

Fishery Management Report No. 12-37

**Fishery Management Report for Sport Fisheries in the
Kuskokwim-Goodnews Management Area, 2010**

by

John Chythlook

November 2012

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the *Système International d'Unités* (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H_A
gram	g			base of natural logarithm	e
hectare	ha	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	catch per unit effort	CPUE
kilogram	kg			coefficient of variation	CV
kilometer	km	at	@	common test statistics	(F, t, χ^2 , etc.)
liter	L	compass directions:		confidence interval	CI
meter	m	east	E	correlation coefficient (multiple)	R
milliliter	mL	north	N	correlation coefficient (simple)	r
millimeter	mm	south	S	covariance	cov
		west	W	degree (angular)	°
Weights and measures (English)		copyright	©	degrees of freedom	df
cubic feet per second	ft ³ /s	corporate suffixes:		expected value	E
foot	ft	Company	Co.	greater than	>
gallon	gal	Corporation	Corp.	greater than or equal to	≥
inch	in	Incorporated	Inc.	harvest per unit effort	HPUE
mile	mi	Limited	Ltd.	less than	<
nautical mile	nmi	District of Columbia	D.C.	less than or equal to	≤
ounce	oz	et alii (and others)	et al.	logarithm (natural)	ln
pound	lb	et cetera (and so forth)	etc.	logarithm (base 10)	log
quart	qt	exempli gratia (for example)	e.g.	logarithm (specify base)	log ₂ , etc.
yard	yd	Federal Information Code	FIC	minute (angular)	'
		id est (that is)	i.e.	not significant	NS
Time and temperature		latitude or longitude	lat. or long.	null hypothesis	H_0
day	d	monetary symbols (U.S.)	\$, ¢	percent	%
degrees Celsius	°C	months (tables and figures): first three letters	Jan,...,Dec	probability	P
degrees Fahrenheit	°F	registered trademark	®	probability of a type I error (rejection of the null hypothesis when true)	α
degrees kelvin	K	trademark	™	probability of a type II error (acceptance of the null hypothesis when false)	β
hour	h	United States (adjective)	U.S.	second (angular)	"
minute	min	United States of America (noun)	USA	standard deviation	SD
second	s	U.S.C.	United States Code	standard error	SE
		U.S. state	use two-letter abbreviations (e.g., AK, WA)	variance	
Physics and chemistry				population	Var
all atomic symbols				sample	var
alternating current	AC				
ampere	A				
calorie	cal				
direct current	DC				
hertz	Hz				
horsepower	hp				
hydrogen ion activity (negative log of)	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

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KUSKOKWIM-GOODNEWS MANAGEMENT AREA, 2010**

by

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The Fishery Management Reports series was established in 1989 by the Division of Sport Fish for the publication of an overview of management activities and goals in a specific geographic area, and became a joint divisional series in 2004 with the Division of Commercial Fisheries. 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.adfg.alaska.gov/sf/publications/>. This publication has undergone regional peer review.

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ABSTRACT

Sport fisheries season and management summaries for 2010 with preliminary information for 2011 in the Kuskokwim-Goodnews Management Area are presented. The Kuskokwim-Goodnews Management Area (KGMA) consists of all waters of the Kuskokwim River drainage, Kuskokwim Bay, and waters extending from the Naskonat Peninsula in the north to the south side of Cape Newenham in the south. Sport and subsistence fisheries target all five Pacific salmon species, as well as rainbow trout (*Oncorhynchus mykiss*), Dolly Varden (*Salvelinus malma*), sheefish (*Stenodus leucichthys*), Arctic grayling (*Thymallus arcticus*), and northern pike (*Esox lucius*). In 2010, angler-days totaled 21,339 with the largest proportion coming from the Kanektok River drainage (0.27). Coho salmon was the predominant sport species harvested in 2010 with 3,527 fish taken, followed by Dolly Varden (1,565), and northern pike (909). The estimated 2010 king salmon harvest in the Kuskokwim-Goodnews Management Area was 354. Summaries of major sport, commercial, and subsistence fisheries within the Kuskokwim-Goodnews Management Area are detailed, including descriptions of recent performances, Alaska Board of Fisheries regulatory actions, social and biological issues, and descriptions of ongoing research and management activities.

Key Words: Southwest Alaska, Bethel, Kuskokwim River, Aniak, McGrath, Kuskokwim Bay, Kanektok River, Holitna River, sport fisheries, subsistence, king salmon, coho salmon, pink salmon, Arctic grayling, Dolly Varden, sheefish, northern pike.

EXECUTIVE SUMMARY

This document provides a wide array of information specific to the recreational angling opportunities and subsistence and commercial fisheries that exist within the Kuskokwim-Goodnews Management Area (KGMA). Information specific to the recreational, subsistence and commercial fisheries within the Kuskokwim River and Kuskokwim Bay drainages during 2010 and preliminary data from 2011 are presented along with a brief history of these fisheries and past Alaska Board of Fisheries (BOF) decisions that have affected them.

INTRODUCTION

This area management report provides information regarding the KGMA and is one in a series of reports annually updating fisheries management information within Region III. The report is provided for the BOF, Fish and Game Advisory Committees (ACs), the general public, and other interested parties. It presents fisheries assessment information and the management strategies that are developed from that information. In addition, this report includes a description of the fisheries regulatory process, geographic, administrative, and regulatory boundaries, funding sources, and other information concerning Division of Sport Fish management programs within the area.

The goals of the Division of Sport Fish of the Alaska Department of Fish and Game (ADF&G) are to protect and improve the state's recreational fisheries resources by managing for sustainable yield of wild stocks of sport fish, providing diverse recreational fishing opportunities, and providing information to assist the BOF in optimizing social and economic benefits from recreational fisheries. In order to implement these goals, the division has in place a fisheries management process.

A regional review is conducted annually during which the status of important area fisheries is considered and research needs are identified. Fisheries stock assessment projects are developed, scheduled, and implemented to meet information needs identified by fisheries managers. Projects are planned within a formal operational planning process. Biological information

gathered from these research projects is combined with effort information and input from user groups to assess the need for and development of fisheries management plans, and to propose regulatory strategies.

Division of Sport Fish management and research activities are funded by ADF&G and Federal Aid in Fisheries Restoration funds. ADF&G funds are derived from the sale of state fishing licenses. Federal aid funds are derived from federal taxes on fishing tackle and equipment established by the Federal Aid in Sport Fish Restoration Act (also referred to as the Dingell-Johnson Act or the D-J Act). The D-J funds are provided to the states at a match of up to 3-to-1 with the ADF&G funds. Additional funding specified for providing, protecting, and managing access to fish and game is provided through a tax on boat gas and equipment established by the Wallop-Breaux (W-B) Act. Other peripheral funding sources may include contracts with various government agencies and the private sector.

This area management report provides information regarding the KGMA and its fisheries for 2010, with preliminary information from the 2011 season. This report is organized into two primary sections: a management area overview including a description of the management area and a summary of effort, harvest, and catch for the area, and a section on significant area fisheries, including specific harvest and catch by species and drainage.

The BOF divides the state into 18 regulatory areas to organize the sport fishing regulatory system by drainage and fishery. These areas (different from regional management areas) are described in Title 5 of the Alaska Administrative Code Chapters 47–74. The Division of Sport Fish of ADF&G divides the state into 3 administrative Regions with boundaries roughly corresponding to groups of the BOF regulatory areas. Region I covers Southeast Alaska (the Southeast Alaska regulatory area). Region II covers portions of Southcentral and Southwest Alaska (including the Prince William Sound, Kenai Peninsula, Kenai River Drainage, Cook Inlet-Resurrection Bay Saltwater, Anchorage Bowl, Knik Arm, Susitna River drainages, West Cook Inlet, Kodiak, Bristol Bay, and the Alaska Peninsula and Aleutian Islands regulatory areas). Region III includes Upper Copper River and Upper Susitna River area and the Arctic-Yukon-Kuskokwim Region (including the North Slope, Northwestern, Yukon River, Tanana River, and Kuskokwim-Goodnews regulatory areas).

Region III is the largest geographic region, encompassing the majority of the landmass of the state of Alaska (Figure 1). The region contains over 442,500 mi² (1,146,000 km²) of land, some of the state's largest river systems (Yukon, Kuskokwim, Colville, Noatak, Upper Copper, and Upper Susitna River drainages), thousands of lakes, thousands of miles of coastline, and streams. Regional coastline boundaries extend from Cape Newenham in the southwest, around all of western, northwestern and northern Alaska to the Canadian border on the Arctic Ocean. Region III as a whole is very sparsely populated, with the most densely populated center located in the Tanana River Valley. Fairbanks (population about 35,000, Fairbanks North Star Borough population of about 99,000) is the largest community.

For administrative purposes Sport Fish Division has divided Region III into five fisheries management areas (Figure 1). They are:

- Northwestern/North Slope Management Area (Norton Sound, Seward Peninsula, Kotzebue Sound, and North Slope drainages);

- Yukon Management Area (the Yukon River drainage except for the Tanana River drainage);
- Upper Copper/Upper Susitna Management Area (the Copper River drainage upstream of Canyon Creek and Haley Creek, and the Susitna River drainage above the Oshetna River);
- Tanana River Management Area (the Tanana River drainage); and,
- Kuskokwim-Goodnews Management Area (the entire Kuskokwim River drainage and Kuskokwim Bay drainages).

Area management biologists for the five areas are located in Nome/Fairbanks, Fairbanks, Glennallen, Fairbanks/Delta Junction, and Bethel/Fairbanks, respectively.

ALASKA BOARD OF FISHERIES

The BOF is a seven-member board that sets fishery regulations and harvest levels, allocates fishery resources, and approves or mandates fishery conservation plans for the State of Alaska. BOF members are appointed by the governor for three-year terms and must be confirmed by the legislature.

Under the current operating schedule, the BOF considers fishery issues for regulatory areas or groups of regulatory areas on a three-year cycle. Proposals to create new or modify existing regulations and management plans are submitted by ADF&G and the public (any individual can submit a proposal to the BOF) for evaluation by the BOF. During its deliberations the BOF receives input and testimony through oral and written reports from ADF&G staff, members of the general public, representatives of local ACs, and special interest groups such as fishermen's associations and clubs. The public provides its input concerning regulation changes and allocation through submission of written proposals and testifying directly to the BOF, by participating in local AC meetings, or by becoming members of local ACs.

ADVISORY COMMITTEES

Local ACs have been established throughout the state to assist the Boards of Fisheries and Game in assessing fisheries and wildlife issues and proposed regulation changes. AC meetings allow opportunity for direct public interaction with ADF&G staff attending the meetings that answer questions and provide clarification concerning proposed regulatory changes regarding resource issues of local and statewide concerns. The Board Support Section within ADF&G's Division of Administrative Services provides administrative and logistical support for the BOF and ACs. During 2010, ADF&G had direct support responsibilities for 81 ACs in the state.

Within the KGMA there are five ACs: Lower Kuskokwim, Central Bering Sea, Central Kuskokwim, Stony-Holitna, and McGrath committees. In addition, Lower Yukon and Togiak ACs often comment on proposals concerning fisheries in the KGMA.

RECENT BOARD OF FISHERIES ACTIONS

The BOF meets annually, but deliberates on each individual regulatory area on a three-year cycle, most recently for the KGMA in January 2010 in Fairbanks. At this meeting a proposal was adopted that aligned the *Kuskokwim Salmon Rebuilding Management Plan* (5 AAC 07.365) with the Aniak River sport regulations adopted at the 2007 BOF meeting. In 2007, a proposal

was adopted that allowed the retention of chum salmon (*Oncorhynchus keta*) in the general regulations, chum salmon were added to the sport fish aggregate bag and possession limit for salmon and the subsistence rod and reel limit is linked to the sport limit (Chythlook 2011). Inadvertently the clause that prohibited the retention of chum salmon in the Aniak River was not removed from the *Kuskokwim Salmon Rebuilding Management Plan* (5 AAC 07.365) at this meeting, but was resolved at the 2010 meeting.

ADF&G EMERGENCY ORDER AUTHORITY

ADF&G has emergency order (EO) authority (5 AAC 75.003) to modify time, area, and bag/possession limit regulations. EOs are implemented to address conservation issues not adequately controlled by existing regulations. Once implemented, an EO is in effect until the situation is resolved or the BOF can formally take up the issue. EOs are also used as a tool for inseason management of fisheries. Inseason management is usually in accordance with a fisheries management plan approved by the BOF. There was one emergency order (3-KS-03-10) issued under this authority for the KGMA during 2010. Effective July 12, 2010 at 12:01 a.m., all waters in the Kwethluk and Tuluksak river drainages were closed to sport fishing for king salmon (*O. tshawytscha*), including catch-and-release fishing. This action was taken to mirror the Yukon Delta National Wildlife Refuge action that closed those rivers to the harvest of king salmon for subsistence purposes. In 2011, there was also an emergency order that closed these rivers and the nearby Kuskokuak Slough as well as the Kisaralik and Kasigluk Rivers to sport fishing for king salmon (3-KS-01-11) effective 12:01 a.m. Wednesday, June 1, 2011. The harvest of king salmon was concurrently closed in the subsistence fishery for these rivers in 2011. These actions collectively were brought about by continued poor escapement numbers at weir projects on the Tuluksak and Kwethluk Rivers.

FEDERAL SUBSISTENCE

The Alaska National Interest Lands Conservation Act established a priority subsistence use of fish and game for federally qualified rural residents on lands and waters for which the federal government asserts jurisdiction. The state of Alaska has also established a priority for subsistence use of fish and game by Alaskan residents (AS 16.05.258) on all lands and waters, but cannot discriminate between rural and urban residents (Alaska State Constitution Article VIII, sections 3 and 15). Because of this difference, the federal government asserted authority to ensure a priority subsistence use of fish and game for rural residents on federal lands and certain adjacent waters. On October 1, 1999, the federal government asserted regulatory authority for assuring the rural priority for subsistence fisheries on federal public lands, which includes non-navigable waters on public lands. Following the “Katie John” decision by the Ninth Circuit Court in 1995, the federal government expanded the definition of public land to include waters for which the federal agencies assert federal reserved water rights. Under current practice, the federal land management agencies adopt regulations to provide for the priority subsistence use by qualified rural residents in non-navigable waters within federal public lands (including Bureau of Land Management [BLM] lands) and in navigable waters adjacent to or within federal conservation system units (generally does not include BLM lands). The state retains all other fish and wildlife management authorities, including management on federal land.

The development of regulations for subsistence fisheries under the federal subsistence program occurs within the established Federal Subsistence Board (FSB) process. The public provides its input concerning regulation changes by testifying in Federal Subsistence Regional Advisory

Council (RAC) meetings or by becoming council members. Ten RACs have been established throughout Alaska to assist the FSB in determining local subsistence issues and providing recommendations on proposed fishing and hunting regulations on the fish and game populations under consideration. Each RAC meets twice a year, and subsistence users and other members of the public can comment on subsistence issues at these meetings.

Within the KGMA the subsistence fisheries for which the federal government asserts management responsibility include those in the Yukon Delta National Wildlife Refuge and the Togiak National Wildlife Refuge. The KGMA fisheries fall mainly under the purview of the Yukon-Kuskokwim Delta RAC and peripherally the Western Interior RAC and Bristol Bay RAC.

REGION III SPORT FISH DIVISION RESEARCH AND MANAGEMENT STAFFING

The Region III Division of Sport Fish staff biologists are organized into a research group and a management group. The management group consists of a management supervisor, a regional management biologist, an area biologist for each of the five management areas, one or more assistant area management biologists, and two stocked water biologists. Area biologists evaluate fisheries and propose and implement management strategies through plans and regulation in order to meet divisional goals. A critical part of these positions is interaction with the BOF, ACs, and the general public. Stocked waters biologists plan and implement the regional stocking program for recreational fisheries. The regional management biologist assigned to the Region III headquarters office in Fairbanks also administers the regional fishing and boating access program.

The research group consists of a research supervisor, a salmon research supervisor, a resident species supervisor, research biologists, and various field technicians. Research biologists plan and implement fisheries research projects in order to provide information needed by the management group to meet divisional goals. The duties of the management and research biologists augment one another.

STATEWIDE HARVEST SURVEY

Sport fishing effort and harvest of sport fish species in Alaska have been estimated and reported annually since 1977 using a mail survey (Howe et al. 1995-1996, 2001a-d; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b; Mills 1979-1980, 1981a-b, 1982-1994; Walker et al. 2003). The Statewide Harvest Survey (SWHS) is designed to provide estimates of effort, harvest, and catch on a site-by-site basis. It is not designed to provide estimates of effort directed towards a single species. Species-specific catch-per-unit-effort (CPUE) information can seldom be derived from the report. Two types of questionnaires are mailed to a stratified random sample of households containing at least one individual with a valid fishing license (resident or nonresident). Information gathered from the survey includes participation (number of anglers and days fished), number of fish caught and number harvested by species and site. These surveys estimate the number of angler-days of fishing effort expended by sport anglers fishing Alaskan waters as well as the sport harvest. Beginning in 1990, the survey was modified to include estimation of catch (release plus harvest) on a site-by-site basis. Survey results for each year are not available until the following year; hence, the results for 2010 were not available until fall 2011. Additionally, creel surveys have been selectively used to verify the mail survey

for fisheries of interest or for fisheries that require more detailed information for inseason management.

The utility of SWHS estimates depends on the number of responses received for a given site (Mills and Howe 1992). In general, estimates from smaller fisheries with low participation are less precise than those of larger fisheries with high participation. Therefore the following guidelines were implemented for evaluating survey data:

1. Estimates based on fewer than 12 responses should not be used other than to document that sport fishing occurred;
2. Estimates based on 12 to 29 responses can be useful in indicating relative orders of magnitude and for assessing long-term trends; and,
3. Estimates based on 30 or more responses are generally representative of levels of fishing effort, catch, and harvest.

For purposes of reporting and organizing statistics in the SWHS, the KGMA is designated as survey area (V).

SPORT FISH GUIDE LICENSING AND LOGBOOK PROGRAM

Since 1998, the Division of Sport Fish has operated a program to register and/or license both sport fishing guides and sport fishing guide businesses, and to collect information on sport fishing participation, effort, and harvest by saltwater and freshwater guided clients (Sigurdsson and Powers 2009). In 1998, the BOF adopted statewide sport fishing guide regulations (5 AAC 75.075) which required all sport fishing guides and businesses to register annually with ADF&G. At this time the BOF also adopted statewide regulations that required logbooks for saltwater charter vessels. The logbooks collected information on charter activity (location, effort, and harvest) that was necessary for the BOF for allocation and management decisions specific to king salmon, rockfish (*Sebastes* spp.), and lingcod (*Ophiodon elongatus*) and for the North Pacific Fishery Management Council for allocation of Pacific halibut (*Hippoglossus stenolepis*).

In 2004, the Alaska Legislature adopted House Bill 452 that established licensing requirements for sport fishing guide business owners and sport fishing guides on a statewide basis (effective 2005). This legislation also required logbook reporting for all freshwater guiding businesses, in addition to the existing saltwater reporting requirements. The logbook data provides location of fishing effort, level of participation, and number of species kept and released by clients. This information is used for the regulation, development, and management of fisheries and has been published annually since 2008 in a Fishery Data Series report (Sigurdsson and Powers 2009-2011).

SECTION I: MANAGEMENT AREA OVERVIEW

MANAGEMENT AREA DESCRIPTION

The KGMA includes all waters of the Kuskokwim River drainage, and all drainages in Kuskokwim Bay (Figure 2). Additionally, the KGMA includes all drainages that flow into the Bering Sea north of Cape Newenham and south of the westernmost point of the Naskonat

Peninsula (approximately Hooper Bay) to the north. Nunivak, St. Matthew, and adjacent islands are also included within the area as well.

For sport fish management purposes, the KGMA is partitioned into two sections; the Kuskokwim River and Kuskokwim Bay (Figure 2).

The KGMA includes substantial parts of two National Wildlife Refuges, the Yukon-Kuskokwim Delta Refuge and the Togiak Refuge. Nearly half of the Yukon-Kuskokwim Delta Refuge is within the KGMA, as are several thousand acres of the Togiak Refuge in the headwaters of Kuskokwim Bay streams.

FISHERY RESOURCES

Sport fisheries began to develop in the KGMA during the early 1980s (Chythlook 2006, 2009; Lafferty 2001). It was during this time period that sport fisheries in this area were captured in the SWHS. Largely, sport fisheries of the KGMA were small, isolated, and received little effort and hence, low catch and harvest (Tables 1, 2, 3).

