

Special Publication No. 12-19

Kvichak River Sockeye Salmon Stock Status and Action Plan, 2012, a Report to the Alaska Board of Fisheries

by

Steve Morstad

and

Charles E. Brazil

November 2012

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



Symbols and Abbreviations

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

Weights and measures (metric)		General		Mathematics, statistics		
centimeter	cm	Alaska Administrative Code	AAC	all standard mathematical signs, symbols and abbreviations		
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H _A	
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e	
hectare	ha			catch per unit effort	CPUE	
kilogram	kg	at	@	coefficient of variation	CV	
kilometer	km			common test statistics	(F, t, χ^2 , etc.)	
liter	L	compass directions:		confidence interval	CI	
meter	m	east	E	correlation coefficient (multiple)	R	
milliliter	mL	north	N	correlation coefficient (simple)	r	
millimeter	mm	south	S	covariance	cov	
Weights and measures (English)		west	W	degree (angular)	°	
	cubic feet per second	ft³/s	copyright	©	degrees of freedom	df
	foot	ft	corporate suffixes:		expected value	E
	gallon	gal	Company	Co.	greater than	>
	inch	in	Corporation	Corp.	greater than or equal to	≥
	mile	mi	Incorporated	Inc.	harvest per unit effort	HPUE
	nautical mile	nmi	Limited	Ltd.	less than	<
	ounce	oz	District of Columbia	D.C.	less than or equal to	≤
	pound	lb	et alii (and others)	et al.	logarithm (natural)	ln
	quart	qt	et cetera (and so forth)	etc.	logarithm (base 10)	log
yard	yd	exempli gratia (for example)	e.g.	logarithm (specify base)	log ₂ , etc.	
Time and temperature		Federal Information Code	FIC	minute (angular)	'	
	day	d	id est (that is)	i.e.	not significant	NS
	degrees Celsius	°C	latitude or longitude	lat. or long.	null hypothesis	H ₀
	degrees Fahrenheit	°F	monetary symbols (U.S.)	\$, ¢	percent	%
	degrees kelvin	K	months (tables and figures): first three letters	Jan,...,Dec	probability	P
	hour	h	registered trademark	®	probability of a type I error (rejection of the null hypothesis when true)	α
	minute	min	trademark	™	probability of a type II error (acceptance of the null hypothesis when false)	β
	second	s	United States (adjective)	U.S.	second (angular)	"
	Physics and chemistry		United States of America (noun)	USA	standard deviation	SD
		all atomic symbols		U.S.C.	standard error	SE
alternating current		AC	U.S. state	variance		
ampere		A		population	Var	
calorie		cal		sample	var	
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					

SPECIAL PUBLICATION NO. 12-19

**KVICHAK RIVER SOCKEYE SALMON
STOCK STATUS AND ACTION PLAN, 2012,
A REPORT TO THE ALASKA BOARD OF FISHERIES**

by
Steve Morstad
Division of Commercial Fisheries, King Salmon
and
Charles E. Brazil
Division of Commercial Fisheries, Anchorage

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

November 2012

The Special Publication series was established by the Division of Sport Fish in 1991 for the publication of techniques and procedures manuals, informational pamphlets, special subject reports to decision-making bodies, symposia and workshop proceedings, application software documentation, in-house lectures, and became a joint divisional series in 2004 with the Division of Commercial Fisheries. Special Publications are intended for fishery and other technical professionals. Special Publications are available through the Alaska State Library, Alaska Resources Library and Information Services (ARLIS) and on the Internet: <http://www.adfg.alaska.gov/sf/publications/>. This publication has undergone editorial and peer review.

Steve Morstad
Alaska Department of Fish and Game, Division of Commercial Fisheries,
PO Box 37, King Salmon, AK 99613, USA
and
Charles E. Brazil
Alaska Department of Fish and Game, Division of Commercial Fisheries,
333 Raspberry Road, Anchorage, AK 99518, USA

This document should be cited as:

Morstad, S. and C. E. Brazil. 2012. Kvichak River sockeye salmon stock status and action plan, 2012, a report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Special Publication No. 12-19, Anchorage.

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

If you believe you have been discriminated against in any program, activity, or facility please write:

ADF&G ADA Coordinator, P.O. Box 115526, Juneau, AK 99811-5526

U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, MS 2042, Arlington, VA 22203

Office of Equal Opportunity, U.S. Department of the Interior, 1849 C Street NW MS 5230, Washington DC 20240

The department's ADA Coordinator can be reached via phone at the following numbers:

(VOICE) 907-465-6077, (Statewide Telecommunication Device for the Deaf) 1-800-478-3648,

(Juneau TDD) 907-465-3646, or (FAX) 907-465-6078

For information on alternative formats and questions on this publication, please contact:

ADF&G Division of Sport Fish, Research and Technical Services, 333 Raspberry Rd, Anchorage AK 99518 (907) 267-2375.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	ii
LIST OF FIGURES.....	ii
ABSTRACT	1
INTRODUCTION	1
Kvichak River Sockeye Salmon	1
Stock Assessment	1
Commercial Fisheries Management	5
Previous Alaska Board of Fisheries Actions.....	5
Regulatory History.....	6
Stock of Concern Analyses.....	7
Escapement	7
Yield.....	7
Harvest Rate	7
Return per Spawner	7
Stock of Concern Recommendation	7
KVICHAK RIVER SOCKEYE SALMON ACTION PLAN	8
Review of 2006 Action Plan.....	8
Current Stock Status	8
Customary and Traditional Use Finding and the Amount Reasonably Necessary for Subsistence	8
Habitat Factors Adversely Affecting the Stock	8
Existing Management Plans.....	8
Action Plan Development History	9
Kvichak Sockeye Salmon Action Plan Goal.....	9
Previous Actions.....	9
Management Under Current Regulations	9
Action Plan Alternatives.....	10
REFERENCES CITED	11
FIGURES	13

LIST OF TABLES

Table	Page
1. Historical yield, escapement and total inshore run of Kvichak River sockeye salmon, 1956-2012.	2
2. Escapement analysis of Kvichak River sockeye salmon, 2008–2012.	4
3. Comparison of recent (2008–2012) prepeak/peak and off-cycle yields to historical median yield for Kvichak River sockeye salmon.	4

LIST OF FIGURES

Figure	Page
1. Bristol Bay commercial salmon fishery management area, Alaska.	14
2. Kvichak River drainage, Bristol Bay, Alaska.	15
3. Kvichak River sockeye salmon lower escapement goals (1969–2012) and number of spawners (1956– 2012).	16
4. Kvichak River sockeye salmon yield by year, 1956–2012.	17
5. Kvichak River sockeye salmon catch, escapement, and harvest rate, 1956–2012.	18
6. Total returns and return per spawner by brood year for sockeye salmon in the Kvichak River system, 1956–2005.	19

ABSTRACT

In response to the guidelines established in the *Policy for management of sustainable salmon fisheries* (SSFP), the Alaska Department of Fish and Game (department) first classified the Kvichak River sockeye salmon *Oncorhynchus nerka* stock as a “stock of yield concern” in 2001. A yield concern is defined as “a concern arising from a chronic inability, despite use of specific management measures, to maintain expected yields.” Classification of Kvichak River sockeye salmon was subsequently changed to a “stock of management concern” in 2003. This classification change was based on the definition of “management concern” found in the policy. A “management concern” is defined as, “a concern arising from a chronic inability, despite use of specific management measures, to maintain escapements for salmon stocks within the bounds of sustainable escapement goal (SEG), biological escapement goal (BEG), optimal escapement goal (OEG), or other specified management objectives for the fishery.” The increased protection provided by commercial, sport, and subsistence fisheries restrictions and closures that have occurred in recent years have helped the Kvichak River sockeye salmon stock recover. The SEG has been met during the last 5 years (2008–2012); there was a surplus harvest of Kvichak River sockeye salmon in the commercial fishery from 2008–2012; and return per spawner has improved in recent years. In 2009, the Kvichak River was reclassified to a “stock of yield concern” and with the continued improvements over the past 5 years, it is recommended that the Kvichak River sockeye salmon stock be removed as a “stock of concern.”

