

Fishery Management Report No. 01-2

**Fishery Management Report for Sport Fisheries in the
Lower Yukon and Lower Kuskokwim Management
Area for 1999 and 2000**

by

Robert Lafferty

March 2001

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. 01-2

**FISHERY MANAGEMENT REPORT FOR SPORT FISHERIES IN THE
LOWER YUKON-LOWER KUSKOKWIM MANAGEMENT AREA FOR
1999 AND 2000**

by

Robert Lafferty
Division of Sport Fish, Bethel

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1599

March 2001

This investigation was partially financed by the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777K) under Project F-10-15.

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. Fishery Management Reports are available through the Alaska State Library and on the Internet: <http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm>. This publication has undergone regional peer review.

Robert Lafferty
Alaska Department of Fish and Game, Division of Sport Fish
P.O. Box 1467, Bethel, AK 99559-1467, USA

This document should be cited as:

Lafferty, Robert, 2001. Fishery Management Report for Sport Fisheries in the Lower Yukon - Lower Kuskokwim Management Area for 1999. Alaska Department of Fish and Game, Fishery Management Report Series No. 01-2, Anchorage.

The Alaska Department of Fish and Game administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information please write to ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; U.S. Fish and Wildlife Service, 4040 N. Fairfax Drive, Suite 300 Webb, Arlington, VA 22203 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-4120, (TDD) 907-465-3646, or (FAX) 907-465-2440.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	ii
LIST OF FIGURES	iii
LIST OF APPENDICES.....	iii
PREFACE.....	1
INTRODUCTION.....	1
SECTION I - MANAGEMENT AREA OVERVIEW	2
Description of the Area.....	2
Regulatory Process	2
Statewide Harvest Survey	7
Sport Fishing Effort	7
Sport Fishing Harvest	8
Management Plans.....	9
Salmon Management Plans	9
Recent Changes.....	9
Resident Fish Management Plans.....	11
Biological, Social and Land Use Issues.....	14
Current Management and Research Activities	15
Access Projects.....	15
Information and Education Sources.....	15
SECTION II: EFFORT.....	16
Description of Statewide Harvest Survey	16
Overview of Area Effort.....	16
Angler Effort in 1999.....	18
SECTION III: FISHERIES.....	18
Salmon Fisheries.....	18
Chinook Salmon Fishery Description	18
Coho Salmon Fishery Description	26
Chum Salmon Fishery Description	32
Resident Species Fisheries.....	36
Rainbow Trout Fishery Description.....	36
Dolly Varden/Arctic Char Fishery Description.....	43
Arctic Grayling Fishery Description Aniak/Kisaralik.....	47
Northern Pike Fishery Description.....	50
Sheefish Fishery Description	52
Lake Trout Fishery.....	54
Burbot Fishery Description.....	57
ACKNOWLEDGEMENTS.....	59
LITERATURE CITED.....	59

LIST OF TABLES

Table	Page
1. Annual sport fishing effort, in angler days, within the state of Alaska, Arctic-Yukon-Kuskokwim region and lower Yukon and lower Kuskokwim Management Area waters as estimated by the SWHS, 1977-1999.....	8
2. Kuskokwim-Kuskokwim Bay drainage sport fish harvest by fish species, 1989-1999	10
3. Angler effort (angler days) in the lower Kuskokwim River and Kuskokwim Bay area of Alaska, 1983-1999.....	17
4. Peak aerial survey counts of chinook salmon in indexed Kuskokwim River spawning tributaries, 1975-2000.....	20
5. Chinook salmon commercial, subsistence, and sport harvests and escapement for the Kanektok River fishery, 1960-1999.....	21
6. Chinook salmon commercial, subsistence, and sport harvest plus escapement for the Goodnews river fishery, 1981-1999.....	23
7. Chinook salmon harvests and catches by anglers in the Kanektok, Goodnews, Arolik, and other rivers within the Kuskokwim Bay area during 1983-1999.	24
8. Chinook salmon harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.....	25
9. Coho salmon commercial, subsistence, and sport harvest plus escapement for the Kanektok River fishery, 1983-1999.....	28
10. Coho salmon harvests and catches by anglers in the Kanektok, Goodnews, Arolik and other rivers within the Kuskokwim Bay area during 1983-1999.	30
11. Coho salmon harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.....	31
12. Chum salmon harvests and catches by anglers in the Kanektok, Goodnews, Arolik and other rivers within the Kuskokwim Bay area during 1983-1999.	33
13. Chum salmon harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.....	34
14. Rainbow trout harvests and catches by anglers in the Kanektok, Goodnews, Arolik and other rivers within the Kuskokwim Bay area during 1983-1999.	38
15. Rainbow trout harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.....	39
16. Dolly Varden / Arctic char harvests and catches by anglers in the Kanektok, Goodnews, Arolik and other rivers within the Kuskokwim Bay area during 1983-1999.	45
17. Dolly Varden / Arctic char harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.....	46
18. Arctic grayling harvests and catches by anglers in the Kanektok, Goodnews, Arolik and other rivers within the Kuskokwim Bay area during 1983-1999.	48
19. Arctic grayling harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.....	49
20. Northern pike harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999	51
21. Sheefish harvests and catches by anglers in the Aniak, Kiskaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.....	53
22. Lake trout harvests and catches by anglers in the Kanektok, Goodnews, Arolik and other rivers within the Kuskokwim Bay area during 1983-1999.	55
23. Lake trout harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.....	56
24. Burbot harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.....	58

LIST OF FIGURES

Figure		Page
1.	Lower Yukon /Lower Kuskokwim Area.....	3
2.	Lower Yukon River Area.	4
3.	Lower Kuskokwim River Area.....	5
4.	Kuskokwim Bay Area.....	6
5.	Aniak River Drainage.....	41

PREFACE

The Division of Sport Fisheries (SF) of the Alaska Department of Fish and Game (ADF&G) is responsible for the management of the sport fisheries and resident fish populations and several marine fish species within the lower Yukon / lower Kuskokwim rivers and Kuskokwim Bay. Salmon management in this area is a cooperative effort between the Divisions of Commercial Fisheries, Subsistence, and Sport Fisheries with consultation with the appropriate Federal managers.

This is first of a series of Annual Management Reports (AMR) detailing the management activities of the Sport Fisheries in the lower Yukon / lower Kuskokwim rivers and Kuskokwim Bay area.

Information within this report represents Sport Fisheries Division's most recent work to define and update the catch, harvest and angler effort of sport fisheries in the lower Yukon/lower Kuskokwim management area. Catch, harvest and angler effort statistics were coalesced from Statewide Harvest Summaries, Survey and Inventory Reports, and department reports from Fishery Data, Management and Manuscript Series. The department regards this report as the most comprehensive source of sport fishing information for the lower Yukon /lower Kuskokwim Management Area. Funding support for the sole office located in Bethel is derived from Fish and Game general funds.

INTRODUCTION

This is the first Area Management Report (AMR) coalescing fishery statistics for the sport fisheries of the lower Yukon / lower Kuskokwim Management Area (LYLK). Prior to 2000, the LYLK was previously shared between the Southcentral and Arctic-Yukon- Kuskokwim (AYK) sport fisheries regions. This management area was created in part because of concerns by local residents regarding fish populations and increased development of sport fisheries. Previous information regarding this management area can be located in the AMR's of Bristol Bay and AYK.

The first section contains a management overview of the area sport fisheries. This section includes brief descriptions of the management area, the regulatory process governing sport fishery regulations, statewide harvest survey and effort information. Additionally, this section contains information on management plans, current biological, social and land use issues within the management area. This section concludes with management, research, access projects and information sources within the area.

The focus of Section II is solely directed to angler effort within the management area. A short review of the statewide harvest survey and specific angler effort of important area fisheries is represented in this section of the AMR.

Descriptions of the primary sport fisheries of the LYLK are located in Section III which is partitioned into two sub-sections: salmon, and resident fish species. Although there are five species of Pacific salmon in both the Yukon and Kuskokwim rivers, this sub-section only addresses the sport fisheries for chinook, coho and chum salmon. The resident fish species sub-section, addresses seven fisheries; these include rainbow trout, Dolly Varden/ Arctic char, Arctic grayling, northern pike, sheefish, lake trout, and burbot. Each fishery description will include a

historical perspective, management goals and objectives in addition to a brief summary and outlook for the upcoming year.

SECTION I – MANAGEMENT AREA OVERVIEW

DESCRIPTION OF THE AREA

The Lower Yukon / Lower Kuskokwim Management Area (LYLK) includes those drainages downstream from Paimiut on the Yukon River and downstream from the Aniak River on the Kuskokwim River and all drainages in Kuskokwim Bay (Figure 1). Additionally, the LYLK includes all drainages that flow into the Bering Sea from Cape Newenham on the south and including the Pastolik River drainage on the north; Nunivak and St. Matthew and adjacent islands are also included within the area as well.

The LYLK is partitioned into three sections; the lower Yukon River (Figure 2), lower Kuskokwim River (Figure 3), and Kuskokwim Bay (Figure 4).

Within the LYLK are two National Wildlife Refuges, the Yukon-Kuskokwim Delta Refuge and the Togiak Refuge. The entire 26 million acres of the Yukon-Kuskokwim Delta Refuge is within the LYLK as are several thousand acres of the Togiak Refuge.

REGULATORY PROCESS

The regulatory process for fisheries management in the state of Alaska has become increasingly complex. Currently wildlife and fisheries resources of the State are under dual management by State and Federal authorities. The dichotomy between agencies is quite simple, the State of Alaska constitution recognizes that all citizens should have equal access to the resources of the State. The Federal governments role is dictated by the Alaska Native Interest Lands Conservation Act (ANILCA) where rural preference is given during periods of wildlife and fisheries resource shortages. This dual management system has been implemented while pending litigation between the State of Alaska and Federal government continues. In the interim, both federal and state fishery and wildlife agencies are making efforts to cooperate regarding fish and wildlife resource management with memorandums of understanding and management protocols defining roles of each agency.

On Federal lands and non-navigable waters within federal land holdings rural subsistence priorities are the primary goal of federal managers. Federal managers are mandated to maintain healthy populations of wildlife and fish on Federal lands and non-navigable waters with a rural subsistence priority. In contrast, the State is mandated to manage for sustained yield based on the Alaska constitution for all the people of the state. Many of the fish and wildlife species in Alaska migrate vast distances and do not recognize the boundaries between state and federal authority. Therefore, both state and federal management agencies have begun a cooperative effort to co-manage fish and wildlife resources on their respective lands and waters within the State of Alaska.

Fish and wildlife managers of the department use biological and harvest information to determine levels of harvestable surpluses of fish and game or aquatic plant resources that are

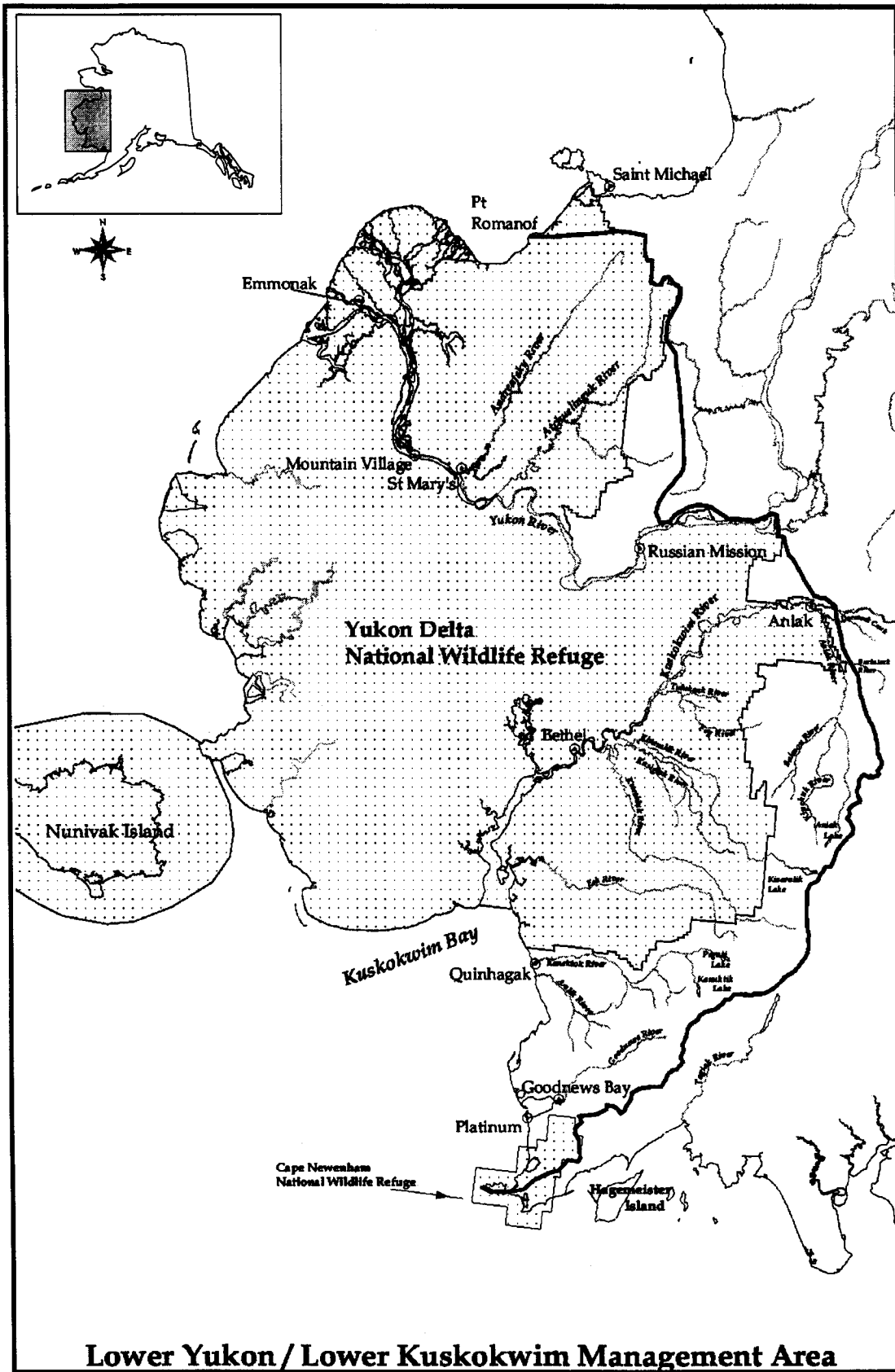


Figure 1.-Lower Yukon/Lower Kuskokwim area.

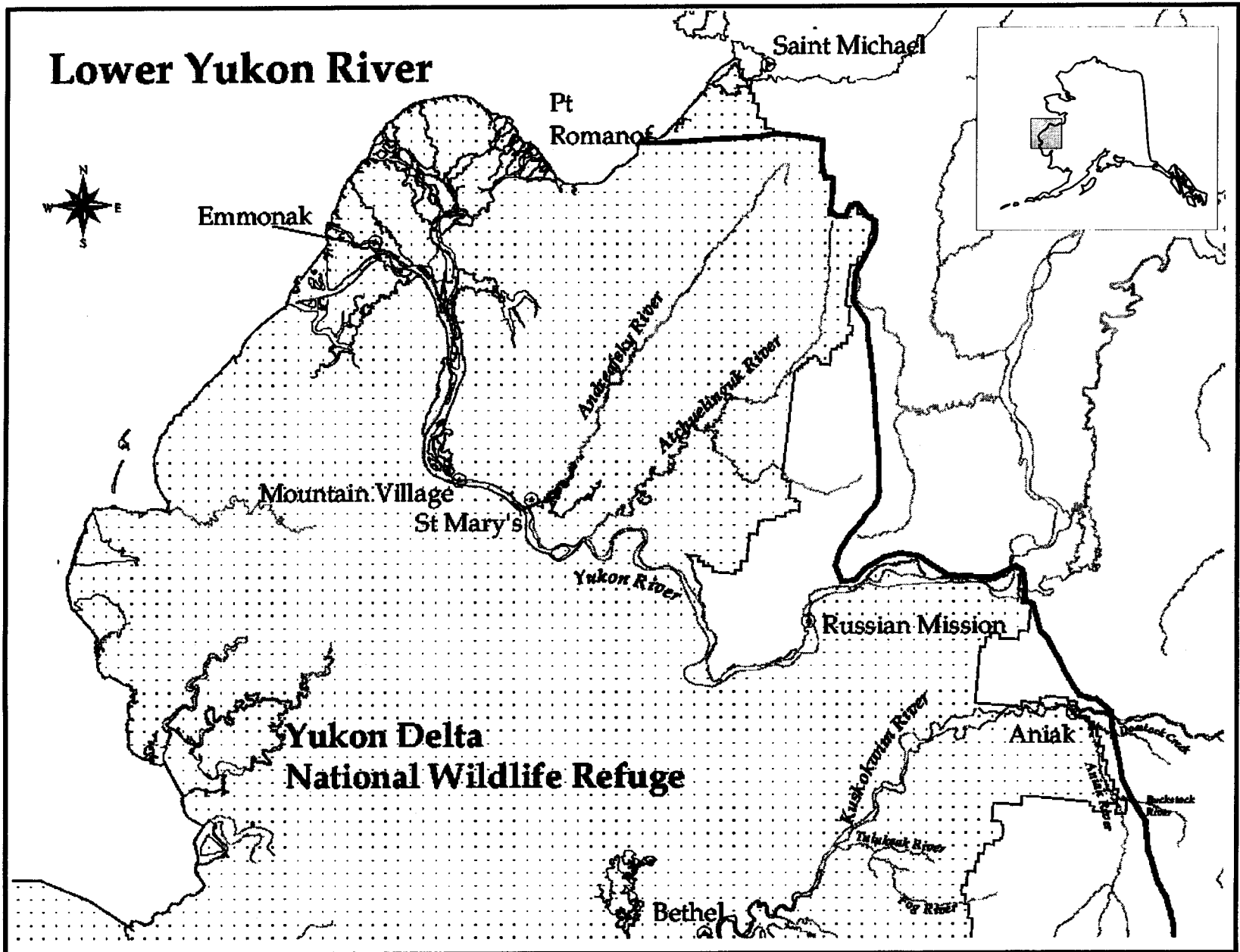


Figure 2.-Lower Yukon River area.

