

AK LEGISLATURE SPECIAL COMMITTEE FILES SCOMM 156 3336

SUSITNA RIVER COHO AND CHUM SALMON DISTRIBUTION

Primary Objective: To estimate spawning distribution and stock composition of coho and chum salmon in the Susitna River watershed.

Description: Four fish wheels will be operated at Flathorn (Susitna River kilometer 31) each year to capture and apply radio tags to coho (*Oncorhynchus kisutch*) and chum (*O. keta*) salmon. Salmon will be captured and tagged throughout the day for the duration of the run (July through mid-September) to account for differential migration timing. Tags will be deployed based on individual fish wheel catch rates to account for differential catchability. Age, sex, and length composition of adult coho and chum salmon escapement will be estimated from samples collected each day. Tissue samples will also be collected for genetic baseline development. Radio tagged salmon will be tracked using a fixed-wing aircraft multiple times throughout the season. Coho and chum salmon distribution estimates will be used to 1) better understand coho and chum salmon spawning distribution in the Susitna River watershed, and 2) evaluate stock composition of escapements throughout the Susitna watershed.

Duration: Five Years

ADFG Budget:

Line Item	FY09	FY10	FY11	FY12	FY13	Total
100 Personnel	\$66.5	\$230.6	\$239.4	\$248.3	\$257.2	\$1,042.0
200 Travel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
300 Contractual	\$0.0	\$47.0	\$48.8	\$50.6	\$52.4	\$198.9
400 Supplies	\$174.2	\$172.7	\$179.3	\$186.0	\$192.6	\$904.8
500 Equipment	\$36.0	\$0.0	\$0.0	\$0.0	\$0.0	\$36.0
Total Direct Costs	\$276.7	\$450.3	\$467.6	\$484.9	\$502.2	\$2,181.6

SUSITNA RIVER CHINOOK SALMON DISTRIBUTION

Primary Objective: To estimate spawning distribution and stock composition of Chinook salmon in the Susitna River watershed.

Description: Drift gillnets will be used at Flathorn (Susitna River kilometer 31) each year to capture and apply radio tags to Chinook salmon (*Oncorhynchus tshawytscha*). Chinook salmon will be captured and tagged for the duration of the run (May through July) to account for differential migration timing. Tags will be deployed based on relative abundance among channels and fishing sites to account for differential catchability. Age, sex, and length composition of adult Chinook salmon escapement will be estimated from samples collected each day. Tissue samples will also be collected for genetic baseline development. Radio tagged salmon will be tracked using a fixed-wing aircraft multiple times throughout the season. Chinook salmon distribution estimates will be used to 1) better understand Chinook salmon spawning distribution in the Susitna River watershed, and 2) evaluate stock composition of escapements throughout the Susitna watershed.

Duration: Five Years

ADFG Budget:

Line Item	FY09	FY10	FY11	FY12	FY13	Total
100 Personnel	\$105.7	\$230.6	\$239.5	\$248.3	\$257.2	\$1,081.3
200 Travel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
300 Contractual	\$2.0	\$47.0	\$48.8	\$50.6	\$52.4	\$200.8
400 Supplies	\$129.3	\$116.5	\$121.0	\$125.5	\$130.0	\$622.3
500 Equipment	\$36.0	\$0.0	\$0.0	\$0.0	\$0.0	\$36.0
Total Direct Costs	\$273.0	\$394.1	\$409.3	\$424.4	\$439.6	\$1,940.4

LITTLE SUSITNA RIVER WEIR INSEASON ASSESSMENT

Primary Objective: To count coho salmon escapement and obtain a partial count of chum salmon escapement into the Little Susitna River.

Description: A weir to count coho salmon currently operates on the Little Susitna River at river kilometer 115. The weir is too far upstream to provide data for inseason assessment of run strength. Previously, the weir was operated at river kilometer 51 but was moved to river kilometer 115 at the public's request. However, weir counts at river kilometer 115 are too late for in season management and it is not certain what proportion of coho and chum salmon escapements spawn below river kilometer 115. The weir will be moved back to river kilometer 51 to remedy these concerns. Change in location will require a wider weir (spanning larger stream channel) and a remote field camp. Additional staffing will be required to accommodate the heavy boat traffic at river kilometer 51. The table below shows only the additional funds needed to operate the weir at river kilometer 51, the balance will be derived using existing project funds currently expended at the existing river kilometer 115 site.

Duration: Five Years

ADFG Budget:

Line Item	FY09	FY10	FY11	FY12	FY13	Total
100 Personnel	\$69.9	\$44.4	\$45.7	\$47.1	\$48.5	\$255.6
200 Travel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
300 Contractual	\$1.7	\$1.8	\$1.8	\$1.8	\$1.9	\$9.0
400 Supplies	\$18.4	\$5.6	\$5.8	\$6.0	\$6.2	\$42.0
500 Equipment	\$8.0	\$0.0	\$0.0	\$0.0	\$0.0	\$8.0
Total Direct Costs	\$98.0	\$51.8	\$53.3	\$54.9	\$56.6	\$314.6

LITTLE SUSITNA CHUM SALMON ESCAPEMENT

Primary Objective: To count escapement of chum salmon in the Little Susitna River.

Description: Total escapement of chum salmon into the Little Susitna River is currently not assessed. A weir used to count escapement of coho salmon into the Little Susitna River is installed in late July, which provides only a partial count of chum salmon escapement. This project would initiate weir activities on approximately July 10 to count the entire chum salmon escapement. Age, sex, and length data will also be collected from chum salmon. The table below depicts funds necessary to extend the duration of the existing counting weir.

Duration: Five Years

ADFG Budget:

Line Item	FY09	FY10	FY11	FY12	FY13	Total
100 Personnel	\$9.4	\$9.7	\$10.0	\$10.3	\$10.6	\$50.0
200 Travel	\$0.0	\$0.0	\$0.0	\$2.7	\$2.8	\$5.5
300 Contractual	\$2.5	\$2.6	\$2.6	\$0.0	\$0.0	\$7.7
400 Supplies	\$1.3	\$1.3	\$1.4	\$1.4	\$1.5	\$6.9
500 Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total Direct Costs	\$13.2	\$13.6	\$14.0	\$14.4	\$14.9	\$70.1

LITTLE SUSITNA RIVER CHUM SALMON SPAWNER DISTRIBUTION

Primary Objective: To estimate distribution of spawning chum salmon in the Little Susitna River.

Description: Distribution and location of spawning habitat for chum salmon in the Little Susitna River is not well documented. To better understand where chum salmon spawn, adult chum salmon will be captured in the lower Little Susitna River and marked with a radio tag. Tagged fish will be monitored throughout the spawning season. Mobile tracking will be done by boat and aircraft to identify and define important spawning areas. Two stationary monitoring sites, one each at river kilometer 51 and 115, would provide distribution of spawners relative to these locations. These locations are the former and current locations, respectively, of a weir used to assess coho salmon and partial assessment of chum salmon escapement.

Duration: Four Years

ADFG Budget:

Line Item	FY09	FY10	FY11	FY12	FY13	Total
100 Personnel	\$60.3	\$91.6	\$94.4	\$97.2	\$0.0	\$343.5
200 Travel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
300 Contractual	\$3.0	\$3.4	\$3.5	\$3.6	\$0.0	\$13.5
400 Supplies	\$31.7	\$26.3	\$27.0	\$27.9	\$0.0	\$112.9
500 Equipment	\$31.0	\$0.0	\$0.0	\$0.0	\$0.0	\$31.0
Total Direct Costs	\$126.0	\$121.3	\$124.9	\$128.7	\$0.0	\$500.9

LITTLE SUSITNA RIVER CHUM SALMON SPAWNER DISTRIBUTION

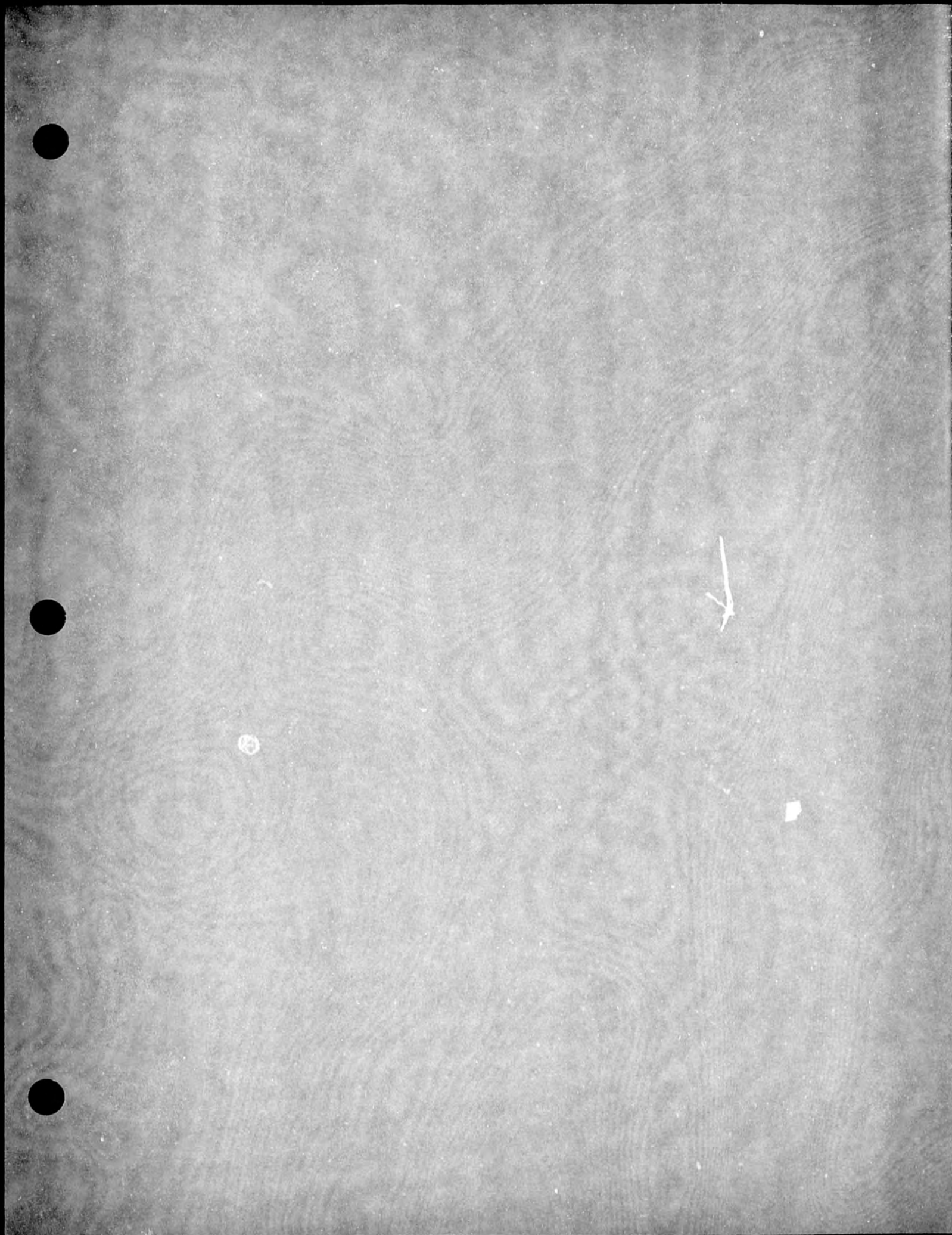
Primary Objective: To estimate distribution of spawning chum salmon in the Little Susitna River

Description: Distribution and location of spawning habitat for chum salmon in the Little Susitna River is not well documented. To better understand where chum salmon spawn, adult chum salmon will be captured in the lower Little Susitna River and marked with a radio tag. Tagged fish will be monitored throughout the spawning season. Mobile tracking will be done by boat and aircraft to identify and define important spawning areas. Two stationary monitoring sites, one each at river kilometer 51 and 115, would provide distribution of spawners relative to these locations. These locations are the former and current locations, respectively, of a weir used to assess coho salmon and partial assessment of chum salmon escapement.

Duration: Four Years

ADP Budget:

Line Item	FY09	FY10	FY11	FY12	FY13	Total
100 Personnel	250.3	291.6	294.4	297.2	20.0	2443.5
200 Travel	40.0	20.0	20.0	20.0	20.0	20.0
300 Contractual	23.0	23.4	23.2	23.0	20.0	213.2
400 Supplies	231.7	226.3	227.0	227.9	20.0	2113.9
500 Equipment	231.0	20.0	20.0	20.0	20.0	231.0
Total Direct Costs	2126.0	2121.3	2124.9	2128.1	20.0	2509.9



Anchor River Chinook Salmon Stock Status and Action Plan, 2001

By

Cook Inlet Staff

November 2001

Alaska Department of Fish and Game

Division of Sport Fish



Symbols and Abbreviations

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

Weights and measures (metric)

Centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

cubic feet per second	ft ³ /s
foot	ft
gallon	gal
inch	in
mile	mi
ounce	oz
pound	lb
quart	qt
yard	yd
Spell out acre and ton.	