Key words: Kvichak River, sockeye salmon, *Oncorhynchus nerka*, stock of concern, commercial, fishing, ADF&G, sustainable salmon fisheries policy, Alaska Board of Fisheries, Bristol Bay, Alaska.

INTRODUCTION

The *Policy for the management of sustainable salmon fisheries* (SSFP; 5 AAC 39.222) directs the Alaska Department of Fish and Game (department) to provide the Alaska Board of Fisheries (board) at regular meetings, with reports on the status of salmon stocks and identify any salmon stocks that present a concern related to yield, management, or conservation (ADF&G 2000). In the Bristol Bay Management Area, one stock (Kvichak River sockeye salmon, *Oncorhynchus nerka*) has been identified (Figures 1 and 2). This report provides the department’s assessment of this stock of concern and recommends that Kvichak River sockeye salmon removed as a stock of yield concern.

KVICHAK RIVER SOCKEYE SALMON

Stock Assessment

Prior to the decline beginning in 1997, the Kvichak River sockeye salmon stock, on average, was the largest contributor to the Bristol Bay salmon harvest. The Kvichak River sockeye salmon stock has historically had a 5-year cycle, with individual years labeled as peak, prepeak, and off-cycle years. Since 1955, the number of Kvichak River spawners has ranged from 226,000 to 24 million sockeye salmon (Table 1). The largest recorded total run (catch and escapement) was 48 million in 1965, a peak cycle year (Table 1). The department has operated a counting tower to enumerate salmon escapements on the Kvichak River since 1955. Additionally, each spring, from 1975–2003, the number of migrating smolt was estimated using hydroacoustics. In conjunction, age, length, and weight information was obtained from smolt sampled with fyke nets (Crawford and Fair 2003); this also began in 1975 and is ongoing.

Table 1.–Historical yield, escapement and total inshore run of Kvichak River sockeye salmon, 1956-2012.

Year	Type	Actual Yield		Actual Escapement		Total Inshore Run	
		Prepeak and peak	Off-cycle	Prepeak and peak	Off-Cycle	Prepeak and peak	Off-Cycle
1956	Peak	4,168,343		9,443,318		13,611,661	
1957	Off-Cycle		3,540,189		2,842,810		6,382,999
1958	Off-Cycle		549,396		534,785		1,084,181
1959	Off-Cycle		281,930		673,811		955,741
1960	Peak	7,976,500		14,602,360		22,578,860	
1961	Off-Cycle		6,863,814		3,705,849		10,569,663
1962	Off-Cycle		1,833,401		2,580,884		4,414,285
1963	Off-Cycle		276,579		338,760		615,339
1964	Off-Cycle		1,224,565		957,120		2,181,685
1965	Peak	24,301,379		24,325,926		48,627,305	
1966	Off-Cycle		5,160,348		3,755,185		8,915,533
1967	Off-Cycle		2,329,215		3,216,208		5,545,423
1968	Off-Cycle		1,418,524		2,557,440		3,975,964
1969	Off-Cycle	5,660,545		8,394,204		14,054,749	
1970	Peak	20,904,379		13,935,306		34,839,685	
1971	Off-Cycle		4,590,715		2,387,392		6,978,107
1972	Off-Cycle		1,122,325		1,009,962		2,132,287
1973	Off-Cycle		183,933		226,554		410,487
1974	Off-Cycle	627,509		4,433,844		5,061,353	
1975	Peak	3,079,181		13,140,450		16,219,631	
1976	Off-Cycle		1,580,050		1,965,282		3,545,332
1977	Off-Cycle		334,328		1,341,144		1,675,472
1978	Off-Cycle		3,769,806		4,149,288		7,919,094
1979	Prepeak	13,708,608		11,218,434		24,927,042	
1980	Peak	15,426,412		22,505,268		37,931,680	
1981	Off-Cycle		5,146,995		1,754,358		6,901,353
1982	Off-Cycle		1,677,035		1,134,840		2,811,875
1983	Off-Cycle		17,926,890		3,569,982		21,496,872
1984	Prepeak	13,440,248		10,490,670		23,930,918	
1985	Peak	6,882,206		7,211,046		14,093,252	
1986	Off-Cycle		833,068		1,179,322		2,012,390
1987	Off-Cycle		4,251,356		6,065,880		10,317,236
1988	Off-Cycle		2,794,085		4,065,216		6,859,301
1989	Prepeak	12,164,331		8,317,500		20,481,831	
1990	Peak	11,219,946		6,970,020		18,189,966	
1991	Off-Cycle		4,388,887		4,222,788		8,611,675
1992	Off-Cycle		5,902,019		4,725,864		10,627,883
1993	Off-Cycle		4,038,041		4,025,166		8,063,207
1994	Prepeak	13,232,752		8,355,936		21,588,688	
1995	Peak	18,384,105		10,038,720		28,422,825	
1996	Off-Cycle		3,023,364		1,450,578		4,473,942
1997	Off-Cycle		890,971		1,503,732		2,394,703
1998	Off-Cycle		1,514,310		2,296,074		3,810,384
1999	Prepeak	7,006,068		6,196,914		13,202,982	
2000	Peak	1,754,681		1,827,780		3,582,461	
2001	Off-Cycle		882,916		1,095,348		1,978,264
2002	Off-Cycle		212,090		703,884		915,974
2003	Off-Cycle		355,039		1,686,804		2,041,843
2004	Prepeak	2,603,360		5,500,134		8,103,494	
2005	Off-Cycle		605,713		2,320,332		2,926,045
2006	Off-Cycle		2,143,967		3,068,226		5,212,193
2007	Off-Cycle		2,200,342		2,810,208		5,010,550

-continued-

Table 1.–Page 2 of 2.

Year	Type	Actual Yield		Actual Escapement		Total Inshore Return	
		Prepeak and peak	Off-cycle	Prepeak and peak	Off-Cycle	Prepeak and peak	Off-Cycle
Historical Years							
Median		9,598,223	1,755,218	8,918,761	2,308,203	19,335,898	4,195,125
Max		24,301,379	17,926,890	24,325,926	6,065,880	48,627,305	21,496,872
Min		627,509	183,933	1,827,780	226,554	3,582,461	410,487
n		18	34	18	34	18	34
Recent Years							
2008	Off-Cycle		3,374,471		2,757,912		6,132,383
2009	Off-Cycle		4,633,653		2,266,140		6,899,793
2010	Off-Cycle		6,723,803		4,207,410		10,931,213
2011	Off-Cycle		5,323,304		2,264,352		7,587,656
2012 ^a	Off-Cycle		6,259,566		4,164,444		10,424,010

^a 2012 data are preliminary estimates.

