7	135
1984	4,611	3,092	0.67	570	0.18	466	9.02	192
1987	4,450	4,779	1.07	434	0.09	423	9.3	81
1988	6,246	3,147	0.50	566	0.18	377	10.6	99
1989	7,249	7,120	0.98	407	0.06	430	15.1	72

Corrective actions in the form of reduced limits as well as size and methods restrictions were proposed to the Board and adopted in 1990 (Minard 1990). Since then, follow-up assessment work has indicated limited success (Dunaway 1994b). Results of a stock assessment program conducted in 1993 indicate the declining size has been arrested.

Management

Sport effort, catch, and harvest are estimated via the statewide harvest survey. Subsistence harvests, considered slight but not well monitored, are the responsibility of the Commercial Fisheries Management and Development Division. Onsite surveys yield detailed estimates of angler use and success. Biological information and demographic information are also collected. Significant stock assessment and creel survey results have been reported by Minard 1989a, Minard 1990, Dunaway 1994b).

There is a long history of special regulations for Naknek River rainbow trout stocks dating back to statehood. Seasons, limits, and gear restrictions were initially liberal. As effort increased, however, reports of declining catch rates and smaller size of the catchable population increased. Department studies conducted in the late 1980s verified the reported decline. Department staff presented the Alaska Board of Fisheries with a regulation package designed to allow the stock to recover while still maintaining substantial angling opportunity. Current regulations (ADF&G 1994a) allow for an open water harvest of 1 rainbow trout less than 18 inches in length and a winter season of 5 less than 18 inches in length. The spawning season closure is still in effect from April 10 to June 7, and only single-hook artificial lures may be used in the area above Rapids camp. The recovery package appears to be working. Reports from the angling public are consistently indicating that catch rates and average size are increasing.

Management Objectives

Naknek River rainbow trout stocks are being managed to restore the historical age and size composition reported in the 1980s.

1994 Season

No field data were collected concerning this fishery in 1994. Infrequent reports from anglers who offered their thoughts were variable. Some indicated a stable fishery while others complained the fishery was still depressed. The need for information about the status of this fishery has risen to the point where the department will be conducting a survey of the fishery in 1995. Results from this work will allow comparisons with data presented in Table 20.

1995 Outlook

Sport fishing for rainbow trout is expected to be good to excellent all season. The best fishing can be expected in mid June at the outlet of the lake and in the Rapids area. During this period, trout are drawn to these areas to feed on sockeye smolt as they migrate to sea. Fishing in early July with dry flies will be good, and then after a lull in late July, early August fishing will improve as the trout move into salmon spawning areas to feed on eggs and carcasses. The best fishing for large trout will occur from late September until freeze-up in October. No inseason adjustments to the fishery are anticipated in 1995. Fishery survey activities in the Naknek River are planned for the period August 15 to October 15 this season.

AGULOWAK RIVER

Fishery Description

The Agulowak River is located just inside the southern boundary of the Wood-Tikchik State Park. Though known primarily for its abundant Arctic char stocks, it is also one of the two most popular rainbow trout fisheries in the central section. As with other fisheries in the SWMA, development of the recreational fishery grew gradually from the 1950s, saw its first commercial lodge facility by the early 1960s, then grew significantly beginning in the early 1970s as more lodges were built and Alaskan fly-out fishing became popular. A unique characteristic of the Agulowak River is the relative ease of access from Bristol Bay's most populous city, Dillingham, and the village of Aleknagik. As consequence, the Agulowak River supports a much greater rate of local use than more remote waters within the section.

The rainbow trout sport fishery takes place throughout the open water period along the entire 3-mile length of the Agulowak River. Favored periods for catching rainbow trout are early summer before the sockeye and pink salmon runs begin and after mid-August when the trout feed on salmon eggs and carcasses. There may be limited fishing through the ice at the head of the river in winter.

Historical Performance

The Agulowak River has not received the regulatory attention like fisheries in the eastern section and little historical information is available. Informal investigations of the sport fishery in 1975, 1976, and 1977 suggested the river was receiving increased sport fishing effort, resulting in increased catches and harvests of rainbow trout. A formal creel survey program conducted on the Agulowak River in 1986, 1987, and 1988 (Minard 1989b) estimated angler effort to range from 3,582 to 6,397 angler-hours per year; estimated annual catches of 1,784 to 2,666 rainbow trout; and estimated harvests to range from 72 to 328 rainbow trout per year (Table 21). Analysis of the size and age data collected during the surveys suggested that the size composition of rainbow trout in the Agulowak River was shifting to the left, indicating the sport fishery may have been harvesting too many older aged fish (Minard 1990). These results prompted management actions to be taken and the fishery is presently in a state of recovery.

Management

Sport effort, catch, and harvest are estimated via the statewide harvest survey. Subsistence harvests, considered slight but not well monitored, are the responsibility of the Commercial Fisheries Management and Development Division. Onsite surveys yield detailed estimates of angler use and success. Biological information and demographic information are also collected. Significant stock assessment and creel survey results have been reported by Minard (1989b and 1990), and Dunaway (1993).

The following is a regulatory chronology for the Agulowak River:

- 1959. Year-round season and a bag limit of 15 fish per day, only 3 over 20 inches.
- 1962. Ten trout per day only 2 over 20 inches.
- 1972. Five rainbow trout, 1 over 20 inches.

Table 21.-Estimates of effort, catch, and harvest of rainbow trout from the sport fisheries in the Agulowak and Agulukpak Rivers, 1986-1988 and 1992.

Year	Location	Survey Dates	Effort		Rainbow Trout			
			Angler Hrs.	SE	Catch	SE	Harvest	SE
1986	Agulowak	6/19-8/23	3,732	533.3	1,784	266	84	15
1987	Agulowak	6/6-9/7	6,397	501.1	2,584	611	328	113
1988	Agulowak	6/6-9/6	3,582	360.9	2,666	618	72	31
1986	Agulukpak	6/29-8/22	1,826	208.8	1,322	151	0	0
1987	Agulukpak	6/17-9/16	4,265	57.5	3,692	25	2	0
1988	Agulukpak	6/14-9/16	3,685	45.9	2,884	48	0	0
1992	Agulukpak	8/1-9/22	2,759	53.6	1,862	72	0	0

- 1984. Season was split with a June 8 to October 31 bag limit of 2 rainbow trout, 1 over 20 inches per day, and a November 1 through June 7 limit of 5 fish per day, 1 over 20 inches long.
- 1990. Adoption of the *Southwest Alaska Rainbow Trout Management Plan*. Created the first special regulations for the Agulowak River. In response to conservation concerns raised by the department, summer bag limits were reduced to 1 rainbow trout daily and terminal tackle was limited to single-hook artificial lures.
- A 1992 stock assessment survey on the Agulowak River indicated that the 1990 regulations are having the desired effect. The project estimated 9,000 to 18,000 rainbow trout over 250 mm (10 inches) in the river and found the population to contain a significantly greater proportion of older fish than was observed in 1988, and size distributions approached those first recorded in the mid 1970s.

Management Objectives

Agulowak River rainbow trout stocks are being managed to restore the historical age and size composition reported in the 1980s.

1994 Season

No surveys were conducted on the Agulowak River rainbow trout fishery in 1994. Incidental contacts with anglers suggested that fishing was considered excellent.

1995 Outlook

Sport fishing for Agulowak River rainbow trout is expected to be good to excellent all season. No inseason management actions are anticipated in 1995.

AGULUKPAK RIVER

Fishery Description

The Agulukpak River is one of the best known rainbow trout fisheries west of the Kvichak River. The river is 2.4 km (1.5 miles) long and drains from Lake Beverly into Lake Nerka in the Wood-Tikchik State Park. The river's remote location and hazardous rocks in its lower section discourage boat access and most anglers come to the river via float equipped aircraft. Development of the Agulowak River fishery is virtually identical to the development of the Agulowak River, but other than one small cabin, no lodges were ever built close to the river. The wide, shallow, and easily waded upper section, clear water, remote location, and abundant rainbow trout, Arctic grayling, and Arctic char populations make the Agulukpak River a premier location for fly fishermen. The sport fishery occurs from spring until freeze-up, mainly in the upper mile of the river.

