Fishery Management Report No. 99-3

Area Management Report for the Recreational Fisheries of the Kenai Peninsula, 1995-1997

by

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September 1999

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.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	Var

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SECTION I: MANAGEMENT AREA OVERVIEW

MANAGEMENT AREA DESCRIPTION

The Kenai Peninsula Sport Fish Management Area (KPMA) previously was comprised of the following areas: (1) fresh waters of the Kenai Peninsula west of a line from Cape Puget to the west bank of the mouth of Ingram Creek, excluding Ingram Creek; (2) marine waters enclosed by a line from Gore Point to Cape Douglas on the south and the East and West Foreland of Cook Inlet on the north; and (3) freshwater drainages which flow into Cook Inlet, Kamishak Bay, and contiguous bays north of Cape Douglas and south of the West Foreland of Cook Inlet.

In spring 1997 the KPMA was further divided into northern and southern management areas. The Southern Kenai Peninsula Management Area (SKPMA) is comprised of all freshwater drainages of the Kenai Peninsula from Kasilof River south to Gore Point. Marine waters included are those waters of Cook Inlet south of a line from Kasilof River to Spring Point. The SKPMA is administered from the Homer office of the Department of Fish and Game. A Sport Fish Division Area Manager has been stationed here since spring 1997.

The Northern Kenai Peninsula Management Area (NKPMA) includes all Kenai Peninsula freshwater drainages from the north bank of Ingram Creek south to the south bank of Kasilof River. On the west side of Cook Inlet the management area is comprised of freshwater drainages from the West Foreland south to Spring Point. Marine waters of the NKPMA are all waters from the latitude of the East Foreland south to a line from Kasilof River to Spring Point (Figure 1).

Due to extensive involvement with the Board of Fisheries regulatory process, no area management report (AMR) for the KPMA was prepared in 1995 or 1996. This AMR for the NKPMA encompasses those years, including the 1997 season. A separate AMR covering this period is being prepared for the SKPMA.

Land managers in the NKPMA include the United States Forest Service (Chugach National Forest), United States Fish and Wildlife Service (Kenai National Wildlife Refuge) and the Alaska Department of Natural Resources. The communities of Kenai, Soldotna, and Sterling also manage lands through zoning under their jurisdictions. The Cook Inlet Regional and Chugach Native Corporations also manage lands granted them under the Alaska Native Claims Settlement Act. Land is also in private ownership near the major population centers and along major road systems.

Larger communities located within the KPMA include Kenai and Soldotna. Smaller communities are Hope, Anchor Point, Cooper Landing, Moose Pass and Sterling. The management area on the Kenai Peninsula is linked to the state's highway system via the Sterling and Seward Highways which provide sport anglers access to many of the area's major fisheries. Remote areas of the KPMA (west side of Cook Inlet) can be accessed via wheel or float-equipped aircraft, boat or walking.

Regulations governing sport fisheries in these areas are embodied in regulations for the Kenai Peninsula, Cook Inlet-Resurrection Bay Saltwater, and Susitna-West Cook Inlet areas. The codified regulations for these regulatory areas are found in Chapters 56, 58 and 61 of the Alaska Administrative Code.

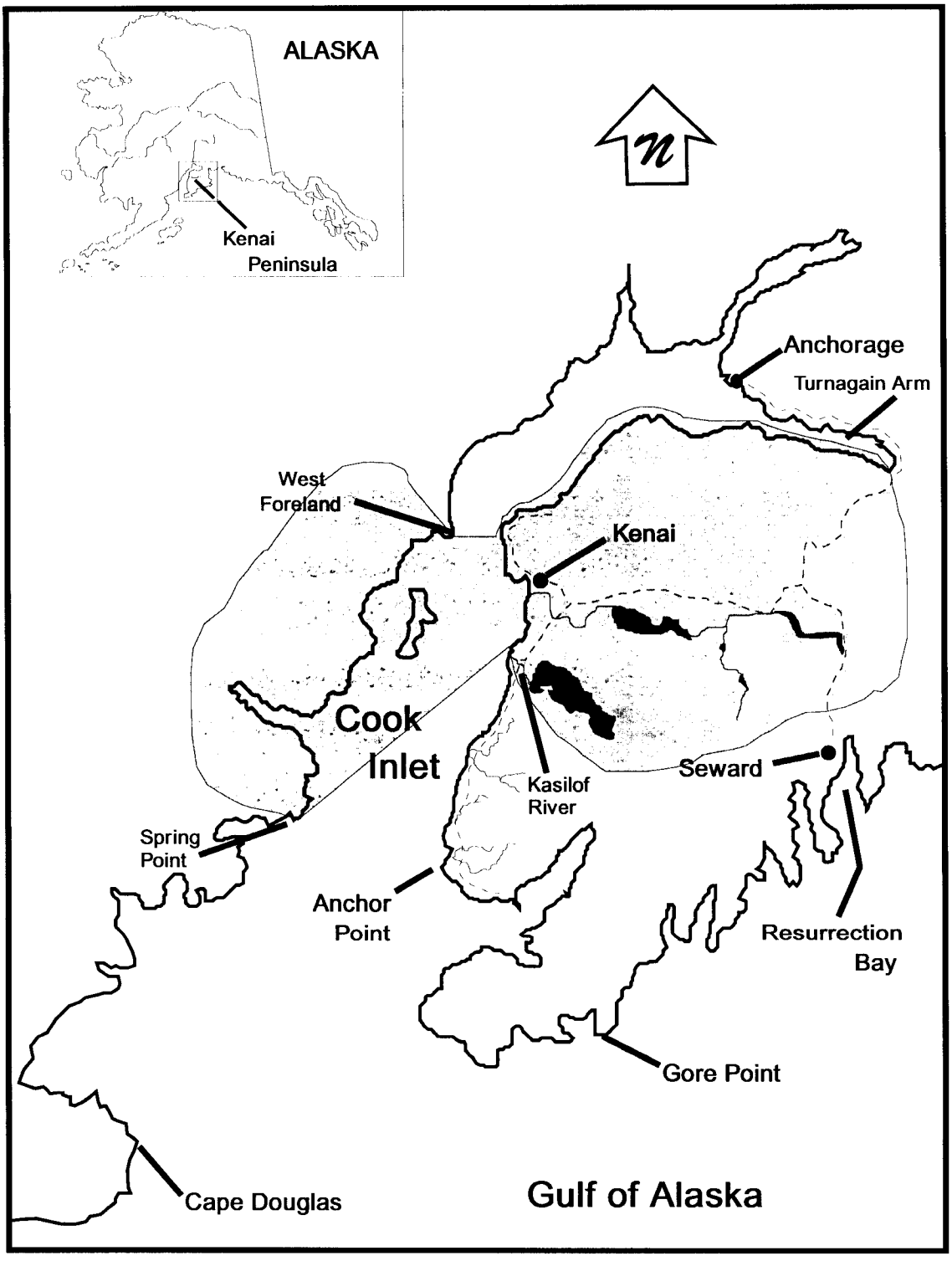

Figure 1.-The Northern Kenai Peninsula Management Area (shaded) includes all freshwater drainages and saltwater fisheries from the Kasilof River north to Turnagain Arm on the Kenai Peninsula; and from Spring Point to West Foreland on the west side of Cook Inlet.

The NKPMA includes portions of two areas for the purposes of participation and harvest reporting in the mail survey of Howe et al. (1997). These are the Kenai Peninsula and Kenai River Area (Area P) less the marine fisheries north of the latitude of East Foreland and south of the latitude of Kasilof River, and that portion of the West Cook Inlet-West Susitna River Drainages Area (Area N) including all freshwater drainages which flow into Cook Inlet, Kamishak Bay, and contiguous bays between Cape Douglas and West Foreland.

Management and research functions for the NKPMA recreational and personal use fisheries are the responsibility of the Soldotna area office of the Alaska Department of Fish and Game (ADF&G), Division of Sport Fish. A Sport Fish Division area manager has been stationed in Soldotna since 1970; Sport Fish Division staff since the 1960s. The Division of Sport Fish staff stationed at Soldotna is comprised of one area management biologist (Dave Nelson), an assistant area management biologist (Dave Athons), two senior research biologists (Steve Hammarstrom and Bruce King), and several assistant research project leaders (Jay Carlon, Larry Larson, Mary King, Larry Marsh, Jeff Breakfield and Tim McKinley). These staff are assisted by approximately 40 seasonal fishery technicians whose employment ranges from 2 to 11 months. The Soldotna staff is supported by a permanent administrative clerk (Roberta Eide) and one seasonal clerical position (Nancy Carver).

ALASKA BOARD OF FISHERIES PROCESS

Development of fishing regulations for the NKPMA occurs within the established Alaska Board of Fisheries process. Public input concerning regulation changes and allocation issues is provided through direct testimony to the Board of Fisheries and through participation in local Fish and Game advisory committees. Advisory committees have been established throughout Alaska to assist the Boards of Fish and Game in evaluating fisheries and wildlife issues and proposed regulatory changes. Most active committees meet at least once each year, usually in the fall prior to the Board meetings. Staff from the Division of Sport Fish and other divisions are often invited to attend the committee meetings. In this way, advisory committee meetings allow for direct public interaction with staff involved with resource issues of local concern. Within the NKPMA there are two advisory committees: Cooper Landing and Kenai-Soldotna. Committees in English Bay-Port Graham, Seldovia, Central Peninsula, Homer and Seward are also actively involved with biological and allocative issues relevant to the NKPMA. The area management biologist serves as advisor regarding biological issues to these advisory committees.

The Board of Fisheries addresses NKPMA fisheries on a 3-year cycle. Proposals regarding the KPMA finfish fisheries were last heard during the 1995-1996 Board meetings and will again be addressed in spring 1999.

FISHERIES RESOURCES

The NKPMA offers diverse fishing opportunities for recreational and personal use anglers. Anglers can target four species of North Pacific salmon (pink *Oncorhynchus gorbuscha*, coho *O. kisutch*, sockeye *O. nerka*, and chinook *O. tshawytscha*). Fisheries for these species occur primarily in fresh, and to a much lesser degree, in salt water. Anglers can also target salmon stocked into various landlocked lakes. Popular fisheries also occur on the area's anadromous stocks of Dolly Varden *Salvelinus malma*, steelhead trout *O. mykiss*, and smelt Osmeridae. Resident stocks of rainbow trout *O. mykiss* and lake trout *Salvelinus namaycush* also support popular sport fisheries. Less popular fisheries occur on resident stocks of Arctic grayling

Thymallus arcticus and northern pike *Esox lucius*. Marine sport fisheries offer more limited opportunities. Adjacent to the mouths of the Kenai and Kasilof rivers and on the west side of Cook Inlet small numbers of anglers target halibut *Hippoglossus stenolepis*, razor clams *Siliqua patula* and several species of hardshell clams. Minor fisheries for Tanner crab *Chionoecetes bairdi*, and Dungeness crab *Cancer magister* occur in several bays on the west side of Cook Inlet.

Two runs of wild Kenai River chinook salmon combine to support the largest recreational fishery for this species in Alaska. Stocked and wild chinook salmon returns support fisheries in Kasilof River.

Wild coho salmon returns to the Kenai River support the largest recreational freshwater coho salmon fishery in Alaska. Numerous smaller streams, on both the east and west sides of Cook Inlet, support smaller sport fisheries for this species. Additional coho salmon fishing opportunity is provided by stocking landlocked Kenai Peninsula lakes.

The Russian River supports an early and late sockeye salmon return. These wild runs support the second largest recreational fishery for this species in Alaska. The Kenai River also supports a relatively new recreational sockeye salmon fishery. A significant sockeye salmon harvest has occurred here since the mid-1980s. This fishery has expanded significantly in recent years and is now the largest sport fishery for this species in Alaska.

The NKPMA also supports two personal use sockeye salmon dip net fisheries at the mouths of the Kenai and Kasilof rivers and a gillnet fishery at the mouth of Kasilof River. Prior to 1996, the dip net fisheries were opened by emergency order predicated on achieving escapement levels specified in management plans adopted by the Alaska Board of Fisheries. These fisheries now have established seasons and provide significant harvest opportunities for personal use participants.

Pink salmon return in large numbers to NKPMA drainages during even-numbered years. Major fisheries for this species occur on the Kenai River wild stocks. Harvest in the Kenai River has increased during even-numbered years because of more liberal bag and possession limits (6 daily).

Chum salmon *O. keta* returns to NKPMA streams are minimal and do not support a significant sport fishery in the KPMA.

The state's largest personal use and recreational razor clam fisheries occur on the east side of Cook Inlet. The fisheries occur along a 50-mile area of beach between the Kasilof and Anchor rivers. This fishery is summarized in the SKPMA Annual Management Report. A smaller fishery for this species occurs adjacent to Polly Creek and Crescent River on the west side of Cook Inlet.

Dolly Varden are found in most freshwater drainages of the NKPMA. This species supports a major fishery in the Kenai River drainage. Numerous smaller streams and lakes support this species, providing additional recreational angling opportunity at roadside as well as more remote locations.

Rainbow trout occur in numerous lakes and streams of the NKPMA. Streams which support major rainbow trout fisheries are the Kenai River (supporting both a harvest-oriented and catch-and-release fishery), Russian River (primarily a catch-and-release fishery by regulation), and the

streams and lakes of the Swanson River and Moose River drainages. To provide additional fishing opportunity, landlocked lakes are also stocked with this species.

Steelhead trout currently provide limited recreational fishing opportunity in Kasilof River. A small stocked return of this species was established in Crooked Creek in the 1980s. This stocking program has been discontinued due to straying of stocked fish into the Kenai River. Since 1995 steelhead trout production in Crooked Creek is from natural production.

MANAGEMENT PLANS AFFECTING FISHERIES

Upper Cook Inlet fisheries (commercial, sport, personal use and subsistence) have been the focus of intensive allocative issues for many years. These controversial issues have led the Board of Fisheries (BOF) to establish management plans and policies to regulate and allocate the area's fisheries resources. These plans ensure for the sustained yield of fishery resources and establish allocation, management actions (in specific situations), and guidelines for fisheries managers of the department.

Management plans germane to NKPMA fisheries are:

1. Upper Cook Inlet Salmon Management Plan (5 AAC 21.363)

   This plan establishes allocation priorities for salmon returns to upper Cook Inlet streams. The plan was adopted by the Board as policy in 1977 and adopted as regulation in 1981.

2. Kenai River Early Run Chinook Salmon Management Plan (5 AAC 56.070)

   This plan establishes escapement objectives and management actions for Kenai River early-run chinook salmon. The plan was adopted by the Board in 1989.

3. Kenai River Late Run Chinook Salmon Management Plan (5 AAC 21.359)

   This plan establishes escapement objectives and management actions for Kenai River late-run chinook salmon. The plan was adopted by the Board in 1989.

4. Kenai River Late Run Sockeye Salmon Management Plan (5 AAC 21.360)

   This plan establishes escapement objectives and management actions and guidelines for the Kenai River sockeye salmon return. The plan was adopted in 1984.

5. Russian River Sockeye Salmon Management Plan (5 AAC 21.361)

   This plan establishes escapement objectives and management actions and guidelines for early- and late-run Russian River sockeye salmon. The plan was adopted in 1988.

6. Kasilof River Sockeye Salmon Management Plan (5 AAC 21.365)

   This plan governs the harvest of sockeye salmon returning to the Kasilof River in excess of spawning escapement requirements. This plan was adopted by the Board in 1986.

7. Big River Sockeye Salmon Management Plan (5 AAC 21.368)

   The purpose of this plan is to authorize a commercial harvest of Big River sockeye salmon by gillnets in the Kustatan Subdistrict under a chinook salmon harvest quota of 1,000. When the incidental chinook salmon harvest reaches 1,000 fish, the targeted sockeye salmon fishery closes. This plan was adopted by the Board in 1989.

8. Cook Inlet and Copper River Basin Rainbow/Steelhead Trout Management Policy

   This management policy was adopted in 1986 to provide future Boards, fisheries managers, and the sport fishing public with: (1) management policies and implementation directives for area rainbow and steelhead trout fisheries, (2) a systematic approach to developing sport fishing regulations that includes a process for rational selection of waters for special management, and (3) recommended research objectives. This Policy has heretofore not been adopted as regulation. It is scheduled to be considered for adoption by the BOF in February 1998.

9. Upper Cook Inlet Personal Use Salmon Fishery Management Plan (5 AAC 77.540)

   This plan provides for a personal use salmon gillnet fishery at the mouth of Kasilof River and salmon dip net fisheries on the Kenai and Kasilof rivers, and Fish Creek in northern Cook Inlet. This plan was in effect for the 1981 season and was adopted as regulation by the Board in 1982. The Plan has undergone several amendments since that time.

10. Riparian Habitat Management Plan (5 AAC 56.065)

    This plan applies to riparian habitats of upper Cook Inlet drainages. The plan provides that the Board of Fisheries will consider as part of its deliberations avoidable impacts to upper Cook Inlet riparian habitat related to recreational fishing. It further provides that the Commissioner of Fish and Game may close riparian habitats to fishing if a fishery is likely to result in habitat loss. The Commissioner may re-open riparian areas to fishing when mitigating action has occurred that will preclude future loss of this habitat. This plan was adopted as regulation in 1996.

11. Kenai River Coho Salmon Management Plan (5 AAC 21.357)

    This plan provides for conservation of Kenai River coho salmon which were determined to be at lower than historic levels of abundance. The plan reduced the length of the east side setnet commercial fishery by one period; prohibits guides in the Kenai River from fishing while guiding clients, reduced the number of days guided anglers could harvest coho salmon, and provides for a coho salmon season. This plan was adopted as regulation in 1997.

RECREATIONAL ANGLER EFFORT

This section provides generalized participation trends in the KPMA. Data are available through 1996. Since the Kenai Peninsula was considered a single management area through 1996, this information combines participation in what is now Northern (NKPMA) and Southern Kenai Peninsula Management Areas (NKPMA).

Since 1977, recreational angler effort in the KPMA has been estimated using a mail survey (Mills 1979-1994) (Howe et al. 1995-1997). This survey estimates participation in sport fishing and the harvest of sport fish species. The survey is designed to provide estimates of participation measured in angler-days and the number of fish harvested on a site by site basis. Beginning in 1990, the survey was modified to include estimations of catch (release plus harvest) on a site by site basis. Harvest and catch are estimated for individual species. Unfortunately, it is not designed to provide estimates of participation directed towards a single species.

Additionally, creel surveys have been selectively used for fisheries that require more detailed information or inseason management and to validate the mail survey for fisheries of interest. The following summary of recreational angler effort in the KPMA is based on estimates produced from the mail survey (Mills 1979-1994, Howe et al. 1995-1997).

Diverse recreational fishing opportunities, combined with ease of access and close proximity to major population centers, attract large numbers of anglers to the Kenai Peninsula. As a result, the KPMA supports the highest angler participation in Alaska. From 1977 through 1996, the KPMA has accounted for an average of 35% of the total statewide recreational angling participation. During 1996, participation approximated 941,000 angler-days in KPMA waters (Table 1).

From 1977 through 1988, recreational angling effort increased from about 380,000 angler-days to about 875,000 angler-days (Figure 2). Peak participation of 1,030,642 angler-days occurred in 1994 with participation exceeding 900,000 angler-days in 1995-1996 (Table 1). The trend appears to be for relatively stable participation of 900,000-1,000,000 angler-days annually. Reasons for this stabilization include full utilization of many existing fish stocks and social issues such as crowding and access.

The Kenai River accounts for the largest recreational fishery in the KPMA. Over the past 5 years, this river has accounted for about 37% of the area's total recreational angling effort, or about 346,500 angler-days annually (Table 1). Most of this effort is expended by nonguided anglers fishing salmon and resident stocks of rainbow trout and Dolly Varden.

Other fresh waters of the Kenai Peninsula also support major fisheries. Of these, the Russian River supports the largest fishery, with most participation directed towards early- and late-run sockeye salmon. The Kasilof River supports a major fishery for stocked early-run chinook salmon. Other freshwater fisheries supporting significant participation include the Southern Kenai Peninsula Management Area streams of Ninilchik, Anchor River and Deep Creek. Angling effort here is directed towards salmon, Dolly Varden and steelhead trout.

Kenai Peninsula salt waters also support large fisheries. In combination, these saltwater fisheries account for about 35% of the total recreational effort expended by anglers in the KPMA over the past 5 years or about 333,000 angler-days annually (Table 1). A large percentage of this effort is directed towards halibut and chinook salmon. The halibut fishery occurs from Deep Creek south to the outer gulf coast. The chinook salmon fishery occurs from Deep Creek south to Bluff Point and to a lesser degree in Kachemak Bay.

Shellfish, notably razor clams, are harvested along the eastern beaches of the Kenai Peninsula. Since 1977, saltwater fisheries for shellfish have accounted for an average of about 47,000 angler-days (Table 1). About 6% of the total recreational effort expended by anglers fishing KPMA waters over the past 5 years has been directed toward shellfish.

Western Cook Inlet saltwater and freshwater fisheries and Kenai Peninsula personal use fisheries account for only a small percentage (less than 2%) of the total recreational fishing effort expended in the KPMA (Table 1).

OTHER USER GROUPS AFFECTING FISHERIES

Fisheries resources of the NKPMA also support commercial, personal use, and scientific/educational fisheries. Drift and set gillnet commercial fisheries occur in Central and

Table 1.-Angler days of effort expended by recreational anglers fishing Kenai Peninsula Management Area waters, 1977-1996.

Year	West Cook Inlet Saltwater	West Cook Inlet Freshwater	Kenai Peninsula Saltwater Finfish	Kenai Peninsula Saltwater Shellfish	Kenai River	Other Kenai Peninsula Freshwater	Kenai Peninsula Dipnet	Kenai Area Total	Percent of State	Alaska Total
1977			79,045	25,393	122,138	154,581		381,157	31.8	1,198,486
1978			93,807	29,750	164,264	180,322		468,143	36.4	1,286,063
1979			100,010	30,323	178,485	182,933		491,751	36.0	1,364,739
1980			89,065	31,494	171,803	188,508		480,870	32.3	1,488,962
1981			93,432	57,867	178,716	159,806		489,821	34.5	1,420,772
1982			91,033	48,826	231,948	172,483		544,290	33.5	1,623,090
1983	2,911	5,425	136,566	53,305	229,228	145,862	9,576	582,873	33.6	1,732,528
1984	4,549	4,182	127,635	55,208	270,422	169,006	7,227	638,229	34.2	1,866,837
1985	4,455	6,952	122,243	49,453	322,230	197,358	10,647	713,338	36.7	1,943,069
1986	5,977	4,471	143,160	55,241	335,051	221,521	15,856	781,277	37.7	2,071,412
1987	3,855	5,594	186,525	46,137	289,165	264,243	32,473	827,992	38.5	2,152,886
1988	6,042	5,520	183,254	44,304	374,259	224,972	37,304	875,655	37.9	2,311,291
1989	3,942	5,850	163,717	32,374	376,902	178,264	33,054	794,103	35.1	2,264,079
1990	4,499	5,970	218,622	39,769	342,662	224,553	2,184	838,259	34.0	2,463,284
1991	3,856	9,443	204,216	38,767	323,368	230,579	12,040	822,269	33.5	2,456,328
1992	3,950	6,867	225,442	60,513	332,573	241,743	12,131	883,219	34.8	2,540,374
1993	4,712	8,042	232,298	54,691	324,120	247,316	16,525	887,704	34.7	2,559,408
1994	5,354	6,656	344,512	67,159	340,904	251,272	14,785	1,030,642	37.9	2,719,911
1995	5,166	7,642	278,461	60,011	377,710	226,586	17,124	972,700	34.9	2,787,670
1996	4,610	10,107	261,885	56,785	357,130	218,630	33,697	942,844	34.5	2,733,008
Mean	4,563	6,623	168,746	46,869	282,154	204,027	18,187	722,357	35.1	2,049,210
Mean 1992-1996	4,758	7,863	268,520	59,832	346,487	237,109	18,852	943,422	35	2,668,074

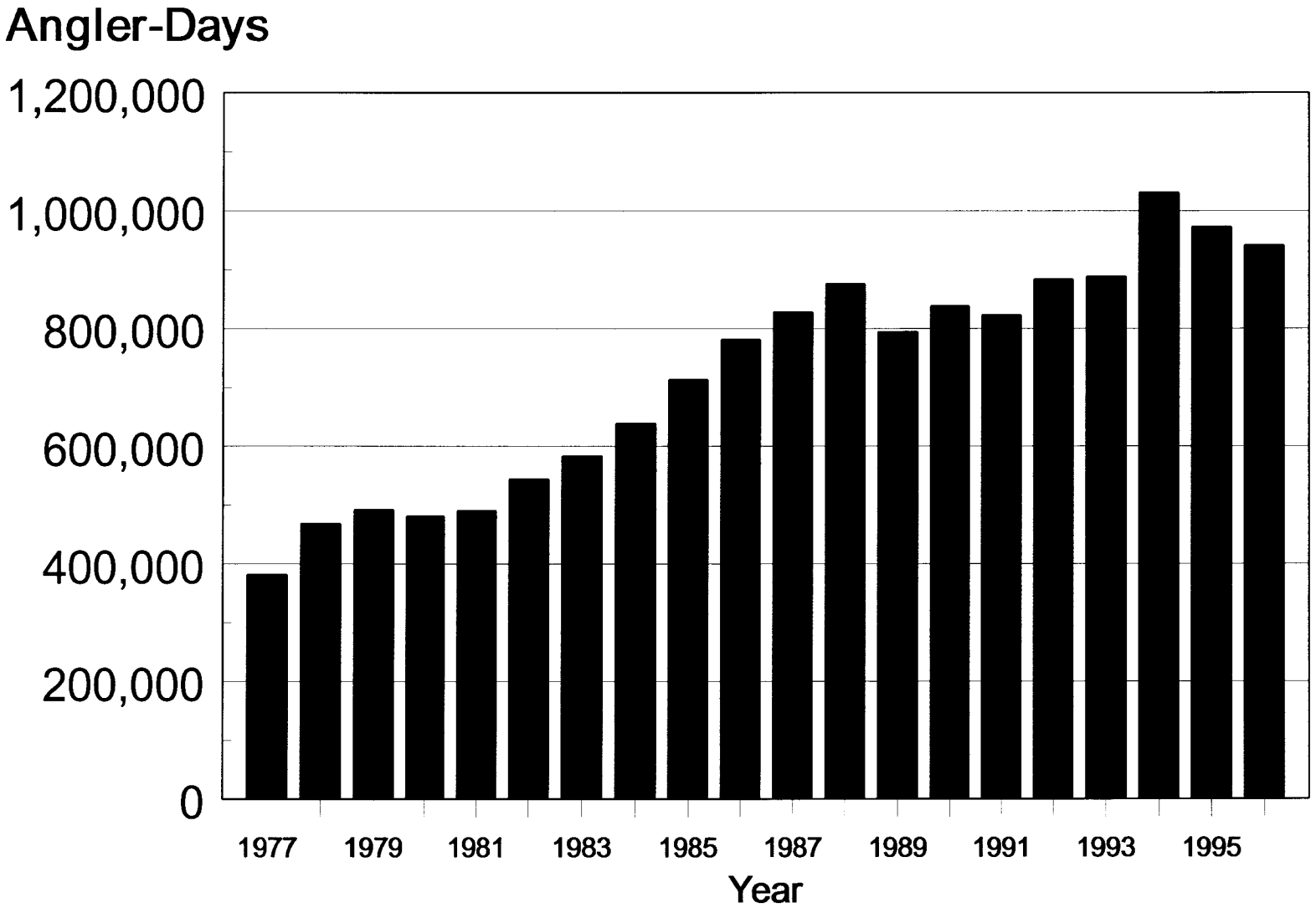

Figure 2.-Recreational angler participation in the Kenai Peninsula Management Area, 1977-1996.

Northern Cook Inlet. Long-term (1954-1997) average harvest in the commercial fishery is 4,044,327 salmon. This average is comprised of 20,239 chinook, 2,407,577 sockeye, 321,428 coho, 712,908 pink and 582,175 chum salmon. The primary species targeted in the commercial fishery is sockeye salmon.

Division of the salmon resource in the NKPMA between sport and commercial interests is an ever-present allocative issue. Stocks of concern to both user groups are late-run Kenai River chinook salmon, late-run Kenai River sockeye salmon, and early-run Kenai River coho salmon. Allocation and management of these resources are governed by management plans. Application of these management plans to these fisheries is addressed in the appropriate chapter of Section II of this report.

In 1992 the Board of Fisheries designated Cook Inlet as a "nonsubsistence area." An exception was provided for subsistence fisheries that occur in areas adjacent to the villages of Tyonek in northern Cook Inlet and Port Graham and English Bay in Kachemak Bay. In fall 1995 the Board provided for a subsistence fishery for the village of Seldovia in Kachemak Bay. These are relatively small fisheries and resource allocation between subsistence and other resource users is not a major issue. In 1993 subsistence fishing did not occur in most areas of Cook Inlet. A 1994 Alaska Supreme Court ruling required the State to provide for a general Cook Inlet subsistence fishery during the 1994 season. In May 1995 the Alaska Supreme Court reestablished the Anchorage/Mat-Su/Kenai areas as a nonsubsistence area. The 1995 fishery was therefore a personal use fishery prosecuted under identical regulations as the 1994 subsistence fishery. In February 1996 the Board adopted *The Upper Cook Inlet Personal Use Salmon Management Plan* (5 AAC 77.540). The fishery was prosecuted under this plan in 1996 and 1997. Personal use fishing in Cook Inlet is a continuing contentious issue as personal use participants emerge as a major harvester of salmon (primarily sockeye salmon) stocks.

A scientific/educational permit has been issued to the Kenaitze Tribe each year since 1989. The permit allows the tribe to harvest salmon with a gillnet in the lower 5.5 miles of the Kenai River and adjacent Cook Inlet waters, establishes a season, and sets allowable salmon harvest by species. The current quota in this fishery is 5,000 salmon. Although controversial at its inception, allocative issues surrounding this fishery have become less of a concern to other user groups in recent years.

A scientific/educational permit was issued for the first time to the Ninilchik Traditional Council in 1993. Terms of the permit were similar to the terms of the Kenaitze scientific/educational permit. The area open was in Cook Inlet from the Ninilchik Boat Harbor north for 1 mile. The harvest quota was 2,000 total salmon. There have been no allocative issues associated with this fishery.

ECONOMIC VALUE OF RECREATIONAL FISHERIES

The economic value of KPMA fisheries was estimated for the calendar year 1986 (Jones and Stokes Associates, Inc. 1987). Anglers fishing KPMA waters during 1986 expended an estimated $82 million (Table 2). Expenditures were about equally split between resident and nonresident anglers despite resident anglers expending more than four times as many angler-days of recreational fishing effort. Anglers were also asked to estimate their "net willingness to pay" (net WTP) to ensure the continuation of these fisheries. Anglers estimated they would expend an additional $163 million to ensure the continued availability of KPMA sport fisheries. Unlike

Table 2.-Economic value (thousands of dollars) of Kenai Peninsula Management Area (KPMA) recreational fisheries during 1986.

Fishery	Resident Anglers		Nonresident Anglers		All Anglers	
	Expenditures	Net WTP[a]	Expenditures	Net WTP	Expenditures	Net WTP
Kenai River						
Early-run chinook salmon fishing	4,186	4,038	6,148	2,916	10,334	6,954
Late-run chinook salmon fishing	3,184	2,477	5,142	2,444	8,326	4,921
Early-run coho salmon fishing	2,848	2,541	1,068	466	3,916	3,007
Late-run coho salmon fishing	2,020	1,645	2,619	1,139	4,639	2,784
Sockeye salmon fishing	1,613	1,711	2,571	418	4,184	2,129
Rainbow trout fishing	1,989	688	486	125	2,475	813
Other fishing	3,092	2,141	995	503	4,087	2,644
All sport fishing	18,932	15,241	19,029	8,011	37,961	23,252
Russian River						
Early-run sockeye salmon fishing	2,804	2,130	1,361	640	4,165	2,770
Late-run sockeye salmon fishing	480	211	566	267	1,046	478
Total	3,284	2,341	1,927	907	5,211	3,248
Lower Kenai Peninsula streams						
Chinook salmon fishing	1,338	503	797	207	2,135	710
Other fishing	2,213	1,467	1,566	289	3,779	1,756
All fishing	3,551	1,970	2,363	496	5,914	2,466
Deep Creek Marine						
Halibut fishing	1,840	2,357	2,192	269	4,032	2,626
Chinook salmon fishing	1,427	1,253	929	404	2,356	1,657
Total	3,267	3,610	3,121	673	6,388	4,283
Kachemak Bay						
Halibut fishing	5,818	5,364	2,902	2,709	8,720	8,073
Other fishing	7,411	111,061	9,902	10,204	17,313	121,265
TOTAL	42,263	139,587	39,244	23,000	81,507	162,587

From: Jones and Stokes Associates, Inc., 1987.

[a] Net willingness to pay.

actual expenditures, resident anglers expressed a much higher net WTP than did nonresident anglers.

Actual expenditures and WTP were also estimated for a subset of KPMA fisheries. For example, recreational anglers fishing the Kenai River expended an estimated $38 million and expressed a net WTP of an additional $23 million for the continued availability of this sport fishery (Table 2). Most of the expenditures ($19 million) occurred during the early and late chinook salmon fisheries. Other fisheries for which angler expenditures were estimated include the Russian River early- and late-run sockeye salmon fisheries ($5 million), lower Kenai Peninsula fisheries ($6 million), Deep Creek marine fishery ($6 million), and the Kachemak Bay halibut fishery ($9 million).

Continued controversy regarding the economic value of commercial and sport fisheries prompted an evaluation of the potential effects of re-allocating Kenai River sockeye salmon. The study was completed in January 1996 and was conducted by the Institute of Social and Economic Research (ISER) of the University of Alaska, Anchorage. The study was conducted under contract to the Alaska Department of Fish and Game. Results are summarized in the report *Economic Effects of Management Changes for Kenai River Late-Run Sockeye* (ISER 1996). The study analyzed the effects of allocating an additional 200,000 late-run Kenai River sockeye salmon from the commercial to the inriver sport fishery.

Economic change was measured in two ways: net economic value and economic impacts. When Kenai River sockeye prices and run size were medium, allocating 200,000 Kenai River sockeye salmon away from the commercial and to the inriver fishery resulted in a net economic loss to the commercial fishing industry of an estimated $1.7 million. Corresponding economic gain to the sport fishing industry was estimated at $1.3 million. An economic impacts analysis estimated 64 jobs would be lost in the commercial fishing industry; 46 gained in the sport fishing industry.

The study also indicated that at high sockeye salmon prices and low run size, commercial losses would be larger than sport gains. During years with high run size, no curtailment of commercial fishing would be required to increase the inriver allocation by 200,000 and there would be no net economic gains or loses to either industry.

These results were presented to the BOF in February 1996. It was concluded that re-allocating Kenai River late-run sockeye salmon was economically neutral to the state's economy. This notwithstanding, the BOF allocated additional sockeye salmon to the inriver fishery at this meeting (see section: Kenai River Late Run Sockeye Salmon Fishery).

MAJOR ONGOING RESEARCH ACTIVITIES

There are currently six major NKPMA research programs.

1. The first program is an annual stock assessment of early- and late-run chinook salmon returns to the Kenai River. This program has four study components. A creel survey estimates chinook salmon harvest during the early- and late-run recreational chinook salmon fisheries. Age and size composition are determined by sampling early- and late-run chinook salmon in the lower area of the river. A sonar counter estimates abundance of early- and late-run chinook salmon entering the Kenai River. A tag and recovery program in 1996 and 1997 was employed to check sonar estimates of late-run chinook salmon. The creel survey and sonar are used for inseason management to ensure Kenai River chinook salmon management plans

are adhered to and the escapement goals, as provided by management plans, are achieved. These data are also used to construct brood tables to assess spawner-recruit relationships and evaluate escapement goals.

2. A second program assesses early and late sockeye salmon returns to the Russian River. Through 1996 creel surveys assessed numbers of sockeye salmon harvested during early- and late-run recreational sockeye salmon fisheries. This component was discontinued in 1997. A weir determines early- and late-run spawning escapement. Scale samples to determine age and size composition were collected in the fishery and at the weir through 1996; only at the weir beginning in 1997. The fishery is managed inseason using run timing models which are predicated on weir data to ensure that the Russian River sockeye salmon management plans are adhered to, and escapement goals achieved. The data are also used to assess spawner-recruit relationships and evaluate escapement goals.

3. A third program assesses Kenai River coho salmon stocks. Begun in 1992, the program's research goal is to estimate annual returns of coho salmon to the Kenai River. This requires accurate estimation of all major components of the annual returns: sport, commercial, and personal use harvests and spawning escapements.

   The current Kenai coho program has four study components. The first is a project to mark juvenile salmon in the Kenai River for later recognition in the mixed-stock commercial harvest. A second component estimates sport harvest using the Statewide Harvest Survey. The third component samples the mixed-stock commercial harvest for Kenai River tags. A fourth component determines the feasibility of using sonar to estimate abundance of coho salmon entering the Kenai River. Information to date indicates enumeration by sonar is not possible given current technology due to simultaneous run timing of coho, sockeye and pink salmon and the behavior of coho salmon. Still to be determined is the spawning escapement. An inriver exploitation rate study in 1998 will address this question.

4. A fourth program provides information to manage the mixed-stock chinook salmon marine fishery that occurs in Cook Inlet between Deep Creek and Anchor River, and to a lesser degree in Kachemak Bay. This fishery occurs in the SKPMA, noted here because a proportion of chinook salmon harvested in the fishery originate in the Kenai River (NKPMA). Wild chinook salmon are tagged in Deep Creek and the Kenai River. A proportion of all hatchery chinook salmon smolt released in Cook Inlet are also tagged. Tagged fish are recovered in the marine fishery by sampling at Deep Creek, Anchor Point, Whiskey Gulch and Homer. The contribution of Kenai River, Deep Creek and hatchery fish to the marine fishery may then be estimated. The contribution of Cook Inlet stocks to the marine sport fishery will assist the BOF and department in addressing allocative and biological issues associated with this fishery.

5. A fifth program addresses Kenai River riparian habitat. The Kenai River sockeye salmon sport fishery is an expanding fishery. Virtually all participants fish from shore. When large numbers of anglers concentrate in a given area, habitat degradation may occur. Nearshore waters have been identified as critical to rearing salmonids, notably chinook and coho salmon. Concern for potential habitat loss prompted a study by the department's Habitat Division in 1993. Results were reported in Liepitz (1994), commonly referred to as "The 309 Study." Results of this study prompted the BOF to adopt the Riparian Habitat Fishery

Management Plan (5 AAC 56.065). This plan in part provides that the commissioner of Fish and Game may close a fishery adjacent to riparian habitat areas if prosecution of a fishery in a specific area will result in habitat loss. Approximately 15 miles of bank have been closed on the Kenai River in accordance with this plan.

The BOF linked habitat loss to sockeye salmon allocation. In February 1996 the BOF amended the Kenai River Late Run Sockeye Salmon Management Plan (5 AAC 21.360). The inriver sockeye salmon allocation was increased. The amended plan further provided that this allocation could be reduced if a net loss of habitat occurred attributable to the sockeye salmon sport fishery. The current Habitat Study is designed to determine the impacts to riparian habitat of this fishery.

6. The sixth program is a Kenai River Dolly Varden study. Harvest data and information received from the public suggest the Dolly Varden population in the upper Kenai River has declined. In 1997 a program was initiated to study this population. Objectives during the initial field season were to describe the upper Kenai River drainage, document areas of Dolly Varden concentration, identify spawning areas and tag fish to elucidate migratory patterns. Project direction will depend on results of the current field season which have not yet been analyzed.

MAJOR ISSUES

Major biological and social issues associated with the NKPMA recreational, commercial and personal use fisheries are summarized below.

1. Marine Chinook Salmon Fishery: The marine chinook salmon fishery occurs adjacent to the lower Kenai Peninsula beaches of Deep Creek, Whiskey Gulch, and Anchor River, and in Kachemak Bay. The fishery is expanding and is in the SKPMA. Early- and late-run chinook salmon stocks returning to various Cook Inlet streams are harvested here. Unfortunately, it is currently not possible to estimate the stock-specific harvest of these chinook salmon. The rapid increase in harvest and uncertainty regarding stock-specific harvests has created allocative and conservation concerns.

   Allocative issues are twofold: Some sport and commercial fishermen believe "large" numbers of chinook salmon of Kenai River origin are being harvested in this fishery. Expansion of this fishery increases the probability that restrictions based on established management plans will be placed on the Kenai River fishery and/or marine commercial setnet fishery for resource conservation. Some anglers fishing chinook salmon in Anchor River, Deep Creek and Ninilchik River maintain that marine anglers are harvesting “large” numbers of fish originating in these streams. This harvest reduces inriver success rates and raises the possibility of inriver fishery restrictions.

   The primary conservation issue, as viewed by the department, is associated with the early-run fishery. An increase in the early-run, mixed-stock marine sport harvest may be negatively impacting numbers of spawning chinook salmon in Anchor River and Deep Creek.

   The BOF addressed these concerns in February 1996 by adopting more restrictive regulations for both the marine and freshwater (Anchor River and Deep Creek) chinook fisheries. A guideline harvest level was adopted for the marine fishery. These actions

notwithstanding, the increasing harvest in the marine fishery remains an allocative and biological issue.

2. Kenai River Early Chinook Salmon: Kenai River early-run chinook salmon returns in 1990, 1991, 1992 and 1997 were well below returns in the mid to late 1980s. Low returns during 1990-1992 required restrictive inseason action. Restricting the fishery for resource conservation was socially disruptive and reduced participation.

   The early-run return increased from 1993 through 1996; inseason restrictions to the fishery were not required. The return again declined in 1997; the fishery was restricted, resulting in the associated social disruption. Management of this fishery will continue to be a major issue, especially during years of low returns.

3. Kenai River Late Run Chinook Salmon: Numbers of late-run chinook salmon returning to the Kenai River declined in 1990, 1991 and 1992. These declines necessitated restrictive inseason management in each of these years to achieve the spawning escapement goal mandated by the management plan. Restrictive inseason management of the fishery for resource conservation was socially disruptive and reduced participation.

   From 1993 through 1997 this run returned to former levels of abundance; inseason restrictions to the sport and commercial fisheries were not required. Should future returns again decline, implementation of inseason management strategies which will be disruptive to users will again be required.

   Also at issue is the harvest of late-run chinook salmon of Kenai River origin in the commercial setnet fishery on the eastside beaches of upper Cook Inlet. Although this fishery targets late-run sockeye salmon, the incidental harvest of late-run chinook salmon is significant. This is primarily an allocative issue; conservation can be assured given existing Board management plans.

4. The Chinook Salmon Sonar Counter: The counter has been a primary tool to manage early- and late-run Kenai River chinook salmon fisheries since 1988. The public generally accepts the sonar estimates during the early run. During the late run there is increasing public perception that the counter is erroneously counting late-run sockeye salmon as chinook salmon and that the chinook salmon estimates are inflated. Repeated tests of the sonar indicate the estimates are driven by chinook salmon abundance; but that late-run chinook estimates may be inflated when large numbers of late-run sockeye salmon enter the river. The tagging program conducted in 1996-97 was designed to answer this question.

5. Kenai River Sockeye Salmon: The Kenai River late-run sockeye salmon fishery is the most rapidly expanding sport fishery in the NKPMA. Late-run sockeye salmon returning to the Kenai River are primarily managed for commercial uses. The recreational harvest of late-run sockeye salmon is limited by the Kenai River Sockeye Salmon Management Plan. In recent years, the recreational fishery demonstrated the capability to exceed the allocation prescribed in this management plan. The Board declined in 1992 to change or amend this management plan to accommodate the harvest potential of the recreational fishery.

The recreational fishery was therefore restricted in 1993 through a reduction in bag and possession limits and a time closure to reduce harvest and comply with the allocative intent of the management plan. In 1994, Commissioner Rosier directed that the allocation in the current management plan be viewed as a guideline harvest level rather than a harvest cap. There was therefore no restriction in the 1994 fishery.

In February 1997 the BOF allocated additional sockeye salmon to the inriver fishery.

This notwithstanding, there is a perception among many recreational anglers that their fishing opportunity is being restricted in favor of commercial uses. This is an allocative issue; conservation is ensured given existing BOF management plans. The BOF will address this issue during the 1998-99 regulatory cycle.

6. Kenai River Coho Salmon: Kenai River early- and late-run coho salmon issues are both biological and allocative. Smolt outmigration declined about 50% between 1992-93 and 1995. The inriver sport exploitation rate, inriver return and spawning escapement are not known. The inriver sport and Cook Inlet commercial fisheries were both restricted in 1997 for resource conservation, predicated on reduced commercial harvest and low returns to Cook Inlet indicator streams.

   Allocative issues focus on the division of the early-run harvestable surplus between commercial and sport user groups. Allocative issues continue to expand and now also involve the division of the early- and late-run inriver harvest between guided and unguided sport anglers.

   A research program continues to address the biological issues. However, data gaps remain. In the interim, the allocative and biological concerns associated with the early- and late-run Kenai River coho salmon resource will continue to be an issue in the management of these fisheries.

7. Riparian Habitat Degradation: The degradation of riparian habitat is a major issue in the NKPMA. Development, boat wakes and the large number of anglers fishing from stream banks are causative factors. Riparian degradation is an issue at the Russian River where streamside habitat change has been effected by bank anglers, and on the mainstem Kenai River where banks have been altered by boat wakes, residential and commercial development, and bank anglers. The loss of riparian habitat is viewed with concern by both the public and the department as this loss may negatively affect the fisheries resources.

8. Congested Fisheries: Many recreational fisheries in the NKPMA are so crowded that there is little if any space available for additional anglers. Participation in the NKPMA's congested fisheries sometimes exceeds or severely taxes parking and camping areas as well as amenities such as sanitary facilities. Congested fisheries are considered aesthetically displeasing to many anglers and are an issue of fishery management. Congested fisheries include the Russian River sockeye salmon fishery, Kenai River sockeye salmon fishery, Kenai River chinook salmon fishery and Kasilof River chinook salmon fishery.

9. Stocking of Anadromous Species in Open Systems: Stocking anadromous species (primarily salmon) in open systems (drainages which ultimately enter salt water) in the

NKPMA has been a common practice for a number of years. The Division of Sport Fish stocks chinook salmon in Crooked Creek/Kasilof River. A private nonprofit aquaculture association stocks sockeye salmon in Tustumena Lake (Kasilof River drainage), Hidden Lake (Kenai River drainage), and in Packers Creek on Kalgin Island. Concerns have been expressed by staff and public that in some situations there has been an insufficient assessment of risks associated with stocking in open systems prior to implementing the stocking program. Risks to be assessed include but are not limited to: (1) The effect on wild anadromous fish (if present) at the origin of the release. (2) The potential over-harvest of wild stocks in mixed stock fisheries harvesting wild and stocked fish. (3) The potential straying and effect of that straying on other wild stocks originating in streams in close proximity to the stocked release site.

10. Anadromous Stocking Evaluation: Some staff and public are concerned that poststocking evaluation of anadromous releases in open systems has at times been inadequate. It has been suggested that evaluation programs be conducted for all stocking programs. These evaluations would address the cost/benefit ratio, effects of stocking on other species present at the stocking location, the contribution of the stocked fish to intercepting fisheries, the ability of the user groups to use all returning stocked fish and the possibility of excessively harvesting nontargeted wild fish in an effort to maximize benefit (harvest) from the stocking program.

11. Regulatory Complexity: A concern of staff and fishery participants is that sport fishing regulations in the NKPMA are too complex for the average angler to readily comprehend. Regulatory complexity is a function of the BOF's efforts to provide a regulatory structure which maximizes opportunity while addressing complex biological and allocative issues associated with the salmon and trout resources.

12. Enforcement of Sport Fishing Regulations: Enforcement of sport fishing regulations is primarily the responsibility of the Fish and Wildlife Protection Division of the Department of Public Safety. The Division of Parks of the Department of Natural Resources and Division of Sport Fish staff of the Department of Fish and Game also enforce regulations. Federal agencies enforce state regulations on federal lands. However, especially during the peak of the fishing season, these enforcement efforts are generally viewed by the enforcing agencies and the public as being inadequate. Inadequate enforcement of fishery regulations erodes the public's confidence in the department's ability to adequately manage and protect the fishery resources of the NKPMA.

13. Increasing Guided Angler Harvest and Participation: Guided angler harvest and participation are increasing in the NKPMA's sport fisheries. Fisheries affected include the early- and late-run Kenai River chinook and coho salmon fisheries, the Kasilof River chinook salmon fishery, and the Kenai River trout fishery. Nonguided anglers correctly contend that the guided angler (who in many cases is a nonresident) is more efficient due to the superior knowledge and equipment of the guide/charter operator. The guided angler is therefore taking an increasingly larger proportion of the harvestable surplus. This allocative issue concerns guided and nonguided anglers in the KPMA in addition to businesses associated with the fishing-oriented tourist industry.

14. Interstate Transport of Sport Caught Salmon: Nonresidents harvest large numbers of salmon in the NKPMA. This highly visible harvest occurs in the Kenai and Russian River sockeye salmon fishery and in the Kenai River chinook and coho salmon fishery. This harvest is not unlawful as long as bag and possession limits are adhered to. However, some Alaska residents have expressed dissatisfaction with the lack of a regulation limiting the amount of salmon a nonresident tourist may legally export from the state. The perceived excessive harvest and transport of salmon by nonresident tourists in the NKPMA is therefore an issue of concern.

    This issue is not limited to the NKPMA. It has generated concern in much of Alaska. The BOF will consider imposing an annual seasonal limit on nonresident anglers at its February 1998 meeting.

15. West Side Cook Inlet Coho Salmon: Participation in the west side Cook Inlet coho salmon fishery is increasing. Streams primarily affected are Kustatan River, Polly Creek, Shelter Creek, Silver Salmon Creek and Clearwater Creek. This area is accessed only via aircraft or boat. Few local residents reside in the area, primarily Chinitna Bay. There is concern by these residents and other historic users of the coho resource that an increase in guided angler participation is negatively affecting the resource. The department has no stock assessment program in the area. Lack of biological information regarding the coho salmon resource is of concern to the department and public.

ACCESS PROGRAMS

Access to NKPMA fisheries is an integral part of this area's program. Historically, boating and nonboating projects have been funded. Most recent purchases and development have been on the Kenai River. A boat launch at the outlet of Kenai Lake (River Mile 82) was dedicated in 1997. This launch is used by anglers to access Kenai Lake and, more commonly, to access the upper Kenai River. Anglers can drift from Kenai Lake to the "Sportsman's" boat launch (River Mile 73.5) which was completed in 1995. The "Pillars" boat launch (River Mile 12.5) was completed in 1997 and provides access to the popular lower Kenai River.

Prior access projects provide reasonable access to major KPMA fisheries. Lack of access is not an issue in this management area; there are no requests for access purchase pending.

A land acquisition is being considered on Crooked Creek, a tributary to the Kasilof River. The parcel is presently state owned and part of the Crooked Creek Hatchery complex. The hatchery is no longer operational and is being surplused. Land to be acquired would be about 0.5 acre adjacent to Crooked Creek. The purpose of the acquisition would be as a future research/weir site should the need arise to study Crooked Creek salmonids. As presently envisioned, the acquisition would not improve public access to a recreational fishery.

SECTION II: FISHERIES OVERVIEW

Section II is a summary of all fisheries in the NKPMA. The section begins with a listing of emergency orders required to manage the area's sport and personal use fisheries from 1995-1997 (Table 3). Each fishery chapter is subdivided into sections which provide the reader with a listing of the fishery objectives, the inseason management approach, an historical perspective of the fishery and a review of recent Board of Fisheries actions, followed by a review of recent fishery performance, the outlook for future years and a review of current issues relevant to the fishery. Each chapter concludes with the author's recommendations for future research and management.

Table 3.-Summary of upper Kenai Peninsula emergency orders, 1995-1997.

Emergency Order Number	Effective Date	Action/Justification
2-RT-1-01-95	4/15/1995 12:01 a.m.	Close Kenai Lake outlet to all fishing through June 10. Conserve rainbow trout.
2-KS-1-11-95	6/13/1995 12:01 a.m.	Extend Ninilchik R. king salmon fishery through June 26. Surplus stocked king salmon.
2-KS-1-17-95	6/17/1995 12:01 a.m.	Permit bait in Kenai River king salmon fishery. Early-run escapement goal projected.
2-RS-1-22-95	6/30/1995 12:00 noon	Open Russian River Sanctuary. Early-run sockeye salmon escapement goal projected.
2-RS-1-26-95	7/11/1995 12:01 a.m.	Close Crescent River drainage (west side of Cook Inlet) to sockeye salmon fishing. Conserve sockeye salmon.
2-RS-1-29-95	7/17/1995 6:00 p.m.	Open Kasilof personal use dip net fishery. Escapement goal of 150,000 to be exceeded.
2-RS-1-33-95	7/25/1995 6:00 a.m.	Open Kenai R. personal use dip net fishery. Escapement goal of 450,000 to be exceeded.
2-KS-1-33-95	7/25/1995 12:01 a.m.	Permit fishing from boats in Kenai River on Monday, July 31 and extend late run king salmon fishery through August 6. Projected escapement goal will be exceeded.

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Table 3.-Page 2 of 4.

Emergency Order Number	Effective Date	Action/Justification
2-SH-1-09-96	4/1/1996 12:01 a.m.	Close Crooked Creek to all fishing through July 31. Prohibits retention of rainbow/steelhead trout and requires only unbaited, artificial lures through May 15 in the Kasilof River downstream from the Sterling Highway Bridge. Issued to implement new regulation passed by BOF not yet in effect.
2-RT-1-10-96	4/15/1996 12:01 a.m.	Close outlet of Kenai Lake to all fishing. Issued to implement new BOF regulation not yet in effect.
2-KS-1-12-96	5/15/1996 12:01 a.m.	Close 1/3 mile of Kenai River in immediate area of the king salmon sonar site to all fishing through June 30. Permit department to accurately estimate early-run king salmon.
2-KS-1-15-96	6/1/1996 12:01 a.m.	Supersedes 2-KS-1-12-96. Close 1/3 mile of Kenai River in immediate area of the king salmon sonar site to all boat fishing through June 30. Shore anglers do not affect sonar.
2-KS-1-17-96	6/9/1996 12:01 a.m.	Rescinds Emergency Order 2-KS-1-15-96 effective June 9. Permits bait use downstream from Skilak Lake. Projected escapement goal will be exceeded.
2-KS-1-20-96	6/15/1996 12:01 a.m.	Extend king salmon fishery on Ninilchik River through June 24. Sufficient numbers of king salmon are present to provide additional fishing opportunity.
2-KS-1-19-96	6/17/1996 12:01 a.m.	Permit fishing from boats downstream from Skilak Lake on Monday June 17. Spawning escapement is projected to exceed optimum escapement by 25%.
2-RS-1-21-96	6/17/1996 12:00 noon	Open Russian-Kenai River Sanctuary. Increase bag limit to 6 fish. Early-run escapement goal projected.
2-KS-23-96	6/24/1996 12:01 a.m.	Permit fishing from boats downstream from Skilak Lake on Monday June 24. Spawning escapement is projected to exceed optimum escapement by 25%.
2S-02-96	6/25/1996 6:00 p.m.	Close Kasilof River personal use gillnet salmon fishery. Projected harvest of 5,000 to 10,000 sockeye salmon will be met.
2-RS-1-28-96	7/2/1996 12:01 a.m.	Close 10 miles of bank along Kenai River through August 15. Protection of shoreline habitat.

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Table 3.-Page 3 of 4.

Emergency Order Number	Effective Date	Action/Justification
2-RS-1-31-96	7/16/1996 12:01 a.m.	Close Crescent River drainage (west side of Cook Inlet) to sockeye salmon fishing. Conserve sockeye salmon.
2-KS-1-33-96	8/1/1996 12:01 a.m.	Extend late-run king salmon fishery downstream from Eagle Rock through August 4. Projected escapement goal will be exceeded.
2-RS-1-36-96	8/3/1996 12:01 a.m.	Close Russian River fly-fishing-only area to sockeye salmon fishing through December 31. Escapement is lagging behind minimum goal established for the late run.
2-KS-1-10-97	5/24/97 12:01 a.m.	Close 200-yard area at Centennial Park for habitat protection.
2-KS-1-12-97	6/17/97 12:01 a.m.	Mandatory catch-and-release required for conservation of early-run Kenai River king salmon. Gear restricted to single-hook, artificial lures.
2-RS-1-14-97	6/18/97 12:00 noon	Open Russian River Sanctuary, increase bag and possession limits to 6. Escapement goal projected.
2-KS-1-16-97	7/1/97 12:01 a.m.	Catch-and-release for king salmon upstream from Soldotna Bridge through July 10. Early-run escapement goal not projected.
2-RS-1-17-97	7/1/97 12:01 a.m.	Close additional 5.1 miles of Kenai bank to bank fishing. Habitat protection.
2-KS-1-24-97	7/21/97 12:01 a.m.	Permit boats to be used downstream from Skilak Lake on Monday, 7/21. Escapement goal for king salmon projected.
2-KS-1-26-97	7/28/97 12:01 a.m.	Permit boats to be used downstream from Skilak Lake on Monday, 7/28. Escapement goal for king salmon projected.
2-RS-29-97	7/31/97 12:01 a.m.	Close Kenai/Russian River "fly-fishing-only" area upstream of ferry crossing. Low late-run spawning escapement.
2-KS-1-27-97	8/1/97 12:01 a.m.	Extend king salmon season downstream from Eagle Rock through 8/3.
2-SS-1-33-97	8/9/97 12:01 a.m.	Prohibit anglers from fishing in Kenai River after taking a limit of 1 coho. Correct omission in E.O. 2-SS-02-31-97.
2-KS-1-07-98	6/5/98 12:01 a.m.	Mandatory catch-and-release in Kenai River king salmon fishery. No bait; single hook; retention of 52 inches and larger fish permitted.