The previous sustainable escapement goal (SEG) adopted in 1997, for Kvichak River sockeye salmon was 2 million to 10 million for off-cycle years and 6 million to 10 million for prepeak and peak years (Fair 2000). Setting an SEG for the Kvichak River sockeye salmon run has proven difficult because of perceived divergence in productivity between cycle years and off-cycle years, poor density dependence in spawner-recruit data, and a lack of fit for Ricker type spawner-recruit curves. In addition to the goal, an exploitation rate of 50% was set on runs of 4 to 20 million to provide guidance in setting goals within the range. The management objective for a given off-cycle year would then be defined as 50% of the total inshore Kvichak River run and would never be less than 2 million or greater than 10 million. The management objective for a given prepeak or peak cycle year would then be defined as 50% of the total inshore Kvichak River run, and would never be less than 6 million or greater than 10 million. Beginning in 1996, escapements were frequently less than the lower goal (Figure 3). However, the SEG has been met for each of the last 5 years (2008–2012; Table 2).

Commercial harvest, or yield, has improved in recent years (2008–2012) (Table 1; Figure 4). During the last 5 years, actual yield was significantly more than the historical median yield of 1.8 million in off-cycle years (Table 3 and Figure 4). Commercial fishing had been restricted in Naknek-Kvichak District at some point each year from 1996–2007, forcing the fishery into the Naknek River Special Harvest Area. However, there have been no restrictions to commercial fishing since 2007. As directed in the *Kvichak River Sockeye Salmon Management Plan* (5 AAC 67.025), sport fishing restrictions have routinely been imposed when escapements were projected to be less than 2 million fish. Restrictions have generally taken the form of bag limit reductions and area closures designed to minimize potential conflicts with subsistence users. Prior to enacting the current management plan, the poor return in 2000 resulted in a closure of the sockeye salmon sport fishery in the entire Kvichak River drainage.

Prior to the establishment of commercial fishing, area residents harvested Bristol Bay salmon for subsistence uses. The board determination of the amount reasonably necessary for subsistence (ANS) uses is described in 5 AAC 01.336 as 157,000 to 172,171 salmon in the Bristol Bay area, “including 55,000 to 65,000 Kvichak River sockeye salmon; this finding does not include salmon stocks in the Alagnak River.” In the Naknek-Kvichak District, sockeye salmon subsistence harvest, as estimated from permit returns, averaged about 92,000 from 1985–1994 and 72,000 from 1995–2004. Annual subsistence harvest of Kvichak River sockeye salmon averaged 67,000 fish from 1988–1997 (Jones et al. 2012), with recent harvests (2002–2011) averaging 45,500 fish.

Table 2.—Escapement analysis of Kvichak River sockeye salmon, 2008–2012.

Year	Actual Escapement	Escapement Goal	Difference	% Deviation from Goal ^a	Escapement >Goal	Frequency of Occurrence ^b
2008	2,757,912	2,000,000	757,912	38%	Yes	20 (n=47)
2009	2,266,140	2,000,000	266,140	13%	Yes	15 (n=48)
2010	4,207,410	2,000,000	2,207,410	110%	Yes	31 (n=49)
2011	2,264,352	2,000,000	264,352	13%	Yes	15 (n=50)
2012 ^c	4,164,444	2,000,000	2,164,444	108%	Yes	32 (n=51)

^a Percent deviation = (Actual - Goal) / Goal.

^b The number of escapement observations (1961–2011) which are less than the escapement of the current year.

^c 2012 data are preliminary estimates.

Table 3.—Comparison of recent (2008–2012) prepeak/peak and off-cycle yields to historical median yield for Kvichak River sockeye salmon.

Year	Actual Yield	Median Yield		Difference	% Deviation from Median ^a	Yield > Lower Range ^b	Frequency ^c
		Prepeak /Peak	Off-cycle				
2008	2,873,889		2,200,342	673,547	31%	Yes	21 (n=31)
2009	3,297,344		2,200,342	1,097,002	50%	Yes	27 (n=32)
2010	5,108,008		2,200,342	2,907,666	132%	Yes	31 (n=33)
2011	3,706,589		2,200,342	1,506,247	68%	Yes	30 (n=34)
2012 ^d	6,259,566		2,200,342	4,059,224	184%	Yes	32 (n=35)

^a Percent deviation = (Actual - Median) / Median.

^b Lower range of prepeak and peak years was 627,509 and off-cycle years was 183,933.

^c The number of yield observations (1961–2011) which are less than the yield of the current year.

^d 2012 Yield is a preliminary estimate.

The current SEG for Kvichak River sockeye salmon, adopted in 2009, is 2 million to 10 million (Baker et al. 2009). In 2009, an interdivisional salmon escapement goal review team, including staff from the divisions of Commercial Fisheries and Sport Fish, was formed to comprehensively review the existing salmon escapement goals in the Bristol Bay Management Area based on the *Policy for the management of sustainable salmon fisheries* (5 AAC 39.222) and the *Policy for statewide salmon escapement goals* (5 AAC 39.223). The escapement goal review team recommended a change to the Kvichak River sockeye salmon escapement goal. Previously, there were two goals, one for prepeak and peak years, and one for off-cycle years. In recent years, the ability to define a prepeak or peak run was made increasingly difficult as runs declined. A prepeak/peak goal, largely composed of five-year-old two-ocean fish, was originally established because it was believed that production differed from that of off-cycle years, and therefore, it was advantageous to separate them. However, a new look at the production of prepeak/peak versus off-cycle years shows similarity such that we cannot conclude they are different (Baker et al. 2009). Therefore, the review team recommended the prepeak/peak escapement goal of 6 million to 10 million be dropped and that the off-cycle goal of 2 million to 10 million be expanded to include all years. In 2012, the interdivisional salmon escapement goal review team recommends continuing with the off-cycle goal of 2 million to 10 million for all years (Fair et al. 2012).

It should be noted that prior to 2012, annual inshore run sizes were based on catch and escapement from age composition. In 2012, annual inshore run sizes (1963–2011) were reconstructed using age and genetic composition of catch for use by the department in evaluating biological escapement goals (Cunningham et al. 2012).

Commercial Fisheries Management

The Bristol Bay commercial fishery is managed using several measures of inseason run strength so that spawning escapement goals are met by distributing the escapement through time based on the historical run timing schedule. Commercial fishing periods are opened based on both spawning escapement and harvest indicators. Commercial fishing in Bristol Bay is not opened by emergency order (EO) until indicators suggest a harvestable surplus of sockeye salmon is available.

Daily and cumulative inseason escapement estimates, based on visual counts from towers, are compared to expected counts derived from historical averages of counts and run timing. This gives managers the ability to determine whether a run is smaller, the same, or larger than expected. Unfortunately, sockeye salmon often require several days to travel from fishing districts to the counting towers. Therefore, inriver test fishing projects have been established to estimate the number of sockeye salmon that have left the fishing district, but have not yet reached the counting tower (West 2009). This allows managers to provide adequate fishing opportunity to harvest surplus production while still achieving spawning escapement goals.

Commercial harvest information is used in a similar fashion to spawning escapement information. The actual daily and cumulative number of sockeye salmon harvested is compared to expected numbers derived from preseason and inseason projections to provide information on run size. Additionally, the department conducts district test fishing during closed fishing periods to gauge the relative abundance and distribution of sockeye salmon within areas that may be open to harvest.

Previous Alaska Board of Fisheries Actions

The Kvichak River sockeye salmon stock was found to be a “stock of yield concern” during the January 2001 board meeting. In response to the “stock of yield concern” designation, the board modified 5AAC 06.357, *Ugashik River Sockeye Salmon Special Harvest Area Management Plan*; 5 AAC 06.359, *Egegik River Sockeye Salmon Special Harvest Area Management Plan*; 5 AAC 06.360, *Naknek River Sockeye Salmon Special Harvest Area Management Plan*; and 5 AAC 67.025, *Kvichak River Drainage Sockeye Salmon Management Plan* to provide additional protection for Kvichak River sockeye salmon. Bristol Bay fisheries were managed in accordance with these plans, with no directed commercial fishing and a reduced sport fishery for Kvichak River sockeye salmon.