Historical Performance

The Agulukpak River has received slightly more attention than the Agulowak River fishery but historical quantitative information remains somewhat scarce. The remote location of the fishery and a tradition of conservative use by many of the visiting anglers have served to protect the Agulowak River rainbow trout population. Informal investigations of the sport fishery during 1976 and 1977 suggested that sport fishing effort, catch, and harvest were increasing. The first definitive work conducted on the Agulukpak River was a creel survey program during the seasons of 1986, 1987, and 1988 (Minard 1989b). Angler effort was estimated to range from 1,826 to 4,265 angler-hours per year; sport catch of rainbow trout ranged from 1,322 to 3,692

fish; and virtually no rainbow trout were harvested during the three seasons sampled (Table 21). The normal distributions of age and length of the fish sampled during the 3-year survey indicated the rainbow trout population was reasonably stable in the Agulukpak River.

Management

Sport effort, catch, and harvest are estimated via the statewide harvest survey. Subsistence harvests, considered slight but not well monitored, are the responsibility of the Commercial Fisheries Management and Development Division. Onsite surveys yield detailed estimates of angler use and success. Biological information and demographic information are also collected. Significant stock assessment and creel survey results have been reported by Minard (1989b and 1990), and Dunaway (1993).

The following is a regulatory chronology for the Agulowak River:

- 1959. Year-round season and a bag limit of 15 fish per day, only 3 over 20 inches.
- 1962. Ten trout per day only 2 over 20 inches.
- 1972. Five rainbow trout, 1 over 20 inches.
- 1984. Managed as a catch-and-release fishery with year round open season. Catch-and-release restriction limited to the upper half of the Agulukpak River.
- 1990. Adoption of the *Southwest Alaska Rainbow Trout Management Plan* in 1990 resulted in designation of the Agulukpak River as a special management area with regulations for the upper half of the river permitting only fly fishing gear from June 8 until August 31, and permitting the use of single-hook artificial lures from September 1 until October 31. In addition, the harvest of rainbow trout was not permitted in the special management area from June 8 until October 31, while the bag limit from November 1 until June 7 became 5 rainbow trout, 1 over 20 inches.

The designation as a special management area in 1990 served to preserve the traditional character of the sport fishery as well as to protect the stocks of rainbow trout in the face of the increasing effort observed during the surveys of 1986 through 1988.

During the fall of 1992, a rainbow trout stock assessment survey and a limited, 53-day creel survey were conducted on the Agulukpak River to gauge whether significant changes in the stock status or the fishery had occurred since 1988. The 1992 study estimated the population of rainbow trout in the upper half of the Agulukpak River to range between 1,764 and 3,128 fish greater than 340 mm (13 in) in length. A statistical comparison of the age and length data collected during 1987 and 1992 failed to detect any change in the rainbow trout size composition. Results from the 1992 creel survey showed 2,759 angler-hours of effort were spent to catch 1,862 rainbow trout (Table 21).

Management Objectives

The Agulukpak River rainbow trout fishery is managed to maintain historical age and size composition and a diversity of angling opportunity by maintaining special management designation; fly-fishing-only catch-and-release regulations.

1994 Season

No surveys were conducted on the Agulupak River rainbow trout fishery in 1994. Incidental contacts with anglers suggested that fishing was considered excellent, but dependent on water level and temperature.

1994 Outlook

In recent seasons, the recreational fishery for rainbow trout on the Agulupak River has been fair to excellent. Angler success was often moderate from early spring until mid autumn after the salmon began to spawn. Fall fishing is typically best after the peak of the salmon spawning until freeze-up. Comparison of the 1992 fishery with prior years' data indicate the present system of regulations adequately balances opportunity with stock conservation. No inseason changes are anticipated in 1995.

KANEKTOK RIVER

Fishery Description

One of the most popular rainbow trout fisheries in the SWMA occurs on the Kanektok River where abundant and brilliantly colored rainbow trout offer excellent angling opportunities. Mainly targeting salmon, the sport fishery grew very quickly since 1980 and subsequent conflicts between commercial and sport anglers drew statewide attention by the late 1980s. Recent changes in the management of the commercial fishery, and a nearly 75% drop in the level of sport fishing effort on the river, seem to have reduced the friction between the two groups.

Historical Performance

Estimates of effort and harvest have been generated from the Statewide Harvest Survey since 1983. Sport fishing effort climbed rapidly from 1,517 angler-days in 1983 to a peak of 12,697 in 1988, and then dropped markedly. Sport fishing effort for the period 1989 to 1993 averaged 4,150 angler-days, and appears stable (Table 3). Most effort is directed toward chinook and coho salmon but rainbow trout are an important attraction. The estimates of rainbow trout harvest are quite variable from year to year but averaged 155 rainbow trout per year from 1989 through 1993 (Table 18). The five onsite creel surveys conducted on the Kanektok River (Snellgrove *Unpublished*, Alt 1986, Minard 1987b, Minard 1990, Minard and Brookover 1988b, and Wagner 1991) by the department or the U.S. Fish and Wildlife Service targeted the salmon fisheries, and did not encompass enough of the season to produce a useful estimate of the harvest of rainbow trout.

Management

Sport effort, catch, and harvest are estimated via the statewide harvest survey. Subsistence harvests are not well monitored and are managed by the Commercial Fisheries Management and Development Division. Onsite surveys yield detailed estimates of angler use and success. Biological information and demographic information are also collected. Significant stock assessment and creel survey results have been reported by Snellgrove (*Unpublished*), Alt (1986), Minard (1987b and 1990), Minard and Brookover (1988b), and Wagner (1991).

Because of the low effort and harvest, little regulatory or management attention has been devoted to the Kanektok River rainbow trout stocks. The following is a regulatory chronology for the Kanektok rainbow trout fishery:

- 1969. Year-round open season and daily bag limit of 15 fish (including rainbow trout) of which no more than 3 could exceed 20 inches in length.
- 1985. Bag limit reduced to 2 fish per day of any size.
- 1990. Single-hook artificial lures required for the Kanektok River below the wilderness boundary of the Togiak National Wildlife Refuge. Sport fishing prohibited within 300 feet of a legally set subsistence gill net.

There have been no indications that further management actions are necessary, however occasional monitoring of the fishery would be prudent. Estimates of stock abundance would be useful in assessing stock status. Unfortunately the cost and lack of precision associated with such estimates diminish the likelihood they will be collected. The variety of salmon species which spawn in the river should impart a measure of stability to the population of Kanektok River rainbow trout by allowing it to be less dependent upon the success or failure of a single run of salmon.

Management Objectives

The Kanektok River rainbow trout fishery is managed to maintain historical age and size composition, and at abundance levels such that stocking is not needed to enhance or supplement the wild population.

1994 Season

No surveys were conducted on the Kanektok River rainbow trout fishery in 1994. Incidental contacts with anglers provided a large range of opinion on the status of the fishery. Sport fishing effort was reported to be up substantially from past years by U.S. Fish and Wildlife Service staff. Department surveys of the lower river chinook salmon fishery indicated that effort had increased over past years as well. Two commercial operators suggested that rainbow trout stocks in the Kanektok River are in decline.

1995 Outlook

The Kanektok River rainbow trout fishery has been good to excellent in recent years and there are no indications that 1995 should be different. Angling success on the Kanektok River in 1994 may depend most heavily on weather and water conditions. No inseason management actions are anticipated for the 1995 season.

NORTHWESTERN RAINBOW TROUT FISHERIES

Northwestern section rainbow trout are found in the Aniak, Kisaralik, and Kwethluk rivers, all of which flow northwesterly into the Kuskokwim River from the Kilbuck Mountains. Until recently, most of the sport effort in this section was limited to the residents of communities along the lower Kuskokwim River. Since 1983, the sport fishery has grown as guides and outfitters from Bristol Bay and within the Kuskokwim drainage offer more services on the Aniak River. The annual harvest of rainbow trout in the northwestern section has ranged from 892 fish in 1983 to as low as 18 fish in 1988 and has averaged less than 4% of the SWMA harvest since 1989 (Table 18).

Rainbow trout in the northwestern section are at the far extreme end of their range in North America and can be characterized as slow growing, small size at age, and not particularly abundant. The northwestern section's severe environment is assumed to make its rainbow trout

populations very sensitive to changes in climate and food availability. Sustaining a population which demonstrates such slow growth, low productivity, and environmental sensitivity typically requires conservative management strategies.

The Aniak River drainage is the only special management area found in the northwestern section. It is managed as a catch-and-release area above its confluence with the Doestock River, and terminal tackle is limited to unbaited single-hook artificial lures.

SECTION VII: OTHER SPECIES FISHERIES

Southwest Alaska offers diverse sport fishing opportunity for a large variety of species that often go unnoticed because of the publicity given the more popular species. Arctic char/Dolly Varden, Arctic grayling, lake trout, and chum salmon, to name four, are species that contribute to the sport fishing pleasures of many anglers who fish the area. Harvest estimates are made annually for these "other species" and trends are followed as for the more popular sport species. Estimates of harvest by species can be found in the Appendix of this report.