Angling effort in the KGMA is third in ranking of the angling effort in the AYK region. The Upper Copper/Upper Susitna and Tanana Management areas support more fishing effort and are largely road accessible. The amount of fishing effort in the area is directly related to the remoteness of the area and difficulty and expense in getting there.

Angling effort in the Kuskokwim River and Kuskokwim Bay reached a high of 27,913 angler-days in 1998, and has fluctuated between 17,000 and 27,000 in recent years, suggesting a fairly stable amount of fishing effort in this area. Even with increased publicity the area has received in national fishing and hunting magazines, as well as local press, effort has remained stable. The static effort may be related to sustained high fuel and transportation costs to and within the region. There are three sport fisheries that dominate the area; they are the Kanektok, Aniak, and Goodnews rivers (Tables 4, 5; Figure 3). These three streams provide salmon fisheries for all five Pacific salmon, as well as rainbow trout (*O. mykiss*), in a remote Alaska setting. Other rivers in the Kuskokwim River area that receive very small to moderate fishing pressure are the Kisaralik and Kwethluk and Holitna rivers (Table 5; Figure 4). Most other rivers in the area do not receive enough fishing effort to show up strongly in the SWHS. In the upper portion of the Kuskokwim River, the Holitna River drainage is spoken of as a “breadbasket” for its production of salmon, but there isn’t much effort expended in angler-days in spite of its large size. The majority of the Kuskokwim River upstream of the Holitna River drainage sees very little effort (Table 5).

Subsistence fisheries for salmon have a long history on the Kuskokwim River, with harvests documented throughout the river dating as far back as 1922 (Burkey et al. 2000). The subsistence fishery for king salmon is the most important, and regularly reaches harvests of over 80,000 for the entire Kuskokwim River drainage based on ADF&G Subsistence Division’s 10- and 15-year averages (Simon et al. 2007; C. Shelden, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication).

Commercial fisheries in the Kuskokwim-Goodnews drainages are relatively small and center on the Lower Kuskokwim River (District 1) and in Kuskokwim Bay at the Kanektok and Goodnews Rivers (Districts 4 and 5, respectively). They are important to the local economies, but may be somewhat irregular in prosecution due to factors including market issues, processing capacity,

exceptionally high chum salmon catches, and run strength (J. Linderman, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication).

Sport fisheries in the KGMA are small by comparison to other sport fisheries in the state with better access (Table 1). The majority of the effort occurs in the Kuskokwim Bay area, focusing mainly on the Kanektok River. Fishing effort on the Kanektok River averages over 6,000 angler-days annually (Table 4). Rainbow trout are the most desired species for anglers on the Kanektok River. Fishing for other resident species such as Arctic grayling *Thymallus arcticus* and Dolly Varden *Salvelinus malma* occurs there also, as well as for salmon, especially king and coho *O. kisutch* salmon. Important rainbow trout sport fisheries also occur in the lower Kuskokwim rivers: the Kisaralik/Kasigluk, Kwethluk, and Aniak Rivers. Fishing for the five Pacific salmon species occurs throughout much of the Kuskokwim River and Kuskokwim Bay drainages. The rivers that drain into the Central and Upper Kuskokwim River, such as the Holitna River, attract a moderate number of sport anglers annually (Table 5).

ESTABLISHED MANAGEMENT PLANS AND POLICIES

Regulations governing fisheries in the KGMA are found in 5 AAC 71.010 through 5 AAC 71.995, 5 AAC 75.001 through 5 AAC 75.995 (sport fishing), in 5 AAC 77.001 through 5 AAC 77.035, and 5 AAC 77.200 through 5 AAC 77.240 (personal use), in 5 AAC 01.250 through 5 AAC 01.295 (subsistence fishing), and in 5 AAC 07.001 through 5 AAC 07.650 (commercial fishing and management plans).

Fisheries-specific management objectives for the management area have been identified in management plans for Arctic grayling and lake trout. In addition, a series of general divisional criteria have been prepared to guide establishment of fishery objectives, and include:

1. **Management and protection of existing fish resources.** Divisional activities should strive to manage and protect Alaska's wild fish stock resources for future generations;
2. **Public use and benefits of existing fish resources.** Alaska's fishery resources should be made available for public use and benefit on a sustained yield basis;
3. **Rehabilitation of depressed stocks and damaged habitat.** Division activities should strive to restore and maintain fish stocks and habitat damaged by man's activities; and,
4. **Enhancement of natural production or creation of new opportunities.** The Division should pursue creation of new sport fishing opportunities through rehabilitation of natural stocks or creation of new fisheries where these opportunities do not negatively impact other fisheries.

Currently, there are three management plans specific to sport fisheries in the KGMA: the *Southwest Rainbow Trout Plan*, the *Wild Arctic Grayling Management Plan* (5 AAC 71.055), and the *Lake Trout Management Plan* (5 AAC 71.040). These plans address time, area, and method and means of harvesting these resident fish species in designated waters. The objectives are to distribute the opportunity to harvest a small proportion of the sustainable surplus over the fishing season without unnecessary disruptions to the sport fishery.

In the past, management plans have been designed to provide managers guidance over inseason management, frequently addressing salmon management. Salmon management in the KGMA is governed by subsistence regulations and several management plans directed at controlling commercial fisheries harvests. Subsequently, managers from Division of Commercial Fisheries

take a lead role in the management of salmon in this area of the state. Most subsistence and commercial fishing regulations are interconnected to provide opportunity to harvest salmon surpluses in the Kuskokwim River drainage.

Salmon Management Plans

Subsistence fishing seasons and periods are the guiding regulations in the harvest of salmon in the Kuskokwim River (5 AAC 01.260). There are two salmon management plans that guide subsistence, commercial, and sport fishing management in the KGMA, including streams in Kuskokwim Bay. These include the:

1. *Kuskokwim River Salmon Rebuilding Management Plan* (5 AAC 07.365); and,
2. *District 4 (Quinhagak) Salmon Management Plan* (5 AAC 07.367).

During the 2007 BOF meeting, the stock of concern designation for Kuskokwim River king salmon and Kuskokwim River chum salmon was discontinued, both of which were first designated as stocks of concern during the 2001 BOF meeting. The “windows” system remained in regulation, however, “windows” would not be used if chum and king salmon returns remain strong during any given year.

The *Policy for the Management of Sustainable Salmon Fisheries* (SSFP, 5 AAC 39.222) applies to the king and chum salmon management plans of the Yukon and Kuskokwim rivers. Comprehensive rebuilding measures were instituted in 2001 by placing windows of salmon passage in migratory routes in freshwater and marine environments. Windows included: restrictions to the Area M fishery, moving the northern commercial fishing boundary of W-4 (Quinhagak) three miles south (Oyak Creek), closing the Kuskokwim River commercial fishery during the months of June and July, adjusting the subsistence fishing schedule to four consecutive fishing days in the Kuskokwim River and basing sport fishery restrictions on inseason abundance, except for the Aniak River. Many of the existing and a few new restrictions in the Aniak River sport fishery were included within the *Kuskokwim River Salmon Rebuilding Management Plan* (5 AAC 07.365), including continuation of the king salmon season from May 1 to July 25, with a bag limit of two king salmon 20 inches or greater and an annual limit of two king salmon 20 inches or greater. On the Aniak River, a combined bag and possession limit of three other salmon species (pink *O. gorbuscha*, sockeye *O. nerka*, chum and coho) per day remains in effect. Inclusion of chum salmon in the aggregate bag limit was reinstated in the Aniak River by BOF action in 2007. A correction of the *Kuskokwim River Salmon Rebuilding Management Plan* in the 2010 AYK BOF meeting reflected continuation of the same action.

Resident Fish Management Plans

As recently as the 1990s, sport fishing bag limits for resident fish species were generous and were used as a surrogate for subsistence uses in the Kuskokwim River drainage. Management of resident fish species in the KGMA is under subsistence and sport fishing regulations. Subsistence regulations of the Kuskokwim Area are an exception to resident species management throughout the state of Alaska. This area, the Lower Yukon and portions of the Norton Sound Area are some of the few areas of the state where a resident of Alaska can harvest unlimited quantities of resident fish (except rainbow trout) during the open water season with hook-and-line under subsistence regulations.

Policy for the management of sustainable wild trout fisheries (5 AAC 75.222, 2003; 5 AAC 75.210, 2003). This policy directs the department to manage wild trout populations in the KGMA for long-term sustained yield through a conservative harvest regime. The policy establishes a conservation plan for wild trout populations, and defines the management approaches under which the department shall manage wild trout populations in the KGMA. The policy establishes that wild trout stocks and habitats should be maintained at levels that assure optimum sustained yield. The policy also outlines guidelines and considerations for the department, public and/or BOF to change or address the management approach for a water body or fish stock.

Wild Arctic Grayling Management Plan (5 AAC 69.155, 2009; 5 AAC 70.055, 2009). This management plan directs the department to manage wild Arctic grayling populations in the KGMA for long-term sustained yield through a conservative harvest regime. The plan establishes and defines three management approaches under which the department shall manage wild Arctic grayling populations in the KGMA: 1) the regional management approach; 2) the conservative management approach; and, 3) the special management approach. The plan also outlines guidelines and considerations for the department, public and/or BOF to change or address the management approach for a water body or fish stock.

Wild Lake Trout Management Plan (5 AAC 69.140, 2009; 5 AAC 70.040, 2009). This management plan directs the department to manage wild lake trout populations in the KGMA by employing a conservative harvest regime and by maintaining harvest below the maximum sustained yield level. The department may take one or more management actions if there is a conservation or biological concern for the sustainability of the fishery or a stock harvested in that fishery. These actions include reduction of bag and possession limit, reduction of fishing time, allowing only catch-and-release, and modification of methods and means of harvest. The plan also specifies allowable measures to reduce harvest if the harvest level exceeds sustainable yield for a two-year period. Finally, the plan establishes a process for designating special management waters and means for limiting harvest in these areas to meet the management objectives.

Land Use Management Plans

The Togiak and Yukon-Kuskokwim National Wildlife refuges have developed Fisheries Management Plans (FMPs) for refuge lands within the KGMA. These plans generally acknowledge state authority for management of sport fisheries and have little direct effect on the day-to-day management of the area's fisheries. ADF&G staff have worked with U.S. Fish and Wildlife Service (USFWS) 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 5-year duration, after which a review process begins. In 1999, the Togiak FMP was adopted and a comprehensive conservation planning phase was implemented. The Togiak Comprehensive Conservation Plan (CCP) was reviewed beginning in December 2001. There are significant numbers of suggestions within this plan that address sport-fishing issues in Kuskokwim Bay. The state has responded to several sport fishing issues within the Togiak CCP, particularly the issue of the quality of sport fishing and subsistence opportunities. The Yukon-Kuskokwim Delta Refuge FMP was adopted in 1992 and has been gradually implemented.

A Public Use Management Plan (PUMP) has 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 affect opportunity in the sport fisheries. In general, the PUMP established levels of commercial use under land lease requirements 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 lease refuge lands for the purpose of providing angler services.

The Togiak PUMP was adopted in 1991. Since adoption, four minor amendments have been made. In 1995, Togiak Refuge began review and revision of the plan when the amount of guided use equaled visitor use. Currently, the plans include a matrix of options that may potentially govern use patterns on rivers that flow through the refuge (Appendix A). ADF&G has opposed many of the options listed in the matrix, and continues to support efforts to maintain access for unguided visitors to these rivers without potentially unnecessary regulation. ADF&G assisted refuge staff during the 2005 review process of the Togiak CCP, but in 2010, ADF&G/DNR and federal managers disagreed on the implementation of an option within the Togiak PUMP that included the restriction of unguided users on select streams that flow through the Togiak Refuge. These include the Kanektok, Goodnews, Arolik, and Togiak rivers. Negotiations are currently at an impasse.

MAJOR ISSUES

1. Development of new sport fisheries in rural Alaska. Relatively rapid development of sport fisheries in remote areas has resulted in friction between local residents and non-local anglers. In many instances, local people have historically enjoyed nearly exclusive use of fishery resources. Sport fishing guides and other anglers seeking less crowded fishing opportunities in wilderness settings continue to “discover” less well known, but potentially high quality fisheries. As popular fishing destinations in Bristol Bay and Southcentral Alaska become increasingly crowded, anglers and guides are likely to continue to travel farther to participate in Alaska’s fisheries. In addition to the social friction caused by this change in use patterns of remote areas and to some extent because of this friction, ADF&G will increasingly be expected to provide information on the status of stocks for which there is minimal information. This is likely to be the biggest challenge in the management of sport fisheries in the KGMA.
2. Rod and reel subsistence. In 2000, the BOF included rod and reel gear as a legal subsistence fishing method for harvest during the open water season in the Association of Village Council Presidents (AVCP) area of the lower Yukon and Kuskokwim rivers. In 2001, rod and reel subsistence fishing was extended upstream to include the remainder of the Kuskokwim River drainage by emergency regulation in response to a petition to the BOF from Nikolai Native Village and the Western Interior RAC. Prior to these actions being taken, rod and reel for subsistence fishing was permitted only through the ice under state regulations. The primary concern with this potential change is how to manage for sustainable fish populations with legalization of rod and reel gear for subsistence fishing. It is likely that rural resident use patterns have incorporated rod and reel in past subsistence harvests, and legalization of this gear will not greatly affect local use patterns. Since all Alaskans qualify for subsistence, resident anglers could choose to rod and reel fish under subsistence regulations instead of sport fish regulations. Resident fishing effort has not yet declined as a result of this regulation change, based on the SWHS. The greatest concerns relate to changes in urban resident behavior in regard to license sales, visitation to rural

fisheries, and harvests of fish populations, and ability to measure these harvests in the absence of harvest surveys or permits.

3. Federal fishery regulation for subsistence in Alaska's navigable waters. In October 1999, federal fishery managers assumed responsibility for ensuring a rural subsistence priority on navigable waters adjacent to or within the boundaries of federal conservation units. There is widespread concern that one result of this action will be reduced opportunity for sport fishing throughout the state. Because of the large amount of federal public land and the high proportion of subsistence users within the KGMA, this loss of opportunity is a concern for sport fishermen in the area. Recent proposals to the FSB to exclude recreational anglers from popular fisheries have required substantial efforts by ADF&G staff to maintain current opportunities.
4. Jurisdictional issues involving navigable water bodies. Jurisdiction over navigable water bodies that run through federal conservation units is in dispute between state and federal managers. For example, land managers of the Togiak National Wildlife Refuge are investigating implementation of several options put forward in the Togiak CCP and PUMP that restrict access to individuals seeking to gain access to sport fisheries in waters in which jurisdiction is contested, namely on the Goodnews, Kanektok, and Togiak Rivers (Togiak PUMP). In a similar issue, land status surrounding the Arolik River continues to be in dispute between the federal and state governments. BLM determined that portions of the Arolik River were non-navigable and under the Alaska Native Claims Settlement Act (ANCSA) conveyed shoreline to Qanirtuuq Inc. as part of its entitlement under the Act. However, the State of Alaska received title to inland navigable water bodies as provided in the Statehood Act of 1958 and the U.S. Submerged Lands Act of 1953. Therefore, the State of Alaska asserts that the shoreline were not in federal ownership and were not BLM's to convey.

ACCESS PROGRAMS

The Wallop-Breaux amendment to the Sport Fish Restoration Act (or the D-J Act) mandates that at least 15% of federal funds collected from taxes on boat gas and sport fishing equipment be used by states for the development and maintenance of motorized boating access facilities. A broad range of access facilities can be approved for funding if constructed to achieve a state fishery management objective. These facilities can include boat ramps and lifts, docking and marina facilities, breakwaters, fish cleaning stations, rest rooms, and parking areas.

To date, relatively few access projects have been proposed for the rural Kuskokwim area. An upgrade of the boat launching site in the community of McGrath has been considered, as well as the possibility of access projects involving boating facilities in Bethel or Aniak. None of these project possibilities have advanced beyond initial discussion at this time. Presently, there are no major access issues for sport fishing in the KGMA, largely because of the remote character of the entire region.

INFORMATION AND EDUCATION

Information regarding regulations, publications, fishing reports, news releases and emergency orders for the KGMA can be found from the *Fishing* and *Sport* links at the ADF&G website (<http://www.adfg.alaska.gov/index.cfm?adfg=fishingSport.main>). From the Interior Area and Kusko link on this website, anglers interested in fishing in the KGMA can read the area

descriptions and other fishing information. The Togiak National Wildlife Refuge and Yukon Delta National Wildlife Refuge are the two federal land units within the area, and a portion of the major rivers in the area are within these lands and have their own corresponding reports and news releases at their websites (<http://togiak.fws.gov>) and (<http://yukondelta.fws.gov>).

There are three regional information and education (I&E) staff located in the Fairbanks office. An Information Officer II and a seasonal Fisheries Technician III respond to questions from the public at the office and via phone and e-mail. In addition, I&E staff distribute and update fishery brochures, fishing regulations, the regional webpage, coordinate the Fairbanks Outdoor Show booth, Kid's Fish & Game Fun Day, and the Becoming an Outdoors Woman program. An Education Associate II coordinates the sport fishing component of the Alaska Conservation Camp and works with schools in various communities throughout the region to provide a curriculum in sport fishing and aquatic education.

SPORT FISHING EFFORT, HARVEST, AND CATCH

Sport fishing effort and harvest in the KGMA remains low for most tributary rivers, and indeed for the entire area (Tables 1–6). Sport fishing effort from 2005 to 2009 averaged over 21,000 angler-days for the entire KGMA, the majority in the Kuskokwim Bay tributaries (Tables 4 and 5). This is similar to the effort over the last 10 years (2000–2009) (Chythlook 2011). The Kanektok River receives the most effort in angler-days and in the last 10 years has received roughly a third of the effort expended for the KGMA. The Kanektok River undoubtedly receives this attention due to the rainbow trout fishery, which is renowned through coverage in national fishing magazines and publications.

The majority of the sport fishing effort occurs in three areas: Kuskokwim Bay tributaries (including the Kanektok, Goodnews, and Arolik Rivers), the Aniak River, and the Lower Kuskokwim tributaries near Bethel (Kwethluk and Kisaralik Rivers, Table 5). There is some sport fishing effort in the Holitna River, but considering the size of this drainage, effort remains exceptionally low.

Fishing effort in the KGMA has remained stable overall, but a general overall decrease was observed in 2009 and 2010. Though the effort was slightly higher in 2010 than 2009, it was below the 5- and 10-year averages. It was anticipated that there would be a drop in travel to the area due to travel restrictions that followed September 11, 2001, but effort remained relatively stable comparable to that prior to 2001 (Tables 4 and 5). There has been considerable speculation that this stability in effort may be relatively short-lived, however, as anecdotally many individuals and guides throughout the region expressed concern over the high energy costs. The 2010 data show a relatively stable fishery, if somewhat diminished compared to previous years (Table 5).

Coho salmon is the primary sport fish species that is harvested in the KGMA (Table 3). Arctic grayling surpasses coho salmon in numbers of fish caught in the Upper Kuskokwim River, but the vast majority of Arctic grayling are released and not harvested.

SECTION II: FISHERIES

SALMON FISHERIES

King Salmon

Background and Historical Perspective

King salmon are present in most streams throughout the KGMA. King salmon are predominantly caught and harvested in tributaries of Kuskokwim Bay and tributaries of the Lower Kuskokwim River. The largest sport fisheries for king salmon are located in the Kanektok and Aniak rivers. These two sport fisheries average approximately 6,000 and 3,000 angler-days of effort, respectively, for all fish species (Tables 4 and 5). Very few king salmon are caught and harvested in the sport fisheries in the Upper Kuskokwim River tributaries, including the Holitna River.

The Kuskokwim River and tributaries contain large runs of king salmon, but many streams are broad and turbid, thus directing sport fishing effort to clearwater tributaries. These salmon fisheries attract a very small number of anglers to western Alaska each year.

Sport harvest and catch of king salmon are estimated through the SWHS. These estimates of harvest and catch are summarized in previous Fishery Management Reports (FMR) (Lafferty 2001, 2003; Chythlook 2006, 2009, 2011). Additional KGMA commercial and subsistence harvest information for 2005–2009 can be found in Bavilla et al. (2010). Division of Sport Fish has monitored both the Kanektok and Aniak river sport fisheries with additional inseason harvest surveys and stock assessment projects in the past (Minard 1987; Minard and Brookover 1988; Dunaway and Bingham 1992; Dunaway and Fleischman 1995; Dunaway 1997; Lafferty and Bingham 2002). Additionally, the USFWS, Togiak Refuge, has collected age and size data from king salmon spawning in the Kanektok River since 1994 (Lisac and MacDonald 1995; MacDonald 1996; M. Lisac, Fisheries Biologist, USFWS, Dillingham, personal communication).