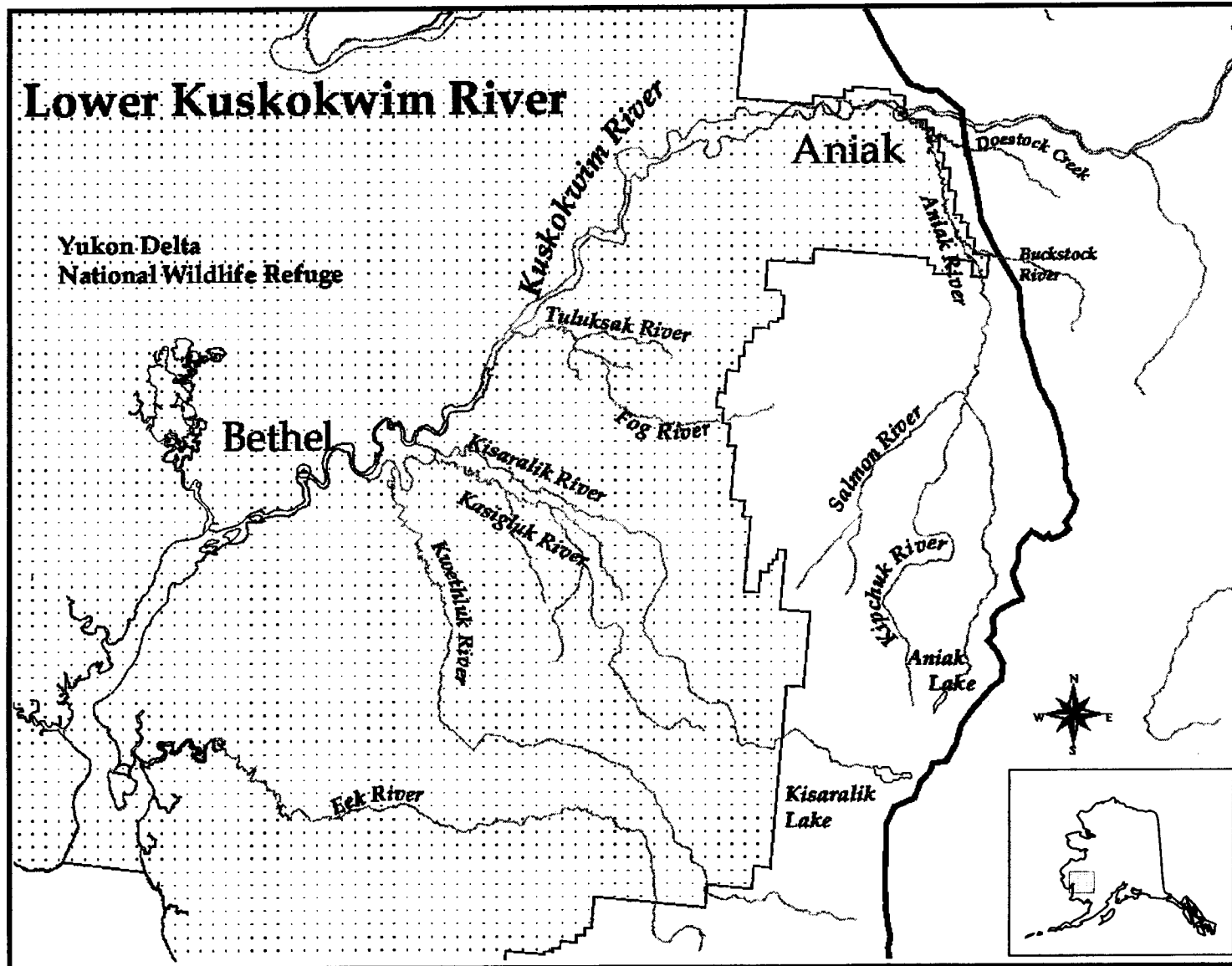


Figure 3.-Lower Kuskokwim River area.

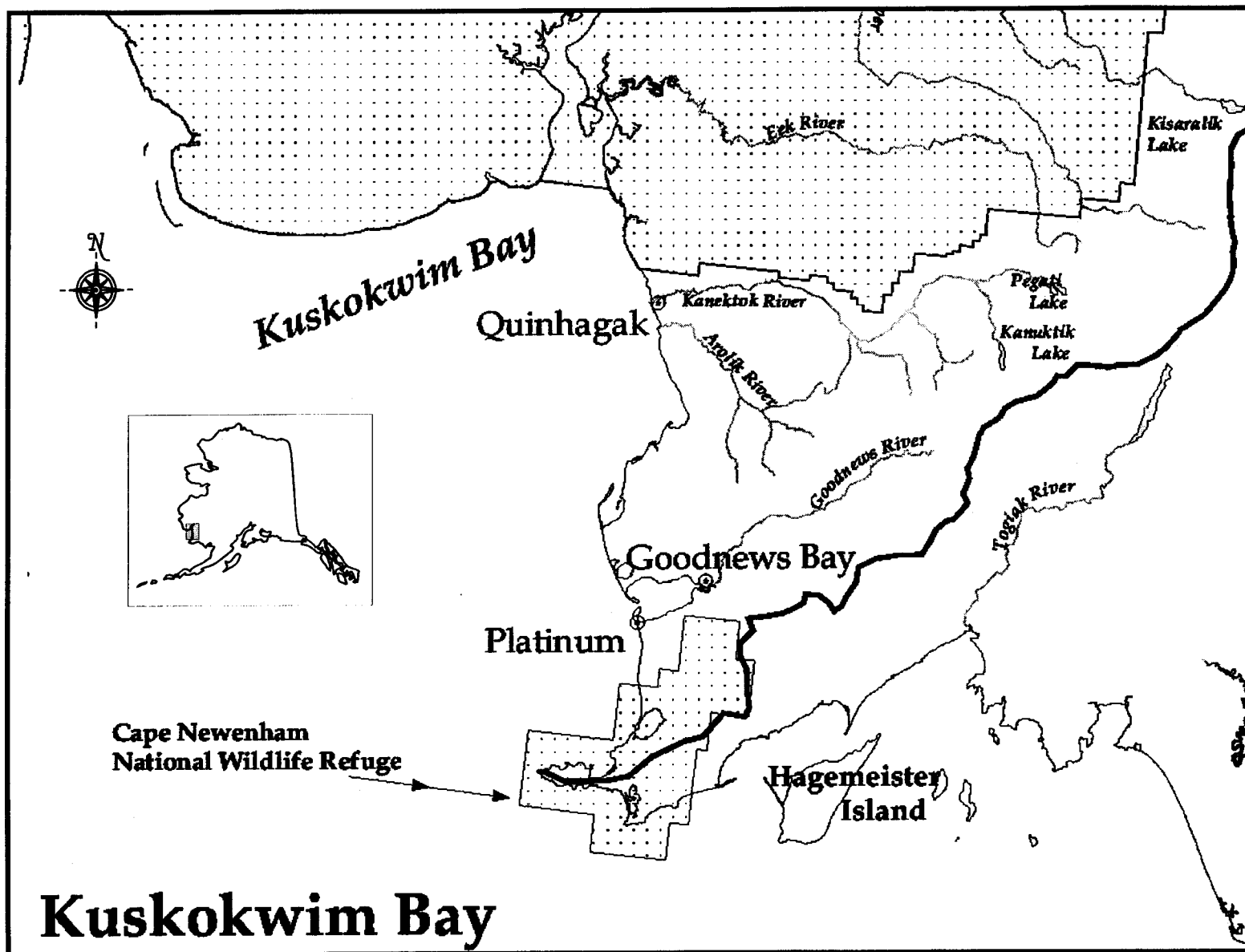


Figure 4.-Kuskokwim Bay area.

available. The Board of Fisheries and Game then decides how, when, where these surpluses can be taken. In summary, the state Board of Fisheries and Game is the entity that strictly allocates fisheries and game resources between user groups in Alaska on state lands and waters.

Fishing regulations, including subsistence, commercial, personal use and sport fishing fall under the authority of the Board of Fisheries and are implemented by the department and enforced by the Department of Public Safety. When there is a need to adjust inseason harvest potential, the commissioner has authority to make specific changes to the regulations in the form of an emergency order. Quite often, these emergency orders are framed within a management plan that has been approved by the Board of Fisheries. However, Regional fishing regulations and management plans are reviewed on a three-year schedule. Fishing and hunting regulations under State authority are reviewed in a public forum. The Board of Fisheries notifies the public by calling for proposals, these proposals are submitted to the Board of Fisheries and then public comment is allowed for a given proposal. Comments are provided from the public in written or oral form during a local Fish and Game Advisory Committee (AC) or Board of Fisheries meeting. The local advisory committees are intended to provide local input to proposed regulations changes submitted by the public. Local AC's then vote on submitted proposals and make recommendations to the board. The AC's provide additional support to the Board of Fisheries and Game by confirming conservation or development concerns at the local level. Often the chair of an advisory committee will report directly to the Board of Fisheries during the public testimony segment of a scheduled meeting for that region of the state. There are currently 81 local fish and game advisory committees statewide divided into six regions across Alaska.

STATEWIDE HARVEST SURVEY

Research and Technical Services (RTS) of the Division of Sport Fisheries has been surveying the angling public with postal questionnaires since 1977. Questionnaire recipients are randomly selected from zip codes from angler license sales throughout the State of Alaska. Surveys are based on the calendar year and a statewide report is often published the following September or October. Anglers are primarily asked locations of sport fish harvests, catch and effort spent fishing by days and trips. This information is used to create a statewide database providing information on where sport fishing occurs, the extent of participation, the preference of participants, and species and numbers of major game fishes being caught and harvested is essential for regulation and management of these sport fisheries. Quite often this data is utilized to evaluate existing policies, prioritize project planning, and weigh in on regulation effectiveness.

SPORT FISHING EFFORT

Effort from anglers has been increasing in the State of Alaska from the inception of the SWHS, 1977 to the mid 1990's (Table 1). During the late 1990's there has been a slight decline with license sales and angler effort, however, Alaska sport fisheries continue to provide more than 2 million angler days of effort since 1986. The recent decreasing statewide trend of effort during the late 1990's has not materialized in Arctic-Yukon-Kuskokwim (AYK) region of the state. Angler effort within the AYK region exceeded the 300,000 level in 1999. Within the LYLK, angler effort has stabilized at about 24,000 angler days since 1995.

Table 1.-Annual sport fishing effort, in angler days, within the state of Alaska, Arctic-Yukon-Kuskokwim Region and Lower Yukon and Lower Kuskokwim Management Area waters as estimated by the SWHS, 1977 –1999.

Year	Statewide	AYK		LY / L.K	
		Region	Percent	Man. Area	Percent
1977	1,197,590	123,161	10.3	a	
1978	1,285,063	145,492	11.3	a	
1979	1,364,739	126,096	9.2	a	
1980	1,488,962	160,266	10.8	a	
1981	1,420,172	148,886	10.5	a	
1982	1,623,090	198,791	12.2	a	
1983	1,732,528	199,361	11.5	a	
1984	1,866,837	199,041	10.7	14,597 ^b	7.3
1985	1,943,069	186,883	9.6	12,484 ^b	6.7
1986	2,071,412	194,713	9.4	11,842 ^b	6.1
1987	2,152,886	217,109	10.1	18,958 ^b	8.7
1988	2,311,291	233,559	10.1	26,171 ^b	11.2
1989	2,264,079	239,626	10.6	18,907 ^b	7.9
1990	2,453,284	245,629	10.0	15,858 ^b	6.5
1991	2,456,328	219,922	9.0	13,055 ^b	5.9
1992	2,540,374	181,852	7.2	14,404 ^b	7.9
1993	2,559,408	220,972	8.6	14,505 ^b	6.6
1994	2,719,911	209,987	7.7	18,117 ^b	8.6
1995	2,787,670	270,141	9.7	16,289 ^b	6.0
1996	2,006,528	201,166	10.0	16,420 ^b	8.2
1997	2,079,514	238,856	11.5	27,318 ^b	11.4
1998	1,856,976	227,841	12.3	27,913 ^b	12.3
1999	2,499,152	304,522	12.2	26,563 ^b	8.7
Mean (all yrs)	2,029,603	204,089	10.1	18,601	9.1
Mean (89-99)	2,395,915	232,089	9.7	19,465	8.4
Mean (95-99)	2,245,968	248,505	11.1	23,932	9.6

^a Specific SWHS data not available for the lower Yukon / Lower Kuskokwim management area.

^b Does not represent SWHS data from the lower Yukon River from Paimiut to the mouth of the Yukon River.

SPORT FISHING HARVEST

Within the Kuskokwim and Kuskokwim Bay drainage recreational anglers primarily harvest salmon with resident species of secondary importance (Table 2). The largest harvests that have been realized are for coho salmon with a range of annual harvests from 1,358 (1990) to 5,565 fish in 1997. The 1999 harvest of 3,974 was slightly less than average. Similarly for chinook salmon annual harvests have ranged from 786 fish to 3,401 (1997) again with the 1999 harvest of 1,400 less than the 10 year average of 1,900 fish. The dolly Varden/Arctic char harvest somewhat mirrors coho and chinook harvests ranging from 800 to 3,500 while rainbow trout for the entire drainage average about 500 fish annually. Other resident fish species with notable harvests are Arctic grayling and northern Pike (Table 2).

MANAGEMENT PLANS

Regulations restricting harvests or a series of regulations in the form of management plans govern the fishery resources in the lower Yukon / lower Kuskokwim area. Salmon management in the lower Yukon / lower Kuskokwim area is governed by subsistence regulations and several management plans directed at controlling commercial fisheries harvests. Subsequently, managers from Commercial Fisheries Division take a lead role in the management of salmon in this area of the State. Most of the subsistence and commercial fishing regulations are interconnected to provide opportunity to harvest salmon surpluses on the Yukon and Kuskokwim rivers.

Salmon Management Plans

Subsistence fishing seasons and periods are the guiding regulations in the harvest of salmon in the Yukon and Kuskokwim rivers (5AAC 01.210 and 5 AAC 01.260, respectively). There are seven salmon management plans that guide commercial fishing in the lower Yukon and lower Kuskokwim area. Five salmon management plans are focused on the salmon stocks of the Yukon River and two for the Kuskokwim area. In the Yukon River there are three species specific salmon management plans and two salmon management plans directed at particular tributaries:

1. Yukon River King Salmon (5AAC 05.360),
2. Yukon River Summer Chum Salmon (5AAC 05.362),
3. Yukon River Coho Salmon (5AAC 05.369),
4. Tanana River Salmon (5AAC 05.367), and
5. Anvik River Chum Salmon (5AAC 05.368).

In the Kuskokwim Area, including streams in the Kuskokwim Bay, there are two salmon management plans:

1. Kuskokwim River Salmon (5AAC 07.365), and
2. District 4 (Kanektok) Salmon (5AAC 07.367).

Recent Changes

During the March 2000 Board of Fisheries meeting, subsistence regulations within the AVCP region were modified to accept rod and reel method and means (5AAC 01.270.(1)). This action has decreased the department's ability to monitor stock specific harvest of salmon and resident fish in the lower Yukon / lower Kuskokwim area. In the past, local residents of the AVCP region

Table 2.-Kuskokwim-Kuskokwim Bay drainage sport fish harvest by fish species, 1989-1999.