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s
Spell out year, month, and week.	

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	Cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
And	&
At	@
Compass directions:	
east	E
north	N
south	S
west	W
Copyright	©

Corporate suffixes:

Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
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
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
Trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

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	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	+ or / (in equations)
equals	=
expected value	E
fork length	FL
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.
mid-eye-to-fork	MEF
minute (angular)	'
multiplied by	x
not significant	NS
null hypothesis	H ₀
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
standard length	SL
total length	TL
variance	Var

REPORT TO THE ALASKA BOARD OF FISHERIES

ANCHOR RIVER CHINOOK SALMON STOCK STATUS AND ACTION PLAN, 2001

by

Cook Inlet Staff

Alaska Department of Fish and Game: Division of Sport Fish, Habitat Division

November 2001

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EXECUTIVE SUMMARY

SYNOPSIS

In response to the guidelines established in the Sustainable Salmon Fisheries Policy (SSFP; 5 AAC 39.222), ADF&G has identified the Anchor River chinook salmon stock as a candidate stock of concern. Identification of Anchor River chinook salmon as a candidate stock is based on the definition of "management concern" contained 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 a salmon stock within the bounds of the SEG, BEG, OEG, or other specified management objectives for the fishery" (5 AAC 39.222 (f) (21)). For this determination, escapements of chinook salmon to the Anchor River were compared to the current SEG range (750 to 1,500 fish indexed by aerial survey). The policy defines "chronic inability" as "the continuing or anticipated inability to meet escapement thresholds over a four to five year period, which is approximately the generation time of most salmon species" (5 AAC 39.222 (f) (5)). Escapements of chinook salmon have fallen below the lower end of the current SEG range for the Anchor River in four of the past six years. The most recent management actions taken to correct this trend were the regulatory changes adopted in the 1995-1996 Board of Fisheries meeting cycle. These have proven to be insufficient to achieve the current SEG.

The SSFP recommends that salmon habitats be maintained to assure sustained yields by avoiding perturbations beyond normal levels of variability. The policy requires completion of detailed science-based assessments prior to authorization of development projects to assess any possible adverse effects on salmon habitat and populations from habitat alteration. Salmon habitat should be protected on a watershed basis including appropriate levels of protection of riparian habitat, water quality, and sufficient water flows to allow for salmon movements. All degraded salmon habitat resources should be restored to previously known natural productivity levels. Access to all essential habitat features should be protected. Long term monitoring should be conducted to assess current status of habitat and the effectiveness of restoration efforts.

STOCK ASSESSMENT

Escapement has been indexed via single aerial surveys beginning in 1976; 19 years of data are available. Aerial surveys are conducted when fish are on the spawning grounds and well after the sport fishery occurs. A general decline in escapement is apparent, with 6 of 12 escapement indices measured since 1989 (1989-2001) below the current SEG range of 750 to 1,500 fish (Table 1; Figure 1). Moreover, escapements in four of the last six consecutive years (1996-2001) have been below the current SEG range.

In-river sport harvest estimation began with a creel survey in 1976. Sport harvests from 1977-present have been estimated from the Statewide Harvest Survey. Harvests have ranged from a low of 578 (1989) to a high of 2,787 (1993) with an average harvest of 1,304 fish (1976-2000; Table 1; Figure 2). Annual harvests have exceeded the 1976-2000 mean in 9 of the 12 years since 1989, and average 1,371 since the regulatory actions of 1996-97.

Anchor River chinook salmon are likely harvested in the nearby marine sport fisheries at Deep Creek, Whiskey Gulch, and Anchor Point. No estimates of contribution are available, as no formal mark/recapture program has been conducted on Anchor River chinook salmon. However, chinook salmon stocks in both Deep Creek and Ninilchik River have been marked and recovered in the marine sport fishery. These stocks contribute 2-3% each of the total annual marine harvest.

It is assumed that Anchor River chinook salmon also contribute only a small fraction of the marine harvest. Early-run marine harvests peaked in 1995 at 8,230 chinook salmon (Table 1). Regulatory actions in 1996-97 created a guideline harvest of 8,000 fish in this fishery and restricted the fishery to reduce harvest of local chinook salmon stocks. Since this regulatory action, harvests have ranged from 4,702 to 5,783 chinook salmon (Table 1).

OUTLOOK AND FISH HABITAT ASSESSMENT

Although no formal forecast of chinook salmon return can be made for the Anchor River, it is likely that escapements will continue to be less than or at the lower end of the SEG range if exploitation rate is not reduced on this stock.

Applications for activities affecting fish habitat on the southern Kenai Peninsula have increased 30% since 1998, which is reflective of the increasing amount of recreational, commercial and industrial development in this area. Additional logging and road construction will occur on private lands in the lower drainage. The State 5-year Timber Sales Schedule includes sales on very large blocks (35 sq. miles) of State land in the upper Anchor River water shed. The Kenai Peninsula Borough owns adjacent lands, which could be sold if access is developed across state lands. If current exploratory wells are successful additional oil and gas wells, pipelines, roads and other facilities will be developed in the Anchor River drainage. ORV use and the existing trail system will continue to expand. Large blocks of private land on the lower Anchor River drainage will be subdivided into smaller recreational lots.

ALASKA BOARD OF FISHERIES ACTION

In response to the guidelines established in the Sustainable Salmon Fisheries Policy, the Alaska Board of Fisheries, during the November 8-12 regulatory meeting, classified the Anchor River chinook salmon stock as a management concern.

ESCAPEMENT GOAL EVALUATION

ESCAPEMENT GOAL HISTORY

Prior to 1999, the escapement goal for chinook salmon on the Anchor River was determined from a combination of rotary and fixed-wing aerial surveys and foot surveys done in the lower-middle river index area during 1966-1991 (Fried 1994; Szarzi and Begich 2001). The escapement goal adopted in 1993 was a minimum of 1,790 fish as determined from a combination of aerial and foot surveys. A more thorough analysis of these data in 1998 indicated that the foot surveys did not increase accuracy of the aerial surveys, so that the foot survey data were dropped from the escapement goal analysis. In addition, only rotary-wing survey data (1976-1997) were used to set an escapement goal range of 1,050 to 2,200 fish (Fried 1999). This range represented the 40th to 80th percentiles of the rotary-wing aerial survey counts from 1976-1997 rounded to the nearest 50 fish. This escapement goal range was adopted in 1999 (Fried 1999).

SPAWNER DATA AND SEG ANALYSIS

Per the Policy for Statewide Salmon Escapement Goals (5 AAC 39.223) spawner and return data were reviewed to determine the type (BEG or SEG) of escapement goal and recommend an escapement goal range for Anchor River chinook salmon. Chinook salmon harvest data are available from freshwater, but are not available for Anchor River fish in marine waters (Table 1). In addition escapements are indexed via rotary-wing aerial survey rather than enumerated (e.g., weir count, sonar, mark-recapture) so that total annual returns cannot be enumerated. No age composition data are available from harvests or escapements. Based on the limitations of these data, the escapement goal policy indicates that a Sustainable Escapement Goal (SEG) be set based on 5 AAC 39.223 (a)(3), "establish sustainable escapement goals (SEG) for salmon stocks for which the department can reliably estimate escapement levels when there is not sufficient information to enumerate total annual returns and the range of escapements that are used to develop BEGs."

In the escapement goal review of Bue and Hasbrouck (2001), spawner index counts from 1976-2001 were inspected and found to have a contrast (ratio of highest escapement to lowest escapement) of greater than 8 (Table 1). In addition, the level of exploitation was deemed to be at least moderate. This indicated that a SEG range should be set from the 25th and 75th percentiles of the escapement data and rounded to the nearest 50 fish (Bue and Hasbrouck 2001). The 25th percentile was 771 fish and the 75th percentile was 1,476, for a SEG range of 750 to 1,500 fish.

ESCAPEMENT GOAL RECOMMENDATION

The most recent escapement goal review for Anchor River recommended a SEG range of 750 to 1,500 chinook salmon based on a single rotary-wing aerial survey (Bue and Hasbrouck 2001). This goal was adopted by the department in October 2001.

MANAGEMENT ACTION PLAN OPTIONS FOR ADDRESSING STOCK OF CONCERN AS OUTLINED IN THE SUSTAINABLE FISHERIES POLICY

ANCHOR RIVER CHINOOK SALMON MANAGEMENT PLAN REVIEW/DEVELOPMENT

Current Stock Status

In response to the guidelines established in the Sustainable Salmon Fisheries Policy (5 AAC 39.222), the department during the October 11-13 work session identified Anchor River chinook salmon as a candidate for stock of management concern status. The Board of Fisheries, after reviewing stock status information and public input during the November 2001 regulatory meeting, classified Anchor River chinook salmon as a stock of management concern. This determination was based on the inability, despite the use of specific management measures, to maintain escapements for a salmon stock within the bounds of the SEG during four of the last six years.

C&T Use Finding and the Amount Necessary

The Anchor River is entirely within the Anchorage-Matsu-Kenai Nonsubsistence Area described in 5 AAC 99.015(a)(3). Based on this and 5 AAC 99.016, there are no subsistence fisheries on the Anchor River for any fish species.

Habitat Factors Adversely Affecting the Stock

Habitat alterations caused by increased recreational ATV use, continued salvage logging, extensive road and trail network, increased oil and gas exploration, development and transportation, gravel mining and recreational and residential development in the Anchor River drainage may be negatively affecting chinook salmon production in the Anchor River. However, habitat alteration is not thought to be the most significant factor in recent reductions in chinook escapement in the Anchor River. Recent studies by the USGS BRD, the USFS, and others have shown that fish population declines may lag more than 10 years behind habitat alterations. There are currently no projects in place to determine if habitat alterations are affecting the ability of the Anchor River or other southern Kenai drainage's to produce fish at this time.

Do New or Expanding Fisheries on this Stock Exist?

Presently there are no new or expanding fisheries on this stock. There are six proposals that would potentially expand fishing opportunities on Anchor River chinook salmon. Proposals 15 and 20 would reduce the size of the saltwater conservation zone at the mouth of the Anchor River. Proposal 16 would decrease the size of the special harvest zone south of the Anchor River conservation zone. Proposal 18 would eliminate the guideline harvest range in the UPPER COOK INLET MARINE EARLY-RUN KING SALMON MANAGEMENT PLAN. Proposal 19 would remove the restrictions to the special harvest zone in the UPPER COOK INLET MARINE EARLY-RUN KING SALMON MANAGEMENT PLAN on June 25 instead of July 1. Proposal 23 would increase the guideline harvest level in the UPPER COOK INLET MARINE EARLY-RUN KING SALMON MANAGEMENT PLAN by 25%.

Existing Management Plans

There is no existing management plan specific to Anchor River chinook salmon. The current regulations pertinent to chinook salmon in the Anchor River are:

5 AAC 56.022 WATERS; SEASONS; BAG, POSSESSION, AND SIZE LIMITS; AND SPECIAL PROVISIONS. (a)(2) Anchor River drainage.

Although not entirely specific to Anchor River chinook salmon, the following management plan does regulate the marine recreational fishery to protect local chinook salmon stocks on the Kenai Peninsula, including the Anchor River:

5 AAC 58.055 UPPER COOK INLET MARINE EARLY-RUN KING SALMON MANAGEMENT PLAN.

And in particular:

5 AAC 58.055 UPPER COOK INLET MARINE EARLY-RUN KING SALMON MANAGEMENT PLAN (d)(3).

There is no habitat management plan for the Anchor River drainage. Approximately one third of the drainage is privately owned, and the State and Kenai Peninsula Borough own the remainder. State lands within the Anchor River are managed under the provisions of the Kenai Area Plan. The bed and banks of the navigable portion of the Anchor River is state land. The Anchor River and its specified anadromous tributaries below the ordinary high water mark are protected under the provisions of the Anadromous Fish Act. Approximately 14 miles of the south Fork of the Anchor River are contained within the Anchor River Fritz Creek Critical Habitat Area which is managed to protect and preserve fish and wildlife habitat. There is a small amount of State Park Land on the lower Anchor River, which is managed for public recreation.

Identify Research Needed on Stock and Habitat

See the Research Plan on pages 8-10.

ACTION PLAN DEVELOPMENT

ANCHOR RIVER CHINOOK SALMON ACTION PLAN GOAL

To rebuild the Anchor River chinook salmon run back to levels that attain the current SEG range.

ACTION PLAN ALTERNATIVES

ACTION 1. Reduce the recreational harvest of chinook salmon in the Anchor River.

Objective

Modify existing regulations to reduce the harvest of chinook salmon in the Anchor River recreational fishery so that the SEG range can be achieved.

