Special Publication No. 09-14

Report to the Alaska Board of Fisheries for the Recreational Fisheries of Bristol Bay, 2007, 2008, and 2009

by

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and

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November 2009

Alaska Department of Fish and Game Divisions of Sport Fish and Commercial Fisheries

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
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

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mid eye to fork	MEF
mid eye to tail fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$log_{2,}$ etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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November 2009

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This document should be cited as:
Dye, J. E and C. J. Schwanke. 2009. Report to the Alaska Board of Fisheries for the recreational fisheries of Bristol Bay, 2007, 2008, and 2009. Alaska Department of Fish and Game, Special Publication No. 09-14, Anchorage.

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TABLE OF CONTENTS

Page

LIST OF TABLES iii

LIST OF FIGURES iv

ABSTRACT 1

MANAGEMENT AREA OVERVIEW 1

Management Area Description 1
Information Sources for Management 2
Sport Effort and Harvest 3
Management Plans and Policies 6
  Nushagak-Mulchatna King Salmon Management Plan 6
  Kvichak River Drainage Sockeye Salmon Management Plan 6
  Southwest Alaska Rainbow Trout Management Plan 6
  Sustainable Salmon Fisheries Policy for Alaska 9
  Statewide Policy and Plan for Management of Sustainable Wild Rainbow Trout Fisheries 9
Emergency Orders Issued in 2007-2009 9
  Emergency Order No.: 2-KS-5-25-07 10
  Emergency Order No.: 2-RS-5-20-08 10
  Emergency Order No.: 2-RS-5-21-08 10

KING SALMON FISHERIES 10

Areawide Fishery Description 10
Areawide Fishery Management and Objectives 11
Nushagak and Mulchatna Rivers 14
  Fishery Description 14
  Fishery Management and Objectives 17
  2009 Season 20

SOCKEYE SALMON FISHERIES 20

Areawide Fishery Description 20
Areawide Harvest 20
Areawide Management 21
Kvichak River 24
  Fishery Description 24
  Harvest and Effort 24
  Fishery Management and Objectives 26
  2009 Season 26

RAINBOW TROUT FISHERIES 26

Areawide Fishery Description 26
Southwest Alaska Rainbow Trout Management Plan 32
  Philosophy of the Plan 32
  Plan Implementation 32
Bristol Bay Rainbow Trout Studies 33
Lower Talarik Creek 33
  Fishery Description 33
  Harvest and Effort 34
  Fishery Management and Objectives 36
Brooks River 38
  Fishery Description 38
  Harvest and Effort 38

TABLE OF CONTENTS (Continued)

Page

Fishery Management and Objectives 39
American Creek 39
Fishery Description 39
Harvest and Effort 39
Fishery Management and Objectives 39

ACKNOWLEDGEMENTS 40

REFERENCES CITED 40

LIST OF TABLES

Table **Page**

1. Sport fishing effort by section and drainage, Bristol Bay Sport Fish Management Area, 1977-2008.....4
2. Sport harvest by species, Bristol Bay Sport Fish Management Area, 1977-2008. 8
3. Sport harvest of king salmon, by section and drainage, Bristol Bay Sport Fish Management Area, 1977-2008. 13
4. Comparison of total run, commercial, subsistence, and sport harvests, inriver sonar estimate, and escapement for king salmon, Nushagak River drainage, 1989-2009.....15
5. Historical aerial escapement counts of king salmon in selected streams in the Wood and Nushagak-Mulchatna river drainages, 1967 to 2009. 18
6. Sport harvest of sockeye salmon by section and drainage, Bristol Bay Sport Fish Management Area, 1977-2008. 22
7. Commercial and subsistence harvests and escapements of sockeye salmon for Kvichak River drainage, and sport harvests of sockeye salmon from Kvichak River, 1974-2008. 25
8. Comparison of expected total sockeye salmon run versus the escapement goal range, midrange, and final escapement estimated by district and river system, Bristol Bay, 2007–2009. 27
9. Sport harvest of rainbow trout by section and drainage, Bristol Bay Sport Fish Management Area, 1977-2008. 29
10. Estimated sport catch of rainbow trout, by section and drainage, Bristol Bay Sport Fish Management Area, 1991-2008.....31
11. Angler effort, catch, catch per unit effort, harvest, and percent retained for rainbow trout, Lower Talarik Creek, 1970-1976, 1986-1987, 1990-1991, and 1993-2005. 37

LIST OF FIGURES

Figure **Page**

1. Bristol Bay Sport Fish Management Area, showing the Eastern, Central, and Western sections. 2
2. Sport fishing effort in angler-days for the Bristol Bay Sport Fish Management Area, 1977-2008. 5
3. Percentage of sport fishing effort expended in the Eastern, Central, and Western sections of Bristol Bay, 2003-2007 average and 2008. 7
4. Popular king salmon sport fisheries in the Bristol Bay Sport Fish Management Area..... 11
5. Sport harvest of king salmon, by section, from the Bristol Bay Sport Fish Management Area, 1977-2008..... 12
6. Popular sockeye salmon sport fisheries in the Bristol Bay Sport Fish Management Area..... 21
7. Sport harvest of sockeye salmon, by section, from the Bristol Bay Sport Fish Management Area, 1977-2008..... 23
8. Popular rainbow trout sport fisheries in the Bristol Bay Sport Fish Management Area..... 28
9. Sport harvest of rainbow trout, by section, from the Bristol Bay Sport Fish Management Area, 1977-2008..... 30
10. Catch-and-release special management areas for rainbow trout in the Bristol Bay Sport Fish Management Area. 34
11. Fly-only/catch-and-release special management areas for rainbow trout in the Bristol Bay Sport Fish Management Area. 35
12. Unbaited single-hook artificial lure special management areas for rainbow trout in the Bristol Bay Sport Fish Management Area..... 36

ABSTRACT

This report summarizes sport fisheries addressed in Bristol Bay proposals to the Alaska Board of Fisheries during 2009. Fisheries include Nushagak-Mulchatna Chinook salmon (king) *Oncorhynchus tshawytscha*, and Brooks River and American Creek rainbow trout *O. mykiss*. The sport fisheries are described, and estimates of sport effort, catch, and harvest, and escapement are provided. Overviews of management for each fishery are provided, such as pertinent sport fishing regulations and management plans, including the Nushagak-Mulchatna King Salmon Management Plan and the Southwest Alaska Rainbow Trout Management Plan.

Key words: Bristol Bay Sport Fish Management Area, Alaska Board of Fisheries, management plan, Alagnak River, Nushagak River, Mulchatna River, Chinook salmon, *Oncorhynchus tshawytscha*, king salmon, Kvichak River, sockeye salmon, *Oncorhynchus nerka*, rainbow trout, *Oncorhynchus mykiss*.

MANAGEMENT AREA OVERVIEW

MANAGEMENT AREA DESCRIPTION

The purpose of this report is to summarize sport fisheries addressed in Bristol Bay proposals to the Alaska Board of Fisheries (BOF) during 2009. The Bristol Bay Sport Fish Management Area (BBMA) is part of Sport Fish Division's Southcentral Region (Region II) and includes all waters and drainages flowing into Bristol Bay between Cape Newenham on the northwest to Cape Menshikof on the southeast (Figure 1).

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

The Eastern Section includes all drainages from the Kvichak River to the area's southern boundary at Cape Menshikof (Figure 1). Major federal jurisdictions in the Eastern Section include the Lake Clark National Park and Preserve, Katmai National Park and Preserve, and the Becharof National Wildlife Refuge. The Central Section is composed of the drainages entering Nushagak Bay, and is dominated by the Nushagak and Wood River systems. The Wood-Tikchik State Park falls within the Central Section boundaries. The Western Section includes all drainages from Cape Constantine on the Nushagak Peninsula west to Cape Newenham and contains portions of the Togiak National Wildlife Refuge. The Togiak River is the major drainage within the section.

Major communities located within the area include Iliamna, Dillingham, King Salmon, Naknek, Togiak, Egegik, and Pilot Point. The management area is not linked to the state's highway system, although local roads provide sport fishermen with limited access near the major communities. Float-equipped aircraft, and to a lesser extent boats, are commonly used to access the area's many remote fisheries.

Although the Alaska Department of Fish and Game (ADF&G) has management jurisdiction for fisheries in the BBMA, the U.S. Fish and Wildlife Service, National Park Service, and U.S. Geological Survey manage federal public lands and conduct research in the area.

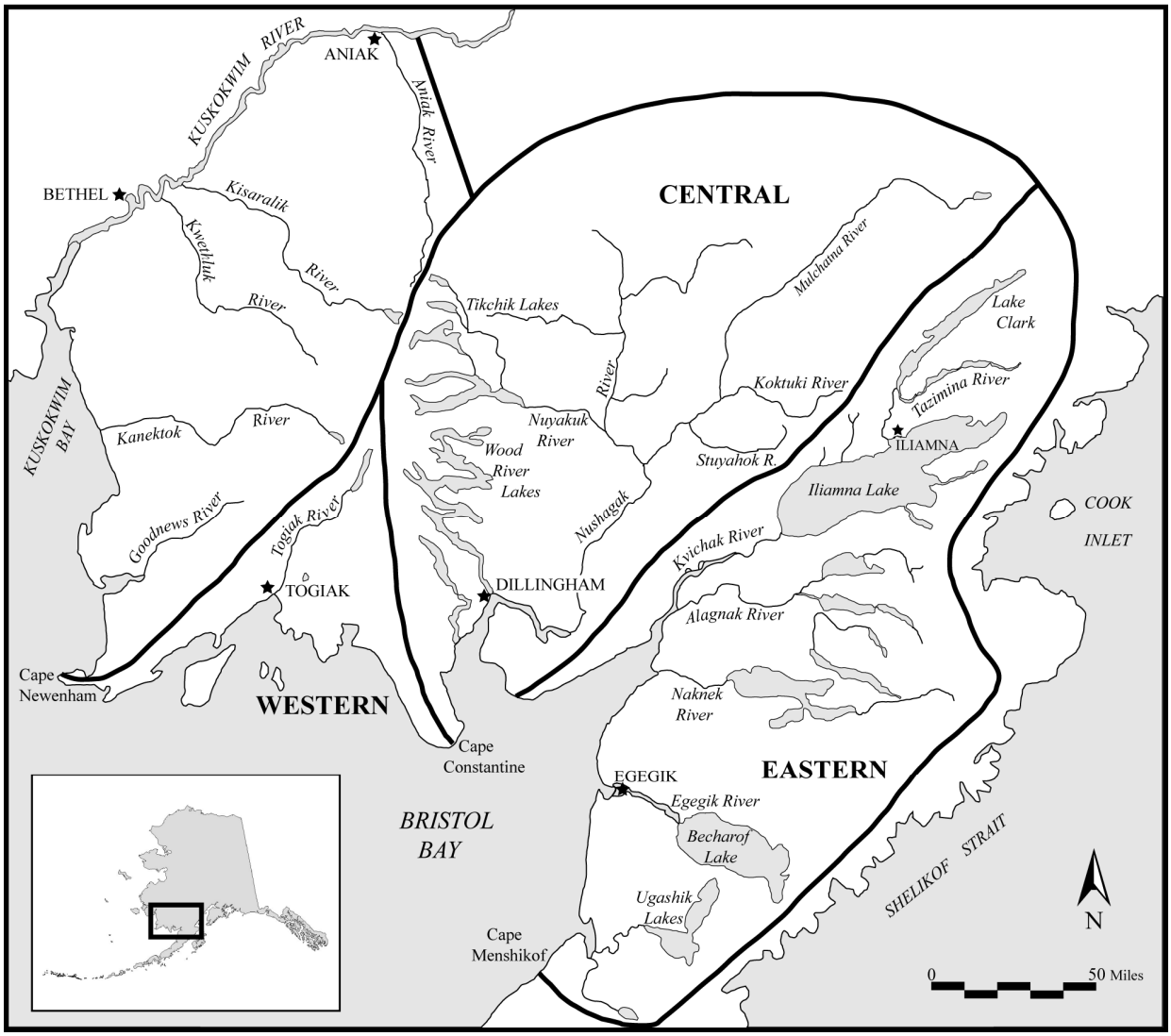

Figure 1.–Bristol Bay Sport Fish Management Area, showing the Eastern, Central, and Western sections.

INFORMATION SOURCES FOR MANAGEMENT

ADF&G utilizes several sources of information to manage fisheries in the BBMA. One of the primary means for monitoring sport fishing effort, catch, and harvest is the Statewide Harvest Survey (SWHS), a mail survey (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*). This survey, begun in 1977, estimates the number of angler-days of sport fishing effort expended by anglers in Alaskan waters (residents as well as non-residents), and harvest by species. The survey provides estimates of effort and harvest on a site-by-site basis but is not designed to provide estimates of effort directed toward a single species. Beginning in 1990, the survey was modified to include estimates of catch (release plus harvest) on a site-by-site basis. The BBMA

includes portions of three areas defined in the SWHS: a portion of the Naknek River Drainage-Alaska Peninsula Area (Area R) excluding the saltwater fisheries and freshwater fisheries of Cold Bay and the Aleutian Islands, the Kvichak area (Area S), and the Nushagak area (Area T).

In addition to the SWHS, since 2005, ADF&G-Division of Sport Fish has operated the freshwater logbook program which requires sport fishing guide businesses to record sport fishing effort, catch, and harvest by freshwater commercially guided clients (Sigurdsson and Powers 2009).

Creel surveys have been selectively used to ground-truth the SWHS and freshwater logbook program for fisheries of interest or for fisheries that require more detailed information or inseason management. These include the Alagnak River (Brookover 1989; Dunaway 1990, 1994; Naughton and Gryska 2000; Collins and Dye 2003), the Kvichak River in 1995 (Dunaway and Fleischman 1996), and Lower Talarik Creek (Russell 1977; Minard 1990; Minard et al. 1992; and unpublished data[1]).

The Division of Sport Fish also conducts stock assessment projects. For example, on the Nushagak and Mulchatna rivers significant monitoring and stock assessment projects have been conducted intermittently since 1986 (Minard 1987; Minard and Brookover 1988; Dunaway et al. 1991; Dunaway and Bingham 1992; Dunaway and Fleischman 1995; Minard et al. 1998; Dye 2005; Cappiello and Dye 2006).

Commercial and subsistence harvests of salmon are monitored and reported by the Division of Commercial Fisheries (Jones et al. 2009). For larger fisheries, forecasts of each season's return are provided by the Division of Commercial Fisheries and are reported in a statewide salmon forecast summary (Sands et al. 2008, Jones et al. 2009*, In prep*).

Escapements of some salmon stocks are monitored by either counting towers, sonar, or aerial index surveys. For example, in the Nushagak River, escapement is estimated by a sonar as the salmon migrate upriver (Jones et al. 2009*, In prep*). Aerial index surveys of king salmon in the Nushagak, Togiak, Alagnak and Naknek River drainages are also conducted.

SPORT EFFORT AND HARVEST

The BBMA contains some of the most productive Pacific salmon *Oncorhynchus*, rainbow trout *O. mykiss*, Arctic grayling *Thymallus arcticus*, Arctic char *Salvelinus alpinus*, and Dolly Varden *S. malma* waters in the world. The area has been acclaimed for its sport fisheries since the 1930s.

Sport effort in the BBMA increased from about 25,000 angler-days in 1977 to a peak of more than 116,000 angler-days in 1995. From 2003-2007, effort averaged nearly 98,000 angler-days annually (Table 1, Figure 2). Effort during 2008 was 88,188 angler-days. Sport effort is expected to stabilize or slowly increase during the foreseeable future.

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[1] Memos summarizing the Lower Talarik Creek rainbow trout projects; located at Alaska Department of Fish and Game, Division of Sport Fish, Dillingham. 1997 data from J. Dye, dated October 15, 1997, Dillingham; 1998 data from C. Schwanke, dated December 1, 1998; 1999 data from J. Dye to Bob Clark, dated November 15, 2000; 2000 data from J. Dye and M. Cavin to Bob Clark, dated November 15, 2000; 2001 data from J. Dye to Bob Clark, dated January 2002; 2003 data from C. Collins to James Hasbrouck, dated August 12, 2004; 2004 data from T. Jaecks to James Hasbrouck, dated January 23, 2005.

Table 1.–Sport fishing effort by section and drainage, Bristol Bay Sport Fish Management Area, 1977-2008.