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Table 3.-Page 4 of 4.

Emergency Order Number	Effective Date	Action/Justification
2-RS-1-10-98	6/20/98 12:00 noon	Open Sanctuary at Russian River.
2-KS-1-11-98	7/1/98 12:01 a.m.	Harvesting of late-run fish permitted downstream from Soldotna bridge; upstream from bridge catch-and-release continues through July 10.
2-RS-1-04-98	7/1/98 12:01 a.m.	Closed 3/4 mile of bank at end of Keystone Drive to fishing from 7/1 - 8/15.
2-KS-1-16-98	7/23/98 12:01 a.m.	No bait in Kenai River king fishery; treble hooks o.k.
2-PU-1-18-98	7/24/98 12:01 a.m.	Reduced time salmon harvested in PU fishery to 6:00 a.m. - 11:00 p.m.
2-RS-1-17-98	7/24/98 12:01 a.m.	Reduced Kenai sockeye limit to 3; hours reduced to 6:00 a.m. - 11:00 p.m.
2-RS-1-19-98	7/25/98 12:01 a.m.	Closed bank fishing at Soldotna Creek Park from July 25 - August 31.
2-KS-1-23-98	7/28/98 12:01 a.m.	Catch-and-release only in Kenai River king fishery. No bait; treble hooks and retention of 52 inches and greater o.k.
2-RS-1-20-98	7/28/98 12:01 a.m.	Closed Kenai River sockeye fishery from RM 19 downstream to Cook Inlet.
2-PU-1-21-98	7/28/98 12:01 a.m.	Closed the personal use fishery at mouth of the Kenai River.
2-RS-1-22-98	7/28/98 12:01 a.m.	Closed Kenaitze educational fishery.
2-RS-1-25-98	8/3/98 12:01 a.m.	Restore Kenai River sockeye bag limit to 6, remove hourly restrictions and re-open sockeye fishing downstream from RM 19.
2-RS-1-26-98	8/3/98 12:01 a.m.	Re-open the Kenaitze educational fishery.
2-RS-1-28-98	8/3/98 12:01 a.m.	Increased bag and possession limits at Russian River to 6 fish.

KASILOF RIVER EARLY-RUN CHINOOK SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVES

The Kasilof River early-run chinook salmon fishery is supported primarily by stocked chinook salmon of Crooked Creek Hatchery origin, supplemented by limited natural production. The fishery objectives are:

Objective 1: To produce a return approximating 8,000 early-run adult chinook salmon to Kasilof River, while ensuring that a minimum of 700 chinook salmon spawn naturally in Crooked Creek upstream from the hatchery.

Objective 2: To generate approximately 35,000 angler-days of annual sport fishing opportunity directed at stocked chinook salmon in the Kasilof River.

Objective 3: To annually stock 210,000 chinook salmon smolt in Crooked Creek.

Observation and data indicate that all objectives are being achieved. The total return in recent years has approximated or exceeded 8,000 fish (Table 4) with an additional but unknown number spawning downstream from the hatchery. The fishery has been continuous without inseason interruption. Participation has exceeded 35,000 angler-days. Total participation in Kasilof River sport fisheries was 45,240 (1994), 50,000 (1995) and 50,800 (1996) (Mills 1979-1994, Howe et al. 1995-1997). About 90% of this river's fishery participation is assumed to occur during the early-run chinook salmon fishery.

INSEASON MANAGEMENT APPROACH

This fishery is supported primarily by stocked fish; no inseason regulation of the fishery has been required. Inseason management activity has been limited to a relative determination of angler success through observation and contact with anglers. This information is used in conveying the general status of the fishery to the news media and public.

HISTORICAL PERSPECTIVE

The recreational fishery for early-run chinook salmon in the Kasilof River occurs from late May through early July. The early run is primarily hatchery fish that return to Crooked Creek, a tributary to the Kasilof River, approximately 6 miles upstream from Cook Inlet (Figure 3).

In the late 1970s and early 1980s virtually all fishing was from the shore of the Kasilof River in the one-half mile immediately downstream from its confluence with Crooked Creek. In recent years an increasing number of drift boats have been employed in the fishery.

The timing of the early run precedes the commercial set gillnet fishery on the east side of Cook Inlet. There is, however, a personal use gillnet fishery that occurs in late June at the mouth of the Kasilof River. This fishery harvests primarily sockeye salmon returning to Tustumena Lake. Each year small numbers of chinook salmon of Crooked Creek origin are also caught here (Table 5).

In 1994 this fishery was replaced with a gillnet subsistence fishery and in 1995 with a gillnet personal use fishery. Regulation of the fishery was identical each year, only the designation of the fishery changed. The 1994 and 1995 fishery occurred on Ninilchik, Cohoe, and Kalifornsky and Salamatof beaches. Regulations were liberal with a resultant harvest of 610 chinook salmon

Table 4.-Historical summary of Kasilof River drainage early-run chinook salmon fishery, 1978-1997.

Year	Kasilof River [a] Harvest		Crooked Creek Egg Take	Crooked Creek Escapement	Sold or Destroyed by Hatchery	Total Return	Catch Per [b] Hour
	Number	Percent	Number	Number	Number	Number	
1978	251	5.1	202	4,513		4,966	0.038
1979	283	7.4	181	3,363		3,827	0.040
1980	310	12.0	167	2,115		2,592	0.019
1981	1,242	30.0	49	2,855		4,146	0.061
1982	2,316	39.8	244	3,259		5,819	0.088
1983	2,853	39.9	496	3,809		7,158	0.044
1984	3,964	52.1	437	3,213		7,614	0.062
1985	2,986	51.5	291	2,521		5,798	0.044
1986	7,071	67.0	317	3,161		10,549	0.073
1987	4,461	54.5	324	3,400		8,185	0.071
1988	4,953	56.6	321	700	2,775	8,749	0.086
1989	3,767	55.6	263	750	1,998	6,778	0.099
1990	2,852	55.6	379	771	1,125	5,127	0.098
1991	5,055	71.5	258	700	1,055	7,068	[c]
1992	6,049	65.3	267	750	2,196	9,262	[c]
1993	9,724	87.9	376	848	113	11,061	[c]
1994	7,217	80.1	134	640	1,016	9,007	[c]
1995	6,681	69.3	0	750	2,206	9,637	[c]
1996	5,435	71.0	0	764	1,460	7,659	[c]
Mean	4,077	51.2	248	2,046	1,549	7,105	0.043
1997			0	[d]	0		[c]

Note: One-ocean jacks not included.

[a] Data obtained from Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995-1997. Includes an unknown small number of late-run fish.

[b] Data obtained from FRED Division Kasilof River creel survey.

[c] No survey conducted.

[d] Hatchery closed; weir not in place.

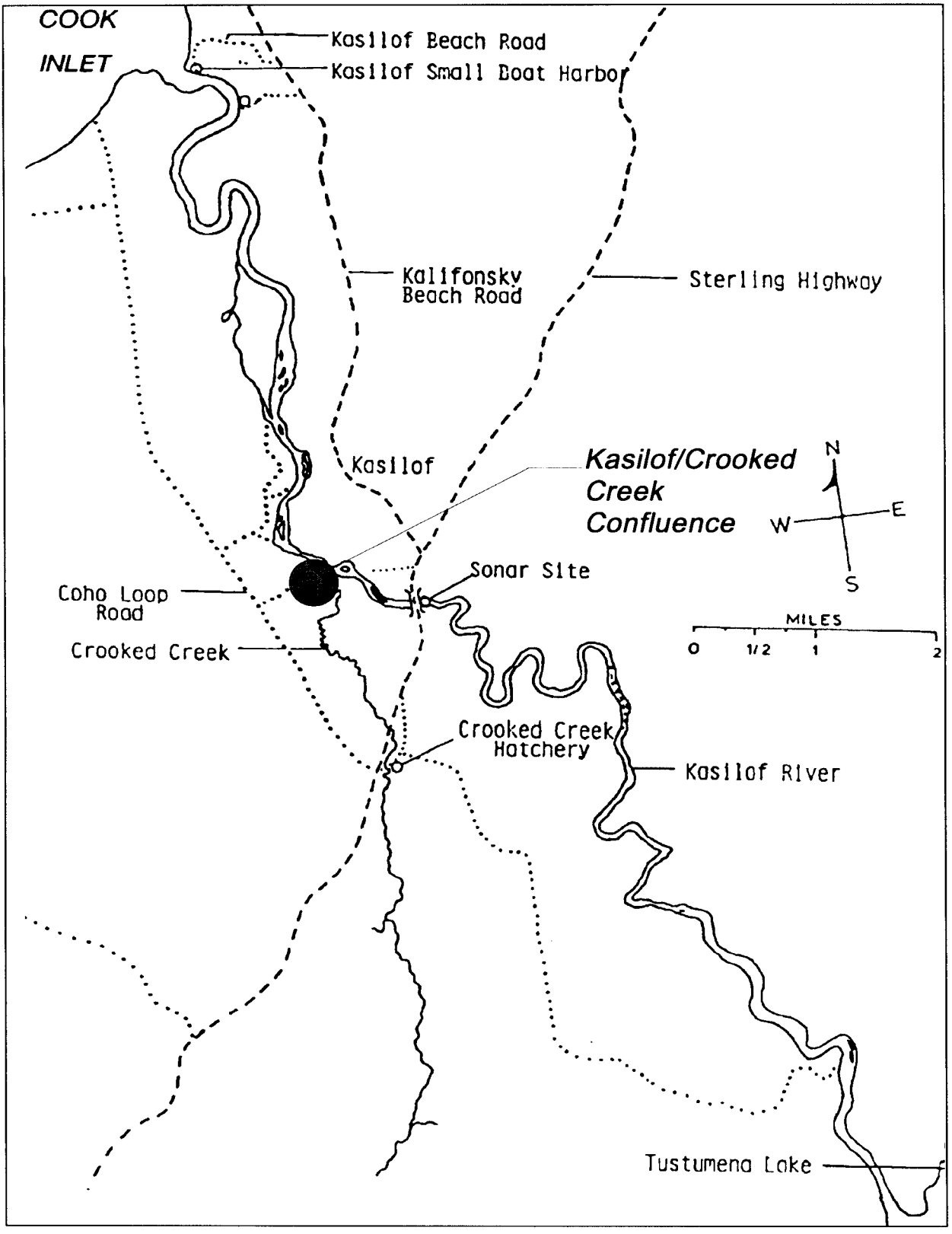

Figure 3.-Kasilof River early-run chinook salmon fishery.

Table 5.-Kasilof River personal use and subsistence gillnet harvest of chinook salmon, 1984-1997.

Year	Chinook Harvest
1984	165
1985	193
1986	168
1987	184
1988	118
1989	186
1990	129
1991	129
1992	no fishery
1993	47
1994	610[a,b]
1995	695[a]
1996	44
1997	62

[a] Fishery occurred on Ninilchik, Cohoe, Kalifornsky, and Salamatof beaches throughout the season, so includes chinook from many parent streams and from both early and late runs.

[b] Fishery in 1994 was designated as a subsistence fishery.

in 1994, 695 in 1995. It must be emphasized that the stream of origin of these fish is not known. Probably all streams supporting this species contributed chinook salmon as the 1994 and 1995 fishery occurred throughout the season. Since 1996, the personal use gillnet fishery has been confined to the mouth of the Kasilof River. The fishery is open for 1 week in late June. Harvests of chinook salmon from this fishery have been less than 100 fish.

BOARD OF FISHERIES ACTIONS

The BOF did not alter regulation of this fishery in 1990, 1992 or during the 1995/96 regulatory cycle. The Board will again accept proposals regarding this fishery in 1998.

RECENT FISHERY PERFORMANCE

Harvest of early-run chinook salmon from the Kasilof River was 7,217 (1994), 6,681 (1995) and 5,435 (1996) (Table 4). Harvest was apportioned 53% to bank anglers, and 47% to boat anglers in 1997, continuing the general trend of increased participation in the boat fishery. Natural spawning escapement upstream from the hatchery from 1994-97 ranged from 640-764; total return from 7,659-9,637.

Harvest estimates for the 1997 season will not be available until fall 1998. The 1997 season occurred in a normal manner with a continuing increase in the number of drift boats employed in

the fishery. The last hatchery egg-take occurred in 1994. On July 1, 1997 Crooked Creek Hatchery was returned to the State by Cook Inlet Aquaculture Association. The hatchery has been surplused and no longer hatches or rears fish. The weir was not operational in 1997; no escapement estimate of early-run chinook salmon was obtained.

OUTLOOK

Total annual return of stocked early-run chinook salmon to this fishery has been relatively consistent. Future adult returns are projected to mirror historic returns.

CURRENT ISSUES

Escapement estimates for early-run chinook salmon can not be obtained without a weir. The Division of Sport Fish has no current plans to implement a weir program. Predicated on historic fishery performance, the assumption is made that the efficiency of the sport fishery will not increase to the point which would depress escapements above the hatchery site to less than 700.

In the early years of the fishery social issues were related to limited parking, habitat degradation and congestion. The parking issue was resolved when the state purchased and enlarged the parking lot. Additional improvements (graveled paths and sanitary facilities) were also added. These amenities are administered by the Division of Parks. The addition of these improvements decreased habitat degradation and provided a more aesthetically pleasing experience. Crowded conditions on the stream will still continue to be part of the fishery. Chinook salmon concentrate in the half mile below the confluence of Crooked Creek and Kasilof River. Anglers direct their efforts here as this area offers the highest probability of success.

RECOMMENDED RESEARCH & MANAGEMENT

No program specific research or changes in management activity are required at this time.

KASILOF RIVER LATE-RUN CHINOOK SALMON FISHERY

FISHERY OBJECTIVE

This fishery is not specifically addressed in a Board adopted management plan. Department objectives adopted for this fishery are:

Objective 1: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

Objective 2: To ensure, through appropriate management and research programs, that the chinook salmon population does not decline below the levels necessary to ensure sustained yield.

INSEASON MANAGEMENT APPROACH

There has been no inseason management in the history of this fishery. The fishery is managed through existing regulations. These regulations are conservative, permitting a harvest of late-run Kasilof River chinook salmon only downstream from the Sterling Highway Bridge.

HISTORICAL PERSPECTIVE

Limited information is available regarding this resource or the fishery it supports. Run timing is believed to be July and early August, similar to that of late-run Kenai River chinook salmon. The spawning area is believed in large part to be confined to that area from the Sterling Highway Bridge upstream to Tustumena Lake, with an unknown proportion of the spawning population

concentrated in the "slackwater" area at the outlet of Tustumena Lake. Here, late-run spawning fish have been captured and provide the brood stock for the department's late-run chinook salmon stocking program in other Kenai Peninsula waters. No hatchery-produced fish have been returned to Kasilof River. A population estimate of late-run Kasilof River chinook salmon has not been made.

Given that run timing and migratory behavior of late-run Kasilof River chinook salmon mirrors late-run Kenai River chinook salmon, both populations contribute to the late-run Cook Inlet marine sport fishery and to the Cook Inlet commercial fishery. The proportionate contribution of Kasilof River chinook salmon to these fisheries is not known.

The inriver Kasilof River sport fishery is limited by regulation to January 1 through July 31. During the early run (late May through June) the river is open in its entirety to chinook salmon fishing. During the July late-run fishery, the area upstream from the Sterling Highway bridge is closed to chinook salmon fishing to protect fish on the spawning grounds. The early run is harvested by both bank and boat-based anglers. Observation indicates the late run is harvested primarily by anglers employing drift boats. The Kasilof River is too shallow to be readily negotiated with conventional power boats; small numbers of air- and jet-driven boats have been observed.

Harvest estimates for the early- and late-run Kasilof River fishery are determined from the Statewide Harvest Survey. This study did not differentiate between early- and late-run fisheries prior to 1996; the proportionate contribution of early- and late-run fish to the total harvest is not known for these years. Estimates of early- and late-run harvest from the Statewide Harvest Study are available beginning in 1996.

BOARD OF FISHERIES ACTIONS

In 1992 the Board considered two public proposals to liberalize the late-run fishery: (1) to open the fishery in July upstream from the Sterling Highway Bridge, and (2) to extend the chinook salmon season through mid-August. Both proposals were rejected because of the assumed small size of the population and the lack of information regarding the population's biological characteristics. Similar proposals were before the Board in November 1996; they were not adopted for like reasons.

RECENT FISHERY PERFORMANCE

The fishery is neither creel surveyed nor monitored. The harvest estimate for the 1996 fishery was 2,172 late-run chinook salmon. The harvest was apportioned among users as follows: 1,113 to nonguided bank anglers, 196 to nonguided boat anglers, 40 to guided bank anglers and 823 to guided boat anglers.

This is the first estimate of late-run harvest. In the Statewide Harvest Survey Questionnaire anglers were asked to report chinook salmon harvested prior to and after July 1. Chinook salmon harvested prior to July 1 were considered early-run fish; after and including July 31 late-run fish.

The designation of July 1 as the demarcation between early- and late-run chinook salmon is arbitrary. A harvest of over 2,000 late-run fish appears to be high given information provided by anglers. It should also be noted that over 1,000 “late-run” fish were harvested by bank anglers. These fish were probably harvested at the confluence of Kasilof River/Crooked Creek, and a high percentage of them could have been latter-arriving early-run fish.

Harvest in the 1997 fishery will be determined by Statewide Harvest Survey with results available in fall 1998. Participants reported that the success rate in 1997 was similar to prior years.

OUTLOOK

Kenai Peninsula July chinook salmon sport fisheries are limited to the marine waters of Cook Inlet, and the Kenai and Kasilof rivers. The Kenai River supports the greatest participation. In years when the Kenai River is restricted for resource conservation, some of the displaced participants will fish the Kasilof River.

Participation is expected to increase in this fishery, especially during years in which the Kenai River late-run fishery is restricted for resource conservation.

CURRENT ISSUES

A late-run chinook salmon population of unknown size is supporting a sport harvest which may approximate 2,000 fish. This stock also contributes to a marine sport and commercial fishery. Although there are no identified conservation concerns at this time, there is the potential to overharvest this resource.

RECOMMENDED RESEARCH & MANAGEMENT

We suggest the department initiate a study of this population. Objectives of research should include estimating population size, identifying spawning areas, and validating run timing and migratory assumptions described above. Until such time as this study is complete, we recommend that no liberalization of the fishery occur.

July 1 may not be the appropriate demarcation date between the early and late run. We recommend observation of the fishery in early July. Relative maturation of fish harvested would provide data to select a date separating early- and late-run harvest.

BIG RIVER LAKE/WOLVERINE CREEK EARLY-RUN SOCKEYE SALMON FISHERY

FISHERY OBJECTIVE

This fishery is not specifically addressed in a Board adopted management plan. Department objectives for this fishery are:

Objective 1: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

Objective 2: To ensure, through appropriate management and research programs, that the Wolverine Lake early-run sockeye salmon spawning population does not decline below levels necessary to ensure sustained yield.

INSEASON MANAGEMENT APPROACH

Inseason management of this fishery has not been required to date. The fishery is managed through existing regulations.

HISTORICAL PERSPECTIVE

Big River is a large, generally clearwater, westside drainage tributary to Cook Inlet about 8 miles south of the West Foreland. The river supports populations of sockeye, chinook, coho and pink

salmon, Dolly Varden and rainbow trout. The drainage is believed to support both an early- and late-run sockeye salmon run.

Cook Inlet Aquaculture Association operated a weir on Wolverine Creek in 1982 and 1983. In 1982 the weir was installed June 22 and was removed August 9. The total sockeye salmon count was 32,950; 59% had passed the structure by July 3 with a peak passage of 3,356 on June 28. In 1983 the weir was operational June 10 and was removed August 6. The total sockeye salmon count was 18,189; 68% had passed the structure by July 3, and peak day of passage (1,485) was June 22.

These fish spawn in Wolverine Lake, which is drained by Wolverine Creek. Wolverine Creek is tributary to Big River Lake which is in large part considered the headwaters of Big River. Big River Lake is about 10 miles from Cook Inlet. Access to the lake is via float plane. The sockeye salmon sport fishery occurs adjacent to the mouth of Wolverine Creek in Big River Lake beginning in mid-June and continuing through July.

In 1982 Cook Inlet Aquaculture personnel staffing the Wolverine Creek weir observed 123 aircraft, one helicopter and three boats which transported 396 anglers to the fishery. Assuming one daily limit catch of 3 sockeye salmon for each angler, harvest that year was 1,188 sockeye salmon or about 3.5% of the return destined for Wolverine Lake spawning grounds. In 1983 weir staff observed 196 aircraft, two canoes and five boats which transported 624 anglers to the mouth of Wolverine Creek. Assuming one daily limit per angler, the 1983 sport harvest was 1,872 sockeye salmon or about 9.3% of the Wolverine Lake return.

Current harvest and participation data in this fishery are derived from the Statewide Harvest Survey and are available for 1990, 1993 and 1994-1996.

In 1988 a public proposal was adopted by the Board establishing Wolverine Creek, including Big River Lake within a 500 yard radius of the mouth of Wolverine Creek, as a fly-fishing-only area from June 1 through July 31. The regulation was adopted to reduce the incidence of both intentional and unintentional snagging which had become a social issue in this fishery.

BOARD OF FISHERIES ACTIONS

There were no regulatory changes adopted for this sport fishery at the 1990, 1992 or 1996 Board meetings.

RECENT FISHERY PERFORMANCE

Harvest in 1996 was estimated at 2,568 sockeye salmon; participation was 1,646 days fished. The estimated catch was 2,568 sockeye salmon (Table 6).

Dan Timm (retired Division of Wildlife Conservation Regional Supervisor) and Karen Timm resided at Big River Lake during the 1991 and 1992 seasons. Their observations were that in both years from June 20 to July 25, an average of eight planes/day arrived and departed from the lakes. In August the daily average declined to 1.25. These observers further estimated the 1991 sockeye salmon numbers were 40%-50% of the number counted in 1982, and in 1992 only about 30%-40% of the 1991 number were present.

OUTLOOK

Because of increasing participation in many Kenai Peninsula salmon fisheries, some anglers are finding them too congested and are seeking less crowded recreational fisheries. The west side

Table 6.-Big River Lakes sockeye salmon harvest, catch, and effort as estimated by the Statewide Harvest Survey, 1990-1996.

Year	Catch	Harvest	Angler-days
1990	1,044	437	370
1991	NA	NA	NA
1992	NA [a]	NA	NA
1993	2,364	976	535
1994	1,595	1,013	653
1995	2,180	998	659
1996	6,140	2,568	1,646

Source: Statewide Harvest Survey (Mills 1991-1994, Howe et al. 1995-1997).

[a] Too few responses to Statewide Harvest Survey from this site to generate an estimate.

Big River Lake early-run sockeye salmon fishery is viewed by some of these anglers as a viable alternative. Similarly, there has been increased interest by commercial air charter operators in promoting participation in the more remote sport fisheries on the west side of Cook Inlet. Participation in this fishery is therefore expected to continue to increase.

CURRENT ISSUES

There are three issues regarding this fishery: (1) the possible decline in the Wolverine Lake sockeye salmon spawning population, (2) the illegal snag fishery which has been reported by fishery participants, and (3) potential negative brown bear/human interaction.

Spawning escapement data for this fishery are limited to weir counts in 1982 and 1983; abundance estimates thereafter are limited to observation (see Historical Perspective). The population status can therefore not be definitively ascertained. A possible decline in abundance is a potential issue in the biological management of this fishery. A perceived decline by the user group is also a management issue.

The attempt by the Board in 1988 to establish a "Russian River type" fishery here, by designating the mouth area as fly-fishing-only, has not been totally successful. Sockeye salmon at Russian River are oriented to the current in close proximity to the bank. The fly is not retrieved but drifted at river velocity. There is virtually no current at the outlet of Wolverine Creek; sockeye salmon are swimming randomly and not necessarily oriented to the limited current. Terminal tackle (artificial fly) cannot drift but must be retrieved. The character of fish behavior here and the lack of flowing water leads to unintentional snagging as the fly is retrieved. Failure to catch fish legally when many fish are present fosters the retention of illegally hooked fish by some of the fishery participants.

Brown bear concentrate at the mouth of Wolverine Creek and feed on sockeye salmon as they enter the stream. This is the area of angler concentration. Although serious altercations between bears and anglers are not known to have occurred, the potential is present.

RECOMMENDED RESEARCH & MANAGEMENT

Of concern to management is the possible decline in the sockeye salmon population and the illegal practice of snagging. We recommended that aerial surveys be conducted in 1998 to ascertain the relative magnitude of the return. If the return appears to be significantly less than enumerated in 1982, a formal enumeration program (weir) for the 1999 season should be considered. This program should be coordinated with the Commercial Fisheries Division (CFD) because the commercial fishery is the primary harvester of this stock.

The issue of unlawful snagging should be referred to Fish and Wildlife Protection with a request that routine contacts with anglers using the fishery be increased.

The issue of potential negative brown bear/human interaction is best addressed by an educational program for the angling public.

RUSSIAN RIVER EARLY-RUN SOCKEYE SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVE

Management of this fishery is governed by the Russian River Sockeye Salmon Management Plan (5 AAC 21.361). The primary management objective, as directed in the plan, is to achieve a minimum spawning escapement goal of 16,000 early-run sockeye salmon into the Russian River system (Figure 4). This goal, originally established at 9,000 when the plan was adopted in 1978 and increased to 16,000 in 1990, has been achieved in all years since 1977, except 1989 (Table 7).

INSEASON MANAGEMENT APPROACH

This fishery is managed by escapement counted at a weir at the outlet of lower Russian Lake. In years of low abundance, the escapement is achieved through inseason restrictions to the sport fishery. In years of high abundance the fishery is liberalized inseason to provide additional fishing opportunity.

Run strength is ascertained by examining three indicators: weir counts, visual enumeration of fish, and observed fishery performance. Weir counts are the primary indicator of run strength. Historical data provide the percentage of the run that is expected to have passed the weir by a given date (Table 8). A determination of run strength can generally be made a few days prior to the historic mid-point (July 1) of the run. In some years fish have been late or have held in the Kenai River. Weir counts are supplemented by onsite enumeration of the numbers of fish present downstream from the weir including the sanctuary area, lower Russian River, the falls area, and the area between the falls and the weir (Figure 5). In addition, observed fishery performance downstream from the sanctuary area is considered as an indicator of run strength. Should inseason restrictions be necessary to achieve the escapement goal the department considers the following options: bag limit reductions, closing only the waters of the Russian River, and a total closure of the Kenai/Russian River fly-fishing-only area until the spawning escapement is projected to be achieved.

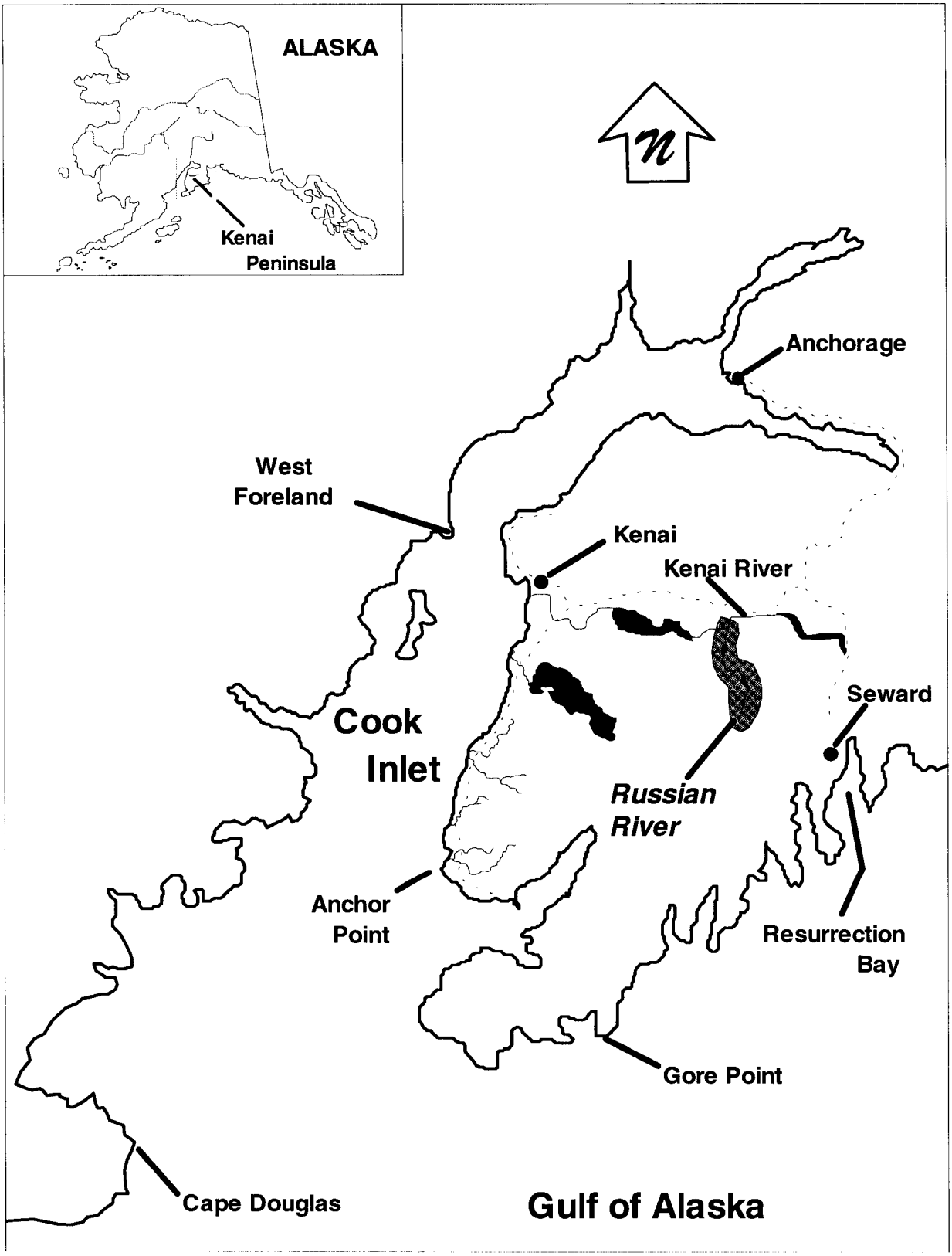

Figure 4.-Location of the Russian River on the Kenai Peninsula, Alaska.

Table 7.-Historical summary of escapement, harvest, angler effort, and harvest rate, Russian River early-run sockeye salmon, 1963-1997.

Year	Days Effort	Hours Effort	Harvest/ Hour	Harvest	Spawning Escapement	Local Return
1963	5,710	Unknown		3,670	14,380	18,050
1964	3,980	13,600	0.261	3,550	12,700	16,250
1965	7,750	37,710	0.266	10,030	21,510	31,540
1966	11,970	63,080	0.237	14,950	16,660	31,610
1967	11,460	62,960	0.115	7,240	13,710	20,950
1968	11,780	66,540	0.104	6,920	9,120	16,040
1969	12,290	61,790	0.095	5,870	5,000	10,870
1970	9,700	48,730	0.118	5,750	5,450	11,200
1971	6,250	33,060	0.085	2,810	2,650	5,460
1972	12,340	52,500	0.096	5,040	9,270	14,310
1973	15,220	70,950	0.095	6,740	13,120	19,860
1974	11,090	61,330	0.105	6,440	13,160	19,600
1975	5,210	20,590	0.068	1,400	5,650	7,050
1976	8,930	28,910	0.117	3,380	14,735	18,115
1977	38,200	138,580	0.147	20,400	16,060	36,460
1978	51,910	196,590	0.192	37,720	34,240	71,960
1979	25,670	96,300	0.087	8,400	19,750	28,150
1980	31,430	130,820	0.208	27,220	28,620	55,840
1981	24,780	103,130	0.104	10,720	21,140	31,860
1982	39,000	163,140	0.211	34,500	56,110	90,610
1983	18,560	78,550	0.106	8,360	21,270	29,630
1984	29,230	144,680	0.248	35,880	28,900	64,780
1985	16,140	75,000	0.164	12,300	30,610	42,910
1986	29,850	126,720	0.277	35,100	36,340	71,440
1987	80,360	319,820	0.482	154,200	61,510	215,710
1988	46,600	186,390	0.294	54,780	50,410	105,190
1989	20,800	79,660	0.142	11,290	15,340 [a]	26,630
1990	44,740	178,970	0.169	30,215	26,720 [b]	56,935
1991	64,651	255,854	0.256	65,390	32,389 [c]	97,779
1992	37,484	143,937	0.212	30,512	37,117	67,629
1993	34,602	134,949	0.276	37,261	39,857	77,118
1994	42,422	178,173	0.275	48,923	44,872	93,795
1995	31,019	124,076	0.190	23,572	28,603	52,175
1996	51,710	225,457	0.334	75,203	52,905	128,108
Mean	26,260	108,900	0.186	24,870	24,700	49,580
1997 [d]					36,280	36,280

[a] Includes 60 fish used to test brood source for disease.

[b] Includes 1,572 fish used as brood source for stocking in Resurrection Bay.

[c] Includes 729 fish used as brood source for stocking in Resurrection Bay.

[d] Creel survey not conducted.

Table 8.-Daily escapement of early-run sockeye salmon at Russian River weir in 1997 and historic mean daily escapement proportion, 1978-1996.

Date	Daily Count	Total Count	Historic Proportion By Day	Date	Daily Count	Total Count	Historic Proportion By Day
09-Jun	0	0	0.001	05-Jul	520	30,490	0.743
10-Jun	1,397	1,397	0.002	06-Jul	323	30,813	0.784
11-Jun	305	1,702	0.006	07-Jul	68	30,881	0.820
12-Jun	3,549	5,251	0.009	08-Jul	1,298	32,179	0.851
13-Jun	1,259	6,510	0.012	09-Jul	318	32,497	0.883
14-Jun	2,153	8,663	0.018	10-Jul	329	32,826	0.908
15-Jun	2,418	11,081	0.024	11-Jul	56	32,882	0.934
16-Jun	578	11,659	0.032	12-Jul	253	33,135	0.946
17-Jun	2,617	14,276	0.044	13-Jul	117	33,252	0.959
18-Jun	4,674	18,950	0.056	14-Jul	314	33,566	0.967
19-Jun	1,137	20,087	0.072	15-Jul	889	34,455	0.972
20-Jun	3,835	23,922	0.094	16-Jul	129	34,584	0.980
21-Jun	988	24,910	0.121	17-Jul	103	34,687	0.986
22-Jun	1,015	25,925	0.149	18-Jul	130	34,817	0.990
23-Jun	86	26,011	0.176	19-Jul	612	35,429	0.992
24-Jun	0	26,011	0.220	20-Jul	244	35,673	0.994
25-Jun	4	26,015	0.265	21-Jul	95	35,768	0.995
26-Jun	2	26,017	0.314	22-Jul	127	35,895	0.995
27-Jun	207	26,224	0.362	23-Jul	246	36,141	0.996
28-Jun	554	26,778	0.404	24-Jul	92	36,233	0.997
29-Jun	947	27,725	0.450	25-Jul	19	36,252	0.997
30-Jun	517	28,242	0.492	26-Jul	19	36,271	0.998
01-Jul	402	28,644	0.534	27-Jul	9	36,280	0.999
02-Jul	353	28,997	0.602	28-Jul	0	36,280	0.999
03-Jul	507	29,504	0.658	29-Jul	0	36,280	0.999
04-Jul	466	29,970	0.702	30-Jul	0	36,280	1.000

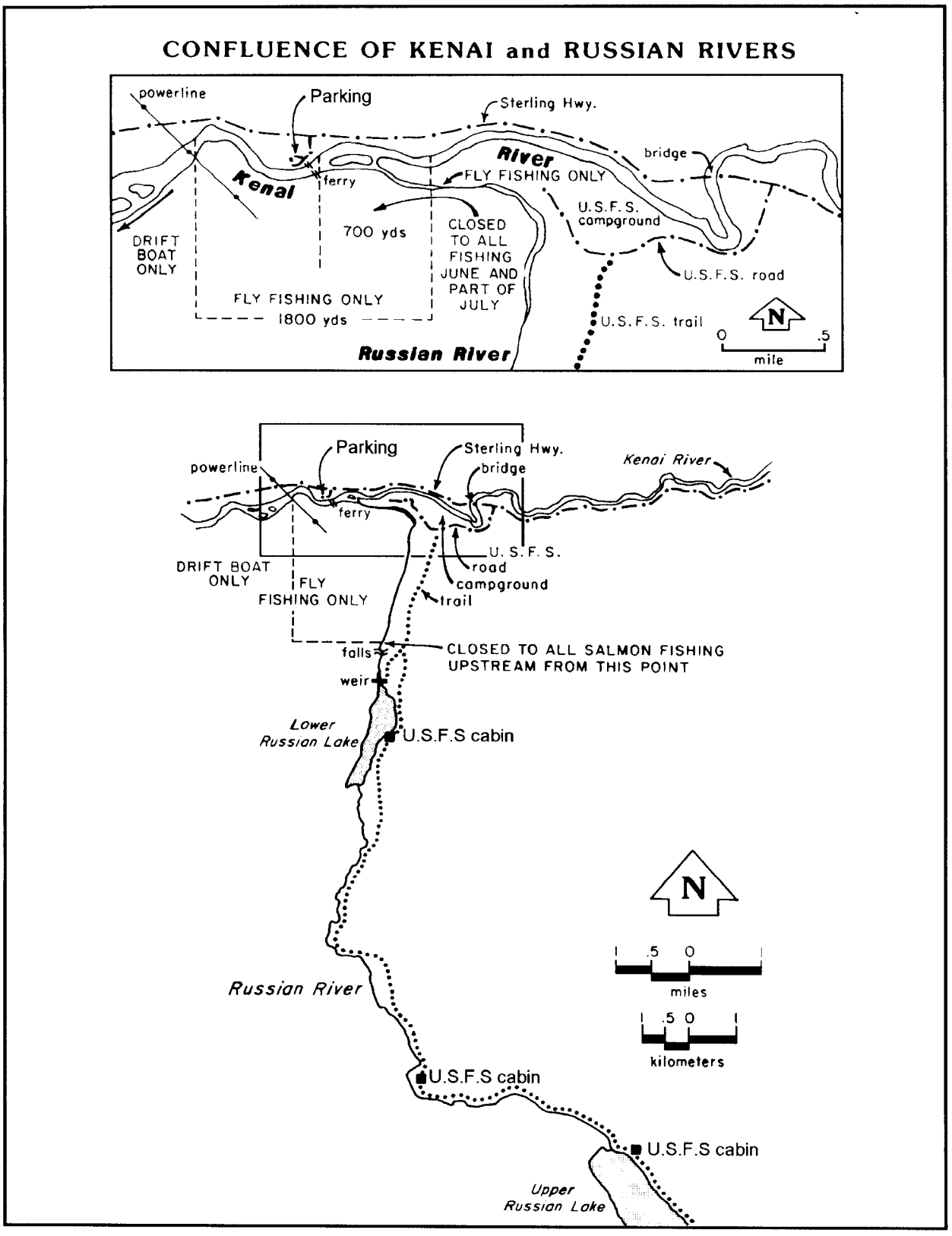

Figure 5.-The Russian River drainage.

Early-run sockeye salmon have been at high levels in recent years and the fishery has been liberalized inseason rather than restricted. The first step is opening the 700-yard sanctuary area at the confluence of the Kenai and Russian rivers to fishing. This area is opened when available information indicate the escapement goal of 16,000 will be achieved. Secondly, if the run is projected to be more than 25% in excess of the escapement goal, the daily bag limit may be increased from 3 to 6 fish.

The area is opened by emergency order. A noon opening is preferable because experience has shown that an opening at this time can take effect in an orderly manner. Late evening, midnight or early morning openings of the sanctuary area are avoided. Opening during the hours of darkness is not desirable because of the large numbers of people competing for limited space in the dark can lead to accidents.

HISTORICAL PERSPECTIVE

The Russian River is a clearwater tributary to the Kenai River near the community of Cooper Landing on the Kenai Peninsula approximately 100 miles south of Anchorage (Figure 4). Lands bordering the stream are federally managed. Public access is via a ferry crossing the Kenai River operated by private concessionaire at the Kenai National Wildlife Refuge parking area near the River's confluence with the Kenai River. Additional access is provided at the Chugach National Forest campground on the Russian River (Figure 5).

The drainage supports one of the largest returns of sockeye salmon to upper Cook Inlet waters and one of the largest freshwater sport fisheries for sockeye salmon in Alaska. In addition, coho, chinook and pink salmon spawn in the system as do resident populations of Dolly Varden and rainbow trout. The drainage is closed to fishing for chinook salmon but supports fisheries for the other species.

Sockeye salmon return to the Russian River during two distinct time periods. An early run arrives at the confluence of the Kenai and Russian rivers in early June. Because of their run timing, these early-run fish are not presently harvested in the upper Cook Inlet commercial fishery. The primary harvest of these fish is therefore in the inriver sport fishery. Early-run fish typically congregate at the confluence of the Russian and Kenai rivers for about 2 weeks before moving into the Russian River to spawn in the upper reaches of the drainage. A late run, part of the larger late run of upper Cook Inlet sockeye salmon, arrives at the confluence area in mid-July and typically migrates directly into the Russian River.

The sport fishery for both early- and late-run sockeye salmon occurs primarily in the lower 3 miles of the Russian River and in the Kenai River downstream for about 1 mile from its confluence with the Russian River. Average early-run harvest is approximately 24,800 fish; angler effort averages about 109,000 angler-hours (Table 7). At times, more than 1,000 anglers simultaneously fish the open 4 mile section of the river. The two public campgrounds managed by federal agencies are routinely filled to capacity and unable to meet public demand for camping and parking.

In 1993 the Sport Fish Division of the Alaska Department of Fish and Game purchased property adjoining Fish and Wildlife Service lands across the Kenai River from the confluence of the Kenai and Russian rivers. The 4.4 acre property, formerly the site of the privately owned Sportsman's Lodge, was purchased for $375,000 primarily with Federal Dingell-Johnson (D-J) funds. The primary reason for the purchase was to provide a launching and take-out area for boat

anglers using the Kenai River. A secondary benefit of the purchase was to provide 50 to 75 additional parking places for anglers fishing sockeye salmon at the confluence of the Kenai and Russian rivers. Purchase of the property has, to a degree, alleviated the previously inadequate parking in this area during peak days of the fishery.

As angler effort has increased, the regulations governing the sport fishery have by necessity become more restrictive. In 1965 the use of treble hooks was prohibited in an effort to reduce snagging. In 1966 terminal gear was limited to flies and the area was designated fly-fishing-only. In 1967 the Board of Fisheries required that only fish hooked in the head, mouth or gills could be retained and, in 1969, this regulation was extended to include all fresh waters of the Kenai Peninsula. In 1973 the regulation was further amended and required that fish hooked elsewhere than in the mouth be released immediately.

Currently, the sport fishery is restricted to terminal tackle consisting of a single-hook, unweighted fly with a maximum hook gap of 3/8 in. This measure was implemented to reduce angler efficiency and provide a measure of protection to the vulnerable fish as they near spawning destinations. To protect holding fish, a portion of the confluence area (termed the "sanctuary") is closed to sport fishing until the early-run escapement is projected to be met. Only the lower 3 miles of the Russian River drainage are open to salmon fishing. The upstream portion is closed to allow fish to migrate unimpeded to spawning destinations.

BOARD OF FISHERIES ACTIONS

The early-run Russian River spawning escapement goal of 9,000 was established by the department in the early 1970s as a minimum goal. This was incorporated by the Board into the Russian River Sockeye Salmon Management Plan in 1978. The minimum spawning escapement goal was based on the maximum availability of spawning habitat in upper Russian Creek, the only known area of early-run spawning at that time. At that time, this was the best methodology available for determining the escapement goal because insufficient stock productivity data were available.

Analysis of 19 years of spawner-to-recruit data indicated production could be optimized by increasing the spawning escapement goal to 16,000 (Vincent-Lang and Carlon 1991). This department-sponsored proposal was adopted by the Board and incorporated into the management plan in 1990.

At its fall 1992 meeting the Board closed the Kenai River from the outlet of Kenai Lake downstream to the upper Killey River (excluding Skilak Lake) to all fishing from April 15 through June 10. Russian River downstream from Lower Russian Lake was closed for the same period. The purpose of the closure was to provide total protection to spawning rainbow trout.

This closure mandated that fishing for sockeye salmon in Russian River and at the confluence of the Russian and Kenai rivers could not begin until June 11. As sockeye salmon are rarely present in significant numbers prior to June 11, this regulation had a negligible effect on the early-run sockeye salmon fishery.

In February of 1996 the Board established a uniform fishing season in the Kenai River between Kenai and Skilak lakes and downstream from Lower Russian Lake of June 15 through April 14. This regulation did not take effect until 1997 to negate economic impacts to anglers and businesses in 1996 which already had reservations in place for fishing, lodging, and guiding

during the 4 days of additional closure. The additional 4-day closure was implemented to reduce impacts on spawning rainbow trout and reduce regulatory confusion, as the trout season did not open until June 15 yet anglers were allowed to fish for Dolly Varden and sockeye salmon beginning June 11.

Regulatory changes to this fishery will next be considered by the Board at its February 1999 meeting.

RECENT FISHERY PERFORMANCE

The 1995 early run of sockeye salmon arrived at the confluence of the Kenai and Russian rivers about June 11. Less than 100 fish had passed the weir before June 19. The primary migration through the weir began on June 19 when more than 1,400 were counted. On June 29, we projected that the spawning escapement goal of 16,000 fish would be achieved. An emergency order, effective 12:00 noon, June 30, opened the 700-yard sanctuary area to fishing. Opening this area increased angler opportunity, harvest, and success.

The early run concluded in late July. Spawning escapement and harvest of early-run fish were estimated to be 28,603 and 23,572, respectively. The 1995 spawning escapement was above the historical mean escapement (24,700) and established goal of 16,000. Harvest was slightly below the historical average of 24,870. Angler success rate of one sockeye salmon harvested per 5.3 hours of fishing approximated the historical early-run success rate (Table 7). Detailed harvest and effort data for the 1995 season was presented by Marsh (1996).

In 1996, early-run sockeye salmon were present in significant numbers at the confluence of the Kenai and Russian rivers when the fishery opened on June 11. The spawning escapement goal of 16,000 was reached June 15. An emergency order, effective 12:00 noon, June 17, opened the 700-yard sanctuary area to fishing and increased the bag limit to 6 fish. Increased angler opportunity, harvest, and success were the result of liberalizing regulations.

The early run concluded in late July and could be characterized as both early and strong. Spawning escapement and harvest of early-run fish were estimated to be 52,905 and 64,733, respectively. The 1996 spawning escapement and harvest were both more than double the historical means. Angler success rate of one sockeye salmon harvested per 3.5 hours of fishing was greater than the historical early-run success rate (Table 7). Detailed harvest and effort data for the 1996 season was presented by Marsh (1998a).

In 1997, the sockeye salmon fishery did not open by regulation until June 15. Early-run sockeye salmon were present in significant numbers at the confluence of the Kenai and Russian rivers at that time. On June 17 we projected that the spawning escapement would be 25% greater than the 16,000 fish goal. An emergency order, effective at 12:00 noon on June 18, opened the 700-yard sanctuary area to fishing and increased the bag limit to 6 fish, resulting in increased angler opportunity, harvest, and success.

The early run concluded in late July. Prior to 1997, inseason harvest of sockeye salmon was estimated by creel survey. Harvest and effort data for the 1997 season will be estimated through the mail out Statewide Harvest Survey postseason. Spawning escapement of early-run fish was estimated to be 36,280; well above the historical mean escapement (24,700) and more than double the established goal of 16,000 (Table 7).

Sampling to determine age, sex, and size of the escapement was conducted during the first and again during the second half of the migration through the weir. Data collection and analysis procedures are described in detail by Marsh (1996). Subsequent analysis determined that there was no significant difference in the two strata allowing the samples to be pooled. Males accounted for 42.2% and females for 57.8% of the early-run escapement. Age 2.3 fish composed 94.5% of the escapement (Table 9).

CURRENT ISSUES

There are no biological issues associated with this fishery. Social issues focus on congestion, and riparian habitat degradation. Some anglers would like to see the opening date of the season returned to June 11. There is no evidence indicating angler-caused habitat alteration has affected the productivity of either the Kenai or Russian rivers. Lands affected are in federal ownership by the United States Forest Service and Fish and Wildlife Service.

Table 9.-Estimated age and sex composition and length-at-age of early-run sockeye salmon at Russian River weir, 1997.

	1.2	1.3	2.2	2.3	3.2	TOTAL
Female						
Sample Size	1		7	158	1	167
Percent	0.3		2.4	54.7	0.3	57.8
SE (Percent)	0.3		0.9	2.9	0.3	2.9
Escapement	126		879	19,835	126	20,965
SE (Escapment)	126		329	1,064	126	1,128
Mean Length (mm)	489		532	597	563	594
SE			6.2	2.1		2.4
Male						
Sample Size		1	6	115		122
Percent		0.3	2.1	39.8		42.2
SE (Percent)		0.3	0.8	2.9		2.9
Escapement		126	753	14,437		15,315
SE (Escapment)		126	305	1,046		1,097
Mean Length (mm)		626	513	594		591
SE			6.1	2.3		2.7
Combined						
Sample Size	1	1	13	273	1	289
Percent	0.3	0.3	4.5	94.5	0.3	100.0
SE (Escapment)	0.3	0.3	1.2	4.1	0.3	
Escapement	126	126	1,632	34,271	126	36,280
SE (Escapment)	126	126	448	1,492	126	
Mean Length (mm)	489	626	523	596	563	592
SE			5.0	1.6		1.8

The greatest amount of habitat degradation has occurred along the eastern bank of the Russian River between the campgrounds and the confluence. The Forest Service has closed some of the trail immediately adjacent to the river and has rerouted the trail away from the bank. Anglers are directed into the river at specific access points to reduce degradation, and a bank rehabilitation project was begun in 1996.

RECOMMENDED RESEARCH & MANAGEMENT

Early-run Russian River sockeye salmon are at high levels of abundance. Spawning escapement goals have been consistently achieved. Angler opportunity and harvest have been maximized. No change in research or management strategy is required at this time.

KENAI RIVER EARLY-RUN CHINOOK SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVE

Management of this fishery is governed by the Kenai River Early Chinook Salmon Management Plan. This plan was adopted by the Board of Fisheries in 1988 and implemented during the 1989 season. **The primary objective of management as outlined in the plan is to achieve an optimum spawning escapement of 9,000 early-run chinook salmon**. The plan outlines management options the department may implement at given projected escapement levels to assure the optimum escapement is achieved.

The fishery begins without the use of bait. If the projected escapement is less than 5,300, the sport fishery is closed to fishing for chinook salmon. At a projected escapement of 5,300 to 9,000, terminal tackle is restricted to unbaited single-hook artificial lures, and the fishery reverts to a "trophy fishery" in which only chinook salmon 52 inches or larger may be retained. Times and/or areas open to fishing may also be restricted. If the projected escapement exceeds 9,000, bait is permitted in the fishery with standard terminal tackle.

Since implementation of the plan in 1989, the primary management objective (spawning escapement of 9,000) has been achieved in 6 of 9 years. In the years in which it was not achieved, spawning escapement was 8,200-9,000.

INSEASON MANAGEMENT APPROACH

The primary objective of inseason management is to achieve the optimum spawning escapement goal of 9,000 fish. Achievement of this objective requires a knowledge of the number of early-run chinook salmon entering the river; an estimate of inseason harvest; and the ability to project the final inriver return, harvest and spawning escapement.

The number of fish entering the river is estimated by sonar counter. The counter is installed May 16; the early run ends by regulation June 30. Counts are generated daily. The count for a given day is available to management staff by the afternoon of the following day.

Harvest is estimated by onsite creel survey. The survey usually begins about May 15 or as soon as water levels rise sufficiently to permit anglers and department staff to use boats on the river downstream from Soldotna. The early-run survey concludes June 30. Harvest estimates are usually generated on a weekly basis; daily estimates are required if a management action is imminent.

The final spawning escapement is projected inseason using a run timing model. This estimate is the projected inriver return minus the projected harvest (including chinook salmon mortality associated with catch-and-release fishing). In most years, an accurate projection can not be made prior to June 10. However, in years of an exceptionally strong or weak return, this projection can be made earlier. Depending on the projection, restrictions or liberalization of the fishery are made in accordance with the management plan.

This is one of the largest and most controversial fisheries in Alaska. Interaction with the user groups affected by management decisions is critical to the successful implementation of any inseason management action. Accurate dissemination of information regarding the fishery's status is imperative and considered by this author to be the key to a successful management program.

The Soldotna office has two recorded message phones. One phone provides a general weekly fishing forecast; the other a brief summary of spawning escapements, weir and sonar counts for major Kenai Peninsula fisheries. A brief summary of this fishery's status is provided daily on the latter message phone. This message phone may receive over 800 calls daily during the peak of the fishery. This not only affords the public reliable access to information, but also increases the efficiency of the Soldotna staff by freeing them from the routine duty of repetitively providing information to anglers who contact the office staff regarding the fishery's status.

Public interaction is also achieved through formal news releases and requests for information from the news media. News releases and requests from the news media are given a priority because they provide a public forum to disseminate information regarding the fishery's status and the management plan which regulates the fishery, and pending management actions.

Restrictive management actions in this fishery are socially disruptive. This disruption can be mitigated by apprising the public of probable restrictions to the fishery through the aforementioned use of the recorded message phone and news media contacts. Staff attempt to issue formal announcements regarding emergency orders that change the management of the fishery as soon as the decision is made, preferably at least 24 hours before a given action occurs.

HISTORICAL PERSPECTIVE

The Kenai River chinook salmon fishery began in the early 1970s when methods were introduced, adopted from the Pacific Northwest, that allowed the harvest of chinook salmon from this glacially turbid river. Bouncing bright terminal tackle, either with or without bait, at river velocity was initially the preferred fishing technique. Gradually other methods such as "jet planing," "back trolling" and 'back-bouncing" proved successful in certain water conditions.

Chinook salmon return to the Kenai River in two distinct runs, early and late. The first run usually begins arriving in harvestable numbers by mid-May, peaks in mid-June, and has passed through the majority of the fishery by late June. Late-run fish are present in July and early August. Most of the early-run fish spawn in two tributaries, the Killey and Funny rivers; late-run fish are primarily mainstem spawners.

Because of its popularity and the magnitude of the chinook salmon runs which support it, the fishery is restrictively regulated. Chinook salmon fishing is limited to a 50-mile area downstream from Skilak Lake (Figure 6). The season is January 1 through July 31. For regulatory purposes the early run ends June 30. The daily bag and possession limit is 1 chinook

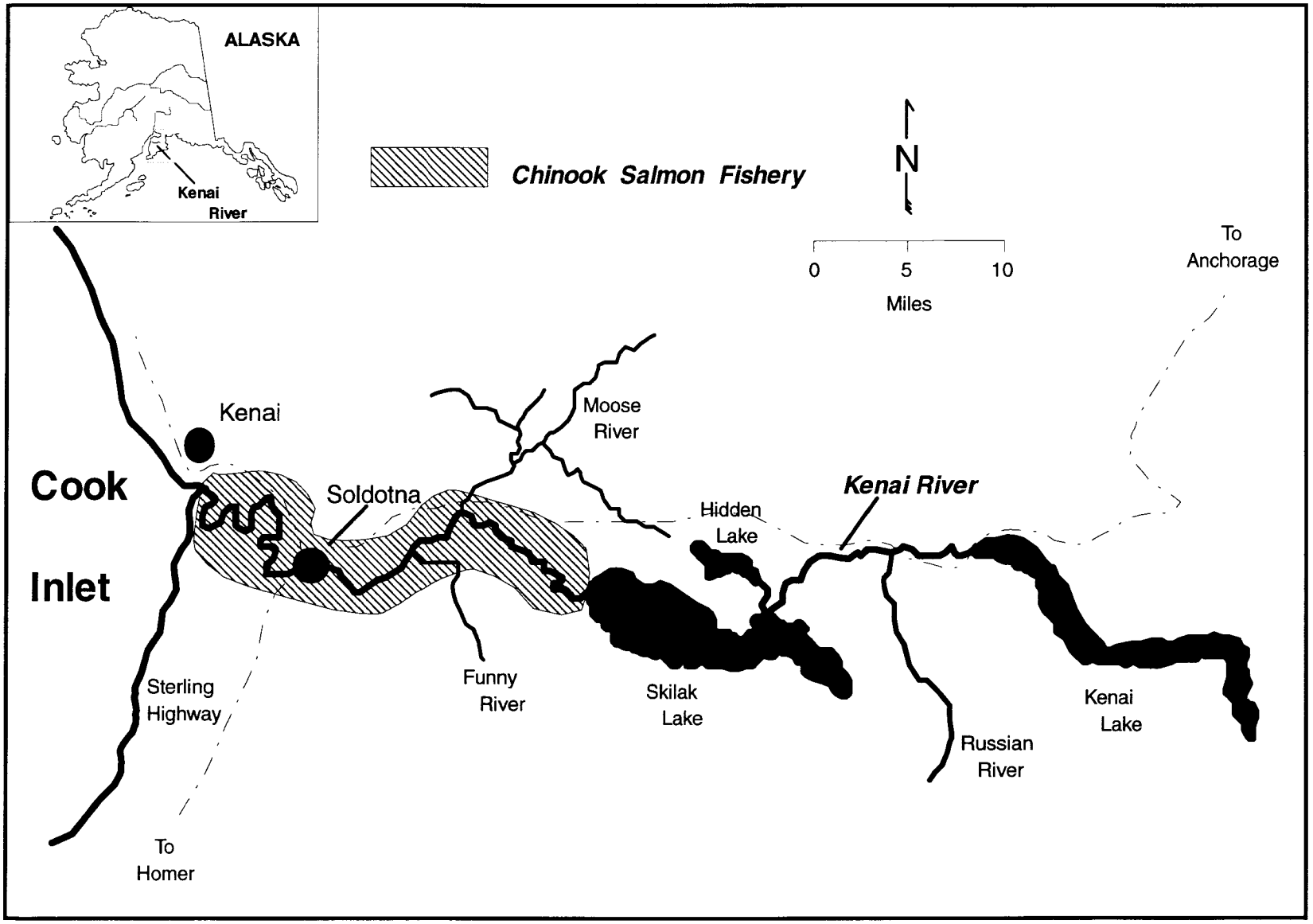

Figure 6.-Map of the Kenai River drainage.

salmon 16 inches or greater in length. The seasonal (April 1-September 30) limit is 2 fish. The majority of the harvest is taken using boats. After retaining a chinook salmon, an angler is prohibited from fishing from a boat in the Kenai River downstream from Skilak Lake for the remainder of that day.