Background

Prior to 1990, the Anchor River was open to chinook salmon fishing on four or less consecutive weekends starting with the Memorial Day holiday weekend. Harvests of chinook salmon in the Anchor River averaged 1,077 fish and the escapement index averaged 1,674 fish during this time (Table 1). The current SEG range of 750 to 1,500 fish was attained or exceeded in all 14 years surveyed. After regulations were changed to five consecutive weekends open to fishing in 1989, harvests of chinook salmon increased to an average of 1,644 fish and the escapement index decreased to an average of 624 fish. The current SEG range was attained in only four of 10 years surveyed since 1991.

Specific Action Recommended to Implement the Objective

Proposal 30 seeks to reduce the number of weekends open to chinook salmon fishing on the Anchor River. A reduction in exploitation rate by reducing the number of open weekends from five to four could increase escapement levels in the Anchor River to within the SEG range.

Cost/Benefit Analysis

There would be an immediate loss of fishing opportunity and potential harvest of chinook salmon by recreational anglers on the Anchor River. Use of the Anchor River during the remaining four weekends could increase as a reaction to loss of the fifth weekend, causing increased crowding. Use of other Peninsula streams could also increase in reaction to the loss of fishing time on the Anchor River. However, if the SEG range is consistently attained as result of this action, fishing success in future years during the remaining four weekends could be improved due to larger returns.

Subsistence Issues/Considerations

None.

Performance Measures

The SEG range for Anchor River chinook would be met annually.

Sport Fish Research Plan to Address Stock of Concern

See Research Plan on page 9.

Action 2. Protect, maintain, and enhance anadromous and resident fish habitat throughout the Anchor River watershed.

Objective

Modify current land use patterns that may adversely affect fish habitat resource values in the Anchor River watershed through education in the form of technical assistance by ADF&G, increased community planning involvement, monitoring, and research.

Background

ADF&G regulates human use activities affecting the Anchor River watershed through issuance of Title 16 permits and enforcement of our authorities detailed in these statutes. The department interacts with other governmental agencies and the public in land use planning, oil and gas leasing, forestry-related plans, and issues related to community expansion and other land use activities. The number of these projects is increasing significantly within the Anchor River watershed. Specific projects include oversight of construction projects and restoration of habitat damage from illegal activities associated with commercial development. ADF&G has documented the extent of ORV use and culverts along with their associated impacts to fish habitat throughout the Anchor River watershed.

Specific Action Recommended to Implement the Objective

- Maintain existing levels of publicly-held (i.e. state, municipal, and federal) lands that support fish habitat
- Increase Title 16 bio-monitoring and enforcement in the Anchor River watershed
- Oppose any new large-scale commercial timber sales on public lands
- Enhance free and efficient fish passage and improve water quality by removing or repairing any stream crossing structures (primarily culverts) assumed to block fish movements or impair water quality as sources of sediment input
- Consult with the Board of Game and user groups to identify the growing problem of illegal ORV crossings of fish streams and adverse impacts to riparian habitat
- Pending availability of funds, purchase lands that will provide protection for fish habitat and investigate the use of conservation easements to protect riparian habitat and maintain healthy streambank conditions
- Foster development of a community-based watershed council for educating the public on proper land use practices that protect fish habitat and for monitoring watershed health and condition

Cost/Benefit Analysis

Maintenance of current levels of fish habitat quality and its geographic extent would result in stable levels of chinook salmon productivity and sustained regional economic values. Costs attributable to implementation of the action plan include costs to repair ORV trail damage, reduced access available to ORV users, and repairing culverts. Prevention of future damage to fish habitat will result in future restoration cost savings.

Subsistence Issues/Considerations

None.

Performance Measures

Maintain, restore and rehabilitate chinook salmon habitat in the Anchor River watershed based on an inventory of chinook salmon habitat and shoreline development (Cumulative Impacts Characterization Project).

Habitat Research Plan to Address Stock of Concern

See Research Plan on Page 10.

- Maintain existing levels of publicly-held (i.e. state, municipal, and federal) lands that support fish habitat
- Increase Title 16 pre-monitoring and enforcement in the Anchor River watershed
- Oppose any new large-scale commercial timber sales on public lands
- Enhance free and efficient fish passage and improve water quality by removing or repairing any stream crossing structures (primarily culverts) assumed to block fish movements or riparian water quality as sources of sediment input
- Consult with the Board of Game and user groups to identify the growing problem of illegal ORV crossings of fish streams and adverse impacts to riparian habitat
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RESEARCH PLAN

CURRENT RESEARCH PROJECTS – SPORT FISH DIVISION

To date there has been little research directed at chinook salmon in the Anchor River. Aside from the current aerial survey program and ancillary information collected from chinook salmon during other projects there has been no research to estimate the total abundance of chinook salmon or age composition information needed to better determine productivity parameters of this stock.

The following research programs have been and are being conducted to gather detailed information about chinook salmon stocks in the lower Kenai Peninsula:

- *Lower Cook Inlet Salmon Escapement* – This program supports an enumeration project for chinook salmon in the Ninilchik River and an enumeration project for coho salmon in Deep Creek. Chinook salmon are enumerated at a weir on the Ninilchik River and are sampled for age composition and contribution of hatchery to the escapement. In addition, this program supports catch sampling of chinook salmon in the recreational chinook salmon fishery in the Ninilchik River. Aerial surveys of chinook salmon in Deep Creek, Ninilchik River and Anchor River are conducted as part of this program. Total annual budget of this program is approximately \$25,000.
- *Lower Cook Inlet Egg Takes and Releases* – This program supports a chinook salmon egg take at the Ninilchik River and releases of chinook and coho salmon at various sites in Lower Cook Inlet (Homer Spit, Halibut Cove Lagoon, Seldovia Boat Harbor, Ninilchik River). Total annual budget of this program is approximately \$80,000.
- *Central Cook Inlet Marine Chinook Salmon CWT Recovery* – This program supports catch sampling of chinook salmon at marine recreational fisheries conducted out of the Homer, Anchor Point, and Deep Creek areas. This program also supports a full-time assistant area biologist position in the Homer area office. Chinook salmon are sampled for maturity, presence of a CWT, and location of capture. Total annual budget of this program is approximately \$115,000.
- *Southcentral Chinook Salmon Hatchery CWT* – This program supports the marking and tagging of 500,000 hatchery-reared chinook salmon in Cook Inlet and PWS, some of which are released at sites in Lower Cook Inlet. Total annual budget of this program is approximately \$90,000.

PROPOSED RESEARCH PROJECTS – SPORT FISH DIVISION

A recent review of Sport Fish Division programs in Lower Cook Inlet identified the need for better escapement and age composition information for chinook and coho salmon and steelhead, and the development of long-term monitoring of smolt abundance relative to changes in habitat due to logging, urbanization, and oil and gas exploration. As a result, existing programs in Sport Fish Division are being reprogrammed to develop a long-term monitoring program for salmon and resident species in the lower Kenai Peninsula.

The following research programs are planned to gather detailed information about chinook salmon stocks in the lower Kenai Peninsula:

- *Lower Cook Inlet Salmon Escapement* – This program will support an enumeration project for chinook and coho salmon in either the Anchor River (1st choice) or Deep Creek (2nd choice). A permanent weir structure will be installed immediately above the forks of the Anchor River in the south fork and a removable weir structure installed at the mouth of the North Fork, each will be sufficient to withstand high water during spring breakup. All salmon species will be enumerated along with steelhead trout and Dolly Varden. A CWT program will be initiated on wild chinook and coho smolts to determine smolt abundance and marine survival rates. The companion adult and juvenile enumeration projects will allow monitoring of long term changes in salmon abundance and production. Aerial surveys of chinook salmon in Deep Creek and Anchor River will be continued. Aerial survey counts will be compared to weir counts on Anchor River or Deep Creek to determine accuracy and precision of the aerial survey program. If weirs cannot be effectively deployed in the Anchor River, aerial survey counts will likely remain the chief method of assessing escapement. Aerial survey methodology concerning timing and distribution of chinook spawning will be calibrated periodically with multiple aerial surveys, comparison of aerial with ground surveys, and surveys extended into additional spawning habitats. The proposed annual budget of this program will be approximately \$125,000. The timeline for this program will likely be: 1) site location, permitting, and construction of permanent weir in 2002-2004, 2) begin capture and tagging of chinook and coho smolt in 2003-2004, 3) begin enumeration of adult salmon and steelhead in 2004.
- *Lower Cook Inlet Egg Takes and Releases* – This program will continue to support a chinook salmon egg take at the Ninilchik River and releases of chinook and coho salmon at various sites in Lower Cook Inlet (Homer Spit, Halibut Cove Lagoon, Seldovia Boat Harbor, Ninilchik River). Total annual budget of this program will likely remain approximately \$80,000.
- *Central Cook Inlet Marine Chinook Salmon CWT Recovery* – This program will be phased out in 2002 to fund the permanent weir structure and long-term monitoring of the Anchor River or Deep Creek.
- *Southcentral Chinook Salmon Hatchery CWT* – This program will continue to support the marking and tagging of 500,000 hatchery-reared chinook salmon in Cook Inlet and PWS, some of which are released at sites in Lower Cook Inlet through 2002. Total annual budget of this program is approximately \$90,000. Marking of chinook salmon with CWTs will be replaced with otolith banding in 2003.

CURRENT RESEARCH PROJECTS – HABITAT AND RESTORATION DIVISION

At this time, only a small number of basic research projects have been completed in the Anchor River watershed. The stimulus for these projects was based on a lack of fundamental information necessary for the division to fulfill its responsibilities to enforce Title 16 provisions and field observations that pointed to a growing problem with culverts and fish passage and unregulated ORV use.

The following research projects have been or are being conducted to address these informational needs:

- ❑ *Geographic Distribution of Anadromous Fish Habitat* – This is an ongoing project that attempts to identify anadromous fish presence and absence throughout the lower Kenai Peninsula, classifies and describes stream channels from basic morphology and metrics, and identifies habitat usage by species and life stage class.
- ❑ *Assessment of Off-road Vehicle (ORV) Use in the Lower Kenai Peninsula* -- This project documented all ORV trails and stream crossings on the lower Kenai Peninsula. Many of these stream crossings are unpermitted and result in adverse effects to fish habitat. Results of the project are available in a GIS product. Project findings are being used to work cooperatively with ORV user groups to develop guidelines for protecting fishery values.
- ❑ *Operational Effectiveness of Culverts for Fish Passage on Kenai Peninsula Logging Roads* – Project fieldwork was completed in 1999. Data analysis and a detailed GIS product for the lower Kenai Peninsula is available for current use. H&R staff are currently developing a draft report.
- ❑ *Inventory, Assessment, and Prioritization of Culverts on State Roads on the Kenai Peninsula* – Fieldwork for this project was completed during summer 2001. Program results for the Anchor River watershed will be used to identify and prioritize culverts for renovation, repair and maintenance on state roads. Total budget is approximately \$70,000.

PROPOSED RESEARCH PROJECTS – HABITAT AND RESTORATION DIVISION

The following new research projects are necessary to gather detailed information about chinook salmon habitat in the lower Kenai Peninsula:

- ❑ *An Assessment of the Cumulative Impacts of Development and Human Uses on Fish Habitat in the Anchor River Watershed (Cumulative Impact Characterization Study)* – This project will quantify and inventory natural and disturbed streambank conditions and fish habitat impacts and will assess chinook salmon habitat quality and cumulative impacts of shoreline development on fish habitat throughout the Anchor River watershed.
- ❑ *Development of a Geographic Information System for Characterizing and Predicting Potential Land Use Problems for Fish Habitat in the Anchor River Watershed* -- This project will develop a GIS specific to the Anchor River watershed that would document anadromous and resident fish habitat, land ownership, vegetation, flood plain delineation, KPB streambank protection zone, soils, human constructed structures, roads and trails, oil and gas activity, forestry, locations of ORV activity, stream crossing structures, and other pertinent mapped coverages.

LITERATURE CITED

- Bue, B. G. and J. J. Hasbrouck. 2001. Escapement goal review of salmon stocks of Upper Cook Inlet. Report to the Board of Fisheries, Alaska Department of Fish and Game, Sport Fish Division, Anchorage.
- Fried, S. M. 1994. Pacific salmon spawning escapement goals for the Prince William Sound, Cook Inlet, and Bristol Bay areas of Alaska. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Special Publication No. 8, Juneau.
- Fried, S. M. 1999. Upper Cook Inlet Pacific salmon biological escapement goal review: Department findings and recommendations to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A99-05, Anchorage.

Szarzi, N. and R. Begich, 2001. Recreational fisheries in the Lower Cook Inlet management area, 1995-2000. Report to the Board of Fisheries, Alaska Department of Fish and Game, Sport Fish Division, Anchorage.

Peninsula, classifies and describes stream channels from basic morphology and metrics, and identifies habitat usage by species and life stage class.