During the December 2003 Bristol Bay board meeting, several regulation changes were adopted concerning the Naknek-Kvichak District. The Kvichak River sockeye salmon stock was elevated from a “stock of yield concern” to a “stock of management concern” due to the recent chronic inability to meet escapement goals. A “stock of management concern” is defined (5 AAC 39.222) as “a concern arising from a chronic inability, despite use of specific management measures, to maintain escapements for a salmon stock within the bounds of the SEG, BEG, optimal escapement goal (OEG), or other specified management objectives for the fishery.” With this 2003 action came the stipulation that if the Kvichak River run is forecasted to

be less than 30% above the minimum BEG, fishing will begin in the special harvest areas of Naknek, Egegik, and Ugashik rivers (5 AAC 06.360(h)).

During the December 2006 Bristol Bay board meeting, it was recommended that the Kvichak River sockeye salmon stock remain classified as a “stock of management concern” (Morstad and Baker 2006). The department stated that we would like to see continued improvement of the Kvichak River sockeye salmon stock for four or five years before recommending the stock for reclassification.

During the December 2009 Bristol Bay board meeting, it was recommended that the Kvichak River sockeye salmon stock be reclassified as a “stock of yield concern” (Morstad and Baker 2009). The department stated that it would like to see continued improvement of the Kvichak River sockeye salmon stock before recommending the stock for reclassification.

Regulatory History

Kvichak River sockeye salmon have been utilized for subsistence for centuries. This system’s main production is sockeye salmon and its importance is increased due to the location of the villages of Levelock, Igiugig, Pedro Bay, Kokhanok, Iliamna/Newhalen, Nondalton, and Port Alsworth within the drainage.

Permits are required to harvest salmon for subsistence purposes in the Kvichak River drainage. Since 1990, under state regulations, nearly all state of Alaska residents have been eligible to participate in subsistence salmon fishing in all Bristol Bay drainages. In Katmai National Park, only local residents who are descendents of Katmai residents who lived in the Naknek Lake and River drainage may subsistence fish, and in Lake Clark National Preserve, only local residents may subsistence fish.

The commercial fishery occurs from June 1 to September 30 and is opened by EO. There are three management plans addressing commercial fishing within the Naknek-Kvichak District. The first is referred to as the *Commercial Set and Drift Gillnet Sockeye Salmon Fisheries Management and Allocation Plan* (5 AAC 06.355; ADF&G 2001). This is an umbrella plan for Bristol Bay that specifies the allocation of sockeye salmon between commercial set and drift gillnet fisheries within the district and establishes management measures to achieve allocation. Part of this plan (5 AAC 06.364 (e); ADF&G 2001) attempts to provide adequate Kvichak River sockeye salmon spawning escapement by managing, to the extent practicable, a fishery in Naknek Section with limited set and drift gillnet gear fishing during ebb tides.

The second plan is referred to as the *Naknek River Sockeye Salmon Special Harvest Area Management Plan* (5 AAC 06.360; ADF&G 2001). This plan states that on or after June 27, if Kvichak River cumulative sockeye salmon escapement is one or more days behind the historical schedule for meeting the goal, the following actions are taken:

1. The Naknek-Kvichak District will be closed, and to reduce the potential for interception of Kvichak River sockeye salmon in other districts,
 - a. Fishing in the Egegik District may be restricted to the Egegik River Special Harvest Area;
 - b. Fishing in the Ugashik District will occur within a restricted area prior to June 29; and,

- c. If Naknek River spawning escapement is projected to be greater than 800,000 sockeye salmon, the Naknek River Special Harvest Area can open, and the upper spawning escapement goal for the Naknek River will be raised from 1.4 million to 2.0 million sockeye salmon.

The third plan is referred to as the *Naknek-Kvichak District Commercial Set and Drift Gillnet Sockeye Salmon Fisheries Management and Allocation Plan* (5 AAC 06.364; ADF&G 2001). The purpose of this plan is to establish the allocation of sockeye salmon between the commercial set and drift gillnet fisheries within Naknek-Kvichak District and to establish management measures for the department to achieve the allocation.

Stock of Concern Analyses

Escapement

During the most recent five years, the SEG was achieved in all five years (Table 2; Figure 3). It should be noted that the lower end of the prepeak goal in 2009 was changed from 6 million to 2 million (implemented in 1998; Table 2).

Yield

During the last five years, the actual yield was more than the historical median yield of 2.20 million (Table 3 and Figure 4).

Harvest Rate

The commercial fishing harvest rate on Kvichak River sockeye salmon was significantly reduced in recent years, especially for very low runs (Figure 5). However, with increased run size, harvest rates have increased significantly and have gone above the 50% rate since 2008.

Return per Spawner

There has been an increase in production (return per spawner) of the Kvichak River sockeye salmon stock in recent years (Figure 6). Return per spawner from brood years 1991–1999 averaged 0.8 fish per spawner. There has been an increase in the return per spawner in recent years (brood years 2000–2005), averaging about three returns per spawner.

Stock of Concern Recommendation

The increased protection provided by commercial and sport fisheries restrictions and closures that have occurred in recent years appears to be helping the Kvichak River sockeye salmon stock recover: there was a harvestable surplus of Kvichak River sockeye salmon in the commercial fishery during 2008–2012; minimum escapement goals were met from 2008–2012; recruits per spawner have improved in recent years; and Kvichak River sockeye salmon stock harvest rates have also increased significantly. With continued improvement over the past five years, it is recommended that the Kvichak River sockeye salmon stock be removed as a “stock of yield concern”.

A yield concern was defined in the SSFP as “a concern arising from a chronic inability, despite use of specific management measures, to maintain expected yields.” However, the amount or degree of yield that constitutes a yield concern was not defined; therefore, when to define a yield concern is subject to interpretation.

Because escapements have been met since 2005, and actual yield over the past five years has exceeded the average yield, it is recommended that the Kvichak River sockeye salmon stock be removed as a “stock of yield concern.”

KVICHAK RIVER SOCKEYE SALMON ACTION PLAN

REVIEW OF 2006 ACTION PLAN

Current Stock Status

In response to the guidelines established in the *Policy for the management of sustainable salmon fisheries*, the Alaska Board of Fisheries, during its October 1–3, 2003 Work Session, classified the Kvichak River sockeye salmon stock as a management concern (Bristol Bay staff 2003). This determination was based on the inability, despite the use of specific management measures, to maintain escapement for a salmon stock within the bounds of the biological escapement goal (BEG) for four of the past five years.

Customary and Traditional Use Finding and the Amount Reasonably Necessary for Subsistence

The board has made a positive customary and traditional use (C&T) finding for all finfish in the Bristol Bay Area and has established the ANS as 157,000 to 172,171 salmon, including 55,000 to 65,000 sockeye salmon for the Kvichak River drainage.

Habitat Factors Adversely Affecting the Stock

There are no habitat factors adversely affecting the Kvichak stock within the entire drainage.

Presently, there are no new or expanding fisheries on this stock. Proposals 24 and 25 regarding use of seines and troll gear, proposals 58–61 regarding General District, and proposal 68 regarding a set gillnet fishery at Levelock may be viewed as expanding fisheries on this stock.

Existing Management Plans

The board reviews existing management plans for consistency with principles and criteria of the SSFP or adopts new management for the stock consistent with the principles and criteria of the SSFP.