The Kenai River chinook salmon fishery supports a commercial guiding industry. Since 1982 guides have been required to register with the state. Guided anglers are more restrictively regulated than nonguided anglers because their efficiency is generally two to three times greater than nonguided anglers and because of social concerns involving allocation of the harvest between guided and nonguided user groups.

The majority of the area open to chinook salmon fishing is managed as a state park by the Department of Natural Resources. In 1986 this agency reduced the maximum size of outboard motors used on the river to 50 horsepower. In 1987 the maximum horsepower was further reduced to 35. The restriction to smaller outboards has generally been favorably received by the angling public. There is no evidence to indicate that use of smaller motors has reduced angler efficiency.

Under current Board of Fisheries regulation, the early run has been allocated almost exclusively to recreational anglers. An unknown number of early-run fish are intercepted in the Cook Inlet marine sport fishery prior to their entry into the Kenai River fishery.

The department's management and research activities directed toward this fishery began in 1974 with the initiation of a creel survey to determine angler harvest, effort and success rates. In 1984, a tag and recapture program was initiated to estimate the population of late-run chinook salmon entering the river. In 1985, the program was expanded to include an estimate of early-run fish. This tagging project used drift gillnets to capture chinook salmon in the lower Kenai River. Tagged chinook salmon were recovered in the sport fishery through the creel survey. The tagging program provided inseason catch per unit effort (CPUE) data and a postseason estimate of early- and late-run abundance.

In 1984, the department implemented an experimental sonar program to count these stocks. From 1984-1994, the sonar counter used dual-beam technology, and starting in 1995 has used split-beam technology to separate and count less abundant chinook salmon from the more abundant sockeye salmon. The gear electronically filters small fish targets (sockeye salmon size fish and smaller) by establishing a threshold of target strength to estimate the abundance of large-fish targets. Chinook salmon migrate almost exclusively in the offshore portion of the river. The nearshore areas, where most of the sockeye salmon are found, are not ensonified. Estimates of abundance were first realized from the sonar counter in 1987; sonar counts have been used for inseason management of the fishery since 1988.

In 1988 the Board of Fisheries adopted a management plan for the early run. This plan established minimum (5,300) and optimum (9,000) escapement goals, identified management actions to be taken at given escapement levels and directed that the fishery initially be prosecuted without bait to reduce angler efficiency. Bait is permitted when the optimum escapement goal is projected.

During 1989 the harvest rate in the early-run fishery more than doubled during times bait was allowed. However, in recent years anglers have become more adept at harvesting fish with artificial lures. Difference in success rates between baited and unbaited lures has been reduced.

BOARD OF FISHERIES ACTIONS

The Board changed several provisions of the Early Run Kenai River Chinook Salmon Management Plan in 1990. If catch-and-release is required for conservation during the early-run fishery, the department may now allow retention of chinook salmon 52 inches or larger.

The Board also adopted a regulation which permits an angler, after retaining a chinook salmon 16 inches or larger from that area of the river downstream from Skilak Lake, to fish from a boat upstream from Skilak Lake the same day. The regulation prohibiting an angler from fishing from a boat for any species on the same day in the Kenai River downstream from Skilak Lake after retaining a chinook salmon 16 inches or larger remains in effect.

The Board did not change the Kenai River Early Chinook Salmon Management Plan at its November 1992 meeting. It did, however, adopt as regulation a department sponsored proposal closing the area at the confluences of Slikok Creek and Funny River with the Kenai to all chinook salmon fishing from January 1 through July 14. Chinook salmon hold for a period of time at the confluences of these tributaries, and require increased protection to facilitate their migration into the spawning streams. The intent of the regulation is to increase spawning escapement in these tributaries. This regulation may also negate the necessity of more stringent restrictions if the optimum spawning escapement goal is not projected, i.e. closure to all chinook salmon fishing in that area upstream from Slikok Creek through July 14 as occurred in 1992.

The following regulations were adopted at the November 1996 meeting:

1. The 400 yard area at the confluence of Slikok Creek was closed to all fishing from January 1 through July 14 to provide total protection to early-run chinook salmon. This prevents anglers from fishing for chinook salmon while ostensibly fishing for other species.
2. The 1-mile area at the confluence of the Funny River was closed to all fishing from January 1 through July 14 to provide total protection to early-run chinook salmon. This prevents anglers from fishing for chinook salmon while ostensibly fishing for other species.
3. That area of the Funny River downstream from the Funny River Road Bridge to the Kenai River (about a half mile) was closed to all fishing from June 15 through August 15. The purpose of this regulation was to provide total protection to early-run chinook salmon that spawn here.
4. That area from a marker 200 yards upstream of the Killey River downstream about 1 mile was closed to all fishing from June 25 through July 14 to provide total protection to early-run chinook salmon of Killey River origin.

RECENT FISHERY PERFORMANCE

In 1995-1997 the sonar counter was operational May 16. The fishery opened without the use of bait as it has since 1989. The 1995 and 1996 fisheries were prosecuted in a normal manner. In 1995 bait was permitted beginning June 17; in 1996 bait was permitted beginning June 9. The

1997 fishery was restricted to ensure the optimum spawning escapement of 9,000 was achieved. On June 17, 1997 catch-and-release was implemented by emergency order. Terminal tackle was restricted to single hook, artificial lures. Only chinook salmon 52 inches or larger could be retained. This restriction applied to that area downstream from Skilak Lake. On July 1 the use of bait, multiple hooks and retention of all sizes of chinook salmon was again permitted downstream from the Sterling Highway Bridge in Soldotna. This permitted the harvest of late-run fish. Upstream from the bridge, catch-and-release and restrictions to terminal tackle remained in effect through July 10. This protected early-run fish which had not yet migrated into spawning tributaries.

Total early-run chinook salmon return to the river was 21,921 in 1995; 23,519 in 1996; and 15,104 in 1997 (Table 10). The optimum spawning escapement goal was exceeded in 1995 and 1996. The 1997 escapement of 8,242 was the lowest escapement since 1988 and the third time in 9 years that the goal has not been achieved (Table 10). Harvest was 10,327 in 1995, 5,966 in 1996 and 6,535 in 1997. Participation in 1997 was below average due to harvest restrictions (Table 11).

Kenai River guides are required to register with the Division of Parks. In 1995, 314 guides registered; in 1995, 335; and in 1997, 354. The number of guides fishing the Kenai River is now at a record high (Table 12).

During the 1980s, the harvest per hour of guided anglers averaged three times greater than the harvest per hour of nonguided anglers (Table 13). In the 1990s, guided anglers have been only about twice as efficient as unguided anglers.

OUTLOOK

Regulatory changes to Kenai Peninsula sport finfish fisheries will be considered by the Board in early 1999. Basic regulation of the fishery will therefore be unchanged during the 1998 season. The primary objective of management will continue to be to achieve the desired spawning escapement of 9,000.

CURRENT ISSUES

Adoption of the Early Run Chinook Salmon Management Plan was essential to the biological management of this fishery. The plan established escapement goals and identified management strategies to achieve these goals. Formalized identification of objectives and strategies to achieve these objectives removed much of the subjectivity from the management of this fishery.

Regulations governing the early-run Kenai River chinook salmon fishery are numerous and complex. Many of these regulations are related to allocative and social rather than biological issues and reflect the Board of Fisheries' desire to provide recreational opportunity for both guided and nonguided anglers.

Restrictive regulations regarding guided anglers initially served a dual purpose: (1) they reduced harvest and were a management tool to conserve the resource; and (2) they addressed the social issue of competition between guided and nonguided anglers, allocating additional time to less efficient nonguided anglers. These regulations were adopted by the Board prior to the adoption of the Early Run Kenai River Chinook Salmon Management Plan in 1988 and the development of the sonar counter as a management tool in 1987.

Table 10.-Summary of early-run Kenai River chinook salmon population data, 1985-1997.

Year	Deep Creek Marine Harvest	Eastside Set Net Harvest	Drift Gill Net Harvest	Commercial Personal Use	Kenaitze Educational Fishery	Kenai River Sport Harvest	Hook-and-Release Mortality	Escapement	Total Return
1985	Unknown	Closed	Closed			7,971		8,001	15,972
1986	Unknown	Closed	Closed			7,561	292	19,227	27,080
1987	Unknown	Closed	Closed			13,281	374	11,988	25,643
1988	Unknown	Closed	Closed			12,747	377	7,756	20,880
1989	Unknown	Closed	Closed		73	7,256	169	10,567	18,065
1990	Unknown	Closed	Closed		40	1,735	285	8,659	10,719
1991	Unknown	Closed	Closed		2	891	116	9,924	10,933
1992	Unknown	Closed	Closed		73	1,365	164	8,558	10,160
1993	Unknown	Closed	Closed		118	7,727	219	11,975	20,039
1994	Unknown	Closed	Closed		56	5,634	128	12,752	18,570
1995	Unknown	Closed	Closed		37	10,327	401	11,156	21,921
1996	Unknown	Closed	Closed		14	5,966	241	17,298	23,519
1997	Unknown	Closed	Closed		141	6,535	186	8,242	15,104

Table 11.-Summary of harvest, angler effort and harvest rate estimated by onsite creel survey, early-run Kenai River chinook salmon fishery, 1974-1997.

Year	Harvest	Days Effort	Hours Effort	HPUE[a]
1974	1,685	11,275	41,098	0.041
1975	615	15,047	55,909	0.011
1976	1,554	16,430	64,750	0.024
1977	2,173	35,479	112,007	0.019
1978	1,542	19,568	96,624	0.016
1979	2,661	39,665	139,154	0.019
1980	1,946	32,365	123,019	0.016
1981	4,525	28,335	120,881	0.037
1982	5,466	45,723	166,334	0.033
1983	6,360	42,716	169,997	0.037
1984	4,956	50,455	201,821	0.025
1985	7,971	47,394	184,836	0.043
1986	7,561	50,608	183,901	0.041
1987	13,281	52,716	216,816	0.061
1988	12,747	52,890	259,901	0.049
1989	7,256	58,218	234,527	0.031
1990	1,735	28,845	123,149	0.024 [b]
1991	891	10,518	47,599	0.031 [b]
1992	1,365	11,615	54,330	0.043 [b]
1993	7,727	34,301	153,899	0.050
1994	5,634	37,628	173,842	0.032
1995	10,327	42,715	188,161	0.055
1996	5,966	35,892	185,921	0.032
Mean	5,041	34,800	143,412	0.034
1997	6,535	29,320	129,009	0.051

[a] Harvest per angler per hour.

[b] Harvest per angler per hour does not include periods open only to retention of trophy (greater than 52 inches) chinook salmon.

Table 12.-Summary of Kenai River fishing guide registration program, 1982-1997.

Year	Businesses Registered	Guides Registered	Vessels Registered		
			Powered	Drift	Total
1982	125	207			179
1983	123	198			185
1984	115	214			199
1985	107	160	131	40	171
1986	130	187	138	60	198
1987	145	222	154	77	231
1988	162	252	180	79	259
1989	202	292	225	101	326
1990	230	310	229	126	355
1991	176	290	198	112	310
1992	194	238	251	134	385
1993	191	222	169	127	296
1994	[a]	257	182	157	339
1995	[a]	314	236	177	413
1996	[a]	335	326	124	450
1997	[a]	354	314	158	472

Note: Data provided by Division of Parks and Outdoor Recreation.

[a] Data not available.

The fishery is presently managed on achieving established escapement goals. The sonar counter now permits an inseason determination of whether or not these escapement goals will be achieved.

Social concerns remain an issue in the orderly development of this fishery. These issues relate to competition between guided and nonguided anglers for the harvestable surplus and, in some years, the increased probability of inseason restrictions for stock conservation. Inseason restrictions are disruptive to guided anglers, nonguided anglers and businesses that derive income from this fishery. Some anglers have questioned the accuracy of the sonar counter. In late 1997 and early 1998 sonar counter data were reviewed by technical staff. All available information indicates the sonar counter is providing an accurate estimate of early-run Kenai River chinook salmon abundance (Burwen and Bosch 1998).

Table 13.-Guided vs. non-guided angler harvest, effort, and success rate, estimated by onsite creel survey, early-run Kenai River chinook salmon fishery, 1981-1997.

	HARVEST								EFFORT				
	Guided			Non-Guided			Total		Guided (Hours)		Non-Guided (Hours)		Total (Hours)
Year	Number	%	HPUE [a]	Number	%	HPUE [a]	Number	HPUE [a]	Number	%	Number	%	Number
1981	2,247	49.7	0.080	2,278	50.3	0.025	4,525	0.037	28,044	23.2	92,837	76.8	120,881
1982	2,464	45.1	0.083	3,002	54.9	0.022	5,466	0.033	29,774	17.9	136,560	82.1	166,334
1983	4,086	64.2	0.084	2,274	35.8	0.019	6,360	0.037	48,789	28.7	121,208	71.3	169,997
1984	2,560	51.7	0.053	2,396	48.3	0.016	4,956	0.025	48,235	23.9	153,586	76.1	201,821
1985	4,780	60.0	0.082	3,191	40.0	0.025	7,971	0.043	58,593	31.7	126,243	68.3	184,836
1986	3,986	52.7	0.081	3,575	47.3	0.027	7,561	0.041	49,033	26.7	134,868	73.3	183,901
1987	6,382	48.1	0.114	6,899	51.9	0.043	13,281	0.061	55,977	25.8	160,839	74.2	216,816
1988	6,956	54.6	0.089	5,791	45.4	0.032	12,747	0.049	78,465	30.2	181,436	69.8	259,901
1989	5,304	73.1	0.052	1,952	26.9	0.015	7,256	0.031	102,245	43.6	132,282	56.4	234,527
1990	1,368	78.8	0.038 [b]	367	21.2	0.010	1,735	0.024 [b]	65,960	53.6	57,189	46.4	123,149
1991	593	66.6	0.043 [b]	298	33.4	0.020	891	0.031 [b]	23,279	48.9	24,320	51.1	47,599
1992	712	52.2	0.052 [b]	653	47.8	0.036	1,365	0.043 [b]	26,113	48.1	28,217	51.9	54,330
1993	4,062	59.3	0.070	2,784	40.7	0.029	6,846 [c]	0.044	58,393	37.9	95,506	62.1	153,899
1994	3,198	67.7	0.040	1,524	32.3	0.016	4,722 [c]	0.027	80,002	46.0	93,840	54.0	173,842
1995	4,724	61.1	0.055	3,009	38.9	0.029	7,733 [c]	0.041	86,057	45.7	102,104	54.3	188,161
1996	3,185	53.4	0.044	981	16.4	0.017	5,966 [c]	0.046	71,629	55.0	58,551	45.0	130,180
Mean	3,538	58.6	0.066	2,561	39.5	0.024	6,211	0.038	56,912	36.7	106,224	63.3	163,136
1997	3,661	56.0	0.057	1,282	19.6	0.034	6,535	0.064	64,449	63.0	37,790	37.0	102,239

[a] Harvest per angler per hour.

[b] Harvest per angler per hour does not include periods open only to retention of trophy (greater than 52 inches) chinook salmon.

[c] Total harvest includes estimated harvest from the upstream Kenai River where the creel survey was not conducted (Hammarstrom 1997).

RECOMMENDED RESEARCH & MANAGEMENT

This fishery's research and management activities are interrelated. Research is required for both inseason management decisions and postseason evaluation of management actions and the current regulatory regime. Current research employs sonar to estimate inriver abundance. A creel survey provides inseason and postseason estimates of harvest, catch and angler participation. Combining data from these programs permits inseason projection of total return and spawning escapement. These data are the basis for inseason management decisions. An active management program employing formal news releases and two recorded message phones informs the public of the fishery's status. The continuation of these research and management programs is mandatory in order for the department to meet its constitutional mandate of sustained yield. Although the department will look at all indictors of run strength, sonar will remain the primary tool to determine run strength in 1998. The sonar counter will be installed about 1 week earlier in 1998 to ensure that the entire run is enumerated.

The Upper Cook Inlet Salmon Management Plan directs that salmon stocks which migrate through Cook Inlet prior to July 1 be managed primarily for recreational uses. Allocation of early-run Kenai River chinook salmon between sport and commercial user groups is therefore not an issue.

The known first harvest of early-run Kenai River chinook salmon occurs in the Cook Inlet marine sport fishery adjacent to the beaches between Anchor Point and Deep Creek. This is a mixed-stock fishery harvesting different stocks composed of both wild and stocked fish, including early-run Kenai River chinook salmon. The contribution of this stock to the total marine harvest is not known. Some anglers contend interception of early-run Kenai River chinook salmon in the marine fishery results in early restrictions to the inriver chinook salmon fishery. This issue received considerable attention at the 1992 Board of Fisheries meeting and will continue to be an issue until the harvest in the marine sport fishery can be apportioned by stream of origin. A stock separation program has been initiated. Although difficulty has been encountered tagging a high enough proportion of Kenai River smolt, estimates of Kenai River early-run chinook salmon harvested in this fishery should be available no later than 1998.

KENAI RIVER LATE-RUN CHINOOK SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVES

Objectives for this fishery are contained in the Kenai River Late Run Chinook Salmon Management Plan. This plan was adopted by the Board of Fisheries in 1988; amendments were added in 1990. Objectives in the plan address both biological and allocative issues. **The primary fishery objective is to achieve an optimum spawning escapement of 22,300 late-run chinook salmon into the Kenai River**.

INSEASON MANAGEMENT APPROACH

The primary objective of inseason management is to achieve the optimum spawning escapement goal of 22,300 fish. Achievement of this objective requires a knowledge of the number of late-run chinook salmon entering the river; an estimate of the inseason harvest; and the ability to project the final inriver return, harvest and spawning escapement.

The number of fish entering the river is estimated by sonar counter. Late-run estimates begin July l and terminate approximately August 10. Estimates are generated daily; the estimate for a given day is available to management staff by the afternoon of the following day. If estimates are required earlier, this request is conveyed to the sonar staff who can, by adjusting schedules, provide counts by the morning of the following day.

Harvest is estimated by onsite creel survey. The late-run survey begins July 1 and is continuous until the end of the fishery. The fishery closes by regulation July 31, although length of the fishery may be adjusted by emergency order predicated on the magnitude of the inriver return. Harvest estimates are usually generated weekly; daily estimates are required if an inseason management action is imminent.

The final spawning escapement is projected inseason using a run-timing model. This estimate is the projected inriver return estimated by sonar counter minus the projected harvest estimated by creel survey. The projected harvest includes estimated mortality associated with catch-and-release fishing practices. In most years, an accurate projection can not be made prior to July 20. However, in years of an exceptionally strong or weak return, this projection can be made earlier in the fishery.

Application of management strategies to this fishery may affect sport and commercial fisheries. Management actions the department is mandated to initiate at specified projected spawning escapement levels are:

1. If the projected spawning escapement level is less than 15,500 chinook salmon, the department shall:
   (A) close the recreational fisheries in the Kenai River and in the salt waters of Cook Inlet north of the latitude of Bluff Point to the taking of chinook salmon;
   (B) close the commercial drift gillnet fishery in the Central District within 3 miles of the Kenai Peninsula shoreline; and
   (C) close the commercial set gillnet fishery in the Upper Subdistrict of the Central District.
2. If the projected spawning escapement level is between 15,500 and 22,300 chinook salmon, the department shall restrict the taking of chinook salmon in the Kenai River recreational fishery as necessary to achieve the optimum escapement. To achieve this the department may:
   (A) reduce time or area open to fishing;
   (B) reduce the bag and possession limits to zero; or
   (C) restrict terminal gear to artificial lures; or
   (D) permit only the retention of chinook salmon 52 inches in length or greater.
3. If the projected spawning escapement is between 15,500 and 19,000 salmon the department shall restrict the commercial fisheries as follows:
   (A) within 3 miles of the Kenai Peninsula shoreline the department shall limit the commercial drift gillnet fishery to regular periods;

(B) the department shall limit the commercial set gillnet fishery in the upper subdistrict of the Central district to regular periods (Monday and Friday);

(C) however, if the inriver sonar count is projected to exceed 700,000 sockeye salmon then the drift gillnet fishery and the set gillnet fishery will not be restricted to conserve Kenai River chinook salmon unless the projected chinook salmon spawning escapement is less than 15,500.

This is one of the largest and most controversial fisheries in Alaska. Interaction with the user groups affected by management decisions is critical to the successful implementation of any inseason management action.

The Soldotna office has two recorded message phones. One phone provides a general weekly fishing forecast; the other a brief summary of spawning escapements, weir and sonar estimates for major Kenai Peninsula fisheries. It is on the latter message phone that a brief summary of this fishery's status is provided daily. This message phone may receive over 800 calls daily during the peak of the fishery. This not only affords the public reliable access to information, but also increases the efficiency of the Soldotna staff by freeing them from the routine duty of repetitively providing information to anglers who contact the office staff regarding the fishery's status.

Public interaction is also achieved through formal news releases and requests for information from the news media. News releases and requests from the news media are given a priority because they provide a public forum to disseminate information regarding the fishery's status, the management plan which regulates the fishery and pending management actions.

Restrictive management actions in this fishery are socially disruptive. This disruption can be mitigated by apprising the public of probable restrictions to the fishery through the aforementioned use of the recorded message phone and news media contacts. Staff attempt to issue formal announcements regarding emergency orders which change the management of the fishery as soon as the decision is made, preferably at least 24 hours before a given action occurs.

HISTORICAL PERSPECTIVE

The Kenai River chinook salmon fishery began in the early 1970s when methods were introduced, adopted from the Pacific Northwest, that allowed the harvest of chinook salmon from this glacially turbid river. Bouncing bright terminal tackle, either with or without bait, at river velocity was initially the preferred fishing technique. Gradually other methods such as “jet planing,” “back trolling” and “back-bouncing” proved successful in certain water conditions.

Chinook salmon return to the Kenai River in two distinct runs, early and late. The early run is present from mid-May through June. Late-run fish appear in early July, peak in late July, and are still entering the system in early August. Research indicates that most of the early-run fish spawn in two tributaries, the Killey and Funny rivers; late-run fish are primarily mainstem spawners.

Because of its popularity and the magnitude of the chinook salmon runs which support it, the fishery is restrictively regulated. Chinook salmon fishing is limited to a 50-mile area downstream from Skilak Lake (Figure 7). The season is January 1 through July 31. For regulatory purposes the late run begins July 1. The daily bag and possession limits are 1 chinook salmon 16 inches or greater in length. The seasonal (April 1-September 30) limit is 2 fish. The majority of the harvest is taken using boats. After retaining a chinook salmon, an angler is

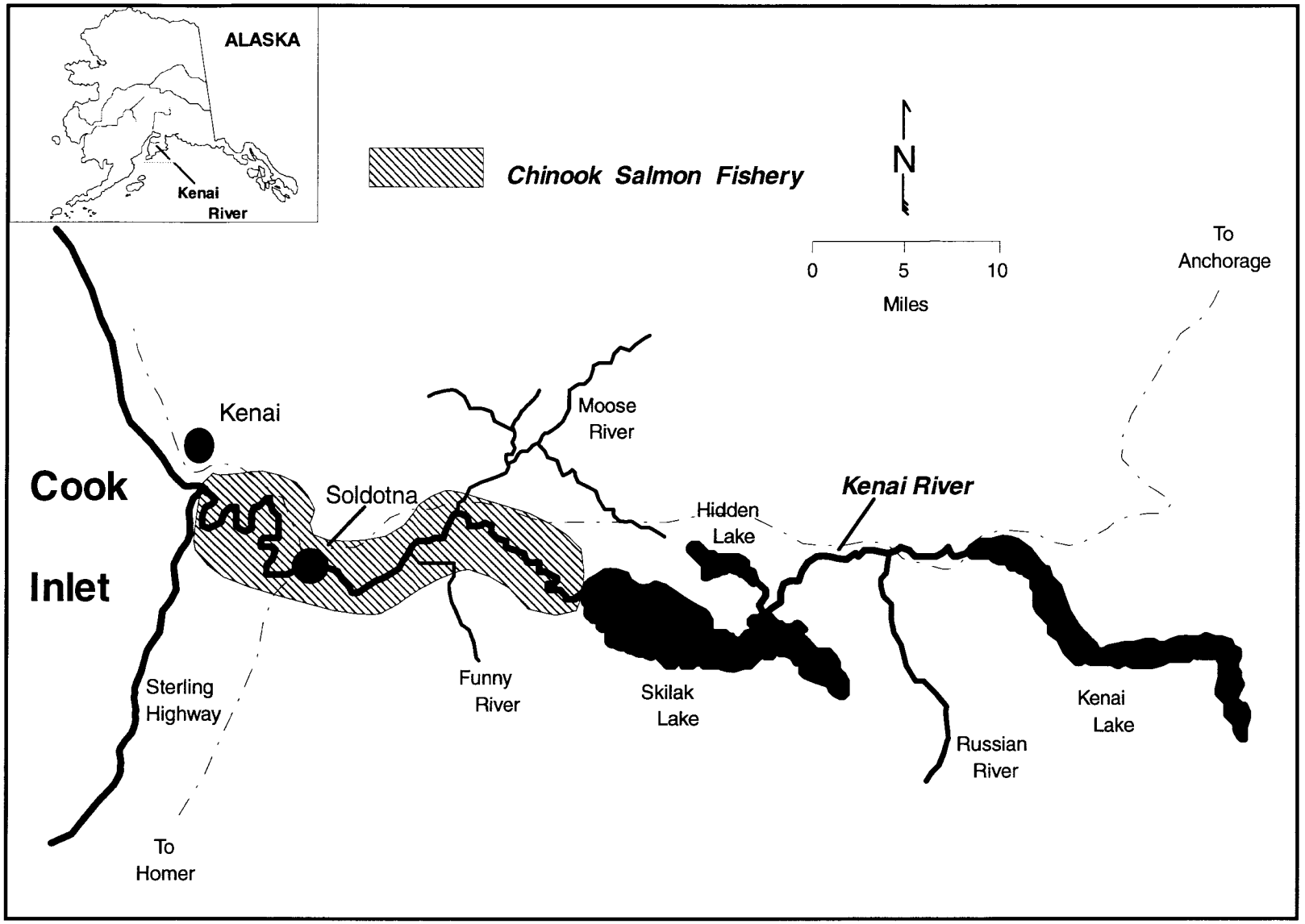

Figure 7.-Map of the Kenai River drainage.

prohibited from fishing from a boat in the Kenai River downstream from Skilak Lake for the remainder of that day.

The Kenai River chinook salmon fishery supports a commercial guiding industry. Since 1982 guides have been required to register with the state. Guided anglers are more restrictively regulated than nonguided anglers because their efficiency is generally two to three times higher than nonguided anglers and because of social concerns involving allocation of the harvest between guided and nonguided user groups.

The majority of the area open to chinook salmon fishing is managed as a state park by the Department of Natural Resources. In 1986 this agency reduced the maximum size of outboard motors used on the river to 50 horsepower. In 1987 the maximum horsepower was further reduced to 35. The restriction to smaller outboards has generally been favorably received by the angling public. There is no evidence to indicate use of smaller motors has reduced angler efficiency.

Late-run fish are harvested by both commercial and sport user groups. Division of the late-run catch between these user groups has been controversial. Commercial interests and the department maintain that sockeye salmon stocks cannot be adequately harvested by eastside beach setnet fishermen without an incidental harvest of late-run chinook salmon. Recreational interests contend that since the incidental commercial chinook salmon harvest has in some years been approximately twice the inriver sport catch, the allocation of late-run Kenai River chinook salmon is neither fair nor equitable.

The department's management and research activities directed toward this fishery began in 1974 with the initiation of a creel survey to determine angler harvest, effort and success rates. In 1984, a tag and recapture program was initiated to estimate the abundance of late-run chinook salmon entering the river. In 1985, the program was expanded to include an estimate of early-run fish. This tagging project used drift gillnets to capture chinook salmon in the lower Kenai River. Tagged chinook salmon were recovered in the sport fishery through the creel survey. The tagging program provided inseason catch per unit effort (CPUE) data and a postseason estimate of early- and late-run abundance.

In 1984 the department implemented an experimental sonar program to estimate abundance of these stocks. From 1984-1994 the sonar counter used dual-beam technology to separate less abundant chinook salmon from the more abundant sockeye salmon. The gear electronically filters small fish targets (sockeye salmon-size fish and smaller) by establishing a threshold of target strength to estimate the abundance of large-fish targets. Chinook salmon almost exclusively migrate in the offshore portion of the river. The nearshore areas, where most of the sockeye are found, are not ensonified. Estimates of abundance were first realized from the sonar counter in 1987; sonar estimates have been used for inseason management of the fishery since 1988.

In 1988 the Board of Fisheries adopted a management plan for the late run. This plan established minimum (15,500) and optimum (22,300) escapement goals, and identified management actions to be taken at given escapement levels. The management plan ensures biological management of the resource and addresses the nontargeted interception of late-run Kenai River chinook salmon in the Cook Inlet commercial fishery.

Regulatory actions taken in the fishery as directed by this plan have been:

1989 No regulatory action in the fishery.

1990 Fishery restricted to single hook, artificial lures on July 27.

Fishery restricted to mandatory catch-and-release on July 28.

1991 Bait prohibited on July 18.

Bait again permitted on July 26.

Fishery extended through August 4 downstream from Eagle Rock.

1992 Fishery restricted to catch-and-release on July 24 with single-hook artificial lures and retention of chinook salmon 52 inches or larger permitted.

No additional fishing time in the East Side Setnet (ESSN) commercial fishery on July 25 or 26.

Regular commercial period fished on Monday (7/27).

Projected on Monday that sockeye sonar would exceed 700,000 therefore no further restrictions to commercial fishery.

1993 Fishery extended downstream from Eagle Rock through August 4.

1994 Fishing permitted from boats on Monday, July 25.

Fishery extended downstream from Eagle Rock through August 7.

1995 Fishing permitted from boats on Monday, July 31.

Fishery extended downstream from Eagle Rock through August 6.

1996 Fishery extended downstream from Eagle Rock through August 4.

1997 Permit fishing from boats on Monday, July 21.

Permit fishing from boats on Monday, July 28.

Extend fishery downstream from Eagle Rock through August 3.

BOARD OF FISHERIES ACTIONS

In 1990 the Board changed several provisions contained in the Late Run Kenai River Chinook Salmon Management Plan. If catch-and-release is required for conservation during the late-run fishery, the department may now allow retention of chinook salmon 52 inches or larger. The Board also directed that if the late-run spawning escapement is projected to be between 15,500 and 19,000, the commercial set gillnet and commercial drift gillnet fisheries within 3 miles of the Kenai Peninsula shoreline will be limited to not more than the regularly scheduled periods on Monday and Friday. However, if the sockeye salmon sonar estimate in the Kenai River is projected to exceed 700,000, then additional commercial openings could occur as long as the projected chinook salmon escapement remained above 15,500. Additionally, the closed waters at the mouth of the Kenai River would not be opened to commercial fishing, regardless of the sockeye salmon escapement, if the projected chinook salmon escapement is less than 22,300.

The Board also adopted a regulation which permits an angler, after retaining a chinook salmon 16 inches or larger from that area of the river downstream from Skilak Lake, to fish from a boat upstream from Skilak Lake the same day. The regulation prohibiting an angler from fishing from a boat for any species on the same day in the Kenai River downstream from Skilak Lake after retaining a chinook salmon 16 inches or larger remains in effect.

The Board considered numerous regulatory changes to this fishery at its November 1992 meeting. All proposals directly relating to this fishery failed to win Board support and were rejected. The Board did, however, clarify the conditions under which the chinook salmon fishery could be extended past its regular closure date of July 31. The fishery could be extended, at the discretion of the department, if the optimum spawning escapement of 22,300 was assured.

The following regulations were adopted at the November 1996 meeting:

1. The 400-yard area at the confluence of Slikok Creek was closed to all fishing from January 1 through July 14 to provide total protection to early-run chinook salmon. This prevents anglers from fishing for chinook salmon while ostensibly fishing for other species.
2. The 1-mile area at the confluence of the Funny River was closed to all fishing from January 1 through July 14 to provide total protection to early-run chinook salmon. This prevents anglers from fishing for chinook salmon while ostensibly fishing for other species.
3. That area of the Funny River downstream from the Funny River Road Bridge to the Kenai River (about a half mile) was closed to all fishing from June 15 through August 15. The purpose of this regulation was to provide total protection to early-run chinook salmon which spawn here.
4. That area from a marker 200 yards upstream of the Killey River downstream about 1-mile was closed to all fishing from June 25 through July 14 to provide total protection to early-run chinook salmon of Killey River origin.

RECENT FISHERY PERFORMANCE

The 1995, 1996 and 1997 fisheries were prosecuted in a normal manner. In 1995 the fishery was liberalized by permitting fishing from boats on Monday, July 31 and extending the fishery through August 6 downstream from Eagle Rock (approximately River Kilometer 18). In 1996 the fishery was extended downstream from Eagle Rock through August 4. The 1997 fishery was liberalized by permitting fishing from boats on Monday July 21 and 28; extending the fishery downstream from Eagle Rock through August 3.

Harvest in 1995, 1996 and 1997 was 10,125, 5,984, and 10,336 chinook salmon, respectively (Table 14). The low harvest in 1996 is attributed to turbid water conditions which persisted throughout the season. The harvest rate was slightly below average in 1995 and 1996; slightly above average in 1997. Participation was above average in all 3 years. Guided anglers took more than 50% of the harvest in all 3 years (Table 15). Harvest in the East Side Setnet commercial fishery ranged from 10,940-12,032 during these years. Spawning escapement exceeded the optimum goal (22,300) in all 3 years (Table 16).

Table 14.-Summary of harvest, angler effort and harvest rate, estimated by onsite creel survey, late-run Kenai River chinook salmon fishery, 1974-1997.

Year	Harvest	Days Effort	Hours Effort	HPUE[a]
1974	3,225	12,335	87,162	0.037
1975	2,355	14,943	53,523	0.044
1976	5,353	28,030	114,795	0.047
1977	5,148	47,539	135,082	0.038
1978	5,578	60,636	212,217	0.026
1979	4,634	58,895	205,887	0.023
1980	3,608	38,260	154,435	0.023
1981	5,285	29,906	149,296	0.035
1982	4,810	43,366	197,775	0.024
1983	9,174	56,295	248,519	0.037
1984	7,376	77,462	348,579	0.021
1985	8,055	73,613	294,453	0.027
1986	9,004	75,092	244,440	0.037
1987	12,327	66,403	310,840	0.040
1988	17,512	85,282	361,759	0.048
1989	9,127	71,110	329,051	0.028
1990	6,247	67,101	291,966	0.022 [b]
1991	6,849	48,604	229,999	0.030
1992	6,680	40,649	187,415	0.039 [b]
1993	15,279	59,434	293,908	0.052
1994	14,388	71,931	354,778	0.041
1995	10,125	65,918	323,982	0.031
1996	5,984	47,987	238,495	0.025
Mean	7,744	53,947	233,407	0.034
1997	10,336	57,313	263,642	0.039

[a] Harvest per angler per hour.

[b] Harvest per angler per hour does not include periods open only to retention of trophy (greater than 52 inches) chinook salmon.

Table 15.-Guided vs. nonguided angler harvest, effort, and success rate, late-run Kenai River chinook salmon fishery, 1981-1997.

	HARVEST								EFFORT				
	Guided			Non-Guided			Total		Guided (Hours)		Non-Guided (Hours)		Total (Hours)
Year	Number	%	HPUE[a]	Number	%	HPUE[a]	Number	HPUE[a]	Number	%	Number	%	Number
1981	2,530	47.9	0.069	2,755	52.1	0.024	5,285	0.035	36,727	24.6	112,569	75.4	149,296
1982	2,397	49.8	0.047	2,413	50.2	0.016	4,810	0.024	50,828	25.7	146,947	74.3	197,775
1983	5,110	55.7	0.100	4,064	44.3	0.021	9,174	0.037	51,195	20.6	197,324	79.4	248,519
1984	2,928	39.7	0.064	4,448	60.3	0.015	7,376	0.021	45,664	13.1	302,915	86.9	348,579
1985	3,045	37.8	0.066	5,010	62.2	0.020	8,055	0.027	45,936	15.6	248,517	84.4	294,453
1986	3,546	39.4	0.067	5,458	60.6	0.028	9,004	0.037	52,843	21.6	191,597	78.4	244,440
1987	5,966	48.4	0.075	6,361	51.6	0.027	12,327	0.040	79,329	25.5	231,511	74.5	310,840
1988	9,409	53.7	0.099	8,103	46.3	0.030	17,512	0.048	95,181	26.3	266,578	73.7	361,759
1989	5,328	58.4	0.054	3,799	41.6	0.016	9,127	0.028	97,966	29.8	231,085	70.2	329,051
1990	3,808	61.0	0.038 [b]	2,439	39.0	0.013 [b]	6,247	0.022 [b]	101,223	34.7	190,743	65.3	291,966
1991	3,864	56.4	0.047	2,985	43.6	0.020	6,849	0.030	82,706	36.0	147,293	64.0	229,999
1992	4,176	62.5	0.064 [b]	2,504	37.5	0.024 [b]	6,680	0.039 [b]	75,324	40.2	112,091	59.8	187,415
1993	7,866	51.5	0.085	7,413	48.5	0.037	15,279	0.052	92,213	31.4	201,695	68.6	293,908
1994	6,628	46.1	0.060	7,760	53.9	0.032	14,388	0.041	110,049	31.0	244,729	69.0	354,778
1995	5,211	51.5	0.042	4,914	48.5	0.025	10,125	0.031	123,585	38.1	200,397	61.9	323,982
1996	3,853	64.4	0.035	2,131	35.6	0.017	5,984	0.025	110,057	46.1	128,438	53.9	238,495
Mean	4,729	51.5	0.063	4,535	48.5	0.023	9,264	0.034	78,177	28.8	197,152	71.2	275,328
1997	5,854	56.6	0.046	4,481	43.4	0.033	10,335	0.039	126,418	48.0	137,225	52.0	263,643

[a] Harvest per angler per hour.

[b] Harvest per angler per hour does not include periods open only to retention of trophy (greater than 52 inches) chinook salmon.

Table 16.-Late-run Kenai River chinook salmon population data, 1984-1997.

Year	Deep Creek [a] Marine Harvest	Eastside Set Net Harvest	Drift Gill Net Harvest	Personal Use	Subsistence and Educational	Kenai River Sport Harvest	Hook-and-Release Mortality	Spawning Escapement	Total Return
1984	835	6,165	1,377			7,376		31,796	47,549
1985	1,731	17,723	2,046			8,055		21,708	51,263
1986	630	19,810	1,834			9,004	522	48,037	79,837
1987	1,097	20,588	4,551			12,237	368	35,518	74,359
1988	1,262	12,870	2,216			17,512	472	34,024	68,356
1989	1,294	10,919	0 [b]	4	22	9,127	327	19,581	41,274
1990	1,318	4,139	621	91	13	6,247	141	27,086	39,656
1991	2,019	4,891	241	130	288	6,849	103	27,662	42,183
1992	2,502	10,718	543	50	402	6,680	308	23,326	44,529
1993	3,344	14,002	751	129	27	15,279	363	34,032	67,927
1994	2,301	15,885	460	13	392	14,388	344	38,549	72,332
1995	3,216	12,032	523	36	648	10,125	312	33,899	60,791
1996	1,996	11,521	365	45	294	5,816 [c]	64 [c]	33,476 [c, d]	53,577 [c, d]
1997	2,895	10,577	489	339	26	10,336	183	29,104 [d]	53,949

[a] Determined by creel survey, 1984-1986 (Hammarstrom et al. 1985 and 1987, Hammarstrom and Larson 1986); by Statewide Harvest Survey (SWHS) 1987-1997 (Mills 1988-1994, Howe et al. 1995-1998). Includes Cook Inlet from Anchor Point to Ninilchik. Late-run harvest 1987-1990 from Sonnichsen and Alexandersdottir 1991. Harvest for 1991-1995 was apportioned 70.5% to the early run and 29.5% to the late run, based on estimates from onsite creel surveys from 1972-1986 (Hammarstrom 1975-1981; Hammarstrom and Larson 1982-1984, 1986; and Hammarstrom et al. 1985). Harvest was estimated separately for the two runs in the 1996 and 1997 SWHS.

[b] No commercial drift net fishery conducted in 1989 due to *Exxon Valdez* oil spill.

[c] Does not include an estimated 304 fish harvested below the sonar counter, and 11 hook-and-release mortalities below the counter.

[d] Sonar counts for 1996 and 1997 were 49,755 and 49,933, respectively (Bosch and Burwen *In prep*). Inriver abundance estimates from radiotelemetry in 1996 and 1997 were 39,356 and 39,080, respectively (Hammarstrom and Hasbrouck 1998 and *In prep*). The more accurate estimate is radiotelemetry. Escapement and total return estimates calculated using radiotelemetry data.

OUTLOOK

Regulatory changes to Kenai Peninsula sport finfish fisheries will not be considered by the Board until February 1999. Basic regulation of the fishery will therefore be unchanged during the 1998 season. The primary objective of management will continue to be to achieve an optimum spawning escapement of 22,300 late-run chinook salmon.

CURRENT ISSUES

Adoption of the Late Run Chinook Salmon Management Plan was essential to the biological management of this fishery. The plan established escapement goals and identified management strategies to achieve these goals. Formalized identification of objectives and strategies removed much of the subjectivity from the management of this fishery.

Social concerns remain an issue in the orderly development of this fishery. These issues relate to competition between guided and nonguided anglers for the harvestable surplus.

The Late Run Chinook Salmon Management Plan directs the sport fishery to bear the burden of conservation if the spawning escapement is projected to be between 15,500 and 22,300. This occurred in 1990, resulting in a restricted sport fishery from July 27 through 31. Some sport fishermen viewed this as unfair and believed the burden of conservation should be shared between the sport and commercial fishermen at this escapement level. The Board addressed this issue at its 1990 meeting and the commercial fishery, in given situations, will be restricted if the projected escapement is 15,500 to 19,000. However, allocation of the late-run Kenai River chinook salmon resource between sport and commercial user groups continues to be a major issue.

Some members of the staff and public have questioned the accuracy of the sonar counter. At issue is the perception that the counter was overestimating abundance. A technical review in late 1997 and early 1998 partially supports that perception (Burwen and Bosch 1998). Data indicated an overestimation of 20%-25% during the 1996 and 1997 late run. Early-run estimates appeared to accurately represent run strength. Questions regarding the accuracy of the sonar counter will continue to be an issue in managing this fishery. To address these concerns, a new mark-recapture study based on radio-tagged fish was initiated during the late run in 1996 (Hammarstrom and Hasbrouck 1998) and will continue through the late run of 1997. This study is designed to provide an independent and accurate estimate of inriver chinook abundance during the late run when the potential for misclassifying sockeye is greatest. Use of radiotelemetry technology will avoid certain biases introduced in previous mark-recapture estimates. Additionally, we continue efforts to improve current methods of species separation through research using tethered and free-swimming fish of known size and/or species to further explore the potential for discriminating size groups of fish using a combination of acoustic parameters (Burwen and Fleischman 1998).

RECOMMENDED RESEARCH & MANAGEMENT

The late-run Cook Inlet marine sport fishery, the Cook Inlet commercial set net and drift gillnet fisheries, and the Kenai River sport fishery are the primary harvesters of late-run Kenai River chinook salmon. Management actions taken predicated on chinook salmon sonar counts may restrict or liberalize these fisheries. Achievement of the spawning escapement and management of the fishery for sustained yield also depend on accurate sonar estimates. A technical review has indicated the sonar counter overestimated abundance in 1996 and 1997.

The overestimate is a function of the counter failing to accurately differentiate sockeye from chinook salmon. The counter provides an accurate estimate of chinook salmon entering the river during the early run and first part of the late run. When large numbers of sockeye enter the river the counter does not accurately discriminate between species. More abundant sockeye salmon are misidentified as chinook salmon and an overestimation occurs. The problem is most acute during the last 2 weeks of July. The problem appears to be limited to 1996 and 1997 as large numbers of sockeye salmon migrated in the main channel in these years.

We can not determine at this time if the overestimation can be corrected by refinements to sonar technology. Staff therefore recommend the following management strategy for the 1998 season:

1. Pre-season forecasts of abundance are predicated on sonar counts. As sonar counts for the prior 2 years are known to be inflated, it is appropriate not to issue a pre-season forecast for 1998.
2. Sonar provides an accurate estimate of late-run abundance until sockeye salmon become abundant about mid-July. Sonar will therefore be used to estimate the abundance of late-run chinook salmon in early July.
3. A test gillnet program will be established to estimate numbers of chinook salmon. The program will begin during the early run and continue throughout the season. Success rates (CPUE) in this program will be correlated with chinook salmon abundance as estimated by sonar during the early run and first part of the late run. CPUE estimates will be converted to numbers of chinook salmon entering the river during the latter part of July.
4. Initially, the program in (3) will be viewed as research and development. In formulating inseason management strategies, staff will review all abundance indicators (commercial harvest, sonar, test net CPUE, and angler success rates).

RUSSIAN RIVER LATE-RUN SOCKEYE SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVES

Management of this fishery is governed by the Russian River Sockeye Salmon Management Plan (5 AAC 21.361). The primary management objective, as directed in this plan, is to achieve a minimum spawning escapement goal of 30,000 late-run sockeye salmon into the Russian River system (Figure 8). This goal has been achieved or exceeded in all years since the plan was adopted in 1978 (Table 17).

The Upper Cook Inlet Salmon Management Plan (56 AAC 21.363) provides that upper Cook Inlet salmon stocks will be managed primarily for commercial uses July 1-August 15. The Russian River Management Plan recognizes that as late-run sockeye salmon stocks are harvested by commercial users as well as Kenai and Russian River recreational anglers, there may be times when the Russian River recreational fishery will need to be restricted in order to provide for the minimum escapement.

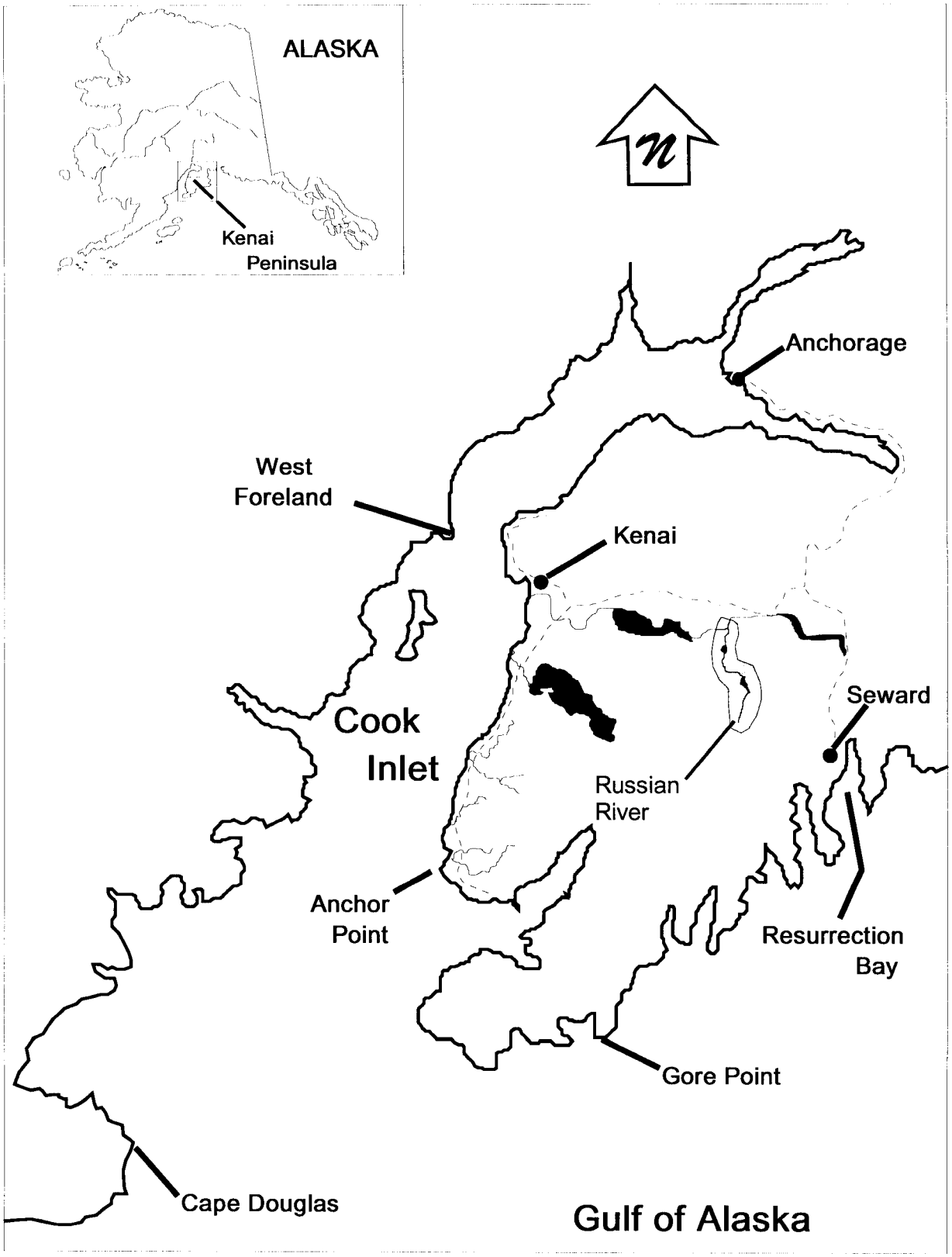

Figure 8.-Location of the Russian River on the Kenai Peninsula, Alaska.

Table 17.-Historical summary of angler effort, harvest rate, harvest and escapement; Russian River late-run sockeye salmon, 1963-1997.

Year	Days Effort	Hours Effort	Harvest/ Hour	Harvest	Escapement		Local Return
					Above Weir	Below Weir	
1963	2,170	Unknown		1,390	51,120	Unknown	52,510
1964	1,350	5,070	0.483	2,450	46,930	Unknown	49,380
1965	1,970	8,280	0.261	2,160	21,820	Unknown	23,980
1966	6,310	28,700	0.254	7,290	34,430	Unknown	41,720
1967	5,500	29,490	0.194	5,720	49,480	Unknown	55,200
1968	5,500	28,250	0.206	5,820	48,880	4,200	58,900
1969	2,640	12,230	0.094	1,150	28,870	1,100	31,120
1970	1,000	2,240	0.268	600	26,200	220	27,020
1971	8,870	37,390	0.287	10,730	54,420	10,000	75,150
1972	13,360	55,920	0.287	16,050	79,115	6,000	101,165
1973	15,470	81,930	0.109	8,930	25,070	6,680	40,680
1974	10,030	45,210	0.188	8,500	24,900	2,210	35,610
1975	11,300	52,770	0.159	8,390	31,960	690	41,040
1976	17,380	74,000	0.185	13,700	31,940	3,470	49,110
1977	31,310	140,780	0.195	27,440	21,360	17,090	65,890
1978	17,950	98,830	0.248	24,530	34,340	18,330	77,200
1979	29,330	124,010	0.216	26,840	87,850	3,920	118,610
1980	24,900	117,100	0.286	33,500	83,980	3,220	120,700
1981	26,250	109,250	0.217	23,720	44,520	4,160	72,400
1982	12,480	59,130	0.175	10,320	30,800	45,000	86,120
1983	13,300	66,650	0.240	16,000	33,730	44,000	93,730
1984	20,320	94,850	0.232	21,970	92,660	3,000	117,630
1985	34,630	159,160	0.367	58,410	136,970	8,650	204,030
1986	22,400	89,780	0.343	30,810	40,280	15,230	86,320
1987	32,650	132,570	0.306	40,580	53,930	76,530	171,040
1988	25,430	94,840	0.206	19,540	42,480	30,360	92,380
1989	39,770	154,510	0.357	55,210	138,380	28,480	222,070
1990	39,970	159,890	0.351	56,180	83,430	11,760	151,370
1991	21,090	78,849	0.399	31,450	78,180	22,270	131,900
1992	23,015	87,918	0.297	26,101	63,478	4,980	94,559
1993	23,491	96,312	0.278	26,772	99,259	12,258	138,289
1994	21,712	91,192	0.289	26,375	122,277	15,366	164,018
1995	17,166	72,099	0.164	11,805	61,982	12,479	86,266
1996	17,322	77,951	0.258	20,142	34,691	31,601	86,434
Mean	17,570	75,500	0.255	20,020	57,050	13,040	90,100
1997 [a]					65,905	11,337	77,242

[a] Creel survey not conducted.

INSEASON MANAGEMENT APPROACH

This fishery is managed by escapement counted at a weir at the outlet of lower Russian Lake. In years of low abundance, the escapement is achieved through inseason restrictions to the sport fishery. In years of high abundance the fishery is liberalized inseason to provide additional fishing opportunity.

Run strength is ascertained by examining three indicators: weir counts, visual enumeration of fish, and observed fishery performance. Weir counts are the primary indicator of run strength. Historical data provide the percentage of the run that is expected to have passed the weir by a given date (Table 18). A determination of run strength can generally be made a few days prior to the historic midpoint (August 5) of the run. Weir counts are supplemented by onsite enumeration of the numbers of fish present downstream from the weir including lower Russian River, the falls area, and the area between the falls and the weir (Figure 9). In addition, observed fishery performance is considered as an indicator of run strength. Should inseason restrictions be necessary to achieve the escapement goal the department considers the following options: bag limit reductions, closing only the waters of the Russian River, a closure of the "Kenai/Russian River fly-fishing-only area," and closures further downstream in the Kenai drainage. These closures remain in place until the spawning escapement is projected to be achieved.

HISTORICAL PERSPECTIVE

The Russian River is a clearwater tributary to the Kenai River near the community of Cooper Landing on the Kenai Peninsula approximately 100 miles south of Anchorage (Figure 8). Lands bordering the stream are federally managed, with public access provided at the Kenai National Wildlife Refuge campground at the river's confluence with the Kenai River and at the Chugach National Forest campground on the Russian River (Figure 9).

The drainage supports one of the largest returns of sockeye salmon to upper Cook Inlet waters and one of the largest freshwater sport fisheries for sockeye salmon in Alaska. In addition, coho, chinook and pink salmon spawn in the system as do resident populations of Dolly Varden and rainbow trout. The drainage is closed to fishing for chinook salmon but supports fisheries for the other species.

Sockeye salmon return to the Russian River during two distinct time periods. An early run arrives at the confluence of the Kenai and Russian rivers in early June. The late run, part of the larger late-run return of upper Cook Inlet sockeye salmon, arrives at the confluence area in mid-July and typically migrates directly into the Russian River. This run has two discrete components: one that spawns in the upper reaches of the drainage (above-weir spawners) and one that spawns in the lower river reaches (below-weir spawners). The component which spawns in the lower river reaches is more closely related to the mainstem Kenai River sockeye salmon stock than to the above-weir component. Typically, the spawning escapement of the late run exceeds that of the early run. For the most part, spawning locations used by the late run are distinct from locations used by the early run. Because of their run timing, late-run sockeye salmon are harvested by a combination of commercial, sport, and personal use user groups.

The sport fishery for both early- and late-run sockeye salmon occurs primarily in the lower 3 miles of the Russian River and in the Kenai River downstream for about 1 mile from its confluence with the Russian River. Both runs support intense sport fisheries. At times, more than 1,000 anglers simultaneously fish this section of the river. The two public campgrounds

Table 18.-Daily escapement of late-run sockeye salmon at Russian River weir in 1997 and historic mean daily escapement proportion, 1978-1996.