Sport harvests of king salmon are minor in comparison to the commercial and subsistence harvests of the area (Tables 7, 8 and 9). However, there is angler desire to participate in the king salmon fisheries of the Kuskokwim-Goodnews area. The average angler trip length in western Alaska is at least six days (Lafferty and Bingham 2002). Kuskokwim Bay sport fisheries average about 10,000 angler-days per season (Table 4), which is about half the total annual effort; total angler-days for the Kuskokwim River and Kuskokwim Bay averages near 21,000 (Table 5).

Historically, about 1,000 king salmon in the KGMA are harvested from a total catch of nearly 11,000 king salmon during 1990–2010 (Tables 10 and 11). Harvests during the last 5 years have remained similar, though the catch numbers have fluctuated greatly in the last few years. Catches in the Kuskokwim Bay area peaked at 21,000 king salmon in 2005, while in 2008 and 2009, catches were near 3,000 king salmon. Catches in 2010 increased to over 6,800. Most anglers participate in the KGMA king salmon fisheries via float trips in tributary headwaters, a significant distance from estuarine waters. Furthermore, most of the popular sport fisheries have significant river segments under unbaited, single-hook, artificial lure requirements to protect rainbow trout. Accepting that delayed hooking mortality is minor, 10% or less (Bendock and Alexandersdottir 1992), overall fishing mortality (harvest + delayed mortality) may account for an additional 1,000 king salmon from KGMA sport fisheries, and bring the total removal by the

sport fishery to around 2,500 king salmon under current regulations. KGMA sport harvest of king salmon is small relative to harvests of king salmon in the Nushagak River and other areas on the road system or with better access such as the Southcentral region and Kenai River.

The harvest of king salmon in the Kuskokwim River drainage sport fisheries has remained low (< 1,000 in recent years) (Tables 2, 11). This is probably due in part to care taken to not retain sport caught king salmon in the Kuskokwim River due to perceptions regarding the sport fishery and the stock of concern designation placed on king salmon stocks in 2001. The BOF removed the stock of concern designation for Kuskokwim River king salmon at its 2007 meeting, but many sport fishermen and guides still exercise restraint in harvesting king salmon, especially in light of recent poor escapements announced by Commercial Fisheries Division (C. Brazil, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication). Catches of king salmon in the sport fishery follow a general trend, for each fish harvested, 10 are caught and released in this area (Table 2, 3).

Recent Fishery Performance

Emergency orders related to the Salmon Management Plans did not prove necessary during the 2004–2009 seasons, though there was a precautionary EO in place in 2004 to reduce king salmon bag and possession limits that was rescinded early in the season. An emergency order in 2010 (3-KS-03-10) to restrict the king salmon harvest in the sport fishery in the Kwethluk and Tuluksak Rivers followed a similar action by the Yukon Delta National Wildlife Refuge that restricted the king salmon harvest in those rivers by the subsistence fishery. The associated EO and other actions did not affect the neighboring streams or mainstem Kuskokwim River.

In 2010, though the king salmon run strength was considered to be below average to poor, the subsistence fishing schedule was not implemented. Chinook salmon escapements were achieved in only 2 of 5 systems with goals that are monitored by weir: the Kogrukluks and Middle Fork Goodnews River (Brazil et al. 2011). An emergency order was issued to close the sport fishery for king salmon in the Kwethluk and Tuluksak Rivers (3-KS-03-10) in response to a special action by USFWS-Yukon Delta NWR to close the federal fisheries on those rivers due to low escapements.

In the commercial fishery, there were a total of 16 commercial fishing periods in District 1 during the 2010 season, between June 25 and August 12, with two registered commercial fish buyers (Brazil et al. 2011). Slightly increased processing capacity allowed for a slight increase in fishing time over the previous year (Brazil et al. 2011). King salmon catch rates were below average at 2,731 king salmon.

During the 2010 season the majority of the king salmon sport fishery occurred in the Lower Kuskokwim River and Kuskokwim Bay, though a minimal catch and harvest occurred in the Upper Kuskokwim River, including the Holitna river drainage (Table 11).

In 2010, sport fishing reports for king salmon from guides in the Kuskokwim Bay fisheries were said to be similar to the previous two years, but catches and harvests increased and were near the five-year average throughout the Kuskokwim Bay drainages (Table 10). King salmon catch in the Kuskokwim Bay was well below the 10-year average at about 6,800 compared to about 10,500 (Table 10). For most Kuskokwim River tributaries (excluding the Kwethluk and Tuluksak, which were closed by emergency order), guide businesses and individual anglers characterized the king salmon catch and harvest as average. Efforts were made by sport fish

guides and operators to avoid harvest, due to the poor escapement counts at weir projects throughout the Kuskokwim. Catch level was near average, but harvest level was below the five- and 10-year averages for king salmon in the Kuskokwim River drainages (Table 11). Sport guiding operators and individual sport anglers in the Lower Kuskokwim streams qualified fishing as average, and were pleased that water levels didn't fluctuate as drastically as they had in recent years. Sport anglers in the Holitna River drainage harvested very few king salmon, with very little corresponding catch (Table 11).

Division of Commercial Fisheries characterized king salmon abundance in 2010 in the Kuskokwim River as below average overall. King salmon escapement was achieved on only two weir projects. Kogrukluk River king salmon escapement (a tributary of the Holitna River and often used as a gauge of the strength of a salmon run) was within the escapement goal range, and aerial survey goals were exceeded or within range (C. Brazil, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication; Table 6).

Preliminary results from the 2011 king salmon run suggest a very poor run (C. Brazil, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication). Pre-season actions included sport, commercial and subsistence closures on the Kwethluk, Kisaralik, and Tuluksak Rivers, as well as Kuskokuak Slough. An emergency order was issued in 2011 (3-KS-01-11) to close the Kwethluk, Tuluksak, and Kisaralik Rivers, as well as the Kuskokuak Slough to harvest of king salmon. This EO was issued prior to the king salmon season in cooperation with conservation measures taken by the Division of Commercial Fisheries and U.S. Fish and Wildlife Service (USFWS). A subsequent three day federal special action to close the mainstem Kuskokwim River to any king salmon harvest from the mouth of the Kuskokwim to the Aniak River was not supported by the state.

Fishery Objectives and Management

ADF&G has focused on assessing salmon escapements and harvest monitoring through several programs in the Kuskokwim River area. Commercial harvest monitoring is conducted through fish tickets and surveys are utilized 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. The primary king salmon escapement programs in the Kuskokwim River drainage are aerial surveys and the Kogrukluk River weir. There have been recent weir additions to further ADF&G understanding of Kuskokwim River drainage escapements, as well as mark-recapture studies (Pawluk et al. 2006)

Most Kuskokwim River king salmon escapement objectives are based on aerial survey information. Often these aerial surveys are sporadic, because of aircraft availability or weather conditions, and this method of evaluating escapement has been unsatisfactory in understanding Kuskokwim River drainage king salmon production. Therefore, ADF&G has invested in weir operations in locations where feasible. Generally, location of these weirs is not based on the proportion of the total run using a tributary, but on the suitability of the site for weir maintenance. Many of the larger tributaries and probably the larger stocks of king salmon, such as the Aniak and Holitna rivers, have no complete assessment other than sporadic aerial surveys of king salmon or a weir on the Kogrukluk River (a Holitna River tributary). The test fishing in the Lower Kuskokwim River, near Bethel, only provides indices of daily passage and not a measure of escapement.

Current Issues and Fishery Outlook

Kuskokwim River and Tributaries

Subsistence and sport fisheries were characterized as below average in 2010 and 2011, and some subsistence users characterized the subsistence fishery as average to poor (C. Brazil, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication). Division of Commercial Fisheries considered the 2010 escapements as poor at most escapement projects with the exception of the Kogruklu River which was characterized as average. 2010 king salmon escapement was very low in the Kwethluk and Tuluksak Rivers, and emergency closures for the subsistence and sport fisheries were implemented from July 10–25. With poor escapements in the lower river tributaries in 2010 and 2011, 2012 will likely be similar.

Kuskokwim Bay Tributaries

The 2010 king salmon escapement into the Goodnews River achieved the escapement goal range of 1,500–2,900 salmon with an estimated weir passage of 2,244 (Brazil et al. 2011). The Division of Commercial Fisheries has been operating an escapement weir since 2002 on the Kanektok River to enumerate salmon escapement. The weir is located more than 40 miles upstream and therefore counts only salmon that spawn upstream of the weir site. Escapement in the lower 40 miles of the Kanektok River is estimated with aerial surveys. In 2010, operation of the weir was from June 28 through August 5. King salmon passage through the Kanektok River weir was estimated at 5,800 salmon. There is no formal escapement goal established for king salmon on the Kanektok River. Escapement estimates for all species were incomplete due to the late start-up of the weir operation and early project stop date (C. Brazil, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication). In 2011, king salmon returns were slightly lower, with 5,032 estimated past the Kanektok River weir, an 1,861 estimated past the Goodnews River weir. Given the poor outlook for the Kuskokwim River and nearby tributaries for 2012, it is anticipated that this will also be the case in the Kuskokwim Bay tributaries.

Recent Board of Fisheries Actions

There have been no proposals specific to the Kuskokwim River or Kuskokwim Bay king salmon sport fisheries during the past two BOF meeting cycles.

Current or Recommended Research and Management Activities

In recent years, weirs have been used to enumerate king salmon escapements on the Kwethluk, Tuluksak, George, Kogruklu, Tatlawiksuk, and Takotna rivers (Whitmore et al. 2008; Brazil et al. 2011). A weir was operated on the Salmon Fork of the Aniak River for the 2006–2008 seasons, but it is unknown whether this project will resume, pending availability of funding. Kuskokwim River king salmon projects in recent years are improving ADF&G's ability to assess escapement and are integral to complying with the *Policy for the Management of Sustainable Salmon Fisheries* and the development of escapement objectives. In addition, from 2001 to 2004 a mark-recapture study was conducted on the Holitna River to estimate abundance of king salmon in that system (Wuttig and Evenson 2002; Chythlook and Evenson 2003; Stroka and Brase 2004; Stroka and Reed 2005). Additionally, in 2002, a mainstem mark-recapture project was implemented by Division of Commercial Fisheries to assess king, chum, and coho salmon abundance upstream of Kalskag. Division of Sport Fish conducted a king salmon radiotelemetry project on the mainstem Kuskokwim from 2002 through 2006 (Stubby 2007). Division of Commercial Fisheries continued this project in 2007. Aerial surveys conducted by Division of

Commercial Fisheries remain an important component of king salmon assessment in the Kuskokwim-Goodnews area (Table 6).

In the main Kuskokwim Bay drainages (Goodnews River and Kanektok River), it has been suggested that the distance of the weir from the mouth of the river is too far upstream to accurately assess the king salmon run. This is partially mitigated by the aerial surveys that are conducted. It may be important to estimate the percentage of king salmon that spawn below the weir, and thus, be able to extrapolate the number of king salmon returning to the river. In both Quinhagak and Goodnews Bay there is considerable opposition to radiotelemetry projects at this time. In the future, a king salmon radiotelemetry project in one or both of these rivers may add valuable information to the weir projects.

Coho Salmon

Background and Historic Perspective

Coho salmon are present in the majority of area streams and are caught and harvested in tributaries of the Kuskokwim Bay and tributaries of the 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 32,000 in 1999 to nearly 1.1 million coho salmon in 1996 (Table 12). The historic commercial harvest has averaged approximately 450,000 coho salmon in the Kuskokwim River (Whitmore et al. 2008). The Kuskokwim River itself is characterized by broad channels and turbid water, thereby limiting sport fishing largely to clear water tributaries of the Kuskokwim River and Kuskokwim Bay. The largest coho salmon sport fisheries are located in the Kanektok, Goodnews, and Aniak rivers (Tables 15 and 16). These sport fisheries average approximately 10,000 and 3,100 angler-days of effort, respectively, for all fish species (Tables 4 and 5), based on a 10-year average.

Sport harvests and catch of coho salmon are estimated through the SWHS. Commercial and subsistence harvests are managed by Division of Commercial Fisheries located in Bethel (Bavilla et. al 2010; Brazil et al. 2011; Burkey et al. 1997-2001; Ward et al. 2003; Whitmore et al. 2005). The Kanektok River has the most complete commercial, subsistence, and sport harvest, and escapement information on coho salmon in the area (Table 13). Division of Sport Fish has monitored both the Kanektok and Aniak rivers with additional inseason harvest surveys and stock assessment projects in the past (Dunaway 1997; Dunaway and Bingham 1992; Dunaway and Fleischman 1995; Lafferty and Bingham 2002; Minard 1987; Minard and Brookover 1988). Data from the Division of Sport Fish Guide Logbook program collected since 2006 should add more precision to catch and harvest estimates based on the SWHS (Sigurdsson and Powers 2009-2011). Additionally, USFWS staff from the Togiak Refuge has collected age and size data from coho salmon spawning in the Kanektok Rivers since 1994 (Lisac and MacDonald 1995; MacDonald 1996).

Prior to 1987 the bag limits for coho salmon were very liberal, allowing 15 fish per day, 30 fish in possession. The liberal bag and possession 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. In 1987, the BOF recognized the significance of the harvest potential of the Kanektok River sport fishery and reduced bag and possession limits to 5 fish. These limits remained the standard for most of the area, except recent changes in the Aniak River. Repeatedly, harvest surveys conducted on the Kanektok River indicate that sport anglers rarely (7%–15%) had taken a full bag limit 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).

Recent Fishery Performance

Sport harvests of coho salmon are very small in comparison to the commercial and subsistence harvests in the area (Tables 12, 13, and 14). However, angler desire to participate in coho salmon fisheries is great. In the recent 5-year average (2005–2009) approximately 5,200 coho salmon were harvested, while approximately 42,000 coho salmon were caught and released (Tables 2, 3). Delayed mortality has been a concern in some coho fisheries within the state; however, these coho fisheries studies were situated in estuarine waters. Most of the anglers participating in the KGMA fisheries are on float trips in tributary headwaters, and furthermore these headwaters have special management regulations to protect rainbow trout, with only unbaited single-hook, artificial lures permitted. Accepting that delayed hooking mortality is minor (15% or less, Stuby 2002), the overall mortality of coho salmon caused by the area sport fisheries is approximately 5,400 coho salmon. This mortality is considered sustainable given escapement levels.

In 2010, coho salmon escapements were characterized as average to below average at most of the 7 tributary weirs, with the exception of the Kogrukluk River (Brazil et al. 2011). Coho salmon escapement decreased in 2010 compared to recent years, and the overall run strength was characterized as average to below average (Brazil et al. 2011). Sport fish catch rates were below average throughout Kuskokwim Bay and the Kuskokwim River (Tables 15 and 16). Sport harvest for the entire management area at the end of the season was well below average (Table 12).

Fishery Objectives and Management

ADF&G has focused on assessing salmon escapements and harvests through several programs in the Kuskokwim-Goodnews area. Harvest monitoring is conducted through commercial fish tickets and surveys designed to estimate harvests from subsistence and sport fisheries. Salmon escapement is monitored through aerial surveys, sonar, test fishing and weirs in the Kuskokwim River drainage. The primary coho salmon escapement programs in the Kuskokwim River drainage are aerial surveys, and the Kogrukluk River weir. An escapement goal for coho salmon was established on the Kwethluk in 2010 with a lower bound SEG of >19,000 fish; however, counts thus far remain incomplete due to operational periods that don't encompass the entire coho salmon run. The Bethel test fishery only provides indices of daily passage.

There are only a few escapement objectives for coho salmon in this area, and weather conditions during coho salmon run seldom allow reliable aerial surveys to be flown to index escapements. However, salmon escapement or weir projects in recent years are improving ADF&G's ability to enumerate coho salmon escapement (Molyneaux and Brannian 2006) and have begun the process to develop escapement objectives in accordance with ADF&G's *Policy for statewide salmon escapement goals* (5 AAC 39.223).

Current Issues and Fishery Outlook

Coho salmon returns to the area have fluctuated during the last 10 years, with especially large returns in 2003 and 2004. Coho salmon return to the Kuskokwim River drainage primarily at four years of age; the 2007 brood was the main parent year for the 2011 return. If these escapements are any indication of coho salmon returns to the Kuskokwim-Goodnews area,

ADF&G could expect a better than average return to the area. Preliminary estimates for all escapement enumeration projects in the Kuskokwim River were near average for 2011. For the Kuskokwim Bay streams, the weirs were likely not operated far enough into the coho salmon return to enumerate total escapement. The outlook for coho salmon returning in 2012 is likely to be near average for 2012.

Recent Board of Fisheries Actions

There have been no proposals specific to the Kuskokwim River or Kuskokwim Bay coho salmon sport fisheries during the past two BOF meeting cycles.

Current or Recommended Research and Management Activities

A study using radiotelemetry and mark-recapture methods based on the existing Kuskokwim River weir projects operated in 2008 and 2009. This project used the combined expertise that divisions of Sport Fish and Commercial Fisheries have gained through the recent king and sockeye salmon projects (Stuby 2007; S. Gilk Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication; Pawluk et al. 2006). Studies that evaluate catch-and-release mortality (Stuby 2002) in KGMA sport fisheries may be useful in interpreting catch estimates. Such studies may answer questions brought about by the general public regarding catch-and-release mortality.

Chum Salmon

Background and Historic Perspective

Kuskokwim-Goodnews area 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 Kuskokwim River; chum salmon were documented as being used for subsistence in 1922 (Burkey et al. 2000). In the past, the subsistence fishery has had few restrictions and most of the harvest has been taken using gillnets, either drift or setnet. Since 1990, chum salmon subsistence harvests have declined from over 126,000 in 1990 to an average of 54,000 from 2005–2009.

Directed commercial fishing for chum salmon in the Kuskokwim River started in 1971. This fishery continued and expanded with a record harvest of 1.4 million in 1988 (Burkey et al. 2000). Since then, commercial harvests declined to less than 100,000 in the late-1990s and more recently ranging broadly from 1,000 to 90,000 (Table 17). Commercial harvests of Kuskokwim River chum salmon have generally declined from harvests that occurred in the 1980s, first due in part to low returns in the late 1990s, and now, largely due to low market demand. During recent record chum salmon returns, chum salmon have not been actively targeted. During the last few years, the chum salmon harvest has been incidental to the harvest of coho salmon in the Kuskokwim River. The harvest of chum salmon is also incidental to the directed commercial fisheries for sockeye salmon in Kuskokwim Bay.

Recent Fishery Performance

On average, sport harvests of chum salmon represent less than one percent of the total KGMA chum salmon harvests (Table 17). Approximately 300 chum salmon were harvested and nearly 21,000 chum salmon released annually from 2005 to 2009 (Tables 18 and 19). It is assumed there is very little hooking mortality because many of the anglers are on float trips in tributary headwaters and these headwaters have special management regulations to protect rainbow trout (i.e., unbaited single-hook, artificial lures). Accepting that delayed hooking mortality is minor,

at most 10%, the overall removal of chum salmon is approximately 2,000 fish in sport fisheries of the KGMA.

Fishery Objectives and Management

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

ADF&G has focused on assessing salmon escapements and harvests through several programs in the KGMA. Harvest monitoring is conducted through commercial 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 drainage. In the past, the primary method of assessing chum salmon escapement in the KGMA was by aerial survey. With the addition of several weirs to the area, including restart of a weir on an Aniak River tributary, aerial surveys have been phased out as an index method.

In 2010, the subsistence fishing schedule ("windows") was not implemented on the mainstem Kuskokwim River. This was in part because of the removal of the stock of concern designation during the January 2007 BOF meeting, and partly, because of better than average run indicators and corresponding escapement (Brazil et al. 2011). With sustained low prices offered dockside to commercial fishermen for chum salmon resulting in reduced commercial harvest, combined with very large runs in recent years, chum salmon have recovered from the exceptionally low escapements observed in 1999 and 2000.

Current Issues and Fishery Outlook

Recent trends in chum salmon production have provided large surpluses for commercial and sport fisheries in the past 4 years. Chum salmon harvests in the commercial fisheries in Kuskokwim Bay are incidental to directed fisheries at king, sockeye, and coho salmon. In the Kuskokwim River, large catches of chum salmon in relation to the more commercially valuable species will often shut down the commercial fishery due to lack of processing capacity.