Species	Year										
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Chinook Salmon	2,237	897	786	1,046	1,674	2,148	1,328	2,439	3,315	3,401	1,400
Coho Salmon	4,282	1,358	2,087	2,033	2,056	2,978	2,771	5,231	5,565	4,897	3,974
Sockeye Salmon	291	620	214	189	715	894	277	752	587	1,867	1,154
Pink Salmon	191	347	36	219	27	126	16	167	77	133	0
Chum Salmon	2,571	749	647	927	731	1,626	455	517	380	596	520
Rainbow Trout	757	475	774	404	486	299	429	567	1,165	539	510
Lake Trout	1,086	72	272	356	218	40	215	126	441	141	128
Dolly Varden/A. char	3,545	1,797	2,924	802	1,499	1,398	1,260	1,743	3,000	1,581	2,038
Arctic Grayling	2,622	1,340	2,603	545	739	850	845	663	1,232	3,554	1,290
Northern Pike	1,785	231	2,018	752	995	828	655	344	390	2,711	548
Whitefish	571	88	158	286	253	183	0	20	317	1,220	9
Burbot	12	1,125	40	169	214	20	0	0	0	185	228
Sheefish	296	107	154	292	54	390	272	20	495	277	268
Smelt	1,324	211	0	1,136	3,343	2,292	633	1,313	28	3,333	0
Halibut	0	144	0	33	54	45	21	0	51	350	0

using rod and reel were required to purchase a sport-fishing license. By purchasing a license, license holders were included in the statewide postal harvest survey that estimates salmon and resident fish catch, harvest and angler effort in a stock specific manner. A harvest survey conducted by Subsistence Division estimates the salmon harvests based on households, this is expanded to estimate community uses of fishery resources. Estimates of numbers and pounds of fish by species are estimated on a community basis. The survey results from Sport Fish and Subsistence Divisions are substantially different; both surveys have different designs to estimate specific harvests. Relaxing the requirement of purchasing a sport fishing license when using rod and reel in the AVCP region has eroded the department's ability to determine stock specific harvests in-river or tributaries within the lower Yukon / lower Kuskokwim area.

Only the District 4 (Quinhagak) Salmon Management Plan links commercial fishing closures to consideration of actions in the sport fishery. If commercial fishing has been closed for 10 days, the department is required to consider taking regulatory action in the sport fishery, relative to the species of concern (5 AAC 07.367 (e)).

Resident Fish Management Plans

Most of the resident fish management in the lower Yukon / lower Kuskokwim area is under subsistence and sport fishing regulations. There are several management plans that address resident fish species in the Kuskokwim Drainage. However, the Southwest Alaska Rainbow Trout Management Plan encompasses a larger region of the state of Alaska. Within the Kuskokwim Drainage and Kuskokwim Bay there are several tributaries, which have, considerable lengths under special management to protect rainbow trout stocks.

Rainbow Trout

In 1990, the Board of Fisheries adopted regulations implementing a comprehensive management plan for rainbow trout in Southwest Alaska. The plan itself was not adopted into regulation, but a guiding policy of conservative wild stock management was accepted. This is a divergence from the root of Alaska fisheries management seeking to manage for sustained yields. However, the policy of conserving wild stocks of rainbow trout does not exclude the harvest of rainbow trout for food or trophies. Under this guiding policy of wild rainbow trout conservation, enhancement is discouraged and is not considered to be a viable alternative for stock rebuilding purposes.

There are three guiding principles in the Southwest Alaska Rainbow Trout Plan:

1. Native rainbow trout populations will be managed to maintain historic size and age composition at population levels sufficient to disregard enhancement options.
2. Special management areas are to be created in such a manner to provide a diversity of sport fishing opportunities for wild rainbow trout. Special management areas are to be considered under ten criteria:
 - a) Stock Status: the body of water must contain a trout population that is naturally reproducing and possess some unique characteristic: abundance, historic size and age or rainbow trout habitat.
 - b) History of Special Management: a body of water perceived by the public having provided a quality trout fishing in the past would be preferred over a body of water that does not have a history of a quality trout fishing.

- c) Proximity to a Community: to avoid conflicts with traditional consumptive use patterns by local residents, a body of water is preferred if it is not located near a permanent community that is commonly used or visited by local residents, unless local residents support special management.
 - d) Legal Access: a body of water with more than 50% of its banks and shore publicly owned.
 - e) Conflicts with Freshwater Net Fisheries: a body of water that is seasonally or spatially segregated from subsistence, personal use and commercial net fisheries is preferred.
 - f) Abundance and size of the trout population: a body of water with unusually high numbers of trout or a body of water with trout that have been recognized in the department's trophy certification program is preferred.
 - g) Clear Geographic Boundaries: a body of water with clear distinguishable legal regulatory boundaries is preferred.
 - h) Relative Economic Importance of a Wild Trout Fishery: a body of water with a high economic value to the State is preferred.
 - i) Geographical Distribution of Special Management Waters: consider the proximity of a body of water to other special management waters and availability of alternatives locations not designated for special management, and
 - j) Research, Educational, or Unique Considerations: a body of water may be designated as special management for research or educational reasons.
3. Management strategies should be consistent with prudent economic development of the State's recreational fishing industry, while acknowledging the value of this fishery resource to all Alaskans.

Aniak River Resident Fish Management Plans

There are two management plans that effect the resident fish in the Aniak River. The subsistence management plan and the sport fishing regulations often called the Aniak Resident Fish Management Plan. Both of these plans are a series of regulations addressing resident fish management in the Aniak River, currently they are the identical. The subsistence rod and reel umbrella of the Kuskokwim –Yukon Delta makes sport-fishing regulations effective only to non-resident anglers. However, the Board made specific Aniak River subsistence regulations that mimic the sport fishing regulations to restrict subsistence harvests. Most of the resident fish harvest occurs in the lower 12 miles of the Aniak River downstream of Doestock Creek. The non-resident regulations in this fishery follow a series of regulation changes that occurred in March 2000, and are referred to as the Aniak River Resident Fish Management Plan. In general, this plan alternates between catch and release during June 1 through August 31 and relaxes restrictions to allow the harvest of resident fish species during the period of September 1 through April 30 upstream of the Doestock Creek. Downstream of the Doestock Creek the resident fish are harvested under both general Kuskokwim-Goodnews and Kuskokwim River Drainage Special regulations. For example, burbot and rainbow trout harvests are managed under the general Kuskokwim-Goodnews regulations and are not mentioned in the Kuskokwim Drainage Special regulations.

Additionally, all waters upstream of the Doestock Creek are recognized as special waters under the Southwest Rainbow Trout Management Plan, fishing gear is restricted to only unbaited, single-hook, artificial lures. Rainbow trout are protected by catch and release regulations for more than 125 miles of the drainage. In the lower 12 miles of the Aniak River, below Doestock Creek, the rainbow trout regulations are 2/day with only one over 20 inches.

Resident fish species have been managed very conservatively with single-hook artificial lures and rainbow trout have been restricted further, to catch and release regulations in the Aniak River, above the Doestock River. Local residents are becoming increasingly concerned with the growing participation in the Kuskowim Area recreational fisheries. These local concerns led to further subsistence and sport fishery restrictions during the March 2000 Board meeting. Catch and release regulations were implemented during the peak timing of salmon availability from June 1 through August 31.

In the interim, local concerns from the Central Kuskokwim Advisory Committee were sensitive to the perceived low production of resident fish species circumstantially related to poor chinook and chum salmon returns. Combined with the growth of the sport fishery were heightened local concerns and the belief that the resident fish population could not withstand current angler harvest rates coupled with subsistence uses. Local leaders describe a chronic decline in resident species and requested catch and release regulations be implemented to protect existing grayling, Dolly Varden/Arctic char, pike, lake trout, sheefish, and whitefish stocks in the Aniak River. These concerns were forwarded to the Board for their consideration in the form of an agenda change request during the fall of 1999. The Board granted the agenda request because these issues were described as a conservation emergency. These issues were heard during the March 2000 Board of Fisheries meeting.

In March of 2000, the Board adopted subsistence findings that residents of the Yukon-Kuskokwim Delta had a history of using rod and reel methods to obtain their subsistence needs. Within the AVCP region, the Board recognized the use of rod and reel as a legal method for subsistence. Therefore Alaska residents who fished within the AVCP region no longer needed a sport-fishing license to harvest fish with a rod and reel and subsequently were not required to follow sport-fishing regulations. There are currently no bag or possession limits on subsistence fish in the ACVP region.

The Board of Fisheries created two separate management plans for the Aniak River that merged the conservation concerns with new rod and reel subsistence regulations. Management plans were created for both the non-resident anglers and subsistence users that addressed the conservation concerns of the Central Kuskokwim Advisory Committee. These management plans incorporated a series of species specific regulations restricting bag / possession limits and catch and release periods were implemented. Both of these management plans restricted the harvest of resident fish during the period of June 1 through August 31 and reduced bag and possession limits for the period of September 1 through May 31, still providing for an opportunity to harvest resident fish. With the State's constitution recognizing that all Alaska residents can participate in subsistence, the Board created the first catch and release subsistence fishery in the Aniak River during the period of June 1 through August 31, 1999.

However, the mechanics of implementing both of these management plans became complex because emergency regulations are only valid for 180 days and the change in bag / possession

limits was greater than 180-day limit. With concurrence from the BOF, a permanent regulation was created with a sunset clause. This sunset clause requires the BOF to address this regulation at every three-year scheduled meeting with or without a proposal addressing this regulation. The regulation became effective on May 9 and expires on December 31, 2000. This management plan is up for review during the January 2001 BOF meeting.

Land Use Management Plans

The Togiak and Yukon –Kuskokwim National Wildlife refuges produce Fisheries Management Plans (FMP's) within the lower Yukon / lower Kuskokwim management area. These plans generally acknowledge the state's authority for the management of sport fisheries and have little direct effect on the day-to-day management of the area's fisheries. Department staff have worked with the U.S. Fish and Wildlife Service (USF&W) refuge staff to develop these plans. These plans are essentially a list of fishery-related issues and concerns and projects that address these concerns. Each refuge plan has a five-year duration then a review process begins. In 1999, the Togiak FMP was adopted and a comprehensive conservation-planning phase was implemented. The Yukon-Kuskokwim Delta Refuge FMP was adopted in 1992 and has been gradually implemented and there are no current plans for review.

Public Use Management Plans (PUMP) for the refuges have been adopted for the Togiak Refuge and allows for certain activities on refuge lands. Commercial sport fishing services are a significant portion of the Togiak Refuge PUMP. Much of the sport fishing effort within the Togiak Refuge is guided, therefore the plan affects guided access and activities that effect opportunity in the sport fisheries. In general the PUMP, established levels of commercial use on a river by river basis. Unguided uses are presently unconstrained in the Togiak PUMP. The Togiak PUMP is complex, requiring operators to submit prospectus applications and bid for the privilege to provide services.

The Togiak PUMP was adopted in 1991. Since adoption, four minor amendments have been made. On schedule in 1995, the Togiak PUMP began review and revision of the plan when the amount of guided use equaled visitor use. The department assisted refuge staff during the PUMP review process. Public review was planned for 1999, however this review was postponed anticipating the 1999 Togiak Refuge Comprehensive Conservation Plan. Present work is incorporating findings from both plans. Occasional differences of opinion occur between state and USF&W regarding management authority on the Togiak Refuge, these are generally minor and are quickly remedied.

BIOLOGICAL, SOCIAL AND LAND USE ISSUES

Often biological and social issues are interconnected in the lower Yukon / lower Kuskokwim management area. Many of the rural residents are subsistence users and have expressed resentment toward sport fisheries and catch-and-release practices. The Yu'pik culture believes that the practice of catch-and-release is disrespectful to the fish and hence take this as a personal affront to their cultural teachings.

Currently there are conflicts between subsistence users in the upper and lower the Kuskokwim Drainage. Subsistence users lower in the river complete their subsistence harvest much earlier than subsistence users upstream. To remedy this the Kuskokwim Salmon Working Group was created. Once the lower river subsistence users complete their harvest, typically there is pressure

to have a commercial fishery. The subsistence lifestyle of the lower Yukon / lower Kuskokwim inhabitants are closely tied to commercial fishing once subsistence needs are met.

Presently, there are no major access issues for sport fishing in the lower Yukon / lower Kuskokwim management area. However, residents of the area have concerns on the amount of anglers using the fishery resources within this management area. Often area residents submit fishery proposals that attempt to reduce anglers access through restrictive fishing regulations. As residents begin to understand that land managers govern angler access, the department will need to become more vigilant on changes of land use.

CURRENT MANAGEMENT AND RESEARCH ACTIVITIES

Sport fishing management and research have been extremely challenging with the opening of a new office in Bethel. The Division has invested considerable amounts of time and expertise in the Federal Subsistence Program to provide funding for management and research projects in the lower Yukon / lower Kuskokwim area. Several project proposals have been advanced for funding review. These are cooperative projects with the Divisions of Commercial Fisheries, Subsistence and local native agencies.

Additionally, the Division has focused on the recent charge from the Board of Fisheries to develop a strategic research plan for chinook and chum salmon in the Kuskokwim River. Multiple Divisions of the department participated in creating draft research plan that targeted existing data gaps in the department's programs and understanding of Kuskokwim chinook and chum salmon stocks. This research plan is attached to the action plans for Kuskokwim River chinook and chum salmon that will be reviewed during the January 2001 Board of Fisheries meeting.

ACCESS PROJECTS

There are currently no access projects in this management area. However, there are some concerns for angler access in the Kanektok River. The Quinhagak airport is being relocated away from the Kanektok River. Existing easements from the airport lands to the river will return to the land holdings of Native Village of Kwinhagak (NVK) once the new airport is completed. This land status change has the potential to move the current exit point for the angling public. This is more of an inconvenience where anglers may in the future need to exit the river at the old boat harbor. The Division will continue to monitor this issue and help provide options in the future.

INFORMATION AND EDUCATION SOURCES

At the regional level there is a single position that provides area support from the Fairbanks Sport Fish Informational Center. When time is available, the area manager is a contact that supplies local information and educational (I&E) needs. Local teachers, scouting groups and local fly fishers have contacted the Bethel office for assistance and support. Updating and creating angler publications is expected during the next year. Additionally, a database was created of local vendors that are interested in participating in posting sport fishing emergency orders.

SECTION II – EFFORT

DESCRIPTION OF STATEWIDE HARVEST SURVEY

Stream or stock specific estimates of angler harvest, catch and effort are estimated across the state through a postal questionnaire. Estimates of sport angler harvest, catch and effort are

reported annually and the report is commonly referred to Statewide Harvest Survey (Mills 1977-1993 and Howe et al. 1994-1999). This survey randomly selects anglers based on their residence zip code and questionnaires are sent out at the end of the calendar year. This voluntary survey asks anglers to record their days of fishing at specific locations and the catch and harvest of salmon and resident freshwater fish and saltwater fish. Because this survey is based on the calendar year, often the estimates and report are not generated until fall of the following year.

Sport Fisheries Division uses this harvest survey extensively, because of the wide expanses and number of sport fisheries within the state. This survey has been collecting angler harvest statistics since 1977. There have been many additions to SWHS since the initial postal questionnaire to address concerns on the harvest of salmon and resident fish throughout Alaska. This survey is the backbone of sport fisheries management in the State of Alaska. Managers rely on this report to monitor most sport fisheries. Often estimates generated by the SWHS come into question and in some instances the Division of Sport Fish will initiate an in-season survey to validate these estimates. The SWHS is an excellent tool for estimating sport fishing harvests, catches and angler effort in large fisheries, which have large numbers of anglers' participation. However, the smaller fisheries are recognized by fishery managers to have less precise estimates and are used as indices of harvest and catch. As the level of angler participation increases in a given fishery so does the level of confidence that department has in the SWHS estimate for that fishery. Comparisons of SWHS estimates and in-season harvest surveys are regularly published in the annual report (Appendix Table A102, Howe et al. 1999).

As new sport fisheries develop in the lower Yukon / lower Kuskokwim management area, the focus of the SWHS shifts from an area perspective to a stock or stream specific nature. Stock specific information is useful for regulating fishery development to conserve salmon and resident fish in given water bodies of the lower Yukon / lower Kuskokwim management area.

OVERVIEW OF AREA EFFORT

The sport fisheries began to develop in the lower Yukon / lower Kuskokwim and Kuskokwim Bay during the mid 1980's. It was during this time period when sport fisheries in this area began to surface in the SWHS. Largely, sport fisheries of the LYLK were small, isolated, and were receiving little effort and hence catch and harvest. As sport fisheries developed, the SWHS started to partition the prominent area fisheries by stream/river in 1983 (Table 3).