WOOD RIVER LAKES ARCTIC CHAR

Fishery Description

The recreational fishery for Arctic char in the Wood River Lakes is the largest fishery for this species in the SWMA. Before 1989, sport fishing effort in the Wood River Lakes averaged about 3,000 angler-days per year but since 1989 has averaged about 8,400 angler-days. Much of the effort is aimed at char and Dolly Varden, and the bulk of the sport harvest for these two species occurs at the mouths of the Agulowak and Agulukpak rivers.

Historical Performance

Abundance of Arctic char at the Agulowak was first estimated in 1954. Since that time, abundance has been estimated for the years 1971 through 1980. With the exception of 1980, abundance estimates indicated a very stable population of 8,000 to 12,000 Arctic char was present at the mouth of the Agulowak.

Similar, but less extensive data are available for the Agulukpak population. Abundance there was also stable, between 4,300 to 7,800 fish.

Harvest has averaged over 1,500 fish annually since 1988 and peaked in 1989 when an estimated 2,348 fish were taken. The vast majority of the harvest comes from the Agulowak River stock, the fishery at the Agulukpak is primarily catch and release although a liberal limit of 10 fish per day is allowed. Assuming the Agulowak stock suffers most of the harvest, exploitation of this stock has likely exceeded allowable limits.

Management

Sport effort, catch, and harvest are estimated via the statewide harvest survey. Subsistence harvests are not well monitored and are managed by the Commercial Fisheries Management and Development Division. Onsite surveys yield detailed estimates of angler use and success. Biological information and demographic information are also collected. Significant stock assessment and creel survey results have been reported by Minard (1989b) and Minard and Hasbrouck (1994).

Bag and possession limits are liberal, 10 fish per day, no size limit; bait is allowed in both the Agulukpak and Agulowak fisheries (ADF&G 1994a).

Management Objectives

The management objectives for this fishery are to:

1. maintain the Agulukpak stock at historic levels and sizes previously documented, and
2. to rebuild the Agulowak stock to previously reported levels observed in the 1980s.

Management objectives for the Agulowak River stock will be addressed by keeping exploitation rates to less than 10% of the available stock size and by minimizing mortality associated with catch-and-release fishing.

1994 Season

Based on studies conducted in 1993 and the subsequent assessment that the Agulowak Arctic char stock was depressed, an emergency order was issued pre-season that reduced bag and possession limit from 10 to 2, and restricted terminal tackle to single-hook artificial lures. A high profile informational campaign was initiated in an effort to alert anglers of the depressed condition of the Arctic char stock at the Agulowak and that emergency restrictions had been issued to address them. Periodic enforcement trips indicated a high degree of compliance with the emergency restrictions as well as a high degree of acceptance.

Sport fishing for Arctic char continued to be good throughout the 1994 season.

The department has drafted a regulation proposal for consideration by the Board of Fisheries in January of 1995. The department is recommending reduction of the bag and possession limits from 10 to 2 per day, and restricting the terminal tackle to single-hook artificial lures only.

1995 Outlook

Agulowak. Because the sport fishery is believed to be partially responsible for the decline in abundance of char at the Agulowak, restrictions on this fishery are anticipated in 1995. The regulation package will attempt to limit exploitation to 10% of the available stock; stock size was estimated to be 5,400 in 1993. Given the performance of the fishery over the last 5 years, a three-fold reduction in harvest will be necessary. As of yet, the 1995 management strategy to hold harvest to 500 to 600 fish per year has not been finalized.

Agulukpak. No regulation changes nor management actions are anticipated for 1995.

KUSKOKWIM RIVER CHUM SALMON

Fishery Description

Kuskokwim River chum salmon stocks are harvested primarily by subsistence and commercial user groups. Subsistence use of chum salmon has been documented as early as 1922 when sporadic surveys were first conducted (Francisco et al. 1993). The subsistence fishery is subject to few restrictions and most subsistence fishing is accomplished by the use of drift gill nets. Directed commercial harvests started in 1971. The chum salmon fishery was allowed to expand with management consisting of catch monitoring. In 1983, escapement-based management was instituted.

The sport fishery for Kuskokwim chum salmon is a very minor component of the overall harvest. Most of the harvest takes place in tributary streams and other small fisheries targeting chinook salmon. The Aniak, a tributary of the Kuskokwim, is the largest sport fishery for chum salmon and has averaged 593 fish per year since 1988 (Appendix A2).

Management

In 1983, chum salmon escapement goals were established for several Kuskokwim River tributary streams based on the average observed escapement in those waters since 1960. Basic to this management approach was the notion that achieving these goals should maintain salmon returns at historic levels, and that observing returns from these escapements would allow for adjustment

of the goals to achieve maximum sustained yield (Francisco et al. 1993). The lower portion of the Kuskokwim River is divided into two fishing districts, District 1 covering the Bethel Area and District 2 covering the area around Aniak. The Kuskokwim chum salmon subsistence and commercial fisheries continue to be managed for BEGs in several key tributaries.

Management Objectives

Kuskokwim River chum salmon stocks are managed to achieve biological escapements of 30,000 past the Kogrukluik weir, and 250,000 past the Aniak Sonar.

1994 Season

The 1994 chum salmon return to the Kuskokwim River was expected to be very poor based on parent year escapement estimates. To reduce exploitation of depressed Kuskokwim River chum salmon the department took action early in the season to restrict commercial and sport fisheries within the drainage. On June 9, the department issued Emergency Order No. 2-CS-5-10-94 that reduced bag and possession limits for chum salmon from 5 to 1 per day and in possession. This action, effective June 11, 1994, was part of a comprehensive harvest reduction strategy designed to reduce overall mortality on these stocks. The department issued notice that the commercial fishery would not be opened until indications from escapement monitoring projects indicated a harvestable surplus was available.

The department monitored run strength on the basis of the Bethel test fishery, and the Kuskokwim mainstem sonar projects. By the weekend of July 9 it was apparent that run strength had improved significantly and that escapement objectives for chum salmon would be met or exceeded. Test fishery results in Bethel and Aniak indicated chum salmon run strength was sufficient to meet escapement needs and sustain subsistence, sport and commercial fisheries. Aniak sonar counts also indicated a harvestable surplus of chum salmon existed in that system. As a result the department issued Emergency Order 2-CS-5-23-94 that reinstated the normal bag and possession limits for the sport fishery.

1995 Outlook

Chum salmon return to the Kuskokwim primarily at 5 and 4 years of age. The parent year escapements for the 1995 return will be 1990 and 1991. Near average numbers of chum salmon are expected to return to the Kuskokwim in 1995. Brood year escapements at Kogrukluik weir were below average which may result in below average returns early in the season. The bulk of the chum salmon production for the Kuskokwim River is attributed to the Aniak River. Aniak escapements in 1990 were 7% below objective and in 1991 were 26% above objective.

SECTION VIII: 1994 MANAGEMENT ACTIONS

Eight emergency orders affecting sport fisheries of the SWMA were issued in 1994. Three addressed sport fishing for chinook salmon, two addressed chum salmon, two addressed coho salmon, and one addressed Arctic char fisheries. The following is a list and brief description of those management actions.

Emergency Order No.	Explanation
<p>2-AC-5-04-94. Effective: 12:01 a.m. Wednesday, June 1, 1994.</p> <p>Issued May 11, 1994.</p>	<p>This emergency order restricts sport fishing in the Agulowak River and Lake Aleknagik by reducing the daily bag and possession limit for Arctic char from 10 to 2 per day, and requiring the use of single-hook artificial lures.</p>
<p>2-KS-5-03-94. Effective: 12:01 a.m. Wednesday, June 1, 1994.</p> <p>Issued May 11, 1994.</p>	<p>This emergency order restricts sport fishing in the Naknek River by closing portions of two tributaries, King Salmon and Paul's Creeks, to sport fishing from June 1 through July 31, 1994. This action is necessary to ensure adequate escapement of chinook salmon into these streams.</p>
<p>2-KS-5-06-94. Effective: 12:01 a.m. Wednesday, June 1, 1994.</p> <p>Issued May 24, 1994.</p>	<p>This emergency order supersedes emergency order 2-KS-5-03-94 and is intended to more clearly define areas and times that are closed to sport fishing in the Naknek River drainage.</p>
<p>2-CS-5-10-94. Effective: 12:01 a.m. Saturday, June 11, 1994.</p> <p>Issued June 9, 1994.</p>	<p>This emergency order reduces the sport bag limit of chum salmon in the Kuskokwim drainage from 5 per day and in possession to 1 per day and in possession. This action is necessary to reduce overall total mortality on Kuskokwim River chum salmon.</p>
<p>2-KS-2-15-94 Effective: 12:01 a.m. Thursday, June 23, 1994.</p> <p>Issued June 21, 1994.</p>	<p>This emergency order reduces bag and possession limits for king salmon in the Kanektok River from 3 per day and in possession of which only 2 may be over 28 inches in length, to 1 fish, no size limit. This action is necessary to ensure adequate escapement of chinook salmon into the Kanektok River.</p>

2-CS-5-23-94.
Effective: 12:01 a.m.
Thursday, July 14, 1994.