The following are the current commercial fishery regulations:

5 AAC 06.200. *Fishing districts, subdistricts, and sections.*

5 AAC 06.310. *Fishing Seasons.*

5 AAC 06.320. *Fishing periods.*

5 AAC 06.355. *Bristol Bay Commercial Set and Drift Gillnet Sockeye Salmon Fisheries Management and Allocation Plan.*

5 AAC 06.359. *Egegik River Sockeye Salmon Special Harvest Area Management Plan.*

5 AAC 06.360. *Naknek River Sockeye Salmon Special Harvest Area Management Plan.*

5 AAC 06.364. *Naknek-Kvichak District Commercial Set and Drift Gillnet Sockeye Salmon Fisheries Management and Allocation Plan.*

5 AAC 06.365. *Egegik District Commercial Set and Drift Gillnet Sockeye Salmon Management and Allocation Plan.*

5 AAC 09.200. *Description of districts and sections.*

5 AAC 09.310. *Fishing seasons.*

ACTION PLAN DEVELOPMENT HISTORY

Kvichak Sockeye Salmon Action Plan Goal

To rebuild the Kvichak River sockeye salmon run back to historical levels by attaining the escapement goal.

Previous Actions

During the board meeting in January 2001, the department presented a summary of four potential action plans (Bristol Bay staff 2000), of which three reduced the exploitation rate on Kvichak River stocks in each eastside district. During deliberation, the board made the following changes: (1) In the Ugashik District, when the preseason forecast of Kvichak River sockeye salmon does not provide for an exploitation rate greater than 40%, fishing time between June 16 to June 23 cannot exceed 48 hours. In addition, if the Naknek River Special Harvest Area (NRSHA) is in effect any time before June 29, fishing will be restricted to the Ugashik River Special Harvest Area (URSHA); (2) In Egegik District, when the NRSHA is open to commercial fishing, then fishing in Egegik District is restricted to the Egegik River Special Harvest Area (ERSHA) and will remain in the ERSHA until fishing resumes in Naknek-Kvichak District; and (3) Naknek-Kvichak District is closed to both gear groups when Kvichak River escapement falls one or more days behind the cumulative escapement goal curve on or after June 27. When fishing the NRSHA, an OEG is in effect, raising the upper end of the Naknek River escapement goal range from 1.4 million to 2.0 million sockeye salmon. During the 2003 board meeting, the department presented one additional action plan item to further reduce the exploitation rate on Kvichak River stocks (Bristol Bay staff 2003). The board required fishing to begin in the special harvest areas of Naknek, Egegik, and Ugashik rivers if the Kvichak River run is forecasted to be less than 30% above the minimum BEG (5 AAC 06.360(h)).

Management Under Current Regulations

In 2004, the sockeye salmon forecast for the Kvichak River projected a harvestable surplus of 6.6 million sockeye salmon, with an escapement goal of 6.0 million. The board authorized a General District fishery in 2004, which opened areas outside of the normal district boundaries. With these additional areas open and a projected harvest of 6.6 million sockeye, no restrictions were placed on eastside fisheries. Limited fishing occurred in Naknek-Kvichak District prior to June 23, with most of the harvest caught in the General District. Commercial fishing was restricted to Naknek Section for the drift fleet and marginal fishing in Kvichak Section for set gillnet gear. Escapement to Kvichak River was on track until July 6, when it fell more than 1 day behind. At that time, the Naknek-Kvichak District was closed and fishing was restricted to the NRSHA. Final escapement was 5.5 million sockeye salmon, slightly less than the minimum escapement goal of 6.0 million. In 2005 and 2006, the preseason forecast projected a surplus of less than 30% above the minimum escapement goal and the eastside fisheries began in their respective special harvest areas. The outcome in 2005 and 2006 was that Kvichak River met its escapement objectives.

The department has the necessary regulations to meet escapement objectives for Kvichak River sockeye salmon when the total run exceeds the minimum escapement goals and is forecasted within 30%. Further, restrictions in current regulations are sufficient to minimize exploitation and ensure the vast majority of the sockeye salmon returning to Kvichak River will escape the commercial fishery when total run is less than the minimum escapement goal.

Action Plan Alternatives

No new action plans necessary; continue under current plans.

REFERENCES CITED

- ADF&G (Alaska Department of Fish and Game) and the Alaska Board of Fisheries. 2000. Policy for management of sustainable salmon fisheries for the State of Alaska. Alaska Department of Fish and Game, Juneau. <http://www.adfg.alaska.gov/index.cfm?adfg=specialstatus.akfishstocks>
- ADF&G (Alaska Department of Fish and Game). 2001. 2001–2004 Bristol Bay, Alaska Peninsula, Atka-Amlia, and Aleutian Island Areas commercial fishing regulations summary. Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau.
- Baker, T. T., L. F. Fair, F. W. West, G. B. Buck, X. Zhang, S. Fleischman, and J. Erickson. 2009. Review of salmon escapement goals in Bristol Bay, Alaska, 2009. Alaska Department of Fish and Game, Fishery Manuscript Series 09-05, Anchorage. <http://www.adfg.alaska.gov/FedAidPDFs/FMS09-05.pdf>
- Bristol Bay Staff. 2000. Kvichak River sockeye salmon stock status and action plan, 2000. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A00-37, Anchorage. <http://www.adfg.alaska.gov/FedAidPDFs/RIR.2A.2000.37.pdf>
- Bristol Bay Staff. 2003. Kvichak River sockeye salmon stock status and action plan 2003. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A03-26, Anchorage. <http://www.adfg.alaska.gov/FedAidPDFs/RIR.2A.2003.26.pdf>
- Crawford, D. L., and L. F. Fair. 2003. Bristol Bay sockeye salmon smolt studies using upward-looking sonar, 2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A03-17, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/RIR.2A.2003.17.pdf>
- Cunningham, C. J., R. Hilborn, J. Seeb, and T. Branch. 2012. Reconstruction of Bristol Bay sockeye salmon returns using age and genetic composition of catch. University of Washington, School of Aquatic and Fishery Sciences.
- Fair, L. F. 2000. Report to the Alaska Board of Fisheries on spawning escapement goal evaluations for Bristol Bay salmon. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A00-38, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/RIR.2A.2000.38.pdf>
- Fair, L. F., C. B. Brazil, X. Zhang, R. A. Clark, S. Fleischman, and J. Erikson. 2012. Review of salmon escapement goals in Bristol Bay, Alaska, 2012. Alaska Department of Fish and Game, Fishery Manuscript Series No. 12-04, Anchorage. <http://www.adfg.alaska.gov/FedAidPDFs/FMS12-04.pdf>
- Jones, M., T. Sands, S. Morstad, T. Baker, G. Buck, F. West, P. Salomone and T. Krieg. 2012. 2011 Bristol Bay area annual management report. Alaska Department of Fish and Game, Fishery Management Report No. 12-21, Anchorage. <http://www.adfg.alaska.gov/FedAidPDFs/FMR12-21.pdf>
- Morstad, S. and T. T. Baker. 2006. Kvichak River sockeye salmon stock status and action plan, 2006; a report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Special Publication No. 06-26, Anchorage. <http://www.adfg.alaska.gov/FedAidPDFs/sp06-26.pdf>
- Morstad, S., and T. T. Baker. 2009. Kvichak River sockeye salmon stock status and action plan, 2009; a report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Special Publication No. 09-16, Anchorage. <http://www.adfg.alaska.gov/FedAidPDFs/SP09-16.pdf>
- West, F. W. 2009. Bristol Bay sockeye salmon inriver test fishing, 2007. Alaska Department of Fish and Game, Fishery Data Series No. 09-19, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds09-19.pdf>