Angling effort in the lower Yukon/ lower Kuskokwim Management Area is third in ranking of the angling effort in the Arctic-Yukon-Kuskokwim region, second to the upper Copper/ upper Susitna and Tanana Management Areas. This is no surprise when considering the distribution of the human population in the AYK region. Angling effort in the lower Kuskokwim and Kuskokwim Bay exceeded 32,000 angler days in 1997, but these areas average about half of this amount. Recently anglers have been expending twice the amount of effort in the streams and lakes of Kuskokwim Bay in comparison to the lower Kuskokwim River. There are clearly three

Table 3.-Angler effort (angler days) in the lower Kuskokwim River and Kuskokwim Bay area of Alaska, 1983-1999.

Year	Kuskokwim Bay					Lower Kuskokwim River					Grand Total
	Kanektok	Goodnews	Arolik	Other	Total	Aniak	Kisaralik	Kwethluk	Other	Total	
1983	1,517	742		20	2,279	253			2,682	2,935	5,214
1984	6,881	1,010		344	8,235	383			1,149	1,532	9,767
1985	4,630	4,214		243	9,087	87			694	781	9,868
1986	8,825	229		61	9,115	1,116			703	1,819	10,934
1987	9,689	2,372		2,073	14,134	507			1,920	2,427	16,561
1988	12,697	1,219		5,233	19,149	2,437			2,724	5,161	24,310
1989	4,382	1,315		4,381	10,078	4,035			3,504	7,539	17,617
1990	4,525	1,507		4,512	10,544	1,964			3,610	5,574	16,118
1991	3,078	1,328		2,656	7,062	3,078			2,126	5,204	12,266
1992	4,972	1,387		2,068	8,427	2,604		640	1,654	4,898	13,325
1993	3,791	2,276		2,844	8,911	2,056		554	2,275	4,885	13,796
1994	6,505	2,038		1,406	9,949	1,815	1,463	466	1,124	4,868	14,817
1995	5,512	1,030		743	7,285	3,569	369	387	1,600	5,925	13,210
1996	8,305	2,322		625	11,252	3,964	1,525	1511	2,891	9,891	21,143
1997	12,521	6,342	1,475	1,807	22,145	6,473	1,578	642	1,445	10,138	32,283
1998	8,114	4,007	347	1,158	13,626	5,548	1,021	1498	1,306	9,373	22,999
1999	8,194	8,353	308	705	17,560	3,235	1,316	402	1,992	6,945	24,505
Average	6,714	2,452	710	1,816	11,108	2,537	1,212	763	1,965	5,288	16,396

sport fisheries that dominate the area; they are the Kanektok, Aniak and Goodnews rivers. All three of these streams provide salmon and rainbow trout fisheries in a wilderness setting.

Angler Effort in 1999

The increasing trend of angling effort continued for the fourth consecutive year with the second largest combined effort of 25,000 angler days in the lower Kuskokwim / Kuskokwim Bay streams. Angler effort increased significantly in the Goodnews River in 1999. Generally, the Goodnews River has half of the angler effort from Kanektok River, but in 1999 the Goodnews angler effort surpassed angler effort on the Kanektok River by a few hundred-angler days. Effort in the Kanektok River remained stable, but the increased effort in the Goodnews River is probably a reflection of increased fishing services for this stream.

Angling effort in the Aniak River returned to levels seen in 1990-1996, with effort less than 4,000 days. The effort on the Kisaralik River remained stable, slightly over the average of 1,200 angler days. For unknown reasons the annual angling effort on the Kwethluk River is alternating between 500 and 1,500 angler days.

SECTION III – FISHERIES

SALMON FISHERIES

Chinook Salmon Fishery Description

Overview

Chinook salmon are present in many streams in through the lower Yukon / lower Kuskokwim area, there are very few chinook salmon caught and harvest in the sport fisheries in the lower Yukon River tributaries, down stream of Paimiut. However, there is a very small developing sport fishery on the Andreafsky River that has raised some local concern. Chinook salmon are predominately caught and harvested in tributaries of the Kuskokwim Bay and tributaries of the lower Kuskokwim River. The largest chinook salmon sport fisheries in the area are located in the Kanektok and Aniak rivers. These two sport fisheries average approximately 6,000 and 2,500 angler days of effort, respectively, across all fish species.

The Yukon and Kuskokwim rivers tributaries contain large runs of chinook salmon, but the many streams are broad and turbid, thus reducing the sport fishing to clear water tributaries. These sport fisheries attract a very small, but growing number of anglers to western Alaska.

Historical Perspective and Fishery Management

Sport harvests and effort are estimated through the statewide harvest survey and reported by Mills (1983-1994) and Howe et al. (1997-1999). Commercial and subsistence harvests are managed by the Commercial Fisheries Division located in Bethel and are reported in their Annual Management Report series (Burkey et al. 1997-2000). Sport Fish Division has monitored both the Kanektok and Aniak rivers sport fisheries with additional in-season harvest surveys and stock assessment projects in the past (Minard 1987, Minard and Brookover 1988, Dunaway and Bingham 1992, Dunaway and Fleischman 1995, and Dunaway 1997). Additionally, the U.S. Fish and Wildlife Service from the Togiak Refuge has collected age and size data from chinook salmon spawning in the Kanektok since 1994 (Lisac and MacDonald 1995 and MacDonald 1996).

The department has focused on assessing the salmon escapement and harvest monitoring through several programs in the Kuskokwim area. Harvest monitoring is conducted through fish tickets and surveys designed to estimate harvests from the subsistence and sport fisheries. Salmon escapement is monitored through aerial surveys, sonar, test fishing and weirs in the Kuskokwim River. There are similar programs in the Yukon, but on a larger scale. The primary chinook salmon escapement programs in the Kuskokwim are aerial surveys, Kogrukluk weir and the Bethel test fishery. There have been recent weir additions and consideration for more weir operations in the future. There is a main stem Kuskowim sonar project that is under development, but is several years away from being a functional tool to assess run strength and perhaps salmon escapements.

Escapements of chinook salmon in the Yukon are monitored with test fishing, sonar, mark-recapture experiments, and counting towers. There are several Biological Escapement Goals (BEG's) for chinook salmon in the Yukon and only a few in the Kuskokwim area. However, salmon escapement or weir projects in recent years are improving the department's ability to count escapement and begin the process to develop BEG's in accordance with Department's Escapement Goal Policy (ADF&G 2000). However aerial surveys remain an important component of chinook salmon assessment in the Kuskokwim area (Table 4).

Regulatory chronology of area sport fisheries for chinook salmon:

1965 – Kuskokwim drainage chinook salmon bag limit of 15 per day, 30 in possession;

1985 – Daily bag and possession limits for chinook salmon were decreased to 5 chinook salmon, with no size restrictions;

1988 – Daily bag and possession limits were decreased to 3 chinook salmon, of which only 2 can be greater than 28 inches or larger;

1997 – May 1 to July 25, sport fishing season was established to protect spawning fish. In some locations fishing gear was restricted to single-hook artificial lures.

Sport harvests of chinook salmon are very small and minor; however, there is angler desire to participate in the chinook fisheries. The average angler stay in western Alaska for fishing is at least five days which equates to approximately 3,500 anglers utilizing the tributaries of the Kuskokwim Bay and 1,500 anglers coming to tributaries in the lower Kuskokwim River. Overall, 5,000 anglers are harvesting 2,400 chinook salmon and catch and releasing 20,000 chinook salmon (Tables 5 - 8). There is very little hooking mortality because many of the anglers are on float trips in tributary headwaters, and furthermore these headwaters have special management regulations to protect rainbow trout (i.e. single-hook artificial lures). Accepting that delayed hooking mortality is minor, the over all harvest of chinook salmon is less than 5,000 fish in sport fisheries of the Kuskokwim Area. The Kuskokwim Area chinook harvest is minimal when compared to other chinook salmon harvests.

Summary of 2000 season

Poor returns of chinook salmon in the Yukon and Kuskokwim required the department to take serious restrictive actions to reduce harvests in the commercial, sport and subsistence fisheries. By early July it became evident that chinook salmon escapements were lagging far behind an average return, a series of emergency orders that restricted harvests in the commercial, sport and

Table 4.-Peak aerial survey counts of chinook salmon in indexed Kuskokwim River spawning tributaries, 1975-2000^a

Year	Eek River	Kwethluk River	Kisaralik River	Tuluksak River	Aniak River	Kipchuk River ^b	Salmon River ^b
1975			118			94	
1976				139		177	
1977		2,290		291			562
1978	1,613	1,732	2,417	403			289
1979		911					
1980	2,378			725			1,186
1981		1,783	672		9,074		894
1982	230				2,645		185
1983	188	471	731	129	1,909		231
1984		273	157	93	1,409		
1985	1,118	629		135			
1986					909		336
1987	1,739	975		60		193	516
1988	2,255	766	840	188	945		244
1989	1,042	1,157	152		1,880	994	631
1990	1,983	1,295	631	166	1,255	537	596
1991	1,312	1,002		342	1,564	885	583
1992					2,284	670	335
1993					2,687	1,248	1,082
1994		848	1,021		1,848	1,520	1,218
1995			1,243		3,174	1,215	1,442
1996					3,496		983
1997			439	173	2,187	855	980
1998		27	457		2,239	353	
1999							
2000					714	182	152
BEG ^c		1,200	1,000	400	1,500		600
Median ^d	1,460					670	

^a Estimates are from peak aerial surveys conducted between July 20 and July 31 under fair, good, or excellent conditions.

^b Tributaries of Aniak River

^c From Buklis (1993).

^d Median of years 1975 through 1994.

Table 5.-Chinook salmon commercial, subsistence, and sport harvest plus escapement for the Kanektok River fishery, 1960 to 1999.

Year	Harvest			Escapement Index ^c	Total Run
	Commercial ^a	Subsistence ^b	Sport		
1960	0			6,047	6,047
1961	4,328				
1962	5,526			935	6,461
1963	6,555				
1964	4,081				
1965	2,976				
1966	278			3,718	3,996
1967	0	1,349			
1968	8,879	2,756		4,170	15,805
1969	16,802				
1970	18,269			3,112	21,381
1971	4,185				
1972	15,880				
1973	14,993			814	15,807
1974	8,704				
1975	3,928				
1976	14,110				
1977	19,090	2,012		5,787	26,889
1978	12,335	2,328		19,180	33,843
1979	11,144	1,420			
1980	10,387	1,940		6,172	18,499
1981	24,524	2,562		15,900	42,986
1982	22,106	2,402		8,142 ^d	32,650
1983	46,385	2,542	1,511	8,890	59,328
1984	33,633	3,109	922	12,182	49,846
1985	30,401	2,341	672	13,465	46,879
1986	22,835	2,682	938	3,643	30,098
1987	26,022	3,663	508	4,223	34,416
1988	13,883	3,690	1,910	11,140	30,623
1989	20,820	3,542	884	7,914	33,160
1990	27,644	6,013	503	2,563	36,723
1991	9,480	3,693	316	2,100	15,589
1992	17,197	3,447	656	3,856	25,156

-continued-

Table 5.-Page 2 of 2.

Year	Harvest				Escapement Index ^c	Total Run
	Commercial ^a	Subsistence ^b	Sport	Total		
1993	15,784	3,368	1,006	20,158	4,670	24,828
1994	8,564	3,995	751	13,310	7,386	20,696
1995	38,584	2,746	739	42,069		f
1996	14,165	3,075	689	17,929	6,107	24,036
1997	35,510	3,433	1,615	40,558	8,080	48,638
1998	23,158	4,041	1,475	28,674		f
1999	18,426	3,167	854	22,447	1,118 ^e	f
2000	21,229	g	g	g	g	g
<hr/>						
1960-1999						
Average	15,922	3,013	938	19,873	6,808	28,175
Percent	80%	15%	5%			
1997-1999						
Average	25,698	3,547	1,315	30,560	8,080	
Percent	84%	12%	4%			

- a. Quinhagak District commercial harvest. Source: Burkey et al. 2000, Appendix C3.
- b. Subsistence harvest by the community of Quinhagak. Source: Burkey et al. 2000, Appendix A12.
- c. Unexpanded observed counts made from fixed-wing aircraft between 20 July and 5 August. Source: Burkey et al. 2000, Appendix C4.
- d. 1982 escapement survey after August 5, late for chinook salmon.
- e. Escapement survey on July 14, before peak.
- f. No total run estimate because of no escapement information or not appropriate survey date.
- g. Information not available.

Table 6.-Chinook salmon commercial, subsistence, and sport harvest plus escapement for the Goodnews River fishery, 1981 to 1999.

Year	Harvest			Total	Escapement Index ^c	Total Run
	Commercial ^a	Subsistence ^b	Sport			
1981	7,190	1,409		8,599	11,454	20,053
1982	9,476	1,236		10,712	4,332	15,044
1983	14,117	1,066	31	15,214	20,420	35,634
1984	8,612	629		9,241	12,003	21,244
1985	5,793	426	323	6,542	10,810	17,352
1986	2,723	555		3,278	6,186	9,464
1987	3,357	816		4,173	6,762	10,935
1988	4,964	310		5,274	8,131	13,405
1989	2,966	467	68	3,501	4,806	8,307
1990	3,303	682		3,985	11,292	15,277
1991	912	682	26	1,620	6,473	8,093
1992	3,528	252	23	3,803	3,757	7,560
1993	2,117	488	81	2,686	7,076	9,762
1994	2,570	657	163	3,390	11,722	15,112
1995	2,922	552	41	3,515	14,701	18,216
1996	1,375	526	157	2,058	8,907	10,965
1997	2,039	449	85	2,573	10,153	12,726
1998	3,675	718	431	4,824	8,381	13,205
1999	1,888	871	223	2,982	9,786	12,768
2000	4,442	^d	^d	^d	6,876	^d
<hr/>						
1960-1999						
Average	4,398	673	138	5,209	9,201	14,480
Percent	84%	13%	3%			
<hr/>						
1997-1999						
Average	2,534	679	246	3,460	8,080	12,900
Percent	73%	20%	7%			

a. Quinhagak District commercial harvest. Source: Burkey et al. 2000, Appendix D4.

b. Subsistence harvest by the community of Quinhagak. Source: Burkey et al. 2000, Appendix D4.

c. Unexpanded observed counts made from fixed-wing aircraft between 20 July and 5 August. Source: Burkey et al. 2000, Appendix D4.

d. Information not available.

Table 7.-Chinook salmon harvests and catches by anglers in the Kanektok, Goodnews, Arolik, and other rivers within the Kuskokwim Bay area during 1983-1999.

Year	Kanektok River		Goodnews River		Arolik River		Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983	1,511		31				210		1,752	
1984	922						137		1,059	
1985	672		323				43		1,038	
1986	938						25		963	
1987	508						177		685	
1988	1,910						264		2,174	
1989	884		68				240		1,192	
1990	503	4,044					54	333	557	4,377
1991	316	1,742	26	68			93	176	435	1,986
1992	656	3,153	23	47			71	284	750	3,484
1993	1,006	5,245	81	469			143	1,249	1,230	6,963
1994	751	1,483	163	230			257	339	1,171	2,052
1995	739	3,226	41	279			42	174	822	3,679
1996	689	6,354	157	1,126			190	2,197	1,036	9,677
1997	1,615	13,244	85	1,569	0	0	34	203	1,734	15,016
1998	1,475	9,528	431	3,171	30	30	77	346	2,013	13,075
1999	854	4,205	223	3,823	0	115	12	25	1,089	8,168
Average	938	5,222	138	1,198	10	48	122	533	1,159	6,848
1997-99										
Average	1,315	8,992	246	2,854	10	48	41	191	1,612	12,086

Table 8.-Chinook salmon harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.

Year	Aniak River		Kisaralik River		Kwethluk River		Other Rivers		Lower Kuskokwim Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983							168		168	
1984							137		137	
1985							43		43	
1986							24		24	
1987							178		178	
1988							264		264	
1989	738						240		978	
1990	285	1,181					55	333	340	1,514
1991	214	222					94	176	308	398
1992	172	827			31	47	71	285	274	1,159
1993	300	1,426			0	47	144	1,249	444	2,722
1994	437	573	148	196			257	339	842	1,108
1995	279	2,729					42	174	321	2,903
1996	592	3,375					190	1,038	782	4,413
1997	795	12,943	49	678	49	108	49	128	942	13,857
1998	1,058	5,896	6	74	75	467	44	167	1,183	6,604
1999	134	2,776	0	12	0	0	109	153	243	2,941
Average	455	3,195	51	240	31	134	124	404	439	3,762
1997-99										
Average	662	7,205	18	255	41	192	67	149	789	7,801

even subsistence fisheries were enacted to improve the chinook salmon escapements in the Yukon and Kuskokwim rivers. These actions included restricting the sport fishery to no retention; commercial fishing was closed for chinook and chum salmon to bolster escapements of both species and gillnet mesh restrictions to improve the number of female chinook salmon in the escapement. Additionally, there was appeal to subsistence users to only take what they needed.