Considering the large numbers of chum salmon returning in 2006 through 2011, the outlook for chum salmon in the KGMA is above average.

Recent Board of Fisheries Actions

At their 2007 meeting, the BOF removed the stock of concern designation on Aniak River chum salmon and the chum salmon no-retention regulation was removed from Aniak River sport fish regulations. Chum salmon can now be harvested under the 3-fish aggregate bag limit for salmon other than king salmon. The chum salmon no-retention clause remained in the *Kuskokwim River Salmon Rebuilding Plan*: this oversight was addressed by a proposal adopted at the January 2010 BOF meeting so there are not contradictory regulations for chum salmon retention by the sport fishery on the Aniak River.

Current or Recommended Research and Management Activities

Few research needs have been identified as the general health of the chum salmon runs throughout the KGMA has been quite good. Division of Commercial Fisheries has archived

chum salmon samples from throughout the Kuskokwim River drainage for future genetics analysis.

Sockeye Salmon

Background and Historic Perspective

Sockeye salmon are present in the Kuskokwim River drainage, but are more plentiful in Kuskokwim Bay tributaries. The sockeye salmon stocks of the Kanektok and Goodnews rivers are the largest in the KGMA. Sockeye stocks of the Kuskokwim River are relatively small and located sporadically throughout the drainage, with the largest occurring in the Holitna River drainage (S. Gilk, Commercial Fisheries Biologist, ADF&G, Anchorage, *personal communication*). Most anglers venturing to western Alaska are interested in king salmon and rainbow trout opportunities; however, sockeye and coho salmon opportunities have been becoming increasingly important to recreational anglers. Anglers seeking sockeye salmon fishing opportunities in the Kanektok and Goodnews rivers focus their efforts during the month of July prior to the king salmon spawning season closure of July 25. Sport harvests and effort are estimated through the SWHS, while commercial and subsistence harvests are managed by Division of Commercial Fisheries located in Bethel and are reported in their Fisheries Management Report series (Ward et al. 2003; Whitmore et al. 2005, 2008; Bavilla et al. 2010; Brazil et al. 2011).

As with the other Pacific salmon, on average, sport harvests of sockeye salmon represent less than one percent of the total KGMA sockeye salmon harvests (Table 20). Commercial fisheries of Kuskokwim Bay target sockeye salmon from late June through mid-July. Sockeye salmon commercial harvests were above average in Kuskokwim Bay in 2010, with about 138,000 taken in the commercial fishery in the Quinhagak district and about 41,000 taken in the Goodnews Bay district (Brazil et al. 2011). Harvests in 2011 were estimated to below average at 41,000 for the Quinhagak district and about 25,000 for the Goodnews Bay district (C. Brazil, Commercial Fisheries Biologist, ADF&G, Anchorage, *personal communication*).

Recent Fishery Performance

With strong returns recently, sport anglers in the Kuskokwim Bay streams have responded by catching more sockeye salmon, with a record catch of over 14,000 in 2006 (Table 21). In 2010, the numbers were near average, at about 6,500 caught. Recreational sockeye salmon catches in the Kanektok and Goodnews rivers in recent years have been a few thousand. Harvest in Kuskokwim Bay rivers has not increased as much as the catch, with most anglers practicing catch-and-release. In general, for the Goodnews and Kanektok Rivers, less than one sockeye salmon is harvested per 10 caught (Table 21). A small sport fishery for sockeye salmon exists on Lower Kuskokwim River tributaries such as the Aniak, Kisaralik, and Kwethluk, but historically the catches have averaged over 7,000 fish, with 2006 being a standout year with over 16,000 salmon caught (Table 22). The 2010 sport fish catch of sockeye salmon in the Lower Kuskokwim River tributaries was just over 1,000 with zero harvest reported (Table 22).

Fishery Objectives and Management

Sockeye salmon management of Kuskokwim Bay is outlined under the *District 4 Salmon Management Plan* (5 AAC 07.367), sockeye salmon management in Goodnews Bay, District 5 follows a similar regulation pattern, although there is no formal management plan (Ward et al. 2003; Whitmore et al. 2005). Escapement-based management has been challenging in

Kuskokwim Bay. In the past, escapements have been evaluated by aerial surveys; however, multiple salmon species and frequent poor survey conditions have made documenting salmon escapements difficult. Finding a reliable method of assessing salmon escapements has not been an easy task in the Kanektok River. Counting towers and sonar projects have been attempted, but water conditions, staff availability, and budgetary constraints have limited the success of these projects. A resistance-board weir has been successful; unfortunately, the weir site is 42 miles upstream from the mouth and commercial fishery. This weir site appears to be functional, but additional assessment may need to be done to evaluate the proportion of spawning that occurs downstream of the weir. The Goodnews River weir is located on the Middle Fork, 15 miles upstream of the mouth and commercial fishery, and represents an index of sockeye salmon escapement into the entire drainage. Aerial surveys are still used to estimate sockeye salmon escapement in other tributaries of the Goodnews River drainage. Additional sockeye salmon assessment has been conducted to evaluate the contribution of escapement in the mainstem of the Goodnews River in relation to index counts from the weir (Menard 1998, 1999; Estensen 2003). A sockeye salmon escapement goal for the Goodnews River were established in 1992 (Buklis 1993) at 25,000 sockeye salmon by either tower or weir counts in the Middle Fork of the Goodnews River, along with aerial survey indices of the main fork and lakes with an escapement objective of 15,000 sockeye salmon. The Kanektok River aerial escapement objective for sockeye salmon is 15,000 fish. Counting sockeye salmon escapement using aerial surveys in the Kanektok and Goodnews rivers have historically had dismal success, with very few surveys conducted during peak spawning, and this has made escapement-based management problematic. However, commercial fisheries management has followed a simple fishing schedule based on fishery performance in relation to the historic mean CPUE of the commercial fishery and this has apparently worked to provide sustained yields.

Current Issues and Fishery Outlook

In 2010, the sockeye salmon run to the Kuskokwim River drainage and Kuskokwim Bay was characterized as above average, though the overall abundance has declined since the record years of 2005 and 2006. In 2010 the Kanektok and Goodnews sockeye escapement was estimated through a combination of weir counts and aerial survey (Brazil et al. 2011). 2010 estimates of escapement indicate sockeye numbers to be well within the lower range of the escapement goals at the Goodnews and Kanektok Rivers with over 35,000 and over 202,000 for each river, respectively. 2010 estimates of sockeye salmon escapements in the Kuskokwim River mainstem drainages suggest that most were near average (C. Brazil, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication). The sockeye returns for 2011 were characterized as below average, but with four previous strong years of returns in the Kuskokwim Bay and Kuskokwim River drainage streams it is difficult to predict whether this will continue into 2012.

Recent Board of Fisheries Actions

No recent BOF actions have occurred for sockeye salmon. Although sockeye salmon catches have increased in the mainstem Kuskokwim River in recent years, the majority of the sockeye salmon fishery occurs in the Kuskokwim Bay. Kuskokwim Bay fisheries are subject to the *District 4 Salmon Management Plan*. This management plan sets guideline dates for the opening of the commercial salmon fishery before June 16. The plan also describes management strategy based on percentages of king salmon and sockeye salmon in the commercial catch.

Current or Recommended Research and Management Activities

Research on sockeye salmon radiotelemetry and sampling for genetics has been undertaken by Division of Commercial Fisheries (S. Gilk, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication). Approximately half of the sockeye salmon in the Kuskokwim River have origins in the Holitna River drainage, followed by the Aniak River, and distantly by other smaller drainages.

RESIDENT SPECIES FISHERIES

Rainbow Trout

Background and Historic Perspective

Combining salmon and rainbow trout fishing is probably one of the major attractions for anglers to the KGMA. Area rainbow trout stocks are extremely important to the people of the state and to recreational and tourism based services that contribute to the state's economy.

Rainbow trout of the KGMA 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 geographic distribution. Many of these rainbow trout stocks 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 climate and food availability. The *Southwest Alaska Rainbow Trout Management Plan* (ADF&G 1990) recognizes these factors and provides a 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 notoriety for high catch rates; the peak catch of 27,000 rainbow trout occurred in 1997. For the most current 5-year period approximately 12,000 rainbow trout were caught annually with virtually no harvest being reported during that period (Table 23). 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. The Kanektok River is the largest rainbow trout fishery in the Kuskokwim Bay and Lower Kuskokwim River. Recently, angling effort in the Kanektok River has been stable (Table 4), with angling effort in the past five years ranging from approximately 3,000 to 8,000 angler-days. Overall, the rainbow trout catch in Kuskokwim Bay drainages has remained steady in the last five years, ranging from 11,000 to 22,000 with the 2008 estimate the highest reported catch since 1997. The sport fishing industry continues to report good catches and rainbow trout across all size categories.

Sport fishing effort, catch, and harvest are estimated by the SWHS. In the past, subsistence harvest surveys have focused on salmon, but in 2000 the Division of Subsistence began to estimate resident fish harvests, including rainbow trout on a community basis. The value of this data is limited since estimates are based on communities rather than drainage of harvest. Division of Commercial Fisheries manages all subsistence fisheries in the region.

Recent Fishery Performance

Angler effort in all sport fisheries of the Kanektok River has seen a rapid increase from 1,500 angler-days in 1983 to over 12,000 angler-days in 1988 (Lafferty 2003; Chythlook 2006). Since 1988, effort has fluctuated from 3,000 to 9,000 angler-days and most likely reflects the availability of guiding services. In 2010, approximately 5,300 angler-days were expended in the

Kanektok River and about 2,300 in the Goodnews River (Table 4). Effort increased slightly over the previous year, but is still much less than the peak 8,000 angler-days that were expended in 2008. Angler effort in the Aniak River sport fisheries peaked at greater than 5,500 angler-days in 1998 but has since fluctuated between 2,000 and 4,500 angler-days (Table 5). Angler effort in the Aniak River is directed primarily towards king and coho salmon, but rainbow trout are an important attraction. Total areawide rainbow trout sport harvests have rarely exceeded 1,500 fish as seen in 1988 (Lafferty 2003; Chythlook 2006), and the recent 5-year average is less than 200 rainbow trout (Tables 23 and 24).

In 2010, the number of angler-days was similar to 2009. Catches were below average overall, likely due to wet conditions and some high water events. The weather remained somewhat wet in both the Kuskokwim River and Kuskokwim Bay drainages but without major flooding events until late in the season. Rainbow trout catches were reported to be good at most Kuskokwim Bay/Kuskokwim River locations when water conditions permitted. This is reflected in somewhat lower catch rates reported by the SWHS for Lower Kuskokwim River drainages, which again were below the 5- and 10-year averages of approximately 13,000 and 18,000, respectively (Table 24). The 2010 catch for the Lower Kuskokwim River drainages was over 19,000 rainbow trout caught (Table 24). In the Kuskokwim Bay drainages in 2010 catches approximated the most recent five- and 10-year averages (Table 23), with approximately 15,500 rainbow trout caught, which is nearly 25% less than the previous year. Though catch rates were characterized as good to average, nearly all sport-caught rainbow trout caught in the entire Kuskokwim-Goodnews area were released.

Fishery Objectives and Management

During the mid-1980s bag limits were adopted in the KGMA to eliminate excessive harvests. Bag limits at this time were very liberal, providing opportunity for local people to meet their subsistence needs. During its February 1990 meeting, the BOF 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 BOF and the public an understanding of the underlying principles by which rainbow stocks are to be managed and provides guidance to the BOF in developing future regulations. In conjunction with the adoption of this plan, the Aniak River drainage (Figure 3) was designated a catch-and-release special management area above its confluence with the Doestock River with unbaited, single-hook, artificial lure restrictions.

During 1997, upper sections of the Kisaralik, Kwethluk, and entire length of the Kasigluk rivers were recognized as special rainbow trout waters under the guidelines of the *Southwest Alaska Rainbow Trout Management Plan* (ADF&G 1990) resulting in regulations allowing only unbaited, single-hook, artificial lures. Parts of this plan were subsequently adopted into the statewide rainbow trout management plan (5 AAC 75.220).

Current Issues and Fishery Outlook

The rainbow trout stocks of the KGMA provide high catch rates in all size classes; strong indicators of healthy fish populations. Local anglers and the sport fishing guiding industry continue to provide positive comments on rainbow trout stocks. Some concerns have been raised about rainbow trout stocks on the Aniak and Kanektok Rivers. These concerns, voiced by some guides and individuals, generally involve a decreasing quality in the fishery, in the form of a lower number of large rainbow trout, and less rainbow trout in general. The outlook for rainbow

trout stocks in the KGMA is generally good. Rainbow trout greater than 25 inches are occasionally caught. In the short term the impacts of rod and reel subsistence fishing appear to be minor, but resident fish populations rebuild slowly, particularly on the edge their distribution range.

In March 2003, the BOF adopted the *Statewide Management Standards for Wild Trout* (5 AAC 75.220, 2003) that consolidated regulations for rainbow trout stocks not under special management. Within the KGMA this includes the Kasigluk, Arolik, Kisaralik and Kwethluk rivers which are not under special management regulations under the *Southwest Rainbow Trout Management Plan*. There are currently no major biological concerns for rainbow trout fisheries in the Kuskokwim River drainage and Kuskokwim Bay. With close attention to sport and subsistence harvests to ensure the health of local stocks, area stocks should continue to provide good angling opportunities for the 2012 season and beyond.

Recent Board of Fisheries Actions

At its January 2004, meeting the BOF adopted regulations for the Arolik, Kasigluk, Lower Kisaralik, and Kwethluk which aligned the rainbow trout regulations in these four rivers with the *Statewide Management Standards for Wild Trout*. The bag and possession limit became two fish, only one 20 inches or greater in length, and created an annual limit of two fish 20 inches or greater in length.

Current or Recommended Research and Management Activities

Several on-site creel surveys in the Kanektok and Aniak rivers have been done to verify catch, harvest, and angler effort (Adams 1996; Alt 1986; Dunaway 1997; Dunaway and Bingham 1992; Dunaway and Fleischman 1995; Lafferty and Bingham 2002; Minard 1987 and 1990; Minard and Brookover 1988; Wagner 1991). The emphasis of these studies was on the sport fisheries that included rainbow trout fisheries as part of the study, except the study by Wagner (1991). Wagner 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 obtained for a 32-kilometer study section. Expanding this information to a drainage-wide estimate, 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 of Kisaralik River rainbow trout in 1997 by the USFWS estimated the rainbow trout population to be in excess of 16,000 rainbow trout in a 79-km study section (Harper et al. 2005). 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 mark-recapture experiments were flawed because of the egress and migration of tagged fish within the study site, the density estimates are a rough approximation of density and provide confidence that existing catches estimated by SWHS are sustainable. Area rainbow trout stocks continue to be conservatively managed.

A rainbow trout radiotelemetry project began in the Aniak River drainage in fall of 2008 (Schwanke and Thalhauser 2011). This project followed radiotagged fish the next two seasons in an attempt to gain insight into spawning areas and migratory habits. One of the major conclusions of this project was to ascertain that the rainbow trout that are caught in the winter subsistence fishery through the ice near the village of Aniak are likely separate populations of fish than are caught by sport and subsistence users upriver during the open-water season.

Similar work on the Kanektok River was initiated in 2009. Somewhat predictably, preliminary data from this project suggest that rainbow trout on the Kanektok River move downriver and into the mainstem during the winter, and spread upriver and into tributaries during the spring/summer.

In addition, proposed work on the Kisaralik River was conducted in 2011. This cooperative project (including Yukon Delta National Wildlife Refuge, Kenai Fisheries Resource Office, and ADFG Sport Fish Division staff) resulted in a mark-recapture study on the Kisaralik River drainage being initiated in 2011. This was in the interest of updating the 1997 Kisaralik River study done by the USFWS to monitor for change in the 10+ years since that study was completed. The estimate generated by this study suggests a slightly lower population than the 1997 study (about 5,000 rainbow trout larger than 350 mm compared to about 7,000) but full biometric review and a small follow up study will occur in summer 2012.

Dolly Varden/Arctic Char

Background and Historical Perspective

Dolly Varden/Arctic char (DV/AC) of the Kuskokwim River drainage are found throughout the area. Distribution of both Dolly Varden and Arctic char *S. alpinus* overlap in this area of Alaska, and it is potentially difficult to differentiate between the species. Populations of Dolly Varden are both anadromous and freshwater resident. Arctic char are primarily lake residents in this part of Alaska. The distributions and external characteristics of these species make identification a challenge. For management purposes, these closely related species are treated as a composite.

Anglers focusing on DV/AC target mainly clear water tributaries and lakes of the area. Within the KGMA, the largest catches of DV/AC occur in tributaries of Kuskokwim Bay and the Aniak River. Many DV/AC are caught incidentally while anglers are fishing for salmon and rainbow trout. Regulations that protect rainbow trout also protect other resident fish species such as DV/AC. With catches generally exceeding 15,000 DV/AC, the Kanektok River is the largest fishery in the Kuskokwim Bay and Lower Kuskokwim River (Table 25 and 26). The DV/AC catch on the Kanektok River in 2010 was slightly below average, with approximately 20,000 caught. The Goodnews and Aniak river DV/AC fisheries are the next largest sport fisheries in the area. Recent catches from the Aniak River have been above average (nearly 9,000 in 2010), with the largest catches reported in 1998 (over 21,000) and 2008 (nearly 17,000) (Table 26). The Goodnews River catch was above average in 2010 at about 11,000 (Table 25). These three fisheries are gaining popularity with the angling public; angling services have increased in recent years as each of these streams gains popularity (Sigurdsson and Powers 2009, 2010, 2011). Local residents seek DV/AC when salmon are not available as a fresh source of fish. Stock sizes of DV/AC in the KGMA remain unknown, and the DV/AC of the Kuskokwim River tributaries remain largely unstudied. Life history and run timing of stocks in the Kanektok and Goodnews River have been studied and are suspected to be similar to stocks in the Lower Kuskokwim tributaries such as the Kwethluk and Kisaralik.

Recent Fishery Performance

In 2010, weather conditions remained cool and wet. River levels were high, with occasional high turbidity and flooding. Catches were characterized as above average at most Kuskokwim Bay/Kuskokwim River locations when water conditions permitted. This is reflected in catch rates reported by the SWHS, which were near average in the Kuskokwim Bay at over 36,000

caught, and Lower Kuskokwim River at nearly 18,000 caught (Tables 25 and 26). Though catch rates were near or above average, nearly all sport-caught DV/AC caught in the entire KGMA were released.

Fishery Objectives and 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. Current regulations and harvests appear to be within sustainable levels for DV/AC of the Kuskokwim River drainage. Declining sport harvests of DV/AC from the early 1980s to the 1990s (Lafferty 2001) can be attributed to additional protection from the *Southwest Alaska Rainbow Trout Management Plan* resulting in conservative methods and means (no bait, single-hook regulations) and changing attitudes of anglers regarding the harvest of DV/AC (Tables 25 and 26).

Current Issues and Fishery Outlook

The DV/AC stocks of the KGMA are believed to be well protected in the area sport fisheries with current regulations. The outlook for DV/AC and other resident fish species in the Kuskokwim-Goodnews area is currently good. ADF&G has invested substantial effort in regulation development to protect resident fish species.

There are currently no major biological concerns for DV/AC fisheries in the KGMA. Area stocks should continue to provide good angling opportunities for the 2012 season.

Recent Board of Fisheries Actions

The BOF at its 2004 meeting reinstated individual bag and possession limits for resident species in the Aniak River drainage replacing the aggregate bag and possession limits that were adopted in 2001. The current DV/AC limit in the Aniak River drainage is 3 fish, no size limit. Kuskokwim Bay rivers (Kanektok, Arolik, and Goodnews) have the same limit for AC/DV, as does the entire Holitna River drainage. Upper Kuskokwim River drainages upstream of the Holitna River are governed by the general regulation for AC/DV and lake trout *S. namaycush* which for flowing waters is a bag limit of 10 per day, only two fish 20 inches or longer and only two may be lake trout. In lakes, the aggregate bag and possession limit for DV/AC and lake trout is two fish, no size limit. The rest of the Kuskokwim River drainages downstream of the Holitna River, with the exceptions already named, have a DV/AC bag limit of five fish, with only two fish 20 inches or longer.

Current or Recommended Research and Management Activities

No major activities are planned or recommended for AC/DV in the near future. However, in conjunction with other studies, incidentally-caught DV/AC should be measured and fin clips taken. Other agencies (USFWS) are developing a baseline genetic database to which any samples taken can be added.