FIGURES

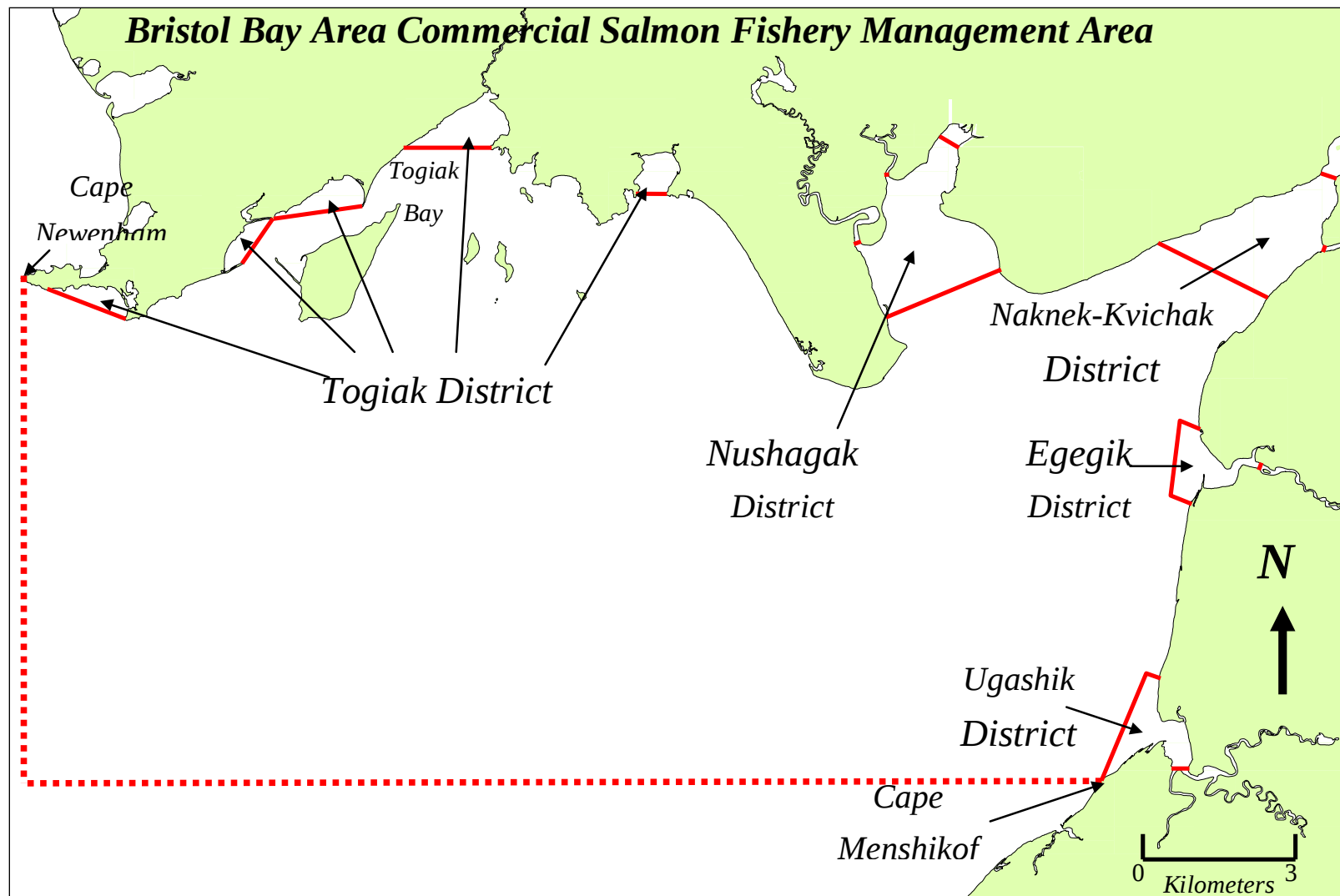


Figure 1.—Bristol Bay commercial salmon fishery management area, Alaska.

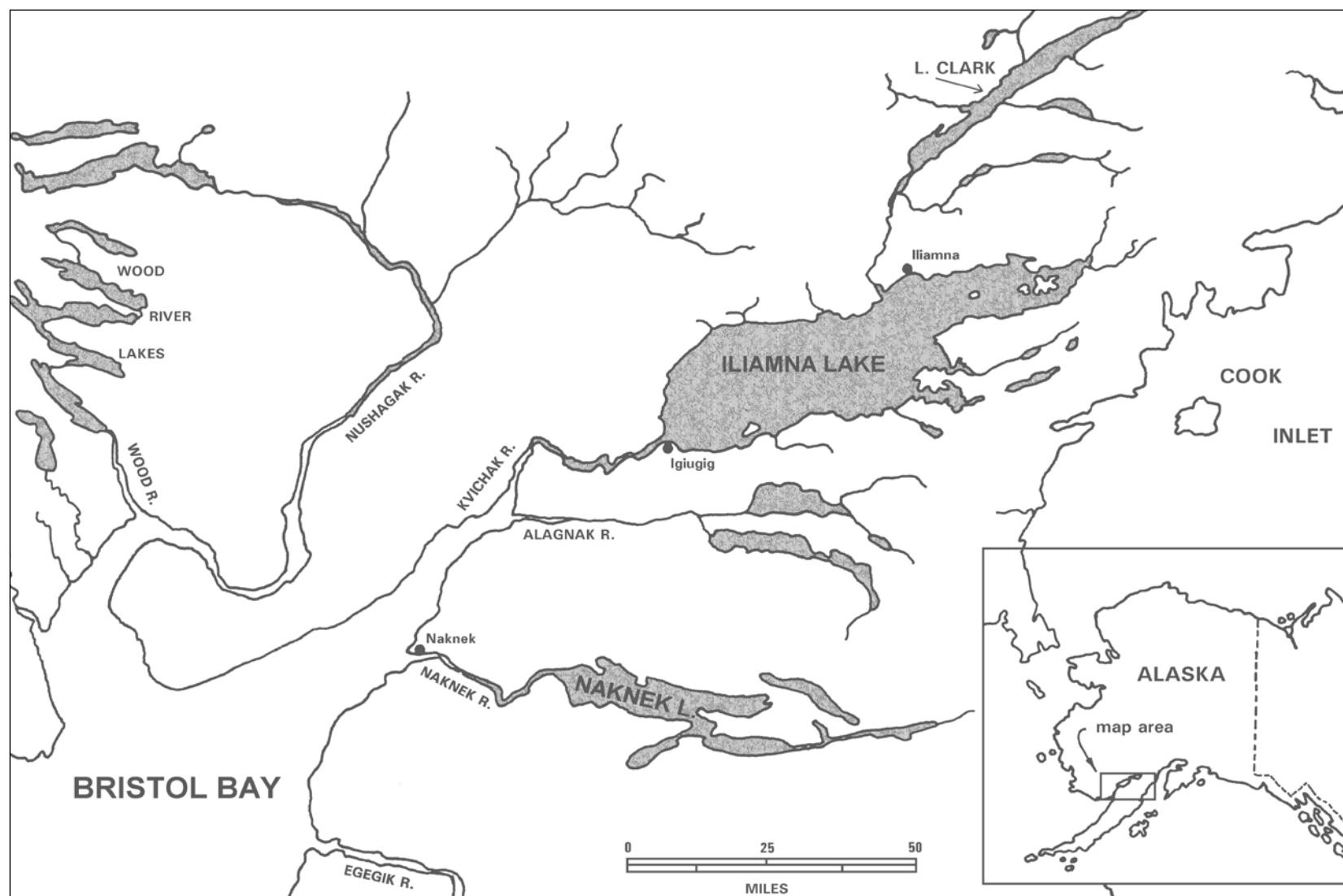


Figure 2.—Kvichak River drainage, Bristol Bay, Alaska.