These early July actions were not enough to provide for adequate escapement in both the Kuskokwim and Yukon rivers. These poor returns were the third consecutive year for not meeting all the escapement goals in the Kuskokwim Drainage. The consistent lack of meeting escapement goals for a third year has accelerated Board of Fisheries concern for the January 2001 meeting. Chinook salmon stocks of concern include both the Yukon and Kuskokwim stocks. It is unclear to the cause of western Alaska chinook and chum salmon declines, parental year chinook salmon escapements were above the BEG's in the Kuskokwim. It has been hypothesized that the extreme marine events that occurred during 1997 and 1998 may have been part of this recent decline. However, these trends were not seen in the Kuskokwim Bay chinook salmon fisheries. Average commercial, sport and subsistence harvests were achieved in 2000, adequate chinook salmon escapement was uncertain in the Kanektok and below average chinook salmon escapement in the Goodnews River during 2000. However, this situation is not as severe as in the Kuskokwim and Yukon rivers. Sport harvests of chinook salmon are expected to be below average for the lower Kuskokwim and Yukon tributaries because of the emergency order restricting the harvest of chinook salmon. Sport harvests of chinook salmon in the Kuskokwim Bay tributaries are expected to be average during 2000.

Fishery Outlook

Lower Kuskokwim and Lower Yukon Rivers:

Given the last three years of poor chinook salmon returns, it is expected that the 2001 chinook return to the Kuskokwim and Yukon will be below average. It is quite possible that 2001 returns may not provide a surplus beyond escapement needs. The department is approaching the 2001 season with little expectation of commercial fishing. Existing sport fishing regulations governing the chinook salmon fisheries will probably change in some form during the January 2001 Board of Fisheries meeting.

Kuskokwim Bay Tributaries:

The recent chinook salmon escapements into the Goodnews River appears to be below average, but parental escapements of 1995-1997 were average to above average and are expected to provide a surplus for both commercial and sport fishing. The recent lack of chinook salmon escapement information in the Kanektok River is alarming, especially with recent declines in chinook salmon production in western Alaska. The department is not proposing any changes to the chinook salmon fisheries of Kuskokwim Bay, however, with the concern over western Alaska chinook salmon stocks, it is quite possible that both commercial and sport fishing restrictions may be enacted by the Board of Fisheries during the 2001 meeting.

Coho Salmon Fishery Description

Overview

Coho salmon are present in most streams throughout the lower Yukon / lower Kuskokwim area. There are very few coho salmon caught and harvested in the sport fisheries in the lower Yukon River tributaries, down stream of Paimiut. However, there is a very small developing sport

fishery on the Andreaksky River that has raised some local concern. Coho salmon are caught and harvested in tributaries of the Kuskokwim Bay and tributaries of the lower Kuskokwim River. There is a large commercial harvest of coho salmon in the Kuskokwim River, in the last 20 years the commercial harvest has ranged from 130,800 in 1997 to record harvest of 937,300 coho salmon in 1996. The commercial harvest has averaged approximately 550,000 coho salmon in the Kuskokwim. The largest coho salmon sport fisheries in the area are located in the Kanektok and Aniak rivers. These two sport fisheries average approximately 6,000 and 2,500 angler days of effort, respectively, across all fish species.

The Yukon and Kuskokwim rivers tributaries contain large runs of coho salmon. The stream characteristics are typically broad channels and turbid water thereby reducing the sport fishing largely to clear water tributaries. These sport fisheries attract a very small, but growing number of anglers to western Alaska.

Historical Perspective and Fishery Management

Sport harvests and effort are estimated through the statewide harvest survey and reported by Mills (1983-1994) and Howe et al. (1997-1999). Commercial and subsistence harvests are managed by the Commercial Fisheries Division located in Bethel and are reported in their Annual Management Report series (Burkey et al. 1997-2000). The Kanektok River has the most complete commercial, subsistence, sport harvest and escapement information on coho salmon in the area (Table 9). Sport Fish Division has monitored both the Kanektok and Aniak with additional in-season harvest surveys and stock assessment projects in the past (Minard 1987, Minard and Brookover 1988, Dunaway and Bingham 1992, Dunaway and Fleischman 1995, and Dunaway 1997). Additionally, the U.S. Fish and Wildlife Service from the Togiak Refuge has collected age and size data from coho salmon spawning in the Kanektok since 1994 (Lisac and MacDonald 1995 and MacDonald 1996).

The department has focused on assessing the salmon escapement and harvest monitoring through several programs in the Kuskokwim Area. Harvest monitoring is conducted through fish tickets and surveys designed to estimate harvests from the subsistence and sport fisheries. Salmon escapement is monitored through aerial surveys, sonar, test fishing and weirs in the Kuskokwim River. There are similar programs in the Yukon, but on a larger scale. The primary coho salmon escapement programs in the Kuskokwim are aerial surveys, Kogrukluq weir and Bethel test fishery. There have been recent weir additions, like the Goodnews and Kwethluk rivers. There is consideration for more weir operations in the future. There is a main stem Kuskowim sonar project that is under development, but is several years away from being a functional tool to assess run strength and perhaps salmon escapements.

Escapements of coho salmon in the lower Yukon / lower Kuskokwim area are monitored with aerial surveys from fixed wing aircraft. Counts are unexpanded and represent minimum escapements. There are only a few Biological Escapement Goals (BEG) for coho salmon in this area, but weather conditions seldom allow reliable aerial surveys to be flown to index coho salmon escapements. However, salmon escapement or weir projects in recent years are improving the department's ability to count coho escapement (Burkey et al. 2000, Appendix Table A7) and begin the process to develop BEG's in accordance with Department's Escapement Goal Policy (ADF&G 2000).

Table 9.-Coho salmon commercial, subsistence, and sport harvest plus escapement for the Kanektok River fishery, 1983 to 1999.

Year	Harvest			Total	Escapement	Total Run ^d
	Commercial ^a	Subsistence ^b	Sport		Index ^c	
1983	32,442		367	32,809		
1984	132,151		1,895	134,046	46,830	180,876
1985	29,992		622	30,614		
1986	57,544		2,010	59,554		
1987	50,070		2,300	52,370	20,056	72,426
1988	68,605	4,317	1,837	74,759		
1989	44,607	3,787	1,096	49,490	^e	
1990	26,926	4,174	644	31,744		
1991	42,571	3,232	358	46,161	4,330	50,491
1992	86,404	2,958	275	89,637		
1993	55,817	2,152	734	58,703		
1994	83,912	2,739	675	87,326		
1995	66,203	2,561	970	69,734	^f	
1996	118,718	1,467	875	121,060	23,656 ^g	144,716
1997	32,862	1,264	1,220	35,346	23,166 ^h	58,512
1998	80,183	1,702	751	82,636		
1999 ⁱ	6,184	2,021	1,091	9,296	10,120	19,416
2000	30,529	^j	^j	^j	^j	
1983-1999 Average	59,717	2,698	1,042	62,664	21,360	87,740
Percent	95%	4%	2%			
1997-1999 Average	39,743	1,662	1,021	42,426	16,643	38,964
Percent	94%	4%	2%			

a Quinhagak (District 4) commercial harvest (Burkey et al. 2000, Appendix C3).

b. Subsistence harvests by the community of Quinhagak (Burkey et al. 2000, Appendix A12).

c. Unexpanded observed count made from fixed-wing aircraft between 20 August and 5 September. Source Burkey et al. 2000, Appendix C4.

d. Considered a minimum number since escapement estimates are unexpanded.

e. In 1989 a count flown early, on July 25 counted 1,755 coho salmon (Aerial survey notebook, Commercial Fisheries Division Bethel)

f. In 1995, a count flown early, on August 14, counted 2,900 coho salmon (Aerial survey notebook, Commercial Fisheries Division, Bethel).

g. 1996 escapement survey was partial due to poor conditions.

h. 1997 escapement estimate is based on tower count ending August 21; aerial survey conditions poor. Aerial survey count of coho salmon on October 1, past the peak of the return was 5,162 (Burkey et al. 2000).

Bag limits for coho salmon were very liberal in 1986, allowing 15 fish per day, 30 fish in possession. In 1987, the Board recognized the significance of the harvest potential of the Kanektok sport fishery and reduced bag and possession limits to 5 fish daily. These bag limits remained the standard for most of the area, except recent changes in the Aniak River. These limits were adopted to accommodate subsistence fishers who were using rod and reel for subsistence purposes, but were required to purchase a sport-fishing license. Repeatedly harvest surveys conducted on the Kanektok River indicate that sport fishers rarely (7-15%) had taken a full bag of coho salmon and most of the anglers (61-66%) elected to take no fish, even though 95% of them had caught and released a fish (Dunaway and Bingham 1992, Dunaway and Fleischman 1995).

In March of 2000, the Board of Fisheries created the Aniak Salmon Management Plan. This plan is a series of species specific regulations restricting bag / possession limits and implementing catch and release for chum and coho salmon. Chum salmon may not be possessed year-around upstream of Buckstock River. During the period of May 1 through August 31 only one coho salmon may be harvested above Buckstock River. However, the mechanics of implementing this management plan became complex because emergency regulations are only valid for 180 days and the change in bag / possession limits was greater than 180-day limit. With concurrence from the BOF, a permanent regulation was created with a sunset clause. This sunset clause requires the BOF to address this regulation at every three-year scheduled meeting with or without a proposal addressing this regulation. The regulation became effective on May 9 and expires on December 31, 2000. This management plan is up for review during the January 2001 BOF meeting.

Sport harvests of coho salmon are very small and minor; however, anglers desire to participate in the coho fisheries. The average angler stay in western Alaska for fishing is at least five days which equates to approximately 3,500 anglers utilizing the tributaries of the Kuskokwim Bay and 1,500 anglers coming to tributaries in the lower Kuskokwim River. Overall, 5,000 anglers are harvesting 3,600 coho salmon and catch and releasing 32,000 coho salmon (Tables 10 and 11). There is very little hooking mortality because many of the anglers are on float trips in tributary headwaters, and furthermore these headwaters have special management regulations to protect rainbow trout, single-hook artificial lures. Accepting that delayed hooking mortality is minor, the over all harvest of coho salmon is less than 5,000 fish in sport fisheries of the Kuskokwim Area. The Kuskokwim area coho harvest is trivial to other coho salmon harvests within the area.

2000 to date Summary

Chinook salmon conservation concerns restrained the commercial coho fishery opening until August of 2000. These actions did allow subsistence users the opportunity to concentrate on coho salmon to assist them in meeting their subsistence needs with poor return of chinook salmon in the Yukon and Kuskokwim rivers. To complicate the issue the Yukon River fall chum salmon run was weak and restrictions were in place for most of August. Overall, the coho runs appeared to be average with the latter portion of both returns showing signs of weakness in the Yukon and Kuskokwim rivers. Area coho escapements provided anglers with above average coho fishing from late July into late September in many streams of the lower Yukon / lower Kuskokwim area. Sport fishing harvests of coho salmon are expected to be above average for the lower Yukon / lower Kuskokwim area.

Table 10.-Coho salmon harvests and catches by anglers in the Kanektok, Goodnews, Arolik, and other rivers within the Kuskokwim Bay area during 1983-1999.

Year	Kanektok River		Goodnews River		Arolik River		Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983	367		168				714		1,249	
1984	1,895						864		2,759	
1985	622		386				74		1,082	
1986	2,010						684		2,694	
1987	2,300						1,232		3,532	
1988	1,837						1,356		3,193	
1989	1,096		224				905		2,225	
1990	644	4,044					260	333	904	4,377
1991	358	2,404	297	1,176			338	553	993	4,133
1992	275	3,174	138	1,571			291	707	704	5,452
1993	734	3,741	189	645			295	1,334	1,218	5,720
1994	675	1,322	170	456			755	1,089	1,600	2,867
1995	970	3,602	114	761			233	623	1,317	4,988
1996	1,251	5,084	466	1,375			379	1,153	2,096	7,612
1997	1,212	14,366	852	2,915	221	276	792	2,179	3,067	19,736
1998	751	15,017	574	7,852	74	737	172	184	1,571	23,790
1999	1,091	13,677	789	12,185	11	621	12	1,281	1,903	27,764
Average	1,064	6,643	364	3,215	99	545	550	944	1,889	10,644
1997-99										
Average	1,018	14,353	738	7,651	99	545	325	1,215	2,180	23,763

Table 11.-Coho salmon harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.

Year	Aniak River		Kisaralik River		Kwethluk River		Other Rivers		Lower Kuskokwim Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983							571		571	
1984							864		864	
1985							74		74	
1986							684		684	
1987							1,232		1,232	
1988							1,355		1,355	
1989	939						905		1,844	
1990	182	1,181					260	333	442	1,514
1991	327	1,432					338	553	665	1,985
1992	235	575			624	1,790	291	708	1,150	3,073
1993	213	753			313	566	295	1,334	821	2,653
1994	507	852	72	492			755	1,089	1,334	2,433
1995	852	2,246					233	623	1,085	2,869
1996	986	3,746					196	5,233	1,182	8,979
1997	975	4,576	182	838	274	490	102	127	1,533	6,031
1998	1,128	3,639	172	2,638	714	3,204	61	184	2,075	9,665
1999	436	3,971	270	2,315	131	774	98	700	935	7,760
Average	616	2,297	174	1,571	411	1,365	489	1,088	1,050	4,696
1997-99										
Average	846	4,062	208	1,930	373	1,489	87	337	1,514	7,819

Fishery Outlook

Lower Yukon / Lower Kuskokwim/ Kuskokwim Bay

Recent trends in coho salmon production have provided surpluses for commercial and sport fisheries in the past ten years. Coho salmon returns to the area have become widely fluctuating during the last five years. Production from the coho escapements of 1992 and 1996 have dominated coho production in the Kuskokwim in the last five years. Coho salmon returns to the Kuskokwim area are primarily four years of age, so the 1997 brood will be the main parent year for the 2001 return. Coho escapement monitoring during 1997 was limited to the Kogrukluq weir, on the Holitna River and the Kanektok River tower. Coho escapements between these two monitoring projects were mixed; the Kanektok River escapement tower project was curtailed on August 21, however the coho count exceeded 23,000, which is above the average coho escapement. The coho escapement in the Kogrukluq in 1997 was 12,000 coho which is half of the BEG of 25,000 coho salmon. If these coho escapements are any indication of coho returns to the Kuskokwim area, then the department could expect an average return to the Kuskokwim Bay fisheries and below average return for the Kuskokwim River. The department's forecasting ability for projecting coho salmon returns is less than exact during most years.

Chum Salmon Fishery Description

Overview

Yukon and Kuskokwim chum salmon stocks are primarily harvested for subsistence and commercial uses. There has been a long history of subsistence use of chum salmon in the Yukon and Kuskokwim rivers, in the Kuskokwim River chum salmon was documented as being used for subsistence in 1922 (Burkey et al. 2000). In the past, the subsistence fishery has had few restrictions in the Kuskokwim River and most of the harvest has been taken using gillnets, either drift or setnet. Directed commercial fishing for chum salmon in the Kuskokwim River started in 1971. This fishery has continued and expanded with management utilizing catch monitoring. In 1983 escapement based management began in the Kuskokwim River.

Sport harvests of chum salmon are very small and minor; however, the angler desire to participate in the salmon fisheries is great. Overall, 5,000 anglers are harvesting 850 chum salmon and catch and releasing 20,000 chum salmon (Tables 12 and 13). There is very little hooking mortality because many of the anglers are on float trips in tributary headwaters, and furthermore these headwaters have special management regulations to protect rainbow trout (i.e. single-hook artificial lures). Accepting that delayed hooking mortality is minor, the over all harvest of chum salmon is less than 1,500 fish in sport fisheries of the Kuskokwim Area. The Kuskokwim Area chum harvest is minuscule to other chum salmon harvests within the area.

Historical Perspective and Fishery Management

Chum salmon escapement goals were established in 1983 for several Kuskokwim River tributaries based on average observed escapements, since 1960. Escapement base management assumes that providing adequate / average numbers of spawners will produce sustainable yields of salmon and return salmon runs to historic levels. As the department's knowledge on stock specific production increases refinements can be made to attempt to reach maximum sustainable yields.

Table 12.-Chum salmon harvests and catches by anglers in the Kanektok, Goodnews, Arolik, and other rivers within the Kuskokwim Bay area during 1983-1999.