Date	Daily Count	Total Count	Historic Proportion By Day	Date	Daily Count	Total Count	Historic Proportion By Day
15-Jul	605 [a]	605	0.002	18-Aug	1215	31,176	0.859
16-Jul	135	740	0.003	19-Aug	1666	32,842	0.873
17-Jul	113	853	0.003	20-Aug	1651	34,493	0.888
18-Jul	131	984	0.003	21-Aug	870	35,363	0.900
19-Jul	1,001	1,985	0.006	22-Aug	2124	37,487	0.909
20-Jul	850	2,835	0.011	23-Aug	1966	39,453	0.917
21-Jul	321	3,156	0.024	24-Aug	3077	42,530	0.929
22-Jul	243	3,399	0.039	25-Aug	1383	43,913	0.936
23-Jul	681	4,080	0.049	26-Aug	2798	46,711	0.946
24-Jul	678	4,758	0.070	27-Aug	2390	49,101	0.952
25-Jul	210	4,968	0.089	28-Aug	1222	50,323	0.959
26-Jul	371	5,339	0.119	29-Aug	2445	52,768	0.965
27-Jul	178	5,517	0.163	30-Aug	2462	55,230	0.969
28-Jul	1,046	6,563	0.200	31-Aug	1290	56,520	0.976
29-Jul	451	7,014	0.228	1-Sep	1788	58,308	0.979
30-Jul	1,594	8,608	0.263	2-Sep	1382	59,690	0.983
31-Jul	1,050	9,658	0.288	3-Sep	1281	60,971	0.986
1-Aug	2,646	12,304	0.334	4-Sep	861	61,832	0.988
2-Aug	934	13,238	0.363	5-Sep	668	62,500	0.990
3-Aug	1,062	14,300	0.402	6-Sep	455	62,955	0.992
4-Aug	1,210	15,510	0.448	7-Sep	454	63,409	0.994
5-Aug	781	16,291	0.502	8-Sep	460	63,869	0.997
6-Aug	593	16,884	0.543	9-Sep	495	64,364	0.997
7-Aug	869	17,753	0.573	10-Sep	572	64,936	0.998
8-Aug	452	18,205	0.617	11-Sep	326	65,262	0.999
9-Aug	660	18,865	0.656	12-Sep	201	65,463	0.999
10-Aug	720	19,585	0.686	13-Sep	88	65,551	0.999
11-Aug	1,166	20,751	0.709	14-Sep	44	65,595	1.000
12-Aug	1,008	21,759	0.735	15-Sep	65	65,660	1.000
13-Aug	1,487	23,246	0.760	16-Sep	45	65,705	1.000
14-Aug	1,368	24,614	0.783	17-Sep	61	65,766	1.000
15-Aug	2,521	27,135	0.806	18-Sep	41	65,807	1.000
16-Aug	1,623	28,758	0.826	19-Sep	19	65,826	1.000
17-Aug	1,203	29,961	0.843	20-Sep	79 [b]	65,905	1.000

[a] Includes 176 late-run sockeye salmon that passed the weir from July 8 through July 14.

[b] Includes 60 late-run sockeye salmon that passed the weir from September 21 through September 30.

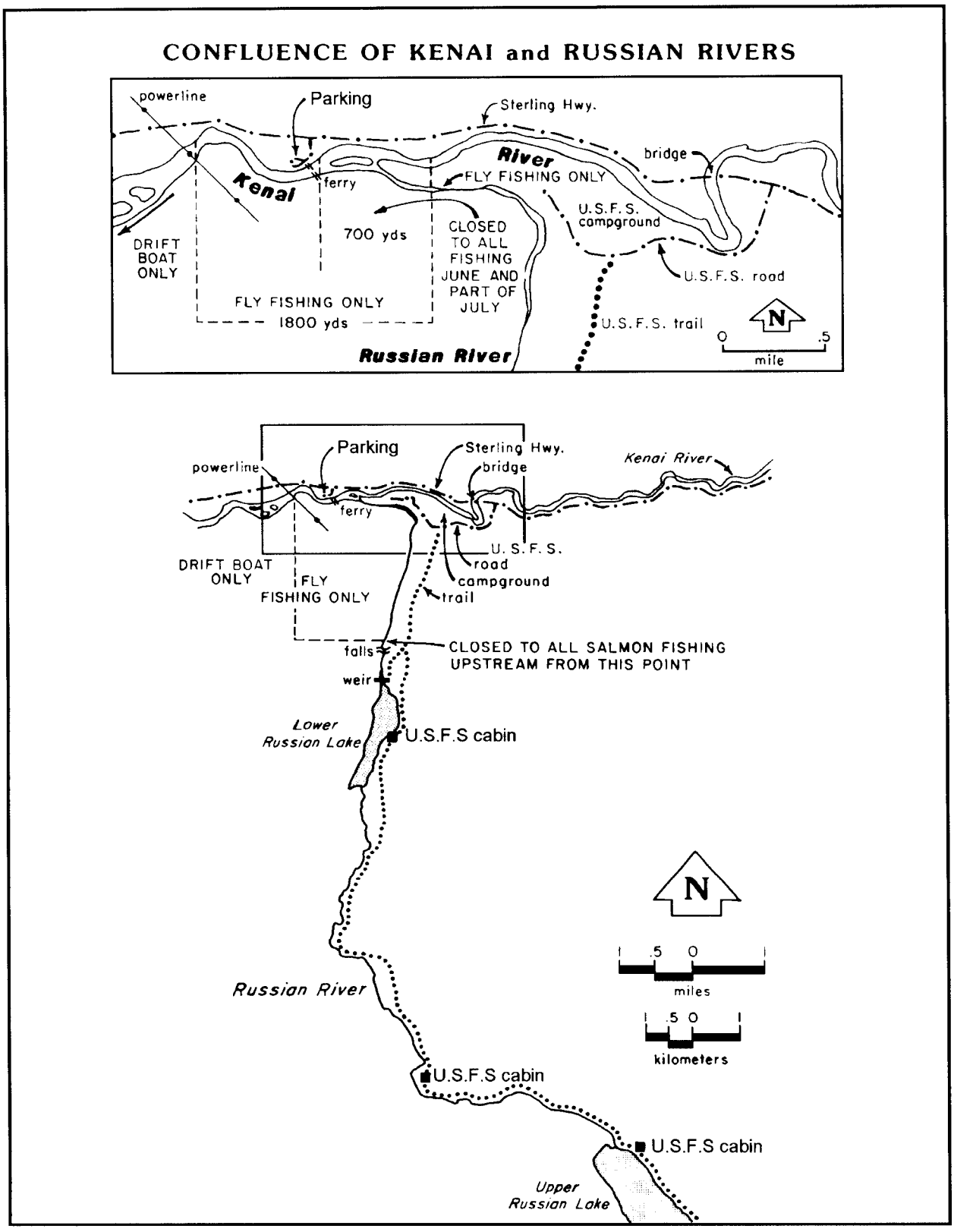

Figure 9.-The Russian River drainage.

managed by federal agencies are routinely filled to capacity and unable to meet public demand for camping and parking.

In 1993 the Sport Fish Division purchased property adjoining Fish and Wildlife Service lands at the confluence of the Kenai and Russian rivers. The 4.4 acre property, formerly the site of the privately owned Sportsman's Lodge, was purchased for $375,000, primarily with Federal D-J funds. The primary reason for the purchase was to provide a launching and takeout area for boat anglers using the Kenai River. A secondary benefit of the purchase was to provide 50 to 75 additional parking places for anglers fishing sockeye salmon at the confluence of the Kenai and Russian rivers. Purchase of the property has, to a degree, alleviated the previously inadequate parking in this area during peak days of the fishery.

As angler effort has increased, the regulations governing the sport fishery have by necessity become more restrictive. In 1965 the use of treble hooks was prohibited in an effort to reduce snagging. In 1966 terminal gear was limited to flies and the area was designated fly-fishing-only. In 1967 the Board of Fisheries required that only fish hooked in the head, mouth or gills could be retained and, in 1969, this regulation was extended to include all fresh waters of the Kenai Peninsula. In 1973 the regulation was further amended and required that fish hooked elsewhere than in the mouth be released immediately.

Currently, the sport fishery is restricted to terminal tackle consisting of a single-hook, unweighted fly with a maximum hook gap of 3/8 in. This measure was implemented to reduce angler efficiency and provide a measure of protection to the vulnerable fish as they near spawning destinations. To protect holding fish, a portion of the confluence area (termed the sanctuary) is closed to sport fishing until the early-run escapement is projected to be met. The late run's migration through this area is more rapid and this increased protection is not required. Only the lower 3 miles of the Russian River drainage are open to salmon fishing. The upstream portion is closed to allow fish to migrate unimpeded to spawning destinations.

BOARD OF FISHERIES ACTIONS

The late-run Russian River sockeye salmon spawning escapement goal of 30,000 was established by the department in 1975 as a minimum goal and incorporated by the Board into the Russian River Sockeye Salmon Management Plan in 1978.

There were no regulatory changes to this fishery at the 1990, 1992, or 1996 Board meetings. The Board will next consider regulatory changes to this fishery in February 1999.

RECENT FISHERY PERFORMANCE

The 1995 late run entered the fishery at the confluence of the Russian and Kenai rivers in mid-July. The fishery was prosecuted in a normal manner through the close of the season on August 20. Anglers expended 72,099 hours of effort to harvest 11,805 late-run sockeye salmon (Table 17).

Spawning escapement above the weir in 1995 was 61,982 and below the weir 12,479. Total late-run return was 86,266. This total was 13.7% of the Kenai River sockeye salmon sonar estimate in 1995 (Table 19). Of the fish counted at the weir, 15.5% or 9,606 (Table 20) were 1-ocean fish (jacks). Harvest and daily escapement data for 1995 have been previously reported (Marsh 1997).

Table 19.-Kenai River sockeye salmon sonar counts, local late-run Russian River sockeye salmon return and percent of the Kenai River sockeye salmon escapement to enter Russian River, 1968-1997.

Year	Kenai River Sockeye Salmon Sonar Estimate	Late Run Russian River Local Return[a]	Percent of Kenai Sonar Estimate that returned to Russian River
1968	88,000	58,900	66.9
1969	53,000	31,120	58.7
1970	73,000	27,020	37.0
1971 [b]		75,160	
1972	318,000	101,165	31.8
1973	367,000	40,680	11.1
1974	161,000	35,610	22.1
1975	142,000	41,040	28.9
1976	380,000	49,110	12.9
1977	708,000	65,890	9.3
1978	399,000	77,200	19.3
1979	285,000	118,610	41.6
1980	464,000	120,700	26.0
1981	408,000	72,400	17.7
1982	620,000	86,120	13.9
1983	630,000	93,730	14.9
1984	345,000	117,630	34.1
1985	503,000	204,030	40.6
1986	501,000	86,320	17.2
1987	1,597,000	171,040	10.7
1988	1,021,500	92,380	9.0
1989	1,600,000	222,070	13.9
1990	659,500	151,370	23.0
1991	645,000	131,890	20.4
1992	994,760	94,559	9.5
1993	813,617	138,289	17.0
1994	1,003,446	164,018	16.3
1995	630,447	86,266	13.7
1996	797,847	86,434	10.8
Mean	578,860	97,960	23.2
1997	1,064,818	77,242 [c]	7.3 [c]

[a] Late-run Russian River local return includes escapement above and below the weir plus sport harvest.

[b] Sonar data from 1971 not available due to equipment malfunction.

[c] Preliminary, harvest unavailable pending Statewide Harvest Survey results; available in August 1998.

Table 20.-Late-run Russian River sockeye salmon harvest, escapement, and returning jacks, 1969-1997.

Year	Sport Harvest	Above Weir Escapement	Jacks Observed[a]	Percent of Escapement
1969	1,150	28,870	352	1.2
1970	600	26,200	2,542	9.7
1971	10,730	54,420	1,429	2.6
1972	16,050	79,115	160	0.2
1973	8,930	25,070	332	1.3
1974	8,500	24,900	1,008	4.0
1975	8,390	31,960	1,788	5.6
1976	13,700	31,940	1,204	3.8
1977	27,440	21,360	537	2.5
1978	24,530	34,340	2,874	8.4
1979	26,840	87,850	1,476	1.7
1980	33,500	83,980	1,533	1.8
1981	23,720	44,520	2,634	5.9
1982	10,320	30,800	1,777	5.8
1983	16,000	33,730	4,360	12.9
1984	21,970	92,660	3,450	3.7
1985	58,410	136,970	1,905	1.4
1986	30,810	40,280	1,812	4.5
1987	40,580	53,930	332	0.6
1988	19,540	42,480	12,589	29.6
1989	55,210	138,380	13,721	9.9
1990	52,980	83,430	6,713	8.0
1991	31,450	78,180	5,196	6.6
1992	26,101	63,478	4,213	6.6
1993	26,772	99,259	34,536	34.8
1994	26,375	122,277	6,730	5.5
1995	11,805	61,982	9,606	15.5
1996	20,142	34,691	7,388	21.3
Mean	23,310	60,250	4,720	7.7
1997	[b]	65,905	4,549	6.9

[a] Fish that have returned after just 1 ocean year. These are visual counts of small fish at the weir, not based on scale pattern analysis.

[b] Creel survey not conducted. Harvest unavailable pending Statewide Harvest Survey results; available in August 1998.

The 1996 late run entered the fishery at the confluence of the Russian and Kenai rivers in mid-July. Catch rates were high (0.439 fish per hour). On August 2, with projections indicating that the minimum spawning escapement would not be achieved, an emergency order was issued closing the Kenai/Russian River fly-fishing-only area to fishing for sockeye salmon effective 12:01 a.m. August 3. During this abbreviated season, anglers expended 77,951 hours of effort to harvest 20,142 late-run sockeye salmon (Table 17).

The minimum spawning escapement in 1996 was achieved with a final escapement of 34,691 (Table 17). A total of 31,601 fish spawned below the weir. The strong return of below-falls spawners is assumed to have contributed heavily to the strong fishery. Total late-run return was 100,494. This total was 13% of the Kenai River sockeye salmon sonar estimate in 1996 (Table 19). Of the fish counted at the weir, 21.3% or 7,388 (Table 20) were 1-ocean fish (jacks). Harvest and daily escapement data for 1996 have been previously reported (Marsh 1998b).

The closure of the Russian River fishery in 1996 was controversial within the community of Cooper Landing due to the economic impact on the local tourist industry. While criticism was leveled at the department because the commercial fishery was not restricted to achieve the Russian River escapement goal, 794,000 sockeye salmon were estimated by the Kenai sonar; near the upper end of the 1996 escapement goal range of 550,000-800,000. Allocation of late-run stocks is defined in the Upper Cook Inlet Management Plan as discussed earlier. Discussions between the department, Cooper Landing business owners, the Cooper Landing Fish and Game Advisory Committee, and finally the Board of Fisheries resulted in a department commitment to attempt to reduce impacts of future Russian River restrictions. By acting as early as possible when data indicate run strength is weak, restrictions can be implemented in a "step down" process which would slow the fishery down but not completely close it. A partial restriction would have less economic impact and, in some years, might preclude a total closure.

In 1997, late-run fish entered the fishery at the confluence of the Russian and Kenai rivers in early July, with the first fish counted at the weir on July 8. Observed success rates in the fishery, which appeared to be approximately 1 week early, could be characterized as "fair" by the middle of July but deteriorated shortly thereafter. The fishery appeared to have been driven primarily by fish which continued upstream into the upper reaches of the Kenai drainage.

Weir escapement through July 28 was 6,563 with a projected escapement of 33,000 fish. Based on historic run timing, 20% of the run should have been enumerated by this time. This projection was down from 45,000 just 2 days earlier and had been in steady decline since July 20 (Table 18). The Kenai River sonar estimate through July 28 was 718,000 sockeye salmon and managers were anticipating a final sonar count of 800,000 to 850,000. Eleven days travel time from the Kenai sonar to Russian River weir has been used for management purposes over the past two decades (Dave Nelson, Alaska Department of Fish and Game, Soldotna, personal communication). The Russian River escapement through July 28 was less than 2% of the July 17 Kenai River cumulative estimate of 443,000.

On July 29 the decision was made to restrict the fishery. This decision was based on the factors described above: a declining projected escapement, apparent early Kenai run timing, low proportion of Russian River stocks in the Kenai escapement, declining success rates in the recreational fishery, and a commitment to begin restrictions in a "step down" process. Beginning July 31 the fly-fishing-only waters upstream of the ferry crossing were closed to sockeye salmon

fishing. This included only the waters of the Russian River and the "sanctuary" area at the mouth of the Kenai and Russian rivers.

While fishing was slow, anglers were having the best success in the "sanctuary" area. The result of the closure, which included the "sanctuary" area, was that few anglers continued to fish. Kenai River sonar counts began increasing August 6 and weir counts began increasing August 11. By August 16 it was apparent that the Russian River minimum goal would be achieved but, as the sockeye salmon fishery closes by regulation on August 20, there was no justification to reopen the fishery.

Prior to 1997, inseason harvest of sockeye salmon was estimated by creel survey. Harvest and effort data for the 1997 season will be estimated through the mail out Statewide Harvest Survey postseason. Spawning escapement above the weir was 65,905 (Table 20), more than double the minimum goal of 30,000. Historically, the midpoint of the Russian River escapement is on August 4; the midpoint of the 1997 return was August 20, the latest on record. Estimated escapement below the weir was 11,337; slightly below the historical average of 13,040. Of the fish enumerated at the weir, 6.9% or 4,549 (Table 20) were small fish, assumed to be 1-ocean fish (jacks).

Sampling to determine age, sex, and size of the escapement was conducted during four separate time periods during the migration through the weir. Data collection and analysis procedures are described in detail by Marsh (1996). Subsequent analysis determined that there were significant differences in the samples requiring stratification of the data by the time period. Males accounted for 60.2% and females 39.8% of the late-run escapement. Saltwater age-.2 fish (1.2, 2.2, and 3.2) accounted for 53.7% of the run; saltwater age-.3 fish (1.3, 2.3, and 3.3) for 25.0% of the run, and saltwater age-.1 fish (1.1 and 2.1) for 21.3% of the run (Table 21). A much higher percentage of age-1 fish were estimated by scale analysis (21.3%) than by observation of small fish at the weir (6.9%).

CURRENT ISSUES

There are no biological issues associated with this fishery. Social issues focus on providing for a fishery throughout the season, congestion, and riparian habitat degradation. There is no evidence indicating angler-caused habitat alteration has affected the productivity of either the Kenai or Russian rivers. Lands affected are in federal ownership by the United States Forest Service and Fish and Wildlife Service.

The greatest amount of habitat degradation has occurred along the eastern bank of the Russian River between the campgrounds and its confluence with the Kenai River. The Forest Service has closed some of the trail immediately adjacent to the river and has rerouted the trail away from the bank. Anglers are directed into the river at specific access points to reduce degradation and a bank rehabilitation project was begun in 1996.

Members of the Cooper Landing community responded favorably to the step down management approach in the recreational fishery in 1997. Following the 1997 season there was little controversy concerning the partial closure of the fly-fishing-only waters despite the subsequent large escapement. Overall, the public recognized the need for restrictions based on the poor recreational fishery, poor escapement projections, and unusual run timing. The impact of the commercial fishery on Russian River stocks remains an issue.

Table 21.-Estimated age and sex composition and length-at-age of late-run sockeye salmon enumerated at Russian River weir, 1997.

	1.1	1.2	1.3	2.1	2.2	2.3	3.2	3.3	TOTAL
Female									
Sample Size		19	7	2	149	61	10	1	249
Percent		2.7	1.0	0.5	23.9	9.7	1.9	0.1	39.8
SE (Percent)		0.8	0.4	0.4	2.1	1.4	0.7	0.1	2.5
Escapement		1,793	642	313	15,776	6,402	1,262	68	26,256
SE (Escapment)		495	294	255	1,371	939	466	68	1,633
Mean Length (mm)		511	569	428	509	563	509	565	523
SE		5.0	11.8	4.0	2.4	3.4	6.7		2.4
Male									
Sample Size	1	17	9	103	121	69	7	1	328
Percent	0.1	3.1	2.0	20.7	20.3	12.0	1.8	0.1	60.2
SE (Percent)	0.1	0.9	0.8	2.1	2.0	1.6	0.8	0.1	2.4
Escapement	68	2,051	1,329	13,644	13,366	7,938	1,186	68	39,649
SE (Escapment)	68	591	510	1,394	1,315	1,069	500	68	1,612
Mean Length (mm)	370	479	598	399	491	578	491	600	483
SE		11.2	3.7	2.0	4.4	2.8	17.3		4.2
Combined									
Sample Size	1	36	16	105	270	130	17	2	577
Percent	0.1	5.8	3.0	21.2	44.2	21.8	3.7	0.2	100.0
SE (Escapment)	0.1	1.2	0.9	2.2	2.9	2.2	1.0	0.1	
Escapement	68	3,844	1,971	13,957	29,142	14,340	2,448	135	65,905
SE (Escapment)	68	770	589	1,417	1,899	1,423	684	96	
Mean Length (mm)	370	496	585	399	501	571	502	583	500
SE		6.4	6.5	2.0	2.4	2.2	8.1	17.5	2.7

RECOMMENDED RESEARCH & MANAGEMENT

Late-run Russian River sockeye salmon are at high levels of abundance; spawning escapement goals have been consistently achieved and angler opportunity and harvest maximized. Research directed toward a better understanding of the relationship between Russian River stocks and the remainder of the Kenai-drainage stocks is appropriate. Methodology to determine the proportion of Russian River stocks present within the Kenai River migration would aid in management of the Russian River fishery which takes place approximately 11 days after passage by the Kenai sonar site.

KENAI RIVER LATE-RUN SOCKEYE SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVES

Objectives for this fishery are contained in the Kenai River Sockeye Salmon Management Plan (5 AAC 21.360) as amended by the BOF in February 1996. Achievement of these objectives is the responsibility of the Commercial Fisheries Division (CFD) and Division of Sport Fish. The CFD is responsible for managing the Cook Inlet commercial fishery to attain a sockeye salmon sonar count in the Kenai River of:

550,000-800,000 sockeye salmon in 1996;

550,000-825,000 sockeye salmon in 1997; and

550,000-850,000 sockeye salmon after 1997.

The Sport Fish Division manages the inriver sport fishery. The management plan provides for a year-round season, fishing 24 hours daily and a 6 sockeye salmon bag and possession limit. There is no guideline harvest level. The plan does not provide for liberalization of the fishery. The fishery would be restricted only if the biological escapement goal (BEG) could not be projected. This is unlikely to occur. The BEG is 300,000-570,000.

INSEASON MANAGEMENT APPROACH

Data upon which to manage the fishery inseason is derived from sonar counts. A postseason estimate of harvest is provided by the Statewide Harvest Survey.

The fishery was restricted pre-season in 1993. The bag and possession limits were reduced to 2 fish; sockeye salmon fishing was prohibited each day from 11:00 p.m. to 6:00 a.m. This was to conform to the management plan as written in 1993, i.e. sport harvest was to be less than 10% of the sonar count when the count was 400,000-700,000.

In 1994 Department of Fish and Game Commissioner Rosier determined that the provision of the management plan directing the department to restrict the sport harvest to less than 10% at a sonar count of 400,000 to 700,000 should be viewed as a guideline harvest level rather than a harvest cap. The 1994 fishery was prosecuted in a normal manner. On August 3, it was projected the sonar count would exceed 700,000. In accordance with the management plan as written, the bag and possession limits were increased to 6 sockeye salmon. The 1995 fishery was also prosecuted in a normal manner. The bag and possession limits were not increased as the sonar count did not exceed 700,000.

In February 1996 the BOF amended the Kenai River Sockeye Salmon Management Plan (as outlined in Fishery Objectives above). The 1996 and 1997 fisheries were prosecuted in a normal manner; no emergency orders were issued.

HISTORICAL PERSPECTIVE

The Kenai River originates at Kenai Lake near the community of Cooper Landing and terminates in Cook Inlet adjacent to the city of Kenai. The river is glacial and approximately 82 miles in length. It is paralleled for much of its length by the state's road system making it the most accessible of Alaska's major salmon producing streams (Figure 10).

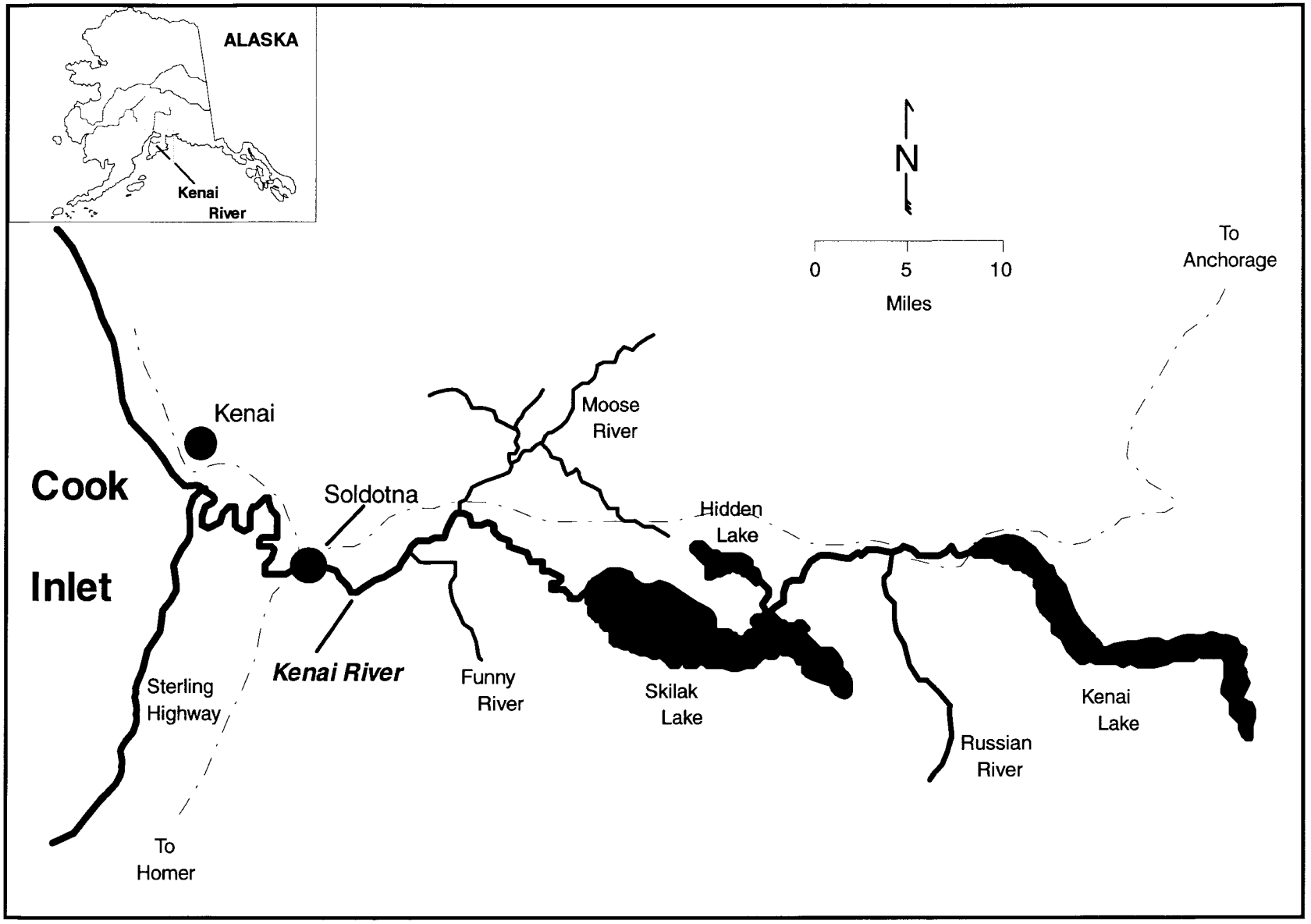

Figure 10.-Map of the Kenai River drainage. The sockeye salmon fishery occurs from Cook Inlet to Kenai Lake.

Historically, snagging was the harvest method for taking sockeye (red) salmon in the Kenai River. It was traditionally held that this species would not strike a lure or accept bait and that conventional (nonsnagging) techniques could not be employed to harvest these fish. When the number of anglers was relatively small, snagging posed neither a biological nor a social problem. However, as the population of Southcentral Alaska grew and the Kenai River sport fishery increased in popularity, anglers began to oppose the practice as an unethical harvest method. Antisnagging measures, first pioneered at the Russian River, culminated in 1975 with the Board promulgating Alaska's present freshwater antisnagging regulation. In 1979 snagging was prohibited in salt water within a 1-mile radius of the Kenai River mouth and in 1984 all snagging in salt water north of Anchor Point was similarly prohibited.

Because snagging was no longer a legal harvest method in either fresh or salt water, anglers began to experiment with alternate terminal tackle in an attempt to legally harvest sockeye salmon in the Kenai River. Their initial efforts were moderately successful with annual harvests averaging 23,580 sockeye salmon from 1977 through 1981 (Tables 22 and 23).

Between 1982 and 1985 the average harvest increased to 48,600. This dramatic increase is attributed to the use of coho flies as terminal gear, with the flies being drifted along the bank similar to the technique used for a number of years at Russian River. The belief that sockeye salmon could not be harvested with conventional tackle was gradually dispelled and this innovative technique prompted additional anglers to seek this species. This, coupled with relatively clear water in 1982 and 1983, is responsible in part for the increased harvest. The harvest was further influenced by the magnitude of the returns; which exceeded 600,000 sockeye in both 1982 and 1983. A return of only 344,600 reduced the 1984 sport harvest. Harvests from 1985-1995 ranged from 57,000-277,230 (Table 22)

The fishery is characterized by: (1) requiring large numbers of sockeye salmon to be present to provide acceptable harvest rates; (2) being of short duration, usually from July 16 to August 5, or approximately 20 days; (3) being affected by water clarity, i.e. turbid water decreases angler efficiency and clear water increases catch rates; and (4) the Kenai River being a multi-species fishery in July and August with only a percentage of the total angler effort directed toward sockeye salmon, irrespective of run strength or fishing conditions.

BOARD OF FISHERIES ACTIONS

The Kenai River Sockeye Salmon Management Plan was not changed by the Board in 1990. At the November 1992 meeting, the Board considered a number of proposals ranging from additional restrictions to liberalization of the plan by increasing the inriver sport allocation. The Board rejected all proposals; the plan as written was not changed.

The Board did, however, reiterate the intent language of the plan. The Sport Fish Division was to manage for a guideline harvest level upstream from the sonar counter of 10% when the sonar count is 400,000 to 700,000. Given the expansion of the fishery in recent years, the conservative action outlined in the plan had to be implemented in 1993 to comply with Board intent. As noted, the 1994 fishery was prosecuted in a normal manner.

This fishery's contentious allocative issues prompted Board of Fisheries Chair, Kay Andrews, to appoint representatives of commercial, sport and subsistence user groups to a Kenai River Sockeye Salmon Task Force. The original mission of the task force, as envisioned by the Board on April 18, 1994, was to prepare a revised draft of 5 AAC 21.360 "The Kenai River Sockeye

Table 22.-Kenai River sockeye salmon escapements and sport harvest, 1977-1997.

Year	Total Kenai River Effort [b] (Angler Days)	Kenai River Inriver Escapement[c]	Sport Harvest [a]			
			Above Soldotna Bridge	Percent [d] of Inriver Return	Below Soldotna Bridge	Total
1977	122,140	708,000				23,200
1978	164,260	398,900				33,600
1979	178,490	285,000				16,900
1980	171,800	464,000				24,500
1981	178,720	407,600	14,450	3.5	5,270	19,720
1982	231,950	619,800	38,400	6.2	11,710	50,110
1983	229,230	630,300	48,310	7.7	22,960	71,270
1984	270,420	344,600	11,280	3.3	4,420	15,700
1985	322,230	502,800	42,270	8.4	14,940	57,210
1986	335,050	501,200	51,220	10.2	21,180	72,400
1987	289,170	1,596,900	155,800	9.8	85,020	240,820
1988	374,260	1,021,500	103,120	10.1	49,630	152,750
1989	376,900	1,598,000	165,340	10.3	111,890	277,230
1990	342,660	659,500	87,580	13.3	33,210	120,790
1991	323,370	645,000	108,240	16.8	53,330	161,570
1992	332,570	994,800	161,960	16.3	80,540	242,500
1993	324,120	813,600	90,310	11.1	46,870	137,180
1994	340,900	1,003,400	63,250	6.3	30,360	93,610
1995	377,710	630,400	75,620	12.0	49,810	125,430
1996	357,130	797,800	140,270	17.6	78,810	219,080
Mean	282,150	731,160	84,840	10.2	43,750	107,780
1997		1,064,820	[e]	[e]	[e]	[e]

[a] Sport harvest data from Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995-1997).

[b] Angler effort directed toward all species. Data from Statewide Harvest Survey.

[c] Number of sockeye salmon enumerated by sonar.

[d] Percent of the sockeye salmon enumerated by sonar harvested upstream from the Soldotna Bridge.

[e] Preliminary, harvest unavailable pending Statewide Harvest Survey results; available in August 1998.

Table 23.-Kenai River recreational harvest of sockeye salmon by river section as determined by Statewide Harvest Survey, 1981-1996.

	Cook Inlet to Soldotna Bridge		Soldotna Bridge to Moose River		Moose River to Skilak Lake		Skilak Lake to Kenai Lake	
Year	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1981	5,270	26.7	5,340	27.1	4,270	21.6	4,850	24.6
1982	11,710	23.4	14,830	29.6	12,140	24.2	11,430	22.8
1983	22,960	32.2	22,450	31.5	15,180	21.3	10,670	15.0
1984	4,420	28.2	2,180	13.9	2,300	14.6	6,800	43.3
1985	14,940	26.1	13,020	22.8	13,300	23.2	15,950	27.9
1986	21,180	29.3	13,850	19.1	13,530	18.7	23,840	32.9
1987	85,020	35.3	65,840	27.3	39,930	16.6	50,030	20.8
1988	49,630	32.5	43,490	28.5	29,180	19.1	30,450	19.9
1989	111,890	40.4	90,550	32.7	45,850	16.5	28,940	10.4
1990	33,210	27.5	37,210	30.8	22,080	18.3	28,290	23.4
1991	53,330	33.0	56,050	34.7	24,740	15.3	27,440	17.0
1992	80,540	33.2	85,940	35.4	40,620	16.8	35,400	14.6
1993	46,870	34.2	41,470	30.2	18,720	13.6	30,120	22.0
1994	30,360	32.4	24,310	26.0	12,370	13.2	26,570	28.4
1995	49,810	39.7	38,600	30.8	17,610	14.0	19,410	15.5
Mean	41,410	31.6	37,010	28.0	20,790	17.8	23,350	22.6
1996	78,810	36.0	58,690	26.8	31,400	14.3	50,190	22.9

Source: Mills 1982-1994, Howe et al. 1995-1997.

Salmon Management Plan." The task force was also to consider the allocation strategy and regulations which govern the Kenai River Personal Use Dip Net Fishery.

On November 15, 1994 the task force received additional instructions from the current Chairman, Larry Engel. Chairman Engel directed the task force to devote special attention to the management of the sport fishery. The Board asked for recommendations on how to implement the vision of a predictable, uninterrupted sport fishery with a bag limit of 3 fish. Specifics requested by Chairman Engel included a statement explaining what was wrong with the existing plan, a recommended sonar count goal and strategies for minimizing the degradation of river bank habitat that results from the foot traffic that occurs during the late-run sport fishery.

The task force held nine meetings in 1994. Members were unable to develop a consensus position on most issues.

In February 1996 the Board amended the Kenai River Sockeye Salmon Management Plan. The sonar count goal was incrementally increased to 550,000-850,000 after 1997. The bag and possession limits were increased to 6 sockeye salmon and fishing was permitted year-round with no hourly restrictions. Reference to "guide line harvest levels" was removed from the plan. The plan also provided for a personal use dip net fishery at the mouth of the Kenai River. Board action stabilized the fishery and increased the allocation to the recreational user group.

RECENT FISHERY PERFORMANCE

The 1995 fishery was prosecuted in a normal manner; no inseason management was required. The 1996 fishery was prosecuted in a normal manner with a bag limit of 6 sockeye salmon; no inseason management was required. Harvest in 1995 and 1996 was 125,430 and 219,080 fish, respectively (Table 22).

Kenai River sockeye salmon generally enter the River in harvestable numbers between July 15-20. Early entry is not unprecedented. In 1997 in excess of 20,000 fish were enumerated by sonar at River Mile 19 beginning July 10. Counts remained high through July 18, declined somewhat from July 19 through 25 and then declined to less than 8,000 fish daily from July 26 through August 5. Large numbers (20,000 + per day) of sockeye were available in the Soldotna area for about 9 consecutive days (July 10-18). Usually, harvestable numbers of sockeye are available here for about 2 weeks. Success rates after July 18 declined in this area. Many anglers began to leave the area by the last week of July. Due to protracted run timing, sockeye salmon fishing remained "good" at the outlet of Skilak Lake and in the upper Kenai River through mid-August.

An unprecedented 321,000 sockeye entered the river in August 1997. This is attributed to protracted run timing and closure of the commercial fishery August 7 for coho conservation. Prior to the closure the East Side Setnet fishery had fished continuously from noon, July 23 through August 4 (12.5 days) to harvest surplus sockeye primarily of Kenai River origin. The early closure reduced the East Side Setnet season by two periods (August 8 and 11), and the commercial drift season by one period (August 8). The final 1997 sonar count was 1,064,820 (counter removed August 25). Harvest will be determined by Statewide Harvest Survey available in fall 1998.

OUTLOOK

The CFD forecasts sockeye salmon production from the Kenai River to be a total return of 1.731 million in 1998. Total return to upper Cook Inlet is projected at 4.0 million sockeye salmon; a commercial harvest of 2.5 million.

The Cook Inlet commercial fishery will continue to be managed to ensure that the Kenai River return is within the desired sonar count range (550,000-850,000). Projected relatively low production from the Kenai River, therefore, does not equate to less than the desired number of fish in the inriver return.

Management of the 1998 inriver sport fishery will be in accordance with the Kenai River Sockeye Salmon Management Plan. Liberalization of the fishery is not provided for. Restrictions to the fishery would occur only if the minimum BEG (300,000) can not be projected.

CURRENT ISSUES

Management of this fishery is governed by the Kenai River Sockeye Salmon Management Plan. Prior to the 1989 season, the plan directed the department to permit a sport harvest not to exceed

6% of the sonar count when the count was 400,000-700,000 sockeye salmon. In 1988 the Board increased the allowable harvest at this escapement level to 10%. The fishery was one of the most rapidly expanding fisheries in Alaska at that time; it had the demonstrated ability to exceed the 10% harvest level.

At its fall 1992 meeting the Board did not change the allocation of Kenai River sockeye salmon between sport and commercial user groups. This necessitated the inseason restriction to the 1993 sport fishery outlined in "Recent Fishery Performance."

This restriction affected a large number of anglers and exacerbated the allocation issue between sport and commercial user groups. In February 1996 the Board amended the management plan, allocating additional sockeye salmon to the sport fishery. This notwithstanding, some sport anglers and others allied to recreational interests do not view the current allocation as equitable and will continue to request an increased allocation for recreational users.

A secondary issue is streambank degradation caused by large numbers of anglers concentrated in confined areas during this brief but intense fishery. Bank and riparian habitat degradation is an issue of biological concern. It is also an allocative issue in that opponents of an expanding sport fishery cite habitat loss to support their position. The management plan also references habitat loss and states that the Board may reduce the allocation to the inriver fishery if the fishery results in riparian habitat loss.

These issues will be discussed by the Board during its 1998/99 regulatory cycle.

RECOMMENDED RESEARCH & MANAGEMENT

A continuing evaluation of the Kenai River sockeye salmon spawning escapement goal is in progress; both the Sport Fish Division and Commercial Fish Division are participating in this process.

The Kenai River Sockeye Salmon Management Plan in part states: "the sonar counts established may be reduced by the Board of Fisheries (board) if noncommercial fishing, after consideration of mitigation efforts, results in a net loss of habitat units on the Kenai River, as determined by the board based on the department's observations and on the use of the habitat evaluation procedures described in Technical Report No 94-6, dated July 1994 and titled *An Assessment of the Cumulative Impacts of Development and Human Uses on Fish Habitat in the Kenai River*.

There is professional disagreement among staff as to whether or not the above study (Liepitz 1994) can accurately measure habitat loss which is directly attributable to the fishery. This issue needs to be reviewed by staff with the Board. If the Board wishes to join habitat to allocation, then staff need to develop a quantifiable program to measure net riparian habitat loss or gain.

KASILOF RIVER/CROOKED CREEK EARLY-RUN COHO SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVES

This fishery is not specifically addressed in any management plan adopted by the Board of fisheries.

The fishery is supported by wild stocks originating in Crooked Creek and Tustumena Lake tributaries.

Objective l: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

Objective 2: To ensure, through appropriate management and research programs, that the spawning escapement does not decline below levels necessary to ensure sustained yield.

INSEASON MANAGEMENT APPROACH

This fishery occurs in the mainstem Kasilof River and Crooked Creek (Figure 11). Wild and stocked early-run coho salmon supported the fishery from 1986 through 1995. Wild stocks exclusively supported the fishery beginning in 1996. A formal program to evaluate the contribution of wild and hatchery fish to the fishery was never implemented during the years stocking occurred.

The spawning escapement goal of 1,250 fish upstream from the hatchery was established in 1991, and was consistently achieved during the years stocked fish returned. It was not achieved in 1996, the first year the fishery was supported exclusively by wild stocks (Table 24**).** No spawning escapement goal has been established for fish which spawn downstream from the hatchery nor for coho salmon which spawn in Tustumena Lake tributaries.

Prior to 1997, there has been no inseason management of this fishery. The fishery is managed through existing regulations.

The 1997 coho salmon return to Upper Cook Inlet (that area north of Anchor Point) was below historic levels. This was determined by low harvest rates in the commercial fishery, low catch rates in sport fisheries monitored by creel survey, poor fishing success as reported by anglers and few coho salmon enumerated at weir sites in northern Cook Inlet. The management strategy to address the low return (except in a few stocked streams) was to manage Cook Inlet as a unit.

The commercial fishery was closed August 7. The early closure reduced the East Side Setnet season by two periods (August 8 and 11) and the commercial drift season by one period (August 8). The bag and possession limits in salt water were reduced to 1 coho salmon. Except in a few stocked streams in Northern Cook Inlet, the freshwater sport bag and possession limits north of Anchor Point were reduced to 1 fish; bait was not permitted.

These restrictions applied to Kasilof River and were in effect from August 9 through the remainder of the 1997 season.

HISTORICAL PERSPECTIVE

The Kasilof River and its major tributary, Crooked Creek (Figure 11), support early-run coho salmon. Limited data are available regarding the Kasilof River run. It is known that this run contributes to the Cook Inlet commercial fishery, has run timing similar to early-run Kenai River coho (late July-August), and spawns in tributaries to Tustumena Lake. A small sport fishery targeting this run occurs at the mouths of these tributary streams. A larger harvest of these fish also occurs in the mainstem Kasilof River sport fishery, which is experiencing an increase in participation.

Prior to stocking (1981-85) Kasilof River harvest ranged from 325-1,085 (Table 24). No harvest estimate is available for Crooked Creek prior to stocking. Stocking increased harvest in Kasilof River to a high of 5,349 in 1995. Harvest in Crooked Creek during the years of stocked returns ranged from 98-1,952.

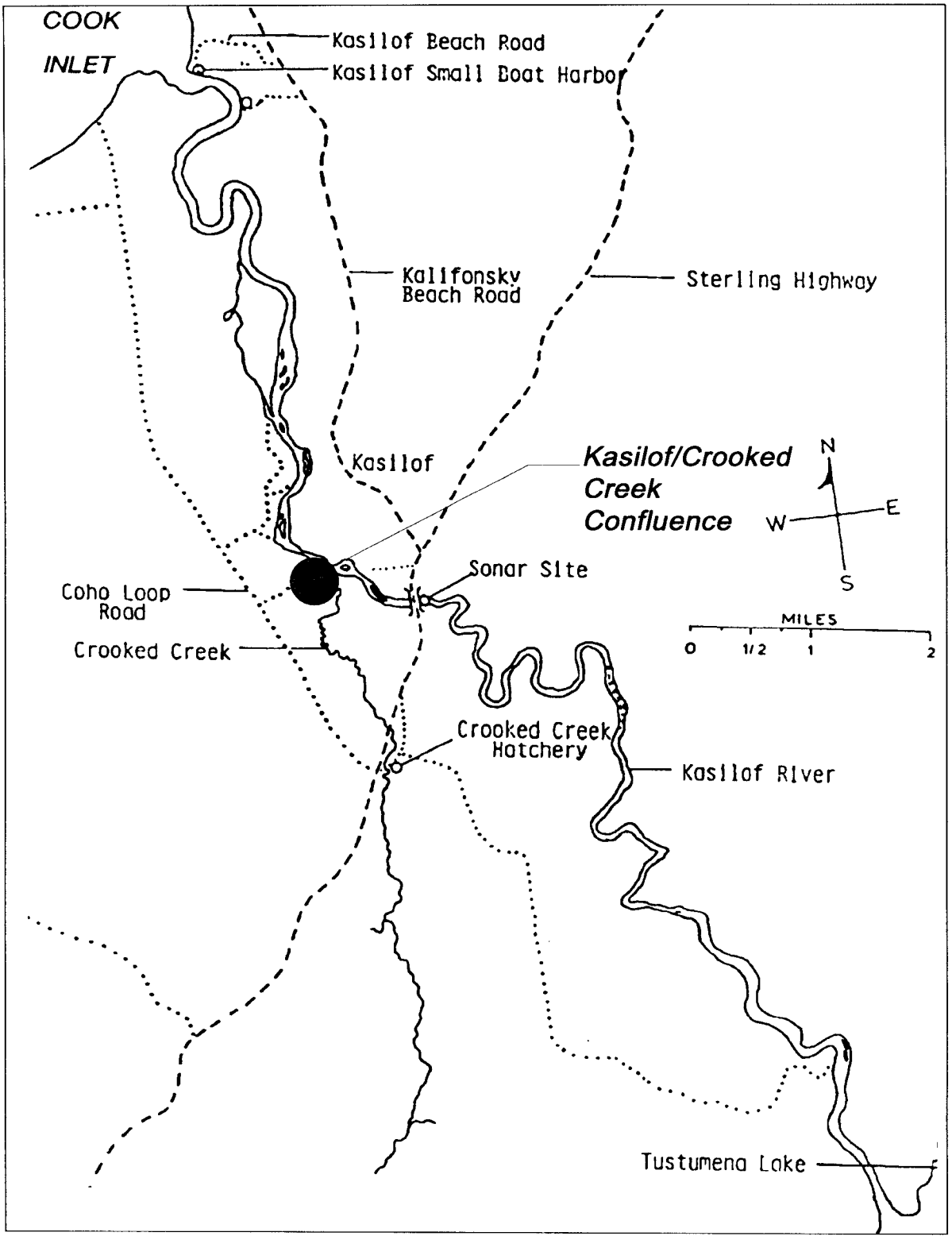

Figure 11.-Map of the Kasilof River early-run coho salmon fishery.

Table 24.-Summary of the Kasilof River and Crooked Creek coho salmon fishery, 1981-1997.

Year	Harvest [a] Tustumena Lake	Kasilof River	Crooked Creek	Total	Brood Stock	Crooked [b] Creek Escapement	Surplus [c]	Approximate [d] Enhanced Return
1981		335						
1982		325						
1983		409						
1984		1,085						
1985		560						
1986 [e]		1,783	497	2,280	515	3,667		5,571
1987	36	3,785			143	531	1,764	4,331
1988	200	2,928	291	3,419	212	212	2,204	4,383
1989	111	4,222	1,952	6,285	177	1,250	3,162	8,652
1990	236	1,590	486	2,312	185	317	1,368	3,151
1991	52	4,754	265	5,071	180	1,293	2,582	6,697
1992	32	3,304	251	3,587	130	1,558	0	3,591
1993	258	3,698	867	4,823	185	1,250	1,050	5,201
1994	30	4,457	1,026	5,513	0 [f]	1,303	250	4,808
1995	218	5,349	98	5,665	0	1,509	300	4,582
1996 [g]	149	2,681	519	3,349	0	259	0	0
Mean	132	2,579	625	4,230	157	1,195	1,268	4,633
1997	[a]	[a]	[a]	[a]	0	[h]	0	

[a] All harvest estimates from Statewide Harvest Survey (Mills 1982-1994, Howe et al. 1995-1997); data not available until season following harvest.

[b] Upstream from hatchery.

[c] Sold to processor, killed, given to public, or not allowed above hatchery.

[d] Assumes 50% of Kasilof River harvest are of Crooked Creek hatchery origin.

[e] First year of hatchery returns.

[f] Enhancement program discontinued; no egg take conducted.

[g] Fishery after 1995 supported entirely by wild stocks.

[h] Hatchery closed; weir not in place.

On July l, 1993 the state-operated Crooked Creek Hatchery was transferred to the Cook Inlet Aquaculture Association. At that time the decision was made to discontinue the coho salmon stocking program at Crooked Creek. The decision was predicated on cost and program prioritization given the remaining space in state hatcheries. The last return of stocked coho salmon to Crooked Creek was 1995.

On July 1, 1997 the hatchery reverted to state ownership. The facility is being surplused and no longer is an incubation or rearing facility.

Stocking increased the numbers of fish available to recreational anglers and increased harvest. Increased numbers of fish available attracted increasing numbers of anglers to Kasilof River and Crooked Creek. Discontinuing stocking has not reduced angler interest in this fishery.

BOARD OF FISHERIES ACTIONS

The Board addressed this fishery in February 1996. The steelhead stocking program had been discontinued. To maximize utilization of small numbers of steelhead, a catch-and-release fishery was established. Retention of steelhead was prohibited in Kasilof River downstream from the Sterling Highway Bridge and in Crooked Creek. In the Kasilof River downstream from the Sterling Highway Bridge, only unbaited, artificial lures may be used from September 1-May 15. In Crooked Creek only unbaited, artificial lures may be used from September 1-December 31. Crooked Creek was closed to fishing from January 1 through July 31.

In November 1996 the Board adopted regulations limiting terminal tackle to single hooks in Kasilof River downstream from the Sterling Highway Bridge from September 1-May 15; and in Crooked Creek from September 1-December 31. The purpose of the regulation was to reduce mortality in the catch-and-release steelhead fishery. This proposal was adopted at the request of the public even though the staff apprised the Board that there was no significant difference in mortality when a fish is caught and released with a single versus a multiple hook.

Prohibiting bait after September 1 will reduce harvest in the coho fishery. Bait is the preferred terminal gear in most coho fisheries; eliminating its use will probably reduce harvest by 50% after September 1.

RECENT FISHERY PERFORMANCE

Total harvest in 1994 and 1995 was 5,513 and 5,665 coho salmon, respectively (Table 24). The latter harvest was one of the highest recorded in the fishery. Harvest in these years was supported by wild and stocked fish. The reasons for a harvest of only 98 fish in Crooked Creek in 1995 are not known. Given an escapement of over 1,500, harvest would have been expected to be greater.

The 1996 fishery was supported entirely by wild stocks of Crooked Creek and Tustumena Lake tributary origin. Total harvest was 3,349. This is considered a relatively high harvest given the absence of stocked fish. The majority of the harvest occurred in Kasilof River, and it is assumed that coho salmon of Tustumena Lake-tributary origin contributed the highest proportion to the harvest (Table 24).

Harvest is determined by the Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995-1997). Results of the 1997 season will be available in fall 1998. The 1997 harvest is expected to be well below historic levels as a result of conservative inseason management action.

OUTLOOK

There are no plans to reinstate the coho salmon stocking program. Future fisheries will be supported by wild stocks. Annual harvest is expected to approximate 2,000-3,000 coho salmon.

CURRENT ISSUES

At issue is the increasing harvest of wild stocks and the lack of biological information upon which to manage the fishery. The Crooked Creek weir is no longer operational and there is no assessment of this stream's spawning escapement. There is no assessment of spawning escapement in Tustumena Lake tributaries, and spawning escapement goals have not been established.

Lack of stock assessment information is of concern to both public and department. The concern is that Kasilof River drainage coho salmon could be subject to excessive harvest in an expanding sport fishery. This could decrease production, result in restrictive regulations and decreased recreational opportunity.

RECOMMENDED RESEARCH & MANAGEMENT

We recommend that a stock assessment program of Kasilof River drainage be initiated. Program objectives would be to identify spawning areas, enumerate spawning fish, estimate total return and determine the harvestable surplus available to the commercial and recreational fisheries.

SWANSON RIVER COHO SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVE

This fishery is not specifically addressed in any management plan adopted by the Board of Fisheries. Department objectives for this fishery are:

Objective 1: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

Objective 2: To ensure, through appropriate management and research programs, that the population does not decline below the level necessary to ensure sustained yield.

INSEASON MANAGEMENT APPROACH

There are currently no active research programs associated with this fishery. Harvest is estimated by the Statewide Harvest Survey. With allowances for annual variation, notably in 1988-1989, this survey indicates a stable fishery. Assuming a stable fishery equates to a relatively stable population with sufficient numbers of coho salmon in the spawning escapement to ensure the fishery continues to be managed for sustained yield. With the exception of 1997, the fishery has been managed inseason by regulation.

The 1997 early-run coho salmon return to Upper Cook Inlet (that area north of Anchor Point) was below historic levels. This was determined by low harvest rates in the commercial fishery, poor fishing success as reported by anglers, and few coho salmon enumerated at weir sites in northern Cook Inlet. Angler success rate as determined by creel survey in the Kenai River was essentially "zero" in early August. The management strategy to address the low return (except in a few stocked streams in northern Cook Inlet) was to manage Cook Inlet as a unit.

The commercial fishery was closed August 7. The early closure reduced the East Side Setnet season by two periods (August 8 and 11) and the commercial drift season by one period (August 8). The sport bag and possession limits in salt water were reduced to 1 coho salmon. Except in a few stocked streams in Northern Cook Inlet, the freshwater sport bag and possession limits north of Anchor Point were reduced to 1 fish; bait was not permitted.

These regulations applied to the Swanson River and were in effect from August 9 through the remainder of the season.

Because of limited access, this fishery is somewhat self-limiting. In years of high abundance, large numbers of coho salmon are harvested in the lower river. The converse is true during years of low abundance. Once through the lower river, the fish are subject to capture only by anglers who use a canoe to float the Swanson River and/or canoe route. Identified spawning areas are the mainstem Swanson River and the tributary streams connecting the numerous lakes to the river. Observation indicates that coho salmon mature very rapidly on entering these tributary streams and are no longer desirable to the majority of anglers. The primary tributary accessible by road is Sucker Creek which flows through a culvert beneath Swan Lake Road. This small stream has been closed to salmon fishing since 1989.

HISTORICAL PERSPECTIVE

The Swanson River is tributary to Cook Inlet, entering salt water approximately 30 miles north of the Kenai River. It is approximately 46 miles in length. The river transects the Swanson River oil field, and virtually all land bordering the river is in federal ownership, administered by the Kenai National Wildlife Refuge. The river downstream from the oil field for about 10 miles is meandering with grass-covered banks. The remaining 10 miles to salt water is characterized by increasing gradient and numerous large rocks in midstream. The upper section of the river (oil field upstream to its headwaters) is characterized by broad stretches of muskeg and swamp which border the slow flowing main channel. Very little gravel is found in this section of stream.

The river drains numerous lakes, many of which are interconnected by small streams. These lakes are all contained within the Kenai National Wildlife Refuge. Forty of these lakes form the Swanson River Canoe Route, which is administered by the refuge. This canoe route is about 36 miles in length and may be increased by an additional 46 miles if the canoeist opts to traverse the Swanson River downstream to the Kenai Spur Road. Access to the canoe route is at about Mile 12 of the Swan Lake Road. This road is reached via Swanson River Road which intersects the Sterling Highway at Mile 83.4.

Initial surveys of this stream were conducted by the Sport Fish Division in the 1960s. In 1967 and possibly 1968, a weir was installed in the river in the area of the oil field to capture coho salmon for egg-take purposes. Three tributary streams (Airport Creek, Canoe Creek, and Sucker Creek) were established as index count areas for coho salmon in the 1960s. Counts in these streams were discontinued in the mid-1970s. Swanson River has also served as a source for rainbow trout eggs, the progeny of which are used in the Sport Fish Division's lake stocking program.

The Swanson River supports coho, sockeye, chinook, and pink salmon; rainbow trout, Dolly Varden, longnose suckers *Catostomus catostomus* and stickleback *Gasterosteus aculeatus*. Relative numbers of these species, notably salmon, were not known prior to 1988. In 1988 the Fish and Wildlife Service installed a weir in the lower river. Installation was May 21; high water

rendered the structure inoperable September 26. This weir enumerated 23,514 coho salmon, 1,542 sockeye salmon, 5 chinook salmon, 72 pink salmon, 15 rainbow trout and 3 Dolly Varden. Coho salmon began entering the stream the latter part of July, the migration peaked in mid to late August and continued through September. Sockeye salmon entered the stream in late June, peaked in late July, and the run was essentially complete by mid-August. The small number of chinook salmon were enumerated in late June, with the pink salmon migration occurring in August.

The weir was also operational in 1989, being installed July 28 and rendered inoperable by high water on August 27. That year 20,841 coho salmon were counted; weir records do not indicate that other species passed through the structure.

Based on this information, chinook salmon are early-run fish and sockeye salmon late run. There is only one run of pink salmon. Coho salmon are believed to be early-run fish, although a migration into late September is somewhat atypical for early-run Peninsula coho salmon. In the Kenai River and other streams the early run is usually complete by early September. The late-run timing in 1988 may in part be attributed to what is considered to be a relatively large return of this species, as large returns tend to begin earlier and end later than average or low returns.

Swanson River coho salmon in some years support a relatively large sport fishery. Harvest data are available from the Statewide Harvest Survey since 1983. In 1983 and 1984 the survey indicated a harvest occurred only in the Swanson River; from 1985 through 1987, only in the canoe route. In 1989 the public became aware of what was considered above average coho salmon returns to this stream. Most fishing occurred in the lower section of river where it is transected by the Kenai Spur Highway at Mile 38.6. This is approximately 0.5 mile upstream from Cook Inlet. Total harvest in 1988 from the Swanson River drainage was 6,149; in 1989, 6,506. Thereafter harvests declined ranging from 892-3,487 (Table 25).

BOARD OF FISHERIES ACTIONS

There have been no recent Board actions affecting this fishery. The fishery will next be reviewed during the 1998/99 regulatory cycle for Cook Inlet finfish.