Issued July 13, 1994.

This emergency order rescinds emergency order 2-CS-5-10-94 issued on June 9, 1994. The effect of this action is to increase the bag and possession limits for chum salmon in the Kuskokwim drainage from 1 per day and in possession to the normal limit of 5 per day and in possession.

2-SS-5-35-94.
Effective: 12:01 a.m.
Tuesday, August 9, 1994.

Issued August 8, 1994.

This emergency order closes the sport fishery in the Nushagak drainage to fishing for coho salmon.

2-SS-5-38-94.
Effective 12:00 noon.
Friday, August 12, 1994.

Issued August 12, 1994.

This emergency order supersedes emergency order 2-SS-5-35-94 and reopens the sport fishery for coho salmon in the Nushagak and Mulchatna river drainages and allows a bag and possession limit of 3 coho salmon per day.

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APPENDIX A

Appendix A1.-Sport harvest of pink salmon from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	0	356	0	34	0	0	0	0	0 ^b
Egegik/Becharof	0	77	0	17	0	0	0	249 ^b	0 ^b
Naknek R.	0	1,723	0	818	0	859	0	1,584	0
Naknek L.	0	0	0	0	0	0	0	0	12 ^b
Bay of Islands							0	0	0
Brooks R.	0	0	0	0	0	0	0	50	0
Brooks L.									
American Cr.							0 ^b	0 ^b	12 ^b
King Salmon R.									
Kvichak R.	0	0	0	0	0	0	0	187	0
Copper R.	0	31	0	0	0	0	0	0 ^b	0 ^b
Alagnak R.					0	0	0	748	0
Newhalen R.	0	0	0	0	0	0	0	0	0
L Talarik Cr	0	0	0	0	0	0	0	0 ^b	0
Lake Clark	0	0	0	0	0	0	0	0	0
Lake Iliamna							0 ^b	0 ^b	0 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other							0	25	0
Subtotal	0	2,187	0	869	0	859	0	2,843	24
Central									
Nushagak	0	836	0	258	0	73	0	50	0
Mulchatna	0	0	0	0	0	0	0	12	0
Wood River L.	0	31	0	0	0	0	0	50	43
Tikchik L.	0	232	0	60	0	0	0	0	0
Koktuli R.									
Other					0	0	0	0	0
Subtotal	0	1,099	0	318	0	73	0	112	43
Western									
Togiak	0	0	0	112	0	210	10	25	0 ^b
Goodnews							168	78 ^b	0
Kanektok							210	195	0
Other							0	0	0
Subtotal	0	0	0	112	0	210	388	298	0
Northwestern									
Aniak							0 ^b	0 ^b	0 ^b
Kwethluk									
Other							0	0	0
Subtotal	0	0	0	0	0	0	0	0	0
Total	0	3,286	0	1,299	0	1,142	388	3,253	67

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Appendix A1.-Page 2 of 2.

Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	31 ^b	0	0 ^b	0	0	0	0	0	0
Egegik/Becharof	0 ^b	0 ^b	0 ^b	26	0	0	0	0	5
Naknek R.	3,089	23	2,939	26	512	10	119	9	135
Naknek L.	0 ^b	0	155 ^b	0	0	0	0	0	0
Bay of Islands	0	0	0 ^b	0	12	0	0	0	2
Brooks R.	0	0	0	26	97	0	101	0	45
Brooks L.					0	0	0	0	0
American Cr.	0 ^b	0 ^b	0 ^b	0	0	0 ^b	0	0	0
King Salmon R.							9	0	2
Kvichak R.	204	0	62	101	141	218	119	0	116
Copper R.	0 ^b	0 ^b	0 ^b	0	0	0	0	0	0
Alagnak R.	0	0	0 ^b	25	94	150	192	60	104
Newhalen R.	0	0	0	0	0	0	0	0	0
L Talarik Cr	0 ^b	0 ^b	0 ^b	0 ^b	0	0	0	0	0
Lake Clark	0	0	0 ^b	0	0	0	0	0	0
Lake Iliamna	0	0	0	25	0	0	0	43	14
Kulik R.							0	0	0
Tazimina R.							0	0	0
Moraine Cr.							0	0	0
Other	0	0	990	51	12	122	101	112	80
Subtotal	3,324	23	4,146	280	868	500	641	224	503
Central									
Nushagak	175	0	31	182	90	11	165	0	90
Mulchatna	0	109	62	26	0	0	0	0	5
Wood River L.	0	0	31	104	23	79	119	0	65
Tikchik L.	0 ^b	0 ^b	31	0	0	0	27	0	5
Koktuli R.							0	0	0
Other	0	0	0	0	23	0	0	0	5
Subtotal	175	109	155	312	136	90	311	0	170
Western									
Togiak	58	0 ^b	31 ^b	156	0	11	27	0	39
Goodnews	0 ^b	0 ^b	55 ^b	0	43 ^b	12	0	17	14
Kanektok	72	18	437	45	145	0	9	0	40
Other	0		218	0	0	0	0	0	0
Subtotal	130	18	741	201	188	23	36	17	93
Northwestern									
Aniak	0 ^b	0 ^b	182 ^b	34	29	0	156	10	46
Kwethluk							27	0	5
Other	0	0	0	0	130	12	27	0	34
Subtotal	0	0	182	34	159	12	210	10	85
Total	3,629	150	5,224	827	1,351	625	1,198	251	850

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

Appendix A2.-Sport harvest of chum salmon from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	0	20	0	0	0	0	0	0	0 ^b
Egegik/Becharof	0	78	0	0	0	0	0	37 ^b	0 ^b
Naknek R.	78	302	18	86	54	126	31	112	124
Naknek L.	0	0	0	0	0	0	0	0	0
Bay of Islands							0	0	0
Brooks R.	0	0	0	0	0	0	0	0	0
Brooks L.									
American Cr.							0 ^b	0 ^b	0 ^b
King Salmon R.									
Kvichak R.	0	0	9	9	0	0	0	37	0
Copper R.	0	0	0	0	0	0	0	0 ^b	0 ^b
Alagnak R.					108	0	0	287	53
Newhalen R.	0	0	0	0	0	0	0	0	0
L Talarik Cr	0	0	0	0	0	0	0	0 ^b	0
Lake Clark	0	117	0	9	0	0	0	0	0
Lake Iliamna							0 ^b	0 ^b	0 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other							10	0	12
Subtotal	78	517	27	104	162	126	41	473	189
Central									
Nushagak	24	117	64	17	130	293	336	399	72
Mulchatna	46	0	55	9	54	178	126	312	202
Wood River L.	0	0	0	0	0	0	0	12	58
Tikchik L.	0	39	0	0	11	10	0	0	0
Koktuli R.									
Other					0	0	52	0	0
Subtotal	70	156	119	26	195	481	514	723	332
Western									
Togiak	0	59	36	17	22	168	199	37	14 ^b
Goodnews							10	130 ^b	124
Kanektok							315	376	323 ^c
Other							0	0	0
Subtotal	0	59	36	17	22	168	524	543	461
Northwestern									
Aniak							115 ^b	26 ^b	75 ^b
Kwethluk									
Other							21	286	25
Subtotal	0	0	0	0	0	0	136	312	100
Total	148	732	182	147	379	775	1,215	2,051	1,082