Year	Kanektok River		Goodnews River		Arolik River		Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983	315		10				461		786	
1984	376						260		636	
1985	149		124				75		348	
1986	777						123		900	
1987	111						283		394	
1988	618						382		1,000	
1989	537		0				442		979	
1990	202	4,532					187	523	389	5,055
1991	80	1,382	189	527			105	393	374	2,302
1992	251	3,994	0	402			91	380	342	4,776
1993	183	4,849	156	924			129	1,135	468	6,908
1994	156	6,386	15	381			496	1,186	667	7,953
1995	213	5,049	0	315			5	82	218	5,446
1996	200	8,155	0	351			9	352	209	8,858
1997	210	11,041	23	1,111	0	43	62	517	295	12,712
1998	213	11,560	50	2,955	0	17	11	175	274	14,707
1999	293	14,241	47	7,561	0	0	0	16	340	21,818
Average	287	7,119	51	1,614	0	20	184	476	507	9,054
1997-99										
Average	239	12,281	40	3,876	0	20	24	236	303	16,412

Table 13.-Chum salmon harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.

Year	Aniak River		Kisaralik River		Kwethluk River		Other Rivers		Lower Kuskokwim Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983							369		369	
1984							260		260	
1985							75		75	
1986							123		123	
1987							283		283	
1988							382		382	
1989	1,140						442		1,582	
1990	182	571					187	523	369	1,094
1991	169	656					105	393	274	1,049
1992	304	1,670			30	91	92	380	426	2,141
1993	101	2,412			0	2,269	129	1,135	230	5,816
1994	231	1,342	58	1,123			496	1,186	785	3,651
1995	127	2,785					5	82	132	2,867
1996	110	3,888					56	3,588	166	7,476
1997	85	2,369	0	9	0	53	0	125	85	2,556
1998	101	2,664	0	163	8	296	15	378	124	3,501
1999	139	4,055	0	456	41	176	0	22	180	4,709
Average	244	2,241	15	438	16	577	178	781	344	3,486
1997-99										
Average	108	3,029	0	209	16	175	5	175	130	3,589

The department has focused on assessing the salmon escapement and harvest monitoring through several programs in the Kuskokwim Area. Harvest monitoring is conducted through fish tickets and surveys designed to estimate harvests from the subsistence and sport fisheries. Salmon escapement is monitored through aerial surveys, sonar, test fishing and weirs in the Kuskokwim River. There are similar programs in the Yukon, but on larger scale. The primary chum salmon escapement programs in the Kuskokwim are aerial surveys, Aniak Sonar, Kogrukluk weir and Bethel test fishery. There have been recent weir additions and consideration for more weir operations in the future. There is a main stem Kuskowim sonar project that is under development, but is several years away from being a functional tool to assess run strength and perhaps escapements.

Exceptionally, poor runs of Kuskokwim River drainage chum salmon in 1993 and 1994 resulted in extensive restrictions in the sport and commercial fisheries. The sport harvest of chum salmon was prohibited by emergency order during 1993 and in 1994 reduced to a bag limit to one chum salmon per day. In 1997, on July 10, an emergency order closed sport fishing (including catch and release) for chum salmon in the Kuskokwim Drainage for the remainder of the 1997 season.

In March of 2000, the BOF created two management plans, one for salmon and one for resident fish. The Aniak Salmon Management Plan is a series of species specific regulations restricting bag / possession limits and implementing catch and release for chum and coho salmon. Chum salmon may not be possessed year-around upstream of Buckstock River. During the period of May 1 through August 31 only one coho salmon may be harvested above Buckstock River. However, the mechanics of implementing this management plan became complex because emergency regulations are only valid for 180 days and the change in bag / possession limits was greater than 180-day limit. With concurrence from the BOF, a permanent regulation was created with a sunset clause. This sunset clause requires the BOF to address this regulation at every three-year scheduled meeting with or without a proposal addressing this regulation. The regulation became effective on May 9 and expires on December 31, 2000. This management plan is up for review during the January 2001 BOF meeting.

2000 To Date Summary

Chum salmon conservation concerns also became apparent after chinook salmon restrictions were enacted in both the Yukon and Kuskokwim rivers in 2000. The commercial fishery in the Kuskokwim River was restrained until August to provided protection for chum and chinook salmon to improve escapements in Kuskokwim tributaries. The chum salmon escapement goals were not met in the Kuskokwim Drainage. These actions did allow subsistence users the opportunity to concentrate on coho salmon and the later part of the chum run in the Kuskokwim River to assist them in meeting their subsistence needs. To complicate the issue the Yukon River fall chum salmon run was weak and restrictions were in place for most of August. Some of the restrictions were relaxed as majority of the fall chum run passed the lower Yukon River. Area chum runs provided anglers with below average chum fishing during late July into late September in many streams of the lower Yukon / lower Kuskokwim area. Sport fishing harvests of chum salmon are expected to be below average for the lower Yukon / lower Kuskokwim area.

Fishery Outlook

Lower Yukon / Lower Kuskokwim/ Kuskokwim Bay

Recent trends in chum salmon production have provided limited surpluses for commercial and sport fisheries in the past ten years. The chum salmon harvests in the commercial fisheries in Kuskokwim Bay are incidental from directed fisheries at other species of salmon. Commercial harvests of chum salmon in the 1990's have generally declined from harvests that occurred in the 1980's. Annual harvests have decreased by approximately 57% from 1980's to 1990's where median harvests in 1980's were 420,000 chum salmon, the median harvests in the 1990's were 240,000. Similar declines have been seen in both the summer and fall chum salmon runs of the Yukon River. The Yukon and Kuskokwim chum salmon runs are typically age four and age five. The parent year escapements of 1996 and 1997 were considered adequate (meeting BEG's) or above average for providing chum salmon surplus for 2001. However the recent parent year escapements from 1993-1995 were considered adequate or above average in the Kuskokwim and Yukon rivers, but expected returns have not materialized from these broods. There are a number of climatic conditions that effect salmon survival in both freshwater and marine environments. The continuing decline of chum stocks has prompted the department and Board of Fisheries to reconsider current management strategies and to consider management options that emphasizes stock rebuilding. Therefore the outlook for chum salmon in the Kuskokwim and Yukon rivers is poor.

RESIDENT SPECIES FISHERIES

Rainbow Trout Fishery Description

Overview

Rainbow trout of the lower Yukon / lower Kuskokwim management area are found only in the lower Kuskokwim River tributaries and tributaries of Kuskokwim Bay. These stocks of rainbow trout are at the northern range of their distribution. Many of these rainbow trout stocks in the Kuskokwim area are small, slow growing, mature at older age and are not particularly abundant. With any population on the edge of its distribution, it is more sensitive to changes in climatic changes and food availability. The Southwest Alaska Rainbow Trout Management Plan recognizes these factors and provides policy for conservative management and maintenance of rainbow trout stocks in the lower Kuskokwim River and Kuskokwim Bay.

Rainbow trout stocks of the Kanektok River are considered "world class" with recent annual catch rates exceeding more than 20,000 rainbow trout. Rainbow trout catch rates from the Kanektok River rival those of the premier rainbow trout stocks of Alagnak and Copper rivers of Bristol Bay and the trophy rainbow trout area on the Kenai River, between Kenai and Skilak Lakes. With catch rates in excess of 20,000 rainbow trout, the Kanektok River is the largest rainbow trout fishery in the Kuskokwim Bay and lower Kuskokwim River. The rainbow trout fisheries in the Aniak and Goodnews rivers are the next largest rainbow trout fisheries in this area. These three fisheries are the primary interest of the angling public; angling services have increased in recent years as each of these streams gain increased popularity.

Historical Perspective

Interest in rainbow trout fishing opportunities has increase in the Kuskokwim Area. Anglers seeking rainbow trout and salmon fishing opportunities in a remote Alaska setting continue to

focus on western Alaska streams. Angler effort in the Kuskokwim Area has increased, as services become more readily available.

Angler effort in all sport fisheries of the Kanektok River has seen rapid increase from 1,500 angler days in 1983 to over 12,000 angler days in 1997. In recent years angler effort has remained steady at over 8,000 angler days in the Kanektok, and the Goodnews River has approached the 8,000-angler day level during 1999 (Table 3). Angler effort in the Aniak sport fisheries has been above 5,500 during 1997 and 1998. Most effort is directed towards chinook and coho salmon but rainbow trout is an important attraction. Total area wide rainbow trout harvest has rarely exceeded 1,500 fish on a given year, and the recent three-year average is slightly over 800 rainbow trout (Tables 14 and 15). There have been several on-site creel surveys in the Kanektok and Aniak rivers to verify catch, harvest and angler effort (Adams 1996, Dunaway 1996, Dunaway and Feischman 1995, Dunaway and Bingham 1992, Wagner 1991, Minard 1990, Minard and Brookover 1988, Minard 1987, and Alt 1986). These studies main focus was on the sport fisheries where the rainbow trout fisheries were a part of the study, except the study by Wanger (1991). Wanger attempted to estimate rainbow trout using a mark-recapture experiment, although several of the assumptions were invalid and a biased population estimate of 15,000 to 20,000 rainbow trout was estimated in 32-kilometer study section. Expanding this information to drainage wide estimate, the abundance of Kanektok rainbow trout was estimated to be in the range of 40,000 to 80,000 fish in 1986 and 1987. Another tagging study on the Kisaralik River rainbow trout in 1997 by the U.S. Fish and Wildlife Service estimated the rainbow trout population to be in excess of 16,000 rainbow trout in 79- kilometer study section (Harper, U.S. Fish and Wildlife Service, personal communication). The rainbow trout density estimates range from 200-rainbow trout/km in the Kisaralik River to 650-rainbow trout/km in the Kanektok River. Although these density estimates are flawed the general magnitude provides confidence that existing catches by SWHS are sustainable and area rainbow trout stocks continue to be conservatively managed under the Southwest Alaska Rainbow Trout Management Plan.

Fishery Management

Sport fishing effort, catch and harvest are estimated by the Statewide Harvest Survey (Mills 1979-1994 and Howe et al. 1995-2000). In the past subsistence harvest surveys have focused on salmon in the lower Yukon / lower Kuskokwim area, but in 2000 the Subsistence Division has begun to collect resident fish harvests, including rainbow trout on a community basis. Commercial Fisheries Division manages all of the subsistence fisheries.

Rainbow Trout Regulation Development in the Kanektok River:

In 1969, the fishing season was open year around and daily bag limit of 15 fish (including rainbow trout) of which not more than 3 could exceed 20 inches in length.

In 1985, the rainbow trout bag limit was reduced 2 per day, with no size limit.

In 1990, single-hook artificial lures required upstream of the Togiak National Wildlife Refuge boundary. Sport fishing was prohibited within 300 feet of legally set subsistence gillnet.

Table 14.-Rainbow trout harvests and catches by anglers in the Kanektok, Goodnews, Arolik, and other rivers within the Kuskokwim Bay area during 1983-1999.

Year	Kanektok River		Goodnews River		Arolik River		Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983	640		52				467		1,159	
1984	312						552		864	
1985	156		451				26		633	
1986	259						111		370	
1987	132						230		362	
1988	400						599		999	
1989	126		316				107		549	
1990	281	7,810					79	1,205	360	9,015
1991	182	5,856	258	2,776			129	517	569	9,149
1992	55	1,496	0	1,282			123	835	178	3,613
1993	130	4,106	145	3,994			71	1,535	346	9,635
1994	59	4,779	19	945			45	326	123	6,050
1995	198	3,046	43	1,263			10	1,324	251	5,633
1996	138	6,833	36	1,581			0	914	174	9,328
1997	230	27,325	430	9,653	43	1,798	53	525	756	39,301
1998	0	13,567	97	5,738	0	631	8	877	105	20,813
1999	73	11,151	133	5,926	0	2,070	12	159	218	19,306
Average	198	8,597	165	3,684	14	1,500	154	822	472	13,184
1997-99										
Average	101	17,348	220	7,106	14	1,500	24	520	360	26,473

Table 15.-Rainbow trout harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.

Year	Aniak River		Kisaralik River		Kwethluk River		Other Rivers		Lower Kuskokwim Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983							467		467	
1984							552		552	
1985							26		26	
1986							111		111	
1987							230		230	
1988							600		600	
1989	101						107		208	
1990	35	2,216					79	1,205	114	3,421
1991	76	1,881					129	517	205	2,398
1992	32	934			71	158	123	835	226	1,927
1993	10	1,144			58	333	72	1,535	140	3,012
1994	8	656	124	1,226			45	326	177	2,208
1995	0	1,581					9	1,234	9	2,815
1996	24	3,347					357	3,329	381	6,676
1997	53	12,293	218	7,060	227	334	48	2,040	546	21,727
1998	349	5,004	0	1,289	69	980	23	2,242	441	9,515
1999	175	4,659	0	1,877	117	269	12	143	304	6,948
Average	78	3,372	86	2,863	108	415	176	1,341	279	6,065
1997-99										
Average	192	7,319	73	3,409	138	528	28	1,475	430	12,730

In 1998, the entire river was restricted to unbaited artificial lures the entire year. During the period of June 8 through October 31, catch and release for rainbow trout. From November 1 through June 7 daily bag and possession limit of 2 rainbow trout, with only one over 20 inches.

Rainbow Trout Regulation Development in the lower Kuskokwim River tributaries:

During the mid 1980's bag limits were adopted in the Kuskokwim area to eliminate excessive harvests. Bag limits at this time were very liberal providing opportunity for local people to meet their food needs.

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

This management plan has three primary aspects.

1. Native rainbow trout populations will be managed to maintain historic size and age composition and at stock levels sufficient such that enhancement (or stocking) is not needed to supplement wild populations.
2. A diversity of sport fishing opportunities for wild trout should be provided through establishment of special management areas by regulation (5 AAC 75.013). Selection of areas for special management will be based on criteria to be adopted by the Board of Fisheries. Selection criteria is inclusive of the following: stock status, history of special management, proximity to local community, legal access, overlap with freshwater net fisheries, abundance and size of rainbow trout, water characteristics, clear geographical boundaries, importance of the rainbow trout fishery to sport fishing industry, geographical distribution of special management.
3. Management strategies should be consistent with prudent economical development of the State's recreational sport fishing industry while at the same time acknowledge the intrinsic value of this fishery resources to the people of Alaska.

Implementation of this plan:

- Expanded the Wild Trout Zone from the Iliamna drainage to include the drainages of Bristol Bay, Kuskokwim Bay and lower Kuskokwim River including the Aniak River drainage.
- Establish eight catch-release areas.
- Establish six fly-fishing catch-and-release only areas.
- Establish eleven unbaited single hook artificial lure only areas to protect rainbow trout stocks in Southwest Alaska.

In 1990, the Aniak River drainage (Figure 5) was effected by the designation of a catch and release special management area with unbaited single hook artificial lure restrictions above its confluence with the Doestock River to protect rainbow trout.



Figure 5.-Aniak River drainage.

Aniak River

- Upstream of the Doestock Creek (at approximately river mile 12) only unbaited, single-hook artificial lures may be used. No retention of rainbow trout.
- Downstream of the Doestock Creek, two rainbow trout a day, with only 1 over 20 inches.

During 1997, upper sections of the Kisaralik, Kasigluk and Kwethluk rivers were recognized as special rainbow trout waters following the Southwest Rainbow Trout Management Plan. Single hook artificial lures only with a restricted bag limit to one fish less than 14 inches in a majority of the drainage.

Detailed rainbow trout regulations:

Kisaralik River

- Upstream of Akiak Village Lodge Site (at approximately river mile 12) only unbaited, single-hook artificial lures may be used. No retention of rainbow trout.
- Downstream of the Akiak Village Lodge Site (at approximately river mile 12) two rainbow trout a day, with only 1 over 20 inches.

Kasigluk River

- In all flowing waters, only unbaited, single-hook artificial lures may be used.

Kwethluk River

- In all flowing waters upstream of the confluence of the Kwethluk River and Pocahontas Creek (at approximately river mile 25) only unbaited, single-hook artificial lures may be used. The bag and possession limit is 1 fish, 14 inches or less in length.

1999 Summary

The decrease in rainbow trout catch in the Aniak River and other lower Kuskokwim tributaries during 1999 is consistent across all fish species within this report. High rainfall during the summer of 1999 can be attributed to the decrease in rainbow trout catch along with a slight decrease in angler effort.

2000 to date Summary

During the March Board of Fisheries meeting a subsistence rod and reel provision was accepted in the AVCP region of the Yukon –Kuskokwim Delta area. Acceptance of this rod and reel subsistence provision actually made all sport fishing regulations in the in AVCP region only effective for nonresident anglers. Since all Alaskan residents are considered subsistence users under State statues and there were no bag or possession limits for subsistence users utilizing rod and reel. Any Alaskan resident in the AVCP region could harvest any number of fish without restrictions. The only exception is the Aniak River; the Central Kuskokwim Advisory Committee recognized that any Alaskan resident may participate in state subsistence fisheries. Therefore, the Central Kuskokwim Advisory Committee felt that the same restrictions in the sport fishery for salmon and resident fish species should apply to all users. So an Aniak River Subsistence Management Plan was created and the regulations mirrored the sport fishing regulations. The first subsistence catch and release fishery was created in the Aniak River.