RECENT FISHERY PERFORMANCE

This fishery is not monitored or creel surveyed. Conversations with the public suggested that the 1990 through 1992 returns were less than occurred in either 1988 or 1989. As in the preceding years, it is assumed that the majority of the harvest continues to occur in the lower section of river in close proximity to the Kenai Spur Highway. Limited access precludes a significant harvest in the upstream areas with the exception of those individuals using a canoe in the Swanson River and/or the canoe route. Harvest ranged from 892 to 3,487 coho salmon from 1990-1993.

Harvest was 1,876 in 1994, 1,189 in 1995 and 2,104 in 1996 (Table 25). As noted, these harvests suggest a relatively stable fishery.

Harvest in 1997 is expected to be below the historical average, given the restrictive 1 fish limit and the prohibition on the use of bait. Harvest estimates for the 1997 season are determined by Statewide Harvest Survey, available in fall 1998.

Table 25.-Coho salmon harvest in Swanson River and Swanson River and Swan Lake Canoe Routes, 1983-1996.

Year	Swanson River	Swanson River/ Swan Lake Canoe Routes	Total Swanson River Drainage
1983	525		525
1984	1,484		1,484
1985		187	187
1986		969	969
1987		1,485	1,485
1988	5,603	546	6,149
1989	6,379	127	6,506
1990	1,501	0	1,501
1991	811	81	892
1992	1,984	49	2,033
1993	3,477	10	3,487
1994	1,876	0	1,876
1995	1,132	57	1,189
Mean	2,477	319	2,176
1996	2,005	99	2,104

OUTLOOK

These early-run coho salmon contribute to the Cook Inlet commercial and Swanson River inriver sport fisheries. The East Side Setnet fishery was reduced by one period in March 1996 by the Board. Numbers of coho salmon returning to Swanson River should therefore, with allowances for annual variation in abundance, remain relatively constant or slightly increase.

Access to the sport fishery is primarily in the lower Swanson River. In effect, this is a lower river intercept fishery in that little fishing activity occurs in the upstream areas. This is not expected to change as no additional road access is planned for the upper river areas.

Harvest in this fishery is proportionate to abundance as demonstrated by the 1988-1989 record harvest which corresponded to weir counts of over 20,000 coho salmon. Given that abundance remains below the record returns of the late 1980s and approximates "average" returns, future annual harvests are expected to range from 2,000-4,000 fish.

CURRENT ISSUES

There are no major issues associated with this fishery.

RECOMMENDED RESEARCH & MANAGEMENT

No research or management activities specific to this fishery are recommended at this time.

WEST SIDE COOK INLET EARLY-RUN COHO SALMON (Kustatan River, Polly Creek, Silver Salmon Creek)

FISHERY OBJECTIVE

This fishery is not specifically addressed in any management plan adopted by the Board of Fisheries. Department objectives for this fishery are:

Objective 1: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

Objective 2: To ensure, through appropriate management and research programs, that west side Cook Inlet early-run coho salmon spawning populations do not decline below the levels necessary to ensure sustained yield.

INSEASON MANAGEMENT APPROACH

In 1987 coho salmon fishing in Silver Salmon Creek was restricted to fishing in the intertidal area only. Concern was expressed by the owner of Silver Salmon Creek Lodge that total production had declined due to stream re-channelization. Total protection was afforded fish which had migrated through the intertidal area. The spawning areas remain closed; production appears to have increased and the stock has returned to former levels of abundance.

The 1997 early-run coho salmon return to Upper Cook Inlet (that area north of Anchor Point) was below historic levels. This was determined by low harvest rates in the commercial fishery, poor fishing success as reported by anglers, and few coho salmon enumerated at weir sites in northern Cook Inlet. The management strategy to address the low return (except in a few stocked streams in northern Cook Inlet) was to manage Cook Inlet as a unit.

The commercial fishery was closed August 7. The early closure reduced the East Side Setnet season by two periods (August 8 and 11) and the commercial drift season by one period (August 8). The sport bag and possession limits in salt water were reduced to 1 coho salmon. Except in a few stocked streams in Northern Cook Inlet, the freshwater sport bag and possession limits north of Anchor Point were reduced to 1 fish; bait was not permitted.

These regulations applied to Silver Salmon Creek and all other west side Cook Inlet coho salmon fisheries, including Polly Creek and Kustatan River. The restrictive bag and possession limits remained in effect from August 9 through October 15, i.e. the remainder of the season.

HISTORICAL PERSPECTIVE

The Kustatan River, Polly Creek and Silver Salmon Creek are west side Cook Inlet tributaries (Figure 12). These streams support an increasingly popular early-run coho salmon fishery. Run timing is usually earlier here than in Kenai Peninsula streams; early-run coho salmon are present from as early as mid-July through August.

Kustatan River is the largest of the three streams and is located immediately south of the West Foreland. This turbid stream also supports what are believed to be relatively small populations of sockeye, chinook and pink salmon, Dolly Varden and rainbow trout. Recreational anglers access the river by wheel and float plane landing in the lower river, small lakes adjacent to the river, at unimproved landing strips, and on gravel bars. Small numbers of anglers access the river by boat. Fishing occurs adjacent to aircraft landing areas. In recent years there have been reports of anglers accessing the area via helicopter. The most popular area is the confluence of

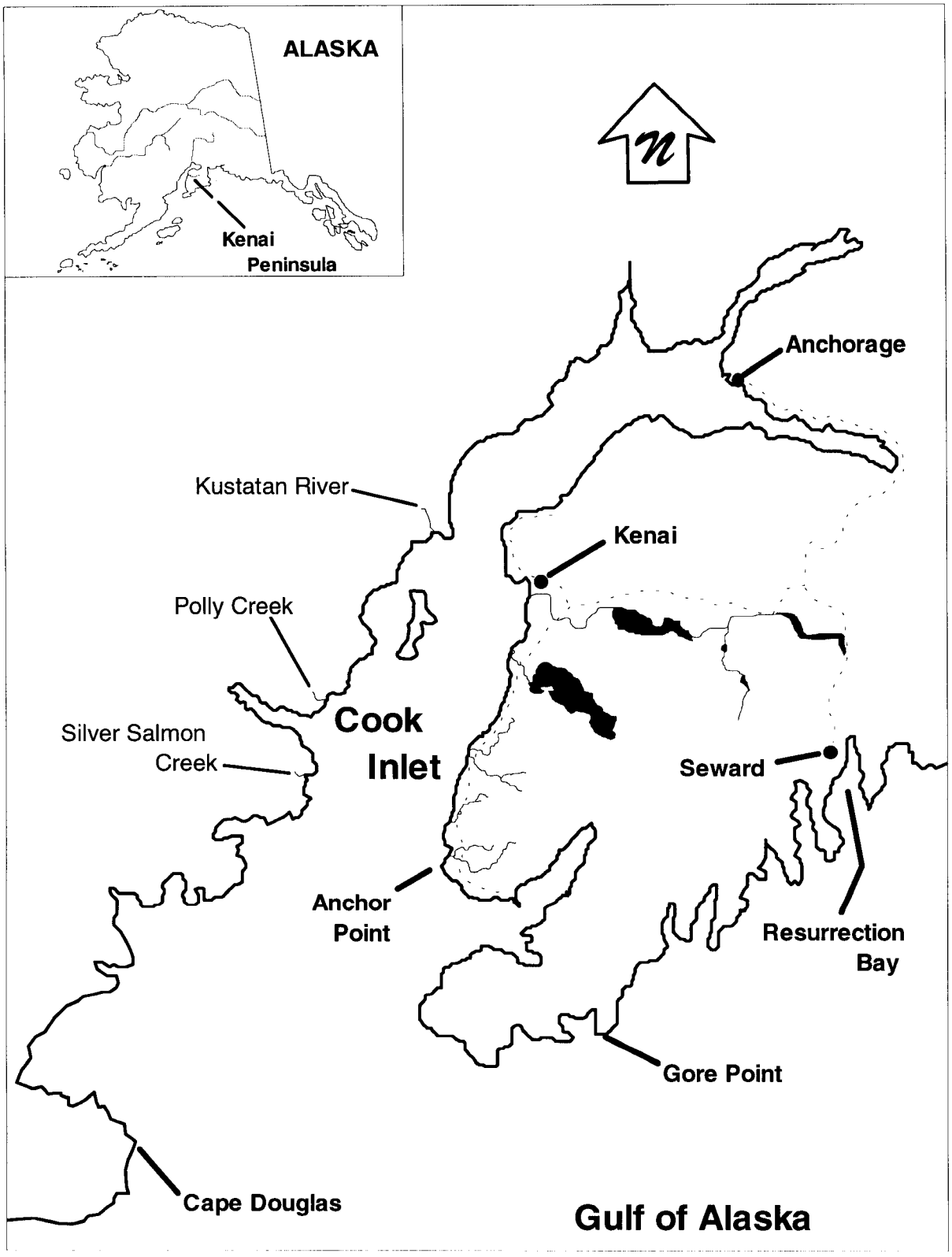

Figure 12.-Westside Cook Inlet drainages of Kustatan River, Polly Creek, and Silver Salmon Creek.

the river and a clearwater slough approximately 3 miles upstream from Cook Inlet. Several commercial operators have established camps here with small boats available for clients to use.

Harvest and participation estimates for the Kustatan River coho salmon fishery are available for most years since 1984 (Table 26). Annual harvests average about 4,900 fish.

Table 26.-Harvest and participation for the Kustatan River coho salmon sport fishery, 1984-1996.

Year	Harvest	Participation (Days)
1984	1,656	1,673
1985		
1986	3,239	2,737
1987	5,723	3,622
1988	6,221	3,674
1989	5,413	3,522
1990	4,584	3,724
1991	5,768	6,674
1992	4,494	4,150
1993	6,457	5,403
1994	5,259	3,972
1995	4,237	3,684
1996	5,304	3,512
Mean	4,863	3,862

Source: Mills 1985-1994, Howe et al. 1995-1997.

Polly Creek is a clearwater stream tributary to Cook Inlet about 4 miles north of Tuxedni Bay. The stream also supports runs of pink and chum salmon, and Dolly Varden. Access is via wheel aircraft which land on the beach or on a private airstrip adjacent to the beach. The majority of angler activity is confined to the lower mile of stream; some lands adjacent to the stream are in private ownership and permanent residences are located here.

Observation indicates Polly Creek supported the most popular westside coho salmon fishery in the 1970s. In the 1980s and 1990s angler attention has been focused on Kustatan River to the north and Silver Salmon Creek to the south. Harvest estimates from the Statewide Harvest Survey are not available for Polly Creek in most years due to small sample size. Estimated harvest in 1992 was 332 coho salmon; participation 747 days fished.

Silver Salmon Creek is located on the west side of Cook Inlet approximately midway between Tuxedni and Chinitna bays (Figure 12). The stream originates in Silver Salmon Lake. Total length of the stream is approximately 1.5 miles. In the intertidal area, the stream's maximum

width is about 200 feet. Above the intertidal area, width decreases to 30-50 feet. Average depth in this area is 2-3 feet depending on rainfall and seasonal variation.

The stream has been a popular area with some Anchorage and Kenai Peninsula anglers for a number of years. Access to the area is via aircraft which land on the beach. These anglers generally fish the intertidal area of the stream. There are several private residences in the area and a long established commercial facility, Silver Salmon Creek Lodge. Reports have been received of at least one other newly constructed lodge in the area. Local residents, in large part, also limit their fishing activity to the lower area of the stream. In the mid-1980s float planes began to land on Silver Salmon Lake. Generally, anglers that arrived via float plane fished the outlet of the lake.

In the spring of 1987, a petition to the Board of Fisheries was received from the owner of the Silver Salmon Creek Lodge. The petition was signed by 43 individuals and requested a sport fishing closure above the main channel. Justification for the request was increased sport fishing activity on the spawning grounds and loss of spawning area due to natural stream re-channelization.

Silver Salmon Creek was observed by division regional and area staff on May 27, 1987. The decision to close the upper one-half mile to salmon fishing was made at that time. Justification was the reduction in spawning area which resulted from stream re-channelization in addition to the increased recreational use of the area. The emergency closure was issued June 8, 1987. This closure was supported by the National Park Service which viewed float plane landings on Silver Salmon Lake as disruptive to swans that use this area.

The emergency closure precluded fishing at the outlet of the lake. This was the area most heavily fished by those who accessed the area by float plane. Float planes continued to land on the lake. Anglers then walked approximately one-half mile downstream and fished the intertidal area.

Four surveys of Silver Salmon Creek were made in 1987. An aerial and ground survey was conducted September 25. About 50 fish were actively spawning and an estimated 1,000-1,500 fish were still schooled at the outlet of the lake.

In 1988 Sport Fish staff decided that Silver Salmon Creek coho salmon should be managed inseason based on the number of fish returning to the drainage. The emergency closure which prohibited fishing at the outlet of Silver Salmon Lake downstream for a distance of about one-half mile was not reissued. It was decided that if 500 coho salmon were not observed at the lake outlet by the first week of September, with an additional 1,000 coho salmon present by late September, restrictions to the fishery may be required. The primary user of the lake outlet (Kalgin Island Lodge) and Silver Salmon Creek Lodge, whose clients fish the lower river, were notified via mail of this management strategy.

Four aerial surveys of the stream were again flown in 1988. Based on experience acquired in 1987, foot surveys cannot be effectively employed to count salmon in this drainage. All surveys were conducted by experienced observers. The final survey revealed 800-1,200 coho salmon present at the lake outlet.

In 1988 the Board closed the Silver Salmon Creek drainage upstream from the treeline to all salmon fishing. Fishing for other species, primarily Dolly Varden, continued to be permitted throughout the drainage. This action changed the prosecution of this fishery in 1989 in that those

anglers who accessed the area via float plane were no longer able to harvest salmon at the lake outlet.

Annual harvests of coho salmon from Silver Salmon Creek range from 302 to 2,094.

BOARD OF FISHERIES ACTIONS

There were no regulatory changes adopted for this fishery during the 1990, 1992 or 1996 Board cycles.

RECENT FISHERY PERFORMANCE

Harvest and participation estimates are provided by the Statewide Harvest Survey. Harvests of coho salmon from Kustatan River (Table 26) were within historic ranges: 4,237 (1995) and 5,304 (1996). Harvests from Silver Salmon Creek (Table 27) were 1,715 (1995) and a record 2,094 (1996). No estimate for Polly Creek is available for 1994 because of small sample size in the Statewide Harvest Study. Harvests in 1995 and 1996 were 175 and 641 coho salmon, respectively.

No spawning escapement surveys have been made in Kustatan River, Polly or Silver Salmon creeks in recent years. Participation in these fisheries has remained relatively constant. No public complaints were received in 1997 regarding the status of the westside Cook Inlet coho salmon resource. In fact, the general public comment was that all of the above streams had a fair return and that the return was "late." These comments notwithstanding, quantitative assessment of stock status was not possible and the bag and possession limits reduction to 1 coho salmon and the prohibition on bait remained in effect throughout the 1997 season.

OUTLOOK

Because of increases in participation in Kenai Peninsula salmon fisheries, some anglers are finding them too congested and are seeking less crowded recreational fisheries. The westside Cook Inlet coho salmon fishery is viewed by some of these anglers as a viable alternative. Participation (both private and guided or chartered) in the coho salmon fishery at Kustatan River, Polly Creek and Silver Salmon Creek is therefore expected to increase.

CURRENT ISSUES

The public continues to bring to the department's attention the perceived increase in participation in the Kustatan River, notably at the confluence of the river with the small clearwater slough approximately 3 miles upstream from Cook Inlet. There is also a perception that participation is increasing in other west side stream coho fisheries.

Blacksand Creek, tributary to Kustatan River, was reported by long time fishery participants to be a major spawning area in this drainage. Reports were that numbers of spawning coho salmon were declining. An aerial survey of the upper Kustatan River was flown on September 24, 1993 to observe the area. Between 300 and 500 coho salmon were observed. The percentage of the total spawning population that this count represents is unknown. No data base exists and this information can not be placed in perspective.

No resource conservation issue has been identified in the aforementioned rivers. This is predicated on relatively stable harvest and participation in the above mentioned fisheries as reported in the Statewide Harvest Survey. Of concern to some members of the public who have fished west side streams for a number of years is the increased usage in recent years by "new

Table 27.-Harvest and participation for the Silver Salmon Creek coho salmon sport fishery, 1983-1996.

Year	Harvest	Participation (Days)
1983	1,872	
1984	661	
1985		
1986	302	
1987	706	
1988		
1989	735	1,285
1990	320	915
1991	1,120	1,112
1992	494	597
1993	853	1,080
1994	270	329
1995	1,715	1,851
1996	2,094	1,850
Mean	929	1,127

Source: Mills 1984-1994, Howe et al. 1995-1997.

anglers," including increased participation by guided and chartered anglers. Most public concern is focused on the concentrated participation occurring in the clearwater slough approximately 3 miles upstream from Cook Inlet in Kustatan River. At this time it is not known if the slough is a spawning area, holding area for coho salmon migrating to spawning grounds upstream, or a combination thereof.

Given the size of the Kustatan drainage, it is unlikely the present annual sport harvest of less than 7,000 coho salmon poses a conservation issue. If the heavily fished slough is a spawning area, sport anglers may be capable of negatively impacting the reproductive potential of fish using this area.

Shelter Creek is a small stream immediately north of Chinitna Bay. Reports from anglers indicate participation in this stream's coho fishery is increasing. As in other west side Cook Inlet streams, stock assessment has not been conducted here.

RECOMMENDED RESEARCH & MANAGEMENT

The department has virtually no biological information regarding the stock status of west side Cook Inlet coho salmon in the Northern Kenai Peninsula Management Area. The sport harvest here is expected to continue to increase. Although increasing harvest is not presently assumed to be a conservation issue, this assumption is not fact. The challenge to the department is to develop a cost-effective program to assess the status of coho salmon in west side Cook Inlet streams between the West Foreland and Chinitna Bay.

There is increasing public concern regarding these coho salmon fisheries. Concern centers on the use of helicopters and air boats in some drainages and a general increase in angler participation. The perception is that increased usage increases harvest and is now, or ultimately will, decrease production. Some anglers have requested a reduction in bag and possession limits from 3 fish with 6 in possession to 2 fish with a prohibition on fishing in known spawning areas.

We anticipate that department staff will meet with concerned individuals in early 1998. Information will be shared. It will be determined if a consensus can be established regarding regulation of the fishery. Information from meetings with the public will be conveyed to the Board at its February 1999 meeting for possible action.

KENAI RIVER EARLY-RUN COHO SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVE

Early-run Kenai River coho salmon are addressed in the Upper Cook Inlet Salmon Management Plan. This Board adopted management plan directs the department to minimize the harvest of this species in the Cook Inlet commercial salmon fishery. In March 1997 the Board adopted the Kenai River Coho Salmon Management Plan. This plan contains regulations which reduced the total (combined sport and commercial) harvest by approximately 20%. In addition to the objectives of the aforementioned management plan, department objectives are:

Objective 1: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

Objective 2: To ensure, through appropriate management and research programs, that the spawning escapement does not decline below levels necessary to ensure sustained yield.

INSEASON MANAGEMENT APPROACH

There presently is no cost effective methodology available to enumerate the inriver coho salmon return; an escapement goal has not been established for this stock. Prior to 1997, there was no inseason management of this fishery.

The 1997 coho salmon return to Upper Cook Inlet (that area north of Anchor Point) was below historic levels. This was determined by low harvest rates in the commercial fishery, poor fishing success as reported by anglers, and few coho salmon enumerated at weir sites in northern Cook Inlet. Angler success rate, as determined by creel survey in the Kenai River, was essentially "zero" through the first 6 days of the fishery. The management strategy to address the low return (except in a few stocked streams in northern Cook Inlet) was to manage Cook Inlet as a unit.

The commercial fishery was closed August 7. The early closure reduced the East Side Setnet (ESSN) season by two periods (August 8 and 11) and the commercial drift season by one period (August 8). The sport bag and possession limits in salt water were reduced to 1 coho salmon. Except in a few stocked streams in Northern Cook Inlet, the freshwater sport bag and possession limits north of Anchor Point were reduced to 1 fish; bait was not permitted.

These regulations applied to the Kenai River and were in effect from August 11 through the regulatory close of the season, September 30.

The effect of this management strategy on the sport fishery will be determined by creel survey and the Statewide Harvest Survey. No determination of the effect of restrictive management on numbers of coho salmon spawning can be made.

HISTORICAL PERSPECTIVE

When the chinook salmon season terminates July 31, anglers immediately direct their efforts towards coho salmon. Coho anglers fish from anchored boats or from shore unlike the mobile or drift fishery directed at chinook salmon. This fishery occurs from the river's mouth upstream to Kenai Lake (Figure 13).

Coho salmon are believed to return to the Kenai River in two runs. This assumption is based on creel survey data that indicate a temporal separation in early September. No other data are available that suggest the presence of two runs. Early-run fish begin entering the system in late July and are present through early September. Late-run fish begin to enter the river in late August, peak in September, and continue to enter the river at reduced levels until December.

A creel survey was conducted in the Kenai River downstream from Soldotna from 1976-1993. The survey provided inseason harvest, harvest per unit effort and angler participation estimates for this area of the river. These data were used postseason to track the relative status of the fishery. Given that harvest is approximately proportionate to coho salmon abundance, numbers of early-run Kenai River coho salmon (with allowances for annual variation) appeared relatively stable. There had never been inseason management actions in this fishery nor were any anticipated. Harvest data were obtained from the Statewide Harvest Survey. The creel survey was determined not to be cost effective and was terminated at the conclusion of the 1993 season.

Despite relatively stable harvests in the recreational fishery through the early 1990s, fisheries managers became increasingly concerned that the current rate of harvest could not be sustained. The Division of Sport Fish therefore began a stock assessment program in 1992. The program is ongoing and relies heavily on annual smolt production as an indicator of future abundance. Early- and late-run smolt can not be distinguished; for the following analysis it is appropriate to treat the Kenai River coho fishery as a single run. Data through 1995 from the assessment program, creel survey, and Statewide Harvest Survey indicate:

1. Harvest of Kenai River coho salmon has increased in the sport fishery. Harvest increased from a low of about 10,000 fish per year in the late 1970s to a peak of 87,000 in 1994.
2. Historically, most of the sport harvest was taken by nonguided anglers. In recent years the harvest by guided anglers has increased and now equals that of nonguided anglers.
3. The harvest rate for guided anglers is about twice that of nonguided anglers.
4. The commercial harvest of Kenai River coho salmon occurs primarily in the East Side Setnet (ESSN) fishery and to a lesser degree in the drift net fishery. Harvest from 1993 through 1996 averaged about 11,600 Kenai coho in the ESSN fishery; 5,600 in the drift fishery (Table 28).
5. The sport fishery harvests 74% of the Kenai River coho harvest (early and late run combined); the commercial fishery 22% and less than 3% of the harvest is taken in personal use and educational fisheries.

6. Smolt outmigration estimates have declined from nearly 1,000,000 in 1992 and 1993 to less than 500,000 in 1995.

There was no onsite creel survey from 1994-1996. The survey was reinstated in 1997. Information obtained from a Kenai River coho salmon assessment program indicated a decline in smolt production. This decline could reduce the adult return, requiring inseason management. The primary indicator of a reduced return inriver would be a decline in harvest rate as determined by the creel survey.

The 1997 coho salmon return to virtually all of Upper Cook Inlet was below historic levels. The Kenai River sport fishery was restricted as described in the Inseason Management Approach section. This is the first inseason restriction in the history of this fishery.

BOARD OF FISHERIES ACTIONS

There were no regulatory changes to this fishery at the 1990 Board of Fisheries meeting. In 1992 the Board prohibited fishing for any species of fish in the Kenai River after taking the daily bag and possession limits of 3 coho salmon greater than 16 inches in length. The purpose of this regulation was to curtail the increasingly prevalent illegal practice of fishing for a "boat limit."

At its February 1996 meeting the Board closed the area from the bridge at the outlet of Kenai Lake downstream about 5 miles to the Sterling Highway Bridge at Milepost 53. Also closed was the outlet of Skilak Lake downstream to the Upper Killey River. These areas were closed to all fishing from January 1 through June 14. The purpose of the closure was to protect spawning coho salmon at the outlet of Kenai and Skilak lakes. These regulations became effective January 1, 1997. Although not definitely known, these are believed to be late-run fish.

The Board addressed this fishery in March 1997 at the request of the department. Staff was concerned that given increased harvest and decreasing smolt production, current harvest rates could not be sustained. The Kenai River Coho Salmon Management Plan was adopted at this meeting. Primary provisions of the plan are:

1. Coho salmon fishing is prohibited from October 1 through June 30;
2. From October 1 through June 30 only unbaited artificial lures may be used in the Kenai River drainage unless provided for by emergency order;
3. From July 31 or the end of the king salmon season, whichever is later, through September 30, sport fishing from a vessel that is registered with the Department of Natural Resources, Division of Parks, as a guide vessel is restricted as follows:
    A) A guide may not sport fish while guiding clients;
    B) The maximum number of rods fished may not exceed the number of clients on board the vessel;
    C) Downstream from the confluence of the Moose and Kenai rivers fishing from a guide vessel is prohibited on Mondays;
    D) Upstream from the confluence of the Moose and Kenai rivers, sport fishing for coho salmon is prohibited on Mondays.

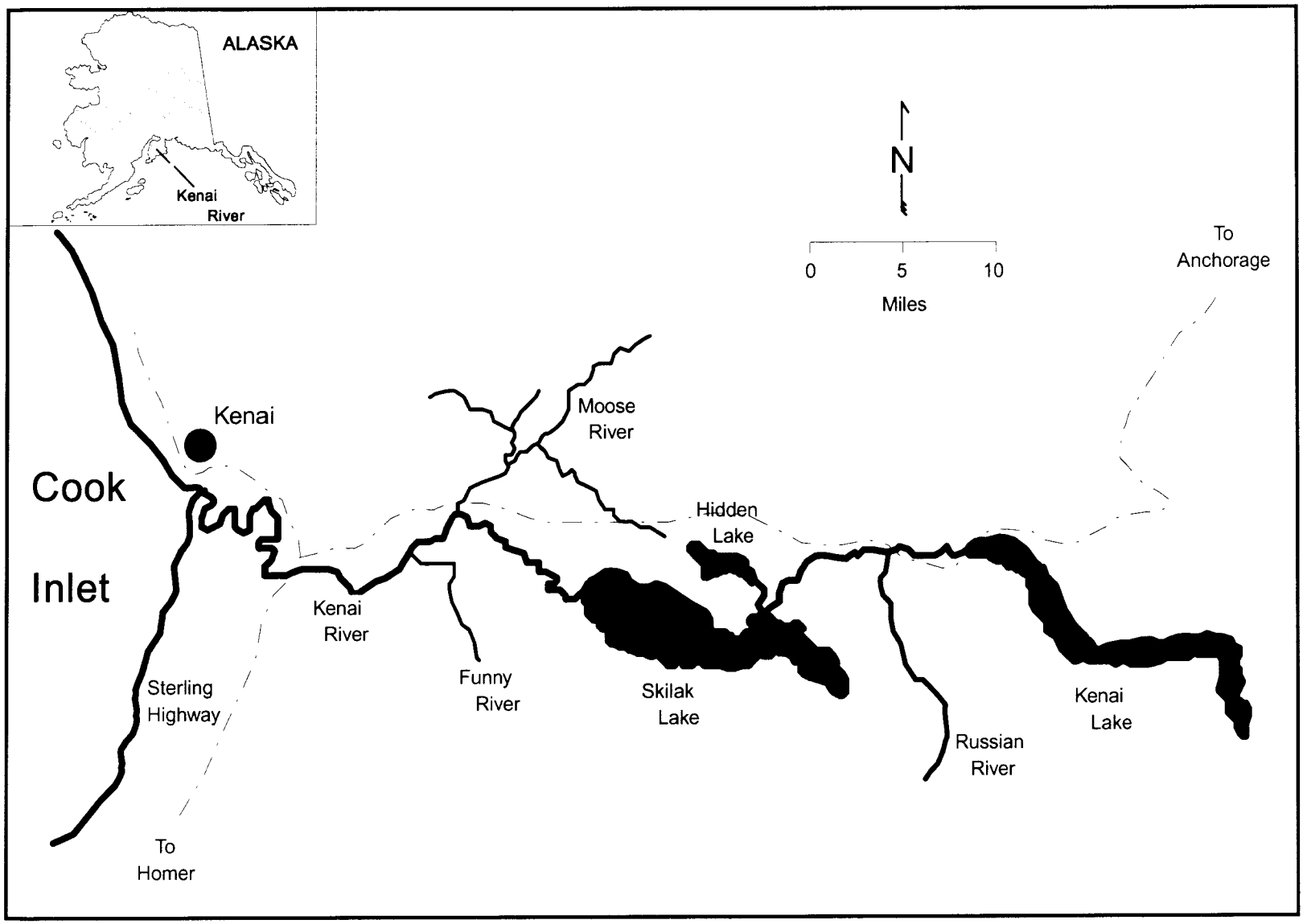

Figure 13.-Map of the Kenai River drainage.

Table 28.-Cook Inlet commercial coho salmon harvest, and harvest of Kenai River coho salmon, 1993-1997.

Year	Commercial Drift Fishery Total Harvest	Commercial ESSN[a] Fishery Total Harvest	Drift Fishery Harvest of Kenai River Coho	ESSN Harvest of Kenai River Coho	Total Kenai River Sport Harvest[b]	Personal Use and Subsistence Dip Net	Educational	Total Harvest of Kenai River Coho	% Kenai Coho Harvest in Commercial Fishery
1993	121,785	43,075	930	6,806	50,538	1,597[c]	427	60,348	12.8
1994	303,935	69,281	11,732	14,673	86,711	2,535[c]	829	116,480	22.7
1995	234,126	44,750	6,956	13,165	46,183	1,556[d]	868	68,728	29.3
1996	171,361	40,548	2,671	11,856	42,066	1,849[c]	592	59,034	24.6
1997	71,517	20,575				520[c]	191		
Mean	180,545	43,646	5,572	11,625	56,375	1,611	581	76,148	22

From: Carlon and Hasbrouck 1996, 1997, 1998; Mills 1994; Howe et al. 1995-1997; Brannian and Fox 1996.

[a] East Side Setnet commercial fishery.

[b] Combined early- and late-run harvest.

[c] Personal Use.

[d] Subsistence.

This plan also reduced the commercial ESSN fishery by one period and closed the personal use dip net fishery at the Kenai River mouth on July 31. These provisions were intended to reduce total (commercial plus early- and late-run sport) harvest of Kenai River coho salmon by about 20%.

In determining the need for conservative management the department relied on smolt estimates. The smolt abundance estimate can not be apportioned by early and late run. The Board therefore addressed the Kenai River coho return as one run; regulations were crafted to reduce harvest in both early and late segments of the run.

RECENT FISHERY PERFORMANCE

Table 29 presents historical data for the coho salmon sport fishery prior to September 1 downstream from the Soldotna Bridge. Harvest for 1994 through 1997 was estimated from the Statewide Harvest Survey by apportioning two-thirds of the harvest in this section of the river to the early-run fishery; one-third to the late-run fishery. Through 1993 guided anglers were

Table 29.-Harvest, angler effort, and harvest rate in the Kenai River early-run (prior to September 1) coho salmon fishery, downstream of the Soldotna Bridge, 1986-1997.

Year	Harvest	Days Effort[a]	Hours Effort	Guided Harvest/hour	Nonguided Harvest/hour	Combined Harvest/hour
1986	26,375	43,765	162,804	0.279	0.139	0.162
1987	15,348	26,301	104,942	0.195	0.134	0.146
1988	22,398	37,417	156,405	0.147	0.143	0.143
1989	24,278	33,850	141,155	0.217	0.156	0.172
1990	26,789	51,816	216,074	0.181	0.104	0.124
1991	41,660	45,030	161,208	0.542	0.201	0.258
1992	20,817	40,919	176,554	0.192	0.098	0.118
1993	21,628	24,577	101,176	0.363	0.167	0.214
1994 [b]	30,898		No Creel Survey			
1995 [b]	20,031		No Creel Survey			
1996 [b]	16,088		No Creel Survey			
1997 [c]	6,433					
Mean	22,729	37,959	152,540	0.265	0.143	0.167

From: Conrad and Hammarstrom 1987, Hammarstrom 1988-1992, Schwager-King 1993 and 1994, L. Marsh, Alaska Department of Fish and Game, Soldotna, personal communication.

[a] Days of effort were calculated from creel survey data by dividing hours of effort by the average trip length of interviewed anglers.

[b] Data from statewide harvest survey (Mills 1987-1994; Howe et al. 1995-1997).

[c] A creel survey was conducted in 1997, but estimates are for the season from August 6 through September 9, not for early and late run. Total estimated harvest was 2,783 coho, with 26,856 hours of effort and 9,236 days of effort (L. Marsh, Alaska Department of Fish and Game, Soldotna, personal communication).

consistently more successful than nonguided anglers. In 1992 and 1993 guided angler success was twice that of nonguided anglers.

Total early-run harvest in 1994 was a record 58,000 coho salmon. Harvests in 1995 and 1996 of 30,000 and 32,000, respectively were below the historical average. In 1996, 50% of the harvest was taken downstream from the Soldotna Bridge, 25% from the Soldotna Bridge upstream to Moose River, 16% from Moose River upstream to Skilak Lake and 9% between Skilak and Kenai lakes. There is a slight trend for an increasing percentage of the harvest to be taken upstream from the Soldotna Bridge, as historically 60% of the harvest occurred in the downstream area of the river (Table 30).

Table 30.-Estimated harvest (in thousands) of early- and late-run Kenai River coho salmon by river section, 1977-1996.

	Lower Section[a]			Mid Section[b]			Upper Section[c]			Inter-Lake[d]			All Sections		
Year	Early Run	Late Run	Total	Early Run	Late Run	Total	Early Run	Late Run	Total	Early Run	Late Run	Total	Early Run	Late Run	Total
1977															10
1978															11
1979															15
1980															27
1981			12			3			6			1			22
1982			27			4			7			2			40
1983			12			4			5			2			23
1984			40			8			8			4			60
1985			23			7			13			2			45
1986	26	13	39	7	3	10	6	3	9	2	1	3	41	20	61
1987	13	6	19	4	2	6	3	1	4	2	1	3	22	10	32
1988	23	11	34	3	2	5	4	2	6	2	1	3	32	16	48
1989	25	12	37	5	3	8	6	3	9	2	1	3	38	19	57
1990	27	13	40	6	3	9	5	2	7	3	1	4	41	19	60
1991	33	16	49	9	4	13	6	3	9	2	1	3	50	24	74
1992	22	11	33	5	3	8	5	2	7	3	1	4	35	17	52
1993	20	10	30	6	3	9	5	2	7	3	2	5	34	17	51
1994	31	15	46	10	5	15	8	4	12	9	4	13	58	28	86
1995	20	12	32	5	1	6	3	3	6	2	1	3	30	17	47
1996	16	5	21	8	3	11	5	2	7	3	1	4	32	11	43
Mean	23	11	31	6	3	8	5	2	8	3	1	4	38	18	43

Note: All data from Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995-1997). For 1986-1994 early- and late-run harvest apportioned as 2/3 early run, 1/3 late run.

[a] Cook Inlet to Soldotna Bridge.

[b] Soldotna Bridge to Moose River.

[c] Moose River to Skilak Lake.

[d] Skilak Lake to Kenai Lake.

In 1994 and 1995 guided anglers harvested 47% and 57% of the total harvest, respectively. In 1996 guided angler harvest was 34% of the total harvest (Table 31). This reverses a trend for guided anglers to take an increasing percentage of the early-run harvest (Table 31). The trend is similar when early- and late-run fisheries are combined (Table 32). The reason for the reduced harvest by guided anglers in 1996 is not known.

Table 31.-Summary of guided vs. nonguided harvest (thousands), early-run Kenai River coho salmon fishery, 1984-1996.

Year	Guided Harvest[a]	%	Nonguided Harvest[a]	%	Total Early-run Harvest
1984	3	7.7	36	92.3	39
1985	3	10.0	27	90.0	30
1986	9	22.5	31	77.5	40
1987	3	13.6	19	86.4	22
1988	3	9.4	29	90.6	32
1989	11	29.7	26	70.3	37
1990	10	25.0	30	75.0	40
1991	21	41.2	30	58.8	51
1992	14	40.0	21	60.0	35
1993	16	47.1	18	52.9	34
1994	27	46.6	31	53.4	58
1995	17	56.7	13	43.3	30
1996	11	34.4	21	65.6	32
Mean	11	30	26	70	37

[a] Data from Statewide Harvest Survey (Mills 1985-1994, Howe et al. 1995-1997).

Harvest of Kenai River coho salmon in the commercial drift fishery from 1993-1996 averaged 5,572 fish; in the ESSN fishery 11,445 (Table 28). The commercial fishery's average harvest of Kenai River coho is 22% of the total harvest of Kenai coho (combined early and late runs); the sport fishery harvests approximately 79%. The remaining 3% are harvested in the personal use and educational fisheries.

Fisheries data from the downstream section of the river were determined by creel survey in 1997. Data analysis has not been completed at the time of this writing. Harvest and participation are expected to be at record lows given the restrictions implemented to reduce harvest. Harvest estimates for the entire 1997 fishery will be available from the Statewide Harvest Survey in fall 1998.

Table 32.-Summary of guided vs. nonguided harvest (thousands), early- and late-run Kenai River coho salmon fishery, 1984-1996.

Year	Guided Harvest[a]	%	Nonguided Harvest[a]	%	Total Harvest
1984	5	8.5	54	91.5	59
1985	4	8.9	41	91.1	45
1986	14	23.3	46	76.7	60
1987	5	15.2	28	84.8	33
1988	4	8.3	44	91.7	48
1989	16	29.1	39	70.9	55
1990	15	25.0	45	75.0	60
1991	31	40.8	45	59.2	76
1992	21	39.6	32	60.4	53
1993	24	47.1	27	52.9	51
1994	41	47.1	46	52.9	87
1995	24	51.1	23	48.9	47
1996	15	34.9	28	65.1	43
Mean	17	29	38	71	55.2

[a] Data from Statewide Harvest Survey (Mills 1985-1994, Howe et al. 1995-1997).

OUTLOOK

Record harvest occurred in 1994 followed by 3 years of harvest which are below historic levels. Assuming a correlation between harvest and abundance, annual returns of early-run Kenai coho are in decline. We do not have sufficient information to link declines in smolt production to declines in future returns. The 1998 return can therefore not be forecast with any degree of certainty. However, decreasing smolt production is problematic and may foretell future returns which are below historic levels.

CURRENT ISSUES

Current management issues, listed below, are both biological and allocative:

1. There is presently no methodology capable of enumerating early-run Kenai River coho salmon.
2. Since early-run coho salmon cannot presently be enumerated in the Kenai River, an escapement goal has not been established.
3. Lacking a method of inseason enumeration and an escapement goal, inseason management actions occur only in extreme situations. This increases the possibility that harvest will exceed sustainable limits.

4. At issue is also the division of the harvestable surplus between commercial and sport fishermen. This allocation issue will be exacerbated as angler effort increases.

RECOMMENDED RESEARCH & MANAGEMENT

A comprehensive juvenile coho salmon tagging program has been initiated in the Kenai River drainage. This is part of a larger Cook Inlet program which includes the tagging of hatchery smolt in northern Cook Inlet. The purpose of the program is to ascertain the proportionate contribution of northern Cook Inlet stocked and wild Kenai River coho salmon to the commercial fishery. The program also estimates Kenai River smolt production with the ultimate objective of correlating smolt numbers to numbers of returning adults. This program should continue.

Since inseason abundance can not be estimated, we recommend that this estimate be made postseason. This can be achieved with radiotelemetry and mark-recapture techniques. Once harvest and escapement are known, an escapement objective can be established. Regulations can be crafted to ensure that a minimum escapement is achieved annually.

KENAI RIVER LATE-RUN COHO SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVE

The Upper Cook Inlet Salmon Management Plan directs that stocks which migrate through Cook Inlet after August 15 be managed primarily for recreational uses. In March 1997 the Board adopted the Kenai River Coho Salmon Management Plan. This plan contains regulations which reduced the total (combined early- and late-run sport, and commercial) harvest by approximately 20%. In addition to the objectives of the aforementioned management plans, department objectives are:

Objective 1: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

Objective 2: To ensure, through appropriate management and research programs, that the spawning escapement does not decline below levels necessary to ensure sustained yield.

INSEASON MANAGEMENT APPROACH

There presently is no cost effective method available to enumerate the inriver coho salmon return; an escapement goal has not been established for this stock. Prior to 1997, there was no inseason management of this fishery.

The 1997 early-run coho salmon return to Upper Cook Inlet (that area north of Anchor Point) was below historic levels. This was determined by low harvest rates in the commercial fishery, poor fishing success as reported by anglers and few coho salmon enumerated at weir sites in northern Cook Inlet. Angler success rate as determined by creel survey in the Kenai River was essentially "zero" through the first 6 days of the fishery. The management strategy to address the low return (except in a few stocked streams in northern Cook Inlet) was to manage Cook Inlet as a unit.

The commercial fishery was closed August 7. The early closure reduced the East Side Setnet season by two periods (August 8 and 11) and the commercial drift season by one period (August 8). The sport bag and possession limits in salt water were reduced to 1 coho salmon. Except in a

few stocked streams in Northern Cook Inlet, the freshwater sport bag and possession limits north of Anchor Point were reduced to 1 fish; bait was not permitted.

These regulations applied to the Kenai River and were in effect from August 11 through the regulatory close of the season, September 30. Regulation of the late-run fishery was predicated on a reduced early-run return. Since adult coho salmon can not be enumerated in the Kenai River, the assumption had to be made that late-run strength would mirror early-run strength. Restrictions applied to the early-run fishery therefore were unchanged during the late-run Kenai River coho salmon fishery.

The effect of this management strategy on the sport fishery will be determined by creel survey and the Statewide Harvest Survey. No determination of the effect of restrictive management on numbers of coho salmon spawning can be made.

HISTORICAL PERSPECTIVE

When the chinook salmon season terminates July 31, anglers immediately direct their efforts towards coho salmon. Coho anglers fish from anchored boats or from shore, unlike the mobile or drift fishery directed at chinook salmon. This fishery occurs from the river's mouth upstream to Kenai Lake (Figure 14).

Coho salmon are believed to return to the Kenai River in two runs. This assumption is based on creel survey data that indicate a temporal separation in early September. No other data are available that suggest the presence of two runs. Early-run fish begin entering the system in late July and are present through early September. Late-run fish begin to enter the river in late August, peak in September, and continue to enter the river at reduced levels until December.

The personal use and subsistence harvest history of late-run Kenai River coho salmon is complex. This complexity is related to the volatile subsistence and personal use fisheries directed at Cook Inlet salmon stocks to include late-run Kenai River coho salmon. Cook Inlet personal use and subsistence fisheries have been subject to numerous changes in the 1980s and 1990s. These changes resulted from legal challenges and regulatory changes adopted by the Board of Fisheries. Numerous changes to these fisheries altered their harvest potential of late-run Kenai River coho salmon and other salmon stocks.

A detailed analysis of the history and amendments to Cook Inlet subsistence and personal use fisheries is beyond the scope of this report. For a detailed history of these fisheries the reader is referred to Braund 1982 and Brannian and Fox 1996.

Coho salmon stock separation in mixed-stock Cook Inlet personal use and subsistence gillnet fisheries is very inexact. It is assumed that the Kenai River has the only significant late coho salmon run in Cook Inlet. Coho salmon caught in Cook Inlet after mid/late August are probably late-run fish of Kenai River origin. Coho caught in July or early August are early-run fish destined for any number of Cook Inlet streams.

Table 33 presents estimates of late-run Kenai River coho salmon harvested in personal use and subsistence fisheries since 1981. A summary of these fisheries is:

1981 – The fall gillnet fishery was designated “noncommercial” by court order. Harvest of late-run Kenai River coho salmon was a record 12,713.

1982 – No history of the fishery was found.

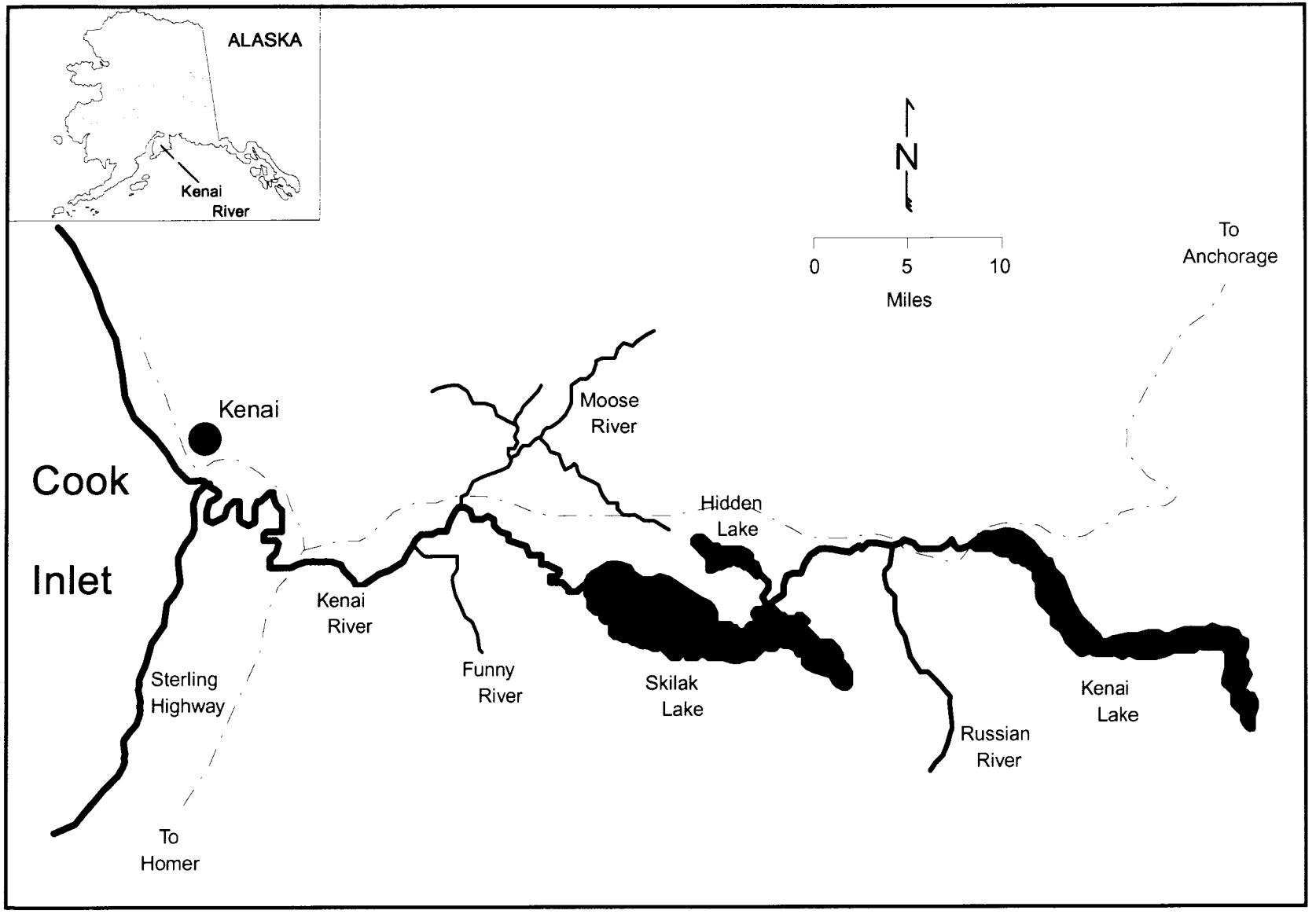

Figure 14.-Map of the Kenai River drainage.

Table 33.-Harvest of coho salmon in Cook Inlet personal use and subsistence fisheries, 1981-1997.

Year	Personal Use Harvest	Subsistence Harvest	Kenai River Early-Run Harvest	Kenai River Late-Run Harvest	Total Harvest	Number Permits Issued
1981	12,713 [a]			12,713	12,713	[b]
1982		No history of the fishery available				
1983	712			712	712	295
1984	2,261			2,261	2,261	309
1985		11,265		11,265	11,265	998
1986	2,422 [c]			2,422	2,422	892
1987	2,213 [c]			2,213	2,213	486
1988	2,662 [c]			2,662	2,662	449
1989	2,376 [c]			2,376	2,376	365
1990	2,290 [c]			2,290	2,290	420
1991 [d]	2,703	3,520	3,520	2,703	6,223	360
1992		10,320 [e]			10,320 [e]	9,500
1993	1,168			1,168	1,168	535
1994		12,181 [f]			12,181 [f]	12,181
1995	11,122 [g]				11,122 [g]	9,300
1996	4,604		4,604		4,604 [h]	14,576
1997	776		776		776 [h]	14,919
Mean	3,234	8,674	2,967	2,262	5,332	4,372

[a] Fishery designated "non-commercial" by court order.

[b] Unknown.

[c] Fishery managed under a 2,500 quota.

[d] A subsistence fishery harvested 3,520 coho; 7,065 permits were issued in Central Cook Inlet. The fall personal use fishery harvested 2,703 fish; 360 permits issued for this fishery.

[e] Total Upper Cook Inlet subsistence harvest; 1,475 taken in Kenai River dip net fishery.

[f] Total Upper Cook Inlet subsistence harvest.

[g] Total Upper Cook Inlet personal use harvest.

[h] Total harvest in Kasilof gillnet; Kenai, Kasilof and Fish Creek dip net fisheries.

1983 and 1984 – In both years there was a fall personal use fishery directed at late-run Kenai River coho salmon.

1985 – A fall subsistence fishery was directed at late-run Kenai River coho salmon.

1986 to 1991 – A fall personal use fishery occurred in September. The fishery was managed under a 2,500 late-run coho salmon quota. In 1991 a subsistence fishery also occurred independent of the fall fishery. Coho harvest was 3,520, all of which was assumed to be early-run fish.

1992 – No fall fishery occurred targeting late-run Kenai River coho, per se. A subsistence fishery occurred in Upper Cook Inlet targeting all salmon. This fishery began in May and concluded in September. Late-run Kenai River coho salmon were harvested based on timing of the periods in September. No estimate of the total number of late-run coho salmon harvested is available.

1993 – A fall personal use fishery occurred in September targeting late-run Kenai River coho salmon.

1994 – No fall fishery occurred targeting late-run Kenai River coho, per se. A subsistence fishery occurred in Upper Cook Inlet targeting all salmon. This fishery began in May and concluded in September. Late-run Kenai River coho salmon were harvested based on timing of the periods in September. No estimate of the total late-run coho salmon harvested is available.

1995 – No fall fishery occurred targeting late-run Kenai River coho, per se. An Upper Cook Inlet personal use fishery did occur beginning in May and concluding in September. An unknown number of late-run Kenai River coho salmon were harvested in this fishery.

1996 – An abbreviated personal use gillnet fishery occurred at the mouth of the Kasilof River which harvested no coho. Personal use dip net fisheries occurred at the mouth of Kasilof River, Kenai River and Fish Creek. These fisheries concluded by early August. No late-run Kenai River coho salmon were harvested.

1997 - An abbreviated personal use gillnet fishery occurred at the mouth of the Kasilof River which harvested no coho. Personal use dip net fisheries occurred at the mouth of Kasilof River, Kenai River and Fish Creek. These fisheries concluded by early August. No late-run Kenai River coho salmon were harvested.

1998 - An abbreviated personal use gillnet fishery occurred at the mouth of the Kasilof River which harvested no coho. Personal use dip net fisheries occurred at the mouth of Kasilof River, Kenai River and Fish Creek. These fisheries concluded by early August. No late-run Kenai River coho salmon were harvested.

From the above and Table 33, the documented harvest of late-run Kenai River coho salmon in Cook Inlet subsistence and personal use fisheries peaked at about 12,700 in 1981. Harvest in 1985 was 11,265. Harvested declined thereafter to less than 3,000 annually. There has been no subsistence or personal use harvest of late-run Kenai River coho salmon since 1995. This reflects an allocative change whereby Board of Fisheries action has increasingly allocated this stock to the recreational angler.

The commercial central district drift gillnet fishery and ESSN fishery also harvest coho salmon. Average harvest in these fisheries from 1966 through 1996 is 174,459 and 46,369 fish, respectively (Ruesch and Fox 1997). The commercial harvest of Kenai River coho salmon occurs primarily in the ESSN fishery and to a lesser degree in the drift net fishery. Harvest from 1993 through 1995 averaged about 11,400 Kenai coho in the ESSN fishery; 5,600 in the drift fishery. Given that there is an early and late run to the Kenai River, the majority of the commercial harvest of Kenai River coho would be assigned to the early run as the commercial fishery closes by mid-August.

A creel survey was conducted in the Kenai River downstream from Soldotna from 1976-1993. The survey provided inseason harvest, harvest per unit effort and angler participation estimates for this area of the river. These data were used postseason to track the relative status of the fishery. Given that harvest is approximately proportionate to coho salmon abundance, numbers of late-run Kenai River coho salmon (with allowances for annual variation) appeared relatively stable through 1992. There had never been inseason management actions in this fishery nor were any anticipated. Harvest data were obtained from the Statewide Harvest Survey. The creel survey was determined not to be cost effective and was terminated at the conclusion of the 1993 season.

Despite relatively stable harvests in the recreational fishery through the early 1990s, fisheries managers became increasingly concerned that the current rate of harvest in the early- and late-run fishery could not be sustained. The Division of Sport Fish therefore began a stock assessment program in 1992. The program is ongoing and relies heavily on annual smolt production as an indicator of future abundance. Early- and late-run smolt can not be distinguished; for the following analysis it is appropriate to treat the Kenai River coho fishery as a single run. Data through 1995 from the assessment program, creel survey and Statewide Harvest Study indicate:

1. Harvest of Kenai River coho salmon has increased in the sport fishery. Harvest increased from a low of about 10,000 fish per year in the late 1970s to a peak of 87,000 in 1994.
2. Historically, most of the sport harvest was taken by nonguided anglers. In recent years the harvest by guided anglers has increased and now equals that of nonguided anglers.
3. The harvest rate for guided anglers is about twice that of nonguided anglers.
4. The commercial harvest of Kenai River coho salmon occurs primarily in the ESSN fishery and to a lesser degree in the drift net fishery. Harvest from 1993 through 1995 averaged about 11,400 Kenai coho in the ESSN fishery; 5,600 in the drift fishery. Harvest of late-run coho is minimal as the commercial fishery closes by regulation in mid-August.
5. The sport fishery harvests 74% of the Kenai River coho harvest (early and late run combined); the commercial fishery 22%, and less than 3% of the harvest is taken in personal use and educational fisheries.
6. Smolt outmigration estimates have declined from nearly 1,000,000 in 1992 and 1993 to less than 500,000 in 1995.

There was no onsite creel survey from 1994-96. The survey was reinstated in 1997. Information obtained from the assessment program indicated a decline in smolt production. This decline

could reduce the adult return, requiring inseason management. The primary indicator of a reduced return inriver would be a decline in harvest rate as determined by the creel survey.

The 1997 coho salmon return to virtually all of Upper Cook Inlet was below historic levels. The Kenai River sport fishery was restricted as described in the Inseason Management Approach section. This is the first inseason restriction in the history of this fishery.

BOARD OF FISHERIES ACTIONS

There were no regulatory changes to this fishery at the 1990 Board of Fisheries meeting. In 1992 the Board prohibited fishing for any species of fish in the Kenai River after taking the limit of 3 coho salmon 16 inches or greater in length. Purpose of this regulation was to curtail the increasingly prevalent illegal practice in this fishery of fishing for a "boat limit."

At its February 1996 meeting the Board closed the area from the bridge at the outlet of Kenai Lake downstream about 5 miles to the Sterling Highway Bridge at Milepost 53. Also closed was the outlet of Skilak Lake downstream to the Upper Killey River. These areas were closed to all fishing from January 1 through June 14. The purpose of the closure was to protect spawning coho salmon at the outlet of Kenai and Skilak lakes. These regulations became effective January 1, 1997. Although not definitely known, these are believed to be late-run fish.

The Board addressed this fishery in March 1997 at the request of the department. Staff was concerned that given increased harvest and decreasing smolt production, current harvest rates could not be sustained. The Kenai River Coho Salmon Management Plan was adopted at this meeting. Primary provisions of the plan are:

1. Coho salmon fishing is prohibited from October 1 through June 30;
2. From October 1 through June 30 only unbaited artificial lures may be used in the Kenai River drainage unless provided for by emergency order;
3. From July 31 or the end of the king salmon season, whichever is later, through September 30, sport fishing from a vessel that is registered with the Department of Natural Resources, Division of Parks, as a guide vessel is restricted as follows:
    A) A guide may not sport fish while guiding clients;
    B) The maximum number of rods fished may not exceed the number of clients on board the vessel;
    C) Downstream from the confluence of the Moose and Kenai rivers fishing from a guide vessel is prohibited on Mondays;
    D) Upstream from the confluence of the Moose and Kenai rivers, sport fishing for coho salmon is prohibited on Mondays.

This plan also reduced the commercial ESSN fishery by one period and closed the personal use dip net fishery at the Kenai River mouth on July 31. These provisions were intended to reduce total (commercial plus early- and late-run sport) harvest of Kenai River coho salmon by about 20%.

In determining the need for conservative management the department relied on smolt estimates. The smolt abundance estimate can not be apportioned by early and late run. The Board therefore

addressed the Kenai River coho return as one run; regulations were crafted to reduce harvest in both early and late segments of the run.

RECENT FISHERY PERFORMANCE

Table 34 summarizes historical fisheries data determined by creel survey in that section of the river downstream from the Sterling Highway Bridge in Soldotna. Harvest was relatively stable through 1995, declining to less than half the historical average in 1996. The reason for this decline is not known. Historical average guided angler success rate is approximately 1.5 times greater than unguided angler success rate.