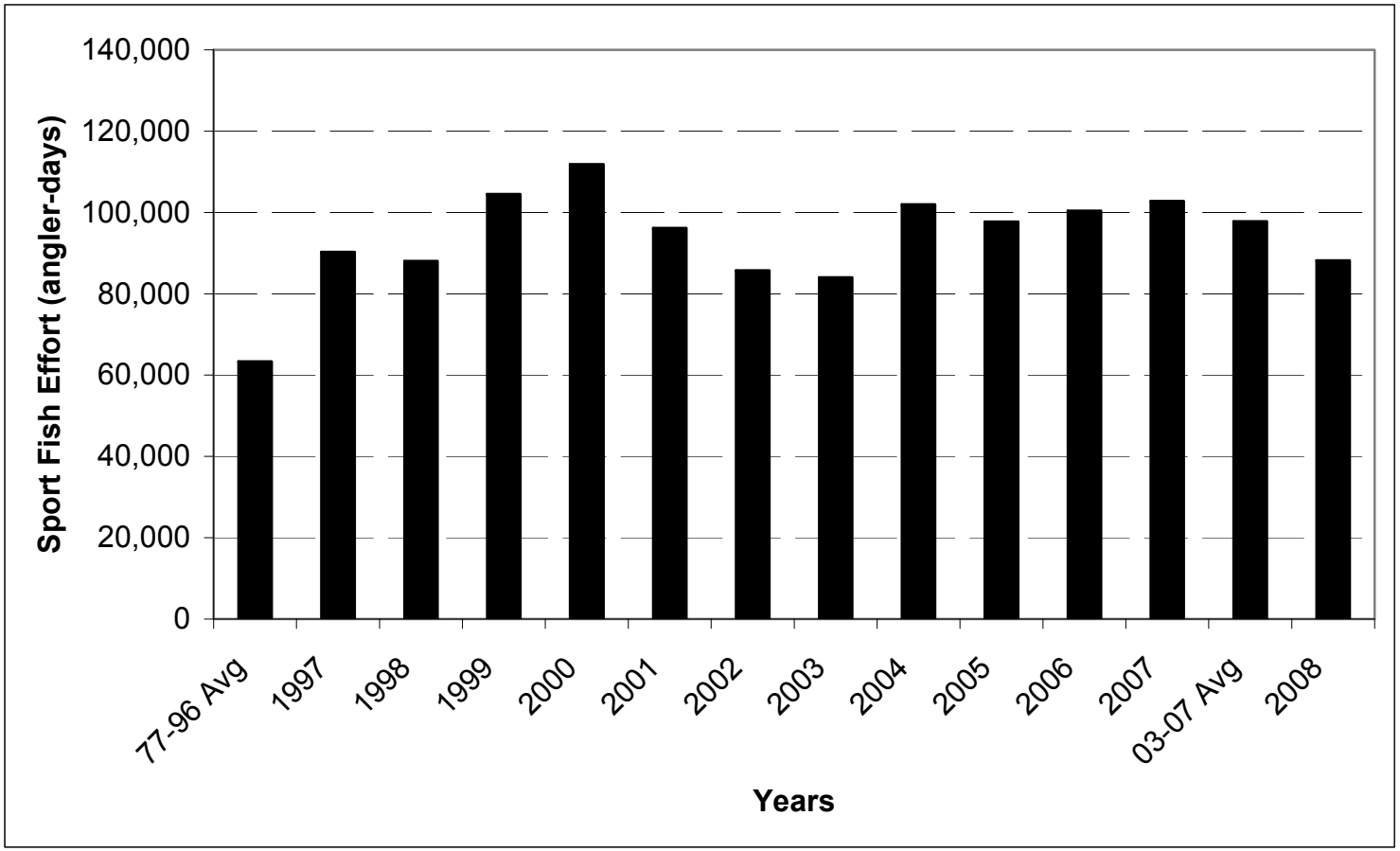
	Sport fishing effort (angler-days)													
Section/drainage	77-96 Avg	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	03-07 Avg	2008
Eastern section:														
Naknek R.	12,911	13,673	13,988	21,189	22,529	12,401	21,020	13,398	16,956	12,699	14,928	17,744	15,145	14,444
Brooks R.	3,195	3,971	2,916	1,418	3,227	3,226	3,381	2,027	3,317	1,945	3,887	3,882	3,012	3,951
Kvichak R.	3,077	3,947	3,339	5,095	7,365	4,763	5,313	5,380	4,219	5,463	7,022	5,557	5,528	5,849
Copper R.	1,621	2,782	2,191	3,359	2,194	2,134	2,485	2,271	1,349	1,082	1,868	2,513	1,817	1,520
Alagnak R.	5,749	11,062	7,715	6,411	7,589	8,576	10,614	9,956	9,028	11,228	11,747	8,881	10,168	8,652
Newhalen R.	4,329	3,773	3,506	5,178	3,063	3,337	1,556	1,959	1,842	1,273	2,169	1,643	1,777	1,470
Lake Clark	2,594	3,132	1,462	2,331	1,429	4,328	1,985	1,472	2,886	1,244	1,103	1,377	1,616	2,008
Other	7,871	17,771	16,872	22,917	20,930	15,137	4,160	7,289	17,216	14,083	14,028	18,944	14,312	15,872
Subtotal [a]	41,346	60,111	51,989	67,898	68,326	53,902	50,514	43,752	56,813	49,017	56,752	60,541	53,375	53,766
Central section:														
Nushagak	6,694	8,866	15,933	15,028	16,150	14,040	13,396	16,834	18,869	17,841	15,302	16,970	17,163	14,936
Mulchatna	3,202	2,356	3,145	2,642	2,306	3,761	2,807	3,706	2,218	3,071	3,930	3,084	3,202	1,524
Agulowak		1,389	1,434	2,028	2,469	2,311	2,712	2,012	2,712	4,094	2,804	3,966	3,118	2,040
Agulukpak		1,384	923	1,102	1,402	1,437	1,225	688	1,473	1,406	1,086	1,249	1,180	1,239
Wood River L.[b]	5,403	4,918	3,653	5,678	8,885	6,685	6,988	8,866	8,884	10,547	6,596	7,300	8,439	6,484
Tikchik/Nuyakuk	2,106	2,380	1,722	1,899	1,826	2,619	2,433	2,433	2,899	2,001	1,009	2,145	2,097	2,070
Other	2,534	5,908	3,886	4,043	5,637	6,297	1,193	1,215	3,693	3,519	8,129	2,371	3,785	1,185
Subtotal [a]	19,939	27,201	30,696	32,420	38,675	37,150	30,754	35,754	38,774	42,479	38,856	37,085	38,984	29,478
Western section:														
Togiak	1,612	2,943	5,206	4,059	4,700	4,931	4,340	4,380	6,249	6,235	4,772	5,181	5,363	4,695
Other	437	59	162	153	137	187	108	108	160	37	70	37	82	249
Subtotal [a]	2,049	3,002	5,368	4,212	4,837	5,118	4,448	4,488	6,409	6,272	4,842	5,218	5,446	4,944
Total	63,334	90,314	88,053	104,530	111,838	96,170	85,716	83,994	101,996	97,768	100,450	102,844	97,805	88,188

Source: Estimates from Alaska Statewide Harvest Survey (SWHS) reports (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*) and the SWHS database (*unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage). 1996-1998 estimates were revised in 2001, so they may not match previously published estimates.

Note: "angler-day" = the time spent fishing by one person for any part of a day

[a] Subtotals of averages may not be the sum of the drainages because information for some drainages is not available for some years.

[b] Wood River Lakes includes Lake Nunavaugaluk. Prior to 1998, Agulowak and Agulukpak rivers were included in Wood River Lakes.



Source: Alaska Statewide Harvest Survey (SWHS) reports (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*) and the SWHS database (*unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage).

Figure 2.–Sport fishing effort in angler-days for the Bristol Bay Sport Fish Management Area, 1977-2008.

Historically, more than 60% of the effort occurred in the waters of the Eastern Section of the BBMA (Table 1). The Eastern Section accounted for 54% of the total effort from 2003 through 2007. The Central Section typically accounts for the second largest proportion of effort, followed by the Western Section. Distribution of effort among sections during 2008 was similar to other recent seasons (Figure 3).

Sockeye *O. nerka*, Chinook (king) *O. tshawytscha* and coho *O. kisutch* salmon are the most popular species harvested in the BBMA, with fewer Dolly Varden/Arctic char, Arctic grayling, and rainbow trout being taken annually (Table 2). The apparent decline in harvests of non-salmon species is likely due in part to the increasingly accepted catch-and-release ethic among sport anglers as well as bag limit reductions for Dolly Varden/Arctic char, northern pike *Esox lucius*, and Arctic grayling adopted by the BOF in 1997, 2001, and 2006.

MANAGEMENT PLANS AND POLICIES

The following section is a list of the various management plans adopted or implemented by the BOF that guide the department's management of Bristol Bay sport fisheries. For those plans specifically adopted as a regulation, the Alaska Administrative Code (AAC) is provided. Additional information is provided later in the pertinent fishery sections. There are other management plans that address commercial salmon fisheries that do not directly address sport fisheries management, but may affect sport fisheries to some extent. These plans are more fully discussed under the specific sport fishery where such plans may be a factor.

Nushagak-Mulchatna King Salmon Management Plan

Management of the subsistence, commercial, and sport fisheries for Nushagak king salmon stocks is governed by the *Nushagak-Mulchatna King Salmon Management Plan* (5 AAC 06.361). The plan was first adopted by the BOF in January 1992 and most recently modified during the December 2003 meeting.

Kvichak River Drainage Sockeye Salmon Management Plan

To ensure biological spawning escapement requirements of sockeye salmon into the Kvichak River drainage, the BOF adopted the *Kvichak River Drainage Sockeye Salmon Management Plan* (5 AAC 67.025) during the January 2001 meeting. The impetus for this plan was the poor sockeye salmon runs of 1999 and 2000. This is an inriver plan that addresses sport and subsistence fisheries only.

Southwest Alaska Rainbow Trout Management Plan

In February 1990, the BOF overhauled nearly all regulations for rainbow trout fisheries in the two management areas now known as the Bristol Bay Management Area and Kuskokwim-Goodnews Sport Fish Management Area. The new regulations essentially implemented the Southwest Alaska Rainbow Trout Management Plan without adopting the plan's language into regulation. However, the BOF recognized the plan as a guiding policy to achieve and maintain a more orderly and comprehensive mix of rainbow trout angling opportunities throughout the two areas. The overriding philosophy of the Southwest Alaska Rainbow Trout Management Plan is one of conservative wild stock management (ADF&G 1990). In 1998 the BOF adopted *Criteria for Establishing Special Management Areas for Trout* (5 AAC 75.013; subsequently amended as 5 AAC 75.210). This regulation embodies most of the criteria that originated and are still used in the Southwest Alaska Rainbow Trout Management Plan.

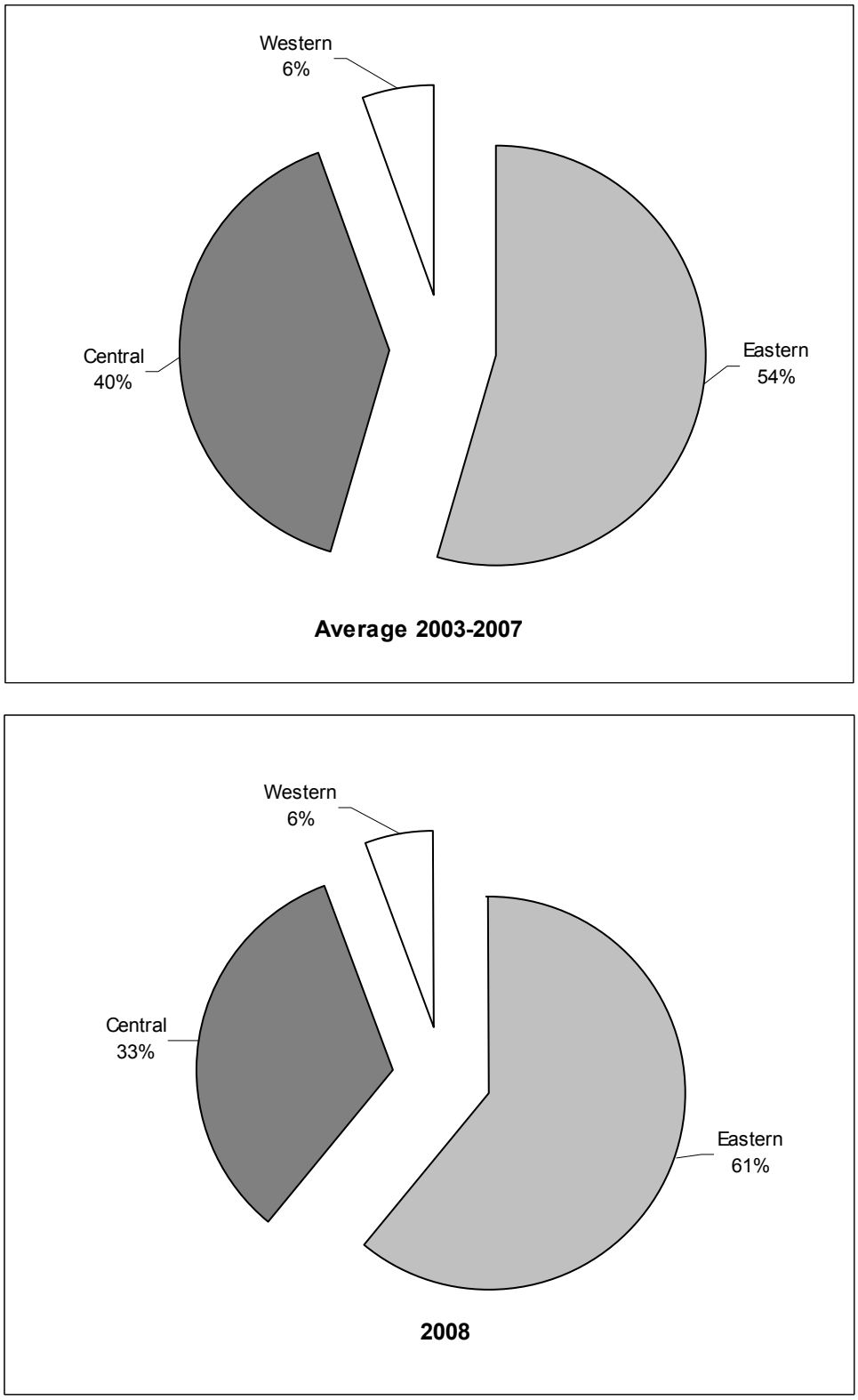


Figure 3.–Percentage of sport fishing effort expended in the Eastern, Central, and Western sections of Bristol Bay, 2003-2007 average and 2008.

Table 2.–Sport harvest by species, Bristol Bay Sport Fish Management Area, 1977-2008.

	Sport harvest (number of fish)													
Species	77-96 Avg.	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	03-07 Avg.	2008
Sockeye salmon	11,657	16,690	24,477	19,048	18,975	11,887	8,153	10,375	12,048	11,771	17,303	14,210	13,141	18,515
King salmon	9,910	14,196	16,029	9,031	9,903	10,427	6,826	10,077	13,102	13,076	12,838	13,821	12,583	18,489
Coho salmon	7,659	14,151	10,606	10,534	11,946	11,590	12,445	14,098	17,977	12,447	14,191	13,129	14,368	20,152
Dolly Varden / Arctic char	6,087	10,069	5,075	3,893	4,373	3,868	3,016	3,548	6,268	2,177	2,104	3,076	3,435	1,930
Rainbow trout	4,804	4,385	2,484	2,792	1,977	1,383	1,384	1,455	1,932	1,902	1,108	2,411	1,762	1,255
Arctic grayling	4,819	6,879	4,686	3,085	2,352	2,815	2,173	1,955	3,010	839	959	1,793	1,711	1,836
Pink salmon	1,278	351	1,367	248	804	633	2,046	469	3,138	550	625	437	1,044	1,579
Lake trout	1,400	1,709	662	1,232	677	691	708	1,094	1,289	1,309	435	738	973	920
Chum salmon	1,593	1,973	3,039	3,380	3,273	2,047	1,544	1,828	1,848	2,703	1,509	501	1,678	1,458
Northern pike	1,445	1,136	1,815	1,391	1,009	1,315	1,067	1,456	1,751	1,626	1,293	1,051	1,435	812
Total	50,651	71,539	70,240	54,634	55,289	46,656	39,362	46,355	62,363	48,400	52,365	51,167	52,130	66,946

Source: Estimates from Alaska Statewide Harvest Survey (SWHS) reports (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*) and the SWHS database (*unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage). 1996-1998 estimates were revised in 2001, so they may not match previously published estimates.

Note: "harvest" = fish kept (number of fish)

Sustainable Salmon Fisheries Policy for Alaska

In March 2000, the BOF adopted the *Policy for the Management of Sustainable Salmon Fisheries* (5 AAC 39.222), that became an integral part of the BOF's yearly review of the state's salmon fisheries. The policy contains five fundamental principles for sustainable salmon management, each with criteria that are to be used by the department and the BOF to evaluate the health of the state's salmon fisheries and address any conservation issues and problems as they arise. The five fundamental principles of the policy are:

- Wild salmon populations and their habitats must be protected to maintain resource productivity;
- Fisheries shall be managed to allow escapements within ranges necessary to conserve and sustain potential salmon production and maintain normal ecosystem functioning;
- Effective salmon management systems should be established and applied to regulate human activities that affect salmon;
- Public support and involvement for sustained use and protection of salmon resources must be maintained;
- In the face of uncertainty, salmon stocks, fisheries, artificial propagation and essential habitats must be managed conservatively.

The policy requires that the department describe the extent to which salmon fisheries and their habitats conform to explicit principles and criteria. In response to these reports the BOF must review fishery management plans or create new ones. If a salmon stock concern is identified in the course of this review, the management plan will contain measures to address the concern, including needed research, habitat improvements, or new regulations.

Statewide Policy and Plan for Management of Sustainable Wild Rainbow Trout Fisheries

The BOF adopted the *Policy for the Management of Sustainable Wild Trout Fisheries* (5 AAC 75.222), and *Statewide Management Standards for Wild Trout* (5 AAC 75.220) in March 2003. The policy provides principles and criteria to ensure conservation, sustainability, and optimal sustained yield and benefits for wild trout, and provides direction to the BOF and the department as to how those principles and criteria are to be applied in the regulatory process. The plan ensures conservative management of wild trout fisheries while recognizing existing plans and policies that guide management of wild trout on a regional basis.