The subsistence rod and reel regulation is in conflict with the Southwest Alaska Rainbow Trout Management Plan, except in the Aniak River. The Board of Fisheries, Department of Fish and Game and members of the public has invested considerable amounts of staff time developing a Southwest Alaska Rainbow Trout Management Plan that included stocks from the Kuskokwim Area. The only rainbow trout stock that is protected from unlimited harvests is the Aniak River stock.

Fishery Outlook

The rainbow trout stocks of the Kuskokwim area are well protected from non-resident anglers. High catches rates and low harvest rates are strong indicators of healthy fish populations. The outlook for rainbow trout stocks in the Kuskokwim area is good as long as the Board of Fisheries in the short term recognizes the conflict between the Southwest Alaska Rainbow Trout Management Plan and subsistence rod and reel regulations. Resident fish populations do not rebuild as quickly as do salmon populations, with increasing probability of salmon restrictions in the Kuskokwim area; local people are going to rely on resident fish to help meet their subsistence needs. There is potential for abuse in the subsistence rod and reel fishery without bag and possession limits.

Dolly Varden/Arctic Char Fishery Description

Overview

Dolly Varden / Arctic char of the LYLK management area are found throughout the region. Sport fishing anglers focus mainly on clear water tributaries. The largest catches of Dolly Varden / Arctic char occur in the tributaries of Kuskokwim Bay and the Aniak River. Most of these Dolly Varden /Arctic char are caught while anglers are fishing for salmon and rainbow trout. The regulations in place to protect rainbow trout also protect other resident fish species such as Dolly Varden/ Arctic char. With catch rates in excess of 20,000 Dolly Varden / Arctic char, the Kanektok River is the largest fishery in the Kuskokwim Bay and lower Kuskokwim River. The Dolly Varden / Arctic char fisheries in the Goodnews and Aniak rivers are the next largest sport fisheries in this area. These three fisheries are of primary interest to the angling public; angling services have increased in recent years as each of these streams gain increasing popularity. Local anglers seek Dolly Varden / Arctic char when salmon are not available as a fresh source of fish. Stock sizes of Dolly Varden / Arctic char in the lower Yukon / lower Kuskokwim is unknown.

Historical Perspective and Fishery Management

Sport fishing effort, catch and harvest are estimated by the SWHS, estimates from the annual report are reviewed to ensure that sport harvests remain with sustainable yields. Sport fishing regulations are developed to match effort and harvest within sustainable bounds. Current regulations and harvests appear to be within sustainable levels for Dolly Varden / Arctic char of the lower Yukon / lower Kuskokwim area. High catch rates with low harvest rates indicate healthy fish stocks.

The declining harvest rates of Dolly Varden / Arctic char from the early 1980's to the 1990's is from the protection of the rainbow trout from the Southwest Alaska Rainbow Trout Management Plan and changing attitudes of anglers regarding the harvest of Dolly Varden / Arctic char (Tables 16 and 17).

The current bag and possession limit for Dolly Varden / Arctic char are slightly different between the Yukon, Kuskokwim Bay and the lower Kuskokwim.

Yukon River

Daily bag and possession limit in flowing and saltwater is 10, with only 2 over 20 inches. In all lakes 2 a day with no size limit.

Kuskokwim Bay

Daily bag and possession limit in all flowing waters is 3, no size limit. In all lakes 2 a day with no size limit.

Lower Kuskokwim River

Daily bag and possession limit in all flowing waters is 5, with only one over 20 inches. In all lakes 2 per day with no size limit. With the exception of the Aniak River.

In March of 2000, the BOF created a management plan for the resident species in Aniak River. This plan is a series of species specific regulations restricting bag / possession limits and implementing catch and release utilizing time and area for grayling, Dolly Varden/Arctic char, pike, lake trout, sheefish, and whitefish. During the period of June 1 through August 31 all resident fish species caught above the Doestock Creek must be released. Sport fishing regulations in the Aniak River downstream of the Doestock Creek; follow the special Kuskokwim River regulations.

1999 Summary

The decrease in Dolly Varden/Arctic char catch in the Aniak River and other lower Kuskokwim tributaries during 1999 is consistent across all fish species within this report (Tables 15 and 16). High rainfall during the summer of 1999 can be attributed to the decrease in Dolly Varden/Arctic char catch along with a slight decrease in angler effort (Table 3).

2000 to date Summary

There were no reported problems of fishers having difficulties locating Dolly Varden / Arctic char during 2000 in the lower Yukon / lower Kuskokwim Management Area. The lack of bag and possession limits for the subsistence rod and reel fishery is of concern to managers of resident fish species. Although no abuses were reported there is concern on how healthy resident fish stocks can be maintained with sustainable bounds with unrestricted harvests and no real stock specific harvest monitoring system in place.

Fishery Outlook

There are no current biological concerns for the Dolly Varden / Arctic char fisheries in this area. These areas should continue to provide good angling opportunities for the 2001 season.

Table 16.-Dolly Varden / Arctic char harvests and catches by anglers in the Kanektok, Goodnews, Arolik, and other rivers within the Kuskokwim Bay area during 1983-1999.

Year	Kanektok Rivers		Goodnews River		Arolik River		Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983	1,406		147				1,583		3,136	
1984	1,116						384		1,500	
1985	815		780				261		1,856	
1986	1,213						195		1,408	
1987	752						704		1,456	
1988	2,146						1,082		3,228	
1989	2,032		530				635		3,197	
1990	1,020	10,572					80	1,013	1,100	11,585
1991	389	10,757	605	9,936			361	2,629	1,355	23,322
1992	66	3,990	82	5,694			233	1,286	381	10,970
1993	378	10,136	343	8,156			206	3,917	927	22,209
1994	233	9,242	132	3,538			197	677	562	13,457
1995	212	6,231	158	2,336			95	1,110	465	9,677
1996	474	13,954	240	4,352			118	1,223	832	19,529
1997	786	41,748	1,067	23,498	21	685	162	1,570	2,036	67,501
1998	368	24,287	460	16,680	0	643	0	25	828	41,635
1999	615	21,700	917	18,174	33	3,248	34	811	1,599	43,933
Average	825	15,262	455	10,263	18	1,525	372	1,426	1,522	26,382
1997-99										
Average	590	29,245	815	19,451	18	1,525	65	802	1,488	51,023

Table 17.-Dolly Varden / Arctic char harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.

Year	Aniak River		Kisaralik River		Kwethluk River		Other Rivers		Lower Kuskokwim Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983							1,583		1,583	
1984							384		384	
1985							261		261	
1986							196		196	
1987							704		704	
1988							1,082		1,082	
1989	808						635		1,443	
1990	598	6,174					81	1,013	679	7,187
1991	547	3,514					360	2,629	907	6,143
1992	115	3,736			57	57	233	1,286	405	5,079
1993	260	9,340			97	349	206	3,917	563	13,606
1994	496	3,115	117	1,013			197	677	810	4,805
1995	481	3,454					95	1,110	576	4,564
1996	159	4,883					642	3,367	801	8,250
1997	314	12,066	413	4,708	243	243	162	1,189	1,132	18,206
1998	394	21,053	92	599	14	188	102	1,595	602	23,435
1999	114	5,909	181	3,875	0	44	34	342	329	10,170
Average	390	7,324	201	2,549	82	176	409	1,713	733	10,145
1997-99										
Average	274	13,009	229	3,061	86	158	99	1,042	688	17,270

Arctic Grayling Fishery Description Aniak/Kisaralik

Overview

Arctic grayling of the lower Yukon / lower Kuskokwim management area are widely distributed throughout many lakes, streams and clear water tributaries. Sport fishing anglers focus mainly on clear water tributaries. The largest catches of grayling occur in the Aniak River. Most of these grayling are caught while anglers are fishing for salmon and rainbow trout. The regulations in place to protect rainbow trout also protect other resident fish species such as grayling. With catch rates in excess of 10,000 grayling, the Aniak River is the largest fishery in the lower Kuskokwim River (Tables 18 and 19). The grayling fisheries in the Kisaralik and Goodnews rivers are the next largest sport fisheries in this area. These three fisheries are the primary interest of the angling public; angling services have increased in recent years as each of these streams gain increasing popularity. Local anglers seek grayling when salmon are not available as a fresh source of fish. Stock sizes of grayling in the lower Yukon / lower Kuskokwim is unknown.

Historical Perspective and Fishery Management

Sport fishing effort, catch and harvest are estimated by the SWHS, estimates from the annual report are reviewed to ensure that sport harvests remain within sustainable yields. Sport fishing regulations are developed to match effort and harvest within sustainable bounds. Current regulations and harvests appear to be within sustainable levels for Arctic grayling of the lower Yukon / lower Kuskokwim area. High catch rates with low harvest rates indicate health fish stocks.

The declining harvest rates of grayling from the early 1980's to the 1990's is from the protection of the rainbow trout from the Southwest Alaska Rainbow Trout Management Plan and changing attitudes of anglers regarding the harvest of grayling (Tables 18 and 19).

In March of 2000, the BOF created a management plan for the resident species in Aniak River. This plan is a series of species specific regulations restricting bag / possession limits and implementing catch and release utilizing time and area for grayling, Dolly Varden/Arctic char, pike, lake trout, sheefish, and whitefish. During the period of June 1 through August 31 all resident fish species caught above the Doestock Creek must be released. Sport fishing regulations in the Aniak River downstream of the Doestock Creek; follow the special Kuskokwim River regulations.

1999 Summary

The decrease in the grayling catch in the Aniak River and other lower Kuskokwim tributaries during 1999 is consistent across all fish species within this report (Tables 18 and 19). High rainfall during the summer of 1999 can be attributed to the decrease in grayling catch along with a slight decrease in angler effort (Table 3).

2000 to date Summary

There were no reported problems of fishers having difficulties locating grayling during 2000 in the lower Yukon / lower Kuskokwim Management Area. The lack of bag and possession limits for the subsistence rod and reel fishery is of concern to managers of resident fish species. Although no abuses were reported there is concern on how healthy resident fish stocks can be

Table 18.-Arctic grayling harvests and catches by anglers in the Kanektok, Goodnews, Arolik, and other rivers within the Kuskokwim Bay area during 1983-1999.

Year	Kanektok River		Goodnews River		Arolik River		Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983	231		178				4,343		4,752	
1984	169						1,033		1,202	
1985	87		416				694		1,197	
1986	213						513		726	
1987	244						1,124		1,368	
1988	164						1,593		1,757	
1989	58		198				875		1,131	
1990	123	3,940					398	2,296	521	6,236
1991	54	3,092	122	461			671	3,295	847	6,848
1992	23	391	0	609			163	2,278	186	3,278
1993	25	2,727	17	851			181	3,636	223	7,214
1994	0	1,599	0	1,813			332	1,674	332	5,086
1995	0	1,128	14	412			167	1,952	181	3,492
1996	0	2,960	47	941			66	2,702	113	6,603
1997	98	5,335	74	2,706	0	180	80	1,703	252	9,924
1998	33	5,576	28	3,126	0	221	105	1,365	166	10,288
1999	159	4,218	84	2,544	0	447	194	1,191	437	8,400
Average	99	3,097	98	1,496	0	283	737	2,209	905	6,737
1997-99										
Average	97	5,043	62	2,792	0	283	126	1,420	285	9,537

Table 19.-Arctic grayling harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.

Year	Aniak River		Kisaralik River		Kwethluk River		Other Rivers		Lower Kuskokwim Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983							4,343		4,343	
1984							1,033		1,033	
1985							694		694	
1986							513		513	
1987							1,124		1,124	
1988							1,593		1,593	
1989	909						875		1,784	
1990	422	5,259					398	2,296	820	7,555
1991	1,085	4,841					671	3,295	1,756	8,136
1992	121	3,855			75	120	163	2,278	359	6,253
1993	288	5,580			47	166	181	3,636	516	9,382
1994	116	2,022	69	1,920			333	1,674	518	5,616
1995	53	2,266					167	1,952	220	4,218
1996	103	5,102					158	2,711	261	7,813
1997	159	15,089	303	3,746	256	499	47	984	765	20,318
1998	715	11,930	64	984	8	1,408	90	1,333	877	15,655
1999	437	8,659	63	3,641	0	226	211	609	711	13,135
Average	401	6,460	125	2,573	77	484	741	2,077	1,052	9,808
1997-99										
Average	437	11,893	143	2,790	88	711	116	975	784	16,369

maintained within sustainable bounds with unrestricted harvests and no real stock specific harvest monitoring system in place.

Fishery Outlook

There are no current biological concerns for the grayling fisheries in this area. These areas should continue to provide good angling opportunities for the 2001 season. However, the potential for abuses in the subsistence rod and reel fishery without bag and possession limits is troubling to the sport fisheries management staff.

Northern Pike Fishery Description

Overview

Most northern pike are harvested in lakes, streams and tributaries of within the lower Yukon / lower Kuskokwim area. Very few pike are being recorded through SWHS in the Kuskowim Bay area. The largest pike sport fishery occurs in the Aniak River of the lower Kuskokwim Management Area. Local anglers seek pike when salmon are not available as a fresh source of fish. Stock sizes of pike in the lower Yukon / lower Kuskokwim is unknown.

Historical Perspective and Fishery Management

Sport fishing effort, catch and harvest are estimated by the SWHS, estimates from the annual report are reviewed to ensure that sport harvests remain with sustainable yields. Sport fishing regulations are developed to match effort and harvest within sustainable bounds. Current regulations and harvests appear to be within sustainable levels for northern pike of the lower Yukon / lower Kuskokwim area. High catch rates with low harvest rates indicate healthy fish stocks.

Annual sport harvests of pike have decreased from the 1980's to the 1990's (Table 20). The reasons for this decline in harvests are unknown, but angler attitudes towards harvesting pike have may have changed in the 1990's or these harvest statistics may be truly representing only sport fishing harvest and not subsistence harvests of pike in the lower Kuskokwim area.

The current bag and possession limit for pike are slightly different between the Yukon and Kuskokwim rivers.

Yukon River pike daily bag and possession limit is 10, with no size limit.

The Kuskokwim River pike daily bag and possession limit 10, with no size limit, except for the following: For those waters downstream of the Holitna to the mouth of the Kuskokwim River, the daily bag and possession is 5, with only one over 30 inches, except in the Aniak River.

In March of 2000, the BOF created a management plan for the resident species in Aniak River. This plan is a series of species specific regulations restricting bag / possession limits and implementing catch and release utilizing time and area for grayling, Dolly Varden/Arctic char, pike, lake trout, sheefish, and whitefish. During the period of June 1 through August 31 all resident fish species caught above the Doestock Creek must be released. Sport fishing regulations in the Aniak River downstream of the Doestock Creek; follow the special Kuskokwim River regulations.

2000 to date Summary

There were no reported problems of fishers having difficulties locating northern pike during 2000 in the lower Yukon / lower Kuskokwim Management Area. The lack of bag and possession

Table 20.-Northern pike harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.

Year	Aniak River		Kisaralik River		Kwethluk River		Other Rivers		Lower Kuskokwim Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983							6,420		6,420	
1984							1,520		1,520	
1985							1,595		1,595	
1986							856		856	
1987							878		878	
1988							4,019		4,019	
1989	70						3,383		3,453	
1990	18	53					213	2,376	231	2,429
1991	244	1,448					1,774	3,173	2,018	4,621
1992	43	794			60	231	504	1,956	607	2,981
1993	0	45			329	526	666	3,094	995	3,665
1994	54	698	0	18			565	2,694	619	3,410
1995	77	623					164	1,423	241	2,046
1996	10	399					176	1,950	186	2,349
1997	42	303	21	119	0	206	99	270	162	898
1998	553	1,883	67	67	18	247	85	241	723	2,438
1999	94	674	0	27	0	0	66	189	160	890
Average	110	692	22	58	81	242	1,352	1,737	1,452	2,573
1997-99										
Average	230	953	29	71	6	151	83	233	348	1,409

limits for the subsistence rod and reel fishery is of concern to managers of resident fish species. Although no abuses were reported there is concern on how healthy resident fish stocks can be maintained with sustainable bounds with unrestricted harvests and no real stock specific harvest monitoring system in place.

Outlook

There are no current biological concerns for the northern pike fisheries in this area. These areas should continue to provide good angling opportunities for the 2001 season.

Sheefish Fishery Description

Overview

Most sheefish are harvested in streams and tributaries within the lower Yukon / lower Kuskokwim area. The largest sheefish sport fishery occurs in the Holitna River above the Aniak River in the upper Kuskokwim Management area. However there are a few local anglers that have recently begun prospecting for sheefish in the lower tributaries of the Yukon and Kuskokwim. In the 1960's there was a directed commercial fishery for sheefish in the winter on the Yukon River. Local anglers seek sheefish in spring and fall when salmon are not available as a fresh source of fish. Stock sizes of sheefish in the lower Yukon / lower Kuskokwim are unknown.