Arctic grayling

Background and Historical Perspective

Arctic grayling are probably the most widely distributed and abundant resident fish in the KGMA. Arctic grayling are found throughout many lakes, streams and clear water tributaries of the area. Nonresident anglers access most of the area via fly-in float trips on many of these

tributaries. Anglers typically catch Arctic grayling while targeting salmon and rainbow trout. Current sport fishing regulations for rainbow trout provide additional protection to other fish species with gear and hook restrictions in local tributaries. Recent sport fish Arctic grayling harvests in Kuskokwim River and Kuskokwim Bay drainages range from 500 to about 1000 fish (Table 2). Recent sport catches average between 23,000 and 35,000 Arctic grayling (Table 3). The Aniak River supports the largest Arctic grayling harvest in the area (100 to 200 fish) with the Kisaralik, Kanektok and Holitna rivers supporting the next largest sport fisheries (Tables 27 and 28).

Recent Fishery Performance

In 2010, Arctic grayling catches in both Kuskokwim River and Kuskokwim Bay drainages were reported to be average at most locations (Tables 27 and 28). Nearly all sport-caught Arctic grayling caught in the entire KGMA were released. Though the summer started out with good weather that was conducive to excellent catches, by mid-August conditions deteriorated somewhat due to rain causing high, turbid water, and catches were reported to be below average in most locations.

Fishery Objectives and Management

Sport fishing effort, catch, and harvest are estimated by the SWHS; estimates from the annual report are reviewed to ensure that sport harvests do not exceed sustained yield. The focus of sport fishing regulation development is to enhance opportunity and provide sustainable harvests. Current regulations appear to be maintaining harvests within sustainable levels for Arctic grayling in the KGMA. The declining harvest rates of Arctic grayling from the early 1980s to the 1990s (Lafferty 2003) can be attributed to more restrictive regulations and changing attitudes of anglers regarding the harvest of Arctic grayling (Tables 27 and 28), as well as development of more stringent regulations regarding catch-and-release of rainbow trout, especially in the Aniak River and Lower Kuskokwim Rivers. These systems now require unbaited, single-hook, artificial lures, which reduces the catch (and harvest) of Arctic grayling as well as providing added protection for the rainbow trout.

Management strategies for Arctic grayling stocks in the KGMA are found in the *Kuskokwim-Goodnews Area Wild Arctic Grayling Management Plan* (5 AAC 71.055). The goal of management is to maintain naturally reproducing populations of Arctic grayling with characteristics that are sustainable and are desirable to the public.

Current Issues and Fishery Outlook

Arctic grayling stocks of the KGMA are well protected with the current sport fishing regulations. There are currently no major biological concerns for Arctic grayling fisheries in the area. Area stocks should continue to provide good angling opportunities for the 2012 season.

Recent Board of Fisheries Actions

During its January 2001 meeting, the BOF established an aggregate bag limit for resident fish species for both subsistence and sport anglers in the Aniak River. A six fish resident species limit was enacted for subsistence anglers during June, July and August. Sport anglers were restricted to an aggregate three resident fish limit, but only allowing one fish of the following species: DV/AC, Arctic grayling, lake trout, sheefish *Stenodus leucichthys*, northern pike *Esox lucius* and burbot *Lota lota* in any combination.

The 2004 BOF meeting reinstated individual bag limits for resident species in the Aniak River. The current Aniak River Arctic grayling bag and possession limit is two fish, no size limit.

Northern Pike

Background and Historic Perspective

Most northern pike are harvested in lakes, streams and tributaries of the Kuskokwim River drainage. Very few pike (less than 50) are harvested by the sport fishery in the Kuskokwim Bay area. The largest northern pike sport fishery occurs in the Holitna River; however, there are a number of sloughs and unnamed lakes that provide northern pike fishing opportunities in the area (Tables 2, 3, and 29). Local anglers seek northern pike when salmon are not available as a fresh source of fish, mostly during the winter months. Most local Bethel subsistence effort is focused during the winter at the mouth of the Johnson River. Localized depletion is evident from repeated comments of only small “hammer handle” northern pike in the subsistence harvest. Stock sizes of northern pike in the Kuskokwim River drainage remain unknown.

Recent Fishery Performance

Northern pike harvests remain low in the Kuskokwim River. The recent five- and 10-year average harvests in the Lower Kuskokwim River are less than 1,000 fish (Table 2 and 29). In 2010, 909 northern pike were estimated to be harvested in Kuskokwim River drainages, which though higher than the recent harvests (and similar to 2009), is quite low considering the number of rivers and large geographic area that this estimate covers. Catch of northern pike during these same periods was approximately 4,400 fish in 2010, compared to an average of near 5,400 and 5,200 for the five- and 10-year averages respectively.

Fishery Objectives and Management

Sport fishing effort, catch, and harvest are estimated by the SWHS; estimates from the annual report are reviewed to ensure that sport harvests do not exceed sustainable yield. The focus of sport fishing regulation development is to enhance opportunity and provide sustainable harvests. Current harvests appear to be within sustainable levels for northern pike in the KGMA. Annual sport harvests of northern pike have fluctuated in recent years, but harvests have remained very low. The Kuskokwim River northern pike bag and possession limit is 10, with no size limit upstream of the Holitna River drainage. In the Holitna River and in those waters downstream of the Holitna River to the mouth of the Kuskokwim River, the bag and possession limit is five, with only one over 30 inches.

Current Issues and Fishery Outlook

There are no current biological concerns in the sport fisheries for northern pike in this area. There were no reported problems by anglers having difficulties locating northern pike during 2010. Area stocks should continue to provide good angling opportunities for the 2012 season.

Recent Board of Fisheries Actions

During its January 2001 meeting, the BOF established an aggregate bag limit for resident fish species for both subsistence and sport anglers in the Aniak River. A six resident fish species limit was enacted for subsistence anglers during June, July, and August. Sport anglers were restricted to an aggregate three resident fish limit, but only allowing one fish of the following species: DV/AC, Arctic grayling, lake trout, sheefish, northern pike and burbot in any combination.

The 2004 BOF meeting reinstated individual bag and possession limits in the Aniak River, which reverted to the five northern pike bag and possession limit, with only one fish over 30”.

Current or Recommended Research and Management Activities

An evaluation of the subsistence fishery at the mouth of the Johnson River should be conducted to investigate public comments regarding the small size of the northern pike harvested during the winter fishery.

Sheefish

Background and Historical Perspective

Most sheefish are harvested in streams and tributaries within the Kuskokwim River drainage. The largest sheefish sport fishery occurs in the Holitna River. The harvest and catch of sheefish by the sport fishery remains very low (Table 30). A few local anglers have recently begun prospecting for sheefish in the lower tributaries of the Kuskokwim 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 Kuskokwim River drainage are unknown. Previous work suggests that there may be at least two stocks, one specific to spawning in the Upper Kuskokwim near Big River, and the other on the Middle Fork (Stuby 2011). Other Kuskokwim area projects have noted high concentrations of sheefish at various times in other areas of the Kuskokwim River (L. Stuby, Sport Fish Biologist, ADF&G, Fairbanks, personal communication).

Recent Fishery Performance

There were no reported problems by anglers having difficulties locating sheefish during recent years in the Kuskokwim River drainage, except for poor fishing conditions attributed to high water or late breakup. Generally, local people in the lower river near Bethel tend to harvest sheefish during the king salmon fishery with gillnets, while people in the upper river, especially near the Holitna and Aniak Rivers, and upriver areas near McGrath catch sheefish mid-summer through to late fall, and occasionally through the ice during winter with hook and line.

Fishery Objectives and 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. The focus of sport fishing regulation development is to enhance opportunity and provide sustainable harvests. Current harvests appear to be within sustainable levels for sheefish of the Kuskokwim River drainage.

Current Issues and Fishery Outlook

There are no current biological concerns for the sheefish fisheries in this area. Area stocks should continue to provide good angling opportunities for the 2012 season.

Recent Board of Fisheries Actions

During its January 2001 meeting, the BOF established an aggregate bag limit for resident fish species for both subsistence and sport anglers in the Aniak River. A six-fish resident species limit was enacted for subsistence anglers during June, July, and August. Sport anglers were restricted to an aggregate three resident fish limit, but only allowing one fish of the following species: DV/AC, Arctic grayling, lake trout, sheefish, northern pike and burbot in any combination.

The 2004 BOF meeting reinstated individual bag limits for resident species in the Aniak River. The current Aniak River sheefish bag and possession limit is two fish, no size limit.

Current or Recommended Research and Management Activities

A radiotelemetry project began in 2007, with the goal of identifying spawning and overwintering locations and collecting genetic information. This project has gained some feeding and overwintering data, as well as having observed some suspected spawning locations in the upper Kuskokwim River. This project was scheduled to run through 2011 (tracking sheefish tagged in 2007 and 2008 via aerial surveys), with an additional radiotagging event in 2012 extending the project another three years. Sheefish in spawning condition were identified through ground truthing of radio-tagged fish in 2001, resulting in spawning areas identified on the Big River and Middle Fork of the Kuskokwim (L. Stuby, Sport Fish Biologist, ADF&G, Fairbanks, personal communication).

Lake Trout

Background and Historical Perspective

Most lake trout are harvested in lakes of the headwater rivers and tributaries within the KGMA. Many of these lakes are located in the Lower Kuskokwim River 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 KGMA are unknown. Lake trout in the area are similar to other Alaskan lake trout stocks. They 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 with a short growing period. Historical harvests of lake trout in other locations in the state of Alaska suggest that past sport fishing practices can rapidly deplete lake trout stocks in small lakes.

Recent Fishery Performance

There were no angler reports of problems of locating lake trout in 2010 and 2011 in the KGMA. Generally, lake trout catches have remained relatively low, with correspondingly low harvests. Kuskokwim Bay drainages catch rates averaged under 600 for the 2000–2009 period, with harvests averaging 25. For the Lower Kuskokwim River drainage, similar catch and harvest rates were observed, with the 2000–2009 average harvest near 20, with average catch of about 300 (Tables 2 and 3).

Fishery Objectives and Management

Sport fishing effort, catch, and harvest are estimated by the SWHS; estimates from the annual report are reviewed to ensure that sport harvests are sustainable. Sport fishing regulations are developed to maintain effort and bag limits to maintain harvest within sustainable yields. Current harvests appear to be within sustainable levels for lake trout of the KGMA. Recent catch and harvest data suggest overall very low fishing pressure from the sport fishery.

Current Issues and Fishery Outlook

Exploitation of area lake trout stocks may be higher in certain lakes with easy access, but it appears to be low due to low catch and harvest (Tables 2 and 3). It is difficult to distinguish lake

trout from lake-resident DV/AC inhabiting the same lake from external characteristics and markings. Occasionally there is some misidentification between DV/AC and lake trout. Some of the large harvests that arise in the SWHS report need further investigation from time to time to ensure proper identification for accurate reporting. Lake trout studies conducted in Region III have shown that even low levels of harvest can overexploit small populations of lake trout.

The outlook for lake trout and other resident fish species in the KGMA is good. ADF&G and the BOF have invested substantial effort in regulation development to protect resident fish species. Should there be concerns raised, the lake trout would be managed according to the *Wild Lake Trout Management Plan* (5 AAC 52.060, 2006). Currently, ADF&G has not identified a biological concern for lake trout fisheries in the area. Area stocks should continue to provide good angling opportunities for the 2012 season.

Recent Board of Fisheries Actions

During its January 2001 meeting, the BOF established an aggregate bag limit for resident fish species for both subsistence and sport anglers in the Aniak River. A six resident fish species bag limit was enacted for subsistence anglers during June, July, and August. Sport anglers were restricted to an aggregate three resident fish bag limit, but only allowing one fish of the following species: DV/AC, Arctic grayling, lake trout, sheefish, northern pike and burbot in any combination.

This regulation was replaced with individual bag limits at the 2004 BOF meeting. The current bag and possession limit for lake trout is two per day, except for restrictions in the Aniak River.

The Board of Fisheries adopted the *Wild Lake Trout Management Plan* in 2006. This management plan directs the department to manage wild lake trout populations in the KGMA by employing a conservative harvest regime and by maintaining harvest below the maximum sustained yield level. The department may take one or more management actions if there is a conservation or biological concern for the sustainability of the fishery or a stock harvested in that fishery. These actions include reduction of bag and possession limit, reduction of fishing time, allowing only catch-and-release, and modification of methods and means of harvest. The plan also specifies allowable measures to reduce harvest if the harvest level exceeds sustainable yield for a 2 year period. Finally, the plan establishes a process for designating special management waters and means for limiting harvest in these areas to meet the management objectives.

Current or Recommended Research and Management Activities

In the near future there should be monitoring activity on at least one of the headwater lakes in either Kuskokwim Bay or the lakes that drain into the Lower Kuskokwim River. A good candidate would be Aniak Lake, Kisaralik Lake, or Pegati Lake, since they all have relatively easy aircraft access from Bethel and Dillingham, and likely receive a similar number of visitors, and similar lake trout utilization. These lake/river systems have a similar size and lake trout catch and harvest to the other Lower Kuskokwim River or Kuskokwim Bay lakes. They may be able to serve as proxy for the health of the lake trout stocks in nearby air-accessible lakes.

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TABLES AND FIGURES

Table 1.—Annual sport fishing effort (angler-days) for Alaska, Region III, and the Kuskokwim-Goodnews Management Area waters as estimated by the SWHS, 1990–2010.

Year	Statewide	Region III	Percent of Statewide	Kuskokwim Mgmt Area	Percent of Region III
1990	2,453,284	245,629	10	15,858	8.7
1991	2,456,328	219,922	9	13,055	5.9
1992	2,540,374	181,852	7.2	14,404	7.9
1993	2,559,408	220,972	8.6	14,505	6.6
1994	2,719,911	209,987	7.7	18,117	8.6
1995	2,787,670	270,141	9.7	16,289	6
1996	2,006,528	201,166	10	16,420	8.2
1997	2,079,514	238,856	11.5	27,318	11.4
1998	1,856,976	227,841	12.3	27,913	12.3
1999	2,499,152	304,522	12.2	26,563	8.7
2000	2,627,805	241,574	9.2	20,030	8.3
2001	2,262,346	194,531	8.6	20,673	10.6
2002	2,259,091	220,276	9.8	20,645	9.4
2003	2,219,398	206,705	9.3	24,369	11.8
2004	2,473,961	217,041	8.8	25,406	11.7
2005	2,463,929	183,535	7.4	19,447	10.6
2006	2,298,092	175,274	7.6	22,389	12.8
2007	2,543,674	204,032	8	21,206	10.4
2008	2,315,601	183,084	7.9	25,862	14.1
2009	2,216,445	194,019	8.8	17,791	9.2
2010	2,000,167	184,824	9.2	19,455	10.5
Average 2005-2009	2,367,548	187,989	7.9	21,339	11.4
Average 2000-2009	2,368,034	202,007	8.5	21,782	10.9

Table 2.–Kuskokwim-Goodnews Management Area (including Kuskokwim Bay drainages) sport fishing harvest by species, 1990–2010.

Year	King Salmon	Coho Salmon	Sockeye Salmon	Pink Salmon	Chum Salmon	Rainbow Trout	Lake Trout	Dolly		Northern Pike	Whitefish	Burbot	Sheefish
								Varden/Arctic char	Arctic Grayling				
1990	394	1,358	620	347	749	475	72	1,797	1,340	231	88	1,125	107
1991	401	2,087	214	36	647	774	272	2,924	2,603	2,018	158	40	154
1992	367	2,033	189	219	927	404	356	802	545	752	286	169	292
1993	587	2,056	715	27	731	486	218	1,499	739	995	253	214	54
1994	1,139	2,978	894	126	1,626	299	40	1,398	850	828	183	20	390
1995	541	2,771	277	16	455	429	215	1,260	845	655	0	0	272
1996	1,432	5,231	752	167	517	567	126	1,743	663	344	20	0	20
1997	1,788	5,430	1,181	75	384	1,336	404	3,337	1,292	408	614	0	589
1998	1,464	4,897	1,867	133	596	539	141	1,581	3,554	2,711	1,220	185	277
1999	279	3,974	1,154	0	520	510	128	2,038	1,290	548	9	228	268
2000	105	3,294	822	10	359	106	152	1,612	361	531	214	588	250
2001	290	4,474	422	11	176	17	63	1,698	807	474	20	50	124
2002	319	4,265	267	143	598	76	134	2,026	1,464	443	54	15	81
2003	401	5,297	289	46	67	204	244	2,710	1,259	783	89	87	45
2004	857	7,096	512	416	117	457	497	2,539	1,953	1,543	975	111	182
2005	572	5,591	792	66	608	141	233	2,135	1,287	3,749	209	75	1,079
2006	444	3,793	864	187	158	107	83	1,937	637	406	58	0	173
2007	1,478	675	110	0	55	0	0	138	631	73	51	0	174
2008	708	6,344	1,109	32	262	219	22	2,038	713	165	96	0	191
2009	904	4,724	394	337	351	197	29	2,176	1,307	981	664	0	161
2010	354	3,527	459	80	235	106	11	1,565	530	909	54	92	67
Average 2000–2009	821	4,225	654	124	287	133	73	1,685	915	1,075	216	15	356
Average 2005–2009	608	4,555	558	125	275	152	146	1,901	1,042	915	243	93	246

Table 3.–Kuskokwim-Goodnews Management Area sport fishing catch by species, 1990–2010.

Year	King Salmon	Coho Salmon	Sockeye Salmon	Pink Salmon	Chum Salmon	Rainbow Trout	Lake Trout	Dolly Varden/Arctic char	Arctic Grayling	Northern Pike	Whitefish	Burbot	Sheefish
1990	2,675	6,184	3,644	7,332	5,853	12,436	1,091	18,789	13,790	3,449	493	1,125	316
1991	2,621	6,538	3,528	741	3,491	11,546	1,019	30,155	14,983	4,621	329	50	539
1992	4,752	8,776	1,791	9,262	7,525	5,540	1,426	16,229	9,539	3,878	638	169	638
1993	9,684	8,390	3,637	1,132	10,741	12,646	1,314	35,825	16,596	3,721	395	214	1,952
1994	3,370	5,564	4,898	4,516	11,848	8,258	1,861	18,320	10,930	4,383	500	20	628
1995	7,271	8,990	1,364	310	9,693	10,532	540	17,503	9,598	5,430	63	-	1,416
1996	21,217	34,170	9,326	8,101	23,217	16,823	1,094	33,449	16,403	6,928	100	-	675
1997	32,990	29,726	5,744	2,766	15,498	61,566	1,167	89,299	34,586	4,432	732	180	2,091
1998	20,980	35,162	8,186	13,826	20,023	30,450	951	65,720	38,856	5,704	2,087	307	1,708
1999	12,859	40,902	7,360	1,209	27,261	26,254	1,089	54,597	23,975	5,643	109	228	1,381
2000	8,786	37,624	7,365	528	20,876	17,671	1,076	34,927	19,215	3,857	994	588	1,048
2001	18,480	42,689	5,102	1,031	12,430	14,494	243	36,550	22,813	4,081	814	50	742
2002	9,116	33,454	5,086	708	20,019	28,170	1,629	48,913	34,740	3,915	284	20	446
2003	9,242	68,545	7,527	1,128	15,513	16,902	3,435	50,250	26,782	2,645	433	97	768
2004	10,719	63,233	3,422	18,212	13,161	22,979	6,941	76,194	31,680	10,613	1,331	111	938
2005	13,143	40,420	7,854	2,454	15,457	17,128	1,951	49,353	11,599	10,425	334	75	3,933
2006	13,414	30,962	16,599	10,778	35,174	36,755	515	61,570	16,493	4,917	894	-	524
2007	21,013	28,406	6,544	1,128	19,563	29,150	655	42,337	20,907	4,606	769	-	452
2008	10,313	45,382	9,824	19,854	19,292	54,877	807	83,835	35,486	2,779	380	-	1,046
2009	6,879	23,143	3,595	1,650	14,398	49,534	654	57,625	35,693	4,354	957	-	768
2010	6,812	25,413	7,646	10,320	16,327	35,470	55,241	1,215	27,870	4,359	688	216	280
Average 2000–2009	12,709	43,162	7,668	5,703	19,875	26,438	1,834	53,853	24,369	5,348	634	117	1,128
Average 2005–2009	13,720	41,681	8,849	10,485	20,529	32,178	2,174	62,658	23,233	6,668	742	37	1,379

Table 4.–Sport fishing effort (angler-days) in the Kuskokwim Bay drainages, 1990–2010.