In most areas of the state, conservative management for wild rainbow trout, cutthroat trout, and steelhead trout, in combination, means a bag and possession limit of two fish, of which only one may be 20 inches or greater in length, with an annual limit of two fish 20 inches or greater in length. The plan recognizes existing plans and policies that guide management of wild trout on a regional basis, and allows the Board to adopt regulations that deviate from the plan as necessary to address sustainability or optimal sustained yield issues, establish special management areas, or liberalize harvest opportunities in specific water bodies under other criteria.

EMERGENCY ORDERS ISSUED IN 2007-2009

There were no emergency orders issued in 2009. One emergency order was issued in 2007 and two were issued in 2008.

Emergency Order No.: 2-KS-5-25-07
Issued July 5, 2007

Effective Date 12:01 a.m., Saturday, July 7, 2007

Expiration Date 11:59 p.m., Monday, December 31, 2007

Unless superseded by subsequent Emergency Order

This emergency order reduced the daily bag and possession limit for king salmon 20 inches or greater in length from two, only one of which may exceed 28 inches in length, to one 20 inches or greater in length in all waters of the Nushagak-Mulchatna River drainages.

Emergency Order No.: 2-RS-5-20-08
Issued July 15, 2008

Effective Date 12:01 AM Wednesday July 16, 2008

Expiration Date 11:59 PM Wednesday, December 31, 2008

Unless superseded by subsequent Emergency Order

This emergency order increased the bag and possession limit for sockeye salmon from 5 to 10 in all waters of the Naknek River drainage open to the harvest of salmon. The limit for other salmon, except king and sockeye salmon, remained at 5 per day, 5 in possession. These limits were in combination with the more liberal limits for sockeye salmon.

Emergency Order No.: 2-RS-5-21-08
Issued July 15, 2008

Effective Date 12:01 AM Wednesday July 16, 2008

Expiration Date 11:59 PM Wednesday, December 31, 2008

Unless superseded by subsequent Emergency Order

This emergency order increased the bag and possession limit for sockeye salmon from 5 to 10 in all waters of the Alagnak River drainage. The limit for other salmon, except king and sockeye salmon, remained at 5 per day, 5 in possession, of which, only 3 fish may be coho salmon. These limits were in combination with the more liberal limits for sockeye salmon.

KING SALMON FISHERIES

AREAWIDE FISHERY DESCRIPTION

Bristol Bay is home to several world-class king salmon sport fisheries. The peak of the sport king salmon fishery occurs from mid-June to mid-July in the lower reaches of the Alagnak, Nushagak, Naknek, and Togiak rivers, as well as several smaller rivers (Figure 4). King salmon stocks throughout the management area significantly increased in abundance from the late 1970s through the early 1980s. From about 1984 through present, king salmon abundance in Bristol Bay returned to levels similar to those prior to the late 1970s.

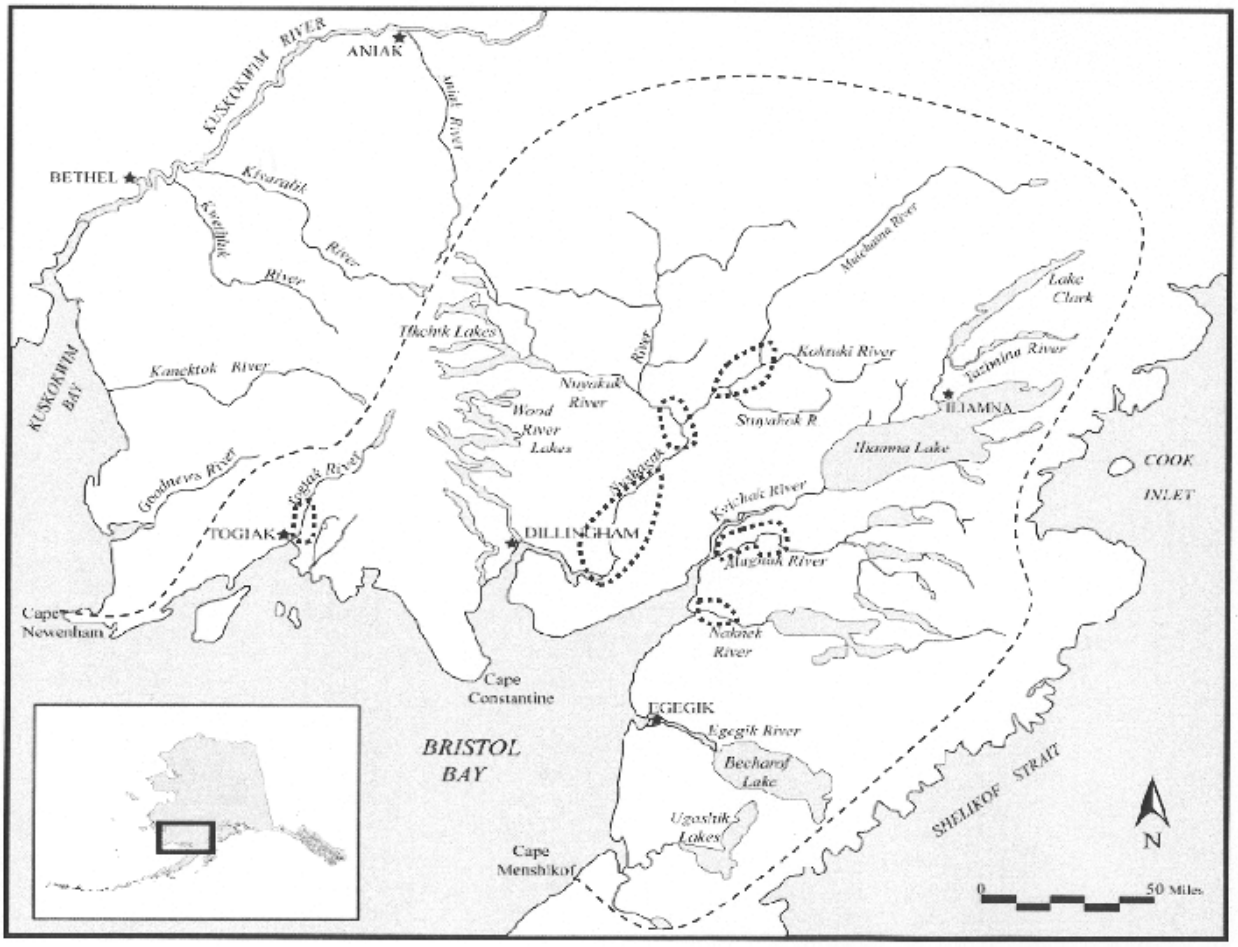


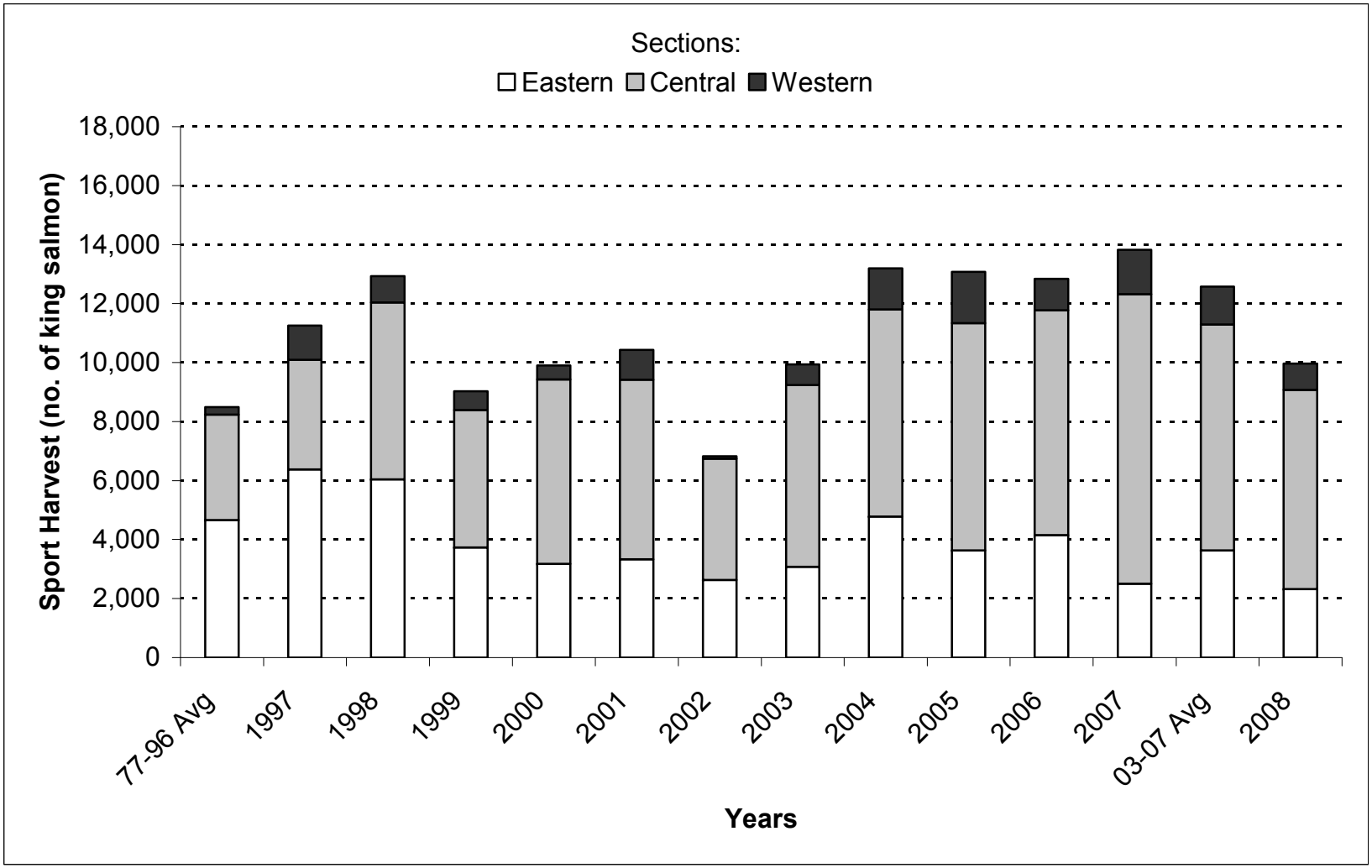
Figure 4.–Popular king salmon sport fisheries in the Bristol Bay Sport Fish Management Area.

The king salmon sport fisheries of the area, like the sport fisheries for most species, are fished primarily by guided anglers. With few exceptions, the guided to unguided angler ratio is about 3 to 1. Anglers usually keep less than 50% of the fish they catch, especially since the adoption of areawide annual bag limits (see management section below).

Sport fishing harvests of king salmon have loosely followed the trends in abundance, reaching peaks of 17,404 fish in 1987 and 17,544 fish in 1994. King salmon typically account for approximately 20-30% of the sport salmon harvest in Bristol Bay. The 2003 through 2007 sport harvest estimate averaged slightly more than 12,000 king salmon (Figure 5). The 2008 sport harvest for the entire Bristol Bay area was 9,969 king salmon (Table 3) and the 2008 commercial harvest was 24,616 king salmon (Jones et al. 2009).

AREAWIDE FISHERY MANAGEMENT AND OBJECTIVES

Since 1960, bag limits for king salmon in Bristol Bay, and across Alaska, have become increasingly conservative and complex. The most conservative and sweeping regulatory changes to the area's king salmon fisheries were adopted during the November and December 1997 BOF meetings. A Bristol Bay-wide annual limit of five king salmon was adopted, and in the Nushagak River drainage, anglers were further restricted to an annual limit of four king salmon.



Source: Alaska Statewide Harvest Survey (SWHS) reports (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*) and the SWHS database (*unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage).

Figure 5.–Sport harvest of king salmon, by section, from the Bristol Bay Sport Fish Management Area, 1977-2008.

Table 3.–Sport harvest of king salmon, by section and drainage, Bristol Bay Sport Fish Management Area, 1977-2008.

	Sport harvest (number of king salmon)													
Section/drainage	77-96 Avg.	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	03-07 Avg.	2008
Eastern section:														
Naknek R.	3,485	4,231	3,443	2,697	2,105	2,656	2,170	2,412	3,004	2,140	2,558	1,431	2,309	1,285
Brooks R.	9	12	0	0	0	0	0	0	0	0	0	0	0	0
Kvichak R.	143	47	239	0	167	61	18	183	27	217	80	68	115	344
Copper R.	18	0	17	22	20	0	0	0	27	0	0	0	5	26
Alagnak R.	709	982	1,531	592	501	508	305	334	1,146	1,008	1,052	1,007	909	394
Newhalen R.	4	0	0	0	0	0	0	0	13	0	0	0	3	78
Lake Clark	0	0	0	0	0	0	0	0	0	0	0	0	0	42
Other	288	1,110	813	423	379	109	140	144	557	267	460	0	286	156
Subtotal [a]	4,656	6,382	6,043	3,734	3,172	3,334	2,633	3,073	4,774	3,632	4,150	2,506	3,627	2,325
Central section:														
Nushagak	2,399	3,343	5,350	3,894	5,785	5,623	3,693	5,590	6,773	7,399	7,429	9,212	7,281	6,505
Mulchatna	870	154	265	262	200	221	191	317	40	134	44	287	164	91
Agulowak		0	0	30	0	0	0	0	0	0	0	0	0	0
Agulukpak		0	30	25	0	0	0	0	0	0	0	0	0	0
Wood River L.[b]	90	23	57	58	0	208	104	186	87	15	94	111	99	26
Tikchik/Nuyakuk	35	0	170	12	0	25	58	48	93	61	0	170	74	104
Other	185	186	120	372	268	12	68	21	40	101	57	34	51	26
Subtotal [a]	3,578	3,706	5,992	4,653	6,253	6,089	4,114	6,162	7,033	7,710	7,624	9,814	7,669	6,752
Western section:														
Togiak drainage	251	1,165	763	644	478	1,004	76	706	1,388	1,734	1,064	1,501	1,279	892
Other	6	0	130	0	0	0	0	0	0	0	0	0	0	0
Subtotal [a]	256	1,165	893	644	478	1,004	76	706	1,388	1,734	1,064	1,501	1,279	892
Total	8,490	11,253	12,928	9,031	9,903	10,427	6,823	9,941	13,195	13,076	12,838	13,821	12,574	9,969

Source: Estimates from Alaska Statewide Harvest Survey (SWHS) reports (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*) and the SWHS database (*unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage). 1996-1998 estimates were revised in 2001, so they may not match previously published estimates.

[a] Subtotals of averages may not be the sum of the drainages because information for some drainages is not available for some years.

[b] Wood River Lakes includes Lake Nunavaugaluk. Until 1997, Agulowak and Agulukpak rivers were included in Wood River Lakes.

The daily bag limits in several other major fisheries were reduced slightly. Season closures of July 25 or 31 were adopted for all Bristol Bay waters to protect spawning king salmon.

In 2001, a statewide regulation (5 AAC 67.010 (b)) created a daily bag and possession limit for king salmon under 20 inches of 10 per day in all fresh waters open to king salmon sport fishing, except for the Nushagak River drainage. The limit is in addition to the daily limits for king salmon 20 inches or longer. Kings under 20 inches do not count toward the annual limit of four and are in addition to the daily bag limit for king salmon 20 inches or longer. The sole exception is the Nushagak River which has a daily bag and possession limit of five king salmon under 20 inches per day.

In the drainages of the Alagnak, Egegik, Kvichak, Igushik, Naknek, Snake, and Ugashik rivers, the daily bag and possession limits for king salmon are uniform at three per day, one of which may exceed 28 inches in length (5 AAC 67.020. (1)). Additionally, recent changes were made to regulations included in the Nushagak-Mulchatna King Salmon Management Plan.

Anglers are prohibited from removing a king salmon from the water before releasing the fish in all fresh waters of Bristol Bay. Any king salmon removed from the water must be kept and becomes part of an angler's daily bag limit. The goal of this regulation is to improve the potential survival of released king salmon and to encourage anglers to be more careful with the fish they release.

The following is a chronology of the bag limit regulatory changes affecting king salmon sport fisheries in all drainages of Bristol Bay.

Effective Year	Regulation
1965	10 salmon (all species combined) per day, no size limit
1972	5 king per day, only 2 may be over 26 inches
1976	5 king per day, only 2 may be over 28 inches
1988	3 king per day, only 2 may be over 28 inches
1998	Daily bag and possession limits on several waters reduced to 3 per day, only 2 over 28 inches. Annual limit of 5 king salmon. Spawning closures for all waters.
2001	Daily bag and possession limits on most Eastern and most Central section waters (except Nushagak and Wood River drainages) reduced to 3 per day, only 1 over 28 inches. All waters except Nushagak drainage allow harvest of 10/day under 20 inches. All fish released must remain in the water from Cape Menshikof to Cape Constantine.
2003	All fish released must remain in the water from Cape Menshikof to Cape Pierce. Harvest of 5/day under 20 inches allowed in the Nushagak drainage.

NUSHAGAK AND MULCHATNA RIVERS

Fishery Description

The Nushagak drainage supports the largest sport, commercial, and subsistence fisheries for king salmon in the BBMA (Tables 3 and 4).