Historical Perspective and Fishery Management

Sport fishing effort, catch and harvest are estimated by the SWHS, estimates from the annual report are reviewed to ensure that sport harvests remain within sustainable yields. Sport fishing regulations are developed to match effort and harvest within sustainable bounds. Current regulations and harvests appear to be within sustainable levels for Dolly Varden / Arctic char of the lower Yukon / lower Kuskokwim area. High catch rates with low harvest rates indicate healthy fish stocks.

Annual sport harvests of sheefish have decreased from the 1980's to the 1990's (Table 21). The reasons for this decline in harvest is unknown, but angler attitudes towards harvesting sheefish may have changed in the 1990's or these harvest statistics may truly representing only sport fishing harvest and not subsistence harvests of sheefish in the lower Kuskokwim area.

The current bag and possession limit for sheefish is slightly different between the Yukon and Kuskokwim rivers.

Yukon River Sheefish daily bag and possession limit is 10, with no size limit.

Kuskokwim River Sheefish daily bag and possession limit is 10, with no size limit, except for the following: For those waters downstream of the Holitna to the mouth of the Kuskokwim River, the daily bag and possession is 5, with no size limit, except in the Aniak River.

In March of 2000, the BOF created a management plan for the resident species in Aniak River. This plan is a series of species specific regulations restricting bag / possession limits and implementing catch and release utilizing time and area for grayling, Dolly Varden/Arctic char, pike, lake trout, sheefish, and whitefish. During the period of June 1 through August 31 all resident fish species caught above the Doestock Creek must be released. Sport fishing regulations

Table 21.-Sheefish harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.

Year	Aniak River		Kisaralik River		Kwethluk River		Other Rivers		Lower Kuskokwim Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983							901		901	
1984							481		481	
1985							210		210	
1986							194		194	
1987							452		452	
1988							1,074		1,074	
1989							722		722	
1990							107	316	107	316
1991	13	141					141	398	154	539
1992	0	11					119	119	119	130
1993	0	626					54	1,326	54	1,952
1994	88	154					124	171	212	325
1995	9	623					94	537	103	1,160
1996	20	89					44	283	64	372
1997	22	225					127	469	149	694
1998	30	47	14	197	38	493	42	99	124	836
1999	81	290	0	0	0	0	27	69	108	359
Average 1997-99	29	245	7	99	19	247	289	379	308	668
Average	44	187	7	99	19	247	65	212	127	630

in the Aniak River downstream of the Doestock Creek; follow the special Kuskokwim River regulations.

2000 to date Summary

There were no reported problems of fishers having difficulties locating sheefish during 2000 in the lower Yukon / lower Kuskokwim Management Area. The lack of bag and possession limits for the subsistence rod and reel fishery is of concern to managers of resident fish species.

Outlook

There are no current biological concerns for the sheefish fisheries in this area. These areas should continue to provide good angling opportunities for the 2001 season.

Lake Trout Fishery

Overview

Most lake trout are harvested in lakes of the headwater rivers and tributaries within the lower Yukon / lower Kuskokwim area. Many of these lakes are located in the lower Kuskokwim and Kuskokwim Bay area. Anglers utilize lakes in the headwaters to begin float trips on adjacent streams and rivers. However there are a few local anglers with float or ski planes fishing on local lakes for lake trout throughout the year. Local residents commonly seek lake trout when salmon are not available as a fresh source of fish. Stock sizes of lake trout in the lakes of the lower Yukon / lower Kuskokwim is unknown. Lake trout in the lower Yukon / lower Kuskokwim are no different than other stocks of lake trout in the state of Alaska. Lake trout are long lived, slow growing, late maturing fish that can be easily overexploited in a relatively short period of time. Many of the lakes that contain lake trout are high altitude alpine lakes that have a short open water period and are considered to have short growing period. Historical harvests of lake trout in other locations in the state of Alaska suggest that past sport fishing practices can deplete lake trout stocks in small lakes.

Historical Perspective and Fishery Management

Sport fishing effort, catch and harvest are estimated by the SWHS, estimates from the annual report are reviewed to ensure that sport harvests remain within sustainable yields. Sport fishing regulations are developed to match effort and harvest within sustainable bounds. Current regulations and harvests appear to be within sustainable levels for lake trout of the lower Yukon / lower Kuskokwim area. High catch rates with low harvest rates indicate healthy fish stocks. Occasionally there is some misidentification between Arctic char / Dolly Varden and lake trout. Some of the large harvests that arise in the Statewide Harvest Survey Report need further investigation from time to time to ensure proper identification for accurate reporting.

Annual sport harvests of lake trout have decreased from the 1980's to the 1990's (Tables 22 and 23). The reasons for this decline in harvest is unknown, but angler attitudes towards harvesting lake trout have changed in the 1990's or these harvest statistics may truly be representing only sport fishing harvest and not subsistence harvests of lake trout in the lower Kuskokwim area.

The current bag and possession limit for lake trout is 4 per day, except for restrictions in the Aniak River. In March of 2000, the Board of Fisheries created a management plan for the resident species in Aniak River. This plan is a series of species specific regulations restricting bag / possession limits and implementing catch and release utilizing time and area for grayling,

Table 22.-Lake trout harvests and catches by anglers in the Kanektok, Goodnews, Arolik, and other rivers within the Kuskokwim Bay area during 1983-1999.

Year	Kanektok River		Goodnews River		Arolik River		Other Locations		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983									0	
1984							117		117	
1985							7		7	
1986							555		555	
1987							14		14	
1988							90		128	
1989			38				7		7	
1990							27	308	27	308
1991			0	38			171	631	171	669
1992							155	810	164	857
1993		18	9	29			104	496	104	496
1994							0	448	0	448
1995	80	90	20	38			27	125	127	253
1996	27	182	9	283			0	203	36	668
1997	112	154	22	211	0	0	137	499	271	864
1998	0	333	40	230	0	0	0	29	40	592
1999	0	33	25	450	0	0	0	9	25	492
Average	44	135	20	183	0	0	88	356	105	565
1997-99										
Average	37	173	29	297	0	0	46	179	112	649

Table 23.-Lake trout harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.

Year	Aniak River		Kisaralik River		Kwethluk River		Other Locations		Lower Kuskokwim Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983							419		419	
1984							545		545	
1985							10		10	
1986							555		555	
1987							14		14	
1988							91		91	
1989	63						7		70	
1990	18	475					27	308	45	783
1991							172	631	172	631
1992	47	555					155	810	202	1,365
1993		10					105	496	105	506
1994		0					0	448	0	448
1995	61	163					27	125	88	288
1996	9	54					56	203	65	257
1997	96	179	90	170	0	0	96	189	282	538
1998	9	62	67	282	0	0	15	44	91	388
1999	18	18	0	67	0	0	0	24	18	109
Average	40	168	52	173	0	0	135	328	163	531
1997-99										
Average	41	86	52	173	0	0	37	86	130	345

Dolly Varden/Arctic char, pike, lake trout, sheefish, and whitefish. During the period of June 1 through August 31 all resident fish species caught above the Doestock Creek must be released. During the period of September 1 through May 31 the daily bag limit is 2 lake trout. Sport fishing regulations in the Aniak River downstream of the Doestock Creek; follow the special Kuskokwim River regulations.

2000 to date Summary

There were no reported problems of fishers having difficulties locating lake trout during 2000 in the lower Yukon / lower Kuskokwim Management Area. The lack of bag and possession limits for the subsistence rod and reel fishery is of concern to managers of resident fish species.

Outlook

There are no current biological concerns for the lake trout fisheries in this area. These areas should continue to provide good angling opportunities for the 2001 season.

Burbot Fishery Description

Overview

Most burbot are harvested in the rivers and tributaries within the lower Yukon / lower Kuskokwim area. More than likely these burbot are harvested local anglers who are participating in subsistence activities in the area. Local residents commonly seek burbot or lush when salmon are not available as a fresh source of fish. Stock size of burbot in the lower Yukon / lower Kuskokwim is unknown and is believed to be fairly large. However local depletion has been known to occur in locations of intensive fishing, such as river mouths during the winter.

Historical Perspective and Fishery Management

Sport fishing effort, catch and harvest are estimated by the SWHS, estimates from the annual report are reviewed to ensure that sport harvests remain with sustainable yields. Sport fishing regulations are developed to match effort and harvest within sustainable bounds. Current regulations and harvests appear to be within sustainable levels for burbot of the lower Yukon / lower Kuskokwim area. The low harvest rates are not an indicator of depressed fish stocks but an under utilized resource (Table 24).

Current bag and possession limit is 15 burbot a day. Burbot may be taken under statewide regulations. Burbot may be taken in fresh water with more than one line and hook, provided:

1. the total aggregate number of hooks may not exceed 15 or the daily bag limit for burbot in the waters being fished, whichever is less;
2. the hooks are single hooks with a gap between point and shank larger than $\frac{3}{4}$ inch;
3. each hook is set to rest on the bottom of lake or stream;
4. each line is identified with the angler's name and address; and
5. each line is physically inspected at least once during a 24-hour period.

Table 24.-Burbot harvests and catches by anglers in the Aniak, Kisaralik, Kwethluk and other rivers within the lower Kuskokwim River area during 1983-1999.

Year	Aniak River		Kisaralik River		Kwethluk River		Other Locations		Lower Kuskokwim Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1983							472		472	
1984							0		0	
1985							105		105	
1986							146		146	
1987							126		126	
1988							91		91	
1989							47		47	
1990							1,125	1,125	1,125	1,125
1991							40	50	40	50
1992							169	169	169	169
1993					107	107	107	107	214	214
1994							20	20	20	20
1995							0	0	0	0
1996							0	0	0	0
1997					180	180	0	0	180	180
1998							136	298	136	298
1999	13	13			76	76	139	139	228	228
Average	13	13			121	121	160	191	182	228
1997-99										
Average	13	13			128	128	92	146	181	235

2000 to date Summary

There were no reported problems of fishers having difficulties locating burbot during 2000 in the lower Yukon / lower Kuskokwim Management Area. The lack of bag and possession limits for the subsistence rod and reel fishery is of concern to managers of resident fish species. Although no abuses were reported there is concern on how health resident fish stocks can be maintained with sustainable bounds with unrestricted harvests and no real stock specific harvest monitoring system in place.

Fishery Outlook

There are no current biological concerns for the burbot fisheries in this area. These areas should continue to provide good angling opportunities for the 2001 season.

ACKNOWLEDGEMENTS

The author thanks Sara Case, Region III publications technician, for a great deal of assistance with tables, formatting, and final report preparation. We also thank Charlie Swanton for his patience and editorial expertise.

LITERATURE CITED

- Adams, F. J. 1996. Status of rainbow trout in the Kanektok River, Togiak National Wildlife Refuge, Alaska 1993-1994. U.S. Fish and Wildlife Service, Alaska Fisheries Technical Report number 39, King Salmon, Alaska.
- ADF&G. 2000. *In prep.* Salmon escapement goal policy. Alaska Department of Fish and Game.
- Alaska Statutes. 2000. Alaska fish and game laws and regulations, 2000-2001 edition. Lexis pp. 1140
- Alt, K. 1986. Kanektok River creel census. Alaska Department of Fish and Game, Federal aid in Fish Restoration, Annual Performance Report, 1985-1986. Project F-10-1, 27 (S-62-1) Juneau.
- Burkey, C., M. Coffing, J. Menard, D. B. Molynarux, P. Salomone, C. Utermohle and T. Vania. 2000. Annual management report for the commercial fisheries of the Kuskokwim area, 1999. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage. pp227.
- Burkey, C., M. Coffing, J. Menard, D. B. Molynarux, P. Salomone, C. Utermohle and T. Vania. 1999. Annual management report for the commercial fisheries of the Kuskokwim area, 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage. pp227.
- Burkey, C., M. Coffing, J. Menard, D. B. Molynarux, P. Salomone, C. Utermohle and T. Vania. 1998. Annual management report for the commercial fisheries of the Kuskokwim area, 1997. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage. pp227.
- Dunaway, D. O. 1997. Monitoring the sport fisheries in the Aniak River, Alaska, 1996. Alaska Department of Fish and Game, Sport Fisheries Division, Fisheries Management Report 97-4, Anchorage.
- Dunaway, D. O. and A. E. Bingham, 1992. Creel surveys on chinook and coho salmon sport fisheries on the lower Kanektok River, 1991. Alaska Department of Fish and Game, Sport Fisheries Division, Fisheries Data Series 92-23, Anchorage.
- Dunaway, D. O. and S. J. Fleischman 1995. Creel surveys on chinook and coho salmon sport fisheries in the Kanektok River, 1994. Alaska Department of Fish and Game, Sport Fisheries Division, Fisheries Data Series 95-22, Anchorage.
- Howe, Allen L., Gary Fidler, Allen E. Bingham, and Michael J. Mills. 1996. Harvest, catch, and participation in Alaska sport fisheries during 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-32, Anchorage.

LITERATURE CITED (Continued)

- Howe, Allen L., Gary Fidler, and Michael J. Mills. 1995. Harvest, catch, and participation in Alaska sport fisheries during 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-24, Anchorage.
- Howe, A. L., G. Fidler, C. Olnes, A. E. Bingham, and M. J. Mills. 1997. Harvest, catch, and participation in Alaska sport fisheries during 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-29, Anchorage.
- Lisac, M. J. and R. MacDonald. 1995. Age distribution of chinook salmon escapement samples, Togiak National Wildlife Refuge, Alaska, 1994. U.S. Fish and Wildlife Service, Fishery Data Series 95-4, Dillingham, Alaska.
- MacDonald, R. 1996. Age distribution of chinook salmon escapement samples, Togiak National Wildlife Refuge, Alaska, 1995. U.S. Fish and Wildlife Service, Fishery Data Series 96-6, Dillingham, Alaska.
- Mills, M. J. 1979. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1978-1979, Project F-9-11, 20 (SW-1), Juneau.
- Mills, M. J. 1980. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980, Project F-9-12, 21 (SW-1), Juneau.
- Mills, M. J. 1981a. Alaska statewide sport fish harvest studies (1979). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (SW-I-A), Juneau.
- Mills, M. J. 1981b. Alaska statewide sport fish harvest studies (1980). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (SW-I-A), Juneau.
- Mills, M. J. 1982. Alaska statewide sport fish harvest studies (1981). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1981-1982, Project F-9-14, 23 (SW-I-A), Juneau.
- Mills, M. J. 1983. Alaska statewide sport fish harvest studies (1982). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24 (SW-I-A), Juneau.
- Mills, M. J. 1984. Alaska statewide sport fish harvest studies (1983). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1983-1984, Project F-9-16, 25 (SW-I-A), Juneau.
- Mills, M. J. 1985. Alaska statewide sport fish harvest studies (1984). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1984-1985, Project F-9-17, 26 (SW-I-A), Juneau.
- Mills, M. J. 1986. Alaska statewide sport fish harvest studies (1985). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1985-1986, Project F-10-1, 27 (RT-2), Juneau.
- Mills, M. J. 1987. Alaska statewide sport fisheries harvest report. Alaska Department of Fish and Game, Fishery Data Series No. 2, Juneau.
- Mills, M. J. 1988. Alaska statewide sport fisheries harvest report. Alaska Department of Fish and Game, Fishery Data Series No. 52, Juneau.
- Mills, M. J. 1989. Alaska statewide sport fisheries harvest report. Alaska Department of Fish and Game, Fishery Data Series No. 122, Juneau.
- Mills, M. J. 1990. Harvest and participation in Alaska sport fisheries during 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-44, Anchorage.
- Mills, M. J. 1991. Harvest, catch, and participation in Alaska sport fisheries during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-58, Anchorage.
- Mills, M. J. 1992. Harvest, catch, and participation in Alaska sport fisheries during 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-40, Anchorage.
- Mills, M. J. 1993. Harvest, catch, and participation in Alaska sport fisheries during 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-42, Anchorage.
- Mills, M. J. 1994. Harvest, catch, and participation in Alaska sport fisheries during 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-28, Anchorage.

LITERATURE CITED (Continued)

- Minard, R. E. 1987. Effort and catch statistics for the sport fishery in the lower Kanektok River, 1986. Alaska Department of Fish and Game, Sport Fisheries Division, Fishery Data Series No.29, Juneau.
- Minard, R. E. and T. E. Brookover. 1988. Effort and catch statistics for the sport fishery for chinook salmon in the lower Kanektok River, 1987. Alaska Department of Fish and Game, Sport Fisheries Division, Fishery Data Series No.44, Juneau.
- Wanger, P.A. 1991. Southwest Alaska rainbow trout investigations, Kanektok River, Togiak National Wildlife Refuge, Alaska, 1985-1987. U.S. Fish and Wildlife Service, Fishery Technical Report No.13, King Salmon, Alaska.