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Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	61 ^b	104	0 ^b	26	0	0	8	0	7
Egegik/Becharof	0 ^b	0 ^b	93 ^b	26	0	0	8	0	7
Naknek R.	387	243	371	260	239	398	175	34	221
Naknek L.	0	0	0	0	0	0	0	0	0
Bay of Islands	0 ^b	0	0 ^b	26	0	20	8	0	11
Brooks R.	0	0	0	0	0	0	0	0	0
Brooks L.					0	0	0	0	0
American Cr.	0 ^b	0 ^b	0 ^b	0	0	0 ^b	0	0	0
King Salmon R.							0	0	0
Kvichak R.	0	27	31	278	81	306	0	17	136
Copper R.	0 ^b	0 ^b	0 ^b	0	0	0	0	0	0
Alagnak R.	68	219	31 ^b	50	219	227	448	545	298
Newhalen R.	0	0	0	0	0	0	0	0	0
L Talarik Cr	0 ^b	0 ^b	0 ^b	0 ^b	0	0	0	0	0
Lake Clark	0	0	0 ^b	0	0	0	0	0	0
Lake Iliamna	0	0	0	50	0	0	0	0	10
Kulik R.							0	0	0
Tazimina R.							0	0	0
Moraine Cr.							0	0	0
Other	0	35	186	260	0	73	30	0	73
Subtotal	516	628	712	976	539	1024	677	596	762
Central									
Nushagak	117	54	495	884	192	219	501	540	467
Mulchatna	321	55	124	156	203	55	175	133	144
Wood River L.	0	0	124	26	24	119	8	33	42
Tikchik L.	0 ^b	0 ^b	62	26	60	27	23	0	27
Koktuli R.							15	0	3
Other	29	55	31	26	0	0	0	26	10
Subtotal	467	164	836	1,118	479	420	722	732	694
Western									
Togiak	0	27 ^b	155 ^b	130	24	37	8	17	43
Goodnews	0 ^b	84 ^b	18 ^b	0	72 ^b	189	0	156	83
Kanektok	316 ^c	112 ^c	618	537	202	80	251	183	251
Other	0		73	26	0	0	0	0	5
Subtotal	316	223	864	693	298	306	259	356	382
Northwestern									
Aniak	98 ^b	70 ^b	91 ^b	1,140	159	169	304	101	375
Kwethluk							30	0	6
Other	98	167	36	525	259	80	183	17	213
Subtotal	196	237	127	1,665	418	249	517	118	593
Total	1,495	1,252	2,539	4,452	1,734	1,999	2,175	1,802	2,432

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

^c Estimates from intensive onsite creel survey.

Appendix A3.-Sport harvest of lake trout from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	14	45	9	9	11	10	10	37	52 ^b
Egegik/Becharof	0	0	0	0	0	0	0	12 ^b	0 ^b
Naknek R.	34	27	9	164	65	42	136	187	52
Naknek L.	23	0	18	155	130	84	105	25	17 ^b
Bay of Islands							52	312	121
Brooks R.	11	9	9	17	11	0	31	12	0
Brooks L.									
American Cr.							0 ^b	0 ^b	104 ^b
King Salmon R.									
Kvichak R.	0	0	0	0	0	0	0	62	0
Copper R.	0	0	0	0	0	0	0	0 ^b	0 ^b
Alagnak R.					0	0	0	0	0
Newhalen R.	0	0	0	0	0	0	0	0	15
L Talarik Cr	0	0	0	0	0	0	0	0 ^b	0
Lake Clark	122	118	518	172	410	430	273	786	59
Lake Iliamna							0 ^b	0 ^b	0 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other							94	112	548
Subtotal	204	199	563	517	627	566	701	1,545	968
Central									
Nushagak	0	0	0	0	0	0	0	25	0
Mulchatna	0	0	27	0	0	0	0	0	29
Wood River L.	0	0	0	0	0	0	42	0	0
Tikchik L.	28	45	45	69	194	10	21	87	58
Koktuli R.									
Other					0	0	1,259	37	0
Subtotal	28	45	72	69	194	10	1,322	149	87
Western									
Togiak	0	0	0	17	0	0	0	0	0 ^b
Goodnews							0	0 ^b	17
Kanektok							0	117	0
Other							0	52	0
Subtotal	0	0	0	17	0	0	0	169	17
Northwestern									
Aniak							0 ^b	0 ^b	0 ^b
Kwethluk									
Other							0	0	0
Subtotal	0	0	0	0	0	0	0	0	0
Total	232	244	635	603	821	576	2,023	1,863	1,072

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Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	3 ^b	172	0 ^b	114	33	17	39	72	55
Egegik/Becharof	0 ^b	21 ^b	0 ^b	10	0	0	0	9	4
Naknek R.	159	21	36	10	33	17	8	28	19
Naknek L.	40	236	109 ^b	0	11	17	39	29	19
Bay of Islands	76 ^b	150	73 ^b	42	11	68	39	40	40
Brooks R.	0	43	18	10	11	0	0	9	6
Brooks L.					535	85	116	28	153
American Cr.	0 ^b	0 ^b	0 ^b	10	11	0 ^b	8	0	6
King Salmon R.							0	0	0
Kvichak R.	0	0	36	30	0	14	0	0	9
Copper R.	0 ^b	0 ^b	0 ^b	10	0	0	0	0	2
Alagnak R.	1,257	0	73 ^b	20	74	14	8	83	40
Newhalen R.	0	0	0	20	21	127	39	20	45
L Talarik Cr	0 ^b	0 ^b	0 ^b	0 ^b	0	0	0	0	0
Lake Clark	714	137	18 ^b	485	402	113	247	219	293
Lake Iliamna	0	46	18	30	42	0	46	156	55
Kulik R.							0	0	0
Tazimina R.							0	0	0
Moraine Cr.							0	0	0
Other	144	422	199	238	93	110	294	207	188
Subtotal	2,393	1,248	580	1,029	1,277	582	883	900	934
Central									
Nushagak	0	46	0	42	0	0	8	31	16
Mulchatna	88	92	437	0	11	0	0	0	2
Wood River L.	0	0	0	0	0	0	0	51	10
Tikchik L.	0 ^b	275 ^b	327	437	176	86	31	192	184
Koktuli R.							0	0	0
Other	58	367	127	133	99	69	23	37	72
Subtotal	146	780	891	612	286	155	62	311	285
Western									
Togiak	0	0 ^b	0 ^b	10	0	0	39	0	10
Goodnews	0 ^b	14 ^b	0 ^b	38	0 ^b	0	0	9	9
Kanektok	9	14	0	959	0	0	0	0	192
Other	0		0	328	18	0	15	0	72
Subtotal	9	28	0	1,335	18	0	54	9	283
Northwestern									
Aniak	0 ^b	0 ^b	36 ^b	63	18	0	47	0	26
Kwethluk							0	0	0
Other	1,101	0	0	55	18	215	309	160	151
Subtotal	1,101	0	36	118	36	215	356	160	177
Total	3,649	2,056	1,507	3,094	1,617	952	1,355	1,380	1,680

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

Appendix A4.-Sport harvest of Dolly Varden/Arctic char from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	51	389	200	164	270	304	73	486	329 ^b
Egegik/Becharof	76	289	18	129	162	31	136	324 ^b	121 ^b
Naknek R.	195	127	527	1,679	1,609	786	808	2,831	416
Naknek L.	9	36	18	43	140	94	42	200	17 ^b
Bay of Islands							84	125	1,561
Brooks R.	71	90	0	9	0	0	27 ^c	0	17
Brooks L.									
American Cr.							10 ^b	0 ^b	191 ^b
King Salmon R.									
Kvichak R.	165	154	55	60	43	42	21	137	59
Copper R.	6	9	18	43	22	10	10	0 ^b	0 ^b
Alagnak R.					86	0	21	75	0
Newhalen R.	85	163	182	405	54	241	199	262	711
L Talarik Cr	6	9	9	69	65	0	10	0 ^b	0
Lake Clark	25	9	136	77	173	859	126	37	15
Lake Iliamna							31 ^b	623 ^b	341 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other	5						218	710	1,625
Subtotal	694	1,275	1,163	2,678	2,624	2,367	1,816	5,810	5,403
Central									
Nushagak	23	45	136	206	151	231	346	274	159
Mulchatna	102	217	100	52	119	52	325	137	72
Wood River L.	435	905	685	646	529	1,048	2,108	1,559	882
Tikchik L.	34	217	145	232	713	272	147	349	130
Koktuli R.									
Other					0	104	1,675	185	29
Subtotal	594	1,384	1,066	1,136	1,512	1,707	4,601	2,504	1,272
Western									
Togiak	133	72	236	560	345	671	1,007	758 ^c	178 ^c
Goodnews							147	195 ^b	780
Kanektok							1,406	1,116	815
Other							0	62	70
Subtotal	133	72	236	560	345	671	2,560	2,131	1,843
Northwestern									
Aniak							105 ^b	91 ^b	69 ^b
Kwethluk									
Other							1,227	130	35
Subtotal	0	0	0	0	0	0	1,332	221	104
Total	1,421	2,731	2,465	4,374	4,481	4,745	10,309	10,666	8,622