Sport fishing effort is concentrated in three areas (Figure 4): the lower Nushagak River near the village of Portage Creek, the middle section of the Nushagak River in the vicinity of the village of Ekwok, and the mid-section of the Mulchatna River between the Stuyahok and Koktuli rivers.

Table 4.–Comparison of total run, commercial, subsistence, and sport harvests, inriver sonar estimate, and escapement for king salmon, Nushagak River drainage, 1989-2009.

		Harvests below sonar					Harvests above sonar		Spawning escapement	
Year	Total run [a]	Commercial [b]	Commercial subsistence removals [c]	Subsistence [d]	Sport [e]	Inriver sonar estimate	Subsistence [f]	Sport [g]	Sonar estimate [h]	Aerial survey estimate [i]
1989	102,872	17,637	632	4,898	1,404	78,302	2,217	2,210	73,875	
1990	86,990	14,812	1,197	6,228	797	63,955	3,325	2,689	57,941	
1991	134,740	19,718	1,971	6,907	1,793	104,351	3,127	3,758	97,466	
1992	140,850	47,563	907	7,688	1,844	82,848	2,499	2,911	77,438	
1993	175,614	62,976	1,867	10,552	2,408	97,812	2,919	3,492	91,401	
1994	229,583	119,480	1,126	8,587	4,436	95,954	3,775	6,191	85,989	
1995	177,801	79,942	1,327	8,672	2,238	85,622	2,420	2,713	80,489	
1996	136,812	72,011	730	9,598	2,346	52,127	3,055	3,045	46,027	
1997	156,096	64,294	544	8,328	931	40,705	3,192	2,567		82,000 [1]
1998	234,107	108,486	805	5,682	1,640	117,495	4,440	4,188	108,868	
1999	79,973	10,893	927	4,888	934	62,331	2,477	3,304	56,551	
2000	75,172	12,055	1,052	4,302	1,389	56,374	2,132	4,628	49,615	
2001	119,527	11,568	1,078	6,126	1,600	99,155	3,372	4,299	91,484	
2002	133,574	39,473	717	5,050	1,193	87,141	4,104	2,500	80,537	
2003	133,653	42,615	672	8,135	2,203	80,028	4,448	3,752	71,828	
2004	219,547	93,414	440	6,726	2,567	116,400	4,378	4,339	107,683	
2005	241,495	61,854	532	4,339	2,863	171,907	4,471	5,702	161,734	
2006	218,413	83,679	956	6,131	3,166	124,683	3,012	4,307	117,364	
2007	121,959	51,350	416	9,564	3,581	60,464	3,411	6,088	50,965	
2008	n/a	18,634	n/a	n/a	3,305	96,641	n/a	3,395	97,330	
1989-2008 Average	153,620	51,623	942	6,969	2,132	88,715	3,304	3,804 #	84,452	
2004-2008 Average	200,354	61,786	586	6,690	3,096	114,019	3,818	4,766 #	107,015	
2009	n/a	24,058	n/a	n/a	n/a	81,480	n/a	n/a	n/a	

-continued-

Note: units = number of king salmon.

[a] Run refers to an aggregation of salmon of all ages returning from ocean feeding grounds to spawn in any given year.

[b] Total Nushagak District commercial harvest. Sources:1967-1970 (Bucher et al. 1987, Appendix Table 39); 1971-1985 (Brookover et al. 1991, Appendix Table 31); 1986-1987 (Salomone et al. 2007, Appendix Table A19); 1988-2008 (Jones et al. 2009, Appendix Table A19).

[c] Nushagak Bay Commercial Harvest from Subsistence Division Subsistence Database. Source: ADF&G Subsistence Division, Subsistence Database from James Fall, Subsistence Division, Region II, Anchorage, Oct. 9, 2006.

[d] Includes Nushagak Bay and Igushik. Source: ADF&G Subsistence Division, Subsistence Database from Charles Utermohle, Program Coordinator, Subsistence Division, Region II, Anchorage, Nov. 20, 2000. Data for 2000-2008 provided by James Fall, Subsistence Division, Region II, Anchorage.

[e] 1977-1996 is 50% of Nushagak River system sport harvest. 1997-2009 is Nushagak River Black Point to sonar. Source: SWHS reports (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*) and (unpublished 2008-2009 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage).

[f] Includes Ekwok area, Iowithla River, Klutuk River, Koliganek area, New Stuyahok area, Portage Creek area, Kokwok area, Mulchatna River, and Nushagak watershed site unknown. Source: ADF&G Subsistence Division, Subsistence Database from James Fall, Subsistence Division, Region II, Anchorage.

[g] 1977-1996 is 50% of Nushagak River system sport harvest, plus Mulchatna River system, Tikchik/Nuyakuk, and Koktuli River harvest reported in Mills (1979-1980, 1981a-b, 1982-1994) and Howe et al. (1995, 1996 2001a). 1997-2001 is 50% of Nushagak River Black Point to Iowithla, Nushagak upstream of Iowithla, Mulchatna River system, Tikchik/Nuyakuk and Koktuli River (Howe et al. 2001b-d; Walker et al. 2003; Jennings et al. 2004); 2002 to 2009 is Nushagak River excluding Black Point to sonar (Jennings et al. 2006 a-b, 2007, 2009 a-b, *In prep*) and (unpublished 2008-2009 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage)).

[h] 1986-1996, and 1998-2008 estimates are sonar estimates minus subsistence and sport harvest above sonar.

[i] Source: Glick et al. 2000.

Between 1992-1997, effort in the Ekwok area was highly variable. Since about 1999, the lower river fishery has begun to expand steadily upriver to Ekwok and the two areas are merging into a single fishery. Angling for king salmon in the middle section of the Mulchatna River seems to have diminished since bait was prohibited there in 1992. Although sport fishing for king salmon does occur in some of the tributaries of the drainage, the overall impact of that activity, in terms of harvest, is considered slight.

Uplands along much of the Nushagak River are privately owned. The Land Department of Choggiung Limited, an Alaska Native-owned corporation, administers a recreational land management program. Since its inception in the mid-1980s, this program has grown to include the lands of the adjoining villages of Ekwok, New Stuyahok, and, in some years, Koliganek. This system has matured into a sound and profitable venture for the corporations. Private and commercial land-use permits sold by the program allow anglers access to desirable campsites while engaged in recreational fishing and hunting.

King salmon stocks in the Nushagak-Mulchatna River drainage are considered stable and at or above average levels, including the 2008 and 2009 runs. The 2007 run was below average and did not achieve the inriver goal of 75,000 Total runs of Nushagak-Mulchatna king salmon averaged 200,354 fish from 2004 through 2008, ranging from 122,000 to 241,500 fish (Table 4).

Total harvest by commercial, subsistence, and sport fisheries averaged 80,743 king salmon from 2004 through 2008 (Table 4). The majority (76%) of the harvest was taken by the commercial fishery, 14% was taken by the subsistence fishery, and 10% by sport anglers (Table 4). After a period of growth from 1978 through 1985, the sport harvest has been relatively stable (Table 4). Sport harvest of king salmon averaged 7,863 fish from 2004 through 2008 (Table 4).

King salmon escapement into the Nushagak and Mulchatna rivers was estimated by aerial surveys beginning in 1967 (Table 5). Since 1987 sonar has been used to estimate the inriver run of king salmon to the Nushagak drainage. The sonar is considered a marked improvement over the aerial survey program since it gives a real-time estimate of escapement on which management decisions can be based.

Fishery Management and Objectives

Under the *Nushagak and Mulchatna King Salmon Management Plan* (5 AAC 06.361, adopted 1/92; amended 12/94, 11/97, 1/01, and 12/03) king salmon are managed to attain an inriver return of 75,000 fish which provides 65,000 spawning fish, a reasonable opportunity to harvest king salmon in the inriver subsistence fishery, and a guideline harvest level in the sport fishery of 5,000. If the inriver return exceeds 75,000 king salmon, then the guideline harvest level does not apply. If the inriver return falls below 75,000 king salmon, then restrictive actions are required for the sport fishery. If the inriver return falls below 55,000 king salmon, then additional restrictive actions are required for the sport fishery. If the inriver return falls below 40,000 king salmon, the sport fishery is to be closed and the subsistence fishery may be restricted.

Table 5.–Historical aerial escapement counts of king salmon in selected streams in the Wood and Nushagak-Mulchatna river drainages, 1967 to 2009.

	Aerial escapement count (number of king salmon)									
	Wood River	Nushakgak-Mulchatna River drainage								
Year	Muklung River	Iowithla River	Kokwok River	Klutispak River	King Salmon River	Stuyahok River	Koktuli River	Nushagak River [a]	Mulchatna River [b]	Total
1967	350	200				2,500	3,300			6,000
1968 [c]	750	850		310	1,000	2,470	4,220	970	510	10,330
1969	520	580	90 [c]	90	670	1,220	1,600	910 [c]	680 [d]	5,840
1970	590	700	110 [c]	320	1,060	1,900	1,500	1,180 [c]	880 [d]	7,650
1971	280	390	80 [c]							470
1972	150	170		280	900	610	1,450	690 [c]	510 [d]	4,610
1973				380	1,470	1,220	950			4,020
1974 [c]	1,010	860	60 [c]	440	2,000	2,300	3,920	2,340	2,160	14,080
1975	660	1,040	270	670	2,900	2,530	4,080	2,320 [c]	1,710 [d]	15,520
1976 [c]	840	1,110	560	1,180	3,510	3,750	6,710	1,760	2,580	21,160
1977 [c]	940	840	310	650	1,420	2,700	4,630	820	1,980	13,350
1978 [c]	1,170	1,700	520	1,940	4,450	4,400	6,730	5,850	2,280	27,870
1979 [c]	950	1,350	170	1,040	2,150	3,570	6,260	2,880	1,730	19,150
1980	1,600	2,310 [d]	70	970	4,500	7,200	10,620	5,300 [c]	3,920 [d]	34,890
1981	2,260	2,630	70	1,650	2,950	5,980	9,960	4,960 [c]	3,670 [d]	31,870
1982	790	2,520	90	350	8,390	3,640	6,780	4,380 [c]	3,240 [d]	29,390
1983 [c]	1,830	2,430	350	2,090	5,990	2,910	8,060	6,330	4,260	32,420
1984 [c]	1,300	1,080	110	770	1,780	2,010	2,860	2,800	1,060	12,470
1985	1,250	1,610	60	1,950	4,460	2,690	4,940	3,420 [c]	2,390 [d]	21,520
1986	230	270		170	380	520	290	380 [c]	260 [d]	2,270
1987	160	140		340	570	280	440	390 [c]	270 [d]	2,430
1988	430	550		780	1,380	2,040	2,580	1,800	710	9,840
1989						190 [c]	240 [c]			430
1990 [e]	60	120		340	900	830	3,390	630	800	7,010
1995	210	170	75	630	3,150	660	2,230			6,915
1996 [e]										
1997 [f]	1,240	640		1,190	8,900	1,460	6,220	21,818	1,496	41,724
1998	150 [g]	[g]	150 [g]	2,620	5,510	550 [g]	720	8,390	180 [g]	18,120
1999	95	450	145	1,545	6,825	645	2,075	6,467		18,152
2000 [e]										-
2001 [h]										-
2002 [e]										-
2003 [e]										-
2004 [e]										-
2005				1,450	3,120	1,130	3,200	7,175		16,075
2006 [e]										-
2007				331	1,060	540	1,044	2,160		5,135
2008 [h]										-
2009 [e]										-
Mean	762	988	183	907	3,015	2,153	3,828	3,845	1,694	16,612

[a] Nushagak River from the outlet of the Nuyakuk River to outlet of King Salmon River (to Big Bend in 1997).

[b] Mulchatna River from outlet of Mosquito Creek to outlet of Koktuli River (to outlet of Stuyahok River in 1997)

[c] Minimal estimate - very poor survey conditions.

[d] These numbers are proportional estimates rather than aerial live counts; estimates are based on the mean proportion of fish counted in these areas during year in which aerial coverage was complete.

[e] No surveys conducted in 1991–1994, 1996, 2000, 2002–2004, 2006, and 2009.

[f] Survey conditions in 1997 excellent, water very clear and very low.

[g] Surveys conducted 8/11/98, well past peak of spawning; Iowithla River not surveyed. Remaining surveys conducted 7/29/98, before peak of spawning.

[h] Surveys conducted in 2001 and 2008 were far past the peak of spawning and poor indications of abundance; therefore counts from both of these years were omitted from this table.

Since 1972, smaller runs and increasing sport effort have prompted restrictive actions on the inshore commercial and sport fisheries. To remain within the sport fishery guideline harvest level of 5,000 fish, the daily bag and possession limit is two king salmon per day, of which only one may be longer than 28 inches in length (ADF&G 2009). Only four of the five king salmon allowed in an angler's Bristol Bay annual harvest may come from the Nushagak-Mulchatna River drainage. Additionally, in the Nushagak-Mulchatna drainage, there is a daily bag and possession limit of five per day for king salmon under 20 inches. King salmon under 20 inches do not count toward the annual limit of four and are in addition to the daily bag limit for king salmon 20 inches or longer.

A chronology of significant regulation changes follows:

Effective Year	Regulation
1990	Sport season established from January 1 to July 25 upstream of and including the Iowithla River. Spawning season closure adopted to afford drainage-wide protection to spawning king salmon stocks.
1992	Gear restricted to single-hook artificial lures for the portion of the Mulchatna River between the Koktuli and Stuyahok rivers.
1992	*Nushagak and Mulchatna King Salmon Management Plan* (5 AAC 06.361) is adopted, capping the sport harvest at 5,000 fish and establishing an escapement projection of 65,000 as the trigger for inseason restrictions in the sport fishery.
1994	*Nushagak and Mulchatna King Salmon Management Plan* (5 AAC 06.361) is amended, setting the sport allocation as a guideline harvest rather then a cap.
1997	*Nushagak and Mulchatna King Salmon Management Plan* (5 AAC 06.361) was amended, by establishing an escapement projection of 55,000 king salmon below which inseason restrictions in the sport fishery must be imposed. The 55,000 fish "trigger" was adopted when analysis showed this escapement level was not likely to show a difference in the expected productivity versus that expected at the 65,000 fish trigger. In addition, the 65,000 fish "trigger" had become quite disruptive to the sport fishery by precipitating frequent inseason restrictions.
1997	The daily bag and possession limit was reduced to 2 king per day, only 1 over 28 inches. An annual harvest limit of 4 king salmon was adopted for the whole Nushagak-Mulchatna drainage.
1997	Guides were prohibited from retaining any species of fish while guiding (Bristol Bay-wide)
1997	The Kokwok River and the Nushagak River upstream from its confluence with Harris Creek were closed to angling for king salmon.
1997	A July 31 spawning season closure was adopted for the Nushagak River drainage downstream from the Iowithla River outlet.
1997	The commercial fishery was to be managed to allow pulses of king salmon to enter the Nushagak River untouched.
2001	The Alaska Board of Fisheries amended the management plan to allow a catch-and-release fishery when the final inriver abundance is projected to be below 55,000 fish but above 40,000 fish. The amended plan also stipulates that when the king salmon sport fishery is restricted to catch-and-release or is closed for conservation, the use of bait must be prohibited.
2001	A regulation allowing a daily bag limit of 10 king salmon less than 20 inches total length (508 mm TL) statewide, specifically excluded the Nushagak-Mulchatna river drainage until ADF&G could study the potential effects of the regulation on the spawning populations and the escapement goal.
2001	As with most other Bristol Bay drainages, the Nushagak drainage was included in the regulation prohibiting anglers from removing king salmon from the water if the fish were to be released.
2003	A daily bag and possession limit for king salmon under 20 inches of 5 per day is implemented on the Nushagak drainage. King salmon under 20 inches do not count toward the annual limit of 4 and are in addition to the daily bag limit for king salmon 20 inches or longer. The *Nushagak and Mulchatna King Salmon Management Plan* (5 AAC 06.361) was amended so that if inriver projections fall below 75,000, a bag limit of 1 per day, 1 in possession, no size limit, is imposed on the sport fishery. The seasonal limit would not be adjusted.

2009 Season

The preseason forecast for the 2009 Nushagak-Mulchatna king salmon run was 145,000 fish. In mid June, inriver escapement projections indicated that more than 55,000 fish would enter the river in 2009. By June 28, the actual escapement estimates had exceeded 55,000 king salmon. The preliminary total estimate of king salmon passing the sonar was 81,480 fish. Three directed king salmon commercial fishing periods allowing large mesh gillnets occurred in the Nushagak District. Along with king salmon taken incidentally during periods targeting sockeye salmon, approximately 24,000 king salmon were landed during commercial fishery openings. Harvest estimates for the sport and subsistence fisheries are not available, but anecdotal information suggests average harvests occurred in both fisheries. By assuming that the sport harvest in 2009 was near the guideline harvest level of approximately 5,000 fish and that an average subsistence harvest of approximately 12,000 fish occurred, the total 2009 run was probably about 122,000 king salmon. This total was slightly below the preseason forecast and below the 2004-2008 average run.