Total late-run harvest peaked in 1994 at 29,000 declining to 17,000 in 1995 and 11,000 in 1996 (Table 35). The reason for the decline in harvest is not known, but is assumed to be related to reduced abundance. Harvest in 1997 will be the lowest recorded due to extensive restrictions to the fishery and a decline in angler participation due to these restrictions.

Guided angler harvest displays a steady increase and approximated unguided angler harvest in 1994. Guided angler harvest declined to 41% of the total harvest in 1995; 36% in 1996 (Table 35).

Table 34.-Harvest, angler effort, and harvest rate in the Kenai River late-run (after and including September 1) coho salmon fishery, downstream of the Soldotna Bridge, 1986-1997.

Year	Harvest	Days Effort[a]	Hours Effort	Guided Harvest/hour	Non-guided Harvest/hour	Combined Harvest/hour
1986	12,631	21,002	78,127	0.235	0.145	0.162
1987	6,774	13,035	52,141	0.164	0.12	0.130
1988	9,434	21,154	88,423	0.154	0.111	0.107
1989	13,125	15,909	66,342	0.273	0.184	0.198
1990	15,849	23,415	97,639	0.202	0.162	0.162
1991	23,340	22,611	80,947	0.413	0.302	0.288
1992	12,794	13,510	65,520	0.274	0.179	0.195
1993	7,444	9,973	46,342	0.247	0.135	0.161
1994 [b]	15,447			No creel survey		
1995 [b]	11,808			No creel survey		
1996 [b]	5,352			No creel survey		
1997 [b,c]	1,117					
Mean	11,260	17,576	71,935	0.245	0.167	0.175

[a] Days of effort were calculated from creel survey data by dividing hours of effort by the average trip length of interviewed anglers.

[b] Data from Statewide Harvest Survey (Mills 1987-1994; Howe et al. 1995-1997).

[c] A creel survey was conducted in 1997, but estimates are for the season from August 6 through September 9, not for early and late run. Total estimated harvest was 2,783 coho, with 26,856 hours of effort and 9,236 days of effort (L. Marsh, Alaska Department of Fish and Game, Soldotna, personal communication).

Table 35.-Summary of guided vs. nonguided harvest (thousands), late-run Kenai River coho salmon fishery, 1984-1996.

Year	Guided Harvest[a]	%	Nonguided Harvest[a]	%	Total Late-Run Harvest
1984	2	10.0	18	90.0	20
1985	1	6.7	14	93.3	15
1986	5	25.0	15	75.0	20
1987	2	18.2	9	81.8	11
1988	1	6.3	15	93.8	16
1989	5	27.8	13	72.2	18
1990	5	25.0	15	75.0	20
1991	10	40.0	15	60.0	25
1992	7	38.9	11	61.1	18
1993	8	47.1	9	52.9	17
1994	14	48.3	15	51.7	29
1995	7	41.2	10	58.8	17
1996	4	36.4	7	63.6	11
Mean	5	29	13	71	18.2

[a] Data from Statewide Harvest Survey (Mills 1985-1994; Howe et al. 1995-1997).

OUTLOOK

Record harvest occurred in 1994, followed by 3 years of harvest below historic levels. Assuming a correlation between harvest and abundance, annual returns of late-run Kenai coho are in decline. We do not have sufficient information to link declines in smolt production to declines in future returns. The 1998 return can therefore not be forecast with any degree of certainty. However, decreasing smolt production is problematic and may foretell future returns which are below historic levels.

CURRENT ISSUES

Current management issues, listed below, are both biological and allocative:

1. There is presently no method capable of enumerating late-run Kenai River coho salmon.
2. Since late-run coho salmon cannot presently be enumerated in the Kenai River, an escapement goal has not been established.
3. Lacking a method of inseason enumeration and an escapement goal, inseason management actions occur only in extreme situations. This increases the possibility that harvest will exceed sustainable limits.

4. At issue is also the division of the harvestable surplus between commercial and sport fishermen. This allocation issue will be exacerbated as angler participation increases or inriver success rates decline.

RECOMMENDED RESEARCH & MANAGEMENT

A comprehensive juvenile coho salmon tagging program has been initiated in the Kenai River drainage. This is part of a larger Cook Inlet program which includes the tagging of hatchery smolt in northern Cook Inlet. The purpose of the program is to ascertain the proportionate contribution of northern Cook Inlet stocked and wild Kenai River coho salmon to the commercial fishery. The program also estimates Kenai River smolt production with the ultimate objective of correlating smolt numbers to numbers of returning adults. This program should continue.

Since inseason abundance can not be estimated, we recommend that this estimate be made postseason. This can be achieved with radiotelemetry and mark-recapture techniques. Once harvest and escapement are known, an escapement objective can be established. Regulations can be crafted to ensure that a minimum escapement is achieved annually.

KENAI RIVER PINK SALMON FISHERY

FISHERY OBJECTIVE

This fishery is not specifically addressed in a management plan adopted by the Board of Fisheries. Department objectives for this fishery are:

Objective 1: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

Objective 2: To ensure, through appropriate management and research programs, that the Kenai River pink salmon spawning population does not decline below levels necessary to ensure sustained yield.

INSEASON MANAGEMENT APPROACH

Inseason management has not been required in this fishery. Management is achieved through existing regulations.

HISTORICAL PERSPECTIVE

Pink salmon in waters of the Kenai Peninsula are generally considered a commercial species. Commercial harvest has averaged 713,000 fish since 1954. This species is abundant only on even-numbered years. Stocks in the commercial harvest originate primarily in the Kenai and Susitna rivers drainages.

Small numbers of pink salmon return to the southern Peninsula streams of Anchor River, Stariski Creek, Deep Creek, and Ninilchik River. They are harvested here incidental to Dolly Varden and coho salmon. Typical annual harvests are less than 500 fish from these four streams. A nontargeted pink salmon fishery also occurs in Kasilof River, with an annual harvest in recent years of less than 200.

The majority of Kenai Peninsula pink salmon are harvested in the Kenai River. As with the commercial fishery, the Kenai River sport harvest is significant only on even years (Table 36).

Table 36.-Sport catch and harvest of pink salmon in the Kenai River, 1977-1995.

Odd Years	Catch	Harvest	Even Years	Catch	Harvest
1977		163	1978		26,579
1979		127	1980		18,580
1981		86	1982		25,572
1983		1,825	1984		28,560
1985		1,306	1986		19,924
1987		941	1988		15,777
1989		1,421	1990	126,251	27,185
1991	5,192	2,416	1992	74,021	10,029
1993	3,001	1,003	1994	42,357	8,701
1995	2,724	991	1996	64,565	14,834
Mean	3,639	1,028		76,799	19,574

From: Mills 1979-1994; Howe et al. 1995, 1996.

Pink salmon mature rapidly on entering fresh water and are readily caught with artificial lures. These fish are therefore popular with juvenile anglers and tourists; the majority of the harvest occurs in the lower river. In 1989 the bag and possession limit in the Kenai River was increased to 6 fish; in other Kenai Peninsula drainages it remained an aggregate of 3 sockeye, coho or pink salmon 16 inches or greater in length.

BOARD OF FISHERIES ACTIONS

There have been no recent regulatory changes in this fishery.

RECENT FISHERY PERFORMANCE

Few pink salmon return to the Kenai River in odd numbered years; relatively large numbers return in even-numbered years. Pink salmon were therefore abundant in 1994 and 1996. Estimated harvest was 8,701 and 14,834 (Table 36). These are the lowest even-numbered year harvests in the history of the fishery.

The Statewide Harvest Survey estimated that the 1994 Kenai River pink salmon catch at 42,357; in 1996, 64,565 fish (Table 36). Harvest is therefore a function of retention rate in the fishery rather than catch rate or numbers of pink salmon available to the angler. Many anglers will not retain any pink salmon.

OUTLOOK

Pink salmon mature rapidly on entering the Kenai River and are not desirable to many, especially local, anglers. The fishery is therefore most popular with juvenile anglers and tourists.

The fishery has not exhibited significant growth since data became available in 1977. Liberalization of the fishery in 1989 did not increase the harvest or popularity of this species among Kenai River sport fishermen. The outlook is therefore for a continuation of a stable fishery with a significant harvest occurring only on even-numbered years.

CURRENT ISSUES

Commercial harvest data indicate a stable population; there are no biological or allocative concerns regarding Kenai Peninsula pink salmon.

RECOMMENDED RESEARCH & MANAGEMENT

No research or management activities specific to this fishery are recommended.

KENAI RIVER RAINBOW TROUT FISHERY

FISHERY OBJECTIVE

Management objectives for this fishery were developed from and are contained in the "Cook Inlet and Copper River Basin Rainbow/Steelhead Trout Management Policy" (CIRTMP) (ADF&G 1986). This policy was adopted by the Board of Fisheries in 1986 for Cook Inlet waters, and was amended in 1988 to include the Copper River Basin.

The CIRTMP provides for two policies to achieve different objectives. Policy I is Conservative Yield Management which addresses the department's responsibility to manage the resource for sustained yield. The majority of trout populations in Cook Inlet are managed under this policy, including Skilak Lake and the Kenai River downstream from Skilak Lake.

Policy II provides a diversity of sport fishing opportunities for wild and hatchery rainbow/steelhead trout through establishment of special management areas by regulation. These management areas may be designated as catch-and-release, trophy or high yield. In 1988 the upper Kenai River was selected by the Board for Trophy Management status.

In conformance with the Trophy Management designation, only trout 20 inches or larger could be retained, and terminal tackle was restricted to single-hook artificial lures throughout the year. The bag and possession limits were 1 trout.

In the fall of 1990 the Board again reviewed this fishery. A public proposal was adopted increasing the minimum retention length in this special management area to 24 inches. At the department's request, the Trophy Trout Management Area in the Kenai River drainage was extended to include the waters of Skilak Lake within a one-half mile radius of the Kenai River inlet. In 1992 the Board again increased the minimum retention length, raising it to 30 inches.

In November 1996 the Board removed the Trophy Trout designation, replacing it with a Catch-and-Release fishery in all waters of the upper Kenai River drainage. The upper Kenai River special management area was extended into Kenai Lake 1/4 mile upstream of the bridge at the outlet of Kenai Lake. The special management area now encompasses Skilak Lake within a 1/2 mile radius of the Kenai River inlet, the Kenai River between Skilak Lake and Kenai Lake and that area 1/4 mile upstream of the bridge at the outlet of Kenai Lake.

Fishery objectives for the upper Kenai River Catch-and-Release Area are:

Objective 1: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

Objective 2: To manage this area of the river as a catch-and-release area, affording anglers the opportunity to fish for trout that approximate the historic age and size structure for this area of the Kenai River.

Fishery objectives for the remainder of the river are:

Objective 1: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

Objective 2: To ensure, through appropriate management and research programs, that the trout population does not decline below levels necessary to ensure sustained yield.

INSEASON MANAGEMENT APPROACH

This fishery is restrictively regulated; no conservation issue has been identified in the Catch-and-Release Area or that area downstream from Skilak Lake. Management of the fishery inseason is effected by existing regulation.

HISTORICAL PERSPECTIVE

The Kenai River is the most heavily utilized river for freshwater sport fishing in Alaska. Although most of the anglers participate in the river's salmon fisheries, the Kenai River also supports a major rainbow trout fishery with catches ranging from 8,720 to 62,152 fish, annually.

Increasing public concern for the rainbow trout resource and a paucity of biological and fishery data from the early years of the fishery prompted the Alaska Board of Fisheries to adopt increasingly restrictive regulations, implemented in the years outlined below:

1959-1964	Season: Areawide spring closure from April 1 to about May 26.
	Daily bag limit: Combined trout/char/grayling/salmon under 16 inches: 10/day, only 2 over 20 inches.
1965-1977	Season: Kenai River changes to no closed season.
1978	Daily bag limit: (Areawide) Combined trout/char/grayling/salmon under 16 inches: 10/day, only 1 over 20 inches.
1979	Yearly bag limit: (Areawide) Harvest record required for rainbow/steelhead trout over 20 inches - 2/year.
1980-81	Yearly bag limit: (Areawide) Increased to 5 rainbow/steelhead trout over 20 inches.
	Gear restriction: (Kenai River) In flowing waters upstream from the Moose River to Kenai Lake only single-hook, artificial lures allowed from January 1 to May 31.
1982-83	Season: (Kenai River) Spring closure from January 1 to June 14 (excludes Skilak Lake).
	Daily bag limit: (Areawide) Changed to 5 rainbow trout with only 1 over 20 inches.

1984-86 Season: (Kenai River) Spring and fall closure from November 1 to June 14 (includes Skilak Lake).

Daily bag limit: (Kenai River) Changed to 3/day, only 1 over 20 inches.

Yearly bag limit: (Areawide) Rainbow/steelhead trout over 20 inches - changed to 2/year.

Gear restriction: (Kenai River) In addition to spring single-hook, artificial lure restriction, only artificial lures may be used between Skilak and Kenai lakes from January 1 to December 31.

1987-88 Season: (Kenai River) Spring and fall closure from November 1 through June 14 (includes Skilak Lake).

Daily bag limit: (Kenai River) Reduced to 2/day; 1 daily over 20 inches.

Yearly bag limit: (Areawide) Rainbow/steelhead trout over 20 inches - remained at 2/year.

Gear restriction: (Kenai River) Artificial lures only upstream from Skilak to Kenai Lake. Single hook restriction repealed. No bait permitted in Skilak Lake and in the Kenai River downstream to Moose River from November 1 through May 31.

1989-1990 Area between Skilak and Kenai lakes designated a Trophy Trout area. Only trout 20 inches or larger could be retained. Susitna-West Cook Inlet seasonal limit remained at 2 trout over 20 inches. Terminal tackle in upper Kenai River limited to single-hook artificial lures.

1991 Trophy trout area extended to include half mile radius of Skilak Lake inlet. Minimum length of trophy trout increased to 24 inches.

1993 Length at which a trout in the Trophy Trout Area could be retained increased to 30 inches. The bag and possession limits for trout in Skilak Lake and the Kenai River downstream from Skilak Lake were reduced to 1 fish. The Trophy Trout Area was closed to <u>all</u> fishing from April 15 through June 10.

1997 Former Trophy Trout Area becomes Catch-and-Release Area. Area extended 1/4 mile into Kenai Lake. No retention of trout permitted in this area and no retention permitted in the flowing waters upstream of Kenai Lake. Trout season in all waters of the Kenai River drainage is now June 15 through April 15. All flowing waters upstream of the Upper Killey River closed to all fishing from April 15 through June 14. From June 15 through October 31 in all lakes tributary to Kenai Lake supporting wild trout the daily bag and possession limits are 2 trout only 1 of which may be 20 inches or greater. From November 1 through April 14 the bag and possession limits in lakes supporting wild trout are 5; only 1 may be 20 inches or greater. The bag and possession limits were not changed in stocked lakes.

In 1986 the Alaska Department of Fish and Game, in conjunction with the School of Fisheries and Ocean Sciences of the University of Alaska, Juneau, initiated a study of Kenai River rainbow

trout. The long-term goal of the study was to compile population and fishery databases for use in formulation of a drainage-wide management strategy for Kenai River rainbow trout.

The 1986 pilot study (Lafferty 1989) had two major components: (1) a creel survey, and (2) a tag and recapture program designed to estimate the trout population in study area 004 from Jim's Landing upstream to the powerline near the Russian River (Figure 15). In 1987 the study was expanded to include two additional sections of the river, 002 and 003 (Lafferty 1989) (Figure 15). This study concluded that the best estimates of trout 6 inches or greater in length for these two river sections was 610 and 1,750 respectively. He also concluded that this estimate was likely biased low.

In 1995 the population estimate was repeated in section 004 (Hayes and Hasbrouck 1996). Data analysis in 1995 included a re-evaluation of the 1986 and 1987 data to provide comparable estimates. Estimates of abundance of rainbow trout 300 mm (12 inches) or greater in length in section 004 in 1986, 1987, and 1995 was 2,520, 3,472, and 5,598 respectively. This study concluded that the trout population in the upper Kenai River had increased and that there was an increased number of trout in each segment of the population from 12-22 inches in length divided into 2 inch intervals. The proportion of trout at least 20 inches in length remained constant at 11%-13% for all 3 years but the proportion of fish from 18-20 inches in length was much greater in 1995. It was further concluded the upper Kenai River trout population was maintaining itself at a high level and that section 004 could serve as an index of abundance of the upper Kenai River trout population.

There has been no further department research directed toward Kenai River rainbow trout since completion of this study.

BOARD OF FISHERIES ACTIONS

In 1992 the Board increased the minimum retention length to 30 inches in the Trophy Trout Management Area. This regulation was developed by amending a proposal which requested the designation of the area be changed to Catch-and-Release. The Board also adopted a proposal prohibiting all fishing in the Trophy Trout Area from April 15 through June 10. This closure also included that area of the Kenai River from the outlet of Skilak Lake downstream to the upper Killey River. This regulation was adopted to preclude the unlawful practice of catch-and-release fishing prior to the opening of the trout season on June 15.

The Board also closed Jean Lake and Hidden Lake creeks to all fishing from April 15 through June 14 and extended the prohibition on all fishing in lower Russian River downstream from the outlet of lower Russian Lake through June 10. The purpose of adopting these department sponsored proposals was to increase protection to rainbow trout during the spring spawning period.

The Board also adopted a public proposal to conserve the trout resource in the remainder of the river. The bag and possession limits from Cook Inlet upstream to and including Skilak Lake were reduced to 1 trout daily of any size. The seasonal limit of 2 trout over 20 inches continues to apply. This proposal was in response to the public's observation that both harvest and participation in the trout fishery were increasing, especially when the river's salmon fisheries were restricted for resource conservation. The department supported this conservative management approach even though a resource conservation issue had not been formally identified.

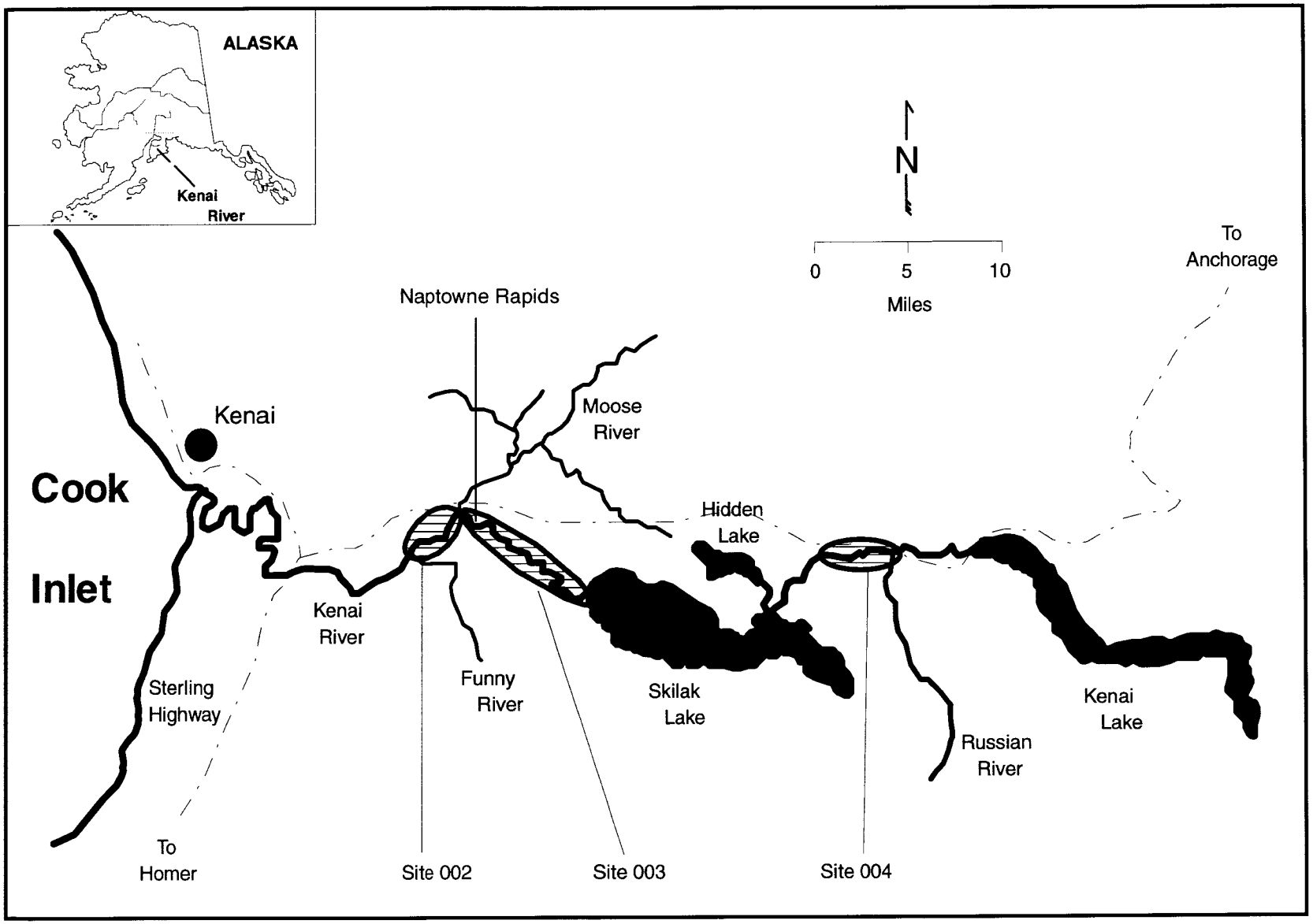

Figure 15.-Map of the Kenai River drainage and rainbow trout study sites.

In November 1996 the Board adopted a number of conservative regulations directed at the upper Kenai River. The former Trophy Trout Area became a Catch-and-Release Area. This area was extended 1/4 mile upstream of the bridge in Cooper Landing into Kenai Lake. No retention of trout is permitted in this area and no retention is now permitted in the flowing waters upstream of Kenai Lake. Trout season **in all waters of the Kenai River drainage** is now June 15 through April 15. All flowing waters upstream of the Upper Killey River were closed to all fishing from April 15 through June 14. From June 15 through October 31 in Kenai Lake and all lakes tributary to Kenai Lake supporting wild trout the daily bag and possession limits are 2 trout only 1 of which may be 20 inches or greater. From November 1 through April 14 the bag and possession limits in lakes supporting wild trout are 5; only 1 may be 20 inches or greater. The bag and possession limits were not changed in stocked lakes. In Kenai Lake within 1/4 mile of all Kenai Lake tributary streams, trout may not be retained at any time and terminal tackle is limited to single hook, artificial lures.

RECENT FISHERY PERFORMANCE

Catch and harvest of rainbow trout in this fishery is determined by Statewide Harvest Survey. In 1993 total catch for all river sections was a record 62,152; harvest was 2,574. Catch in 1994, 1995 and 1996 was 53,833; 55,151; and 59,052 trout, respectively. Retention rate during 1994-1996 ranged from 3.9%-2.9%. This low retention rate indicates anglers are continuing to voluntarily adopt a catch-and-release philosophy in this fishery.

Catch in the Trophy Trout Area of the upper Kenai River was a record 37,775; harvest 192 and retention rate 0.5% in 1993. Catch in 1994, 1995 and 1996 was 35,089, 33,476 and a record 39,197 trout, respectively. Retention rate during these years ranged from 0.5%-0.9%. Low harvest and retention rates are attributed to the increased minimum size at retention from 24 to 30 inches in this area of the river beginning in 1993. Harvest, catch and retention rate for all river sections are summarized in Table 37.

Participation in the Kenai River rainbow trout fishery can not be quantified because the Statewide Harvest Survey estimates participation by area fished and not by target species. Staff observation, information provided by knowledgeable anglers and observation by other agency staff (U.S. Forest Service and Fish and Wildlife Service) all subjectively conclude increased participation in the fishery. The most notable increase in participation was in the Trophy Trout Area followed by the upstream area of the river which is that area downstream from Skilak Lake to Naptowne Rapids.

Although harvest estimates for 1997 are not yet available, regulatory changes (catch and release only in most of the upper Kenai River drainage) most likely reduced total harvest in 1997.

Historical catch and harvest for Ptarmigan Creek, Quartz Creek, Kenai Lake, Russian River and Skilak Lake are presented in Table 38. Catch declined slightly in Ptarmigan Creek and increased slightly in Quartz Creek in 1996. Declining catches in these streams in part prompted the Board to prohibit retention of trout here beginning in 1997. Kenai Lake catches also declined for unknown reasons. Russian River catch was within historical ranges; Skilak Lake trout catch was a record high 1,716 in 1996.

Table 37.-Kenai River rainbow trout, number caught and number retained by river section as determined by Statewide Harvest Survey, 1984-1996.

Year	Cook Inlet to Soldotna Bridge			Soldotna Bridge to Moose River			Moose River to Skilak Outlet			Skilak Inlet to Kenai Lake (Trophy Trout Area)			Kenai River Total		
	Number Caught[a]	Number Retained	Percent Retained	Number Caught[a]	Number Retained	Percent Retained	Number Caught[a]	Number Retained	Percent Retained	Number Caught[a]	Number Retained	Percent Retained	Number Caught[a]	Number Retained	Percent Retained
1984[b]	3,460	710	20.5	2,910	1,250	43.0	5,110	580	11.4	4,200	930	22.1	15,680	3,470	22.1
1985[b]	3,400	880	25.9	2,650	850	32.1	5,410	1,500	27.7	3,520	710	20.2	14,980	3,940	26.3
1986	2,570	620	24.1	2,380	170	7.1	1,750	900	51.4	2,020	730	36.1	8,720	2,420	27.8
1987	2,220	520	23.4	3,450	670	19.4	6,430	630	9.8	3,870	360	9.3	15,970	2,180	13.7
1988	2,780	290	10.4	1,560	220	14.1	5,880	1,060	18.0	7,580	560	7.4	17,800	2,130	12.0
1989	2,020	480	23.8	2,230	350	15.7	6,470	830	12.8	6,870	250	3.6	17,590	1,910	10.9
1990	2,620	510	19.5	3,570	940	26.3	5,370	940	17.5	12,000	1,150	9.6	23,560	3,540	15.0
1991	3,670	520	14.2	3,840	1,120	29.2	7,930	940	11.9	18,110	740	4.1	33,550	3,320	9.9
1992	4,450	430	9.7	3,880	410	10.6	15,130	740	4.9	28,700	400	1.4	52,160	1,980	3.8
1993	6,190	1,150	18.6	5,560	580	10.4	12,650	650	5.1	37,780	190	0.5	62,150	2,570	4.1
1994	3,800	510	13.4	3,980	360	9.0	10,970	540	4.9	35,090	160	0.5	53,840	1,570	2.9
1995	4,520	620	13.7	4,090	440	10.8	13,070	780	6.0	33,480	310	0.9	55,160	2,150	3.9
Mean	3,480	600	18.1	3,340	610	19.0	8,010	840	15.1	16,100	540	9.6	30,930	2,600	12.7
1996	5,920	310	5.2	4,790	640	13.4	9,150	430	4.7	39,200	330	0.8	59,060	1,710	2.9

[a] Catch estimates for 1984-1989 are unpublished estimates from the Statewide Harvest Survey (M. J. Mills, Alaska Department of Fish and Game, Anchorage, personal communication.)

[b] In 1984 and 1985, catch estimates were mistakenly reported as harvest in Mills 1985 and Mills 1986. Numbers for harvest presented here are correct.

Table 38.-Rainbow trout harvest and catch and effort for all species for Quartz Creek, Ptarmigan Creek, Kenai Lake, Russian River and Skilak Lake, 1984-1996.

	Ptarmigan Creek			Quartz Creek			Kenai Lake		
	Rainbow Trout			Rainbow Trout			Rainbow Trout		
Year	Effort[a]	Harvest	Catch	Effort[a]	Harvest	Catch	Effort[a]	Harvest	Catch
1984	1,857	237		2,530	87		502	25	
1985	988	295		451	69		607		
1986	1,483	474		4,146	122		NA[b]	15	
1987	942	18		5,361	54		580	36	
1988	1,946	18		3,965	54		855	36	
1989	790	29		4,893	67		377	20	
1990	2,041	260	906	5,655	198	500	1,042	42	73
1991	1,200	115	700	5,354	94	648	1,064	115	1,400
1992	1,750	24	499	7,906	237	1,314	1,536	87	135
1993	1,742	415	1,709	9,152	174	2,182	2,586	615	1,306
1994	1,425	311	912	7,241	268	2,088	2,524	356	1,189
1995	1,914	131	574	5,179	66	780	3,240	233	654
1996	613	36	497	4,070	59	1,124	1,242	86	86

	Russian River		Skilak Lake	
	Rainbow Trout		Rainbow Trout	
Year	Harvest	Catch	Harvest	Catch
1984	324		12	
1985	0		0	
1986	0		0	
1987	91		145	
1988	91		72	
1989	96		67	
1990	198	4,789	115	458
1991	230	7,221	125	637
1992	253	8,312	95	522
1993	284	12,377	68	857
1994	134	11,744	35	614
1995	151	15,381	56	1,335
1996	130	12,887	24	1,716

From: Mills 1985-1994, Howe et al. 1995-1997; except Kenai Lake 1984-1988, M. Mills, Alaska Department of Fish and Game, Division of Sport Fish, Research and Technical Services, Anchorage, personal communication.

[a] Effort directed toward all species.

[b] NA = not available.

OUTLOOK

Harvest is not permitted in the upper Kenai River Catch-and-Release Area nor is harvest permitted in other flowing waters of the upper Kenai River drainage. Fishing mortality is limited to mortality associated with the practice of catch-and-release. This mortality is believed to approximate 5%. Increasingly restrictive regulations will have a positive effect on the trout resource and conservation will not be an issue. Participation in the fishery is expected to increase through advertising by guides and other businesses associated with the trout fishery.

No conservation issue has been identified for the trout resource of Skilak Lake or the river downstream from this lake. The bag limit reduction to 1 trout (effective in 1993) in this area should ensure the resource continues to be effectively managed for sustained yield.

The area downstream from Skilak Lake is noted for its large trout and is now the focus of Kenai River anglers who wish to retain trout. Anglers displaced by the restrictions to the 1997 Kenai River coho salmon fishery may have fished trout here as an alternative to coho fishing. Although increased harvest should not affect sustained yield, the number of large trout available could decline.

CURRENT ISSUES

Kenai River rainbow trout are conservatively managed. Fishing is not permitted during the spawning period, the upper Kenai River is now managed as a catch-and-release fishery and bag limits are restrictive in the remainder of the river. Conservation of the resource is therefore not an issue.

There is a desire by some trout anglers for additional fishing opportunity in the spring. The department, for biological reasons, opposes any fishing (including catch-and-release fishing) on spawning rainbow trout. The issue is when the spawning period occurs. It is documented that spawning can continue through June 14. Less well documented is when spawning begins. Currently, that date is assumed to be April 15. Further investigation is required to select a reasonable date at which spawning begins. If that date is later than April 15, consideration of additional fishing time is warranted.

Participation in the upper Kenai River catch-and-release trout fishery is not known. These data would be helpful for the Board of Fisheries during their deliberations regarding changes in regulation of this fishery. We thought that approximate participation estimates could be obtained by subtracting participation estimates from the sockeye salmon fishery at the confluence of the Kenai and Russian rivers from the total participation in the upper Kenai River as determined from the Statewide Harvest Survey. However, this method provided a negative estimate in most years for participation in the trout fishery. Either the estimated participation at the confluence of the Kenai/Russian River was erroneously high or the estimate of total participation in the upper Kenai River from the Harvest Survey is too low. This lack of information regarding participation in the Catch-and-Release Area is an issue because the participation trend in the fishery cannot be ascertained nor can the number of anglers affected by regulatory changes in the area be conveyed to the Board of Fisheries.

RECOMMENDED RESEARCH AND MANAGEMENT

Management will continue to engage in public informational and educational activities to apprise the public of the fisheries status and to promote lawful and ethical fishing practices.

A research program is recommended which would more closely define the rainbow trout spawning period in the upper Kenai River.

SWANSON RIVER AND SWAN LAKE CANOE ROUTES RAINBOW TROUT FISHERY

FISHERY OBJECTIVE

Objectives for this wild trout fishery are defined in the Cook Inlet and Copper River Basin Rainbow/Steelhead Trout Management Policy adopted by the Board of Fisheries (ADF&G 1986). **This fishery is managed under Policy I. Policy I directs that this rainbow trout resource be managed under a conservative yield philosophy and that management practices do not alter the historic size and age composition or stock levels of the population.** Consistent with this policy, protection is given the resource through a spring spawning closure on flowing streams. Bag and possession limits are conservatively set at 5 trout, only 1 of which may be 20 inches in length or greater.

INSEASON MANAGEMENT APPROACH

There are currently no active research programs associated with this fishery. Harvest is estimated from the Statewide Harvest Survey. With allowances for annual variation, this survey indicates a stable fishery. A stable fishery equates to a stable population with sufficient numbers of trout in the spawning population to ensure the fishery continues to be managed for sustained yield. The fishery is therefore managed inseason by regulation.

HISTORICAL PERSPECTIVE

The Swanson River Canoe Route links more than 40 lakes with 46 miles of the Swanson River. All lakes of the canoe route are tributary to the Swanson River which flows into Cook Inlet about 30 miles north of the Kenai River. Access to the canoe route is via the Swanson River Road and Swan Lake Road.

The Swan Lake Canoe Route is also reached via the above road system. This route is located south of Swan Lake Road, with the majority of the 30 lakes of this canoe route being tributary to Moose River. Lands bordering both canoe routes are in federal ownership, administered by the Kenai National Wildlife Refuge. The lands and the canoe routes are further designated as "wilderness areas" and outboard motors and/or aircraft are not permitted on waters of these routes.

Both canoe routes support wild populations of rainbow trout and Dolly Varden. With the exception of limited research relating to Dolly Varden, Sport Fish Division research in the area has been confined to basic lake surveys in the 1960s and early 1970s. Harvest has been determined since 1977 by Statewide Harvest Survey (Table 39).

Harvest estimates from 1977 through 1983 were combined for the two canoe routes and the Swanson River. Total rainbow trout harvest through 1983 was relatively consistent, ranging between 4,000 and 6,900 trout. An estimate in 1984 was made only for the Swanson River rainbow trout harvest (3,490). In 1985 and 1986, harvest for the canoe routes, including Swanson River, was about 6,200 fish, very similar to the 1980-1983 estimates. Harvests have declined since 1986, reaching a low of 2,600 in 1989, increasing again in the early 1990s with a gradual decline in the mid-90s.

Table 39.-Swanson River and Swanson River and Swan Lake Canoe Route rainbow trout (RT) and Dolly Varden (DV) fisheries data, 1977-1996.

	Swanson River		Swanson River Canoe Route		Swan Lake Canoe Route		Total Harvest		Total [a] Participation
Year	RT	DV	RT	DV	RT	DV	RT	DV	
1977							5,860	1,090	6,380
1978							4,390	1,160	5,770
1979							4,010	450	5,780
1980							6,900	1,300	6,700
1981							6,180	1,110	5,240
1982							6,440	1,150	6,330
1983							6,700	2,970	9,140
1984	3,490	320							
1985			3,070 [b]	280 [b]	3,160	450	6,230	730	7,060
1986			4,940 [b]	370 [b]	1,250	350	6,190	720	13,440
1987			1,940 [b]	240 [b]	2,260	890	4,200	1,130	12,330
1988	930	40	1,370	210	1,310	220	3,610	470	16,970
1989	550	90	1,190	90	860	160	2,600	340	11,240
1990	1,520	40	1,510	270	1,720	350	4,750	660	10,980
1991	1,118	131	1,233	104	1,703	183	4,054	418	11,259
1992	1,100	16	2,462	418	2,699	98	6,261	532	11,228
1993	424	88	1,588	419	1,608	331	3,620	838	10,840
1994	585	81	1,331	655	640	233	2,556	969	8,832
1995	747	272	1,576	95	688	172	3,011	539	9,127
Mean	1,163	120	2,019	286	1,627	312	4,865	921	9,369
1996	247	426	1,217	421	579	0	2,043	847	10,503

From: Mills 1979-1994, Howe et al. 1995-1997.

[a] Days fished for all species.

[b] Includes Swanson River harvest.

Participation prior to 1986 was less than 10,000 angler-days. From 1986-1992 it has ranged from 10,980-16,970 angler-days. In the last 5 years it has stabilized at 9,000-11,000 days fished annually.

Regulation of this fishery has been unchanged since 1983. In that year individual bag and possession limits were established for the various species. In these canoe routes, including the Swanson River, the bag and possession limits were established at 5 trout, only 1 of which could be 20 inches or greater in length. Bait may be used in this fishery throughout the open season. There is no closed season in the lakes of the canoe route. In all flowing waters, including those small tributaries between the lakes, the season is open from June 15 through April 14. The remaining 2 months of the year are closed to rainbow trout fishing in streams to protect spawning fish.

BOARD OF FISHERIES ACTIONS

Regulation of this fishery has not changed since 1983. The fishery will next be reviewed during the 1998/99 Cook Inlet regulatory cycle of the Board of Fisheries.

RECENT FISHERY PERFORMANCE

This fishery is not surveyed or monitored. Harvest and participation is estimated from the Statewide Harvest Survey (Table 39). Total harvest in 1994, 1995 and 1996 was 2,556, 3,011 and 2,043 rainbow trout, respectively. Harvest in 1994 and 1995 is the lowest recorded in the fishery. Reason for reduced harvest is not known but it is not believed related to declining stocks. No negative public comments regarding stock status were received by the area office. Harvest data for the 1997 season will be from the Statewide Harvest Survey, available in fall 1998.

OUTLOOK

Observation indicates increasing interest in Kenai Peninsula rainbow trout fisheries. Although the reason(s) for this increased interest is not definitely known, it may be in response to the increasingly crowded salmon fisheries. Some anglers consider Kenai Peninsula salmon fisheries too congested and no longer participate in them, preferring the less crowded rainbow trout fisheries such as those that occur in the Swanson River area. Participation and harvest in this fishery therefore may display moderate annual increases, although these increases are not yet evident (Table 39). No change in the status of the rainbow trout resource is anticipated and there should be no negative impacts related to increased participation in this fishery.

CURRENT ISSUES

There are no issues associated with this fishery.

RECOMMENDED RESEARCH & MANAGEMENT

We do not recommend any research or management activities specific to this fishery.

KASILOF RIVER/CROOKED CREEK STEELHEAD RECREATIONAL FISHERY

FISHERY OBJECTIVE

This fishery is not specifically addressed in any management plan adopted by the Board of Fisheries. Department objectives for this fishery are:

Objective 1: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

INSEASON MANAGEMENT APPROACH

The fishery is now managed as a Catch-and-Release fishery. The only fishery related mortality is that associated with this angling practice. This fishery is therefore managed inseason by regulation.

HISTORICAL PERSPECTIVE

The mainstem Kasilof River is not known to support steelhead trout. Crooked Creek, tributary to the Kasilof River (Figure 16), historically supported a small, wild run. Total wild returns to this stream were estimated at a maximum of several hundred fish, too few to support a viable fishery. To provide additional recreational opportunity, a steelhead stocking program was initiated here in the early 1980s.

The first return of stocked steelhead to Crooked Creek occurred in late fall of 1986. Observation of the fishery indicated these fish did not immediately enter Crooked Creek, but overwintered in the Kasilof River. Observation further indicated a very small fall harvest, with additional fish being harvested in early spring prior to their spawning migration into Crooked Creek. Annual harvest from 1986 through 1991 was less than 200 fish, returns to the hatchery were less than 500 fish. Although harvest was relatively small, the fishery was important to recreational anglers in that: (1) it was the only stream where the retention of steelhead was permitted on the Peninsula, and (2) it was one of the few areas anglers could fish for trout in a stream in early spring.

Harvests, catches, and returns to the hatchery began to increase in 1991 and peaked in 1993 when more than 2,000 steelhead were harvested and almost 3,000 returned to the hatchery. Increasing returns to Crooked Creek were related to increases in the number of smolts stocked, not to any known changes in survival rate.

Stocked steelhead trout originating in Crooked Creek strayed into the Kenai River. Because of concern that these hatchery fish would negatively impact wild stock Kenai River trout and salmon production, the Crooked Creek steelhead stocking program was terminated in 1993.

Steelhead trout smolt were last stocked in spring 1992. These fish returned as adults in fall 1994, and were available for harvest in fall 1994 and spring 1995. Steelhead trout harvested after 1995 are the progeny of natural production.

The 1996 return to the hatchery declined to 108. Catch declined to 765 (Table 40). There was no harvest as the fishery was designated a catch-and-release fishery in March 1996 by the Board of Fisheries. This regulation was first in effect during the 1996 season.

BOARD OF FISHERIES ACTIONS

In 1990 the Board adopted a proposal liberalizing this fishery in Crooked Creek. Beginning in 1991, Crooked Creek from its confluence with the Kasilof River upstream to the Johnson Lake Road opened to fishing for all species from January 1 through May 31 and again from August 1 through December 31. Prior to this Board action, Crooked Creek was open only from August 1 through December 31. Permitting spring fishing in the lower area of this stream increased the

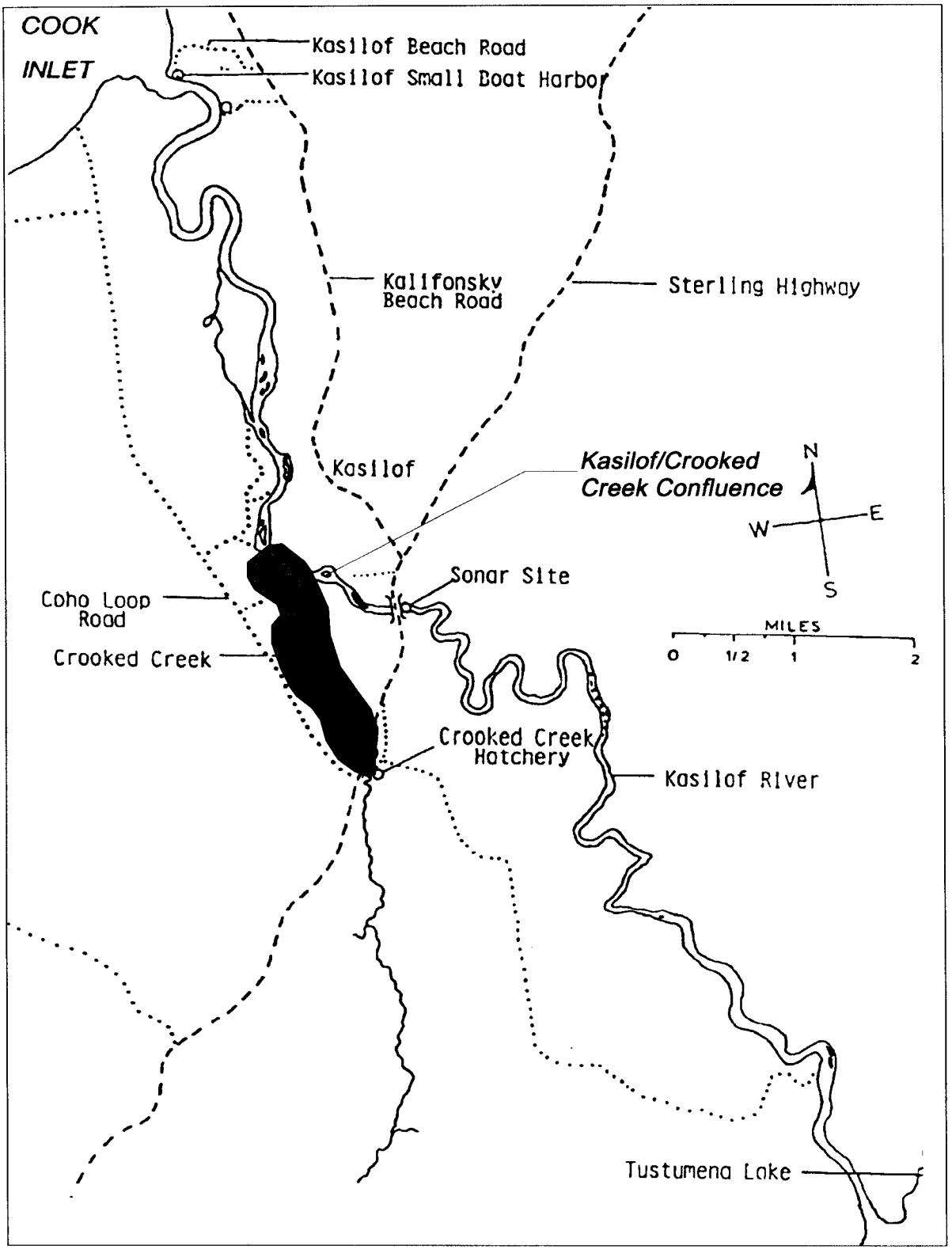

Figure 16.-Map of the Kasilof River and Crooked Creek steelhead trout fishery area.

harvest of stocked steelhead returning to Crooked Creek Hatchery. The closure in June and July protected migrating and spawning chinook salmon.

The season upstream from Johnson Lake Road was unchanged by the Board. Fishing is permitted here only from August 1 through December 31. The closure here from January 1 through July 31 protects spawning rainbow trout and chinook salmon.

At its November 1992 meeting, the Board adopted a public proposal with staff support which liberalized the use of bait in this stocked fishery. As no conservation issue was present and increased harvest was a management objective, the Board permitted the use of bait in both the Kasilof River and Crooked Creek at any time the streams were open to fishing. Prior to this action, bait was prohibited in Crooked Creek and the Kasilof River after September 15.

In March 1996 the Board restricted the fishery to catch-and-release. This was in response to the termination of the stocking program and the desire of the Board to maximize benefits from a minimal number of steelhead trout. Regulatory changes were:

1. In the Kasilof River downstream from the Sterling Highway Bridge and in Crooked Creek, steelhead may not be retained.
2. In the Kasilof River downstream from the Sterling Highway Bridge only unbaited, artificial lures may be used from September 1-May 15.
3. In Crooked Creek only unbaited, artificial lures may be used from September 1-December 30.
4. Crooked Creek is closed to fishing from January 1 through July 31.

The Board again addressed the fishery in November 1996. At the request of the public the Board limited terminal tackle to single-hook, unbaited artificial lures in Kasilof River downstream from the Sterling Highway Bridge from September 1 through May 15, and in Crooked Creek from September 1 through December 31. The Board also adopted a regulation which prohibited removing from the water a steelhead trout which was intended to be released.

RECENT FISHERY PERFORMANCE

The Crooked Creek Hatchery and weir had been operated by Cook Inlet Aquaculture Association. The Association ceased operations at the hatchery about January 1, 1997. The weir was not operational in 1997 and no counts of any species were conducted. All fish returning to the hatchery were afforded unobstructed passage to areas of Crooked Creek upstream of the weir site. This was effected by removing the stop logs in the weir. Operation of the hatchery reverted to the state July 1, 1997. The facility is being surplused and no further fish production is planned.

Catch estimates for the 1997 season will be determined from the Statewide Harvest Survey. Estimates will be available in fall 1998.

OUTLOOK

The Kasilof River and Crooked Creek steelhead trout fishery is now supported by the progeny of naturally-spawning fish. The fishery is restrictively regulated (no retention permitted), which addresses conservation concerns associated with prosecuting a fishery on a small stock. Catch is expected to be less than 1,000 fish annually.

Table 40.-Return, harvest and catch of steelhead in the Kasilof River and Crooked Creek steelhead trout fishery, 1986-1997.

Year	Harvest[a]	Catch[a]	Return to Hatchery
1986	92		
1987	185		142
1988	36		228
1989	48		420
1990	145		236
1991	12	179	
1992	520	1,746	805
1993	2,065	6,862	2,960
1994	1,262	6,156	511
1995	692	3,835	583
1996	[b]	765	108
1997	[b]		[c]

[a] Catch and harvest are a combination of harvest and catch from the Kasilof River and Crooked Creek (Mills 1987-1994, Howe et al. 1995-1997).

[b] Fishery regulated as catch-and-release beginning in 1996.

[c] Weir operation terminated about January 1, 1997. No estimate of return available.

CURRENT ISSUES

There are currently no major issues associated with the fishery.

RECOMMENDED RESEARCH & MANAGEMENT

No research activity associated with this fishery is recommended at this time.

Crooked Creek Hatchery and land is state owned and scheduled to be sold. It is probable the land would become private. We recommend that approximately one acre of land (which encompasses both sides of Crooked Creek) be retained in public ownership. This land could be used for a future weir and research site when warranted by increasing use of Crooked Creek's steelhead, Dolly Varden, and coho salmon stocks.

KENAI RIVER DOLLY VARDEN FISHERY

FISHERY OBJECTIVE

This fishery is not specifically addressed in any management plan adopted by the Board of Fisheries. Department objectives for this fishery are:

Objective 1: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

Objective 2: To ensure, through appropriate management and research programs, that the Kenai River Dolly Varden population does not decline below the level necessary to ensure sustained yield.

INSEASON MANAGEMENT APPROACH

Inseason management has not been required in this fishery. The fishery is managed by existing regulations.

HISTORICAL PERSPECTIVE

Dolly Varden are harvested in all areas of the Kenai River. The season is January 1 through December 31, except in those areas of the river upstream of the Upper Killey River, where more restrictive seasons apply. Prior to 1984 the bag and possession limit was 10 Dolly Varden of any size. Beginning in 1984, this limit was reduced to 5 Dolly Varden of any size. This applied to all Kenai Peninsula waters. Harvest and catch of this species is determined by the Statewide Harvest Survey.

The Kenai River is assumed to support both a resident and an anadromous Dolly Varden population. Only limited biological information is available regarding both populations. Resident fish are believed to inhabit the entire river, including both Skilak and Kenai lakes. Seasonal movements of these resident fish are not known, but it is assumed that a percentage of the stream-residing fish overwinter in Skilak and Kenai lakes. The anadromous population is believed to enter the Kenai River in July and it is assumed that a percentage of this population also overwinters in Skilak Lake and probably Kenai Lake. The outmigration occurs in April and May. Harvest estimates presented in Table 41 do not differentiate between resident and anadromous populations.

A Kenai River Dolly Varden study was initiated on July 1, 1997. The primary objective of this study is to locate major staging areas of Dolly Varden within the Kenai River watershed upstream of Skilak Lake. Future Dolly Varden investigations will be based on the age, maturity and availability of Dolly Varden within these staging locations. Because this study began in July, only summer and fall staging areas have been explored to date.

Methods used to locate staging areas include deploying various trapping devices and conducting visual observations. A concurrent Dolly Varden radiotelemetry study is being conducted by the United States Fish and Wildlife Service. During the past 2 years, 200 radio transmitters have been placed in Dolly Varden within the Kenai River, selected tributaries, and Skilak and Kenai lakes. The radiotelemetry study is providing fish movement information and assisting in locating staging and overwintering areas.

Preliminary findings indicate Dolly Varden occupy most tributary streams to Kenai Lake and the Kenai River. Several staging areas, containing spawning fish, have been identified in Quartz,

Table 41.-Kenai River Dolly Varden harvest and catch by river section as determined by Statewide Harvest Survey, 1984-1996.

	Harvest									Catch								
	Cook Inlet to Soldotna Bridge		Soldotna Bridge to Moose River		Moose River to Skilak Outlet		Skilak Inlet to Kenai Lake		Total	Cook Inlet to Soldotna Bridge		Soldotna Bridge to Moose River		Moose River to Skilak Outlet		Skilak Inlet to Kenai Lake		Total
Year	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number
1984	7,506	23.9	1,966	6.3	11,211	35.7	10,724	34.1	31,407									
1985	7,560	28.8	3,277	12.5	8,930	34.0	6,468	24.7	26,235									
1986	1,249	21.6	771	13.4	1,928	33.4	1,827	31.6	5,775									
1987	2,429	31.8	1,671	21.9	2,139	28.0	1,391	18.2	7,630									
1988	3,531	32.2	1,266	11.5	3,527	32.1	2,653	24.2	10,977									
1989	3,414	33.9	1,371	13.6	3,649	36.3	1,630	16.2	10,064									
1990	2,738	22.9	2,424	20.2	2,741	22.9	4,079	34.0	11,982	7,795	22.5	5,094	14.7	7,537	21.8	14,151	40.9	34,577
1991	4,211	29.0	3,285	22.6	4,268	29.4	2,740	18.9	14,504	10,665	15.5	8,116	11.8	19,363	28.2	30,601	44.5	68,745
1992	3,777	26.1	2,516	17.4	4,900	33.9	3,269	22.6	14,462	11,822	15.0	5,899	7.5	26,348	33.4	34,754	44.1	78,823
1993	4,599	36.2	1,539	12.1	3,503	27.6	3,057	24.1	12,698	13,019	17.1	6,079	8.0	20,778	27.2	36,451	47.8	76,327
1994	3,276	38.6	1,107	13.0	2,051	24.2	2,052	24.2	8,486	8,752	14.2	5,185	8.4	14,584	23.6	33,168	53.8	61,689
1995	4,069	42.7	1,732	18.2	2,113	22.2	1,609	16.9	9,523	10,146	18.4	5,399	9.8	12,447	22.6	27,103	49.2	55,095
Mean	4,030	30.7	1,910	15.2	4,250	30.0	3,460	24.1	13,650	10,370	17.1	5,960	10.0	16,840	26.1	29,370	46.7	62,540
1996	1,998	32.3	1,456	23.5	1,635	26.4	1,100	17.8	6,189	8,006	17.9	4,842	10.9	10,019	22.5	21,742	48.7	44,609

From: Mills 1985-1994, Howe et al. 1995-1997.

Summit, and Cooper creeks and the Snow River; with Quartz Creek and its associated tributaries suspected of being one of the major spawning populations upstream of Skilak Lake. To date, no major Dolly Varden staging areas have been located within Kenai Lake during the summer and fall period. Radiotelemetry data indicate Dolly Varden prefer traveling throughout the pelagic zone of Kenai Lake during the summer and fall rather than the shoreline and, during winter, may frequent the area around Porcupine Island. Porcupine Island is one of the few areas within Kenai Lake having a shallow gravel bottom, and may be preferred overwintering habitat for Dolly Varden.

BOARD OF FISHERIES ACTIONS

At its March 1990 meeting the Board agreed with observations and comments of the public that the Dolly Varden harvest in the Trophy Trout area of the river (that area between Kenai and Skilak lakes) was probably increasing and would continue to increase concurrent with increasing angler effort. Although the Board recognized that a conservation issue could not be identified at that time, it chose a conservative management approach and reduced the Dolly Varden bag and possession limits in the Trophy Trout area to 2 daily, only 1 of which may be 24 inches or larger. There was no seasonal limit placed on the harvest of these large Dolly Varden; regulation of this species in other areas of the river was unchanged.

In 1992 the Board adopted a public proposal with staff support that reduced the Dolly Varden bag and possession limits in the remainder of the Kenai River, including Skilak Lake, to 2 daily and in possession. No size limit was requested or applied by the Board in adopting this proposal.

At its March 1996 meeting the Board further restricted the fishery. Regulations in effect for the 1996 season were:

1. In all flowing waters of the Kenai River drainage upstream from Skilak Lake, including the waters of Skilak Lake within a half mile of the Kenai River inlet, Dolly Varden may only be taken from June 15 through April 14.
2. In all flowing waters of the Kenai River drainage upstream from Skilak Lake, including the waters of Skilak Lake within a half mile of the Kenai River inlet, the Dolly Varden bag and possession limit is 2 fish only 1 of which may be 24 inches or greater in length. Dolly Varden between 12 and 24 inches may not be retained.
3. In all flowing waters of the Kenai River drainage upstream from Skilak Lake including the waters of Skilak Lake within a half mile of the Kenai River inlet, only unbaited, single-hook artificial lures may be used. The exception is the confluence of the Kenai and Russian rivers which is a fly-fishing-only area during the sockeye salmon fishery.
4. In all lakes and ponds of the Kenai River drainage upstream from Skilak Lake, the Dolly Varden bag and possession limit is 2 fish only 1 of which may be 24 inches or greater in length. Dolly Varden between 12 and 24 inches may not be retained.

In November 1996 the Board reduced the Dolly Varden bag and possession limits in all flowing waters of the Kenai Peninsula to 2 fish of any size. Unless otherwise regulated, the bag and possession limits in lakes were unchanged and remained at 5.

Regulations adopted by the Board at their March and November 1996 meetings were at the request of the public and with department support. The public perceived that the numbers of

Dolly Varden in the upper Kenai River were declining. The department had virtually no data regarding stock status in any area of the NKPMA. A conservative management approach was therefore deemed appropriate by the public, department and Board.

RECENT FISHERY PERFORMANCE

This fishery is not creel surveyed or monitored in season. Harvest estimates are derived from the Statewide Harvest Survey. Estimates in Table 41 reflect a fishery with a peak harvest in 1984 (31,407). The significant decline in 1986-1987 harvests is attributed to the more restrictive bag limit (5 fish) and adoption of a voluntary catch-and-release philosophy. Harvests from 1988 through 1993 stabilized at 10,000-15,000 Dolly Varden. Harvests from 1994 through 1996 declined to 6,000-8,000.

Catch peaked in 1992 at 78,000. Catch has since declined to 44,600 in 1996. In 1996 retention rate was 14%.

Harvest and catch in 1996 declined in all river sections. Reasons for the decline are not definitively known. It is reasonable to assume that regulatory restrictions reduced harvest and catch in the upstream fishery. However, regulatory restrictions do not explain reduced catch in the river sections below Skilak Lake.

Table 42 presents Dolly Varden catch and harvest for Ptarmigan Creek, Quartz Creek, Kenai Lake, Russian River and Skilak Lake. These are all part of the Kenai River drainage. With the exception of Skilak Lake, Dolly Varden catch and harvest in these areas has declined. The most dramatic decline was in Ptarmigan Creek in which 189 fish were caught and 0 harvested in 1996. This compares most unfavorably with a harvest of 1,057 and a catch of 8,202 in 1993.