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- Fried, S. M. 1994. Pacific salmon spawning escapement goals for the Prince William Sound, Cook Inlet, and Bristol Bay areas of Alaska. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Special Publication No. 8, Juneau.
- Fried, S. M. 1999. Upper Cook Inlet Pacific salmon biological escapement goal review. Department findings and recommendations to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A99-02, Anchorage.

Table 1. Total effort, chinook salmon harvest, and chinook salmon escapement in the Anchor River, and total chinook salmon harvest in the early-run marine recreational fishery north of Bluff Point, 1977-2001.

Year	Effort ^a	Harvest ^b	Escapement ^c	Marine Harvest ^d
1976	Not available	830	2,125	5,495
1977	31,515	1,077	3,585	4,617
1978	42,671	2,109	2,209	2,669
1979	44,220	1,913	1,335	3,088
1980	33,272	605	No survey	521
1981	34,257	1,069	1,066	2,363
1982	24,709	718	1,493	2,497
1983	28,881	1,269	1,033	1,000
1984	26,919	998	1,087	2,386
1985	31,715	672	1,328	5,087
1986	34,938	1,098	2,287	3,106
1987	39,045	761	2,524	3,613
1988	24,356	976	1,458	4,243
1989	19,145	578	940	3,863
1990	28,829	1,479	967	4,694
1991	22,187	1,047	589	4,824
1992	24,028	1,685	99	5,996
1993	29,338	2,787	1,110	8,136
1994	27,856	2,478	837	6,867
1995	25,888	1,475	No survey	8,230
1996	16,016	1,483	277	4,702
1997	17,020	1,563	477	5,646
1998	14,310	783	789	5,783
1999	21,184	1,409	685	4,907
2000	23,141	1,727	752	4,773
2001	Not available	Not available	414	Not available
Mean (76-00)	27,727	1,304	1,263	4,364

a Effort is the number of recreational angler-days expended on the Anchor River for all species.

b Harvest is the harvest of chinook salmon from the Anchor River.

c Escapement is the aerial survey index of escapement of chinook salmon into the Anchor River.

d Marine harvest is the harvest of all chinook salmon in saltwater north of Bluff Point prior to June 25.

Table 1. Total effort, chinook salmon harvest, and chinook salmon escapement in the Anchor River and total chinook salmon harvest in the city and within recreational fishery north of Bluff Point 1977-2001.

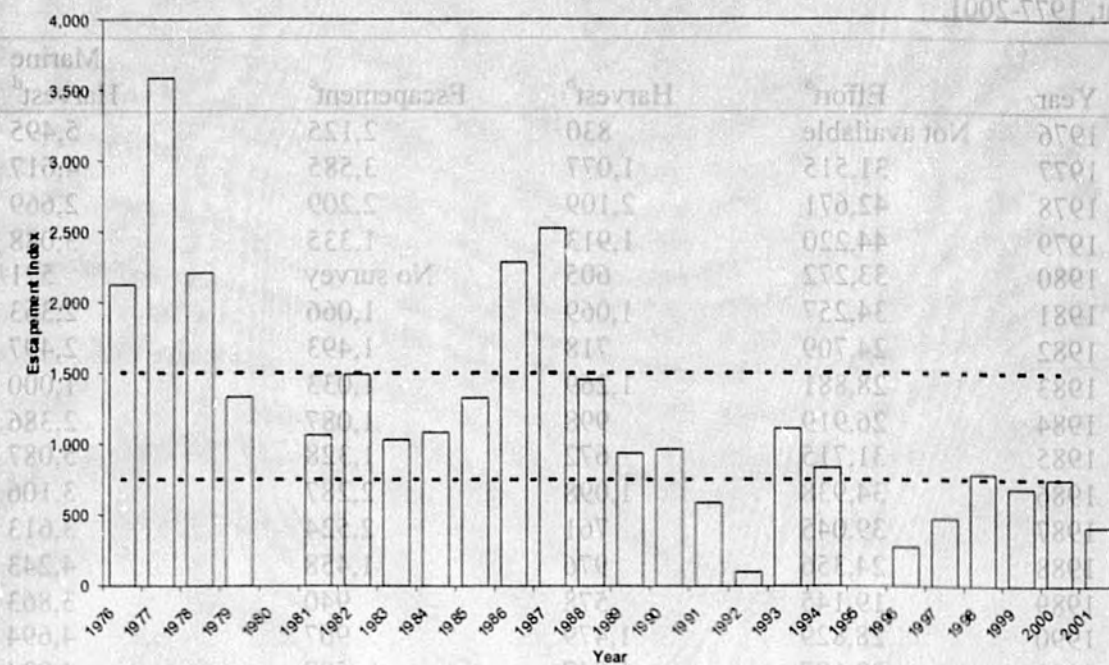


Figure 1. Escapement index of chinook salmon in the Anchor River (bars) relative to the current SEG range of 750-1,500 fish (dotted lines), 1976-2001.

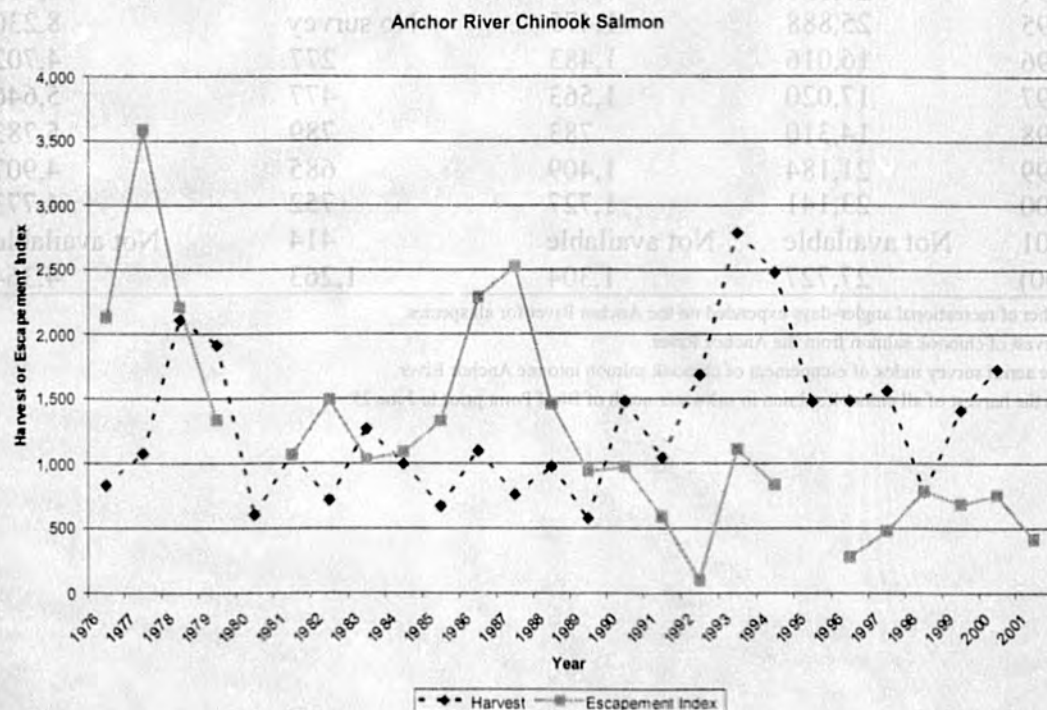
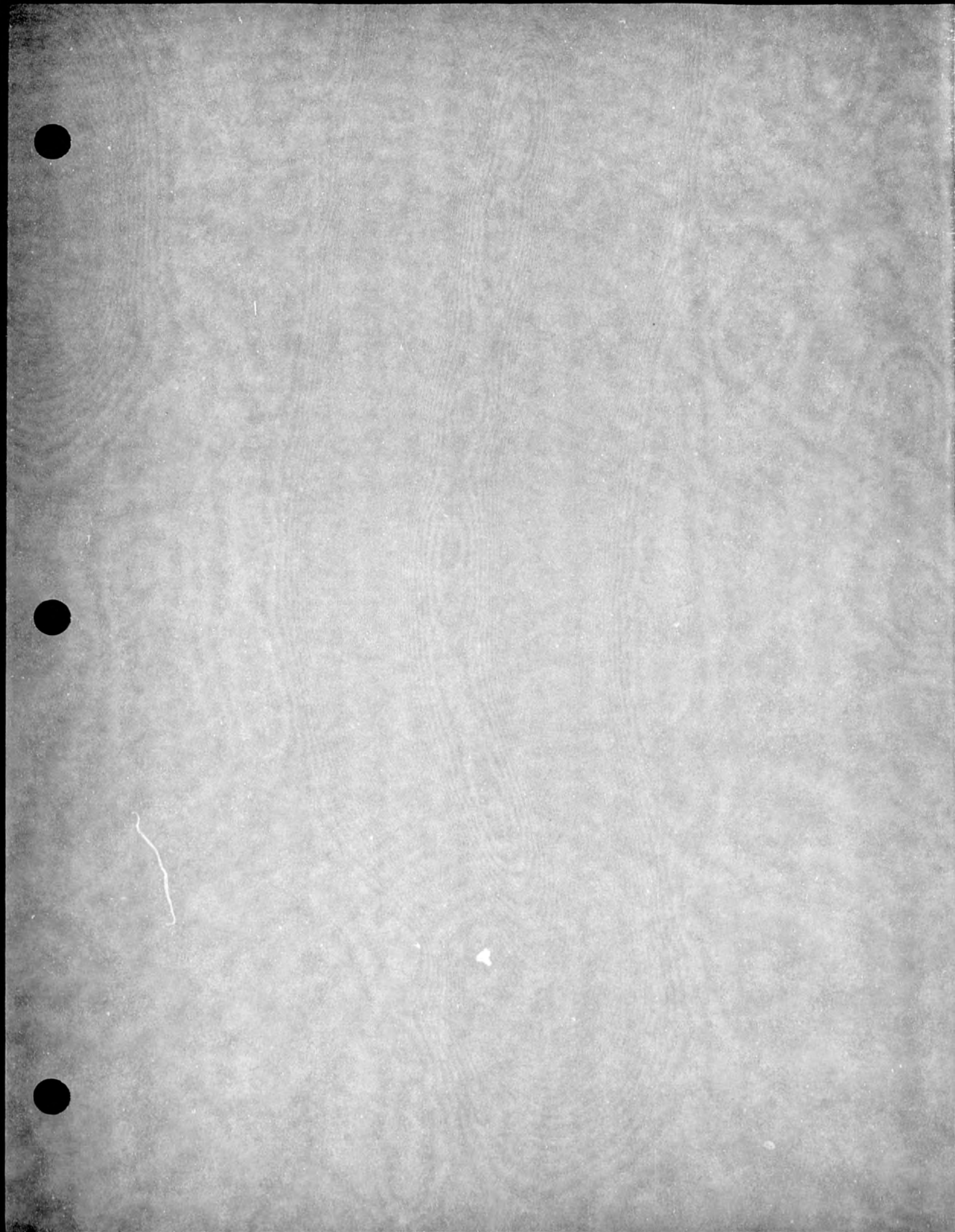


Figure 2. Freshwater harvest (dotted line) and escapement index (solid line) of chinook salmon in the Anchor River, 1976-2001.



Kvichak River Sockeye Salmon Stock Status and Action Plan, 2006; a Report to the Alaska Board of Fisheries

by
Steve Morstad
and
Timothy T. Baker

November 2006

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



Special Publication No. 9

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SPECIAL PUBLICATION NO. 06-26

KVICHAK RIVER SOCKEYE SALMON STOCK STATUS AND ACTION PLAN, 2006; A REPORT TO THE ALASKA BOARD OF FISHERIES

by

Steve Morstad

Alaska Department of Fish and Game, Division of Commercial Fisheries, King Salmon

and

Timothy T. Baker

Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage

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November 2006

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KVICHAK RIVER SOCKEYE SALMON STOCK STATUS AND ACTION PLAN, 2006; A REPORT TO THE ALASKA BOARD OF FISHERIES

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ABSTRACT

In response to the guidelines established in the *Sustainable Salmon Fisheries Policy* (ADF&G 2000), the Alaska Department of Fish and Game (ADF&G) first classified the Kvichak River sockeye salmon *Oncorhynchus nerka* stock as a "Stock of Yield Concern" in 2001 (Bristol Bay Staff 2000). The 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 appears to be helping the Kvichak River sockeye salmon stock recover: there was a surplus harvest of Kvichak River sockeye salmon in the commercial fishery in 2006; minimum escapement goals were met in 2005 and 2006; recruits per spawner have improved in recent years; and the Kvichak River sockeye salmon stock exploitation rates have been significantly reduced in recent years. Even with these recent improvements, there is still need for concern. The sockeye salmon escapements to the Kvichak River have fallen below the lower end of the current escapement goal during 7 of the past 11 years, including 5 of the past 7 years. Therefore, it is recommended that the Kvichak River sockeye salmon stock remain classified as a "Stock of Management Concern." ADF&G would like to see the continued improvement of the Kvichak River sockeye salmon stock before demoting to a lower classification.