SOCKEYE SALMON FISHERIES

AREAWIDE FISHERY DESCRIPTION

Sockeye salmon are the most abundant of the Pacific salmon species to spawn in Bristol Bay, the world's largest producer of sockeye salmon. Their prized table quality makes sockeye salmon the most popular species of salmon on the commercial market. Sockeye salmon are often indifferent to most fishing lures making them difficult to catch. However, anglers have discovered innovative ways to legally catch sockeye salmon with customary sport gear, and the species has gained favor as a hard fighting and delectable game fish. The most popular fisheries are in the Naknek and Kvichak River drainages but effort occurs in other waters of the BBMA as well (Figure 6).

AREAWIDE HARVEST

Sport harvests of sockeye salmon in the BBMA were at or below 10,000 fish from 1977 through 1988. After 1988, the harvest of sockeye salmon increased substantially in number and variability, with a peak of nearly 33,000 fish taken in 1989 and a low of approximately 8,000 in 2002. From 2003 through 2007, the sport harvest averaged 13,329 sockeye salmon annually (Table 6). The most active sport fisheries occur in the Eastern Section of the management area where an average of about 10,000 fish, or 77% of the annual harvest, is taken. The Central Section fishery harvests nearly 2,700 sockeye salmon annually and harvests in the Western Section are approximately 400 fish annually (Table 6, Figure 7).

Even at its highest levels, the sport harvest is only 0.08% of the total average annual run of sockeye salmon. From 1998 through 2007, about 71% of the total annual Bristol Bay sockeye run was harvested in the commercial fishery (Sands et al. 2008, Jones et al. 2009*, In prep*). However, sockeye salmon are likely to play an increasingly important role in the development and expansion of the recreational fishery in the Bristol Bay Management Area. Subsistence fishermen harvested approximately 1% of the annual sockeye salmon run from 1998 through 2007.

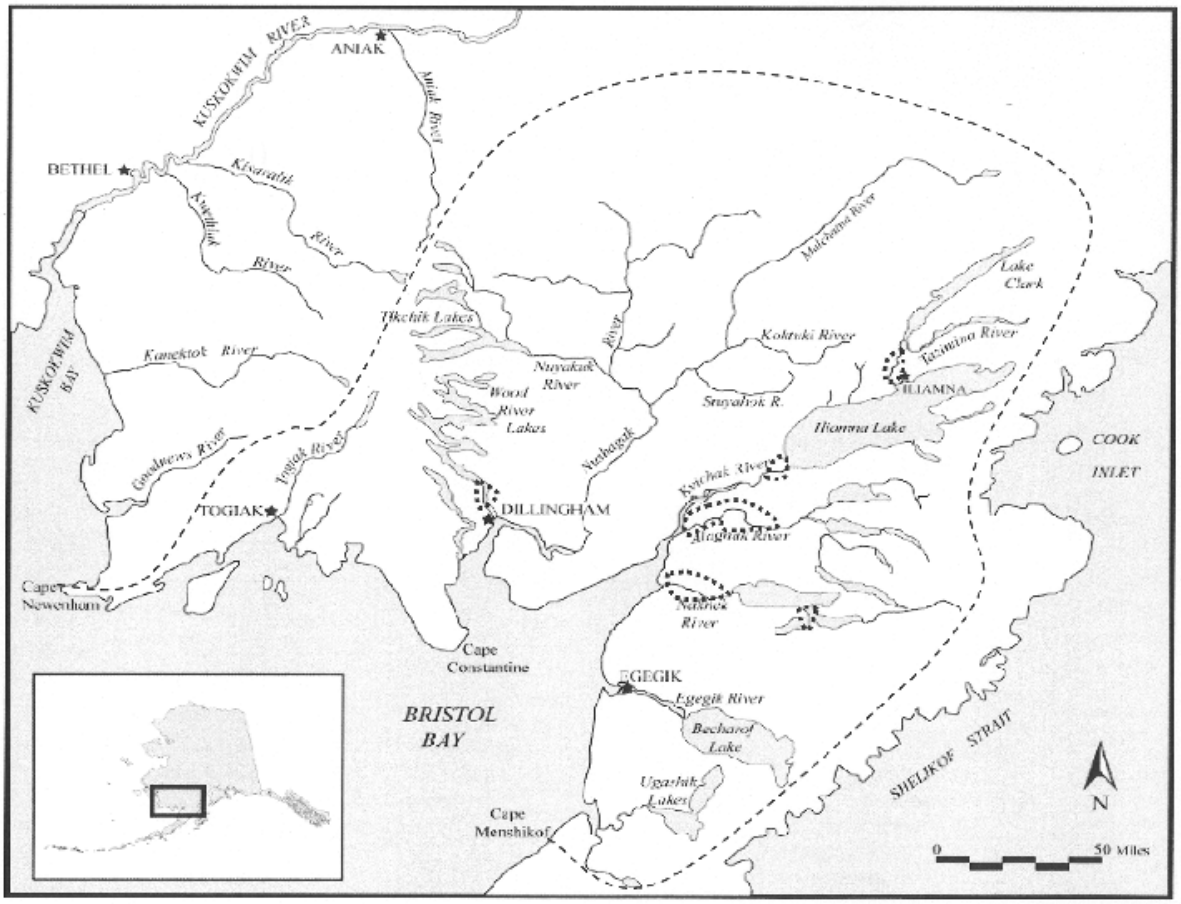


Figure 6.–Popular sockeye salmon sport fisheries in the Bristol Bay Sport Fish Management Area.

AREAWIDE MANAGEMENT

Sockeye salmon share the same bag and possession limits with all salmon except king salmon: five salmon per day, no size limit. This region-wide limit has been in effect since 1972. The department's ability to manage for sustained yield is essentially unaffected by the recreational harvest of sockeye salmon.

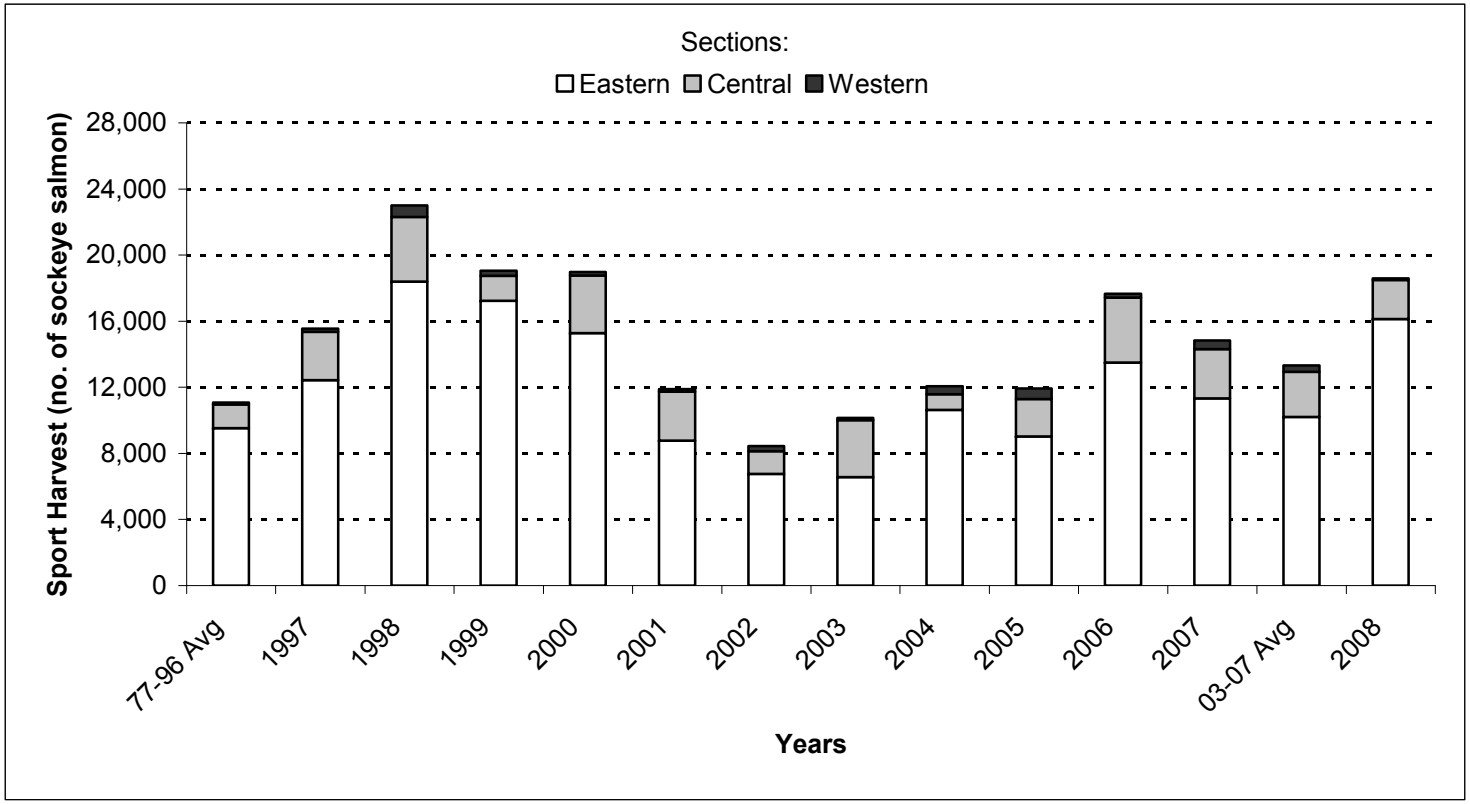
Table 6.–Sport harvest of sockeye salmon by section and drainage, Bristol Bay Sport Fish Management Area, 1977-2008.

	Sport harvest (number of sockeye salmon)													
Section/drainage	77-96 Avg	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	03-07 Avg	2008
Eastern section:														
Naknek R.	551	225	787	1,883	2,617	2,515	2,114	2,304	1,525	1,098	4,670	4,346	2,789	6,008
Brooks R.	441	434	490	85	506	422	653	177	996	133	415	61	356	353
Kvichak R.	1,546	1,404	2,910	3,516	3,554	0	848	864	2,210	2,431	927	873	1,461	2,777
Copper R.	355	293	850	825	668	0	220	274	73	97	158	225	165	195
Alagnak R.	516	2,182	2,519	1,249	1,034	445	606	727	2,121	3,340	3,346	2,101	2,327	2,849
Newhalen R.	4,211	4,348	6,838	6,356	3,414	1,099	801	1,616	2,741	1,528	2,085	1,886	1,971	1,039
Lake Clark	341	443	159	161	148	376	34	314	147	236	122	0	164	225
Other	1,567	3,106	3,843	3,165	3,331	3,914	1,482	291	813	166	1,778	1,837	977	2,690
Subtotal [a]	9,527	12,435	18,396	17,240	15,272	8,771	6,758	6,567	10,626	9,029	13,501	11,329	10,210	16,136
Central section:														
Nushagak	350	509	1,282	386	891	849	286	1,132	252	721	442	342	578	568
Mulchatna	315	697	258	137	206	167	39	323	67	355	134	580	292	65
Agulowak		253	457	11	276	193	209	326	22	618	689	171	365	250
Agulukpak		106	16	0	209	122	91	36	169	0	412	125	148	65
Wood River L.[b]	490	1,065	1,420	712	1,588	1,434	607	1,367	427	575	2,243	1,769	1,276	1,210
Tikchik/Nuyakuk	102	0	110	0	0	61	0	90	0	0	0	0	18	195
Other	171	285	376	253	314	134	142	173	23	0	0	0	39	0
Subtotal [a]	1,427	2,915	3,919	1,499	3,484	2,960	1,374	3,447	960	2,269	3,920	2,987	2,717	2,353
Western section:														
Togiak drainage	112	191	673	309	197	156	305	140	485	627	237	519	402	104
Other	2	0	14	0	22	0	7	0	0	0	0	0	0	0
Subtotal [a]	114	191	687	309	219	156	312	140	485	627	237	519	402	104
Total	11,068	15,541	23,002	19,048	18,975	11,887	8,444	10,154	12,071	11,925	17,658	14,835	13,329	18,593

Source: Estimates from Alaska Statewide Harvest Survey (SWHS) reports (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*) and the SWHS database (*unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage). 1996-1998 estimates were revised in 2001, so they may not match previously published estimates.

[a] Subtotals of averages may not be the sum of the drainages because information for some drainages is not available for some years.

[b] Wood River Lakes includes Lake Nunavaugaluk. Until 1997, Agulowak and Agulukpak rivers were included in Wood River Lakes.



Source: Alaska Statewide Harvest Survey (SWHS) reports (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*) and the SWHS database (*unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage).

Figure 7.–Sport harvest of sockeye salmon, by section, from the Bristol Bay Sport Fish Management Area, 1977-2008.

KVICHAK RIVER

Fishery Description

The Kvichak River drainage (Figure 6) hosts the single largest sockeye salmon run in the world and the river itself is a popular destination for anglers targeting this species. Two locations within the drainage support the biggest sport fisheries for sockeye salmon in Bristol Bay (Table 6). The first location is the fishery on the Kvichak River at the outlet of Lake Iliamna. The other, often larger, fishery occurs on the Newhalen River near the community of Iliamna. Smaller tributaries within the drainage are fished much less intensively and sport harvests there are relatively minor in comparison to the two large fisheries.

Sockeye salmon first appear in the Kvichak River during the last week of June. The run peaks in the first week of July, then declines steadily until late July or early August. In peak years, the sport fishery may be active for much of the month of July.

A modern airstrip and trail system in the village of Igiugig provides easy access to the river where it drains out of Lake Iliamna and floatplanes can land on the lake or on the river. Although much of the sport effort is from nonresident guided anglers, a growing component is the resident unguided angler arriving from Anchorage in private, chartered, or scheduled aircraft. The Igiugig Native Corporation owns most of the uplands along the upper Kvichak River, and charges anglers modest daily fees for access. Commercial operators are charged more substantial fees for annual leases.

Harvest and Effort

Historically, the Bristol Bay commercial salmon fleet harvests roughly half of the annual Kvichak River sockeye salmon run and, until 1995, the subsistence fishery took an average of nearly 75,000 fish annually, or about 1% of the total run (Table 7). Since 1995, the annual subsistence harvest has declined to less than 60,000. This decline is probably not related to run strength.

Kvichak River drainage sockeye salmon sport harvests ranged between 600 and 7,000 fish per year until 1989 when nearly 24,000 fish were taken (Table 7). After 1989, estimates of the sport harvest ranged from nearly 2,300 sockeye salmon in 2002 to 16,145 in 1993. From 2004 through 2008, the annual sport harvest averaged 1,533 sockeye salmon from the Kvichak River alone (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*; and *unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage); Table 7). Even the highest estimates of sport harvest in 1989 amounted to approximately 0.2% of the total Kvichak River sockeye salmon harvest. From 2004 through 2008, effort was about 5,600 angler-days (effort is for all species, although anglers mainly fish for rainbow trout and sockeye salmon at the Kvichak River; Table 1). At such low levels, the sport fishery has little effect on the department's ability to manage for sustained yield.

In 1995, the department conducted a benchmark survey of the sockeye salmon sport fishery near Igiugig (Dunaway and Fleischman 1996). Harvest was found to be an important aspect of this fishery with nearly 60% of the angler trips harvesting the daily limit of five sockeye salmon. Virtually all anglers fished from the shore; fly tackle was used in 97% of the trips; 66% of the anglers were guided; and 81% were nonresidents (Dunaway and Fleischman 1996). The field survey's estimate of onsite effort was very similar to effort levels estimated by the annual Statewide Harvest Survey (Howe et al. 1996).

Table 7.–Commercial and subsistence harvests and escapements of sockeye salmon for Kvichak River drainage, and sport harvests of sockeye salmon from Kvichak River, 1974-2008.

	Harvest						
			Sport				
Year	Commercial [a]	Subsistence [b]	Kvichak River [c]	All other tributaries [d]	Subtotal	Total	Escapement [e]
1974	148,595	98,100				246,695	4,433,844
1975	1,605,407	115,500				1,720,907	13,140,450
1976	1,458,180	75,900				1,534,080	1,965,282
1977	739,464	72,000	583	1,683	2,266	813,730	1,341,144
1978	3,815,636	83,900	380	2,677	3,057	3,902,593	4,149,288
1979	13,418,829	65,500	283	3,160	3,443	13,487,772	11,218,434
1980	12,743,074	72,600	654	1,052	1,706	12,817,380	22,505,268
1981	5,234,733	75,600	400	2,215	2,615	5,312,948	1,754,358
1982	1,858,475	61,300	639	3,233	3,872	1,923,647	1,134,840
1983	16,534,901	96,500	603	3,768	4,371	16,635,772	3,569,982
1984	12,523,803	100,500	898	3,828	4,726	12,629,029	10,490,670
1985	6,183,103	86,500	1,827	3,620	5,447	6,275,050	7,211,046
1986	787,303	59,900	102	510	612	847,815	1,179,322
1987	3,526,824	72,000	1,805	5,334	7,139	3,605,963	6,065,880
1988	2,654,364	77,100	526	3,622	4,148	2,735,612	4,065,216
1989	11,456,509	71,400	4,769	18,845	23,614	11,551,523	8,317,500
1990	10,468,631	76,600	2,988	7,452	10,440	10,555,671	6,970,020
1991	3,837,923	66,786	1,249	11,467	12,716	3,917,425	4,222,788
1992	5,678,494	72,148	1,964	9,174	11,138	5,761,780	4,725,864
1993	5,239,770	74,123	2,923	13,222	16,145	5,330,038	4,025,166
1994	13,840,448	64,343	4,001	11,453	15,454	13,920,245	8,337,840
1995	17,509,862	54,679	3,811	11,212	15,023	17,579,564	10,038,720
1996	8,187,720	54,872	1,604	4,474	6,078	8,248,670	1,450,578
1997	182,000	59,508	1,404	6,471	7,875	247,965	1,503,732
1998	1,072,760	53,656	2,910	10,209	13,119	1,139,535	2,296,074
1999	6,781,260	57,723	3,516	9,244	12,760	6,851,743	6,196,914
2000	1,034,000	36,990	3,554	4,925	8,479	1,079,469	1,827,780
2001	324,963	32,808	1,364	3,174	4,538	362,309	1,095,348
2002	0	33,001	848	1,340	2,256	35,257	703,884
2003	35,742	38,805	823	2,245	3,068	77,615	1,687,000
2004	1,832,101	53,225	1,238	3,860	5,098	1,890,424	5,500,134
2005	557,186	48,263	1,852	2,440	4,292	609,741	2,320,332
2006	2,736,218	49,850	927	3,471	4,398	2,790,466	3,068,226
2007	1,470,358	44,567	873	4,172	5,045	1,519,970	2,810,208
1974-2007 Average	5,161,136	66,360	1,655	5,598	7,256	5,234,071	5,038,916
Percent	99%	1%			<1%		
2003-2007 Average	1,326,321	46,942	1,143	3,238	4,380	1,377,643	3,077,180
Percent	96%	3%			<1%		
2008	2,879,516		2,777	6,427	9,204	2,888,720	2,760,000

Note: units = number of sockeye salmon.