OUTLOOK

There is a general increased interest in Kenai Peninsula rainbow trout and Dolly Varden fisheries. In the Kenai River the target species is more often rainbow trout than Dolly Varden, with Dolly Varden being harvested incidental to rainbow trout. As participation in rainbow trout fisheries increases, interest in Dolly Varden will also increase.

CURRENT ISSUES

The aggregation of spawning Dolly Varden in tributary pools after September 1 is of concern to fisheries managers. The locations of many tributary aggregations are along the highway system or secondary roads that are easily accessible to anglers. Spawning areas of primary concern and recommended for closure from September 15 through October 31 include Quartz Creek upstream of the Sterling Highway bridge, Cooper Creek, and the Snow River.

RECOMMENDED RESEARCH & MANAGEMENT

We recommend that the stock assessment project continue. Emphasis should be placed on ascertaining the size of the population and its biological characteristics. Seasonal movements of this species should be ascertained and the presence of both anadromous and resident fish in the Kenai River drainage should be verified. Research should continue to focus on that area of the river between Kenai and Skilak lakes, as this area is experiencing a rapid growth in angler participation.

Table 42.-Dolly Varden harvest and catch and effort for all species for Quartz Creek, Ptarmigan Creek, Kenai Lake, Russian River and Skilak Lake, 1984-1996.

	Ptarmigan Creek			Quartz Creek			Kenai Lake		
Year	Effort[a]	Harvest	Catch	Effort[a]	Harvest	Catch	Effort[a]	Harvest	Catch
1984	1,857	2,120		2,530	3,791		502	224	
1985	988	1,387		451	121		607	69	
1986	1,483	2,508		4,146	1,605		NA[b]	76	
1987	942	417		5,361	181		580	109	
1988	1,946	527		3,965	1,292		855	546	
1989	790	628		4,893	2,399		377	134	
1990	2,041	1,041	4,081	5,655	2,842	8,672	1,042	302	926
1991	1,200	705	3,445	5,354	1,905	14,329	1,064	326	757
1992	1,750	1,188	4,342	7,906	2,441	9,864	1,536	98	236
1993	1,742	1,057	8,202	9,152	4,317	21,473	2,586	764	1,656
1994	1,425	296	1,877	7,241	2,175	11,702	2,524	443	1,017
1995	1,914	801	1,642	5,179	1,004	4,659	3,240	606	2,730
1996	613	0	189	4,070	283	2,637	1,242	40	192

	Russian River		Skilak Lake	
Year	Harvest	Catch	Harvest	Catch
1984	1,072		0	
1985	399		0	
1986	826		0	
1987	72		91	
1988	473		110	
1989	361		438	
1990	760	2,290	187	583
1991	1,148	6,134	378	1,240
1992	664	3,629	172	1,352
1993	1,001	4,141	145	653
1994	595	4,443	233	772
1995	554	6,430	224	1,031
1996	112	3,178	120	1,093

From: Mills 1985-1994, Howe et al. 1995-1997; except Kenai Lake 1984-1988, M. Mills, Alaska Department of Fish and Game, Division of Sport Fish, Research and Technical Services, Anchorage, personal communication.

[a] Effort directed toward all species.

[b] NA = not available.

LAKE TROUT RECREATIONAL FISHERY

FISHERY OBJECTIVE

This fishery is not specifically addressed in any management plan adopted by the Board of Fisheries. Department objectives adopted for this fishery are:

Objective 1: To provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.

Objective 2: To ensure, through appropriate management and research programs, that the lake trout population does not decline below the level necessary to ensure sustained yield.

INSEASON MANAGEMENT APPROACH

There has been no inseason management in the history of this fishery. The fishery is managed by existing regulations.

HISTORICAL PERSPECTIVE

Lake trout are indigenous to a number of Kenai Peninsula lakes and have been introduced into one lake. Natural populations occur in glacial Tustumena, Skilak, Kenai and Upper and Lower Trail lakes. Clearwater lakes naturally supporting this species include Hidden, Juneau, Swan, and possibly Trout lakes. Swan Lake is tributary to the Chickaloon River; Juneau and Trout lakes are tributary to the Kenai River via Juneau Creek. Crescent Lake (located on the west side of Cook Inlet) also supports this species.

In 1970, 204 lake trout were captured by gillnet in Skilak Lake and transported by Sport Fish Division personnel to Upper Summit Lake. In 1988 several lake trout were captured in Upper Summit Lake by gillnet. The small size of most of these fish and the presence of a larger adipose clipped fish indicated fish of the original stocking were still present and that reproduction had occurred. There is, however, no confirmation that anglers have successfully harvested lake trout from Upper Summit Lake.

Lake trout are harvested in Trail River, Kenai River and Kasilof River. Observation indicates the majority of the river harvest occurs at the inlets and outlets of the inriver lakes. These fisheries occur primarily in spring and fall. During the summer months it is assumed this species inhabits the deeper areas of lakes, with a relatively small percentage of the population remaining in the shallower waters adjacent to the lake inlet or outlet. A harvest of this species is known to occur at the outlet of Crescent Lake (west side of Cook Inlet) throughout the open water period.

Research directed toward this species has been confined to Hidden Lake. In 1987, 435 fish were captured by gillnet to determine the population's age class composition. Weights and lengths of sampled fish are on file at the Soldotna Department of Fish and Game office. Harvest information is obtained annually from the Statewide Harvest Survey (Table 43).

BOARD OF FISHERIES ACTIONS

There were no regulatory changes to this fishery considered at the 1990 or 1992 Board meetings.

The Board addressed the Hidden Lake fishery in November 1996. Both staff and public were concerned that the harvest here was exceeding sustainable levels. Prior to Board action the bag and possession limits were 2 lake trout 20 inches or more in length; 10 lake trout less than 20 inches. The Board reduced the bag and possession limits to 2 lake trout of any size.

Table 43.-Kenai Peninsula lake trout harvest as determined by Statewide Harvest Survey, 1977-1996.

Year	Kenai River	Kasilof River	Other Rivers	Hidden Lake	Skilak Lake	Tustumena Lake	Kenai Lake	Other Lakes	Total
1977	250		540	1,540				1,350	3,680
1978	520		60	850				1,680	3,110
1979	410		540	1,110				1,550	3,610
1980	110		160	1,860				1,430	3,560
1981	720	150	160	1,070				1,260	3,360
1982	630	40	10	2,120				1,540	4,340
1983	650	0	0	1,440				1,330	3,420
1984	540	30	0	1,050				810	2,430
1985	950	40	40	1,400				290	2,720
1986	970	90	0	3,760				1,420	6,240
1987	320	140	0	1,050	710	180		850	3,250
1988	890	150	90	1,180	550	470		600	3,930
1989	290	50	250	620 [a]	90	50	100	510	1,960
1990	260	90	0	1,260	260	270	170	260	2,570
1991	500	80	0	1,494	363	162	485	362	3,446
1992	450	371	23	995	455	231	185	670	3,380
1993	335	71	57	1,449	233	92	816	809	3,862
1994	401	155	275	822	74	110	489	860	3,186
1995	178	30	0	852	626	22	552	627	2,887
Mean	493	99	116	1,364	373	176	400	958	3,418
1996	148	0	9	778	279	138	193	266	1,811

From: Mills 1979-1994, Howe et al. 1995-1997.

[a] Access restricted due to campground construction.

A small number of anglers who fished Hidden Lake lake trout claimed they were burbot fishing. This permitted these anglers to use up to 15 lines and complicated enforcement efforts. Concomitant with the bag and possession limits reduction, the Board closed Hidden Lake to burbot fishing.

RECENT FISHERY PERFORMANCE

Lake trout harvest for eight Peninsula fisheries is presented in Table 43. Kenai River harvest declined in 1995 and 1996. The reason for this decline is not known, but annual fluctuations are not unexpected given that harvest is incidental to other species. Kasilof River harvest declined in 1995 and was reported as 0 in 1996. The absence of harvest is related to small sample size, as it

is known lake trout were harvested in the Kasilof River in 1996, and there is no reason to suspect a decline in the population.

Hidden Lake harvest appears to have stabilized at an annual harvest of 700-900 fish. Harvest in Skilak Lake from 1994-1996 ranged from 74-626. Tustumena Lake harvest during this period ranged from 22-138 and Kenai Lake from 193-552.

In 1997 a Thermal Habitat Volume (THV) analysis of Hidden Lake was conducted. The purpose of the analysis was to estimate the maximum sustained yield of lake trout, based on the temperature profile of the lake.

Temperature profiles were collected from Hidden Lake on two occasions, July 21 and August 5, 1997. Temperature depth measurements were collected every 2.5 meters with a YSI model 58 temperature probe from three of the deepest lake sites. The July temperature profile had the lowest variability and was therefore used to estimate THV.

The THV analysis yielded an estimated potential harvest of 4,185 kg/yr. Using a mean weight of 1.05 kg/lake trout estimated during USFWS creel surveys in 1992 and 1993, this translates to a potential sustained harvest of 3,986 lake trout/yr from Hidden Lake, much higher than the current average harvest of 1.093 lake trout/yr.

The THV model developed by Payne et al. (1990) has not been proven to be applicable to Southcentral Alaska coastal lakes. The estimated THVs for Southwestern Alaska coastal lakes are on average considerably higher than those for interior Alaska and Ontario (Jaenicke et al. 1996). Estimates of sustained yield contained in this report are highly preliminary and fish managers should be cautious about their utility in altering current management strategies. That notwithstanding, it is encouraging to note that, based on this model, Hidden Lake is currently harvested at less than 30% of estimated maximum sustained yield (MSY).

OUTLOOK

Salmon fisheries on the Kenai Peninsula are becoming increasingly congested. Anglers are expected to seek alternate fisheries which provide opportunities to catch or harvest rainbow trout, Dolly Varden and lake trout.

We expect that participation and harvest will increase moderately in this fishery. These increases should not negatively impact the lake trout resource because, with the exception of Hidden Lake, this species is not fully utilized by Kenai Peninsula recreational anglers.

CURRENT ISSUES

Given November 1996 action by the Board to reduce harvest of Hidden Lake lake trout, there are no issues associated with this fishery.

RECOMMENDED RESEARCH & MANAGEMENT

No research or revision to management strategy is recommended at this time.

KENAI PENINSULA STOCKED LAKES

FISHERY OBJECTIVES

Seasons and bag limits for nonanadromous native species on the Kenai Peninsula have become increasingly restrictive in recent years as a result of elevated fishing effort due to population

growth and increased tourist activity. The primary objective of this program is to increase sport fishing opportunity on the Kenai Peninsula and generate 10,000 angler-days of effort by 2001. An additional objective is to provide sport fishing diversity through stocking of both coho salmon and rainbow trout.

Lakes stocked are in close proximity to communities, rural subdivisions, or popular recreation areas. Most can be reached by highway vehicle although a few are remote and accessible by short hiking trails. Stocked lakes provide opportunity for both open water and winter ice fishing.

INSEASON MANAGEMENT APPROACH

Management of this fishery is through existing regulations.

HISTORICAL PERSPECTIVE

The first lake stocking on the Kenai Peninsula took place in 1952 when Crescent Lake was stocked with grayling and Longmare Lake with rainbow trout. Grayling are not indigenous to the Peninsula but they survived, began reproducing in Crescent Creek, and support a popular sport fishery today. Over the next two decades grayling were planted in several additional lakes. Reproducing grayling populations can also be found today in Fuller, Grayling, Upper Paradise, Bench, Twin, and Iceberg lakes. Grayling are not currently being stocked in area lakes.

Strains of rainbow trout from Washington, Oregon, and Montana hatcheries as well as from numerous Alaska locations were planted during the 1950s, 1960s, and 1970s. Coho salmon were also obtained from several locations in Alaska and Oregon. Since the late 1970s only native Alaskan fish have been stocked. Rainbow trout from Swanson River, Kenai Peninsula brood stock and coho salmon from Cook Inlet and Resurrection Bay stocks are used today.

Chinook salmon were stocked in several local lakes during the early to mid-1980s. While they grew more rapidly than coho salmon during the first year after release, the survival rate into the second season was poor. Additional releases of landlocked chinook salmon are not planned.

Rainbow trout is the most popular species stocked in Kenai Peninsula area lakes today and are placed in 22 of the 28 Peninsula lakes currently being stocked (Table 44). Aurora, Loon, Long, and Troop lakes are recent additions to the program. Fifteen of these lakes are stocked on alternating years with the rest being stocked annually. Twenty-one of the 28 stocked lakes are landlocked and do not support native populations of sport fish. The seven lakes which are not landlocked have had barrier structures installed to prevent egress and are stocked with sterile female rainbow trout. Johnson Lake, located adjacent to a popular state park, has occasionally failed to overwinter stocked fish during extremely cold winters. It is stocked annually with 8,500 catchable trout as well as 8,500 fingerling to assure the availability of fish. Coho salmon are preferred to rainbow trout by some anglers and are stocked in eight lakes. Two of these are large popular lakes which are also stocked with rainbow trout.

BOARD OF FISHERIES ACTIONS

In recent years there have been no actions taken which directly targeted stocked lakes or the two species currently stocked on the Kenai Peninsula. However, in an effort to address concerns for rainbow trout in the upper Kenai River drainage, the Board did establish a rainbow trout season of June 15 through April 14 for the 1997 season. This regulation impacted Carter, Jerome, and Meridian lakes which are located within the drainage. They are, however, barriered to prevent egress and do not contain naturally reproducing populations of rainbow trout.

Table 44.-Kenai Peninsula lake stocking summary for nonanadromous fish, 1995-1997.

Lake	Nearest Community	Size (Acres)	Species Stocked	Stocking Schedule	Number Stocked
Arc	Soldotna	16	Coho	Annual	5,000
Aurora [a]	Sterling	8	Coho	Annual	2,000
Barbara	Nikiski	45	Rainbow	Even Years	11,000
Cabin	Nikiski	57	Rainbow	Annual	15,000
Carter	Moose Pass	48	Rainbow	Even Years	10,000
Cecille	Nikiski	10	Rainbow	Odd Years	2,000
Centennial	Kasilof	25	Coho	Annual	5,000
Chugach Estates	Nikiski	18	Rainbow	Even Years	6,000
Douglas	Nikiski	90	Rainbow	Odd Years	18,000
Elephant	Soldotna	340	Coho	Annual	34,000
			Rainbow	Odd Years	34,000
Encelewski	Kasilof	101	Rainbow	Even Years	20,000
Island	Nikiski	268	Rainbow	Annual	54,000
Jerome	Moose Pass	16	Rainbow	Annual	3,000
Johnson	Kasilof	85	Rainbow	Annual	17,000
Long	Seward	15	Rainbow	Odd Years	4,000
Longmare	Soldotna	172	Coho [b]	Annual	17,000
			Rainbow	Annual	17,000
Loon	Soldotna	18	Coho	Annual	4,000
Meridian	Seward	15	Rainbow	Odd Years	4,000
Quintin	Kasilof	15	Rainbow	Odd Years	3,000
Rainbow	Cooper Landing	15	Rainbow	Even Years	5,000
Roque	Kasilof	5	Coho	Annual	2,000
Scout	Sterling	95	Coho	Annual	19,000
Sport	Soldotna	72	Rainbow	Annual	15,000
Thetis	Nikiski	45	Rainbow	Even Years	15,000
Tirmore	Nikiski	52	Rainbow	Even Years	12,000
Troop	Seward	27	Rainbow	Odd Years	5,000
Upper Summit	Moose Pass	258	Rainbow	Odd Years	64,000
Vagt	Moose Pass	43	Rainbow	Annual	9,000

[a] Aurora was stocked in 1987; stocking reinitiated in 1997.

[b] Coho were first stocked in Longmare Lake in 1997; 34,000 rainbow trout were stocked previously.

Table 45.-Kenai Peninsula stocked lakes harvest and effort as estimated by Statewide Harvest Survey, 1985-1996.

Lake	1996			1995			1994			1993			1992			1991		
	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow
Arc				43			25			368	671							
Aurora																		
Barbara	301		218	243		85	64	82	94	202		138	160		325	340		84
Cabin	59		82	43		0	548		278	83		30	117		198			
Carter	226		99	153		168	374		159	218		129	310		158	147		31
Cecille																		
Centennial													245	622				
Chugach Estates																		
Douglas	55		118	210		300	757		358	36		30	416		245			
Elephant	1,197	1,287	564	1,303	369	100	847	1,186	554	13								
Encelewski																		
Island	690		365	69		111	303		191	390		322				238		
Jerome	15			198		120	467		286	93		79	181		32	98		10
Johnson	2,789		1,739	3,033		1,485	2,564		2,190	1,505		648	1,152		689	1,573		491
Loon																		
Long																		
Longmare	190		12	1,445		1,210	851		99	127		79	597		364			
Meridian																		
Quintin																		
Rainbow	291		71	447		311	519	27	393	593		647	373		277	49		
Roque																		
Scout	575	248		261	178		1,250	636		728	1,599		523	1,568		181	869	
Sport	427		482	412		197	959		403	330		287	758		641	272		178
Thetis																		
Tirmore																		
Troop																		
Upper Summit	486			445			537			446			619			344	22	
Vagt	88			41		20	356		327	232		208	299		103	521		523
Total	7,389	1,535	3,750	8,346	547	4,107	10,421	1,931	5,332	5,364	2,270	2,597	5,750	2,190	3,032	3,763	891	1,317
Total Harvest			5,285			4,654			7,263			4,867			5,222			2,208

-continued-

Table 45.-Page 2 of 2.

Lake	1990 Days Fished	1990 Coho	1990 Rainbow	1989 Days Fished	1989 Coho	1989 Rainbow	1988 Days Fished	1988 Coho	1988 Rainbow	1987 Days Fished	1987 Coho	1987 Rainbow	1986 Days Fished	1986 Coho	1986 Rainbow	1985 Days Fished	1985 Coho	1985 Rainbow
Arc				16	10													
Aurora																		
Barbara	16																	
Cabin				190		143	31		18	54		72				121		277
Carter	181		104				31			36		36	61		31	104		139
Cecille																		
Centennial				219	105	10												
Chugach Estates																		
Douglas																		
Elephant																		
Encelewski																		
Island	181			209		67	291		509	91		36	183		107			
Jerome	234		83	48			93		18	471		36						
Johnson	1,786		1,156	314		67	2,729		545	677		109	496		367	711		434
Loon																		
Long																		
Longmare	66		156	114			309	364	55	199		308	153		92			
Meridian																		
Quintin																		
Rainbow	33			63		20	546		55				146		153	52		
Roque																		
Scout	164	198		724	352		55	327										
Sport	33						91		73	217		54	428		336			
Thetis																		
Tirmore																		
Troop																		
Upper Summit	659						164			217			292			87		
Vagt	393		833	171		20	93		36	92		18	657		352	381		329
Total	3,746	198	2,332	2,068	467	327	4,433	691	1,309	2,054	0	669	2,416	0	1,438	1,456	0	1,179
			2,530			794			2,000			669			1,438			1,179

Note: Harvest estimates for stocked lakes are generally based on very few responses to the Statewide Harvest Survey and are therefore not published in the Statewide Harvest Survey report. These estimates are from M. Mills, Alaska Department of Fish and Game, Division of Sport Fish, Research and Technical Services, Anchorage, personal communication.

RECENT FISHERY PERFORMANCE

Sport fishing harvest and effort is estimated through the Statewide Harvest Survey. Mean harvest and effort for the years 1994-1996 is 5,734 rainbow trout and coho salmon, and 8,719 angler-days which are 147% and 153%, respectively, larger than the 1985-1993 mean. Mean annual harvest and effort since 1985 has averaged 3,176 fish and 4,767 angler-days. The largest reported harvest and effort was in 1994 when 7,263 fish were harvested during 10,421 days of fishing (Table 45). There is wide variability in harvest and effort estimates for individual lakes from year to year; likely due to the small number of survey respondents used to make the estimates. Harvest and effort has been estimated for only 13 to 15 of the stocked lakes during this time period. Lakes not estimated in the survey tend to be the smaller, less accessible ones.

CURRENT ISSUES

There are no biological issues associated with this fishery. Trespass, litter, and vandalism to private property adjacent to public access sites has increased in recent years. Public use of state-owned boat ramps to launch jet skies where only small boats used for fishing were launched in the past has led to conflict as well. In recent years there have been requests to vacate public access and terminate the stocking of fish due to both issues.

RECOMMENDED RESEARCH & MANAGEMENT

Harvest and effort information will continue to be used to evaluate the effectiveness of the lake stocking program. A program should be initiated to evaluate all stocked lakes through periodic onsite sampling to determine if current stocking practices need revision to produce harvestable fish.

The stocked lakes brochure should continue to be updated annually. This brochure has been one of the most popular handouts distributed through the Soldotna office in recent years. In addition, Kenai Peninsula stocked lakes should be included in the department notebook series. This series provides detailed information on individual lakes that is not included in the stocked lakes brochure including bathymetric maps, stocking history, and adjacent land status.

NORTHERN PIKE RECREATIONAL FISHERY

FISHERY OBJECTIVE

This fishery is not specifically addressed in any management plan adopted by the Board of Fisheries. Northern pike are an illegally-introduced species on the Kenai Peninsula. The department-adopted objective for this fishery is:

To provide the opportunity for angler participation to continue at present or increased levels.

INSEASON MANAGEMENT APPROACH

There has been no inseason management in the history of this fishery. The fishery is managed through existing regulations. Regulations are liberal because northern pike were illegally introduced into Kenai Peninsula waters and compete with resident trout and salmon species.

HISTORICAL PERSPECTIVE

Northern pike are not indigenous to the Kenai Peninsula. This species was illegally introduced into Derk's Lake, tributary to Soldotna Creek, in the mid-1970s. From this initial introduction

they rapidly spread through the remainder of the Soldotna Creek drainage, including East and West Mackey lakes, Soldotna Creek and Soldotna (Sevena) Lake.

Pike is a predator species, and reports from anglers indicated that as the number of pike in the drainage increased, numbers of rainbow trout and Dolly Varden declined. Soldotna Lake, prior to the introduction of pike, was reputed to support one of the most viable rainbow trout populations on the Peninsula. This lake's reputation as a trout producer declined steadily in the 1980s as pike became the dominant species.

There was considerable public and department concern that pike would become established in the mainstem Kenai River, negatively impacting this river's salmon and trout populations. Although small numbers of pike have been caught here (Table 46), there is no evidence to date that pike are reproducing in the mainstem Kenai River, and negative impacts to the river's salmon and trout cannot be documented. Pike have, however, used the Kenai River as a migratory corridor.

Table 46.-Kenai Peninsula northern pike harvest as determined by Statewide Harvest Survey, 1981-1996.

Year	Lakes	Kenai River	Total
1981	30		30
1982	100		100
1983	290		290
1984	190		190
1985	50	70	120
1986	0	0	0
1987	0	10	10
1988	40	0	40
1989	50	20	70
1990	30	10	40
1991	86	0	86
1992	239	0	239
1993	216	26	242
1994	36	0	36
1995	219	29	248
Mean	105	15	116
1996	0	0	0

From: Mills 1982-1994, Howe et al. 1995-1997.

In spring 1986 a weir was established on the east fork of the Moose River in conjunction with a rainbow trout study. One pike was known to have passed through the structure. Information from the Statewide Harvest Survey also indicates that anglers have harvested small numbers of pike in the inriver lakes (Afonasi, Imeri, Watson, Equmen, Peterson, Kelly and Hikers lakes) of this drainage. Harvests of pike are too small to be estimated for specific lakes (Table 46).

Northern pike were also illegally introduced into three unnamed lakes about 6 miles south of Soldotna in the early to mid-1980s. These lakes are accessed via Tote Road and it is assumed the pike were introduced by local residents. These lakes are landlocked.

Although there is some local interest in pike fishing, this species supports a minor if not insignificant sport fishery. The best pike fishing is in the Mackeys and Soldotna lakes. These lakes are almost entirely bordered by private land and access is limited. Some fishing by local residents, including spear fishing during the winter months, occurs throughout the year. Pike harvested in the east fork of the Moose River are probably caught incidentally to rainbow trout and Dolly Varden. Total pike harvest on the Peninsula averages about 100 fish annually.

BOARD OF FISHERIES ACTIONS

There were no regulations adopted affecting this species at either the 1990 or 1992 Board meetings.

RECENT FISHERY PERFORMANCE

Harvest estimate for 1994 was 36 pike in lakes. In 1995 it was estimated 219 pike were harvested from Peninsula lakes; 29 from the Kenai River. The Statewide Harvest Survey indicated a “zero” harvest in 1996 although it is known some pike were caught (Table 46).

OUTLOOK

No change in stock status or harvest is anticipated in the immediate future. Northern pike immigration into new waters within the Kenai Peninsula drainage is slow; reproduction in waters other than Soldotna Creek drainage also appears limited. Angler participation in this fishery is limited and is expected to remain at low levels. Limited participation is attributed to limited public access in the Soldotna Creek drainage and the availability of alternate fisheries.

CURRENT ISSUES

As pike are not indigenous to the Peninsula and prey on native game species, their presence on the Kenai Peninsula is viewed negatively by the department and the majority of the angling public. When these fish were confined to Derk's and Mackeys lakes, there were tentative plans to eradicate them with rotenone. Before this plan could be implemented, they had spread throughout the Soldotna Creek drainage. Because this drainage is extensive and tributary to the Kenai River, chemical eradication was no longer feasible. Because they are now present in the mainstem Kenai River and are believed to have established a reproducing population in the east fork of the Moose River, eradication or control of the species in the Kenai River drainage is no longer possible.

RECOMMENDED RESEARCH & MANAGEMENT

No research or management activities specific to this fishery are recommended.

KENAI RIVER SOCKEYE SALMON DIP NET FISHERY

FISHERY OBJECTIVE

Regulation and management of this fishery are governed by the Upper Cook Inlet Personal Use Salmon Fishery Management Plan.

The fishery objective is to implement the provisions of this Board adopted management plan.

INSEASON MANAGEMENT APPROACH

Management of this fishery is the joint responsibility of the Commercial Fisheries Division (CFD) and the Division of Sport Fish. The CFD is responsible for operation of the Kenai River sonar counter which enumerates sockeye salmon entering the river. The personal use dip net fishery opens and closes by regulation. Inseason management by the Division of Sport Fish would be required only in the unlikely event the minimum sonar count goal (550,000) could not be projected, and achievement of this goal required restrictions to the dip net fishery.

HISTORICAL PERSPECTIVE

The Cook Inlet Personal Use Salmon Dip Net Fishery Management Plan (5 AAC 77.545) was adopted at the 1981 Board of Fisheries meeting. The plan provided for a personal use dip net fishery targeting sockeye salmon. The fishery could occur on the Kenai River after an escapement of 500,000 sockeye salmon was projected. As with other personal use dip net fisheries, only Alaska residents could participate. A sport fishing license was required, but permits were not required. The daily bag and possession limits were 6 sockeye salmon which were not in addition to other marine and freshwater sport fishing limits. Legal gear was confined to a dip net. Regulations restricted the fishery to the lower section of the river downstream from the Warren Ames Bridge (Figure 17).

Prior to 1987, the Kenai River personal use dip net fishery occurred only in 1982 and 1983. Harvest is unknown in 1982, and only 7,560 sockeye were taken in 1983 (Table 47). The reasons for the harvest were a combination of unperfected angler technique, relatively clear water, and relatively small numbers of fish present.

In 1987 the dip net fishery opened at 12 noon, July 23. The fishery was continuous for 13.5 days, closing August 5. Total sockeye salmon escapement to the Kenai River was a record 1.6 million fish. During the peak of the fishery, dipnetting was successfully conducted 24 hours a day. A harvest of 24,090 sockeye salmon was estimated by Statewide Harvest Survey (Mills 1988).

At the 1988 Board of Fisheries meeting the trigger point for the personal use dip net fishery in the Kenai River was raised to 700,000, the upper end of the new escapement goal. Projected escapement exceeded 700,00 in 1989 so the personal use fishery occurred. In 1990 projected escapement was below 700,000 so there was no personal use fishery.

In 1989 Alaska Supreme Court's McDowell Decision ruled that all Alaska residents are subsistence users. In December of 1990, the Alaska Board of Fisheries adopted the Upper Cook Inlet Subsistence Salmon Management Plan. Under this plan subsistence fishing was allowed in most marine waters of Upper Cook Inlet normally open to commercial gillnet fishing. Set gillnet fishing was also allowed in Knik Arm, as well as dip net fishing in the mouths of the Kenai and Kasilof rivers. Permits were required for these fisheries, but as a subsistence fishery a valid Alaska resident sport fishing license was not required. The annual bag and possession limit was

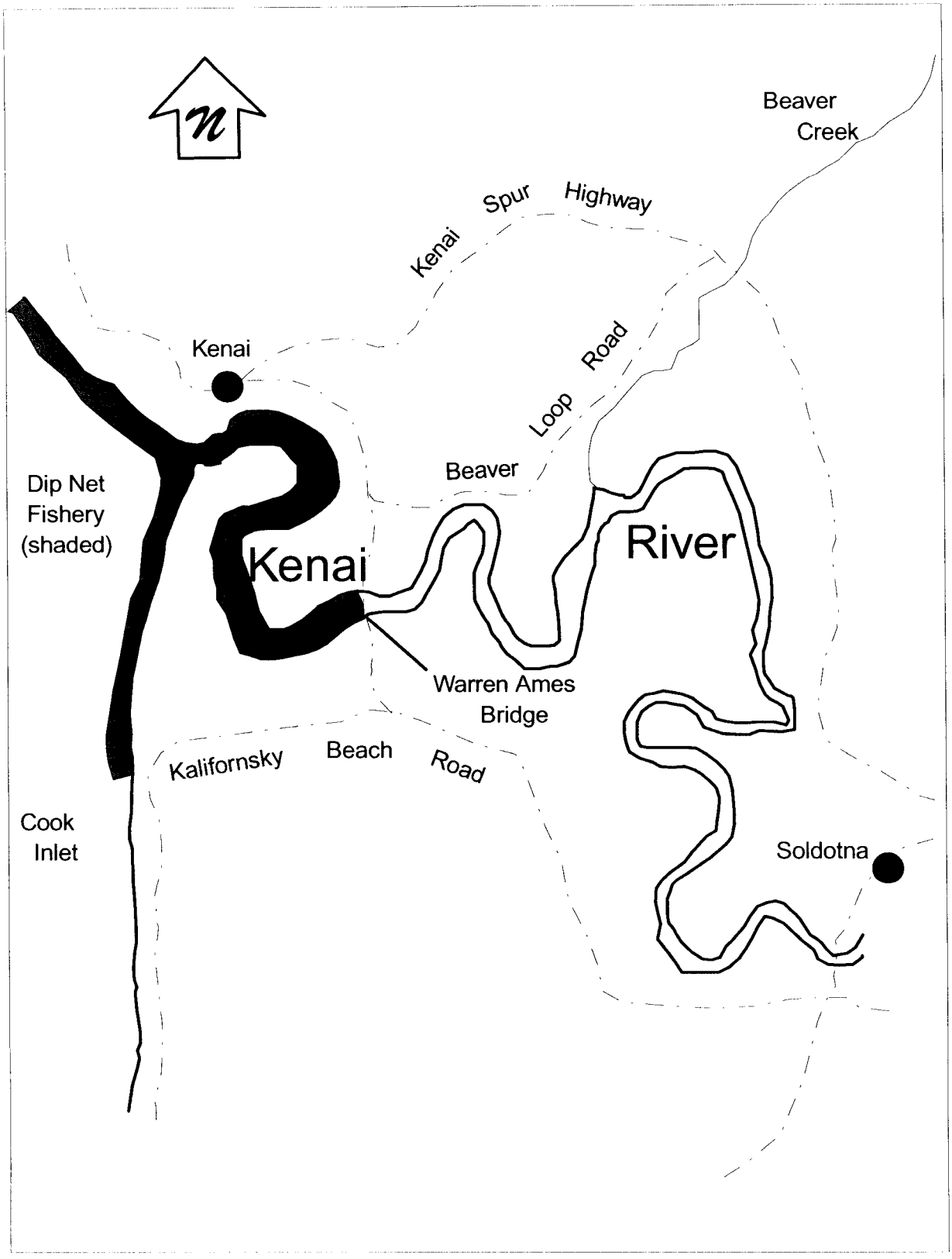

Figure17.-The Kenai River sockeye salmon dip net fishery.

Table 47.-Kenai River personal use sockeye salmon dip net fishery summary, 1981-1997.

Year	Date and Time Opened	Date and Time Closed	Total Days	Sockeye Available During Dip Net Fishery [a]	Sockeye Harvest[b]	% of Available Fish Harvested	Total Sockeye Salmon Escapement	Percent of Escapement Harvested	% of Escapement Available to Fishery	Participation (Days Fished)[c]
1981	No Fishery			No fishery			407,600			
1982	7/26 18:00	8/ 5 24:00	9.25	172,072	Unknown		619,800		27.8	
1983	7/20 18:00	8/ 5 24:00	15.25	251,272	7,562	3.0	630,000	1.2	39.9	3,203
1984	No Fishery									
1985	No Fishery									
1986	No Fishery									
1987	7/23 12:00	8/ 5 24:00	13.50	755,500	24,086	3.2	1,600,000	1.5	47.2	22,550
1988	7/22 18:00	8/ 5 24:00	14.25	260,000	16,880	6.5	1,000,000	1.7	26.0	29,010
1989	7/21 00:01	8/ 5 24:00	15.0	812,800	48,976	6.0	1,598,000	3.1	50.9	31,310
1990	No Fishery									
1991	Subsistence Fishery only									
1992 [c]	7/27 12:00	8/5 24:00	6.5 [d]	144,756	12,189	8.4	994,760	1.2	14.6	10,371
1993	7/17 14:00	7/31 24:00	14.4	392,477	33,467	8.5	813,617	4.1	48.2	14,896
1994	Subsistence Fishery only									
1995	7/25 06:00	7/31 24:00	4.75 [d]	79,300	14,352	18.1	630,447	2.3	12.6	11,122
1996	7/10 00:01	8/5 24:00	27.0	710,441	98,429	13.9	797,847	12.3	89.0	9,948
Mean			13.32	397,624	31,993	9.3	909,210	3.4	39.6	16,551
1997	7/10 00:01	7/31 24:00	22.0	666,928	107,577	16.1	1,064,818	10.1	62.6	10,364

[a] Total number of fish passing sonar counters during fishery, plus harvest.

[b] Harvest not known in 1982; 1983-1995 from Statewide Harvest Survey (Mills 1984-1994, Howe et al. 1995, 1996). 1996-1997 total reported harvest from returned permits.

[c] A subsistence dip net fishery also occurred in 1992.

[d] Fishery closed on Wednesday and Saturday to avoid conflict with concurrent subsistence permit fishery. Total days reflects this closure.

[e] 1981-1995 is individual days fished. 1996-1997 is household days fished. Each household day fished may include fishing effort by more than one household member named on the household's permit.

25 salmon per head of household of which no more than 5 could be chinook salmon. In addition a household was allowed another 10 salmon for each household member, of which no more than 1 could be a chinook salmon.

The Cook Inlet Personal Use Dip Net Fishery Management Plan was still in place, however, fisheries under this management plan in the Kasilof and Kenai rivers could not occur on the same day as the subsistence dip net fishery. The escapement level that triggered the personal use dip net fishery in the Kenai River was set to 700,000 in years when a subsistence dip net fishery occurred, and 400,000 if there was no subsistence fishery.

Escapement in 1991 was less than 700,000 so the personal use dip net fishery in the Kenai River did not occur. Subsistence dip net fishing was open on the Kenai River on May 25 and August 3 only; all other openings in the Kenai River were canceled due to legal challenges and court action. Reported sockeye salmon harvest in the Kenai River subsistence dip net fishery was 10,468, with 75% of permits returned (Brannian and Fox 1996).

Legal challenges did not occur during the 1992 season, so the subsistence dip net fishery was open for a total of 34 days, including 3 days in May, 4 days in June, and every Wednesday and Saturday in July, August, and September (Brannian and Fox 1996). Reported harvest, with 43% of the permits returned, was 16,240 sockeye salmon. The Kenai River personal use dip net fishery allowed under the Cook Inlet Personal Use Salmon Dip Net Fishery Management Plan also took place in 1992 (Table 47). It was restricted to days when the subsistence fishery was not open. It continued to have a possession limit of 6 sockeye salmon and did not require a permit.

The Alaska State Legislature during the 1992 session passed legislation that required the Boards of Fisheries and Game to identify nonsubsistence areas where dependence on subsistence was not a principle characteristic of the economy, culture, and way of life. During their November 1992 meeting the Boards of Fisheries and Game established the Anchorage/Mat-Su/Kenai non-subsistence area. The Board of Fisheries also rescinded the Upper Cook Inlet Subsistence Salmon Management Plan. This ended all subsistence fisheries in Upper Cook Inlet except the Tyonek subsistence fishery The personal use dip net fishery remained in place. The escapement trigger for the personal use dip net fishery on the Kenai River was now 400,000, and once the fishery opened fishing could be continuous. The 1993 personal use fishery opened on July 17 and closed on July 31, with an estimated harvest of 33,467 sockeye salmon (Table 47).

In October 1993, Superior Court judge Dana Fabe (in Kenaitze v. Alaska) found unconstitutional the provision in the 1992 state subsistence law that directed the Boards of Fisheries and Game to designate nonsubsistence areas. This ruling was appealed by the State of Alaska to the Alaska Supreme Court where a stay was granted on March 10, 1994. This stay was vacated by the full court on April 11, 1994. A special meeting of the joint Boards of Fisheries and Game was convened on April 28, 1994 by teleconference. As a result of these meetings the Upper Cook Inlet Subsistence Salmon Management Plan was readopted on April 28, 1994.

Since there was not enough time for a formal Board meeting prior to the 1994 season, the Board directed that the Commissioner of Fish and Game should exercise his emergency regulatory authority to adopt regulations for the 1994 fishery. The Board directed that this fishery should mirror the 1992 subsistence fishery. Subsistence fishing periods were again on select Wednesdays and Saturdays from late May to the end of September. The annual bag and possession limit was again 25 salmon per head of household of which no more than 5 could be

chinook salmon. In addition a household was allowed another 10 salmon for each household member, of which no more than 1 could be a chinook salmon. A permit was required to participate, but not a sport fishing license. Reported subsistence dip net harvest, with 48% of the permits returned, was 13,897 sockeye salmon (Brannian and Fox 1996). The personal use dip net fishery remained in place. The escapement trigger for years when a subsistence fishery occurs remained at 700,000 sockeye salmon. The trigger for years without a subsistence fishery was changed to 450,000 to reflect a new minimum escapement goal. In 1994 the sonar count of 700,000 could not be projected prior to July 31 and personal use dip net fishery did not occur despite a final sonar count in excess of 1 million.

In 1995, subsistence fisheries were scheduled to begin on May 20, however, in early May the Alaska Supreme Court overturned the October 1993 Superior Court decision. This ruling reestablished the Anchorage/Mat-Su/Kenai nonsubsistence area. The Board of Fisheries convened an emergency meeting by teleconference on May 24, 1995 to close subsistence fisheries in the now nonsubsistence area. The Board delegated authority to the Commissioner to readopt the Upper Cook Inlet Subsistence Salmon Management Plan as a personal use fishery. The 1995 dip net fishery was therefore prosecuted as a personal use fishery, having the same regulations as the 1994 subsistence fishery, and still requiring a permit. This permitted fishery was open on select Wednesdays and Saturdays from late May to the end of September. To further complicate the situation, the old personal use fishery allowed under the Cook Inlet Personal Use Salmon Dip Net Management Plan was still in place. It still had a possession limit of 6 sockeye salmon and did not require a permit. The nonpermitted personal use fishery triggered by a projected escapement count of 450,000 opened at 6:00 a.m. July 25. The fishery occurred daily except Wednesdays and Saturdays, when the permitted fishery occurred. The non-permitted fishery closed July 31, with a total fishing time of 4.75 days.

The estimate of permitted Kenai River sockeye salmon personal use dip net harvest was 18,502 (Brannian and Fox 1996). This includes a known harvest of 11,771 from returned permits (Ruesch and Fox 1996) and an estimate of the harvest from those who had permits but did not return them. The Statewide Harvest Survey (Howe et al. 1997) estimated total Kenai River sockeye salmon personal use harvest (both permitted and nonpermitted) to be 14,352.

RECENT BOARD OF FISHERIES ACTIONS

In March 1996 the Board amended the Upper Cook Inlet Personal Use Salmon Management Plan. The old, nonpermitted, personal use fishery with a bag limit of 6 sockeye salmon was eliminated.

The Kenai River personal use dip net fishery opening was no longer triggered by sonar count. A season of July 10 through August 5 was established with fishing permitted 24 hours daily. A permit was required and a seasonal limit established. The seasonal limit was 25 salmon for head of household and 10 for each additional family member. This limit was the combined seasonal limit for the Kasilof River dip net fishery, Kasilof River gillnet fishery, Kenai River dip net fishery and Fish Creek dip net fishery. However, only one chinook salmon could be retained in the dip net fisheries. The area open was identical to prior years (from the commercial fishing regulatory markers in Cook Inlet upstream for 1 mile). Shorebased participants could use the entire area. Those dipnetting from a boat were restricted to that area from a marker immediately upstream from the City Dock to the downstream edge of the Warren Ames Bridge.

Permits were required to be returned to the department. Information required on the permit was where the household fished, the days fished and the harvest by species.

These regulations governed the 1996 fishery. In March 1996 the Board minimized harvest of Kenai River coho salmon (projected to be at reduced levels of abundance), closing the fishery July 31 rather than August 5. With this exception, regulation of the 1997 fishery was identical to the 1996 fishery.

RECENT FISHERY PERFORMANCE

Fisheries data were determined by summing reported harvest on returned permits. In 1996 14,576 permits were issued. This permit was required to participate in the Kenai River dip net fishery, Kasilof River dip net fishery, Fish Creek dip net fishery and Kasilof River gillnet fishery; so not all permits were used on the Kenai River.

Harvest in the 1996 Kenai River dip net fishery was 98,429 sockeye, 282 chinook, 1,849 coho, 2,315 pink and 163 chum salmon. Participation on the Kenai River was 9,948 days fished by 6,175 households. There was an average of three household members per fished permit. Average harvest was 17 salmon per permit, 5 salmon per individual.

In 1997, 14,919 permits were issued. Harvest was 107,577 sockeye, 339 chinook, 520 coho, 578 pink, and 53 chum salmon. Participation was 10,364 days fished.

OUTLOOK

The Board will next review this fishery at its February 1999 meeting. Harvest in 1998 is expected to approximate 1997 harvest. Participation is expected to display small, incremental growth.

CURRENT ISSUES

This fishery now opens and closes on dates specified in regulation. Opening the fishery by date rather than at a given sonar count has given the fishery a measure of predictability which heretofore was lacking. This notwithstanding, allocation of the harvestable surplus remains an issue between commercial and personal use participants. Success rates in the personal use fishery generally decline during or immediately after commercial fishing periods in the East Side Setnet (ESSN) fishery. Consecutive fishing periods may mean consecutive days of low success rates in the dip net fishery. Low success rates attributed to consecutive commercial fishing periods therefore is an issue in the management of the fishery.

Most shorebased participants fish on the north bank at the river's mouth with a lesser number dipnetting from the south bank. The area on the north bank is owned by City of Kenai. Litter, fish waste and parking are problems here. The Division of Sport Fish is working with the city to resolve these issues.

A small number of participants rappelled from the bluffs on the north side of the river in 1997 to access the fishery. Rappelling exacerbates erosion in this area. Erosion is currently threatening both property and structures here. The City of Kenai with department support successfully requested an agenda change from the Board. The Board will review this issue in February 1998. A proposal has been submitted by the City of Kenai to prohibit dipnetting from the Coast Guard marker on the north bank at the mouth of the River upstream to a marker near the City Dock. If adopted, this regulation would close approximately a mile of bank to dip net participants. Only

those rappelling from the bluff would be affected, as there is no other reasonable access to this area.

RECOMMENDED RESEARCH & MANAGEMENT

No research or revised management strategies are recommended.

KASILOF RIVER PERSONAL USE DIP NET FISHERY

FISHERY OBJECTIVE

Regulation and management of this fishery are governed by the Upper Cook Inlet Personal Use Salmon Fishery Management Plan.

The fishery objective is therefore to implement the provisions of the Board adopted management plan.

INSEASON MANAGEMENT APPROACH

Management of this fishery is the joint responsibility of the Commercial Fisheries Division (CFD) and the Division of Sport Fish. The CFD is responsible for operation of the Kasilof River sonar counter which enumerates sockeye salmon entering the river. The personal use dip net fishery opens and closes by regulation. Inseason management by the Division of Sport Fish would be required only in the unlikely event the minimum sonar count and biological escapement goal (both are 150,000) could not be projected and achievement of these goals required restrictions to the dip net fishery.

HISTORICAL PERSPECTIVE

In the spring of 1981, the Alaska Board of Fisheries adopted a Cook Inlet Personal Use Salmon Dip Net Fishery Management Plan. It was the intent of the Board to provide for salmon dip net fisheries in the waters of Cook Inlet, allowing Alaska residents an opportunity to harvest sockeye salmon for their personal consumptive needs. The board intent was not to disrupt existing fisheries. Personal use dip net fisheries did not initially open until the department determined that specific escapement goals were met and/or subsistence, commercial, and other sport users have had, or will have, reasonable opportunity to harvest fish in excess of spawning requirements. In recent years this criteria has been relaxed.

Participants in the fishery include local residents as well as residents from other areas in Southcentral Alaska. While sockeye salmon are the target species in the fishery, small numbers of silver and pink salmon are also caught and retained. Fishing takes place from both banks of the Kasilof River as well as from small boats. The majority of the effort occurs along the north bank of the river where there is good road access, parking spaces and, prior to 1988, a public boat launch.

Typically, catch rates are highest during the period approximately 2.5 hours before and after high tide; however, during the peak of large runs, sockeye salmon are harvested at virtually all tide levels.

In 1981 and 1982 harvest and angler participation were determined by creel census. Because dip net fishermen harvest sockeye salmon which are surplus to the spawning escapement and the fishery is managed by the numbers of salmon enumerated by sonar counter, the creel census was discontinued. Harvest and estimates of angler participation were determined by the Statewide

Harvest Survey (Mills 1982-1994, Howe et al. 1995-1996) through 1995; by returned permits in 1996 and thereafter.

From 1981 through 1988 the Kasilof River dip net fishery (Figure 18) was open approximately 2-3 weeks each year from mid-July through early August. The popularity of this fishery increased annually, with record levels of both harvest and effort occurring in 1986. Average harvest and angler participation from 1981 through 1988 was 14,120 sockeye salmon and 7,170 days fished, respectively. Dipnetters harvested an average of 13.5% of the sockeye salmon entering the Kasilof River during the time the season was open. Of the total number of sockeye salmon to enter the river in a given season, this personal use fishery harvested 1% to 14%, averaging 5.3%. Approximately 44% of the sockeye salmon to enter the river were available to personal use dip net fishermen (Table 48).

In 1989 and 1990 the minimum sonar count established by the Board to open this fishery was not achieved or was achieved too late to provide reasonable dipnetting opportunity. The personal use dip net fishery did not occur in these years.

In 1990 the Board established a subsistence set and dip net fishery for upper Cook Inlet. The dip net fishery occurred in the mouths of the Kenai and Kasilof rivers. Days and times subsistence dipnetting occurred was provided for in regulation. The area open to subsistence dipnetting in these rivers was identical to the area where personal use dipnetting occurs when the latter fishery is open. Permits were required for these fisheries, but as a subsistence fishery a valid Alaska resident sport fishing license was not required. The annual bag and possession limits were 25 salmon per head of household of which no more than 5 could be chinook salmon. In addition a household was allowed another 10 salmon for each household member, of which no more than 1 could be a chinook salmon. The Board determined that subsistence and personal use dipnetting would not occur concurrently. They therefore amended the Cook Inlet Personal Use Salmon Dip Net Fishery Management Plan to state that when the personal use fishery occurs in either the Kenai or Kasilof rivers, it (personal use) will be closed at 12:01 a.m. on those days that the subsistence fishery occurs, re-opening again at 12:01 a.m. the following day.

The Cook Inlet Personal Use Salmon Dip Net Fishery Management Plan was further amended as it pertained to the Kasilof River. The escapement goal which triggers the opening of the personal use dip net fishery was raised from the minimum goal of 150,000, to the maximum escapement goal of 250,000. However, during years when the subsistence dip net fishery did not occur, the personal use fishery would open when the minimum sockeye salmon escapement goal of 150,000 could be projected.

A subsistence fishery occurred in 1991. The maximum sonar count goal of 250,000 was not realized and a personal use dip net fishery did not occur. Reported 1991 subsistence harvest, with 75% of the permits returned, was 907 sockeye salmon (Brannian and Fox 1996). Regulation of the subsistence fishery was identical in 1992. The maximum sonar count goal was not achieved in 1992, and a personal use dip net fishery in the Kasilof River again did not occur. Reported 1992 subsistence harvest, with 43% of the permits returned, was 1,230 sockeye salmon (Brannian and Fox 1996).

The Alaska State Legislature during the 1992 session passed legislation that required the Boards of Fisheries and Game to identify nonsubsistence areas where dependence on subsistence was not a principle characteristic of the economy, culture, and way of life. During their November 1992

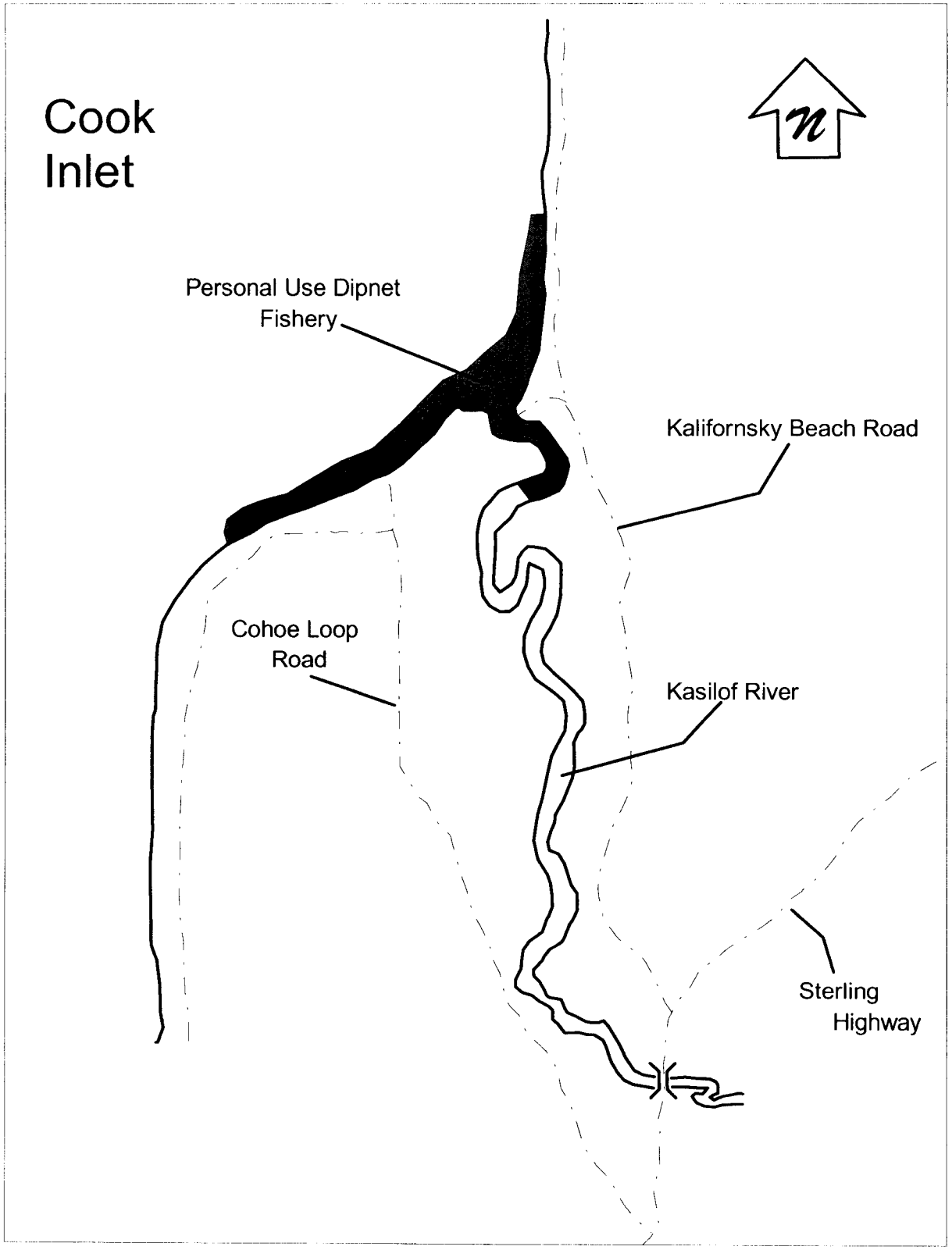

Figure 18.-The Kasilof River personal use sockeye salmon dip net fishery.

Table 48.-Kasilof River personal use dip net fishery summary, 1981-1997.

Year	Date and Time Opened	Date and Time Closed	Total Days	Sockeye Available During Dip Net Fishery [a]	Sockeye[b] Harvest	% of Available Fish Harveste	Total Sockeye Salmon Escapement	Percent of Escapement Harvested	% of Escapement Available to Fishery	Participation (Days Fished)[e]
1981	7/ 4 12:00	7/31 24:00	27.50	122,080	10,300	8.4	256,630	4.0	47.6	5,370
1982	7/21 12:00	8/ 5 24:00	15.50	36,930	1,800	4.9	180,240	1.0	20.5	2,580
1983	7/15 24:00	8/ 5 24:00	21.00	96,500	11,124	11.5	210,270	5.3	45.9	4,420
1984	7/16 12:00	8/ 5 24:00	20.50	126,930	12,771	10.1	231,690	5.5	54.8	5,960
1985	7/15 18:00	8/ 5 24:00	21.25	363,590	16,284	4.5	505,050	3.2	72.0	9,260
1986	7/15 06:00	8/ 5 24:00	21.75	138,500	38,674	27.9	275,960	14.0	50.2	13,930
1987 [c]	7/10 12:00	8/ 5 24:00	25.50	135,560	18,454	13.6	249,250	7.4	54.4	8,910
1988	7/22 18:00	8/ 5 24:00	14.25	12,950	3,547	27.4	200,000	1.8	6.5	6,930
1989	No Fishery						157,739			
1990	No Fishery						144,140			
1991	Subsistence Fishery						238,000			
1992	Subsistence Fishery						183,178			
1993	No Fishery						150,329			
1994	7/22 12:00	8/ 5 23:59	10.50 [d]	35,464	3,679	10.4	204,525	1.8	17.3	2,361
1995	7/17 18:00	7/31 24:00	10.25 [d]	44,700	4,160	9.3	204,935	2.0	21.8	2,845
1996	7/10 00:01	8/5 24:00	27.0	117,954	10,736	9.1	249,944	4.3	47.2	1,236
81-96 Mean			19.55	111,923	11,960	12.5	227,618	4.6	39.8	5,800
1997	7/10 00:01	8/5 24:00	27.0	78,237	9,082	11.6	266,025	3.4	29.4	1,027

[a] Total number of fish passing sonar counters during fishery, plus harvest.

[b] Harvest and participation during first 2 years of fishery are field creel survey estimates. 1983-1995 data are from Statewide Harvest Survey (Mills 1984-1994, Howe et al. 1995, 1996). 1996 and 1997 data are summary of returned permits.

[c] The fishery was closed from 6:00 a.m. 7/14 - 6:00 p.m. 7/15 as a precautionary measure due to possible oil contamination.

[d] Fishery closed on Wednesday and Saturday due to subsistence/personal use permit fishery. Total days reflect this closure.

[e] 1981-1995 is individual days fished. 1996-1997 is household days fished. Each household day fished may include fishing effort by more than one household member named on the household's permit.

meeting the Boards of Fisheries and Game established the Anchorage/Mat-Su/Kenai nonsubsistence area. The Board of Fisheries also rescinded the Upper Cook Inlet Subsistence Salmon Management Plan. This ended all subsistence fisheries in Upper Cook Inlet except the Tyonek subsistence fishery. The personal use dip net fishery remained in place. The trigger point for the opening of the personal use fishery reverted to the minimum projected sonar count of 150,000. The final sonar count was 152,230. The minimum sonar count (150,000) could not be projected with assurance until August l. By this late date there were insufficient sockeye salmon entering the river to prosecute a successful dip net fishery; the personal use fishery did not occur for the fifth consecutive year.

In October 1993, Superior Court judge Dana Fabe (in Kenaitze v. Alaska) found unconstitutional the provision in the 1992 state subsistence law that directed the Boards of Fisheries and Game to designate nonsubsistence areas. This ruling was appealed by the State of Alaska to the Alaska Supreme Court where a stay was granted on March 10, 1994. This stay was vacated by the full court on April 11, 1994. A special meeting of the joint Boards of Fisheries and Game was convened on April 28, 1994 by teleconference. As a result of these meetings the Upper Cook Inlet Subsistence Salmon Management Plan was readopted on April 28, 1994.