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 *Sustainable Salmon Fisheries Policy* (SSFP; 5 AAC 39.222) directs the Alaska Department of Fish and Game (ADF&G) to provide the Alaska Board of Fisheries (BOF), 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. In the Bristol Bay Management Area one stock (Kvichak River sockeye salmon, *Oncorhynchus nerka*) has been identified (Figures 1 and 2). This report provides ADF&G's assessment of this candidate stock of concern and recommendation that Kvichak River sockeye salmon remain a stock of management concern.

KVICHAK RIVER SOCKEYE SALMON

Stock Assessment

Previously the Kvichak River sockeye salmon stock, on average, was the largest contributor to the Bristol Bay salmon harvest. The Kvichak stock has historically had a 5-year cycle with individual years labeled as: peak, pre-peak and off-cycle years. Since 1955, the number of Kvichak River spawners has ranged from 227,000 to 24 million sockeye salmon (Table 1). The largest recorded total run was 48 million in 1965, a peak cycle year (Table 1). ADF&G has operated a counting tower to enumerate salmon escapements on the Kvichak River since 1955. Additionally, each spring from 1975 to 2003, the number of migrating smolt were 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.

The current Biological Escapement Goal (BEG) for Kvichak River sockeye salmon, adopted in 1997, is 2 million to 6 million for off-cycle years and 6 million to 10 million for pre-peak and peak years (Fair 2000). Setting a BEG for the Kvichak River sockeye salmon run has proven difficult because of 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 4–20 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 pre-peak 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 with 7 of the past 11 years below the goal (Figure 3).

Commercial harvests have also declined in recent years from a combined average of approximately 5.7 million (1966 to 1995) to an average of approximately 1.4 million (1996 to 2005; Figure 4). Moreover, commercial fishing was restricted in the Naknek-Kvichak District at some point each year since 1996, forcing the fishery into the Naknek River Special Harvest Area. In recent years, as directed in *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 drainage.

Prior to commercial fishing, area residents harvested Bristol Bay salmon for subsistence uses. The BOF determination of the amount reasonably necessary for subsistence uses is described in 5 AAC 01.336 as 157,000–172,171 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 subsistence harvest averaged about 92,000 from 1985–1994 and 72,000 from 1995–2004. Annual subsistence harvest of Kvichak River sockeye salmon averaged 60,000 fish from 1985 to 2004 (Westing et al. 2006) with recent harvests ranging from 33,000 to 53,000 (2000–2005).

In April 2006 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). While this review is ongoing, fisheries data analyses indicate that the current Kvichak River sockeye salmon escapement goal will be changed from a BEG to an Sustainable Escapement Goal (SEG), but otherwise remain unchanged. Results of this escapement goal review will be presented at the December 2006 BOF meeting.

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 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 and Fair 2006). 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 pre- and inseason projections to provide information on run size. Additionally, ADF&G 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 Alaska Board of Fisheries meeting. In response to the "Stock of Yield Concern" designation, the BOF modified 5AAC 06.357 *Ugashik River Sockeye Salmon Special Harvest Area Management Plan*, 5AAC 06.359 *Egegik River Sockeye Salmon Special Harvest Area Management Plan*, 5AAC 06.360 *Naknek River Sockeye Salmon Special Harvest Area Management Plan*, and 5AAC 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 2003 December Bristol Bay BOF meeting, several regulation changes were adopted concerning the Naknek/Kvichak District. The Kvichak 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)).

Regulatory History

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

Permits are required to harvest salmon for subsistence purposes in the Kvichak River drainage. Since 1990, under state regulations, all state of Alaska residents have been eligible to participate in subsistence salmon fishing in all Bristol Bay drainages. Gillnets up to 25 fathoms are the only recognized legal subsistence gear.

The commercial fishery is closed between June 1 and September 30, but it can be opened by emergency order. 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 (5AAC 06.355; ADF&G 2001). This plan 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 (5AAC 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 the 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* (5AAC 06.360; ADF&G 2001). This plan states that on or after June 27, if Kvichak River cumulative 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* (5AAC 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 the Naknek-Kvichak District and to establish management measures for ADF&G to achieve the allocation.

Stock of Concern Analyses

Escapement

During the most recent 5 years, the minimum escapement goal was achieved in 2005 and 2006 (Table 2; Figure 3). The minimum escapement goal has been met in only 4 out of the last 11 years: 1998, 1999, 2005, and 2006 (Figure 3). It should be noted that the off-cycle escapement goal was changed from 4 million to 2 million (variable) in 1997 (implemented in 1998; Table 2). Escapements in 1996 and 1997 would not have met the current off-cycle goal of 2 million although the shortfall is not alarming. However, ADF&G was concerned with the 70% escapement shortfall during a Kvichak peak year (2000). There have been two pre-peak (1959 and 1964) and no peak year escapements which were less than the escapement in 2000. ADF&G was encouraged that the minimum escapement goal was met in 2005 and 2006.

Yield

The actual yield was less than the median yield in all years (both peak and off-cycle) except one (2006) of the most recent 5-year period (Table 3 and Figure 4). The term "lower range of historic harvest" was not defined in the "Sustainable Salmon Fisheries Policy." Therefore, the degree of yield concern and the point at which a yield concern was classified were subject to interpretation.

Exploitation Rate

The commercial fishing exploitation rate on Kvichak sockeye salmon was significantly reduced in recent years, especially for very low runs (Figure 5). For example, in 2002 and 2003, the exploitation rate of Kvichak stocks was less than 2%.

Return per Spawner

There has been an increase in the production of the Kvichak River sockeye salmon stock in recent years. The return per spawner from brood years 1991–1999 averaged 0.8 fish per spawner (Figure 6). There has been an increase in the return per spawner in recent years (brood years 2000–2002) averaging 3.1 returns per spawner since 2000. We expect the return per spawner to increase for these recent years even further because the return for these broods has not been completed.

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 surplus harvest of Kvichak River sockeye salmon in the commercial fishery in 2005 and 2006; minimum escapement goals were met in 2005 and 2006; recruits per spawner have improved in recent years; and Kvichak River sockeye salmon stock exploitation rates have been significantly reduced in recent years. Even with these recent improvements, there is still need for concern. The sockeye salmon escapements to the Kvichak River have fallen below the lower end of the current escapement goal during 7 of the past 11 years, including 5 of the past 7 years. Therefore, it is recommended that the Kvichak River sockeye salmon stock remain classified as a "Stock of Management Concern". AD&FG would like to see the continued improvement of the Kvichak River sockeye salmon stock for 4 or 5 years before demoting to a lower classification.

KVICHAK RIVER SOCKEYE SALMON ACTION PLAN

ACTION PLAN REVIEW

Current Stock Status

In response to the guidelines established in the Sustainable Salmon Fisheries Policy, the Alaska Board of Fisheries during the October 1–3, 2003 work session classified the Kvichak River sockeye salmon stock as a management concern. 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 BEG for 4 of the past 5 years.

Customary and Traditional Use Finding and the Amount Necessary

The Alaska Board of Fisheries has made a positive finding for Customary and Traditional Use for all salmon in the Bristol Bay area of 157,000 to 172,171 salmon. Of those, 55,000 to 65,000 sockeye salmon were determined reasonably necessary for Kvichak River drainage.

Habitat Factors Adversely Affecting the Stock

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

Do New Or Expanding Fisheries On This Stock Exist?

Presently, there are no new or expanding fisheries on this stock. There are no proposals specific to expanding fisheries on this stock.

Existing Management Plans

The Board reviews existing management plans for consistency with principles and criteria of the Sustainable Salmon Fisheries Policy or adopts new management for the stock consistent with the principles and criteria of the Sustainable Salmon Fisheries Policy.

The following are the current 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/KVCHIAK 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 FISHERIES MANAGEMENT AND ALLOCATION PLAN.

5 AAC 09.200. DESCRIPTION OF DISTRICTS AND SECTIONS.

5 AAC 09.310. FISHING SEASONS.

ACTION PLAN DEVELOPMENT

Kvichak Sockeye Salmon Action Plan Goal

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

Previous Actions

During the BOF meeting in January of 2001, ADF&G presented a summary of four potential action plans (Bristol Bay staff, 2000) of which three reduced the exploitation rate on Kvichak stocks in each eastside district. In deliberation the BOF made the following changes: (1) In the Ugashik District, when the preseason forecast of Kvichak sockeye salmon does not provide for an exploitation rate greater than 40%, fishing time between June 16 to June 23 can not exceed 48-hours. In addition, if the Naknek River Special Harvest Area (NRSOA) is in effect anytime before June 29, fishing will be restricted to the Ugashik River Special Harvest Area (URSHA); (2) In the Egegik District, when the NRSOA is open to commercial fishing then fishing in the Egegik District is restricted to the Egegik River Special Harvest Area (ERSHA) and will remain in the ERSOA until fishing resumes in the Naknek/Kvichak District; and (3) In the

Naknek/Kvichak District, the 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 escapement goal range from 1.4 million to 2.0-million sockeye salmon. During the 2003 BOF meeting, ADF&G presented one additional action plan item to further reduce the exploitation rate on Kvichak stocks (Bristol Bay 2003). The BOF required that fishing will 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 biological escapement goal (5 AAC 06.360 (h)).

Management Under Current Regulations

In 2004, the forecast for the Kvichak River projected a harvestable surplus of 6.6 million sockeye salmon with an escapement goal of 6.0 million. The BOF 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 the eastside fisheries. Limited fishing occurred in the Naknek/Kvichak District prior to June 23 with most of the harvest caught in the General District. Commercial fishing was restricted to the Naknek Section for the drift fleet and marginal fishing in the 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 District was closed and fishing was restricted to the NRSHA. The final escapement was 5.5 million sockeye salmon which was 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 both in 2005 and 2006 was that the Kvichak River met its escapement objectives.

It is ADF&G's opinion that it 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, it is the department opinion that the restrictions in current regulations are sufficient to minimize the exploitation and insure the vast majority of the sockeye salmon returning to the 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.

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Table 1.-Historical yield, escapement and total inshore run of Kishikaw River sockeye salmon.

Year	Actual Yield		Actual Escapement		Total Inshore Run	
	Pre-Peak & Peak	Off-cycle	Pre-Peak & Peak	Off-cycle	Pre-Peak & Peak	Off-cycle
1959	281,910		680,000		961,910	
1960	2,970,500		14,830,000		22,800,500	
1961		6,603,834		3,703,940		10,307,774
1962		1,813,401		2,280,484		4,093,885
1963		223,459		338,500		561,959
1964	163,460		927,130		1,090,590	
1965	7,782,604		24,022,930		31,805,534	
1966		4,188,435		3,712,124		7,900,559
1967		1,600,643		2,216,208		3,816,851
1968		287,207		3,251,840		3,539,047
1969	3,700,288		8,204,304		11,904,592	
1970	10,281,234		13,036,206		23,317,440	
1971		4,704,803		3,187,302		7,892,105
1972		143,130		126,294		269,424
1973		21,301		126,294		247,595
1974	148,202		4,433,444		4,581,646	
1975	4,602,407		12,140,430		16,742,837	
1976		1,448,180		1,964,123		3,412,303
1977		399,404		1,241,144		1,640,548
1978		3,813,030		4,140,288		7,953,318
1979	13,418,230		5,112,143		18,530,373	
1980	12,743,874		22,302,208		35,046,082	
1981		4,334,737		6,134,108		10,468,845
1982		1,658,475		1,114,840		2,773,315
1983		10,434,901		1,150,983		11,585,884
1984	12,323,303		10,460,670		22,783,973	
1985	6,283,103		7,217,046		13,499,149	
1986		587,303		1,178,353		1,765,656
1987		3,330,834		6,003,880		9,334,714
1988		5,824,364		4,003,210		9,827,574
1989	7,142,930		8,117,300		15,260,230	
1990	10,211,213		6,970,020		17,181,233	
1991		3,808,877		4,223,246		8,032,123
1992		2,118,413		4,123,284		6,241,697
1993		8,287,257		4,022,166		12,309,423
1994	22,840,013		8,717,840		31,557,853	
1995	17,741,906		10,148,030		27,889,936	
1996		1,943,208		1,450,237		3,393,445
1997		1,129,480		1,103,132		2,232,612
1998		1,069,304		2,360,074		3,429,378
1999	6,743,246		6,186,914		12,930,160	
2000	1,018,680		1,847,180		2,865,860	
2001		370,332		1,922,248		2,292,580
2002	9,203,440		8,306,023		17,509,463	
2003	17,782,664		24,122,436		41,905,100	
2004	148,640		680,000		828,640	
2005		34,344		1,880,000		1,914,344
2006	7,217,186		2,200,134		9,417,320	
2007		837,440		2,330,332		3,167,772
2008	2,338,218		3,098,230		5,436,448	

* Yield is a preliminary estimate in 2008.