[a] Estimated Kvichak River fish only - captured in Naknek Kvichak District commercial fishery.

[b] Harvests are extrapolated for all permits issued, based on those returned. Harvest estimates prior to 1991 are rounded the nearest hundred fish. Harvest estimates prior to 1990 are based on the community where the permit was issued; estimates from 1990 to the present are based on community of residence and include fish caught only in the Kvichak District. Sources: 1974-1978 (Brookover et al. 1991, Appendix Table 47); 1979-2000 (Weiland et al. 2001, Appendix Table 32); 2001-2008 (Jones et al. 2009 Appendix Table A27).

[c] Kvichak River sport harvest only. Sources: SWHS reports (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*) and (unpublished 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage).

[d] Estimated sport harvest from other tributaries of the Kvichak River, excluding the Alagnak River. This is the Statewide Harvest Survey area S freshwater total, minus the Alagnak River. Sources: SWHS reports (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*) and (unpublished 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage).

[e] Tower counts conducted at Igiugig. Sources: 1974-1978 (Brookover et al. 1991, Appendix Table 14); 1979-2000 (Glick et al. 2000; Weiland et al. 2001, Appendix Table 13); 2001-2008 (Jones et al. 2009, Appendix Table A11).

Fishery Management and Objectives

Kvichak River sockeye salmon stocks are managed to achieve a sustainable escapement goal (SEG) range of 2-10 million fish in off-peak years and 6-10 million in pre-peak and peak years (Sands et al. 2008, Jones et al. 2009*, In prep*, Table 8).

In 2007, the minimum SEG was 2.0 million fish and the total run was expected to be 3.9 million sockeye. In 2008, the minimum SEG was 2.0 million fish and the total run was expected to be 3.6 million sockeye. For the 2009 season, the minimum SEG was 2.0 million fish and the total run was expected to be 5.3 million sockeye (Table 8).

The sport fishery is managed to provide increased participation and opportunity. The level of participation could grow quickly in the near future by improving access to desirable fishing sites, promoting the fishery as a destination, and working to assure necessary facilities are provided to accommodate the growth in a responsible manner. To this end, the department has worked closely with the Igiugig City Council on a project to build trails to desirable fishing locations close to the village airfield. For example, a trail was completed from the village road system to a prime sockeye salmon fishing site along the Kvichak River in fall 2001.

2009 Season

The 2009 sockeye salmon run to the Kvichak River exceeded the minimum SEG of 2.0 million fish. Approximately 2.3 million sockeye salmon were counted at the Igiugig tower.

Although no estimate is available at this time, we expect the subsistence harvest to be within the normal historical range of 40,000 to 60,000 sockeye salmon.

Due to a fair forecast and no inseason emergency orders restricting the sport fishery, the number of anglers targeting sockeye in the Iliamna drainage during 2009 was likely near the recent 20-year average and it is therefore anticipated that the sport fishery harvest will be similar to the recent 20-year average. An estimate of the recreational harvest will not be available until SWHS results are reported in mid-2010.

RAINBOW TROUT FISHERIES

AREAWIDE FISHERY DESCRIPTION

Wild rainbow trout stocks are a cornerstone to the multimillion-dollar recreational fishing industry of the BBMA. Sport fishing opportunity for both guided and unguided anglers occurs primarily during the ice-free season, generally from June through October, although fisheries in early and late winter are gaining some popularity. Found throughout the area, the most popular rainbow trout waters include tributaries of the Kvichak River drainage, the Naknek River drainage, portions of the Nushagak-Mulchatna River drainages, and streams of the Wood River Lakes system (Figure 8).

The rainbow trout fisheries within the BBMA underwent rapid growth from the late 1970s to mid-1980s, with annual harvests peaking in 1983. From 2003 through 2007, annual harvests averaged 1,787 fish (Table 9, Figure 9). The species' importance to the recreational fisheries is not adequately described by estimates of harvest. Results of the SWHS as well as field studies show clearly that during the last 10 to 15 years, the retention rate, or the number of fish kept from total catch, has declined steadily while the total effort and catch remained stable or increased (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*; *unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage;

Table 8.–Comparison of expected total sockeye salmon run versus the escapement goal range, midrange, and final escapement estimated by district and river system, Bristol Bay, 2007–2009.

			Escapement		
Year	DISTRICT/river system	Expected total run [a]	Goal range (millions)	Midrange (millions)	Estimate (no. of fish)
2007	NAKNEK-KVICHAK:				
	Kvichak R.	3,876,000	2.0 - 10.0	6.00	2,810,208
	Alagnak R.	2,025,000	0.17 - 0.2	0.18	2,466,414
	Naknek R.	5,637,000	0.8 - 1.4	1.10	2,945,304
	Subtotal	11,538,000	2.97 - 11.6	7.28	8,221,926
	EGEGIK	9,203,000	0.8 - 1.4	1.10	1,432,500
	UGASHIK	4,179,000	0.5 - 1.2	0.85	2,599,186
	NUSHAGAK: [b]				
	Wood R.	5,847,000	0.7 - 1.5	1.10	1,528,086
	Igushik R.	1,196,000	0.15 - 0.3	0.225	415,452
	Nushagak R.	1,868,000	0.34 - 0.76	0.55	518,041
	Subtotal	8,911,000	1.19 - 2.56	1.88	2,461,579
	TOGIAK [c]	588,000	0.1 - 0.2	0.15	269,646
	BRISTOL BAY Total	34,419,000	5.56 - 16.96	11.26	14,984,837
2008	NAKNEK-KVICHAK:				
	Kvichak R.	3,555,000	2.0 - 10.0	6.00	2,757,912
	Alagnak R.	3,315,000	0.17 - 0.2	0.18	2,180,502
	Naknek R.	7,775,000	0.8 - 1.4	1.10	2,472,690
	Subtotal	14,645,000	2.97 - 11.6	7.28	7,411,104
	EGEGIK	8,019,000	0.8 - 1.4	1.10	1,259,568
	UGASHIK	6,483,000	0.5 - 1.2	0.85	596,332
	NUSHAGAK: [b]				
	Wood R.	7,103,000	0.7 - 1.5	1.10	1,724,676
	Igushik R.	1,371,000	0.15 - 0.3	0.225	1,054,704
	Nushagak R.	1,931,000	0.34 - 0.76	0.55	492,546
	Subtotal	10,405,000	1.19 - 2.56	1.88	3,271,926
	TOGIAK [c]	738,000	0.1 - 0.2	0.15	205,680
	BRISTOL BAY Total	40,290,000	5.56 - 16.96	11.26	12,744,610
2009	NAKNEK-KVICHAK:				
	Kvichak R.	5,300,000	2.0 - 6.0	4.00	2,266,140
	Alagnak R. [d]	2,030,000	0.185	NA	970,818
	Naknek R.	4,790,000	0.8 - 1.4	1.10	1,169,466
	Subtotal	12,120,000	2.8 - 7.6	5.18	4,406,424
	EGEGIK	9,590,000	0.8 - 1.4	1.10	1,146,276
	UGASHIK	2,380,000	0.5 - 1.2	0.85	1,346,118
	NUSHAGAK: [b]				
	Wood R.	5,010,000	0.7 - 1.5	1.10	1,319,232
	Igushik R.	2,260,000	0.15 - 0.3	0.22	517,188
	Nushagak R.	1,660,000	0.34 - 0.76	0.55	484,149
	Subtotal	8,930,000	1.19 - 2.56	1.87	2,320,569
	TOGIAK [e]	770,000	0.1 - 0.2	0.15	313,946
	BRISTOL BAY Total	33,780,000	5.39 - 12.96	9.15	9,533,333

Source: (Sands 2008*;* Jones et al. 2009, *In prep*)

Note: units = number of sockeye salmon.

[a] *Run* refers to an aggregation of salmon of all ages returning from ocean feeding grounds to spawn in any given year. *Expected total run* = the preseason forecast.

[b] Forecast for Snake River system was not included (1971-1991 average escapement was 18,000).

[c] Forecasts for Kulukak, Kanik, Osviak, and Matogak River systems were not included. These systems may contribute an additional 62,000 (1992-2001 mean catch) to Togiak District harvest.

[d] The Alagnak River spawning goal is based on aerial surveys.

[e] Forecasts for Kulukak, Kanik, Osviak, and Matogak River systems were not included. These systems may contribute an additional 57,000 (1993-2002 mean catch) to Togiak District harvest.

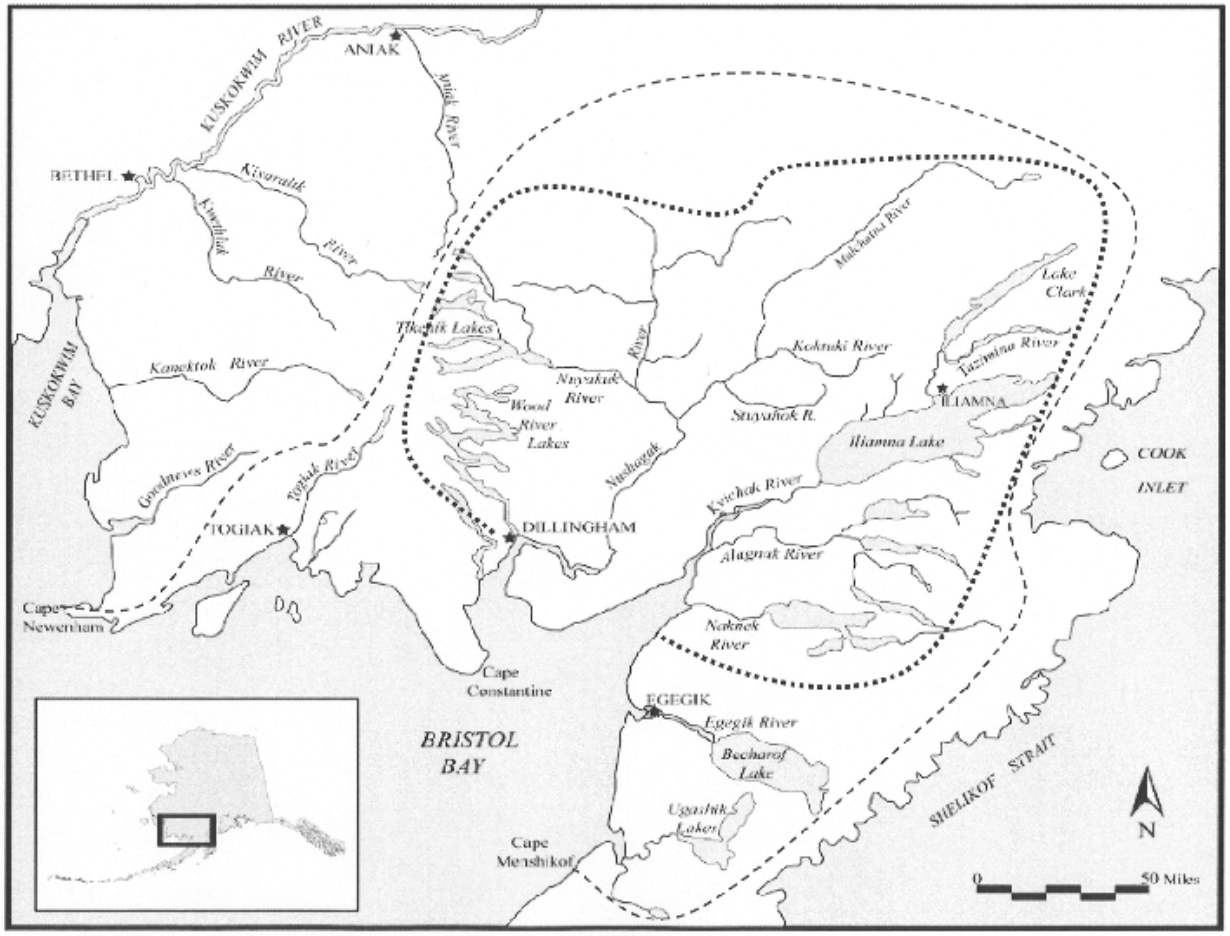


Figure 8.–Popular rainbow trout sport fisheries in the Bristol Bay Sport Fish Management Area.

Minard 1989, 1990; Brookover 1989; Dunaway 1993). Estimates of catch (number of fish kept plus fish released) were first available from the SWHS in 1991, and have ranged from about 123,000 to 218,000 fish annually (Table 10). From 2003 through 2007 the annual catch averaged 196,825 rainbow trout. It is evident the angling public has embraced the concept of catch-and-release for rainbow trout, and has voluntarily reduced their harvests throughout the area.

Prior to 1993, rainbow trout were explicitly excluded from harvest under the subsistence priority. The status of rainbow trout as a subsistence species was changed in 1993 when the BOF allowed rainbow trout caught incidentally to other species to be retained by subsistence users. In 1994 the BOF recognized subsistence use of rainbow trout among all other finfish in Bristol Bay (5 AAC 01.336). The subsistence taking of rainbow trout from non-navigable waters located within federal land holdings (National Wildlife Refuges and National Parks) has been allowed since December 1991. In 2002, the Federal Subsistence Board adopted regulations allowing rod and reel subsistence harvest of rainbow trout in federally managed subsistence fisheries in the Bristol Bay area.

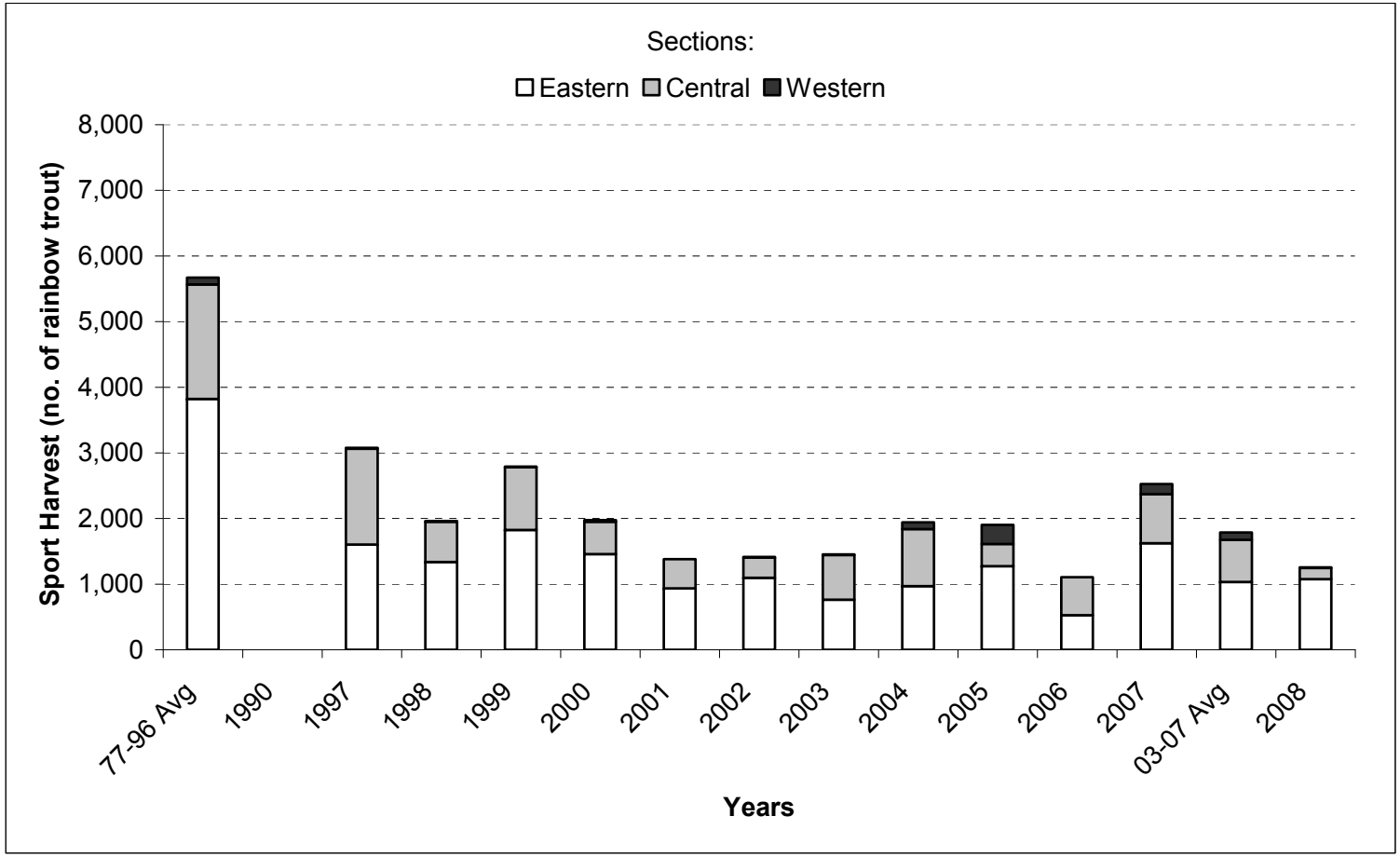
Table 9.–Sport harvest of rainbow trout by section and drainage, Bristol Bay Sport Fish Management Area, 1977-2008.