Year	Kuskokwim Bay			Total
	Kanektok	Goodnews	Other	
1990	4,525	1,507	4,512	10,544
1991	3,078	1,328	2,656	7,062
1992	4,972	1,387	2,068	8,427
1993	3,791	2,276	2,844	8,911
1994	6,505	2,038	1,406	9,949
1995	5,512	1,030	743	7,285
1996	8,305	2,322	625	11,252
1997	9,706	5,011	1,807	17,999
1998	8,114	4,007	1,158	13,626
1999	8,194	8,353	705	17,560
2000	7,231	4,038	121	11,403
2001	9,063	2,826	201	12,206
2002	5,885	3,215	271	10,136
2003	7,655	3,622	133	11,659
2004	6,364	2,499	410	10,729
2005	5,789	2,612	32	8,854
2006	7,861	2,833	342	11,682
2007	5,071	3,375	960	9,406
2008	8,024	3,738	969	10,775
2009	3,267	2,212	1,031	6,510
2010	5,307	2,258	1,122	8,867
Average				
2000–2009	6,621	3,097	447	10,336
Average				
2005–2009	6,002	2,054	667	9,445

Table 5.—Sport fishing effort (angler-days) in the Kuskokwim River, 1990–2010.

Year	Kuskokwim River					KGMA Area
	Aniak	Kisaralik	Kwethluk	Other	Holitna	Total
1990	1,964	-	-	3,504	398	15,858
1991	3,078	-	-	3,610	1,022	13,055
1992	2,604	-	640	2,126	480	14,044
1993	2,056	-	554	2,275	763	14,505
1994	1,815	1,463	466	1,124	949	18,817
1995	3,569	369	387	1,600	640	16,289
1996	3,964	1,525	1511	2,891	747	16,420
1997	4,778	1,578	642	1,445	1,678	27,318
1998	5,548	1,021	1498	1,306	771	27,913
1999	3,235	1,316	402	1,992	1,236	26,563
2000	2,141	2,084	1,131	472	791	20,030
2001	2,121	1,304	1,069	258	1,853	20,673
2002	2,688	2,410	920	1,620	1,296	20,645
2003	2,998	1,439	2,646	3,548	1,748	24,369
2004	4,186	2,071	2,021	340	993	25,406
2005	2,497	714	2,022	525	1,452	19,447
2006	3,096	-	1,922	1,867	9,034	22,389
2007	3,363	-	1,067	4,414	9,217	21,206
2008	4,559	2,576	1,092	1,958	10,185	25,862
2009	2,611	2,235	1,387	1,203	7,346	17,791
2010	2,909	2,056	1,453	975	575	19,455
Average 2000-2009	3,026	1,854	1,528	1,621	1,080	21,782
Average 2005-2009	3,225	1,842	1,498	1,993	824	21,339

Note: Cells without a number indicates a year where there were not enough Statewide Harvest Survey respondents, so the estimates for that year may be in the “Other” category.

Table 6.–Peak aerial survey index counts of king salmon in tributaries of the Lower Kuskokwim River, 1983–2010.

Year	Eek River	Kwethluk River	Kisaralik River	Tuluksak River	Aniak River	Kipchuk River ^a	Salmon River ^c
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
2001	-	-	-	-	-	-	598
2002	-	1,795	2,285	-	1,856	1,615	1,236
2003	1,236	2,628	654	94	3,514	1,493	1,242
2004	4,653	6,801	6,913	1,196	5,569	1,868	2,177
2005	-	5,002	4,081	672	-	1,944	4,097
2006	-	-	4,734	-	5,639	1,618	-
2007	-	-	692	173	3,984	2,147	1,458
2008	-	487	1,074	-	3,222	1,061	589
2009	-	-	-	-	-	-	-
2010	-	-	235	-	-	-	-
2011	249	-	610	-	-	116	79
				SEG			
		580–1,800	400–1,200		1,200–2,300		600

Note: Estimates are from peak aerial surveys conducted between July 20 and July 31 under fair, good, or excellent conditions. Blank cells indicate years in which surveys were not flown.

^a Tributaries of Aniak River.

^b Lower Kuskokwim drainages not surveyed in 2009 due to poor weather conditions.

Table 7.—Harvest of king salmon in the commercial, subsistence, test and sport fisheries of the Kuskokwim River, 1990–2010.

Year	Harvest				Total
	Commercial ^a	Subsistence ^b	Test Fishery	Sport ^c	
1990	53,504	85,979	512	394	140,389
1991	37,778	85,554	117	401	123,850
1992	46,872	64,795	1,380	367	113,414
1993	8,735	87,512	2,483	587	99,317
1994	16,211	93,242	1,937	1,139	112,529
1995	30,846	96,436	1,421	541	129,244
1996	7,419	78,063	247	1,432	87,161
1997	10,441	81,577	332	1,227	93,577
1998	17,359	81,265	210	1,434	100,268
1999	4,705	73,194	98	252	78,249
2000	444	64,893	874	105	66,316
2001	90	73,610	86	90	73,876
2002	72	71,334	288	72	71,766
2003	158	67,788	409	158	68,513
2004	2,300	80,065	691	2,300	85,356
2005	4,784	70,393	608	4,784	80,569
2006	2,777	63,177	352	2,777	69,083
2007	179	68,645	503	179	69,506
2008	8,865	97,061	420	708	107,054
2009	6,670	77,368	515 ^d	103	84,656
2010	2,731	66,056	470	354	69,611
Average					
2000–2009	2,634	73,437	470	608	77,098
Average					
2005–2009	4,655	75,329	474	821	81,182

^a District 1 and 2.

^b Estimated subsistence harvest expanded from villages surveyed. 2008 and 2009 estimates are preliminary. Methodology changed starting in 2008.

^c Statewide Harvest Survey (1990–2007).

^d Estimated from 5 year average (2004–2008).

Table 8.—Harvest of king salmon in the commercial, subsistence, and sport fisheries in the Goodnews River, 1990–2010.

Year	Harvest			Total
	Commercial ^a	Subsistence ^b	Sport	
1990	3,303	682	0	3,985
1991	912	682	26	1,620
1992	3,528	252	23	3,803
1993	2,117	488	81	2,686
1994	2,570	657	163	3,390
1995	2,922	552	41	3,515
1996	1,375	526	157	2,058
1997	2,039	449	86	2,574
1998	3,675	718	431	4,824
1999	1,888	871	223	2,982
2000	4,442	703	243	5,388
2001	1,519	895	147	2,561
2002	979	857	224	2,060
2003	1,412	649	10	3,483
2004	2,565	851	100	3,516
2005	2,035	868	0	2,903
2006	2,892	676	79	3,647
2007	3,112	24	177	3,313
2008	1,278	1,060 ^c	78	2,416
2009	6,670	510 ^c	31	7,242
2010	1,752	494	0	2,246
Average 2000–2009	2,690	494	0	2,246
Average 2005–2009	3,197	523	72	3,904

^a Goodnews District commercial harvest (J. Estensen, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication)

^b Subsistence harvest by the community of Goodnews (J. Estensen Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication)

^c Preliminary subsistence harvest estimate (J. Estensen Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication)

Table 9.—Harvest of king salmon in the commercial, subsistence, and sport fisheries in the Kanektok River, 1990–2010.

Year	Harvest			Total
	Commercial ^a	Subsistence ^b	Sport	
1990	27,604	6,013	503	34,160
1991	9,480	3,693	316	13,489
1992	17,197	3,447	656	21,300
1993	15,784	3,368	1,006	20,158
1994	8,564	3,995	751	13,310
1995	38,584	2,746	739	42,069
1996	14,165	3,075	689	17,929
1997	35,510	3,433	1,632	40,575
1998	23,158	4,041	1,475	28,674
1999	18,426	3,167	854	22,447
2000	21,229	3,106	833	25,168
2001	12,775	2,923	947	16,645
2002	11,480	2,475	779	14,734
2003	14,444	3,898	323	18,665
2004	25,465	3,726	228	29,419
2005	24,195	3,083	520	27,798
2006	19,184	3,521	754	23,459
2007	19,573	3,412	633	23,618
2008	1,281	4,090 ^c	220	5,591
2009	13,921	2,909 ^c	400	17,360
2010	14,230	2,692	552	17,474
Average 2000–2009	16,355	3,268	602	20,426
Average 2005–2009	15,631	3,339	577	19,565

^a Kanektok District commercial harvest (J. Estensen, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication)

^b Subsistence harvest by the community of Quinagak (J. Estensen Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication)

Table 10.—Sport fishing harvest and catch of king salmon in the Kanektok, Goodnews, Arolik, and other Kuskokwim Bay rivers, 1990–2010.

Year	Kanektok River		Goodnews River		Arolik/Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	503	4,044	N/A	N/A	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	1,632	13,244	86	1,569	147	203	1,865	15,016
1998	1,475	9,528	431	3,171	107	376	2,013	13,075
1999	854	4,205	223	3,823	12	140	1,089	8,168
2000	833	6,086	243	1,527	0	0	1,076	7,613
2001	947	10,842	147	2,769	0	212	1,094	13,823
2002	779	3,815	224	1,594	75	482	1,078	5,891
2003	323	3,480	10	695	0	47	343	4,222
2004	228	2,758	100	1,754	12	7,800	340	5,292
2005	520	10,116	0	375	0	0	520	21,127
2006	754	7,292	79	2,243	0	399	1,277	13,414
2007	633	6,331	177	1,461	922	1,997	1,732	9,789
2008	78	2,490	220	365	0	138	298	2,993
2009	400	2,522	31	561	51	210	482	3,293
2010	552	2,619	0	547	0	82	552	6,812
Average 2000-2009	602	5,573	112	1,334	106	1,129	824	5,573
Average 2005-2009	577	5,750	72	1,001	195	544	862	10,523

Table 11.—Sport fishing harvest and catch of king salmon in the Aniak, Kisaralik, Kwethluk and other Kuskokwim rivers, 1990–2010.

Year	Aniak River		Kisaralik River		Kwethluk River		Holitna River		Kuskokwim River Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	285	1,181	-	-	-	-	0	27	340	653
1991	214	222	-	-	-	-	0	0	351	2,621
1992	172	827	-	-	31	47	23	109	296	4,752
1993	300	1,426	-	-	-	-	68	375	444	9,684
1994	437	573	148	196	-	-	40	110	977	3,370
1995	279	2,729	-	-	-	-	19	91	506	3,592
1996	592	3,375	-	-	-	-	256	662	1,506	11,540
1997	801	12,943	49	678	49	108	166	786	1,480	17,974
1998	1,058	5,896	6	74	75	467	54	335	1,388	7,905
1999	134	2,776	0	12	0	0	25	240	351	4,691
2000	10	435	10	343	20	171	22	22	105	1,173
2001	12	713	0	62	43	77	73	823	290	4,657
2002	135	1,759	46	531	30	195	53	210	319	3,225
2003	12	874	75	335	103	861	48	272	391	5,020
2004	335	1,103	58	1,774	150	778	136	619	857	5,427
2005	189	594	40	907	68	385	180	470	572	2,652
2006	29	1,201	86	359	183	493	16	173	444	3,480
2007	218	5,380	446	1,096	93	733	86	171	1,683	11,224
2008	26	3,612	148	1,578	149	844	122	992	739	7,382
2009	10	796	51	287	42	499	0	676	917	3,586
2010	0	1,902	0	717	107	591	39	130	354	3,564
Average										
2000–2009	98	1,647	96	504	88	504	74	443	632	4,783
Average										
2005–2009	94	2,317	154	591	107	591	81	496	871	5,665

Table 12.—Harvest of coho salmon in the commercial, subsistence, and sport fisheries in the Kuskokwim-Goodnews Management Area, 1990–2010.

Year	Harvest			Total
	Commercial	Subsistence ^{a,b}	Sport ^c	
1990	410,332	44,791	581	455,704
1991	500,935	50,331	1,003	552,269
1992	666,170	40,168	1,692	708,030
1993	610,739	31,737	980	643,456
1994	724,689	33,050	1,925	759,664
1995	555,539	36,277	1,497	593,313
1996	1,099,853	32,741	3,423	1,136,017
1997	166,648	29,032	2,408	198,088
1998	311,910	27,210	2,419	341,539
1999	32,251	27,755	1,998	62,004
2000	307,439	35,670	1,689	344,798
2001	220,804	31,686	1,204	253,694
2002	113,199	34,413	2,030	149,642
2003	346,555	38,791	5,297	390,643
2004	539,897	55,575	7,096	602,568
2005	205,762	28,838	5,591	240,191
2006	224,990	32,809	3,793	261,592
2007	189,456	26,720	2,504	218,680
2008	260,497	48,427	6,344	315,268
2009	162,354	28,856	7,819	199,029
2010	58,031	32,106	6,900	97,037
Average				
2000–2009	257,095	36,179	4,337	297,611
Average				
2005–2009	208,612	33,130	5,210	246,952

^a Estimated subsistence harvest expanded from villages surveyed.

^b 2008–2010 are preliminary estimates (H. Carroll, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication).

^c Statewide Harvest Survey (1990–2011).

Table 13.—Harvest of coho salmon in the commercial, subsistence, and sport fisheries in the Kanektok River, 1990–2010.

Year	Harvest			Total
	Commercial ^a	Subsistence ^{b,c}	Sport	
1990	26,926	4,174	644	31,744
1991	42,571	3,232	358	46,161
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
1996	118,718	1,467	875	121,060
1997	32,862	1,264	1,220	35,346
1998	80,183	1,702	751	82,636
1999	6,184	2,021	1,091	9,296
2000	30,529	1,088	799	32,425
2001	18,531	1,525	2,448	22,504
2002	26,695	1,099	1,784	29,578
2003	49,833	2,047	1,076	54,157
2004	82,398	1,209	1,362	52,493
2005	51,708	1,443	1,006	48,833
2006	26,831	1,019	1,742	29,592
2007	34,710	1,143	1,087	36,940
2008	40,760	2,296	1,541	44,597
2009	48,180	1,717	876	50,773
2010	13,690	1,547	1280	16,517
Average 2000–2009	41,018	1,459	1,404	40,189
Average 2005–2009	40,438	1,524	1,291	42,147

^a Estimated subsistence harvest expanded from villages surveyed.

^b Statewide Harvest Survey (1991 – 2011).

^c 2009 and 2010 are preliminary estimates (personal communications, Chris Shelden, ADF&G Commercial Fisheries Biologist, Anchorage).

Table 14.—Harvest of coho salmon in the commercial, subsistence, and sport fisheries in the Goodnews River, 1990–2010.

Year	Harvest			Total
	Commercial ^a	Subsistence ^{b,c}	Sport	
1990	7,804	1,646	-	9,450
1991	13,312	1,828	297	15,437
1992	19,875	1,353	138	21,366
1993	20,014	1,226	189	21,429
1994	47,499	512	170	48,181
1995	17,875	305	114	18,294
1996	43,836	352	466	44,654
1997	2,983	397	855	4,235
1998	21,246	331	574	22,151
1999	2,474	582	789	3,845
2000	15,531	517	795	16,843
2001	9,275	616	822	10,713
2002	3,041	297	429	3,767
2003	12,730	1,110	42	13,882
2004	23,690	1,411	622	25,723
2005	11,735	839	1,046	12,781
2006	12,436	704	553	13,693
2007	13,689	20	211	13,920
2008	22,547	1,491	220	24,258
2009	8,406	252	284	8,942
2010	4,900	516	597	6,013
Average 2000–2009	13,308	726	554	14,452
Average 2005–2009	13,763	661	440	14,719

^a Goodnews Bay (District 5) commercial harvest.

^b Subsistence harvests by the communities of Goodnews Bay and Platinum.

^c 2008–2010 estimates are preliminary (H. Carroll, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication).

Table 15.—Sport fishing harvest and catch of coho salmon in Kuskokwim Bay drainages, 1990–2010.

Year	Kanektok River		Goodnews River		Arolik/Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	644	4,044	-	-	-	-	904	4,377
1991	358	2,404	297	1,176	-	-	993	4,133
1992	275	3,174	138	1,571	-	-	704	5,452
1993	734	3,741	189	645	-	-	1,218	5,720
1994	675	1,322	170	456	-	-	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	1,220	14,366	855	2,915	924	2,455	2,989	19,736
1998	751	15,017	574	7,852	246	921	1,571	23,790
1999	1,091	13,677	789	12,185	23	1,902	1,903	27,764
2000	799	13,043	795	9,045	0	0	1,594	22,088
2001	2,448	21,941	822	8,431	0	832	3,270	31,204
2002	1,784	10,922	429	6,889	22	1,353	2,235	19,164
2003	1,076	19,257	681	15,845	58	231	1,815	35,333
2004	1,362	23,845	622	10,985	0	3,656	1,984	38,486
2005	520	13,279	1,046	11,541	0	2,397	1,566	27,217
2006	1,742	12,282	553	7,091	24	243	2,319	19,640
2007	1,087	12,768	211	3,528	0	625	1,298	16,358
2008	1,541	18,083	220	5,425	552	948	2,313	24,456
2009	876	6,896	284	2,805	38	2,252	1,198	11,953
2010	1280	7,192	597	10,164	101	1,090	1,978	18,446
Average								
2000–2009	1,324	15,232	554	8,159	69	1,254	1,959	24,590
Average								
2005–2009	1,153	12,662	463	6,078	123	1,293	1,739	19,925

Note: Blank spaces indicate years in which these rivers did not show up in the Statewide Harvest Survey, or were included in the estimates with other rivers.

Table 16.—Sport fishing harvest and catch of coho salmon in the Aniak, Kisaralik, Kwethluk and Holitna Rivers, 1990–2010.

Year	Aniak River		Kisaralik River		Kwethluk River		Holitna River		Kuskokwim River Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	182	1,181	-	-	-	-	0	27	581	1,652
1991	327	1,432	-	-	-	-	0	0	1,003	2,958
1992	235	575	-	-	-	-	23	109	1,692	4,031
1993	213	753	-	-	-	-	68	375	980	4,004
1994	507	852	72	492	-	-	40	110	1,925	4,242
1995	852	2,246	-	-	-	-	19	91	1,497	4,627
1996	986	3,746	-	-	-	-	256	662	3,423	18,310
1997	978	4,576	182	838	274	490	166	786	2,408	12,316
1998	1,128	3,639	172	2,638	714	3,204	54	335	2,419	12,993
1999	436	3,971	270	2,315	131	774	25	240	1,998	15,040
2000	440	8,531	199	1,231	220	1,705	22	22	1,689	15,547
2001	335	2,186	195	2,605	237	1,608	73	823	1,204	11,485
2002	673	3,193	167	1,766	153	310	53	210	2,030	14,290
2003	405	11,480	377	1,518	824	6,276	48	272	5,297	33,212
2004	1,207	6,337	226	2,457	649	3,608	136	619	7,096	24,747
2005	1,164	3,813	298	751	387	588	180	470	5,591	13,203
2006	169	4,233	184	2,027	669	2,626	16	173	1,474	11,322
2007	339	3,553	84	801	96	1,225	86	171	2,504	11,485
2008	799	7,969	807	5,029	117	1,026	91	497	3,976	20,867
2009	298	3,249	559	1,358	445	2,153	0	676	3,526	11,190
2010	70	1,406	172	1,764	136	348	146	391	1,482	6,049
Average										
2000–2009	583	5,454	310	1,954	380	2,113	71	393	3,439	16,735
2005–2009										
Average	554	4,563	386	1,993	343	1,524	75	397	3,414	13,613

Note: Blank spaces indicate years in which these rivers did not show up in the Statewide Harvest Survey, or were included in the estimates with other rivers.

Table 17.—Harvest of chum salmon in the commercial, subsistence, test and sport fisheries in the Kuskokwim River, 1990–2010.