Table 1.—Historical yield, escapement and total inshore run of Kvichak River sockeye salmon.

Year	Actual Yield		Actual Escapement		Total Inshore Run	
	Pre-Peak & Peak	Off-cycle	Pre-Peak & Peak	Off-Cycle	Pre-Peak & Peak	Off-Cycle
1959	281,930		680,000		961,930	
1960	7,976,500		14,630,000		22,606,500	
1961		6,863,814		3,705,849		10,569,663
1962		1,833,401		2,580,884		4,414,285
1963		223,459		338,760		562,219
1964	763,486		957,120		1,720,606	
1965	17,785,664		24,325,926		42,111,590	
1966		4,168,575		3,775,184		7,943,759
1967		1,800,652		3,216,208		5,016,860
1968		387,565		2,557,440		2,945,005
1969	3,760,565		8,394,204		12,154,769	
1970	16,581,224		13,935,306		30,516,530	
1971		3,764,861		2,387,392		6,152,253
1972		342,150		1,009,962		1,352,112
1973		21,791		226,554		248,345
1974	148,595		4,433,844		4,582,439	
1975	1,605,407		13,140,450		14,745,857	
1976		1,458,180		1,965,282		3,423,462
1977		739,464		1,341,144		2,080,608
1978		3,815,636		4,149,288		7,964,924
1979	13,418,829		11,218,434		24,637,263	
1980	12,743,074		22,505,268		35,248,342	
1981		5,234,733		1,754,358		6,989,091
1982		1,858,475		1,134,840		2,993,315
1983		16,534,901		3,569,982		20,104,883
1984	12,523,803		10,490,670		23,014,473	
1985	6,183,103		7,211,046		13,394,149	
1986		787,303		1,179,322		1,966,625
1987		3,526,824		6,065,880		9,592,704
1988		2,654,364		4,065,216		6,719,580
1989	11,456,509		8,317,500		19,774,009	
1990	10,551,217		6,970,020		17,521,237	
1991		3,808,873		4,222,788		8,031,661
1992		5,718,947		4,725,864		10,444,811
1993		5,287,523		4,025,166		9,312,689
1994	13,893,613		8,337,840		22,231,453	
1995	17,391,906		10,138,720		27,530,626	
1996		1,983,269		1,450,578		3,433,847
1997		179,480		1,503,732		1,683,212
1998		1,069,294		2,296,074		3,365,368
1999	6,392,296		6,196,914		12,589,210	
2000	1,026,986		1,827,780		2,854,766	
2001		330,538		1,095,348		1,425,886
MED	9,263,859	1,858,475	8,366,022	2,387,392	18,647,623	4,414,285
MAX	17,785,664	16,534,901	24,325,926	6,065,880	42,111,590	20,104,883
MIN	148,595	21,791	680,000	226,554	961,930	248,345
2002				703,884		703,884
2003		34,244		1,686,804		1,721,048
2004	2,211,186		5,500,134		7,711,320	
2005		532,450		2,320,332		2,852,782
2006		2,736,218 ^a		3,068,226		5,804,444

^a Yield is a preliminary estimate in 2006.

Table 2.—Escapement analysis of Kvichak River sockeye salmon, 2002–2006.

Year	Actual Escapement	Minimum Escapement Goal	Difference	% Deviation from Goal ^a	Escapement > Goal	Frequency of Occurrence ^b
2002	703,884	2,000,000	-1,296,116	-65%	No	3 (n=27)
2003	1,686,804	2,000,000	-313,196	-16%	No	9 (n=27)
2004	5,500,134	6,000,000	-499,866	-8%	No	4 (n=27)
2005	2,320,332	2,000,000	320,332	16%	Yes	13 (n=27)
2006	3,068,226	2,000,000	1,068,226	53%	Yes	18 (n=27)

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

^b The number of escapement observations (1956–1998) which are less than the escapement of the current year.

Table 3.—Comparison of recent (2002–2006) pre-peak, peak and off-cycle yields to historical median yield for Kvichak River sockeye salmon.

Year	Historical Median Yield		Difference	% Deviation from Median ^a	Yield < Lower Range ^b	Frequency of Occurrence ^c
	Actual Yield	Pre-peak, Peak 1959–2000, n=18 Off-cycle 1961–2001, n=25				
2002	0	1,858,475	-1,858,475	-100%	Yes	0 (n=27)
2003	34,244	1,858,475	-1,824,231	-98%	No	2 (n=27)
2004	2,211,186	9,263,859	-7,052,673	-76%	No	5 (n=27)
2005	532,450	1,858,475	-1,326,025	-71%	No	8 (n=27)
2006	2,736,218	1,858,475	877,743	47%	No	18 (n=27)

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

^b Lower range of Pre-Peak and Peak years was 148,595 and off-cycle years were 21,791.

^c The number of yield observations (1959–2001) which are less than the yield of the current year.

^d Yield is a preliminary estimate in 2006.

**Bristol Bay Area Commercial
Salmon Fishery Management Districts**

Alaska Department of Fish and Game

Division of Commercial Fisheries

(For Illustration Purposes Only - BBSALALL.PPT, Revised 10/14/97)

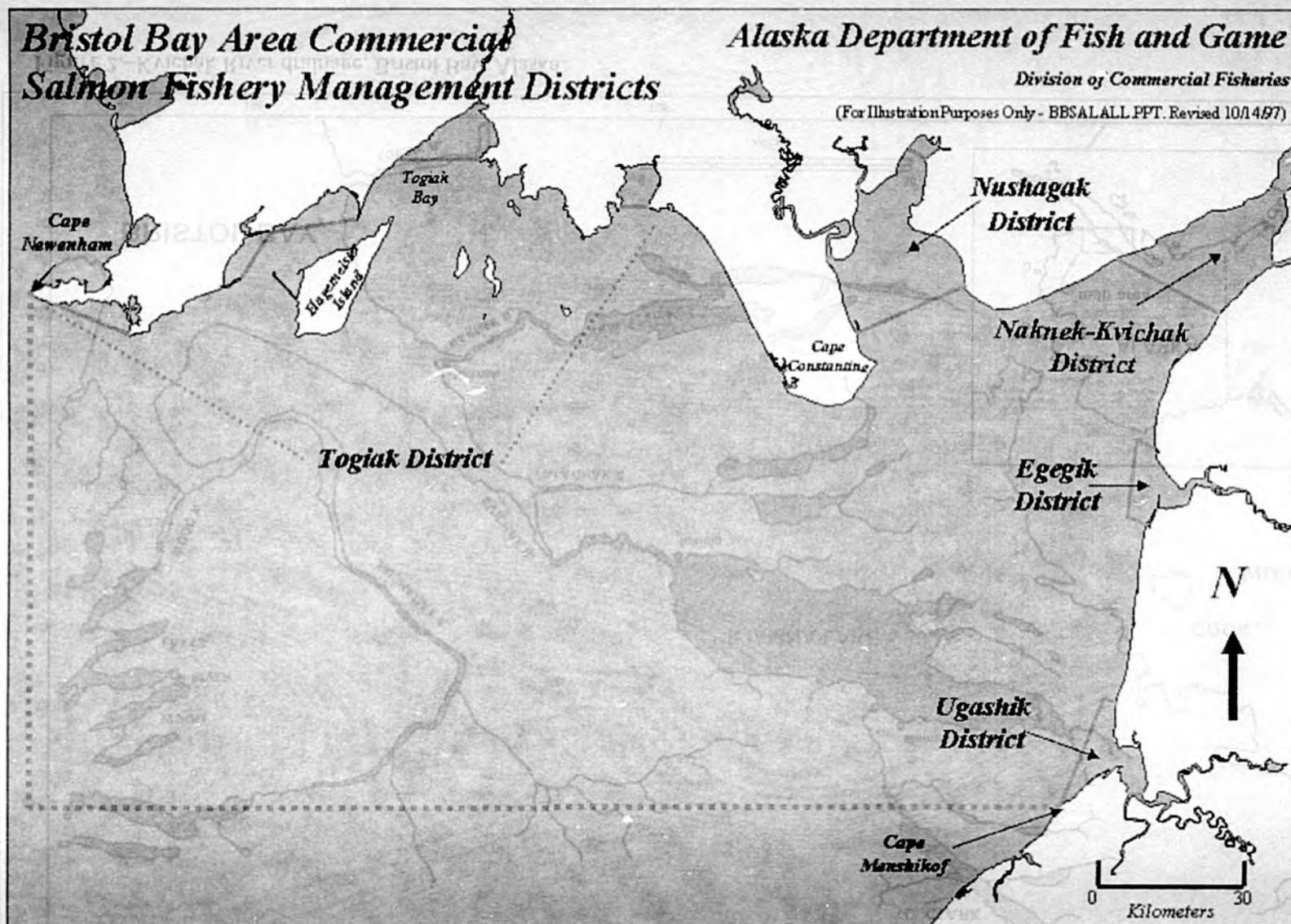


Figure 1.—Bristol Bay commercial salmon fishery management area, Alaska.

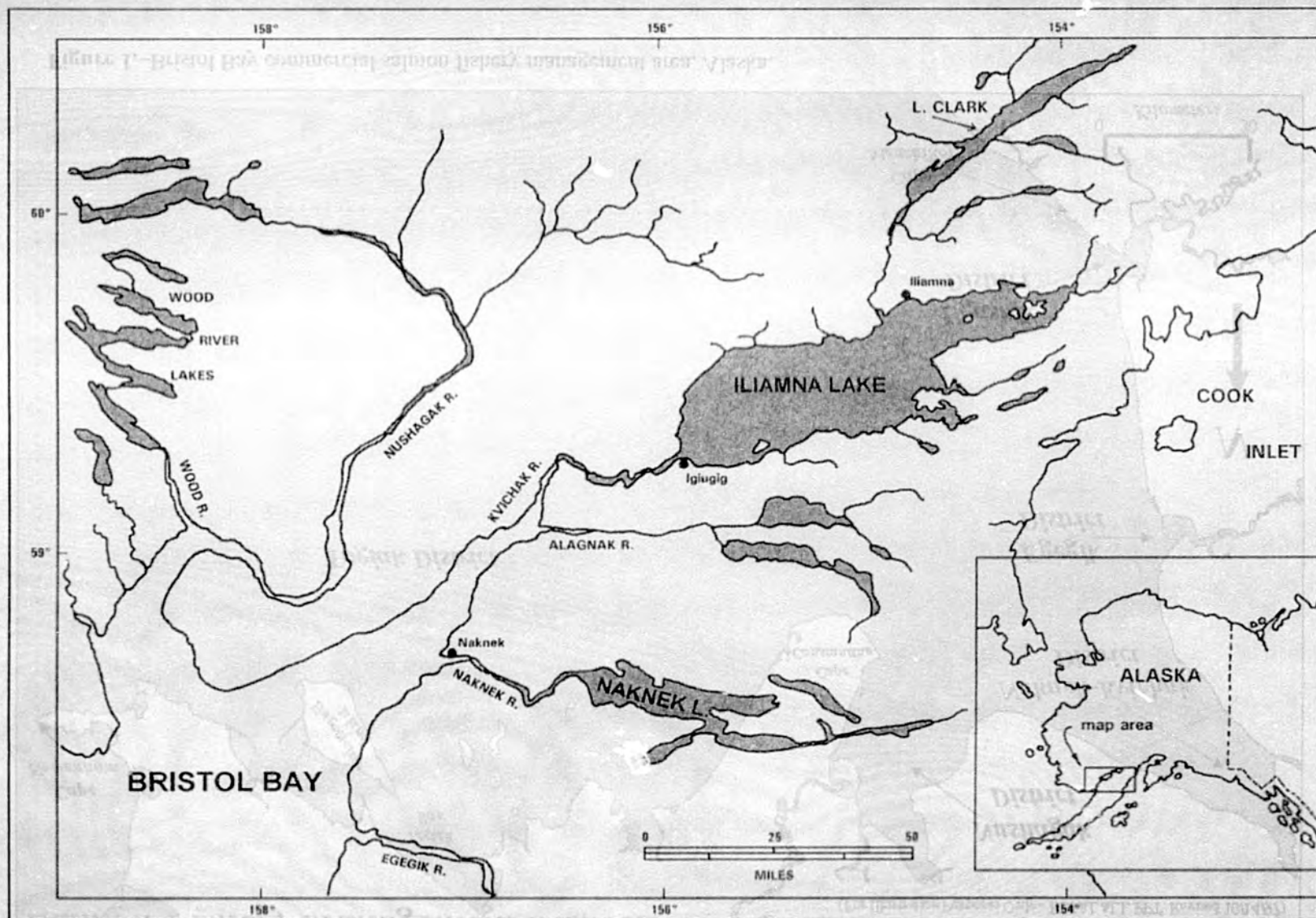


Figure 2.—Kvichak River drainage, Bristol Bay, Alaska.