	Sport harvest (number of rainbow trout)													
Section/drainage	77-96 Avg	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	03-07 Avg	2008
Eastern section:														
Naknek R.	1,189	246	388	343	450	160	760	171	272	175	196	307	224	175
Brooks R.	95	0	0	0	24	0	0	0	0	358	22	152	106	0
Kvichak R.	274	27	25	135	506	155	176	497	193	221	0	457	274	136
Copper R.	85	0	0	49	56	0	0	0	14	0	0	0	3	0
Alagnak R.	254	254	35	57	33	166	71	11	163	413	47	20	131	66
Newhalen R.	226	254	377	724	101	371	48	54	89	77	72	10	60	272
Lake Clark	16	119	0	12	11	0	8	21	27	0	0	0	10	0
Other	1,681	705	514	508	277	86	32	11	212	31	191	677	224	430
Subtotal [a]	3,820	1,605	1,339	1,828	1,458	938	1,095	765	970	1,275	528	1,623	1,032	1,079
Central section:														
Nushagak	237	84	257	251	87	229	72	220	164	74	39	243	148	32
Mulchatna	409	684	163	278	35	92	122	85	37	36	298	262	144	25
Agulowak		15	43	23	0	0	0	21	397	22	72	76	118	77
Agulukpak		0	0	0	0	0	13	33	0	21	0	0	11	0
Wood River L.[b]	437	329	71	131	152	78	68	279	156	55	104	169	153	31
Tikchik/Nuyakuk	89	44	0	0	31	0	17	0	0	0	0	0	0	0
Other	575	302	80	270	190	46	21	42	117	132	67	0	72	0
Subtotal [a]	1,746	1,458	614	953	495	445	313	680	871	340	580	750	644	165
Western section:														
Togiak drainage	96	15	8	11	24	0	8	10	102	287	0	152	110	11
Other	12	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal [a]	108	15	8	11	24	0	8	10	102	287	0	152	110	11
Total	5,674	3,078	1,961	2,792	1,977	1,383	1,416	1,455	1,943	1,902	1,108	2,525	1,787	1,255

Source: Estimates from Alaska Statewide Harvest Survey (SWHS) reports (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*) and the SWHS database (*unpublished* data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage). 1996-1998 estimates were revised in 2001, so they may not match previously published estimates.

[a] Subtotals of averages may not be the sum of the drainages because information for some drainages is not available for some years.

[b] Wood River Lakes includes Lake Nunavaugaluk. Until 1997, Agulowak and Agulukpak rivers were included in Wood River Lakes.



Source: Alaska Statewide Harvest Survey (SWHS) reports (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*) and the SWHS database (*unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage).

Figure 9.–Sport harvest of rainbow trout, by section, from the Bristol Bay Sport Fish Management Area, 1977-2008.

Table 10.–Estimated sport catch of rainbow trout, by section and drainage, Bristol Bay Sport Fish Management Area, 1991-2008.

	Estimated sport catch (number of rainbow trout)													
Section/drainage	91-96 Avg	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	03-07 Avg.	2008
Eastern section:														
Naknek R.	14,435	13,737	12,795	17,946	30,738	16,198	30,635	26,183	20,497	16,431	15,555	25,692	20,872	19,886
Brooks R.	10,108	16,166	6,157	5,718	11,635	12,414	19,124	9,707	9,728	8,804	13,399	14,284	11,184	15,891
Kvichak R.	10,011	15,705	5,584	7,753	13,342	19,411	20,284	27,494	25,564	13,435	31,293	30,912	25,740	24,545
Copper R.	13,190	29,158	15,164	20,745	10,569	7,508	34,251	22,504	15,164	8,273	13,571	14,548	14,812	14,644
Alagnak R.	22,103	29,881	9,711	10,781	10,586	28,415	26,148	58,896	19,371	37,195	40,008	39,564	39,007	22,194
Newhalen R.	3,144	1,403	3,803	7,178	3,848	1,271	2,174	1,414	2,720	2,600	2,654	1,615	2,201	1,696
Lake Clark	478	1,104	432	344	33	732	496	151	2,043	415	47	2,309	993	13
Other	40,866	56,114	33,980	51,337	46,128	7,854	46,882	5,247	48,673	36,884	63,275	59,502	42,716	72,946
Subtotal [a]	114,334	163,268	87,626	121,802	126,879	93,803	179,994	151,596	143,760	124,037	179,802	188,426	157,524	171,815
Central section:														
Nushagak	9,167	12,304	10,649	15,575	8,599	11,177	12,810	13,268	11,956	6,638	5,609	6,616	8,817	5,478
Mulchatna	4,716	4,866	3,576	3,693	4,534	3,206	2,239	4,785	5,201	2,001	4,046	4,429	4,092	2,365
Agulowak		8,140	6,906	3,941	4,762	4,228	7,024	4,270	5,230	6,885	7,465	10,760	6,922	8,026
Agulukpak		11,382	3,413	6,122	6,526	4,156	4,982	3,803	8,335	4,966	6,130	5,965	5,840	4,767
Wood River L.[b]	8,656	5,366	3,856	2,504	6,081	4,019	3,952	3,978	4,575	7,270	6,773	5,784	5,676	4,058
Tikchik/Nuyakuk	1,837	3,531	1,708	1,104	3,483	1,380	1,544	2,584	5,167	1,038	588	1,426	2,161	1,016
Other	3,073	7,347	3,663	5,597	3,178	1,546	1,172	528	5,018	2,538	3,331	1,329	2,549	1,014
Subtotal [a]	27,448	52,936	33,771	38,536	37,163	29,712	33,723	33,216	45,482	31,336	33,942	36,309	36,057	26,724
Western section:														
Togiak drainage	1,401	1,810	1,773	1,691	1,924	1,907	1,694	2,041	5,716	3,475	2,261	2,282	3,155	3,977
Other	129	0	31	207	62	37	0	0	445	0	0	0	89	121
Subtotal [a]	1,529	1,810	1,804	1,898	1,986	1,944	1,694	2,041	6,161	3,475	2,261	2,282	3,244	4,098
Total	143,311	218,014	123,201	162,236	166,028	125,459	215,411	186,853	195,403	158,848	216,005	227,017	196,825	202,637

Source: 1991-1995 estimates from Alaska Statewide Harvest Survey (SWHS) reports (Mills 1992-1994; Howe et al. 1995, 1996) and 1996-2008 estimates from the SWHS database (unpublished data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage). 1996-1998 estimates were revised in 2001, so they may not match previously published estimates.

Note: "catch" = fish harvested plus fish released; "harvest" = fish kept.

[a] Subtotals of averages may not be the sum of the drainages because information for some drainages is not available for some years.

[b] Wood River Lakes includes Lake Nunavaugaluk. Until 1997, Agulowak and Agulukpak rivers were included in Wood River Lakes.

SOUTHWEST ALASKA RAINBOW TROUT MANAGEMENT PLAN

In February 1990, the BOF adopted regulations implementing a comprehensive management plan for rainbow trout in the area previously known as the Southwest Alaska Management Area. This area included the BBMA; the waters flowing into Kuskokwim Bay from Cape Newenham to the outlet of the Kuskokwim River; and the Kuskokwim River and tributaries from the Aniak River to Kuskokwim Bay (ADF&G 1990). Still in force, this plan is not a regulation but is used as a policy for guiding the BOF and the public. It provides a clear understanding of the underlying principles by which rainbow trout stocks are to be managed and provides guidance for the BOF in developing future regulations. In 1998, the BOF adopted *Criteria for Establishing Special Management Areas for Trout* (5 AAC 75.013). This regulation embodies most of the criteria that originated, and is still used, in the Southwest Alaska Rainbow Trout Management Plan.

Philosophy of the Plan

The overriding philosophy of the Southwest Alaska Rainbow Trout Management Plan is one of conservative wild stock management. Conservative wild stock management does not necessarily preclude limited harvest of rainbow trout for food or trophies. However, maximum yield principles which emphasize harvest are ruled out. Additionally, under a philosophy that emphasizes wild trout management, mitigating losses of wild stocks through enhancement or stocking is not considered a desirable management alternative.

Conservative wild stock management is guided by both biological considerations and social concerns. Growth in the region's rainbow trout sport fisheries is inevitable, but by managing the area's wild rainbow trout stocks conservatively, the potential for serious long-term resource problems is minimized. From a social perspective, conservative wild stock management is consistent with the priorities of most of the public presently using the resource. The Southwest Alaska Rainbow Trout Management Plan contains three policies which are intended to protect the biological integrity of the region's wild trout stocks and maximize their recreational benefit and economic potential. The policies guide the development of sport fishing regulations and provide ADF&G management biologists, BOF members, and the public with clear direction as to how rainbow trout fisheries in the BBMA should be managed. The three policies are as follows:

- ***Policy I***: Native rainbow trout populations will be managed to maintain historic size and age compositions and at stock levels sufficient such that stocking is not needed to enhance or supplement the wild population.
- ***Policy II***: A diversity of sport fishing opportunities for wild rainbow trout should be provided through establishment of special management areas by regulation. Selection of areas for special management will be based on criteria to be adopted by the Board of Fisheries.
- ***Policy III***: Management strategies should be consistent with the prudent economic development of the state's recreational sport fishing industry while at the same time acknowledging the intrinsic value of this fishery resource to the people of Alaska.

Plan Implementation

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

- Expanded the Wild Trout Zone from the Iliamna drainage to include the drainages of Bristol Bay and Kuskokwim Bay and the Kuskokwim River from Aniak River downstream.
- Established eight catch-and-release areas in the Bristol Bay Management Area and three catch-and-release areas in the Lower Kuskokwim Management Area (Figure 10).
- Established six artificial fly-only/catch-and-release-only areas (Figure 11).
- Established 11 unbaited single-hook artificial lure only areas to protect rainbow trout stocks (Figure 12, drainages 1-10).

Adoption of regulations implementing the management policies contained in this plan was not expected to be a one-time effort. Rather, policy implementation was understood to be a long-term process, with the policies being used as the framework for development of a very important and unique resource. This has been the case and special management regulations have since been adopted using this process for the Kvichak River in Bristol Bay, and the Kanektok, Kwethluk, Kasigluk, and Kisaralik rivers in the Kuskokwim area during the BOF meetings held in the fall and winter of 1997. This plan has also proved to be a useful guide for rainbow trout management in other parts of the state.

BRISTOL BAY RAINBOW TROUT STUDIES

During 2009, the first year of a long-term study of Lower Talarik Creek rainbow trout was funded by the Division of Sport Fish. The project involves identifying critical habitat areas and estimation of abundance and dynamic rates (e.g. survival, cause-specific mortality, movement, etc.) of spawning rainbow trout in Lower Talarik Creek.

LOWER TALARIK CREEK

Fishery Description

Lower Talarik Creek, located at the northwest corner of Lake Iliamna, is renowned for its high quality rainbow trout sport fishery. The creek is relatively small and most anglers only fish along the first 2 miles above its entrance into Lake Iliamna. The large fish, for which Lower Talarik Creek is so famous, enter the creek from Iliamna Lake to feed on salmon eggs and carcasses in the fall. The sport fishery takes advantage of this migration and is most active from mid-August until late September or October. Most anglers fishing Lower Talarik Creek are guided nonresidents who make daily fly-in trips from the many lodges operating in the Lake Iliamna area. From 10 to 30 anglers can be accommodated at any given time in the lower portion of the creek that is commonly fished.

In 1992, a Native land claim had the potential to eliminate public access to this world-class rainbow fishery. Through an agreement with the claimant, the Nature Conservancy (TNC) obtained the land and coordinated a land management agreement with ADF&G and the Alaska Department of Natural Resources. One stipulation of the agreement was to create a Special Use Area along the lower reaches of Lower Talarik Creek that would allow public access. After extensive discussions with local leaders, the Special Use Area was created in August 1999. In the spring of 2001, the Nature Conservancy initiated a process to convey these lands to the state for management. The Department of Natural Resources Realty section has finalized the transfer.

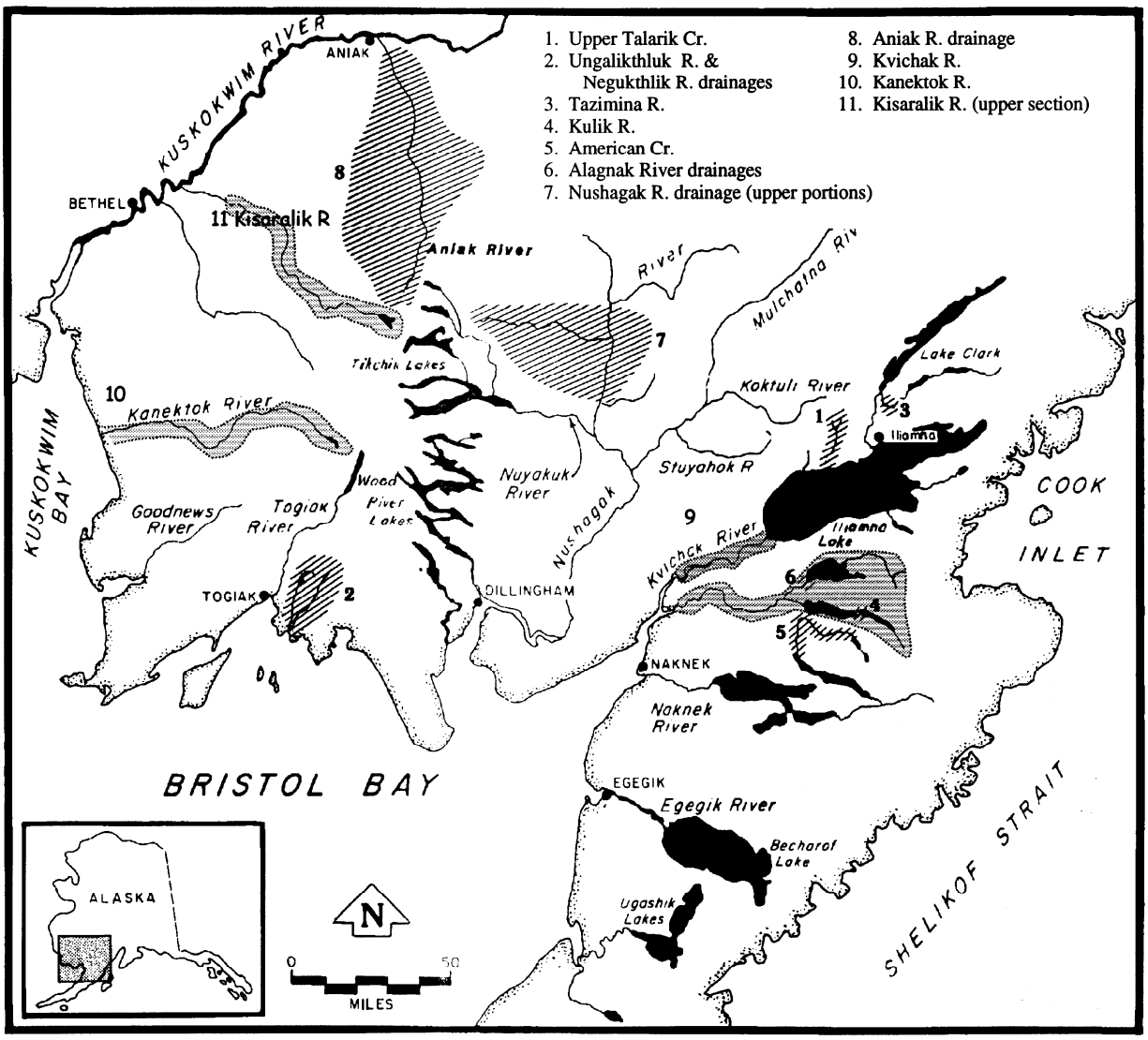


Figure 10.–Catch-and-release special management areas for rainbow trout in the Bristol Bay Sport Fish Management Area.