Year	Harvest				Total ^d
	Commercial ^a	Subsistence ^{b, c}	Test Fishery	Sport	
1990	461,624	126,508	2,107	533	590,772
1991	431,802	93,075	931	378	526,186
1992	344,603	96,491	15,330	608	457,032
1993	43,337	59,396	8,451	359	111,543
1994	271,115	72,025	11,998	1,280	356,418
1995	605,918	67,862	17,473	226	691,479
1996	207,877	88,965	2,864	280	299,986
1997	17,026	39,970	790	86	57,872
1998	207,809	63,537	1,140	291	272,777
1999	23,006	43,601	562	180	67,349
2000	11,570	51,696	1,038	26	64,330
2001	1,272	49,874	1,743	112	53,001
2002	1,900	72,603	2,666	53	77,203
2003	2,764	43,320	1,713	67	47,864
2004	20,429	52,374	1,810	117	74,730
2005	69,139	46,036	4,459	608	120,242
2006	44,070	64,206	3,547	158	111,836
2007	10,763	51,308	3,237	424	65,732
2008	30,798	67,714	2,954	121	122,548
2009	78,205	41,935	2,204	204	122,548
2010	93,148	46,148	2,872	85	142,253
Average					
2000–2009	27,091	54,107	2,537	189	86,003
Average					
2005–2009	46,095	54,240	3,280	303	108,581

^a Districts 1 and 2, only; no chum harvests reported in District 3.

^b Estimated subsistence harvest expanded from villages surveyed.

^c 2008–2010 estimates are preliminary (H. Carroll, Commercial Fisheries Biologist, ADF&G, Anchorage, personal communication).

^d Total does not include test fish, no test fishing data are available

Table 18.—Sport fishing harvest and catch of chum salmon in the Kanektok, Goodnews, Arolik, and other Kuskokwim Bay rivers, 1990–2010.

Year	Kanektok River		Goodnews River		Arolik/Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	202	4,532	^a	^a	187	523	369	1,094
1991	80	1,382	189	527	105	393	274	1,049
1992	251	3,994	0	402	91	380	426	2,141
1993	183	4,849	156	924	129	1,135	230	5,816
1994	156	6,386	15	381	496	1,186	785	3,651
1995	213	5,049	0	315	5	82	218	5,446
1996	200	8,155	0	351	9	352	209	8,858
1997	212	11,041	24	1,111	62	560	298	12,712
1998	213	11,560	50	2,955	11	192	274	14,707
1999	293	14,241	47	7,561	0	16	340	21,818
2000	231	10,200	12	4,243	0	24	243	14,467
2001	43	6,457	21	2,188	0	129	64	8,774
2002	446	10,779	99	4,059	0	695	545	15,533
2003	14	7,138	14	3,195	0	3,195	28	10,402
2004	33	4,715	0	1,757	0	2,309	33	8,781
2005	108	9,241	0	1,481	0	0	108	10,722
2006	145	21,528	0	5,566	0	0	145	26,986
2007	15	7,971	0	3,026	0	1,362	15	12,359
2008	48	9,232	26	922	67	1,113	141	11,267
2009	44	3,802	22	3,193	0	542	66	7,537
2010	150	10,298	0	1,334	0	430	150	12,062
Average 2000–2009	113	9,106	19	2,963	7	937	139	12,683
Average 2005–2009	72	10,355	10	2,838	13	603	95	13,774

^a Goodnews River harvests included in the Other Rivers category for 1990.

Table 19.–Sport fishing harvest and catch of chum salmon in the Aniak, Kisaralik, Kwethluk and Holitna rivers, 1990–2010.

Year	Aniak River		Kisaralik River		Kwethluk River		Holitna River		Kuskokwim River Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	182	571	-	-	-	-	14	101	380	4,759
1991	169	656	-	-	-	-	119	159	373	2,442
1992	304	1,670	-	-	30	91	91	471	501	5,384
1993	101	2,412	-	-	0	2,669	208	881	501	4,925
1994	231	1,342	-	-	-	-	0	38	841	8,197
1995	127	2,785	-	-	-	-	0	327	237	4,247
1996	110	3,888	-	-	-	-	0	230	308	14,359
1997	86	2,369	0	9	0	53	33	116	86	2,786
1998	101	2,664	0	163	8	296	0	25	322	5,316
1999	139	4,055	0	456	41	176	0	135	180	5,443
2000	0	3,914	13	2,091	0	85	0	0	116	6,409
2001	0	1,899	0	106	71	425	73	350	112	3,656
2002	0	2,096	0	745	34	455	53	426	53	4,486
2003	0	2,347	0	450	0	0	48	209	39	5,111
2004	0	1,602	0	606	70	308	136	426	84	4,380
2005	0	788	0	247	0	0	180	1,638	500	4,735
2006	0	2,135	0	80	0	2,089	0	802	13	8,188
2007	0	3,191	0	140	0	21	0	0	40	7,204
2008	45	2,427	31	2,465	0	960	45	408	121	8,025
2009	156	1,487	22	778	0	1,218	0	538	285	6,861
2010	0	1,360	24	2,069	61	524	0	37	85	4,265
Average 2000–2009	20	2,189	7	771	18	556	54	480	136	5,906
Average 2005–2009	40	2,006	11	742	0	858	45	677	192	7,003

Note: Blank spaces indicate years in which these rivers did not show up in the Statewide Harvest Survey, or were included in the estimates with other rivers.

Table 20.—Harvest of sockeye salmon in the commercial, subsistence, test and sport fisheries in the Kuskokwim River, 1990–2010.

Year	Harvest				Total
	Commercial	Subsistence ^a	Test Fishery ^b	Sport ^c	
1990	84,870	36,276	ND	61	121,184
1991	108,946	52,984	ND	38	162,061
1992	92,218	32,066	ND	131	124,632
1993	27,008	49,348	ND	348	76,715
1994	49,365	37,159	ND	359	86,619
1995	92,500	27,791	ND	95	120,606
1996	33,878	34,213	ND	315	68,220
1997	21,989	40,097	ND	423	62,160
1998	60,906	35,425	ND	178	96,396
1999	16,976	46,677	ND	54	63,699
2000	4,130	41,783	ND	46	46,144
2001	84	48,601	510	231	50,175
2002	84	25,499	228	26	26,694
2003	282	34,452	0	289	35,023
2004	9,748	32,433	742	512	42,693
2005	27,645	33,878	1,062	792	62,315
2006	12,618	30,226	519	187	43,594
2007	703	33,234	488	382	34,807
2008	15,601	57,195	584	273	73,069
2009	26,012	33,810	515	631	60,453
2010	22,428	38,103	495	419	61,455
Average 2000–2009	9,691	37,111	516	337	47,497
Average 2005–2009	16,516	37,669	634	453	54,848

^a Estimated subsistence harvest expanded from villages surveyed. 2008–2010 are preliminary estimates.

^b Test fishery sockeye harvests not available.

^c Statewide Harvest Survey (1990–2010).

Table 21.—Sport fishing harvest and catch of sockeye salmon in the Kanektok, Goodnews, Arolik, and other Kuskokwim Bay rivers, 1990–2010.

Year	Kanektok River		Goodnews River		Arolik/Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	462	3,293	-	-	-	-	535	3,390
1991	88	1,147	63	2,003	-	-	176	3,276
1992	66	1,290	8	90	-	-	131	1,626
1993	331	1,887	53	321	-	-	644	3,504
1994	313	3,622	70	207	-	-	877	4,359
1995	148	733	34	380	42	64	224	1,177
1996	335	2,157	87	1,119	120	186	542	3,462
1997	607	2,155	61	1,625	10	248	678	4,028
1998	942	3,987	502	3,402	60	148	1,504	7,537
1999	496	4,537	561	1,999	0	278	1,057	6,814
2000	694	5,700	82	997	11	11	787	6,708
2001	83	1,415	108	1,128	0	358	191	2,901
2002	73	1,423	149	3,112	3	195	225	4,830
2003	107	5,082	42	1,502	0	60	149	6,644
2004	112	1,330	0	891	0	331	112	2,552
2005	156	5,692	0	683	0	43	156	6,418
2006	523	11,450	98	2,798	12	276	633	14,524
2007	385	3,481	84	903	0	0	469	4,384
2008	654	6,777	104	1,185	78	758	836	6,331
2009	75	768	111	1,205	46	623	232	2,596
2010	404	4,872	15	1,184	0	499	419	6,555
Average								
2000–2009	286	4,312	78	1,440	15	266	379	5,789
Average								
2005–2009	359	5,639	79	1,355	27	340	465	6,851

Note: Blank spaces indicate years in which these rivers did not show up in the Statewide Harvest Survey, or were included in the estimates with other rivers.

Table 22.—Sport fishing harvest and catch of sockeye salmon in the Aniak, Kisaralik, Kwethluk, and Holitna rivers, 1990–2010.

Year	Aniak River		Kisaralik River		Kwethluk River		Holitna River		Kuskokwim River Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	49	182	-	-	-	-	0	0	620	3,644
1991	38	151	-	-	-	-	0	76	214	3,528
1992	25	74	-	-	-	-	0	0	189	1,791
1993	17	79	-	-	-	-	43	902	715	3,637
1994	17	87	-	-	-	-	0	0	894	4,898
1995	43	166	-	-	-	-	0	0	277	1,364
1996	186	367	-	-	-	-	0	0	752	9,326
1997	353	391	-	-	-	-	21	0	1,181	5,744
1998	195	367	-	-	-	-	0	64	1,867	8,186
1999	21	407	-	-	-	-	0	84	1,154	7,360
2000	23	286	0	117	-	-	12	124	822	7,365
2001	24	222	34	156	0	37	48	951	422	5,102
2002	26	54	0	16	0	61	16	24	267	5,086
2003	0	390	74	75	42	42	0	105	289	7,527
2004	119	185	22	45	65	218	124	270	512	3,422
2005	0	606	22	22	0	0	345	467	792	7,854
2006	16	1,042	67	160	0	0	136	431	864	16,599
2007	0	118	0	179	0	0	0	81	110	6,544
2008	102	450	410	171	0	188	0	42	1,109	9,824
2009	0	203	10	82	12	130	20	91	394	3,595
2010	0	597	0	0	0	0	0	0	0	1,051
Average 2000–2009	31	356	64	102	13	75	70	259	464	7,292
Average 2005–2009	24	484	102	123	2	64	100	222	465	8,883

Note: Blank spaces indicate years in which these rivers did not show up in the Statewide Harvest Survey, or were included in the estimates with other rivers.

Table 23.—Sport fishing harvest and catch of rainbow trout in the Kanektok, Goodnews, Arolik, and other Kuskokwim Bay rivers, 1990–2010.

Year	Kanektok River		Goodnews River		Arolik/Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	281	7,810	N/A	N/A	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	231	27,325	433	9,653	68	2,323	732	39,301
1998	0	13,567	97	5,738	8	1,598	105	20,813
1999	73	11,151	133	5,926	12	2,229	218	19,306
2000	0	6,019	0	2,446	11	134	11	8,599
2001	0	7,984	0	2,312	0	593	0	10,889
2002	0	8,846	32	2,915	0	2,732	32	14,493
2003	0	8,455	44	3,125	0	453	44	12,033
2004	68	8,525	68	2,540	12	5,183	148	16,248
2005	0	7,070	0	2,747	0	1,769	0	11,586
2006	0	11,793	0	3,446	0	5,412	67	20,651
2007	11	11,538	105	2,451	40	2,638	156	16,627
2008	0	16,375	47	3,051	10	2,794	57	22,220
2009	0	12,670	108	1,712	30	6,209	138	20,591
2010	17	10,263	34	1,696	0	3,614	51	15,573
Average 2000–2009	8	9,928	40	2,675	10	2,792	65	15,394
Average 2005–2009	2	11,889	52	2,681	16	3,764	84	18,335

Table 24.—Sport fishing harvest and catch of rainbow trout in the Aniak, Kisaralik, Kwethluk, and other Kuskokwim rivers 1990–2010.

Year	Aniak River		Kisaralik River		Kwethluk River		Kwethluk/Other Rivers		Kuskokwim River Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
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	24	2,040	522	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
2000	24	4,643	47	3,076	24	1,054	0	0	95	8,773
2001	0	1,268	0	1,010	17	896	0	8	17	3,182
2002	0	2,942	29	5,520	0	3,398	15	1,275	44	13,135
2003	0	2,477	21	1,241	-	-	21	650	42	4,368
2004	0	1,908	99	3,134	117	1,027	0	0	216	6,069
2005	0	1,077	78	3,378	-	-	53	487	131	4,942
2006	0	4,772	0	4,339	0	5,990	0	4,612	0	15,531
2007	0	7,243	21	1,457	31	3,277	0	409	52	10,929
2008	0	13,081	136	9,237	26	6,688	0	3,005	162	32,011
2009	0	11,019	136	10,006	26	6,615	0	880	162	28,520
2010	0	5,452	0	9,490	55	4,037	0	215	55	19,194
Average 2000–2009	2	5,043	48	4,240	30	3,618	10	1,258	92	12,746
Average 2005–2009	0	7,438	84	5,683	21	5,643	11	1,879	101	18,387

Note: Blank spaces indicate years in which these rivers did not show up in the Statewide Harvest Survey, or were included in the estimates with other rivers.

Table 25.—Sport fishing harvest and catch of Dolly Varden/Arctic char in the Kanektok, Goodnews, Arolik, and other Kuskokwim Bay rivers, 1990–2010.

Year	Kanektok Rivers		Goodnews River		Arolik/Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
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	789	41,748	1,071	23,498	35	2,255	1,895	67,501
1998	368	24,287	460	16,680	0	668	828	41,635
1999	615	21,700	917	18,174	67	4,059	1,599	43,933
2000	417	13,490	658	11,422	12	424	1,087	25,336
2001	543	15,673	418	12,613	44	815	1,005	29,101
2002	497	15,555	664	14,436	97	2,975	1,258	32,966
2003	457	16,988	555	19,016	0	298	1,012	36,302
2004	482	29,990	331	10,886	289	14,829	1,102	55,705
2005	256	17,443	742	18,994	12	3,198	1,010	39,635
2006	339	30,420	395	7,270	396	7,889	1,143	45,592
2007	232	22,617	256	5,572	139	1,357	627	29,546
2008	223	36,492	231	7,865	45	2,192	499	46,549
2009	223	23,007	231	7,364	45	3,403	499	33,774
2010	334	19,784	351	11,300	15	5,232	700	36,316
Average 2000–2009	367	22,168	448	11,544	108	3,738	924	37,859
Average 2005–2009	255	25,996	371	9,413	127	3,608	756	40,331

Note: Blank spaces indicate years in which these rivers did not show up in the Statewide Harvest Survey, or were included in the estimates with other rivers.

Table 26.—Sport fishing harvest and catch of Dolly Varden/Arctic char in the Aniak, Kisaralik, Kwethluk, and other Lower Kuskokwim rivers, 1990–2010.

Year	Aniak River		Kisaralik River		Kwethluk River		Holitna and Upper Kuskokwim		Kuskokwim River Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	598	6,174	-	-	-	-	18	387	697	7,204
1991	547	3,514	-	-	-	-	245	3,845	1,569	6,833
1992	115	3,736	-	-	57	57	65	647	421	5,259
1993	260	9,340	-	-	97	349	79	2,204	572	13,616
1994	496	3,115	117	1,013	-	-	156	662	836	4,863
1995	481	3,454	-	-	-	-	78	1,062	795	7,826
1996	159	4,883	-	-	-	-	85	644	911	13,920
1997	316	12,066	413	4,708	243	243	143	1,892	1,442	21,798
1998	394	21,053	92	599	14	188	67	364	753	24,085
1999	114	5,909	181	3,875	0	44	112	589	439	10,664
2000	40	5,333	367	3,664	47	95	71	313	525	9,591
2001	87	1,857	320	2,454	33	142	253	387	693	7,449
2002	212	6,288	345	4,494	53	2,223	0	1,922	768	15,947
2003	178	4,033	432	2,693	77	1,196	629	4,144	1,698	13,948
2004	288	6,496	114	4,343	230	2,376	765	7,554	1,437	20,489
2005	296	2,477	246	1,241	106	237	337	1,152	1,125	9,718
2006	150	7,064	14	3,655	76	365	421	3,341	794	15,978
2007	291	7,193	147	1,311	0	1,586	138	1,784	865	12,791
2008	948	16,771	113	6,627	36	1,874	306	5,746	1,539	37,286
2009	510	9,756	232	4,949	129	5,418	301	980	1,677	23,851
2010	400	8,875	124	6,542	133	2,174	0	56	658	17,647
Average										
2000–2009	300	6,727	233	3,543	79	1,551	322	2,732	1,112	16,741
Average										
2005–2009	439	8,652	150	3,557	69	1,896	301	2,601	1,200	19,925

Note: Blank spaces indicate years in which these rivers did not show up in the Statewide Harvest Survey, or were included in the estimates with other rivers.

Table 27.—Sport fishing harvest and catch of Arctic grayling in the Kanektok, Goodnews, Arolik, and other Kuskokwim Bay rivers, 1990–2010.

Year	Kanektok River		Goodnews River		Arolik/Other Rivers		Kuskokwim Bay Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
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	99	5,335	74	2,706	88	1,883	261	9,924
1998	33	5,576	28	3,126	105	1,586	166	10,288
1999	159	4,218	84	2,544	194	1,638	437	8,400
2000	25	3,632	0	1,726	0	86	25	5,444
2001	47	3,955	65	2,431	19	458	131	5,844
2002	47	3,622	221	2,543	0	1,182	268	7,347
2003	0	3,888	42	1,130	0	380	42	5,398
2004	33	3,417	130	2,343	60	1,329	223	8,418
2005	11	1,895	29	749	0	51	40	2,695
2006	28	2,180	17	1,044	20	1,726	65	4,950
2007	30	1,259	0	4,339	0	1,243	30	6,841
2008	0	7,220	26	2,331	55	2,249	81	11,800
2009	22	5,882	36	1,365	0	3,365	58	10,612
2010	14	4,598	0	846	0	2,902	14	8,346
Average								
2000–2009	24	3,695	57	2,000	15	1,207	96	6,935
Average								
2005–2009	18	3,687	22	1,966	15	1,727	55	7,380

Note: Blank spaces indicate years in which these rivers did not show up in the Statewide Harvest Survey, or were included in the estimates with other rivers.

Table 28.—Sport fishing harvest and catch of Arctic grayling in the Aniak, Kisaralik, Kwethluk, and other Kuskokwim rivers, 1990–2010.

Year	Aniak River		Kisaralik River		Kwethluk River		Holitna and Upper Kuskokwim		Kuskokwim River Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	422	5,259	-	-	-	-	301	2,761	1,340	13,790
1991	1,085	4,841	-	-	-	-	569	4,082	2,603	14,983
1992	121	3,855	-	-	75	120	107	1,775	545	9,539
1993	288	5,580	-	-	47	166	218	2,103	739	16,596
1994	116	2,022	69	1,920	-	-	284	2,556	850	10,930
1995	53	2,266	-	-	-	-	357	2,036	845	9,598
1996	103	5,102	-	-	-	-	309	2,241	663	16,403
1997	162	15,089	303	3,746	256	499	209	3,881	1,292	34,586
1998	715	11,930	64	984	8	1,408	1858	11,015	3,554	38,856
1999	437	8,659	63	3,641	0	226	142	1,636	1,290	23,975
2000	42	5,950	29	3,605	38	995	179	2,149	361	19,215
2001	77	3,300	64	3,356	77	3,058	458	7,255	807	22,813
2002	172	11,518	507	8,184	226	3,000	108	2,428	1,464	34,740
2003	58	6,787	280	3,188	ND	ND	536	8,646	1,259	26,782
2004	0	3,844	45	4,669	23	697	1,651	15,161	1,953	31,680
2005	108	2,149	346	2,822	ND	ND	597	2,192	1,287	11,599
2006	58	2,357	83	1,845	97	2,701	314	3,341	637	16,493
2007	38	4,242	38	1,255	0	3,440	64	1,792	631	20,907
2008	253	5,794	121	9,911	42	2,828	106	2,012	713	35,486
2009	253	8,055	121	5,269	42	4,144	498	4,162	1,307	35,693
2010	26	5,502	0	8,814	114	3,355	376	1,549	530	27,870
Average 2000–2009	106	5,400	158	4,410	63	2,608	451	4,914	1,042	25,541
Average 2005–2009	142	4,519	127	4,220	41	3,278	316	2,700	915	24,036

Note: Blank spaces indicate years in which these rivers did not show up in the Statewide Harvest Survey, or were included in the estimates with other rivers.

Table 29.—Sport fishing harvest and catch of northern pike in the Aniak, Kisaralik, Kwethluk, and other Kuskokwim rivers, 1990–2010.