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Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	84 ^b	493	200 ^b	104	164	165	41	248	144
Egegik/Becharof	260 ^b	43 ^b	346 ^b	52	207	166	180	171	155
Naknek R.	1,506	13 ^c	101 ^c	51 ^c	939	580	721	568	572
Naknek L.	459	43	128 ^b	145	0	179	0	19	69
Bay of Islands	76 ^b	21	54 ^b	42	11	41	66	28	38
Brooks R.	0	21	18	20	0	0	0	0	4
Brooks L.					11	0	8	0	4
American Cr.	0 ^b	64 ^b	0 ^b	42	22	442 ^b	8	44	112
King Salmon R.							33	10	9
Kvichak R.	0	46	18	71	63	84	180	89	97
Copper R.	0 ^b	46 ^b	0 ^b	20	0	118	16	9	33
Alagnak R.	170	412	36 ^b	30	21	84	139	54	66
Newhalen R.	204	366	127	91	106	355	131	190	175
L Talarik Cr	0 ^b	0 ^c	36 ^b	10 ^c	0 ^c	84	82	0	35
Lake Clark	0	46	18 ^b	202	42	51	82	86	93
Lake Iliamna	204	92	18	30	63	51	98	106	70
Kulik R.							0	0	0
Tazimina R.							0	0	0
Moraine Cr.							0	0	0
Other	197	893	327	217	183	932	386	593	462
Subtotal	3,160	2,599	1,427	1,127	1,832	3,332	2,171	2,215	2,135
Central									
Nushagak	29	138	36	31	77	144	254	270	155
Mulchatna	117	46	291	41	165	131	172	200	142
Wood River L.	526	2,335	564	2,348	1,362	1,724	1,818	1,288	1,708
Tikchik L.	0 ^b	321 ^b	200	218	77	170	344	376	237
Koktuli R.							57	9	13
Other	29	642	36	145	638	39	41	47	182
Subtotal	701	3,482	1,127	2,783	2,319	2,208	2,686	2,190	2,437
Western									
Togiak	1,133 ^c	547 ^c	146 ^c	218	88	78	66	117	113
Goodnews	0 ^b	306 ^b	291 ^b	530	18 ^b	605	82	343	316
Kanektok	656 ^c	752	2,146	1,073	1,020	389	66	378	585
Other	0		327	288	0 ^b	0	41	0	66
Subtotal	1,789	1,605	2,910	2,109	1,126	1,072	255	838	1,080
Northwestern									
Aniak	245 ^b	56 ^b	764 ^b	808	598	547	115	260	466
Kwethluk							57	97	31
Other	98	237	0	655	89	476	433	334	397
Subtotal	343	293	764	1,463	687	1,023	605	691	894
Total	5,993	7,979	6,228	7,482	5,964	7,635	5,717	5,934	6,546

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

^c Estimates from intensive onsite creel survey.

Appendix A5.-Sport harvest of Arctic grayling from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	141	72	145	215	195	142	168	237	87 ^b
Egegik/Becharof	59	81	55	43	140	105	94	249 ^b	87 ^b
Naknek R.	484	398	300	1,128	799	796	1,007	1,297	347
Naknek L.	17	0	18	0	0	105	10	12	0
Bay of Islands							0	0	0
Brooks R.	50	63	73	26	43	0	21	12	69
Brooks L.									
American Cr.							0 ^b	0 ^b	139 ^b
King Salmon R.									
Kvichak R.	361	579	136	207	162	136	63	87	311
Copper R.	0	0	0	0	0	73	31	0 ^b	15 ^b
Alagnak R.					119	52	94	436	518
Newhalen R.	88	172	164	207	54	576	252	536	681
L Talarik Cr	60	36	18	86	65	63	10	0 ^b	0
Lake Clark	275	606	373	301	626	377	713	698	726
Lake Iliamna							0 ^b	0 ^b	0 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other			118				115	361	429
Subtotal	1,535	2,007	1,400	2,213	2,203	2,425	2,578	3,925	3,409
Central									
Nushagak	34	72	345	95	238	283	273	312	116
Mulchatna	59	443	227	103	324	1,373	462	461	347
Wood River L.	201	199	527	525	259	587	692	237	159
Tikchik L.	108	199	318	775	400	84	776	274	347
Koktuli R.									
Other					0	260	2,097	374	58
Subtotal	402	913	1,417	1,498	1,221	2,587	4,300	1,658	1,027
Western									
Togiak	26	18	200	241	43	31	315	150	0 ^b
Goodnews							178	104 ^b	416
Kanektok							231	169	87
Other							0	0	0
Subtotal	26	18	200	241	43	31	724	423	503
Northwestern									
Aniak							63 ^b	234 ^b	35 ^b
Kwethluk									
Other							1,364	26	746
Subtotal	0	0	0	0	0	0	1,427	260	781
Total	1,963	2,938	3,017	3,952	3,467	5,043	9,029	6,266	5,720

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Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	122 ^b	278	18 ^b	41	0	0	0	0	8
Egegik/Becharof	0 ^b	21 ^b	18 ^b	93	120	117	143	37	102
Naknek R.	474	213 ^c	157 ^c	128 ^c	197	337	316	501	296
Naknek L.	153	21	73 ^b	10	11	13	0	0	7
Bay of Islands	0 ^b	0	0 ^b	0	0	0	0	17	3
Brooks R.	0	21	36	42	11	52	0	0	21
Brooks L.					11	0	0	0	2
American Cr.	0 ^b	21 ^b	0 ^b	42	11	13 ^b	0	0	13
King Salmon R.							0	9	2
Kvichak R.	68	504	36	141	127	122	180	139	142
Copper R.	0 ^b	92 ^b	18 ^b	20	0	15	0	50	17
Alagnak R.	578	138	73 ^b	222	106	184	180	171	173
Newhalen R.	102	641	218	171	85	291	263	185	199
L Talarik Cr	9 ^c	19 ^c	18 ^b	0 ^c	0	31	23	0	11
Lake Clark	1,801	641	54 ^b	313	402	168	548	568	400
Lake Iliamna	0	46	0	30	42	0	8	101	36
Kulik R.							0	0	0
Tazimina R.							0	76	15
Moraine Cr.							0	0	0
Other	0	681	127	195	401	469	340	244	330
Subtotal	3,307	3,337	846	1,448	1,524	1,812	2,001	2,098	1,777
Central									
Nushagak	409	92	673	72	307	170	624	316	298
Mulchatna	438	870	1,037	260	285	425	210	762	388
Wood River L.	58	92	164	104	220	524	143	212	241
Tikchik L.	175 ^b	92 ^b	91	93	296	1,473	218	650	546
Koktuli R.							45	101	29
Other	380	2,107	200	287	604	312	136	69	282
Subtotal	1,460	3,253	2,165	816	1,712	2,904	1,376	2,110	1,784
Western									
Togiak	0	46 ^b	109 ^b	62	0	0	23	65	30
Goodnews	0 ^b	14 ^b	200 ^b	198	53 ^b	122	0	17	78
Kanektok	213	244	164	58	123	54	23	25	57
Other	0		255	0	0	0	128	0	26
Subtotal	213	304	728	318	176	176	174	107	190
Northwestern									
Aniak	318 ^b	111 ^b	273 ^b	909	422 ^b	1,085	121	288	565
Kwethluk							75	47	24
Other	195	237	200	734	71	773	295	208	416
Subtotal	513	348	473	1,643	493	1,858	491	543	1,006
Total	5,493	7,242	4,212	4,225	3,905	6,750	4,042	4,858	4,756

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

^c Estimates from intensive onsite creel survey.