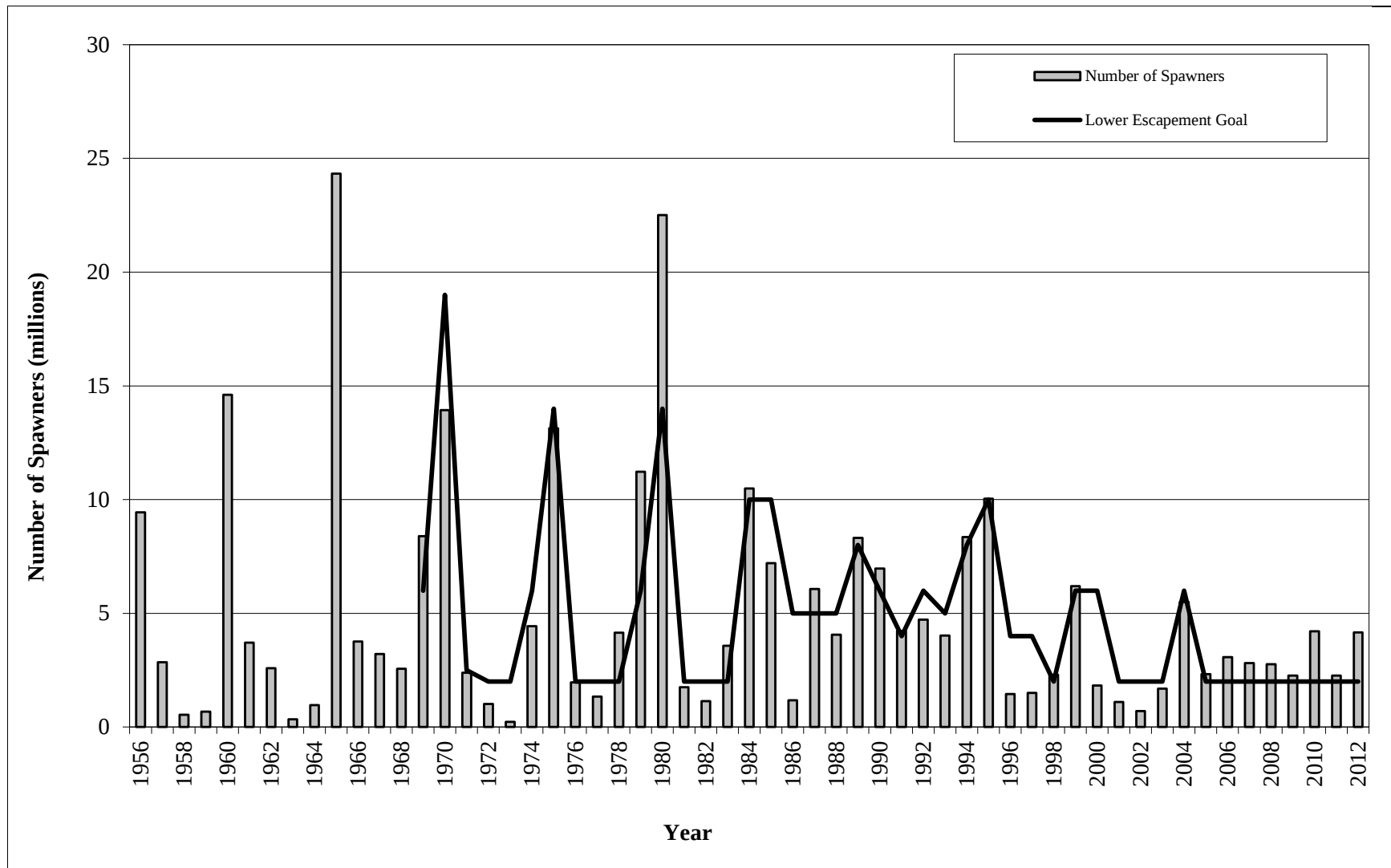


Figure 3.—Kwichak River sockeye salmon lower escapement goals (1969–2012) and number of spawners (1956–2012).

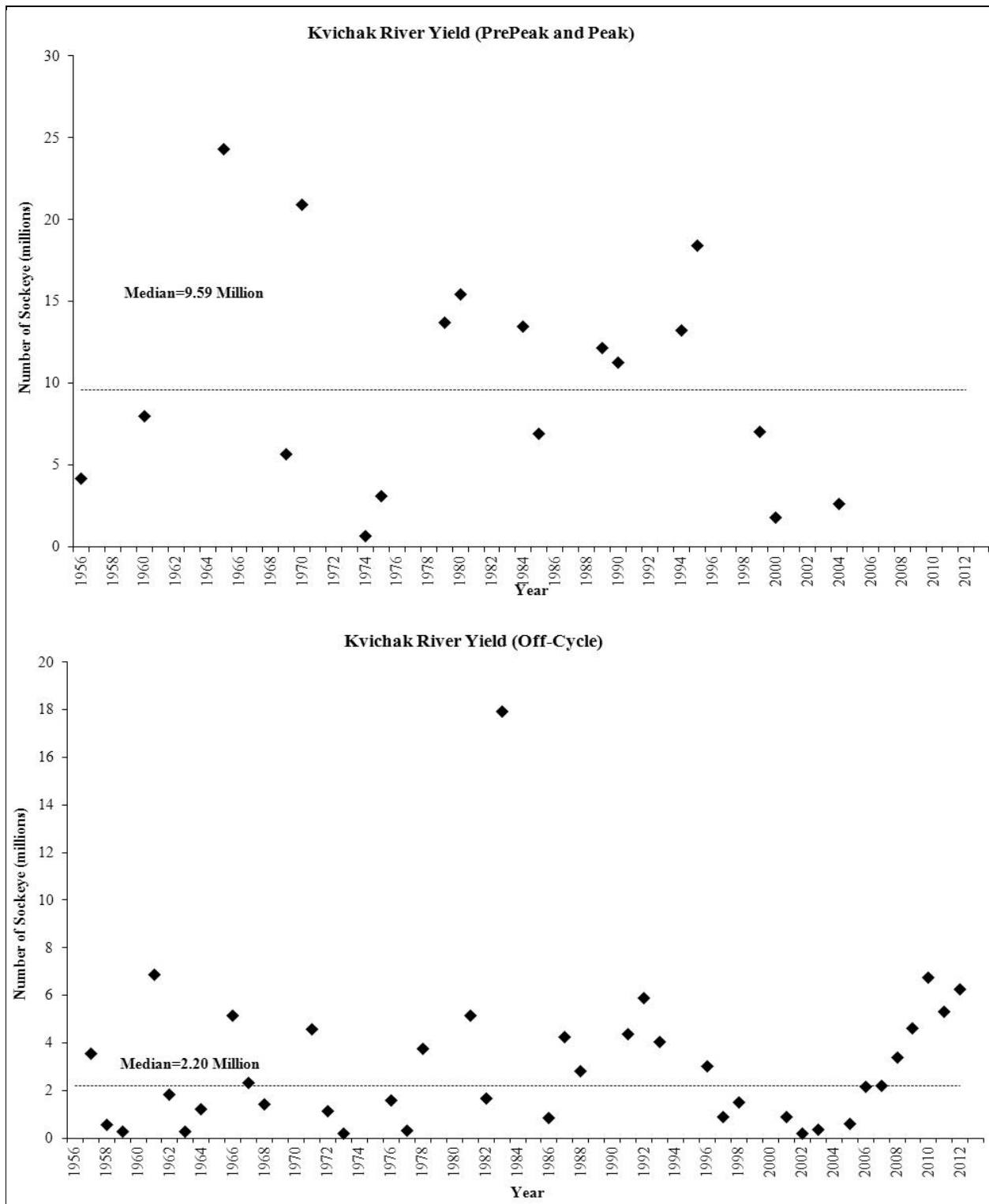


Figure 4.—Kvichak River sockeye salmon yield by year, 1956–2012.