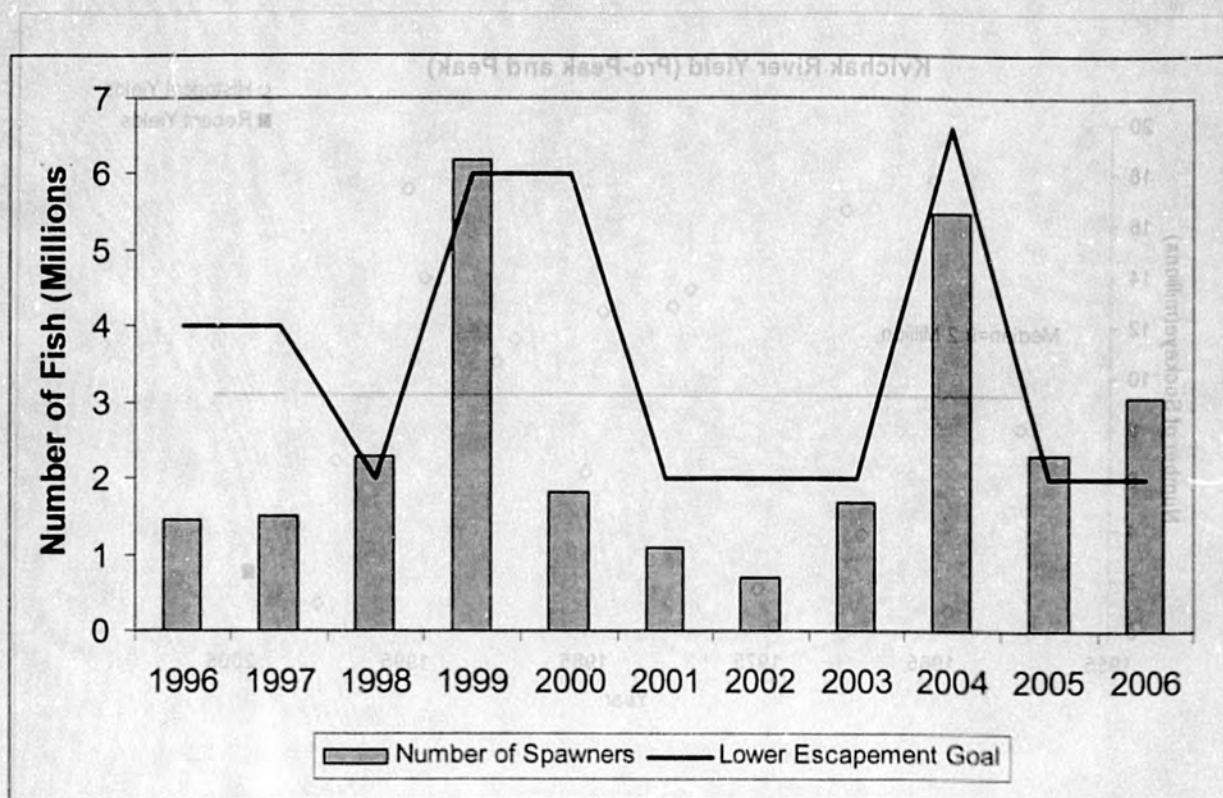


Figure 3.—Kvichak River sockeye salmon lower escapement goals and number of spawners, 1996–2006.

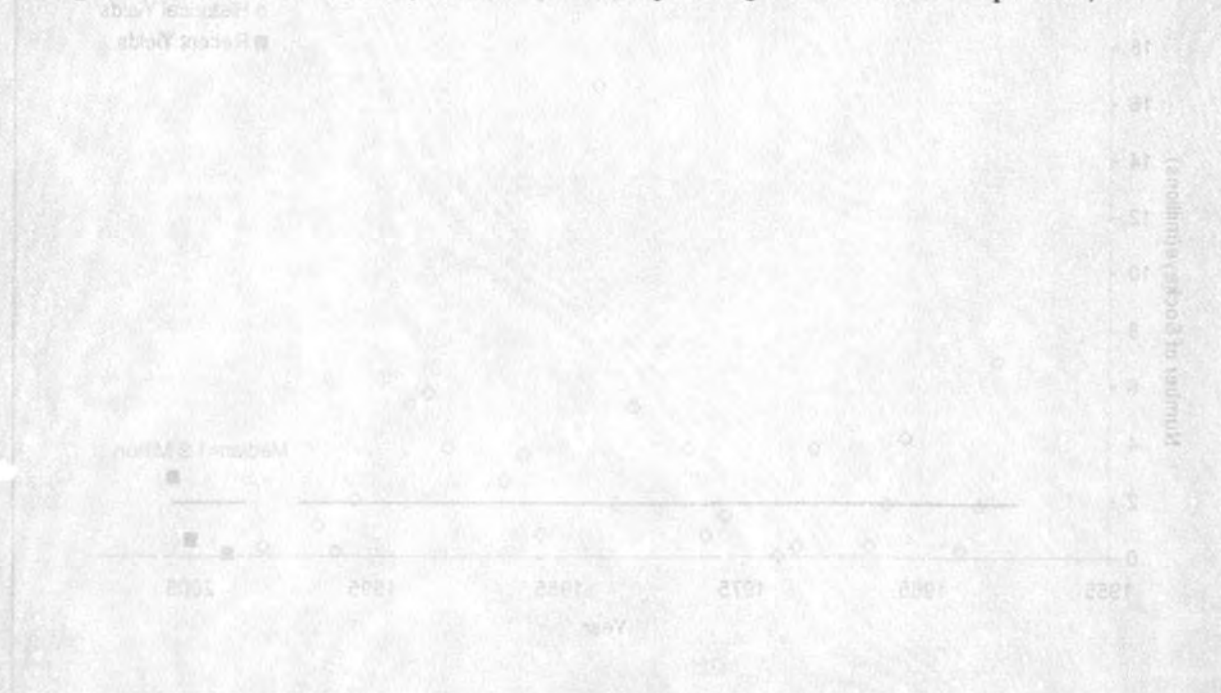


Figure 4.—Kvichak River sockeye salmon yield by year.

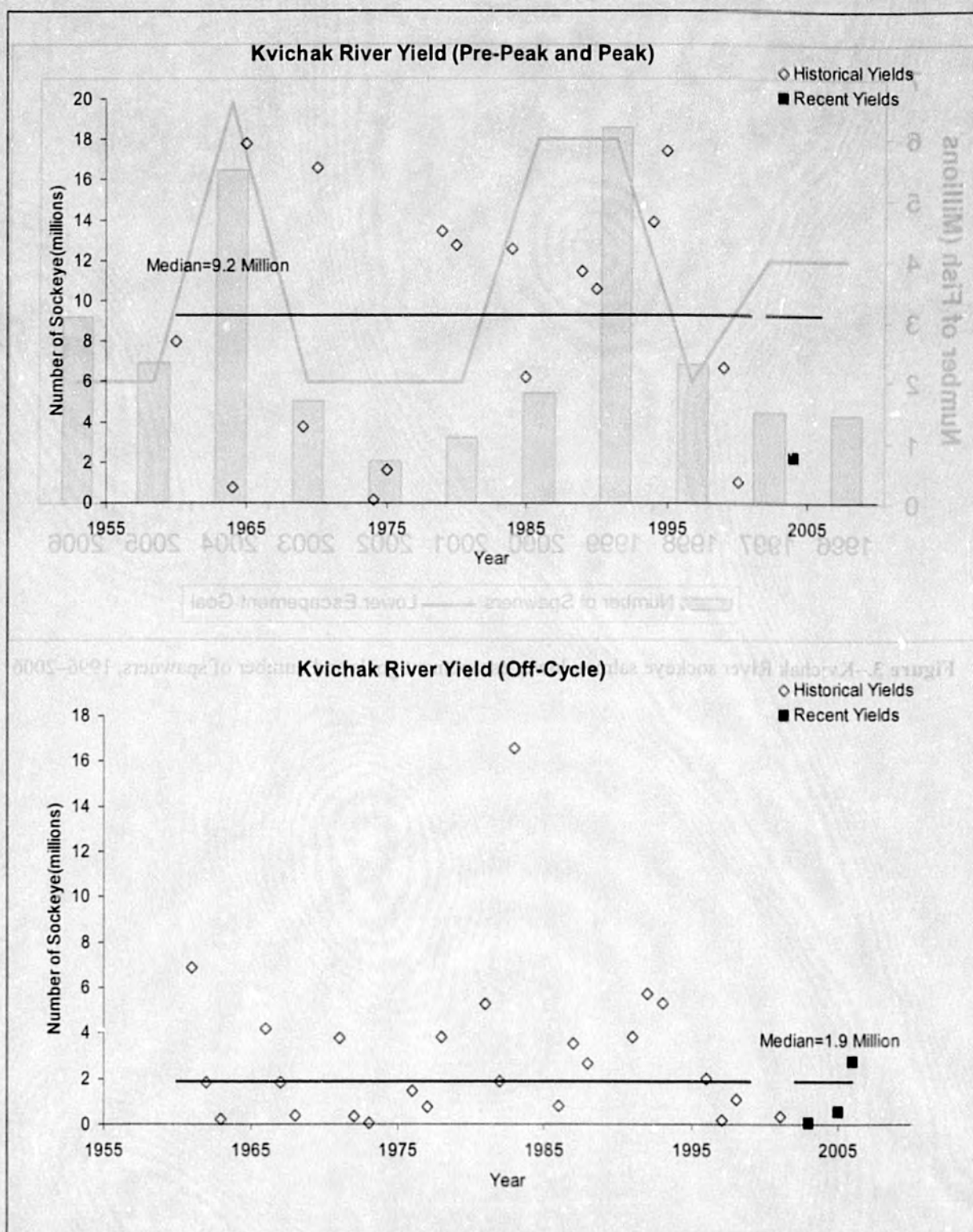


Figure 4.—Kvichak River sockeye salmon yield by year.

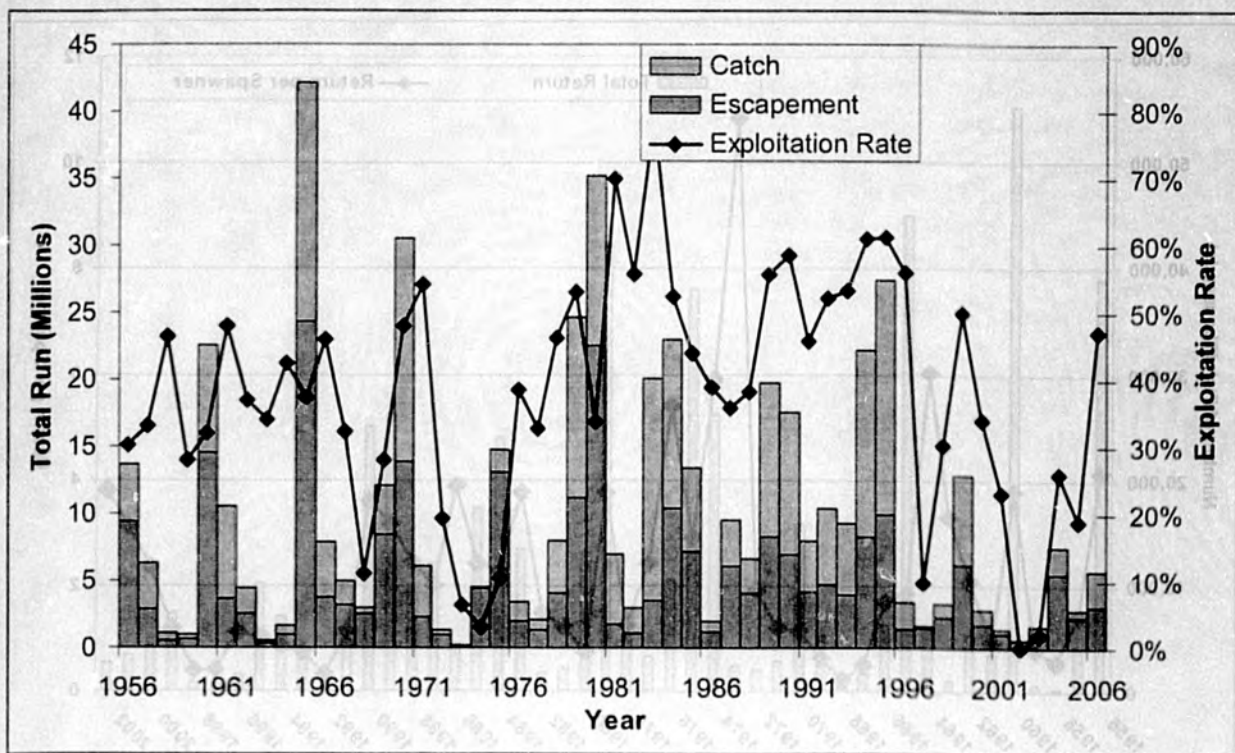


Figure 5.—Kvichak River sockeye salmon catch, escapement, and exploitation rate, 1956–2006.