Appendix A6.-Sport harvest of whitefish from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	0	0	0	0	0	0	0	0	0 ^b
Egegik/Becharof	0	0	0	0	0	0	0	0 ^b	0 ^b
Naknek R.	5	25	0	17	43	0	10	12	0
Naknek L.	0	0	0	0	0	0	0	0	0 ^b
Bay of Islands							0	0	0
Brooks R.	0	0	0	0	0	0	0	0	0
Brooks L.									
American Cr.							0 ^b	0 ^b	0 ^b
King Salmon R.									
Kvichak R.	0	0	0	0	0	0	0	25	0
Copper R.	0	0	0	0	0	0	0	0 ^b	0 ^b
Alagnak R.					0	0	0	25	0
Newhalen R.	0	0	0	0	0	0	0	0	0
L Talarik Cr	0	0	0	0	0	0	0	0 ^b	0
Lake Clark	3	0	0	0	140	168	168	75	805
Lake Iliamna							0 ^b	0 ^b	0 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other							0	0	350
Subtotal	8	25	0	17	183	168	178	137	1,155
Central									
Nushagak	0	0	0	0	0	0	0	0	0
Mulchatna	0	0	0	0	0	0	0	0	0
Wood River L.	0	0	0	0	0	0	0	12	0
Tikchik L.	0	0	0	0	0	0	0	125	0
Koktuli R.									
Other					0	0	0	0	0
Subtotal	0	0	0	0	0	0	0	137	0
Western									
Togiak	0	0	0	0	0	0	0	0	0 ^b
Goodnews							0	0 ^b	0
Kanektok							0	13	0
Other							0	0	0
Subtotal	0	0	0	0	0	0	0	13	0
Northwestern									
Aniak							0 ^b	0 ^b	0 ^b
Kwethluk									
Other							198	0	175
Subtotal	0	0	0	0	0	0	198	0	175
Total	8	25	0	17	183	168	376	287	1,330

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Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	0 ^b	21	0 ^b	0	0	0	0	0	0
Egegik/Becharof	0 ^b	0 ^b	0 ^b	0	0	0	0	0	0
Naknek R.	122	43	18	20	17	40	55	0	26
Naknek L.	0 ^b	21	0 ^b	0	0	0	0	0	0
Bay of Islands	0 ^b	0	0 ^b	0	0	0	0	0	0
Brooks R.	0	21	0	0	0	0	0	0	0
Brooks L.					0	0	0	0	0
American Cr.	0 ^b	0 ^b	0 ^b	10	0	0 ^b	0	0	2
King Salmon R.							0	0	0
Kvichak R.	0	0	18	10	0	0	46	0	11
Copper R.	0 ^b	0 ^b	0 ^b	10	0	0	0	0	2
Alagnak R.	34	46	0 ^b	10	17	0	0	16	9
Newhalen R.	0	0	0	10	67	0	0	0	15
L Talarik Cr	0 ^b	0 ^b	0 ^b	0 ^b	0	0	0	0	0
Lake Clark	680	0	18 ^b	10	501	136	166	26	168
Lake Iliamna	0	0	0	10	0	0	0	9	4
Kulik R.							0	0	0
Tazimina R.							0	0	0
Moraine Cr.							0	0	0
Other	34	0	18	0	33	0	9	44	17
Subtotal	870	152	72	90	635	176	276	95	254
Central									
Nushagak	88	0	36	20	208	140	74	174	123
Mulchatna	0	46	18	31	87	0	18	87	45
Wood River L.	0	0	0	20	521	0	0	35	115
Tikchik L.	0 ^b	0 ^b	0	10	0	0	9	0	4
Koktuli R.							0	0	0
Other	0	0	0	0	17	260	0	0	55
Subtotal	88	46	54	81	833	400	101	296	342
Western									
Togiak	0	0 ^b	0 ^b	20	0	0	0	0	4
Goodnews	0 ^b	0 ^b	0 ^b	0	0 ^b	0	0	0	0
Kanektok	0	0	18	0	0	24	0	0	5
Other	0		0	0	0	0	0	0	0
Subtotal	0	0	18	20	0	24	0	0	9
Northwestern									
Aniak	0 ^b	0 ^b	55 ^b	10	0	0	0	0	2
Kwethluk							0	0	0
Other	0	49	18	30	70	134	258	166	132
Subtotal	0	49	73	40	70	134	258	166	134
Total	958	247	217	231	1,538	734	635	557	739

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

Appendix A7.-Sport harvest of northern pike from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	0	0	0	0	0	0	0	0	17 ^b
Egegik/Becharof	0	0	0	0	0	0	0	0 ^b	0 ^b
Naknek R.	15	18	36	0	86	21	42	137	225
Naknek L.	12	9	9	26	22	63	21	0	17 ^b
Bay of Islands							10	62	35
Brooks R.	0	0	0	0	0	0	0	0	0
Brooks L.									
American Cr.							0 ^b	0 ^b	0 ^b
King Salmon R.									
Kvichak R.	0	0	0	0	0	0	0	0	15
Copper R.	0	0	18	0	0	0	0	12 ^b	0 ^b
Alagnak R.					0	42	21	224	0
Newhalen R.	0	18	45	34	22	115	0	0	0
L Talarik Cr	0	0	0	0	0	0	0	37 ^b	0
Lake Clark	43	54	127	43	162	409	84	87	104
Lake Iliamna							157 ^b	0 ^b	0 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other							0	1,409	0
Subtotal	70	99	235	103	292	650	335	1,968	413
Central									
Nushagak	5	63	9	26	43	42	178	50	202
Mulchatna	25	0	18	0	22	31	252	87	43
Wood River L.	3	18	100	95	0	0	315	12	14
Tikchik L.	8	199	0	52	76	0	73	125	14
Koktuli R.									
Other					0	0	241	100	0
Subtotal	41	280	127	173	141	73	1,059	374	273
Western									
Togiak	12	0	0	0	0	84	0	25	0 ^b
Goodnews							0	0 ^b	0
Kanektok							0	0	0
Other							0	0	0
Subtotal	12	0	0	0	0	84	0	25	0
Northwestern									
Aniak							42 ^b	78 ^b	17 ^b
Kwethluk									
Other							1,322	403	277
Subtotal	0	0	0	0	0	0	1,364	481	294
Total	123	379	362	276	433	807	2,758	2,848	980

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Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	0 ^b	64	0 ^b	31	11	0	17	19	16
Egegik/Becharof	18 ^b	0 ^b	0 ^b	0	0	0	0	0	0
Naknek R.	171	64	18	62	175	0	68	0	61
Naknek L.	0	21	0 ^b	10	0	62	68	0	28
Bay of Islands	15 ^b	64	0 ^b	41	22	31	60	75	46
Brooks R.	0	0	0	0	0	0	0	0	0
Brooks L.					0	0	0	0	0
American Cr.	0 ^b	0 ^b	0 ^b	0	0	0 ^b	0	8	2
King Salmon R.							0	0	0
Kvichak R.	68	0	0	50	0	65	60	17	38
Copper R.	0 ^b	0 ^b	0 ^b	0	0	0	0	0	0
Alagnak R.	34	0	0 ^b	20	63	98	145	0	65
Newhalen R.	0	0	0	0	0	33	0	0	7
L Talarik Cr	0 ^b	0 ^b	0 ^b	0 ^b	0	0	0	0	0
Lake Clark	0	46	0 ^b	40	85	196	162	247	146
Lake Iliamna	68	229	18	0	32	0	51	0	17
Kulik R.							0	0	0
Tazimina R.							0	0	0
Moraine Cr.							0	0	0
Other	18	43	18	102	0	227	274	27	126
Subtotal	392	531	54	356	388	712	905	393	551
Central									
Nushagak	58	595	127	343	110	604	393	508	392
Mulchatna	146	46	91	31	44	14	26	74	38
Wood River L.	0	916	36	374	99	503	333	139	290
Tikchik L.	0 ^b	0 ^b	18	62	0	72	9	9	30
Koktuli R.							0	0	0
Other	88	92	36	93	77	57	0	0	45
Subtotal	292	1,649	308	903	330	1,250	761	730	795
Western									
Togiak	29	0 ^b	18 ^b	0	44	0	9	17	14
Goodnews	0 ^b	0 ^b	0 ^b	0	0 ^b	0	0	0	0
Kanektok	0	0	18	23	0	0	0	0	5
Other	0		0	0	0	0	0	0	0
Subtotal	29	0	36	23	44	0	9	17	19
Northwestern									
Aniak	98 ^b	125 ^b	127 ^b	70	18	244	43	0	75
Kwethluk							60	329	78
Other	24	126	36	781	124	294	182	170	310
Subtotal	122	251	163	851	142	538	285	499	463
Total	835	2,431	561	2,133	904	2,500	1,960	1,639	1,827