Year	Aniak River		Kisaralik River		Kwethluk River		Holitna and Upper Kuskokwim		Kuskokwim River Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	18	53	-	-	-	-	53	634	231	3,449
1991	244	1,448	-	-	-	-	1,480	2,197	2,018	4,621
1992	43	794	-	-	60	231	256	1,230	752	3,878
1993	0	45	-	-	329	526	142	1,565	995	3,721
1994	54	698	0	18	-	-	314	1,877	828	4,383
1995	77	623	-	-	-	-	381	3,080	655	5,430
1996	10	399	-	-	-	-	131	1,866	344	6,928
1997	42	303	21	119	0	206	295	1,845	408	4,432
1998	553	1,883	67	67	18	247	278	2,094	2,711	5,704
1999	94	674	0	27	0	0	144	2,914	548	5,643
2000	0	298	11	55	0	153	186	2,735	531	3,857
2001	65	493	0	0	14	41	330	3,469	474	4,081
2002	45	655	0	47	78	350	74	2,133	443	3,915
2003	10	1,756	0	65	0	0	483	2,345	783	2,645
2004	121	713	0	692	289	1,603	862	5,527	1,543	10,613
2005	77	805	247	283	0	0	1,536	6,023	3,749	10,425
2006	0	877	0	114	0	152	340	2,874	406	4,917
2007	60	927	357	0	143	10	73	1,314	73	4,606
2008	60	539	9	232	0	33	80	1,527	165	2,779
2009	168	620	0	25	0	115	58	2,839	981	4,354
2010	0	794	0	150	101	261	782	3,084	909	4,359
Average 2000–2009	61	768	62	151	52	246	402	3,079	915	5,219
Average 2005–2009	73	754	123	131	29	62	417	2,915	1,075	5,416

Note: Blank spaces indicate years in which these rivers did not show up in the Statewide Harvest Survey, or were included in the estimates with other rivers.

Table 30.—Sport fishing harvest and catch of sheefish in the Aniak and Lower Kuskokwim rivers and the Holitna and Upper Kuskokwim rivers 1990–2010.

Year	Aniak River		Other Lower Kuskokwim		Total Lower Kuskokwim		Holitna River		Other Upper Kuskokwim		Kuskokwim Total	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1990	-	-	-	-	107	316	53	158	0	35	107	316
1991	13	141	-	-	141	398	128	372	13	26	154	539
1992	0	11	-	-	119	119	173	508	0	0	292	638
1993	0	626	-	-	54	1,326	45	1,317	0	0	54	1,952
1994	88	154	-	-	124	171	130	189	0	19	390	628
1995	9	623	103	1,160	103	1,160	113	472	38	150	272	1,416
1996	20	89	64	372	64	372	26	206	21	306	20	675
1997	22	225	149	694	149	694	168	1,098	42	296	589	2,091
1998	30	47	94	789	124	836	35	729	8	771	277	1,708
1999	81	290	27	69	108	359	102	745	28	813	268	1,381
2000	0	7	158	158	158	165	58	512	34	371	250	1,048
2001	0	232	0	0	0	232	124	381	0	129	124	742
2002	51	133	0	0	51	133	18	270	12	12	81	446
2003	0	0	0	0	0	0	30	59	15	768	45	768
2004	0	0	0	29	0	29	156	591	0	292	182	938
2005	32	32	162	325	194	357	349	2,843	454	617	1,079	3,933
2006	0	141	0	0	20	182	14	142	139	200	173	524
2007	0	0	261	261	261	261	0	0	174	191	174	452
2008	0	67	0	0	0	67	81	174	0	364	191	1,046
2009	0	79	0	13	0	92	13	528	148	148	161	768
2010	0	37	0	0	127	37	12	152	55	91	67	280
Average												
2000–2009	10	69	58	79	68	152	84	550	98	309	257	1,067
Average												
2005–2009	6	64	85	120	95	192	91	737	183	304	360	1,345

Note: Blank spaces indicate years in which these rivers did not show up in the Statewide Harvest Survey, or were included in the estimates with other rivers.

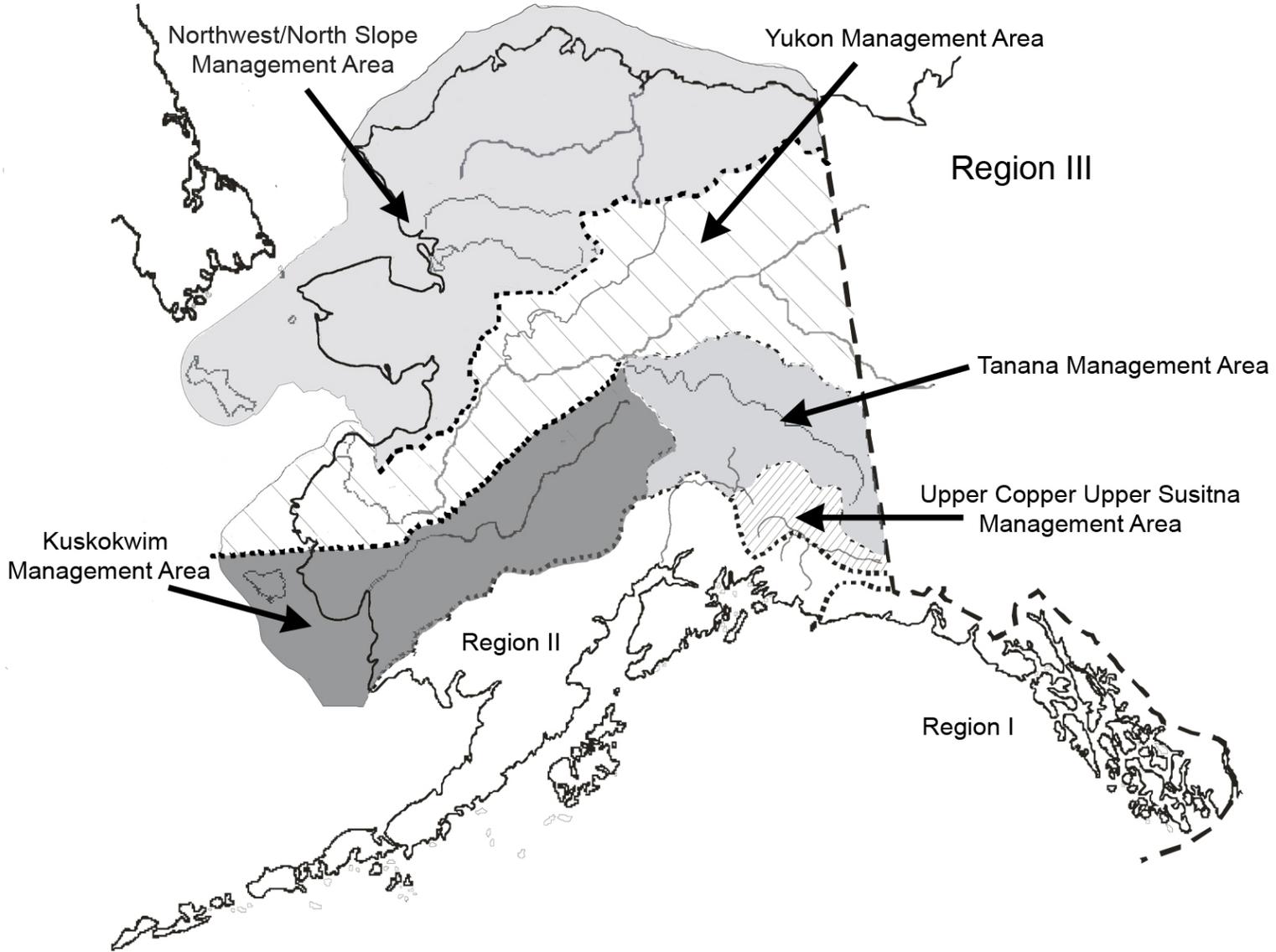


Figure 1.—Map of the sport fish regions in Alaska and the five Region III management areas.

Kuskokwim-Goodnews Drainages

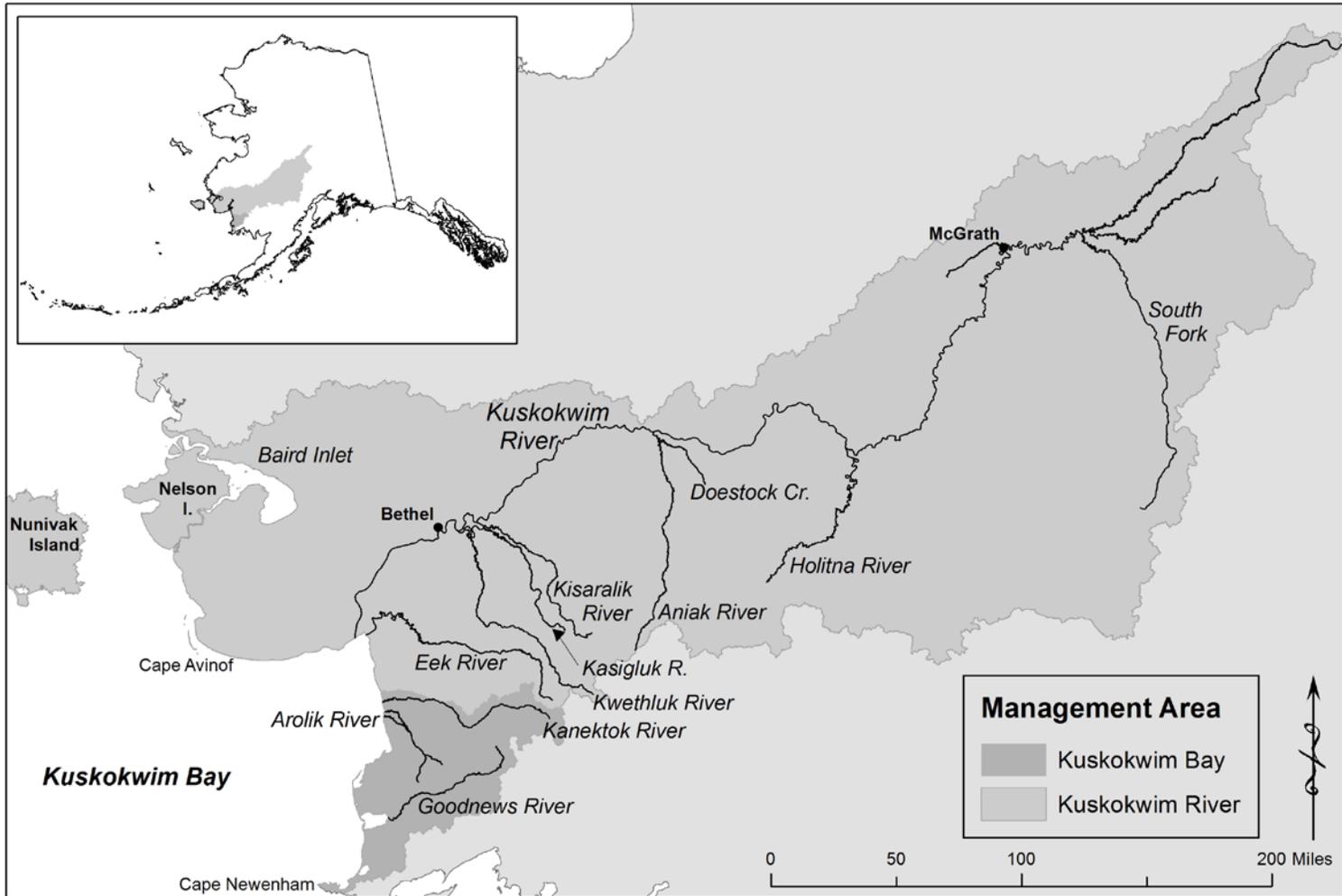


Figure 2.—Kuskokwim-Goodnews Management Area.



Figure 3.—Aniak River Drainage.

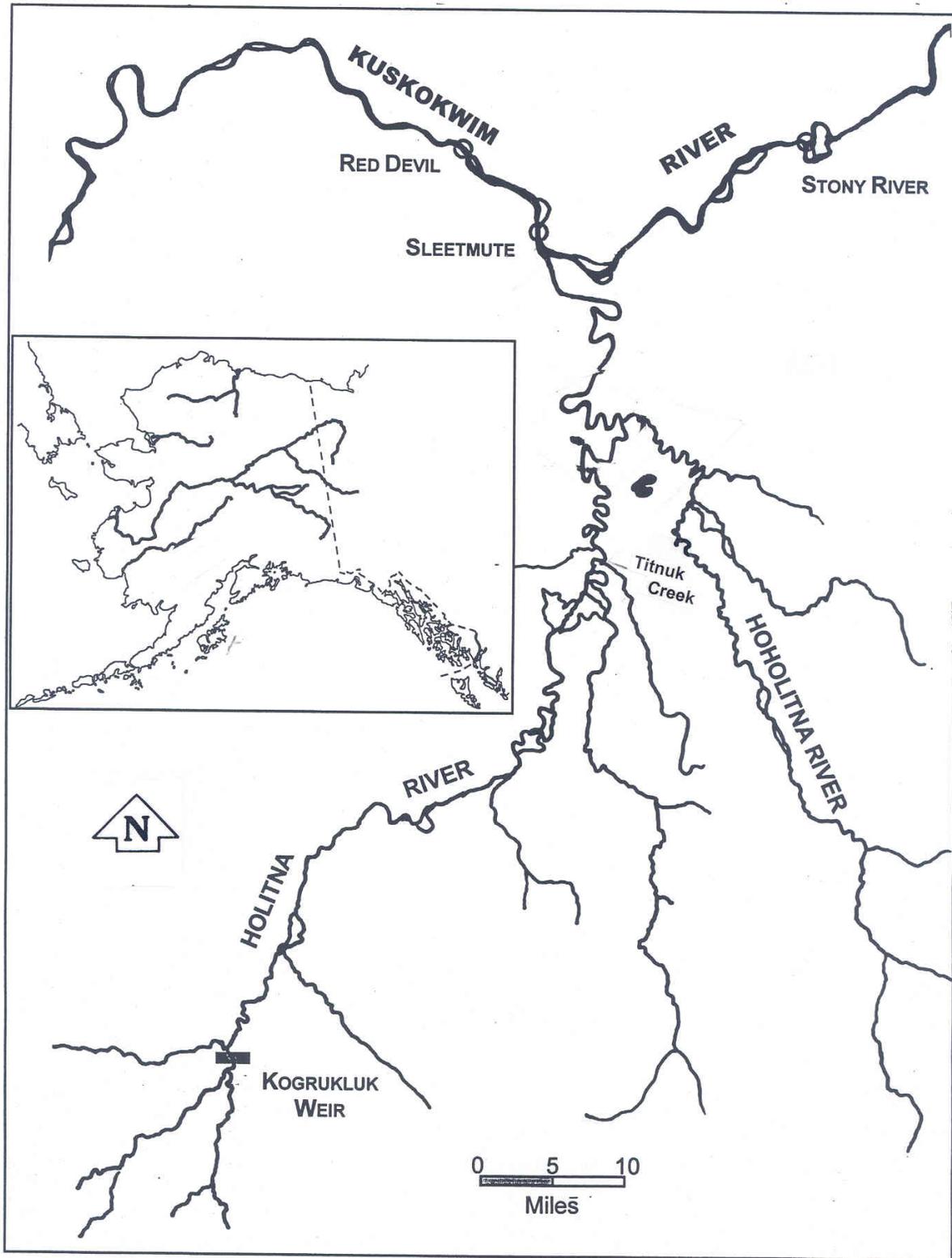


Figure 4.—Holitna River Drainage.

**APPENDIX A–TOGIAK NATIONAL WILDLIFE REFUGE
PUBLIC USE MANAGEMENT PLAN DIRECTION AND
ALTERNATIVES**

Appendix A1.—Togiak National Wildlife Refuge public use management plan direction and alternatives.

Chapter 2: Public Use Management Plan Direction and Alternatives

Table 2-3 Alternatives for the Togiak Refuge Draft Public Use Management Plan

	Alternative A (current management)	Alternative B	Alternative C (Preferred Alternative)	Alternative D	Alternative E
Issue 1. Public Use at Cape Peirce Wildlife Viewing Area and Public Facilities at Sangor Lake	Management Direction —Emphasize wildlife viewing that complements the research and study of fish, wildlife, plants, and their habitats	Management Direction —Same as Alternative A	Management Direction —Facilitate wildlife viewing that complements the protection and preservation of the area’s natural and cultural resource values	Management Direction —Emphasize a structured wildlife-viewing experience.	Management Direction —Emphasize wildlife viewing and educational and outreach programs that focus on cultural and natural significance of the area
	Visitation —Maximum one flight per day and six people at one time	Visitation —Same as Alternative A	Visitation —Additional opportunities for as many as two flights per day and 12 people at one time. Guide or refuge staff may accompany. At low use levels refuge manager may waive permits.	Visitation —Same as Alternative C	Visitation —Same as Alternative C
	Allocation —Permits for all visitors issued on first-come, first-served basis	Allocation —50 percent commercially guided/ and 50 percent general public; unused permits available through a common pool	Allocation —Same as Alternative B	Allocation —100 percent commercially guided use	Allocation —30 percent commercially guided and 70 percent general public (accompanied by Refuge staff); unused permits available through a common pool

	Alternative A (current management)	Alternative B	Alternative C (Preferred Alternative)	Alternative D	Alternative E
	Facilities —No facilities constructed. An outhouse could be constructed to protect natural resources and public health	Facilities —Same as Alternative A	Facilities —Minimal facilities for as many as 12 people to ensure public health, and safety (i.e., tent platforms, food storage, outhouse)	Facilities —Moderate facilities to accommodate as many as 12 people, (i.e., one cabin, tent platform, and outhouse)	Facilities —Same as Alternative D, plus accommodations for interpretive cultural and natural history programs (i.e., large cabin with meeting area and outhouse)
Issue 2. Unguided Recreational Opportunities: Kanektok and Goodnews River Watersheds	No limits	Kanektok —One trip every other day; maximum four boats and 12 people per trip Goodnews —Limit to existing level of use	One trip every other day, and on the Goodnews River only, two trips on weekends during peak use seasons (June 25–July 15; August 10–September 7); maximum four boats and 12 people per trip. Permits required. At low use levels refuge manager may waive permits.	Voluntary trip registration available all season	One trip every three days; maximum three boats and nine people per trip
Issue 3. Waste Management	Bury waste 100 feet from surface waters on public lands only; outhouses at Kagati and Goodnews lakes	If monitoring suggests standards are at risk of being exceeded, require all float groups to carry out solid human waste on the Kanektok River	In addition to actions in Alternative B, work with partners to facilitate the construction and voluntary use of DEC-approved disposal sites for packing out human waste	Same as Alternative B	Implement human-waste pack-out program for all users as DEC-approved disposal sites become available and accessible

Chapter 2: Public Use Management Plan Direction and Alternatives

Table 2-4 Issue 4. Commercial Sport Fishing Guide Alternatives for the Togiak Refuge Public Use Management Plan Revision Draft

	Alternative A (current management)	Alternative B	Alternative C (Preferred Alternative)	Alternative D	Alternative E
Goodnews River North Fork	Motorized Up to 9 motorboats and 18 clients at one time. Average use 1990–2001; 17 trips per year Float—One trip per week; maximum 4 boats and 12 people per trip	Same as Alternative A	Motorized—One boat and three people per day Float—One trip per week (with option of using Middle Fork); maximum four boats and 12 people per trip	Motorized—Temporary camp; maximum nine motorboats and 27 people per day Float—One trip every other day; maximum four boats and 12 people per trip	Same as Alternative A
Middle Fork	Motorized—One temporary camp; two boats and six people per day Float—None	Motorized—One temporary camp, three boats and 10 people per day Float—None	Motorized—Same as Alternative A Float—One trip per week (with option of using North Fork); maximum four boats and 12 people per trip	Motorized—One temporary camp; three motorboats and 10 people per day Float—One trip every week; maximum four boats and 12 people per trip	Same as Alternative A
Osviak and Matogak Rivers	No permits	Same as Alternative A	Same as Alternative A	Motorized—One trip per week (either river); maximum two boats and six people per trip	Same as Alternative A
Togiak River	Motorized—Maximum seven motorboats and 28 people per day Float—Two trips per week; two boats and eight people per trip	Same as Alternative A	Same as Alternative A	Motorized—Maximum 14 motorboats and 42 people per day Float—Two trips per week maximum two boats and eight people per trip	Same as Alternative A

NOTES: Management activities undertaken by the Service, or by volunteers, cooperators, or contractors working for the Service, with limited exception, are exempt from compatibility review [Part 603, Compatibility, of the Service Manual (Draft)].
The term “temporary” refers to any structure or other human-made improvement that can be readily and completely dismantled and removed from the site when the period of authorized use terminates.
Management of activities occurring on navigable waters will be coordinated with the appropriate state agency.