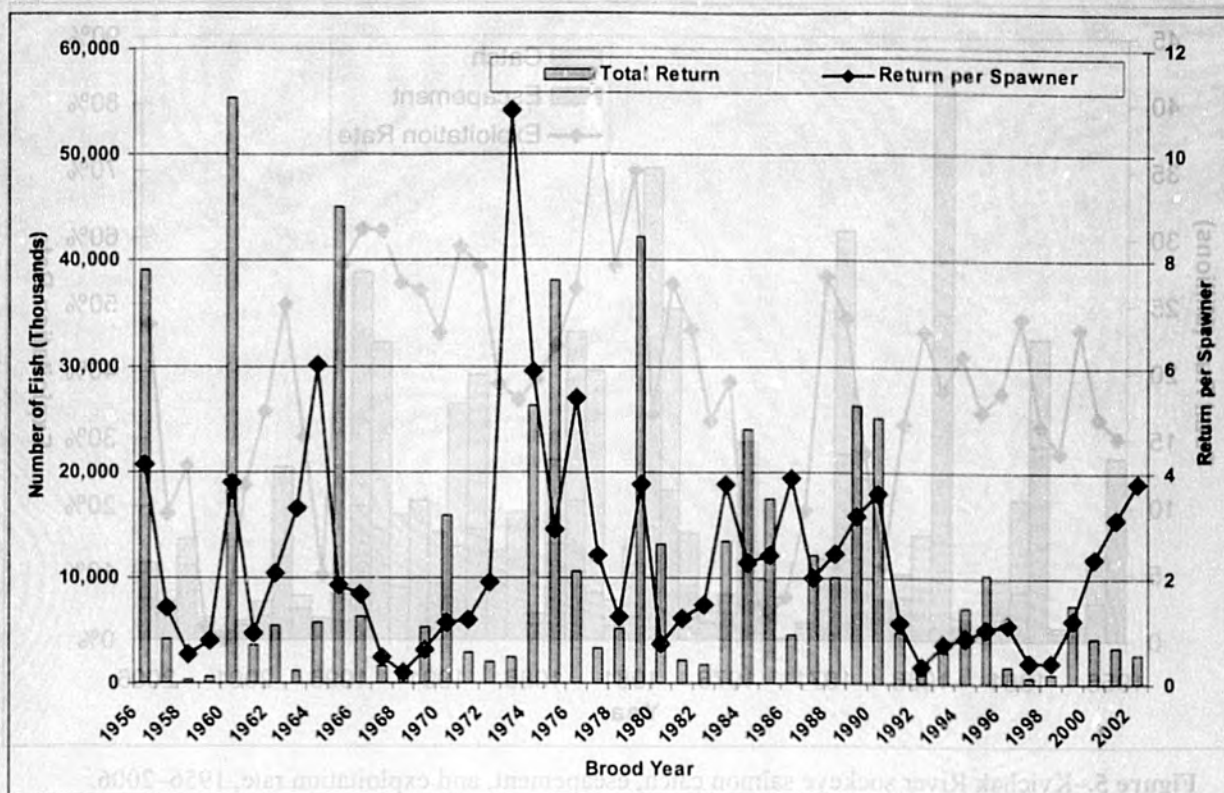
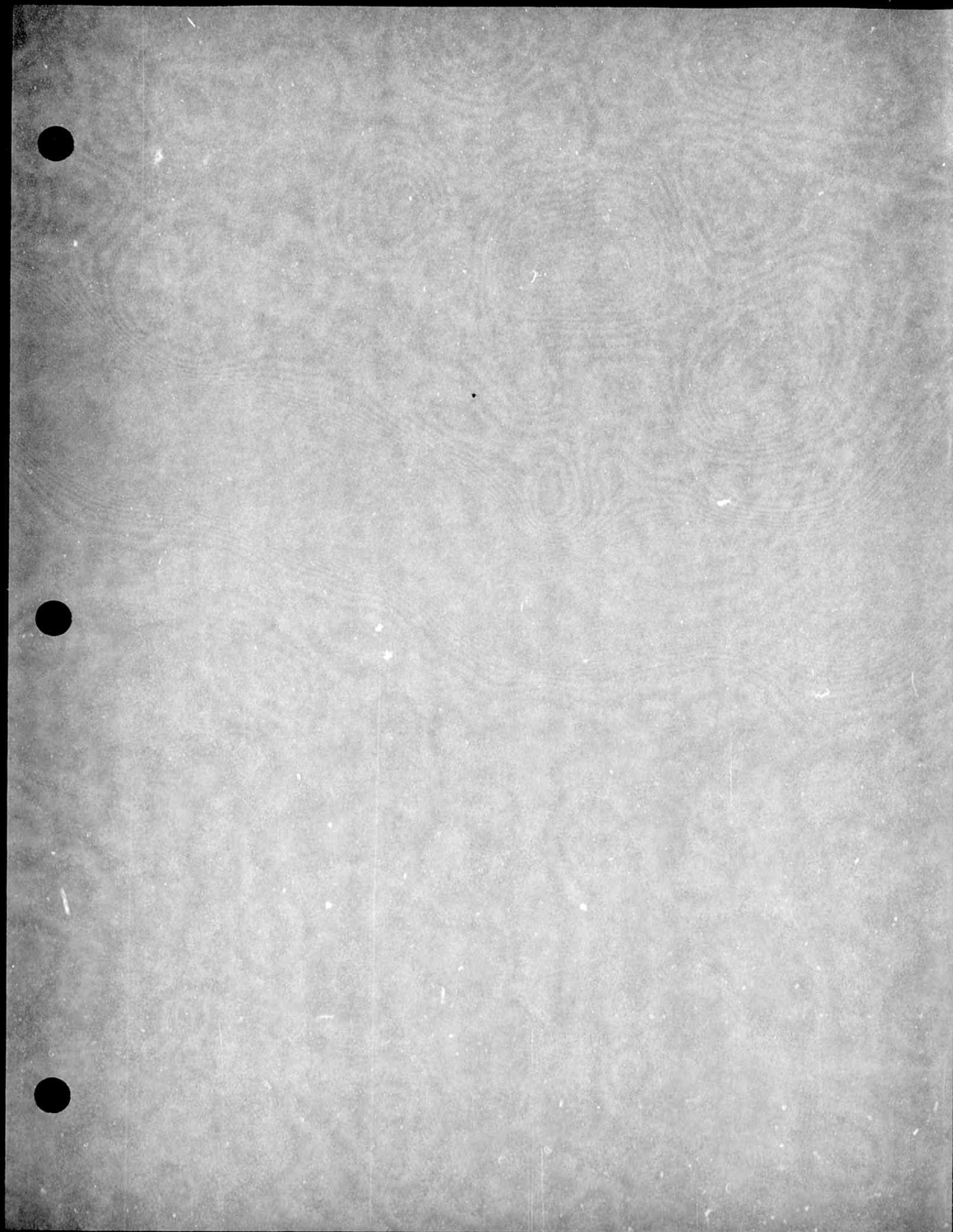


Figure 6.—Total returns and return per spawner by brood year for sockeye salmon in the Kvichak River system, 1956–2002.



Economic Significance of Fishing in Alaska during 2007

Prepared for
Upper Cook Inlet Salmon Task Force
June 25, 2008
Anchorage, Alaska

Bill Romberg
Fisheries Biologist
Alaska Department of Fish and Game
Sport Fish Division
907-267-2366

Background

Background

- USFWS National Survey—every 5 years, small sample, statewide only. Limited utility.
- ADF&G-SF has periodically contracted statewide and regional economic analysis
 - Jones & Stokes 1986, 1988
 - UAA- ISER 1993-1998
 - Several regional and fishery-based studies
- Reliable estimates for Alaska are nearly 15-years old

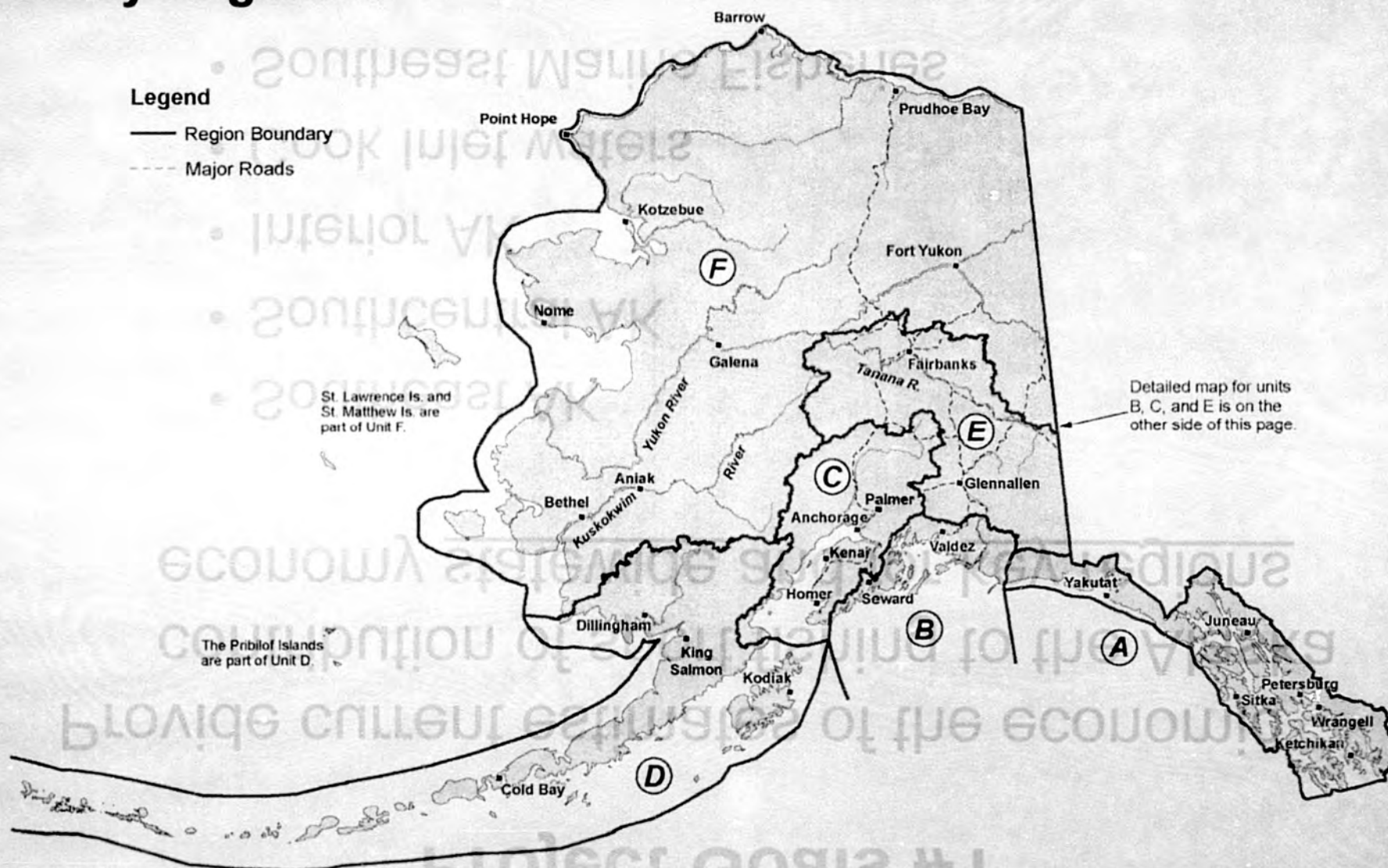
Project Goals #1

Provide current estimates of the economic contribution of sport fishing to the Alaska economy statewide and for key regions

- Southeast AK
- Southcentral AK
- Interior AK
- Cook Inlet waters
- Southeast Marine Fisheries

Study Regions

3



4

Project Goal #2

- Establish a consistent and repeatable method for collecting and reporting estimates of economic contribution of sportfishing to the Alaska economy.
 - Make estimates available on a more regular basis--every 2-3 yrs.
 - Track and compare such estimates over time
 - Scalable-allowing for more detailed analyses or expansion in future

Type of Study

Economic Significance/Impact Analysis:

A) Estimate what residents and non-residents actually spent on sport fishing activities in Alaska in 2007 (total expenditures)

B) Estimate the direct, indirect, and induced economic benefits of such spending to Alaska economy using an economic input/output model (IMPLAN) customized to Alaska's economy

NOT an economic valuation study that attempts to estimate the total value or net economic value (willingness to pay – expenses) of sportfishing in Alaska.

Definitions

- Economic Significance= total economic activity within a region (e.g. economic benefits of both resident & nonresident spending)
- Economic Impact= economic benefits from dollars originating outside the region (e.g. nonresident spending in region)
- Angler Expenditures= dollars spent for the primary reason of sportfishing.