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

Appendix A8.-Sport harvest of burbot from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	0	0	0	0	0	0	0	0	0 ^b
Egegik/Becharof	0	0	0	0	0	0	0	0	0 ^b
Naknek R.	0	0	0	0	11	0	0	0	0
Naknek L.	0	0	0	0	0	0	10	0	0 ^b
Bay of Islands							0	0	0
Brooks R.	0	0	0	0	0	0	0	0	0
Brooks L.									
American Cr.							0 ^b	0 ^b	0 ^b
King Salmon R.									
Kvichak R.	0	0	0	0	0	0	0	12	0
Copper R.	0	0	0	0	0	0	0	0 ^b	0 ^b
Alagnak R.					0	0	0	0	0
Newhalen R.	0	0	0	0	0	0	0	0	0
L Talarik Cr	0	0	0	0	0	0	0	0 ^b	0
Lake Clark	0	0	227	0	0	0	0	112	105
Lake Iliamna							0 ^b	0 ^b	0 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other							0	0	700
Subtotal	0	0	227	0	0	0	0	124	805
Central									
Nushagak	0	0	0	0	0	0	0	0	0
Mulchatna	0	0	0	0	0	0	0	0	0
Wood River L.	0	0	0	0	0	0	0	0	0
Tikchik L.	0	0	0	0	0	0	0	0	0
Koktuli R.									
Other					0	0	0	0	0
Subtotal	0	0	0	0	0	0	0	0	0
Western									
Togiak	0	0	0	0	0	0	0	0	0 ^b
Goodnews							0	0 ^b	0
Kanektok							0	0	0
Other							0	0	0
Subtotal	0	0	0	0	0	0	0	0	0
Northwestern									
Aniak							0 ^b	0 ^b	0 ^b
Kwethluk									
Other							189	0	35
Subtotal	0	0	0	0	0	0	189	0	35
Total	0	0	227	0	0	0	189	124	840

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Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	0 ^b	0	0 ^b	0	0	0	0	0	0
Egegik/Becharof	0 ^b	0 ^b	0 ^b	0	0	0	0	0	0
Naknek R.	76	0	0	0	0	0	0	0	0
Naknek L.	0	0	0 ^b	0	0	0	0	0	0
Bay of Islands	0 ^b	0	0 ^b	0	0	0	0	0	0
Brooks R.	0	0	0	0	0	0	0	0	0
Brooks L.					0	0	0	0	0
American Cr.	0 ^b	0 ^b	0 ^b	0	0	0 ^b	0	0	0
King Salmon R.							0	0	0
Kvichak R.	0	0	0	0	0	0	0	0	0
Copper R.	0 ^b	0 ^b	0 ^b	0	0	0	0	0	0
Alagnak R.	0	0	0 ^b	0	0	0	0	0	0
Newhalen R.	0	0	0	0	0	0	0	0	0
L Talarik Cr	0 ^b	0 ^b	0 ^b	0 ^b	0	0	0	0	0
Lake Clark	204	0	18 ^b	0	100	53	0	0	31
Lake Iliamna	0	0	0	0	0	0	0	0	0
Kulik R.							0	0	0
Tazimina R.							0	0	0
Moraine Cr.							0	0	0
Other	0	0	0	0	0	0	0	0	0
Subtotal	204	0	18	0	100	53	0	0	31
Central									
Nushagak	0	0	0	0	0	0	0	0	0
Mulchatna	0	0	0	0	17	0	0	0	3
Wood River L.	0	0	0	0	0	0	0	0	0
Tikchik L.	0 ^b	0 ^b	0	0	0	0	0	0	0
Koktuli R.							0	0	0
Other	29	0	0	0	0	0	0	0	0
Subtotal	29	0	0	0	17	0	0	0	3
Western									
Togiak	0	0 ^b	0 ^b	0	0	0	0	0	0
Goodnews	0 ^b	0 ^b	0 ^b	0	0 ^b	0	0	0	0
Kanektok	0	0	0	0	0	0	0	0	0
Other	0		0	0	0	0	0	0	0
Subtotal	0	0	0	0	0	0	0	0	0
Northwestern									
Aniak	0 ^b	70 ^b	0 ^b	0	0	0	0	0	0
Kwethluk							0	107	21
Other	122	14	91	0	1,125	40	169	107	288
Subtotal	122	84	91	0	1,125	40	169	214	310
Total	355	84	109	0	1,242	93	169	214	344

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.

Appendix A9.-Sport harvest of smelt from waters of Southwest Alaska, 1977-1993.^a

Drainage	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern									
Ugashik	0	0	0	0	0	0	0	0	0 ^b
Egegik/Becharof	0	0	0	0	0	0	0	873 ^b	175 ^b
Naknek R.	6,434	1,077	65,238	30,764	5,778	14,547	3,902	6,986	7,420
Naknek L.	0	0	0	0	0	0	0	0	0 ^b
Bay of Islands							0	0	0
Brooks R.	0	0	0	0	0	0	0	0	0
Brooks L.									
American Cr.							0 ^b	0 ^b	0 ^b
King Salmon R.									
Kvichak R.	0	0	0	0	0	0	0	0	0
Copper R.	0	0	0	0	0	0	0	0 ^b	0 ^b
Alagnak R.					0	0	0	0	0
Newhalen R.	0	0	0	0	0	0	0	0	0
L Talarik Cr	0	0	0	0	0	0	0	0 ^b	0
Lake Clark	0	0	0	0	0	0	0	0	0
Lake Iliamna							0 ^b	0 ^b	0 ^b
Kulik R.									
Tazimina R.									
Moraine Cr.									
Other							0	0	8,750
Subtotal	6,434	1,077	65,238	30,764	5,778	14,547	3,902	7,859	16,345
Central									
Nushagak	5,630	757	0	0	0	0	0	0	0
Mulchatna	0	0	0	0	0	0	0	0	0
Wood River L.	0	0	0	0	0	0	0	0	0
Tikchik L.	0	0	0	0	0	0	0	0	0
Koktuli R.									
Other					0	0	0	0	0
Subtotal	5,630	757	0	0	0	0	0	0	0
Western									
Togiak	0	0	0	0	0	0	0	0	0 ^b
Goodnews							0	0 ^b	0
Kanektok							0	0	0
Other					0		0	0	0
Subtotal	0	0	0	0	0	0	0	0	0
Northwestern									
Aniak							0 ^b	0 ^b	0 ^b
Kwethluk									
Other							0	0	1,750
Subtotal	0	0	0	0	0	0	0	0	1,750
Total	12,064	1,834	65,238	30,764	5,778	14,547	3,902	7,859	18,095

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Drainage	1986	1987	1988	1989	1990	1991	1992	1993	5 Year Average
Eastern									
Ugashik	0 ^b	0	0 ^b	0	0	530	0	0	106
Egegik/Becharof	0 ^b	0 ^b	0 ^b	0	1,724	398	541	0	533
Naknek R.	1,284	21	30,321	4,456	1,448	14,321	14,235	2,704	7,433
Naknek L.	0	0	0 ^b	0	0	0	0	0	0
Bay of Islands	0 ^b	0	0 ^b	0	0	0	0	0	0
Brooks R.	0	0	0	0	0	0	0	0	0
Brooks L.					0	0	0	0	0
American Cr.	0 ^b	0 ^b	0 ^b	0	0	0 ^b	0	0	0
King Salmon R.							0	0	0
Kvichak R.	0	0	0	0	0	0	0	0	0
Copper R.	0 ^b	0 ^b	0 ^b	0	0	0	0	0	0
Alagnak R.	0	0	0 ^b	0	0	0	0	0	0
Newhalen R.	0	0	0	0	0	0	0	0	0
L Talarik Cr	0 ^b	0 ^b	0 ^b	0 ^b	0	0	0	0	0
Lake Clark	0	0	0 ^b	0	0	0	0	0	0
Lake Iliamna	0	0	0	0	0	0	0	0	0
Kulik R.							0	0	0
Tazimina R.							0	0	0
Moraine Cr.							0	0	0
Other	0	21	0	0	0	0	0	0	0
Subtotal	1,284	42	30,321	4,456	3,172	15,249	14,776	2,704	8,071
Central									
Nushagak	0	46	0	14,980	1,736	2,946	4,976	0	4,928
Mulchatna	0	0	0	0	0	0	0	0	0
Wood River L.	0	0	31	20,568	521	2,970	1,190	2,446	5,539
Tikchik L.	0 ^b	0 ^b	0	0	0	0	0	0	0
Koktuli R.							0	0	0
Other	0	0	0	13,712	0	0	0	48	2,752
Subtotal	0	46	31	49,260	2,257	5,916	6,166	2,494	13,219
Western									
Togiak	0	0 ^b	0 ^b	2,571	0	0	0	0	514
Goodnews	0 ^b	0	0	0	0				
Kanektok	0	0	248	0	211	0	0	0	42
Other	0		0	189	0	0	0	0	38
Subtotal	0	0	248	2,760	211	0	0	0	594
Northwestern									
Aniak	0 ^b	0 ^b	0 ^b	0	0	0	0	0	0
Kwethluk							0	1,211	242
Other	0	0	0	1,135	0	0	1,136	1,049	664
Subtotal	0	0	0	1,135	0	0	1,136	2,260	906
Total	1,284	88	30,600	57,611	5,640	21,165	22,078	7,458	22,790

^a Estimates from statewide harvest survey with 12 or more responses.

^b Estimates from statewide harvest survey with less than 12 responses are less reliable.