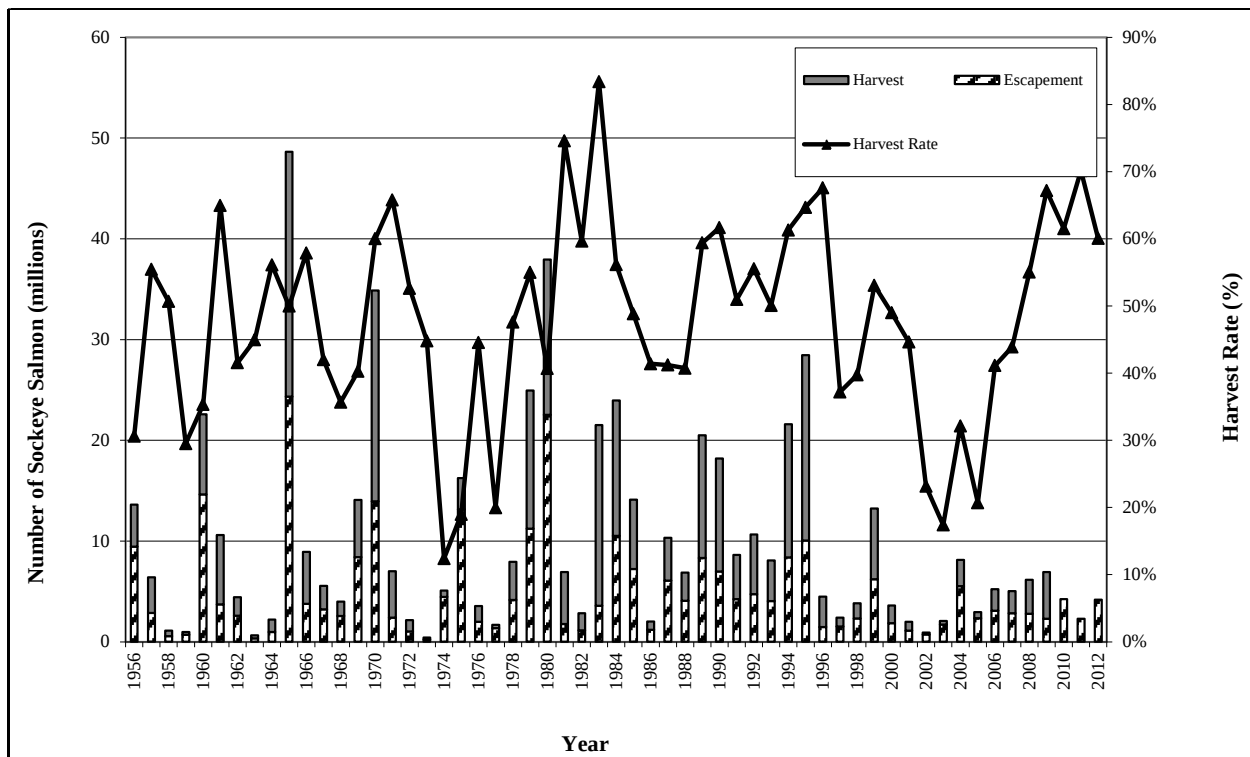


Figure 5.—Kvichak River sockeye salmon catch, escapement, and harvest rate, 1956–2012.

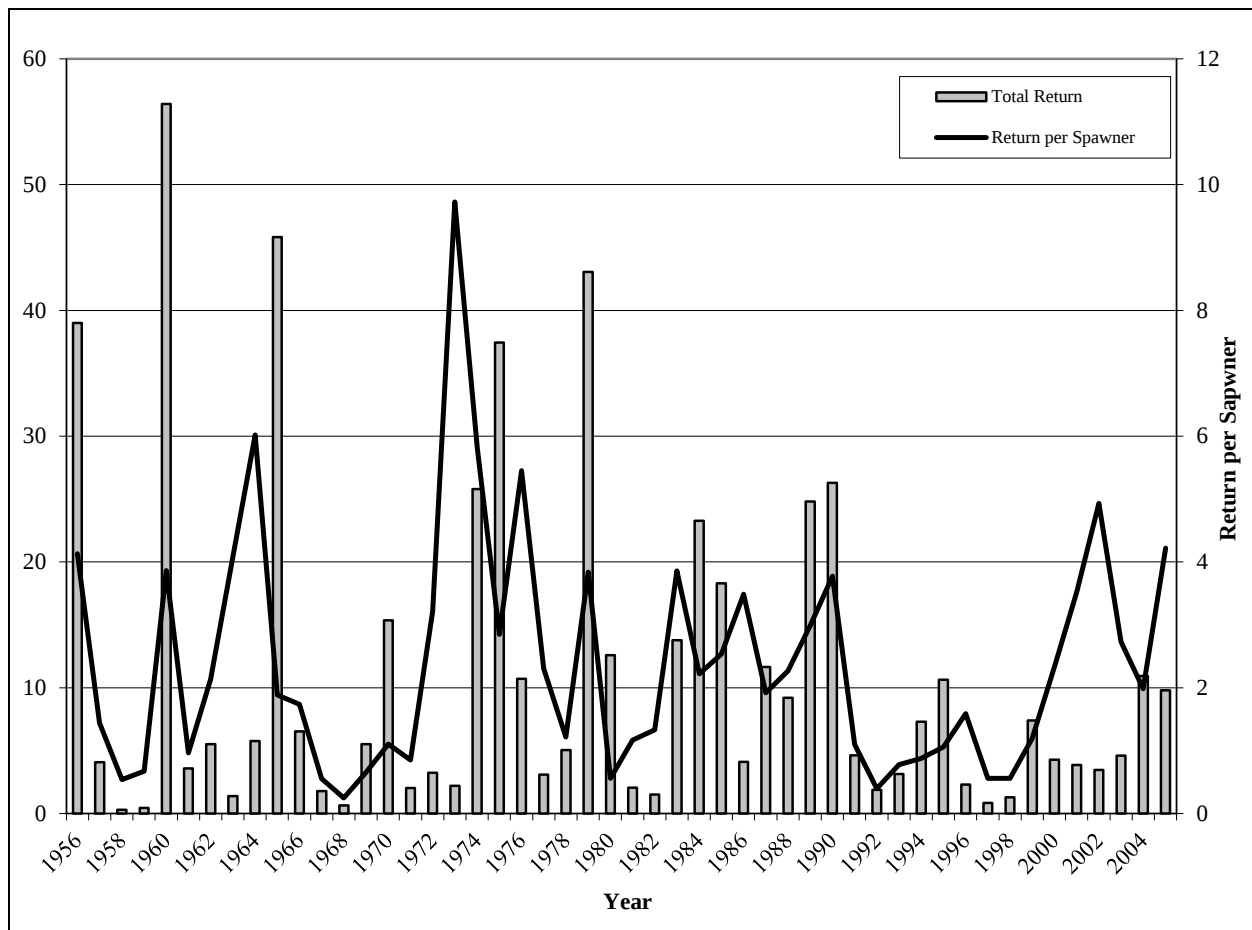


Figure 6.—Total returns and return per spawner by brood year for sockeye salmon in the Kvichak River system, 1956–2005.