Harvest and Effort

Sport fishing effort and harvest on Lower Talarik Creek rainbow trout was first estimated with onsite creel surveys from 1970 through 1976 (Table 11). Annual harvest ranged from a high of 433 fish in 1971 to 73 fish in 1974. Creel surveys conducted during the fall fisheries of 1987, 1990, 1991, and 1993 through 2005 found effort was at the upper range of, but not significantly different from, the levels observed in the 1970s (Table 11). Low catch and effort in 1997 and 2001 are due to the short duration of surveys those years.

Based on the SWHS, effort on Lower Talarik Creek has been relatively constant at 350 to 900 angler-days per year. Harvests of Lower Talarik creek rainbow trout were less than 100 fish annually since 1977 and were virtually nonexistent after 1985 (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, *In prep*; and *unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage).

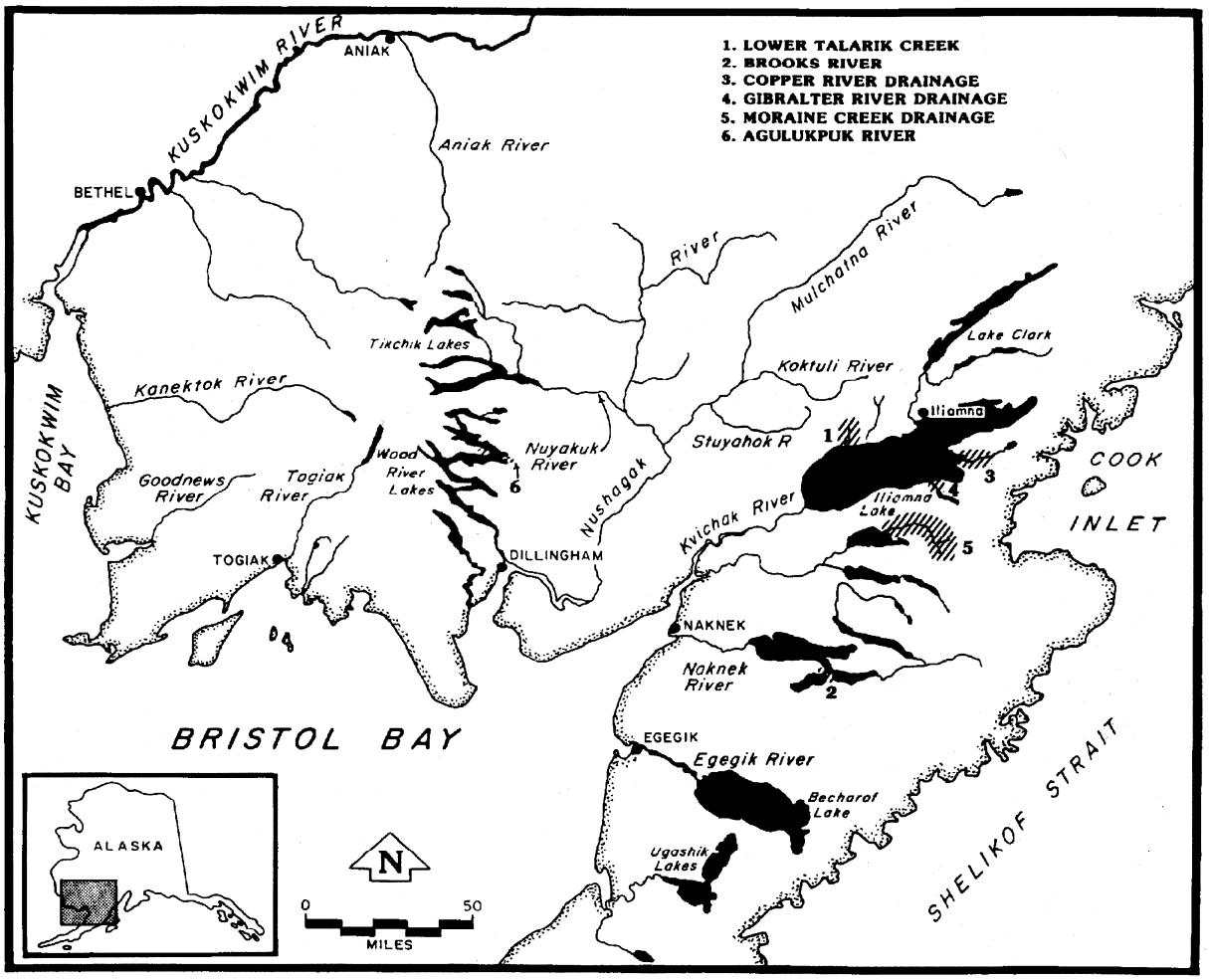


Figure 11.–Fly-only/catch-and-release special management areas for rainbow trout in the Bristol Bay Sport Fish Management Area.

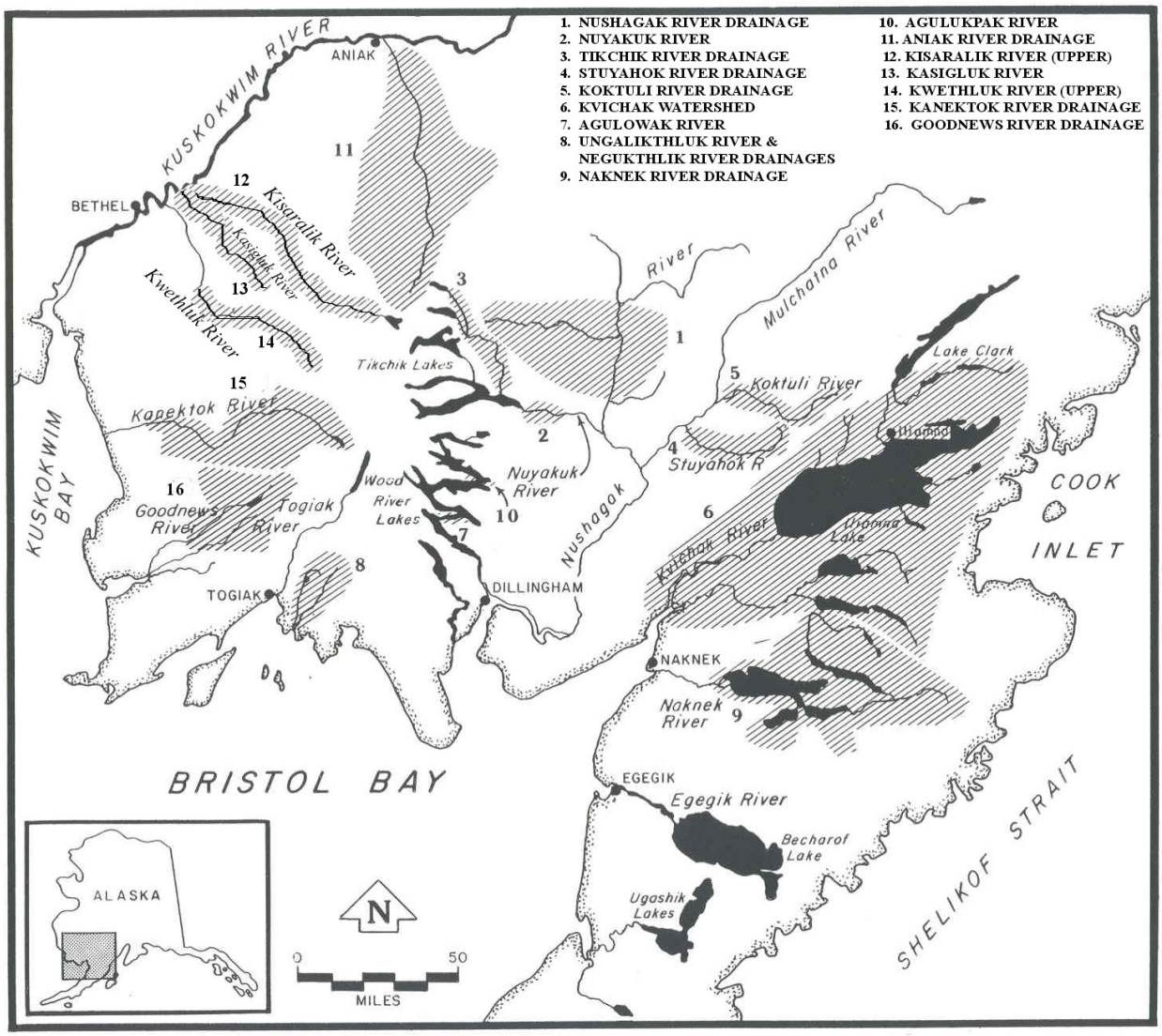


Figure 12.–Unbaited single-hook artificial lure special management areas for rainbow trout in the Bristol Bay Sport Fish Management Area.

Fishery Management and Objectives

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

Lower Talarik Creek was designated a special management area in 1990 as part of the implementation of the Southwest Alaska Rainbow Trout Management Plan. Sport fishing is restricted to unbaited artificial flies, and the area is catch-and-release only for rainbow trout. A season closure from April 10 through June 7 provides protection for spawning rainbow trout during this critical life stage.

Table 11.–Angler effort, catch, catch per unit effort, harvest, and percent retained for rainbow trout, Lower Talarik Creek, 1970-1976, 1986-1987, 1990-1991, and 1993-2005.

Year	Effort (angler-hours)	Catch (no. of fish)	CPUE [a]	Mean angler-hours per day	Harvest (no. of fish)	Percent retained	Survey dates
1970	1,315	600	0.46	27.4	119	20%	8/26-10/11
1971	2,604	2,300	0.88	26.3	433	19%	6/8-9/30
1972	1,718	834	0.49	17.4	141	17%	6/8-9/30
1973	1,376	780	0.57	13.9	113	14%	6/8-9/30
1974	1,037	498	0.48	10.5	73	15%	6/8-9/30
1975	1,048	1,648	1.57	10.6	127	8%	6/8-9/30
1976	438	843	1.92	21.9	92	11%	6/8-6/15; 9/12-9/23
1986	2,063	2,389	1.16	62.5	16	1%	6/8-6/15; 8/15-10/9
1987	1,893	2,844	1.5	59.2	4	1%	8/22-9/22
1990	2,086	2,910	1.4	77.3	0	NA[b]	9/1-9/27
1991	1,729	2,363	1.37	64.0	0	NA[b]	8/30-9/25
1993	1,080	699	0.65	98.2	0	NA[b]	9/10-9/20
1994	2,462	3,273	1.33	87.9	0	NA[b]	9/2-9/29
1995	2,496	3,200	1.28	86.1	0	NA[b]	9/1-9/29
1996	1,930	1,655	0.86	68.9	0	NA[b]	9/3-9/30
1997[c]	1,210	1,794	1.48	80.7	0	NA[b]	9/1-9/15
1998	2,596	1,698	0.65	118.0	0	NA[b]	8/31-9/21
1999	2,121	1,192	0.57	81.6	0	NA[b]	8/29-9/23
2000	2,813	4,868	1.73	104.2	0	NA[b]	8/28-9/23
2001[c]	934	692	0.74	77.8	0	NA[b]	9/2-9/13
2002[c]	1014	770	0.76	67.6	0	NA[b]	9/5-9/19
2003[c]	789	685	0.87	60.7	0	NA[b]	9/1-9/13
2004	1,321	1,044	0.84	45.8	0	NA[b]	9/1-9/29
All Years Avg.	1,655	1,721	1.02	59.5	49	-	
Five Year Avg.	1,374	1,612	0.99	71.2	0	-	
2005	1,002	2,100	2.10	35.8	0	NA[b]	9/2-9/29

Sources: Russell 1977, Minard 1990, Minard et al. 1992, T. Jaecks, ADF&G Sport Fish biologist, Dillingham, *unpublished* data).

Note: "NA" = not applicable, "-" = can't be computed due to limitations of the data.

[a] "CPUE" = catch per unit effort. Unstratified CPUE, recalculated from total catch and hours in original reports.

[b] Lower Talarik Creek became a catch-and-release fishery beginning in 1990.

[c] Small total catch and effort is due to the short duration of the survey.

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

Effective Year	Regulation
1965	Spawning season closure imposed on Lower Talarik Creek. Lower Talarik Creek closed to all fishing from April 10 through June 7.
1968	Lower Talarik Creek was included in the "Bristol Bay Trophy Fish Area."
1969	Bag and possession limits reduced to 5 trout, only 1 over 20 inches in length. Helicopter access was forbidden, single hooks were required on tackle.
1974	The use of bait was prohibited during the summer months.
1977	Trophy Fish Area renamed the Bristol Bay Wild Trout Area, retaining the regulations accumulated since 1965.
1981	Gear was limited to single-hook artificial flies from June through October.
1984	Reduced the bag and possession limit to 2 rainbow trout, 1 over 20 inches.
1985	Reduced the bag limit to 1 rainbow trout during the summer.
1990	Adopted the Southwest Alaska Rainbow Trout Management Plan. Lower Talarik Creek was designated as a special management area, to be managed under artificial-fly only, catch-and-release restrictions.
1999	Alaska Department of Natural Resources (ADNR) designated the five sections of State-owned land immediately surrounding the lower reaches of Lower Talarik Creek as a Special Use Area. Guidelines for overnight camping, and commercial activities were established. Also, the ADNR entered into an Interagency Land Management Agreement (ILMA) for approximately two acres of land on which stands the Division of Sport Fish cabin.
2001	The Nature Conservancy initiated a transfer of its privately held lands to the ADNR with management responsibilities to be delegated to ADF&G Sport Fish.

BROOKS RIVER

Fishery Description

Brooks River, which drains Brooks Lake into Naknek Lake, is a 2-mile long stretch of water located within the boundaries of the Katmai National Park and Preserve (Figure 11). This river is cherished by some anglers because of its classic pool-and-riffle structure and excellent fishing opportunities. Brooks Camp, located on Naknek Lake, was established in 1960 primarily as a sport fishing facility, but in recent years it has also become popular with tourists for hiking and bear viewing opportunities. Access to Brooks River and Brooks Camp is by float-equipped aircraft or boat. Beside guest cabins, a campground facility is available for overnight visitors. At the lower end of Brooks River is a footbridge which allows visitors to cross between the south and north shores without wading. The sport fishery for rainbow trout generally takes place above the bridge. The recreational fishery occupies waters also used by brown bears fishing for salmon. This overlap has caused management problems and conflicts. At issue is the safety of visitors and the priority that the different groups (bear viewers, sport fishermen, hikers) should have.

Harvest and Effort

Sport fishing effort and harvest on Brooks River rainbow trout are estimated with the SWHS. Effort on the Brooks River from 2004 through 2008 has averaged 3,396 angler-days per year (Jennings et al. 2007, 2009 a-b, *In prep*; and *unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage). The catch and harvest of Brook

River rainbow trout has averaged 12,421 and 106 fish, respectively, annually from 2004 through 2008 (Jennings et al. 2007, 2009 a-b, *In prep*; and *unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage).

Fishery Management and Objectives

The Brooks River rainbow trout fishery is managed to maintain historical age and size composition and a diversity of angling opportunity by maintaining the special management designation with artificial fly-only, catch-and-release.

The Brooks River was designated a special management area in 1990 as part of the implementation of the Southwest Alaska Rainbow Trout Management Plan. Sport fishing is restricted to unbaited artificial flies, and is catch-and-release only for rainbow trout. A season closure from April 10 through June 7 provides protection for spawning rainbow trout during this critical life stage.

Following is a chronology of the regulatory changes affecting rainbow trout sport fisheries on the Brooks River:

Effective Year	Regulation
1979	Sport fishing closure from April 10 to June 7 to protect spawning rainbow trout.
1990	Catch and release for rainbow trout from June 8 to October 31 and limited to unbaited, single-hook, artificial fly.
1997	Closed to retention of fish from Brooks Lake downstream to bridge at Brooks Camp.
2006	Fishing below the bridge restricted to unbaited, single-hook, artificial flies. Nonflowing waters within ¼ mile of inlet and outlet streams opened to sport fishing April 10 to June 7.

AMERICAN CREEK

Fishery Description

American Creek is a remote 50-mile long river that flows into Lake Colville in the Naknek River drainage (Figure 10). It is well known for its high quality rainbow trout and Dolly Varden fisheries. Due to its remoteness the river is mainly fished by guided anglers that access the river with float planes. The upper river is floated with rafts from Lake Hammersly, while the lower 15 miles of the river is jet boat accessible.

Harvest and Effort

Sport fishing effort and harvest on American Creek rainbow trout are estimated with the SWHS. From 2004 through 2008, effort on American Creek has averaged 1,442 angler-days per year (Jennings et al. 2007, 2009 a-b, *In prep*; and *unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage). The catch and harvest of American Creek rainbow trout has averaged 7,260 and 80 fish annually from 2004 through 2008. (Jennings et al. 2007, 2009 a-b, *In prep*; and *unpublished* 2008 data, Gretchen Jennings, SWHS project manager, ADF&G, Division of Sport Fish, Anchorage).

Fishery Management and Objectives

The American Creek rainbow trout fishery is managed to maintain historical age and size composition and a diversity of angling opportunity by maintaining the special management designation with artificial fly-only, catch-and-release.

American Creek was designated a special management area in 1990 as part of the implementation of the Southwest Alaska Rainbow Trout Management Plan. Sport fishing is restricted to catch-and-release only for rainbow trout.

ACKNOWLEDGEMENTS

We would like to thank several people who were instrumental to the completion of this report. Dillingham Fish and Wildlife Technician III Ian Fo updated numerous tables for this report. Regional Management Biologist Matt Miller also contributed significant edits to this report. Thanks also go to the people credited with personal communications throughout this report.

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