Since there was not enough time for a formal Board meeting prior to the 1994 season, the Board directed that the Commissioner of Fish and Game should exercise his emergency regulatory authority to adopt regulations for the 1994 fishery. The Board directed that this fishery should mirror the 1992 subsistence fishery. Subsistence fishing periods were again on select Wednesdays and Saturdays from late May to the end of September. The annual bag and possession limit was again 25 salmon per head of household of which no more than 5 could be chinook salmon. In addition a household was allowed another 10 salmon for each household member, of which no more than 1 could be a chinook salmon. A permit was required to participate, but not a sport fishing license. Reported 1994 subsistence dip net harvest, with 48% of the permits returned, was 2,735 sockeye salmon (Brannian and Fox 1996).

The personal use dip net fishery remained in place. It was this author's interpretation of events that it was the intent of the department to adopt personal use regulations for the Kasilof River dip net fishery which were identical to 1992 regulations for this fishery. In the Kasilof River the sonar count trigger which opened the personal use fishery in 1992 was 250,000. The department adopted a trigger of 150,000 for the 1994 fishery. This author believes that this number was adopted as an administrative error and that to mirror the 1992 Kasilof River personal use dip net fishery regulations the fishery should have opened at 250,000 which is the upper rather than the lower end of the escapement goal range.

This notwithstanding, a sonar count of 150,000 was the trigger which opened the Kasilof River personal use dip net fishery in 1994. A sonar count of 150,000 was assured the morning of July 22; the personal use dip net fishery was opened at 12:00 noon and continued through August 5. As this fishery could not occur on days subsistence dipnetting occurred, the fishery was restricted to July 22, 24, 25, 26, 28, 29 and 31 and August 1, 2, 4 and 5. Total fishing time was 10.5 days (Table 48).

In 1995, subsistence fisheries were scheduled to begin on May 20, however, in early May the Alaska Supreme Court overturned the October 1993 Superior Court decision. This ruling reestablished the Anchorage/Mat-Su/Kenai nonsubsistence area. The Board of Fisheries

convened an emergency meeting by teleconference on May 24, 1995 to close subsistence fisheries in the now nonsubsistence area. The Board delegated authority to the Commissioner to readopt the Upper Cook Inlet Subsistence Salmon Management Plan as a personal use fishery. The 1995 dip net fishery was therefore prosecuted as a personal use fishery, having the same regulations as the 1994 subsistence fishery, and still requiring a permit. This permitted fishery was open on select Wednesdays and Saturdays from late May to the end of September. To further complicate the situation, the old personal use fishery allowed under the Cook Inlet Personal Use Salmon Dip Net Management Plan was still in place. It still had a possession limit of 6 sockeye salmon and did not require a permit. The nonpermitted personal use fishery triggered by a projected escapement count of 150,000 opened at 6:00 p.m. July 17. The fishery occurred daily except Wednesdays and Saturdays, when the permitted fishery occurred. The non-permitted fishery closed July 31, with a total fishing time of 10.25 days (Table 48).

The estimate of 1995 permitted Kasilof River sockeye salmon personal use dip net harvest was 6,371 (Brannian and Fox 1996). This includes a known harvest of 4,572 from returned permits (Ruesch and Fox 1996) and an estimate of the harvest from those who had permits but did not return them. The Statewide Harvest Survey (Howe et al. 1996) estimated total Kasilof River sockeye salmon personal use harvest (both permitted and non-permitted) to be 4,160.

RECENT BOARD OF FISHERIES ACTIONS

Major changes to personal use fishing in Cook Inlet were adopted at the Board's March 1996 meeting. The personal use gillnet harvest of salmon in Cook Inlet was prohibited except at the mouth of the Kasilof River. This fishery opened June 21 and was closed by emergency order after a harvest of 5,000-10,000 sockeye salmon was projected. Fishing periods were 6:00 a.m. to 6:00 p.m. daily and a permit was required. Fishing occurred between commercial fishing regulatory markers located near the mouth of the Kasilof River. Gillnets could not exceed 10 fathoms in length, 6 inches in mesh size and 45 meshes in depth. No part of a set gillnet could be operated within 100 feet of another set gillnet. Fishing was prohibited within the flowing waters or over the stream bed or channel of the Kasilof River at any stage of the tide. Fishing was prohibited beyond 1 mile of the mean high tide. The net had to be attended at all times by the permit holder. Each household was eligible for a permit with the head of household eligible for 25 salmon and 10 for each additional household member. Only 1 chinook salmon could be retained. This was an aggregate seasonal limit which applied to dip net fisheries in Kasilof River, Kenai River and Fish Creek and to the gillnet fishery at the mouth of Kasilof River.

The Kasilof River personal use dip net fishery opening was no longer triggered by sonar count. A season of July 10 through August 5 was established with fishing allowed 24 hours daily. A permit was required and the seasonal limit described was applicable. The area open was identical to prior years (from the commercial fishing regulatory markers in Cook Inlet upstream for 1 mile).

Permits were required to be returned to the department. Information required was where the household fished, the days fished and the harvest by species.

These regulations governed the 1996 and 1997 fisheries.

RECENT FISHERY PERFORMANCE

Fisheries data were determined by analysis of returned permits. In 1996 14,576 permits were issued. This permit was required to participate in the Kenai River dip net fishery, Kasilof River dip net fishery, Fish Creek dip net fishery and Kasilof River gillnet fishery.

Harvest in the 1996 Kasilof River dip net fishery was 10,736 sockeye, 49 chinook, 317 coho, 102 pink and 17 chum salmon. Participation was 1,236 days fished by 768 households. There was an average of three individuals per permit. Each permit harvested an average of 15 salmon; averaging 5 salmon per individual.

In 1997, 14,919 permits were issued. Harvest in the 1997 Kasilof River dip net fishery was 9,082 sockeye, 33 chinook, 87 coho, 95 pink, and 18 chum salmon. Participation was 1,027 household days fished.

The 1996 gillnet harvest at the mouth of Kasilof River was 9,006 sockeye, 44 chinook, 8 pink and 1 chum salmon. Reported participation was 550 days fished by 340 households. There was an average of three individuals per permit. Each permit harvested an average of 27 salmon, averaging 8 salmon per individual.

The harvest in the 1997 Kasilof River gillnet fishery was reported as 16,838 sockeye, 62 chinook, 1 coho, 18 pink and 3 chum salmon. Participation was 764 household days fished.

OUTLOOK

The Board will next review this fishery at its February 1999 meeting. Regulation of the 1998 fishery will therefore be identical to 1997. Harvest in 1998 is expected to approximate 1997 harvest. Participation is expected to display small, incremental growth.

CURRENT ISSUES

This fishery now opens and closes on dates specified in regulation. Opening the fishery by date rather than at a given sonar count has given the fishery a measure of predictability which heretofore was lacking. This notwithstanding, allocation of the harvestable surplus remains an issue between commercial and personal use participants. Success rates in the personal use fishery generally decline during or immediately after commercial fishing periods in the Eastside Setnet fishery. Consecutive fishing periods may mean consecutive days of low success rates in the dip net fishery. Low success rates attributed to (or perceived to be attributed to) consecutive commercial fishing periods are an issue in the management of the fishery.

RECOMMENDED RESEARCH & MANAGEMENT

No research or management actions are recommended at this time.

KENAITZE TRIBAL AND NINILCHIK TRADITIONAL COUNCIL EDUCATIONAL FISHERIES

FISHERY OBJECTIVE

These are Federal Court-ordered fisheries for which regulations were developed by consent preliminary injunction. Terms of the injunction were incorporated into the Educational Permit. The objective of the fishery is to implement the provisions of the permit. Standards, general conditions, and requirements of an educational fishery program are outlined in 5 AAC 93.200-235.

Council and Tribal objectives for the educational fisheries include teaching and preserving the cultural and traditional subsistence way of life as well as providing food for the Elders and others in need.

INSEASON MANAGEMENT APPROACH

Inseason management of the fisheries follows terms of the educational permits issued each year as outlined in Recent Fishery Performance.

HISTORICAL PERSPECTIVE

The first Kenaitze Tribal fishery (1989) originated as a Federal Court-ordered subsistence fishery resulting from extensive legislation and litigation related to both state and federal interpretation of subsistence. Prior to the 1993 fishing season the Alaska Superior Court in negotiations with the department and the Kenaitze Tribe ordered the department to issue educational fishing permits as an interim measure during ongoing litigation. An abbreviated chronology of events leading to the present fishery follows:

1. In 1971 the Alaska Native Claims Settlement Act, in exchange for $962.5 million and 46 million acres, extinguished aboriginal hunting and fishing rights.
2. In 1978 Alaska passed legislation providing for a subsistence priority in allocating fish and game resources.
3. Alaska National Interest Lands Conservation Act (ANILCA) was enacted in 1980. This act provided that "the taking on public lands of fish and wildlife for nonwasteful subsistence uses shall be accorded priority over the taking on such lands of fish and wildlife for other purposes." "Subsistence uses" were defined as "the customary and traditional uses by rural Alaska residents of wild, renewable resources." ANILCA did not define rural.
4. ANILCA provided for the continued state management of fish and wildlife resources on federal lands if the state subsistence law mirrored the subsistence provision of ANILCA.
5. In December 1980 the Board of Fisheries established 10 criteria to identify "customary and traditional uses" of Cook Inlet salmon stocks. In the spring of 1981, the Board applied these criteria to Cook Inlet which virtually eliminated subsistence fishing there. This action lead directly to "Madison vs. Alaska Department of Fish and Game" in 1985 which challenged rural priority.
6. In the spring of 1982 the joint Boards adopted what became known as the "eight criteria regulation." This joint Board action limited the subsistence priority to "rural Alaska residents."
7. In May 1982, the Secretary of the Interior certified that the state was in compliance with ANILCA.
8. In 1985 the Alaska Supreme Court found the action of the Boards inconsistent with state law (Madison vs. Alaska Department of Fish and Game). This decision held that subsistence uses of fish and game could not be solely for rural residents.
9. Following the "Madison decision," the Secretary of the Interior notified the state that it was no longer in compliance with ANILCA.

10. In 1986 the Alaska Legislature amended the state subsistence statute to limit subsistence to rural residents and provided a definition of "rural." The term was defined as "a community or area of the state in which the noncommercial, customary and traditional use of fish or game for personal or family consumption is a principle characteristic of the economy or of the community or area."
11. With the passage of the 1986 subsistence statute, Alaska was again in compliance with ANILCA.
12. A letter from Assistant Secretary of the Interior, William Horn (November 7, 1986), stated that under the original state subsistence statute (1978) the Kenai Peninsula was a rural area and qualified for the subsistence priority; 1986 state legislation precluded most of the Kenai Peninsula from the definition of rural and hence from the subsistence priority.
13. In 1986 the Kenaitze Tribe in federal district court contended that the state's definition of "rural" in which the noncommercial use of fish or game is a "principle characteristic of the economy" is not consistent with the term "rural" as used by Congress in enacting ANILCA. This tribe argued that the Kenai Peninsula was rural.
14. Initially, the U.S. District Court found Alaska's definition of rural consistent with ANILCA and denied the Kenaitze request for a preliminary injunction.
15. In 1989 the Ninth Circuit Court reversed the District Court ruling and held that Alaska's definition of rural was not consistent with "rural" as used in ANILCA. The Ninth Circuit Court held the Kenai Peninsula to be a rural area under ANILCA and remanded the case back to the District Court with instructions to issue a preliminary injunction granting a subsistence fishery to the Kenaitze Tribe.
16. As a result of the McDowell vs. Alaska decision by the Alaska Supreme Court in 1989 the "rural" requirement was removed from state statute.
17. In 1990 the Board announced that all Alaska residents are subsistence users and adopted the Upper Cook Inlet (UCI) Subsistence Salmon Management Plan.
18. In 1992 the Alaska State Legislature passed legislation that required the Boards of Fish and Game to identify nonsubsistence areas. Most of UCI was designated a nonsubsistence area and the UCI Subsistence Salmon Management Plan was rescinded.
19. Prior to the start of the 1993 fishing season the Alaska Superior Court ordered the department to create an educational fishery for the Kenaitze Indian Tribe (later joined by the Ninilchik Traditional Council, the Native Village of Eklutna, and the Knik Tribal Council) as means to continue an established fishery while waiting for final court rulings.
20. In October 1993 the Alaska Superior Court ruled in Kenaitze vs. Alaska that the "nonsubsistence areas" provision was unconstitutional. The UCI Subsistence Salmon Management Plan was re-adopted in April 1994.
21. In early May of 1995 the Alaska Supreme Court ruled in Kenaitze vs. Alaska and reestablished the "nonsubsistence areas." The Board closed the subsistence fisheries in these areas and adopted the previous "subsistence" management plan as a "personal use" management plan to provide for the consumptive needs of Alaska residents.

These educational fisheries, originally ordered as an interim fishery until the court cases were decided, have been applied for and renewed by the department annually. Reports on the educational program, as required by each permit, have been submitted annually.

BOARD OF FISHERIES ACTIONS

The Board has not addressed this fishery. Regulations have been developed by the department in cooperative negotiations with the Kenaitze Tribe and Ninilchik Traditional Council.

RECENT FISHERY PERFORMANCE

The Kenaitze Tribal fishery has occurred each year since 1989. Permit stipulations in 1994 were:

1. The salmon season was May 28 to September 1, and September 16 through September 30. Smelt and hooligan season was June 1 through November 30.
2. Maximum gillnet mesh was 8.5 inches. If the chinook salmon quota was achieved, mesh size would then be reduced to 6.0 inches for the remainder of the season.
3. The harvest quota was 5,000 salmon, no more than 300 of which could be chinook salmon.
    a. If 300 chinook salmon or 1,000 sockeye salmon were taken prior to July 1, salmon fishing would terminate and not resume until July 1;
    b. If the chinook salmon quota was achieved, any chinook salmon caught had to be released.
4. No more than 500 coho salmon could be taken after September 15.
5. The area in which fishing was permitted was identical to prior years, i.e. approximately the lower 5 miles of the Kenai River, including Cook Inlet immediately adjacent to the mouth of the Kenai River.
6. Salmon harvested had to be marked by removing both lobes of the caudal fin.

Seasonal harvest as reported by the Tribe in 1994 was 2,927 salmon. Harvest is apportioned in Table 49 by species and stock.

Permit stipulations in 1995 were:

1. The salmon season was May 1 to October 15. Smelt and hooligan season was May 1 through November 30. Fishing could occur 24 hours daily.
2. Maximum gillnet length was 10 fathoms, 45 meshes in depth with a maximum mesh of 8.5 inches. If the chinook salmon quota was achieved, mesh size would then be reduced to 6.0 inches for the remainder of the season. If the department restricted the inriver chinook salmon sport fishery to catch-and-release or closed the fishery, mesh size was restricted to 6 inches and all chinook salmon had to be released.
3. The harvest quota was 5,000 salmon, no more than 300 of which could be chinook salmon.
    a. If 300 chinook salmon or 1,000 sockeye salmon were taken prior to July 1, salmon fishing would terminate and not resume until July 1;
    b. If the chinook salmon quota was achieved, any chinook salmon caught had to be released.

4. No more than 500 coho salmon could be taken after September 15.
5. The area in which fishing was permitted was identical to prior years, i.e. approximately the lower 5 miles of the Kenai River, including Cook Inlet immediately adjacent to the mouth of the Kenai River.
6. Salmon harvested had to be marked by removing both lobes of the caudal fin.

Seasonal harvest as reported by the Tribe in 1995 was 2,441 total salmon. Harvest is apportioned in Table 49 by species and stock.

Table 49.-Harvest in the Kenaitze Tribal Educational Fishery, 1989-1998.

Year	Early-Run Chinook	Late-Run Chinook	Early-Run Sockeye	Late-Run Sockeye	Early-Run Coho	Late-Run Coho	Pink Salmon	Total Salmon
1989								4,121
1990								4,973
1991								4,948
1992								3,987
1993								2,156
1994	56	1	436	1,471	346	483	134	2,927
1995	37	3	130	1,368	275	593	35	2,441
1996	104	1	953	1,289	261	331	211	3,150
1997	122	20	922	1,488	28	163	5	2,748
1998[a]	131	2	971	1,650	252	386	58	3,450

[a] Preliminary data.

Permit stipulations in 1996 were:

1. The salmon season was May 1 to October 15. Smelt and hooligan season was May 1 through November 30. Fishing could occur 24 hours daily.
2. Maximum gillnet length was 10 fathoms, 45 meshes in depth with a maximum mesh of 8.5 inches. If the chinook salmon quota was achieved, mesh size would then be reduced to 6.0 inches for the remainder of the season. If the department restricted the inriver chinook salmon sport fishery to catch-and-release or closed the fishery, mesh size was restricted to 6 inches and all chinook salmon had to be released.
3. The harvest quota was 5,000 salmon, no more than 300 of which could be chinook salmon.
   a. If 300 chinook salmon or 1,000 sockeye salmon were taken prior to July 1, salmon fishing would terminate and not resume until July 1;
   b. If the chinook salmon quota was achieved, any chinook salmon caught had to be released.

4. No more than 500 coho salmon could be taken after September 15.
5. The area in which fishing was permitted was identical to prior years, i.e. approximately the lower 5 miles of the Kenai River, including Cook Inlet immediately adjacent to the mouth of the Kenai River.
6. Salmon harvested had to be marked by removing both lobes of the caudal fin.

Seasonal harvest as reported by the Tribe in 1996 was 3,150 salmon. Harvest is apportioned in Table 49 by species and stock.

Permit stipulations in 1997 were identical to 1996. An addition to the permit in 1997 was a provision for restriction of the fishery if a conservation concern was identified with stocks being targeted in the fishery. The provision read: The Alaska Department of Fish and Game may exercise its emergency order authority under Alaska Statute 16.05.060 with respect to this educational fishery for conservation purposes, only after all other relevant fisheries are closed.

Seasonal harvest as reported by the Tribe in 1997 was 2,748 salmon. Harvest is apportioned in Table 49 by species and stock. The 1997 harvest was therefore the third lowest recorded in the 9-year history of the fishery (Table 49).

Permit stipulations in 1998 were identical to 1997. In 1998 a conservation issue was identified regarding late-run Kenai River sockeye salmon. After closure of all other relevant fisheries, this educational fishery was closed July 28. Sockeye salmon entry into the Kenai River increased thereafter and the fishery was re-opened August 3.

Seasonal harvest as reported by the Tribe in 1998 was 3,450 salmon. Harvest is apportioned in Table 49 by species and stock.

The Tribe has provided the department with daily harvests since the fisheries inception. These reports and copies of annual permits are on file in the Soldotna office.

The Ninilchik Traditional Council educational permit was patterned after the Kenaitze educational permit. This permit was first issued in 1993. Permit stipulations in 1993 were an allowable catch of 2,000 salmon, not more than 50 chinook salmon could be taken prior to July 21. Fifty additional chinook salmon would be authorized beginning July 21 if the 22,300 chinook salmon spawning escapement was projected in the Kenai River. Fishing area was from about 100 yards north of Ninilchik River north for 1 statute mile in Cook Inlet within a quarter mile of shore. Gear was a 10 fathom set gillnet no more than 45 meshes deep. Mesh size could not exceed 6 inches. No chinook salmon could be taken after July 20 if a spawning escapement of 22,300 late-run Kenai River chinook salmon was not projected. The coho harvest was capped at 250.

Seasonal harvest as reported by the Council in 1993 was 215 salmon.

Permit stipulations in 1994 were:

1. The salmon season was May 28 through August 31, and September 16 to September 30, 1994.
2. Salmon could be taken only by a single set gillnet not exceeding 10 fathoms in length, 45 meshes in depth and a maximum of 6 inches in mesh size.

3. The fishing area was limited to the waters of Cook Inlet between a point 100 yards north of the Ninilchik boat harbor entrance and the latitude of a marker located approximately 1 statute mile north of the Ninilchik boat harbor entrance and extending one-fourth statute mile offshore from mean low water.
4. The harvest quota was 2,000 salmon, no more than 250 of which could be coho salmon and no more than 50 could be chinook salmon taken prior to July 21. The department would authorize the taking of an additional 50 chinook salmon after July 21 provided the projected spawning escapement of chinook salmon in the Kenai River exceeded 22,300. After July 20 chinook salmon could not be taken if the projected spawning escapement to the Kenai River was below 22,300 or there were restrictions to either the Kenai River chinook salmon sport or Cook Inlet commercial fishery.
5. Salmon harvested under the terms of this permit were required to have both lobes of the caudal fin removed.
6. As with the Kenaitze fishery, the Council was required to report their harvest to the department when requested; a summary of the season was required to be submitted to the department 10 days after the close of the season.

Seasonal harvest as reported by the Council in 1994 was 304 salmon. Harvest is apportioned in Table 50 by species and stock.

Table 50.-Harvest in the Ninilchik Traditional Council Educational Fishery, 1993-1997.

Year	Early-Run Chinook	Late-Run Chinook	Early-Run Sockeye	Late-Run Sockeye	Early-Run Coho	Late-Run Coho	Pink Salmon	Total Salmon
1993								215
1994	7	0	3	159	119	0	16	304
1995	65	12	6	223	85	0	23	414
1996	82	19	98	812	52	4	8	1,075
1997	69	25	233	241	99	0	55	722

Permit stipulations in 1995 were:

1. The salmon season was May 8 to September 30. Fishing could occur 24 hours daily.
2. Salmon could be taken only by a single set gillnet not exceeding 10 fathoms in length, 45 meshes in depth and a maximum of 6 inches in mesh size.
3. Fishing area was limited to the waters of Cook Inlet between a point 100 yards north of the Ninilchik boat harbor entrance and the latitude of a marker located approximately 1 statute mile north of the Ninilchik boat harbor entrance and extending one-fourth statute mile offshore from mean low water. In addition, a stick fence was allowed to be placed within

the waters of the Ninilchik River downstream of the Sterling Highway bridge for one tide on May 31.

4. The harvest quota was 2,000 salmon, no more than 250 of which could be coho salmon and no more than 50 could be chinook salmon taken prior to July 21. No more than 20 of these 50 could be taken in the freshwater fishery. The department would authorize the taking of an additional 50 chinook salmon after July 21 provided the projected spawning escapement of chinook salmon in the Kenai River exceeded 22,300. After July 20 chinook salmon could not be taken if the projected spawning escapement to the Kenai River was below 22,300 or there were restrictions to either the Kenai River chinook salmon sport or Cook Inlet commercial fishery.
5. Salmon harvested under the terms of this permit were required to have both lobes of the caudal fin removed.
6. The Council was required to report their harvest to the department when requested; a summary of the season was required to be submitted to the department 10 days after the close of the season.

Seasonal harvest as reported by the Council in 1995 was 414 salmon. Harvest is apportioned in Table 50 by species and stock. The harvest was taken entirely in Cook Inlet. The stick fence was built but did not catch anything.

Permit stipulations in 1996 were:

1. The salmon season was May 8 to October 31. Fishing could occur 24 hours daily.
2. Salmon could be taken only by a single set gillnet not exceeding 10 fathoms in length, 45 meshes in depth and a maximum of 6 inches in mesh size.
3. The fishing area was limited to the waters of Cook Inlet between a point 100 yards north of the Ninilchik boat harbor entrance and the latitude of a marker located approximately 1 statute mile north of the Ninilchik boat harbor entrance and extending one-fourth statute mile offshore from mean low water.
4. The harvest quota was 2,000 salmon, no more than 250 of which could be coho salmon and no more than 100 could be chinook salmon taken prior to July 21. The department would authorize the taking of an additional 50 chinook salmon after July 21 provided the projected spawning escapement of chinook salmon in the Kenai River exceeded 22,300. After July 20 chinook salmon could not be taken if the projected spawning escapement to the Kenai River was below 22,300 or there were restrictions to either the Kenai River chinook salmon sport or Cook Inlet commercial fishery for chinook salmon conservation. This authorization was granted on July 25.
5. Salmon harvested under the terms of this permit were required to have both lobes of the caudal fin removed.
6. The Council was required to report their harvest to the department when requested; a summary of the season was required to be submitted to the department 10 days after the close of the season.

7. In addition to the marine fishery the permit provided for limited fishing opportunity within the Ninilchik River downstream from the Sterling Highway bridge by traditional methods using tools constructed of natural materials. Terms were: On May 29 and 30, June 5 and 6 and August 7 and 8, the Ninilchik Traditional Council may fish within the waters of the Ninilchik River downstream of the Sterling Highway Bridge using traditional methods. Traditional methods include stick fence weirs, grass baskets, dip nets made from tree roots and other tools constructed using naturally occurring materials. No more than 20 chinook salmon or 30 coho salmon may be taken within the waters of the Ninilchik River using these methods. These fish are not in addition to the total harvest quota. Rainbow trout/steelhead must be released. Inseason requests were granted to change the first two sets of fishing days to May 22-23, and June 12-13.

Seasonal harvest as reported by the Council in 1996 was 1,075 salmon. Harvest is apportioned in Table 50 by species and stock.

Regulation of the 1997 fishery was essentially identical to 1996. Additionally, the permit provided for fishing in Ninilchik River downstream from the Sterling Highway Bridge using traditional methods. Fishing could occur here only on June 3-5, June 10-12, July 8-10, August 5-7 and August 12-14. Not more than 20 chinook and 30 coho salmon could be harvested in fresh water. No fish were harvested in the freshwater fishery.

Seasonal harvest as reported by the Council in 1997 was 722 salmon. Harvest is apportioned in Table 50 by species and stock.

The Council has provided the department daily harvests since the fishery inception. These records are on file in the Soldotna office as are copies of annual permits.

In 1998 management and administrative authority for the Ninilchik Traditional council educational permit was transferred to the SKPMA based in Homer. Results of the 1998 fishery will be reported in the area management report originating in that office.

OUTLOOK

These are Federal Court ordered fisheries; their annual occurrence is dependent on negotiation of a consent preliminary injunction and the issuance of an educational permit in compliance with the injunction. The injunction is directly related to Alaska's subsistence issue. The issue of subsistence has yet to be resolved and is still before the courts. Given the fluidity and volatility of the subsistence issue, it is not possible to predict whether or not these fisheries will again occur in 1999.

CURRENT ISSUES

The Kenaitze Educational Fishery harvests salmon of Kenai River origin. The harvest of chinook salmon is minimal and has an insignificant effect on the inriver sport fishery. The coho and sockeye salmon harvests are also relatively small in relation to numbers of fish present.

There was some negative public reaction to this fishery in 1989. Negative public comment was prevalent during the early weeks of the 1990 season, abating as the season progressed. Comments focused on the exclusion of non-Kenaitze participants in the fishery and the perceived negative effect this fishery would have on the inriver sport fisheries. Visible public dissatisfaction with this fishery was minimal in 1991 and virtually absent thereafter.

This was the fifth year of the Ninilchik Traditional Council Educational Fishery. Very few complaints regarding this fishery have been received by the Soldotna area office.

RECOMMENDED RESEARCH & MANAGEMENT

No research or management activity specific to this fishery is recommended.

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APPENDIX A: UPDATED TABLES

Appendix A1.-Angler-days of effort expended by recreational anglers fishing Kenai Peninsula Management Area waters, 1977-1997.

Year	West Cook Inlet Saltwater	West Cook Inlet Freshwater	Kenai Peninsula Saltwater Finfish	Kenai Peninsula Saltwater Shellfish	Kenai River	Other Kenai Peninsula Freshwater	Kenai Peninsula Dipnet	Kenai Area Total	Percent of State	Alaska Total
1977			79,045	25,393	122,138	154,581		381,157	31.8	1,198,486
1978			93,807	29,750	164,264	180,322		468,143	36.4	1,286,063
1979			100,010	30,323	178,485	182,933		491,751	36.0	1,364,739
1980			89,065	31,494	171,803	188,508		480,870	32.3	1,488,962
1981			93,432	57,867	178,716	159,806		489,821	34.5	1,420,772
1982			91,033	48,826	231,948	172,483		544,290	33.5	1,623,090
1983	2,911	5,425	136,566	53,305	229,228	145,862	9,576	582,873	33.6	1,732,528
1984	4,549	4,182	127,635	55,208	270,422	169,006	7,227	638,229	34.2	1,866,837
1985	4,455	6,952	122,243	49,453	322,230	197,358	10,647	713,338	36.7	1,943,069
1986	5,977	4,471	143,160	55,241	335,051	221,521	15,856	781,277	37.7	2,071,412
1987	3,855	5,594	186,525	46,137	289,165	264,243	32,473	827,992	38.5	2,152,886
1988	6,042	5,520	183,254	44,304	374,259	224,972	37,304	875,655	37.9	2,311,291
1989	3,942	5,850	163,717	32,374	376,902	178,264	33,054	794,103	35.1	2,264,079
1990	4,499	5,970	218,622	39,769	342,662	224,553	2,184	838,259	34.0	2,463,284
1991	3,856	9,443	204,216	38,767	323,368	230,579	12,040	822,269	33.5	2,456,328
1992	3,950	6,867	225,442	60,513	332,573	241,743	12,131	883,219	34.8	2,540,374
1993	4,712	8,042	232,298	54,691	324,120	247,316	16,525	887,704	34.7	2,559,408
1994	5,354	6,656	344,512	67,159	340,904	251,272	14,785	1,030,642	37.9	2,719,911
1995	5,166	7,642	278,461	60,011	377,710	226,586	17,124	972,700	34.9	2,787,670
1996	4,610	10,107	261,885	56,785	357,130	218,630	33,697	942,844	34.5	2,733,008
1997	4,804	7,928	259,519	49,775	321,235	208,851	33,068	885,180	33.3	2,654,454

Appendix A2.-Economic value (thousands of dollars) of Kenai Peninsula Management Area (KPMA) recreational fisheries during 1986.

Fishery	Resident Anglers		Nonresident Anglers		All Anglers	
	Expenditures	Net WTP[a]	Expenditures	Net WTP	Expenditures	Net WTP
Kenai River						
Early-run chinook salmon fishing	4,186	4,038	6,148	2,916	10,334	6,954
Late-run chinook salmon fishing	3,184	2,477	5,142	2,444	8,326	4,921
Early-run coho salmon fishing	2,848	2,541	1,068	466	3,916	3,007
Late-run coho salmon fishing	2,020	1,645	2,619	1,139	4,639	2,784
Sockeye salmon fishing	1,613	1,711	2,571	418	4,184	2,129
Rainbow trout fishing	1,989	688	486	125	2,475	813
Other fishing	3,092	2,141	995	503	4,087	2,644
All sport fishing	18,932	15,241	19,029	8,011	37,961	23,252
Russian River						
Early-run sockeye salmon fishing	2,804	2,130	1,361	640	4,165	2,770
Late-run sockeye salmon fishing	480	211	566	267	1,046	478
Total	3,284	2,341	1,927	907	5,211	3,248
Lower Kenai Peninsula streams						
Chinook salmon fishing	1,338	503	797	207	2,135	710
Other fishing	2,213	1,467	1,566	289	3,779	1,756
All fishing	3,551	1,970	2,363	496	5,914	2,466
Deep Creek Marine						
Halibut fishing	1,840	2,357	2,192	269	4,032	2,626
Chinook salmon fishing	1,427	1,253	929	404	2,356	1,657
Total	3,267	3,610	3,121	673	6,388	4,283
Kachemak Bay						
Halibut fishing	5,818	5,364	2,902	2,709	8,720	8,073
Other fishing	7,411	111,061	9,902	10,204	17,313	121,265
TOTAL	42,263	139,587	39,244	23,000	81,507	162,587

From: Jones and Stokes 1987.

[a] Net willingness to pay.

Appendix A3.-Summary of upper Kenai Peninsula emergency orders, 1995-1998.

Emergency Order Number	Effective Date	Action/Justification
2-RT-1-01-95	4/15/1995 12:01 a.m.	Close Kenai Lake outlet to all fishing through June 10. Conserve rainbow trout.
2-KS-1-11-95	6/13/1995 12:01 a.m.	Extend Ninilchik R. king salmon fishery through June 26. Surplus stocked king salmon.
2-KS-1-17-95	6/17/1995 12:01 a.m.	Permit bait in Kenai River king salmon fishery. Early-run escapement goal projected.
2-RS-1-22-95	6/30/1995 12:00 noon	Open Russian River Sanctuary. Early-run sockeye salmon escapement goal projected.
2-RS-1-26-95	7/11/1995 12:01 a.m.	Close Crescent River drainage (west side of Cook Inlet) to sockeye salmon fishing. Conserve sockeye salmon.
2-RS-1-29-95	7/17/1995 6:00 p.m.	Open Kasilof personal use dip net fishery. Escapement goal of 150,000 to be exceeded.
2-RS-1-33-95	7/25/1995 6:00 a.m.	Open Kenai R. personal use dip net fishery. Escapement goal of 450,000 to be exceeded.
2-KS-1-33-95	7/25/1995 12:01 a.m.	Permit fishing from boats in Kenai River on Monday, July 31 and extend late run king salmon fishery through August 6. Projected escapement goal will be exceeded.
2-SH-1-09-96	4/1/1996 12:01 a.m.	Close Crooked Creek to all fishing through July 31. Prohibits retention of rainbow/steelhead trout and requires only unbaited, artificial lures through May 15 in the Kasilof River downstream from the Sterling Highway Bridge. Issued to implement new regulation passed by BOF not yet in effect.
2-RT-1-10-96	4/15/1996 12:01 a.m.	Close outlet of Kenai Lake to all fishing. Issued to implement new BOF regulation not yet in effect.
2-KS-1-12-96	5/15/1996 12:01 a.m.	Close 1/3 mile of Kenai River in immediate area of the king salmon sonar site to all fishing through June 30. Permit department to accurately estimate early-run king salmon.
2-KS-1-15-96	6/1/1996 12:01 a.m.	Supersedes 2-KS-1-12-96. Close 1/3 mile of Kenai River in immediate area of the king salmon sonar site to all boat fishing through June 30. Shore anglers do not affect sonar.

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Appendix A3.-Page 2 of 4.

Emergency Order Number	Effective Date	Action/Justification
2-KS-1-17-96	6/9/1996 12:01 a.m.	Rescinds Emergency Order 2-KS-1-15-96 effective June 9. Permits bait use downstream from Skilak Lake. Projected escapement goal will be exceeded.
2-KS-1-20-96	6/15/1996 12:01 a.m.	Extend king salmon fishery on Ninilchik River through June 24. Sufficient numbers of king salmon are present to provide additional fishing opportunity.
2-KS-1-19-96	6/17/1996 12:01 a.m.	Permit fishing from boats downstream from Skilak Lake on Monday June 17. Spawning escapement is projected to exceed optimum escapement by 25%.
2-RS-1-21-96	6/17/1996 12:00 noon	Open Russian-Kenai River Sanctuary. Increase bag limit to 6 fish. Early-run escapement goal projected.
2-KS-23-96	6/24/1996 12:01 a.m.	Permit fishing from boats downstream from Skilak Lake on Monday June 24. Spawning escapement is projected to exceed optimum escapement by 25%.
2S-02-96	6/25/1996 6:00 p.m.	Close Kasilof River personal use gillnet salmon fishery. Projected harvest of 5,000 to 10,000 sockeye salmon will be met.
2-RS-1-28-96	7/2/1996 12:01 a.m.	Close 10 miles of bank along Kenai River through August 15. Protection of shoreline habitat.
2-RS-1-31-96	7/16/1996 12:01 a.m.	Close Crescent River drainage (west side of Cook Inlet) to sockeye salmon fishing. Conserve sockeye salmon.
2-KS-1-33-96	8/1/1996 12:01 a.m.	Extend late-run king salmon fishery downstream from Eagle Rock through August 4. Projected escapement goal will be exceeded.
2-RS-1-36-96	8/3/1996 12:01 a.m.	Close Russian River fly-fishing-only area to sockeye salmon fishing through December 31. Escapement is lagging behind minimum goal established for the late run.
2-KS-1-10-97	5/24/97 12:01 a.m.	Close 200-yard area at Centennial Park for habitat protection.

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Appendix A3.-Page 3 of 4.

Emergency Order Number	Effective Date	Action/Justification
2-KS-1-12-97	6/17/97 12:01 a.m.	Mandatory catch-and-release required for conservation of early-run Kenai River king salmon. Gear restricted to single-hook, artificial lures.
2-RS-1-14-97	6/18/97 12:00 noon	Open Russian River Sanctuary, increase bag and possession limits to 6. Escapement goal projected.
2-KS-1-16-97	7/1/97 12:01 a.m.	Catch-and-release for king salmon upstream from Soldotna Bridge through July 10. Early-run escapement goal not projected.
2-RS-1-17-97	7/1/97 12:01 a.m.	Close additional 5.1 miles of Kenai bank to bank fishing. Habitat protection.
2-KS-1-24-97	7/21/97 12:01 a.m.	Permit boats to be used downstream from Skilak Lake on Monday, 7/21. Escapement goal for king salmon projected.
2-KS-1-26-97	7/28/97 12:01 a.m.	Permit boats to be used downstream from Skilak Lake on Monday, 7/28. Escapement goal for king salmon projected.
2-RS-29-97	7/31/97 12:01 a.m.	Close Kenai/Russian River "fly-fishing-only" area upstream of ferry crossing. Low late-run spawning escapement.
2-KS-1-27-97	8/1/97 12:01 a.m.	Extend king salmon season downstream from Eagle Rock through 8/3.
2-SS-1-33-97	8/9/97 12:01 a.m.	Prohibit anglers from fishing in Kenai River after taking a limit of 1 coho. Correct omission in E.O. 2-SS-02-31-97.
2-KS-1-07-98	6/5/98 12:01 a.m.	Mandatory catch-and-release in Kenai River king salmon fishery. No bait; single hook; retention of 52 inches and larger fish permitted.
2-RS-1-10-98	6/20/98 12:00 noon	Open Sanctuary at Russian River.
2-KS-1-11-98	7/1/98 12:01 a.m.	Harvesting of late-run fish permitted downstream from Soldotna bridge; upstream from bridge catch-and-release continues through July 10.
2-RS-1-04-98	7/1/98 12:01 a.m.	Closed 3/4 mile of bank at end of Keystone Drive to fishing from 7/1 - 8/15.
2-KS-1-16-98	7/23/98 12:01 a.m.	No bait in Kenai River king fishery; treble hooks o.k.

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Appendix A3.-Page 4 of 4.

Emergency Order Number	Effective Date	Action/Justification
2-PU-1-18-98	7/24/98 12:01 a.m.	Reduced time salmon harvested in PU fishery to 6:00 a.m. - 11:00 p.m.
2-RS-1-17-98	7/24/98 12:01 a.m.	Reduced Kenai sockeye limit to 3; hours reduced to 6:00 a.m. - 11:00 p.m.
2-RS-1-19-98	7/25/98 12:01 a.m.	Closed bank fishing at Soldotna Creek Park from July 25 - August 31.
2-KS-1-23-98	7/28/98 12:01 a.m.	Catch-and-release only in Kenai River king fishery. No bait; treble hooks and retention of 52 inches and greater o.k.
2-RS-1-20-98	7/28/98 12:01 a.m.	Closed Kenai River sockeye fishery from RM 19 downstream to Cook Inlet.
2-PU-1-21-98	7/28/98 12:01 a.m.	Closed the personal use fishery at mouth of the Kenai River.
2-RS-1-22-98	7/28/98 12:01 a.m.	Closed Kenaitze educational fishery.
2-RS-1-25-98	8/3/98 12:01 a.m.	Restore Kenai River sockeye bag limit to 6, remove hourly restrictions and re-open sockeye fishing downstream from RM 19.
2-RS-1-26-98	8/3/98 12:01 a.m.	Re-open the Kenaitze educational fishery.
2-RS-1-28-98	8/3/98 12:01 a.m.	Increased bag and possession limits at Russian River to 6 fish.

Appendix A4.-Historical summary of Kasilof River drainage early-run chinook salmon fishery, 1978-1998.

Year	Kasilof River [a] Harvest		Crooked Creek Egg Take	Crooked Creek Escapement	Sold or Destroyed by Hatchery	Total Return	Catch Per [b] Hour
	Number	Percent	Number	Number	Number	Number	
1978	251	5.1	202	4,513		4,966	0.038
1979	283	7.4	181	3,363		3,827	0.040
1980	310	12.0	167	2,115		2,592	0.019
1981	1,242	30.0	49	2,855		4,146	0.061
1982	2,316	39.8	244	3,259		5,819	0.088
1983	2,853	39.9	496	3,809		7,158	0.044
1984	3,964	52.1	437	3,213		7,614	0.062
1985	2,986	51.5	291	2,521		5,798	0.044
1986	7,071	67.0	317	3,161		10,549	0.073
1987	4,461	54.5	324	3,400		8,185	0.071
1988	4,953	56.6	321	700	2,775	8,749	0.086
1989	3,767	55.6	263	750	1,998	6,778	0.099
1990	2,852	55.6	379	771	1,125	5,127	0.098
1991	5,055	71.5	258	700	1,055	7,068	[c]
1992	6,049	65.3	267	750	2,196	9,262	[c]
1993	9,724	87.9	376	848	113	11,061	[c]
1994	7,217	80.1	134	640	1,016	9,007	[c]
1995	6,681	69.3	0	750	2,206	9,637	[c]
1996	5,435	71.0	0	764	1,460	7,659	[c]
1997	5,679		0	[d]	0		[c]
Mean	4,157	51.2	235	2,046	1,394	7,105	0.041
1998			0	[d]	0		[c]

Note: One-ocean jacks not included.

[a] Data obtained from Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995-1998). Includes an unknown small number of late-run fish.

[b] Data obtained from FRED Division Kasilof River creel survey.

[c] No survey conducted.

[d] Hatchery closed; weir not in place.

Appendix A5.-Kasilof River personal use and subsistence gillnet harvest of chinook salmon, 1984-1997.

Year	Chinook Harvest
1984	165
1985	193
1986	168
1987	184
1988	118
1989	186
1990	129
1991	129
1992	no fishery
1993	47
1994	610[a,b]
1995	695[a]
1996	44
1997	62

[a] Fishery occurred on Ninilchik, Cohoe, Kalifornsky, and Salamatof beaches throughout the season, so includes chinook from many parent streams and from both early and late runs.

[b] Fishery in 1994 was designated as a subsistence fishery.

Appendix A6.-Big River Lakes sockeye salmon harvest, catch, and effort as estimated by the Statewide Harvest Survey, 1990-1997.

Year	Catch	Harvest	Angler-days
1990	1,044	437	370
1991	NA	NA	NA
1992	NA [a]	NA	NA
1993	2,364	976	535
1994	1,595	1,013	653
1995	2,180	998	659
1996	6,140	2,568	1,646
1997	4,485	1,404	1,290

Source: Statewide Harvest Survey (Mills 1991-1994, Howe et al. 1995-1998).

[a] Too few responses to Statewide Harvest Survey from this site to generate an estimate.

Appendix A7.-Historical summary of escapement, harvest, angler effort, and harvest rate, Russian River early-run sockeye salmon, 1963-1998.

Year	Days Effort	Hours Effort	Harvest/ Hour	Harvest	Spawning Escapement	Local Return
1963	5,710	Unknown		3,670	14,380	18,050
1964	3,980	13,600	0.261	3,550	12,700	16,250
1965	7,750	37,710	0.266	10,030	21,510	31,540
1966	11,970	63,080	0.237	14,950	16,660	31,610
1967	11,460	62,960	0.115	7,240	13,710	20,950
1968	11,780	66,540	0.104	6,920	9,120	16,040
1969	12,290	61,790	0.095	5,870	5,000	10,870
1970	9,700	48,730	0.118	5,750	5,450	11,200
1971	6,250	33,060	0.085	2,810	2,650	5,460
1972	12,340	52,500	0.096	5,040	9,270	14,310
1973	15,220	70,950	0.095	6,740	13,120	19,860
1974	11,090	61,330	0.105	6,440	13,160	19,600
1975	5,210	20,590	0.068	1,400	5,650	7,050
1976	8,930	28,910	0.117	3,380	14,735	18,115
1977	38,200	138,580	0.147	20,400	16,060	36,460
1978	51,910	196,590	0.192	37,720	34,240	71,960
1979	25,670	96,300	0.087	8,400	19,750	28,150
1980	31,430	130,820	0.208	27,220	28,620	55,840
1981	24,780	103,130	0.104	10,720	21,140	31,860
1982	39,000	163,140	0.211	34,500	56,110	90,610
1983	18,560	78,550	0.106	8,360	21,270	29,630
1984	29,230	144,680	0.248	35,880	28,900	64,780
1985	16,140	75,000	0.164	12,300	30,610	42,910
1986	29,850	126,720	0.277	35,100	36,340	71,440
1987	80,360	319,820	0.482	154,200	61,510	215,710
1988	46,600	186,390	0.294	54,780	50,410	105,190
1989	20,800	79,660	0.142	11,290	15,340 [a]	26,630
1990	44,740	178,970	0.169	30,215	26,720 [b]	56,935
1991	64,651	255,854	0.256	65,390	32,389 [c]	97,779
1992	37,484	143,937	0.212	30,512	37,117	67,629
1993	34,602	134,949	0.276	37,261	39,857	77,118
1994	42,422	178,173	0.275	48,923	44,872	93,795
1995	31,019	124,076	0.190	23,572	28,603	52,175
1996	51,710	225,457	0.334	75,203	52,905	128,108
1997 [d]				50,558	36,280	86,838
Mean	26,260	105,790	0.180	25,610	25,030	50,640
1998 [d]					34,143	34,143

[a] Includes 60 fish used to test brood source for disease.

[b] Includes 1,572 fish used as brood source for stocking in Resurrection Bay.

[c] Includes 729 fish used as brood source for stocking in Resurrection Bay.

[d] Creel survey not conducted.

Appendix A8.-Daily escapement of early-run sockeye salmon at Russian River weir in 1998 and historic mean daily escapement proportions, 1978-1997.

Date	Daily Count	Total Count	Historic Proportion By Day	Date	Daily Count	Total Count	Historic Proportion By Day
08-Jun	0	0	0.000				
09-Jun	1	1	0.001	05-Jul	1,817	25,270	0.749
10-Jun	0	1	0.004	06-Jul	1,947	27,217	0.789
11-Jun	19	20	0.008	07-Jul	1,711	28,928	0.823
12-Jun	28	48	0.016	08-Jul	1,407	30,335	0.854
13-Jun	464	512	0.021	09-Jul	1,017	31,352	0.886
14-Jun	243	755	0.029	10-Jul	801	32,153	0.909
15-Jun	133	888	0.038	11-Jul	1,008	33,161	0.934
16-Jun	1,383	2,271	0.047	12-Jul	115	33,276	0.946
17-Jun	2,049	4,320	0.062	13-Jul	350	33,626	0.959
18-Jun	2,409	6,729	0.081	14-Jul	226	33,852	0.967
19-Jun	758	7,487	0.097	15-Jul	56	33,908	0.973
20-Jun	2,298	9,785	0.124	16-Jul	67	33,975	0.980
21-Jun	1,930	11,715	0.150	17-Jul	59	34,034	0.986
22-Jun	1,279	12,994	0.179	18-Jul	54	34,088	0.990
23-Jun	934	13,928	0.204	19-Jul	3	34,091	0.993
24-Jun	1,367	15,295	0.246	20-Jul	35	34,126	0.995
25-Jun	313	15,608	0.289	21-Jul	5	34,131	0.996
26-Jun	444	16,052	0.336	22-Jul	12	34,143	0.997
27-Jun	300	16,352	0.381	23-Jul	0	34,143	0.998
28-Jun	1,258	17,610	0.422	24-Jul	0	34,143	0.998
29-Jun	1,392	19,002	0.467	25-Jul	0	34,143	0.999
30-Jun	1,315	20,317	0.508	26-Jul	0	34,143	1.000
01-Jul	587	20,904	0.548	27-Jul	0	34,143	1.001
02-Jul	404	21,308	0.613	28-Jul	0	34,143	1.001
03-Jul	1,300	22,608	0.667	29-Jul	0	34,143	1.001
04-Jul	845	23,453	0.710	30-Jul	0	34,143	1.001

Appendix A9.-Estimated age and sex composition and length-at-age of early-run sockeye salmon at Russian River weir, 1998.

	1.2	1.3	2.2	2.3	3.3	TOTAL
Female						
Sample Size	1	29	11	113	0	154
Percent	0.3	9.9	3.7	38.4		52.4
SE (Percent)	0.3	1.7	1.1	2.8		2.9
Escapement	116	3,368	1,277	13,123		17,884
SE (Escapment)	116	594	378	969		995
Mean Length (mm)	508	568	531	570	0	566
SE		4.1	6.6	1.9		1.9
Male						
Sample Size		20	5	114	1	140
Percent		6.8	1.7	38.8	0.3	47.6
SE (Percent)		1.5	0.8	2.8	0.3	2.9
Escapement		2,323	581	13,239	116	16,259
SE (Escapment)		501	257	970	116	995
Mean Length (mm)		566	519	574	590	571
SE		4.1	6.3	2.0		2.0
Combined						
Sample Size	1	49	16	227	1	294
Percent	0.3	16.7	5.4	77.2	0.3	100.0
SE (Percent)	0.3	2.2	1.3	2.4	0.3	
Escapement	116	5,691	1,858	26,362	116	34,143
SE (Escapment)	116	742	452	835	116	
Mean Length (mm)	508	567	527	572	590	569
SE		2.9	5.0	1.4		1.4

Appendix A10.-Summary of early-run Kenai River chinook salmon population data, 1985-1998.

Year	Deep Creek Marine Harvest	Eastside Set Net Harvest	Drift Gill Net Harvest	Commercial Personal Use	Kenaitze Educational Fishery	Kenai River Sport Harvest	Hook-and-Release Mortality	Escapement	Total Return
1985	Unknown	Closed	Closed			7,971		8,001	15,972
1986	Unknown	Closed	Closed			7,561	292	19,227	27,080
1987	Unknown	Closed	Closed			13,281	374	11,988	25,643
1988	Unknown	Closed	Closed			12,747	377	7,756	20,880
1989	Unknown	Closed	Closed		73	7,256	169	10,567	18,065
1990	Unknown	Closed	Closed		40	1,735	285	8,659	10,719
1991	Unknown	Closed	Closed		2	891	116	9,924	10,933
1992	Unknown	Closed	Closed		73	1,365	164	8,558	10,160
1993	Unknown	Closed	Closed		118	7,727	219	11,975	20,039
1994	Unknown	Closed	Closed		56	5,634	128	12,752	18,570
1995	Unknown	Closed	Closed		37	10,327	401	11,156	21,921
1996	Unknown	Closed	Closed		14	5,966	241	17,298	23,519
1997	Unknown	Closed	Closed		141	6,535	186	8,242	15,104
1998	Unknown	Closed	Closed		122	891	63	8,230	9,306

Appendix A11.-Summary of harvest, angler effort and harvest rate estimated by onsite creel survey, early-run Kenai River chinook salmon fishery, 1974-1998.

Year	Harvest	Days Effort	Hours Effort	HPUE[a]
1974	1,685	11,275	41,098	0.041
1975	615	15,047	55,909	0.011
1976	1,554	16,430	64,750	0.024
1977	2,173	35,479	112,007	0.019
1978	1,542	19,568	96,624	0.016
1979	2,661	39,665	139,154	0.019
1980	1,946	32,365	123,019	0.016
1981	4,525	28,335	120,881	0.037
1982	5,466	45,723	166,334	0.033
1983	6,360	42,716	169,997	0.037
1984	4,956	50,455	201,821	0.025
1985	7,971	47,394	184,836	0.043
1986	7,561	50,608	183,901	0.041
1987	13,281	52,716	216,816	0.061
1988	12,747	52,890	259,901	0.049
1989	7,256	58,218	234,527	0.031
1990	1,735	28,845	123,149	0.024 [b]
1991	891	10,518	47,599	0.031 [b]
1992	1,365	11,615	54,330	0.043 [b]
1993	7,727	34,301	153,899	0.050
1994	5,634	37,628	173,842	0.032
1995	10,327	42,715	188,161	0.055
1996	5,966	35,892	185,921	0.032
1997	6,535	29,320	129,009	0.051
Mean	5,103	34,572	142,812	0.034
1998	891	13,018	67,182	0.013

[a] Harvest per angler per hour.

[b] Harvest per angler per hour does not include periods open only to retention of trophy (greater than 52 inches) chinook salmon.

Appendix A12.-Summary of Kenai River fishing guide registration program, 1982-1998.

Year	Businesses Registered	Guides Registered	Vessels Registered		
			Powered	Drift	Total
1982	125	207			179
1983	123	198			185
1984	115	214			199
1985	107	160	131	40	171
1986	130	187	138	60	198
1987	145	222	154	77	231
1988	162	252	180	79	259
1989	202	292	225	101	326
1990	230	310	229	126	355
1991	176	290	198	112	310
1992	194	238	251	134	385
1993	191	222	169	127	296
1994	[a]	257	182	157	339
1995	[a]	314	236	177	413
1996	[a]	335	326	124	450
1997	[a]	354	314	158	472
1998	[a]	325	326	137	463

Note: Data provided by Division of Parks and Outdoor Recreation.

[a] Data not available.

Appendix A13.-Guided vs. nonguided angler harvest, effort, and success rate, estimated by onsite creel survey, early-run Kenai River chinook salmon fishery, 1981-1998.

	HARVEST								EFFORT				
	Guided			Non-Guided			Total		Guided (Hours)		Non-Guided (Hours)		Total (Hours)
Year	Number	%	HPUE [a]	Number	%	HPUE [a]	Number	HPUE [a]	Number	%	Number	%	Number
1981	2,247	49.7	0.080	2,278	50.3	0.025	4,525	0.037	28,044	23.2	92,837	76.8	120,881
1982	2,464	45.1	0.083	3,002	54.9	0.022	5,466	0.033	29,774	17.9	136,560	82.1	166,334
1983	4,086	64.2	0.084	2,274	35.8	0.019	6,360	0.037	48,789	28.7	121,208	71.3	169,997
1984	2,560	51.7	0.053	2,396	48.3	0.016	4,956	0.025	48,235	23.9	153,586	76.1	201,821
1985	4,780	60.0	0.082	3,191	40.0	0.025	7,971	0.043	58,593	31.7	126,243	68.3	184,836
1986	3,986	52.7	0.081	3,575	47.3	0.027	7,561	0.041	49,033	26.7	134,868	73.3	183,901
1987	6,382	48.1	0.114	6,899	51.9	0.043	13,281	0.061	55,977	25.8	160,839	74.2	216,816
1988	6,956	54.6	0.089	5,791	45.4	0.032	12,747	0.049	78,465	30.2	181,436	69.8	259,901
1989	5,304	73.1	0.052	1,952	26.9	0.015	7,256	0.031	102,245	43.6	132,282	56.4	234,527
1990	1,368	78.8	0.038 [b]	367	21.2	0.010	1,735	0.024 [b]	65,960	53.6	57,189	46.4	123,149
1991	593	66.6	0.043 [b]	298	33.4	0.020	891	0.031 [b]	23,279	48.9	24,320	51.1	47,599
1992	712	52.2	0.052 [b]	653	47.8	0.036	1,365	0.043 [b]	26,113	48.1	28,217	51.9	54,330
1993	4,062	59.3	0.070	2,784	40.7	0.029	6,846 [c]	0.044	58,393	37.9	95,506	62.1	153,899
1994	3,198	67.7	0.040	1,524	32.3	0.016	4,722 [c]	0.027	80,002	46.0	93,840	54.0	173,842
1995	4,724	61.1	0.055	3,009	38.9	0.029	7,733 [c]	0.041	86,057	45.7	102,104	54.3	188,161
1996	3,185	53.4	0.044	981	16.4	0.017	5,966 [c]	0.046	71,629	55.0	58,551	45.0	130,180
1997	3,661	56.0	0.057	1,282	19.6	0.034	6,535 [c]	0.064	64,449	63.0	37,790	37.0	102,239
Mean	3,545	58.5	0.066	2,486	38.3	0.024	6,230	0.040	57,355	38.2	102,199	61.8	159,554
1998	675	75.8	0.015	216	24.2	0.010	891	0.013	46,104	68.6	21,078	31.4	67,182

[a] Harvest per angler per hour.

[b] Harvest per angler per hour does not include periods open only to retention of trophy (greater than 52 inches) chinook salmon.

[c] Total harvest includes estimated harvest from the upstream Kenai River where the creel survey was not conducted (Hammarstrom 1997).

Appendix A14.-Summary of harvest, angler effort and harvest rate, estimated by onsite creel survey, late-run Kenai River chinook salmon fishery, 1974-1998.

Year	Harvest	Days Effort	Hours Effort	HPUE[a]
1974	3,225	12,335	87,162	0.037
1975	2,355	14,943	53,523	0.044
1976	5,353	28,030	114,795	0.047
1977	5,148	47,539	135,082	0.038
1978	5,578	60,636	212,217	0.026
1979	4,634	58,895	205,887	0.023
1980	3,608	38,260	154,435	0.023
1981	5,285	29,906	149,296	0.035
1982	4,810	43,366	197,775	0.024
1983	9,174	56,295	248,519	0.037
1984	7,376	77,462	348,579	0.021
1985	8,055	73,613	294,453	0.027
1986	9,004	75,092	244,440	0.037
1987	12,327	66,403	310,840	0.040
1988	17,512	85,282	361,759	0.048
1989	9,127	71,110	329,051	0.028
1990	6,247	67,101	291,966	0.022 [b]
1991	6,849	48,604	229,999	0.030
1992	6,680	40,649	187,415	0.039 [b]
1993	15,279	59,434	293,908	0.052
1994	14,388	71,931	354,778	0.041
1995	10,125	65,918	323,982	0.031
1996	5,984	47,987	238,495	0.025
1997	10,336	57,313	263,642	0.039
Mean	7,852	54,088	234,667	0.034
1998	5,981	36,409	188,726	0.032 [b]

[a] Harvest per angler per hour.

[b] Harvest per angler per hour does not include periods open only to retention of trophy (greater than 52 inches) chinook salmon.

Appendix A15.-Guided vs. nonguided angler harvest, effort, and success rate, late-run Kenai River chinook salmon fishery, 1981-1998.

	HARVEST								EFFORT				
	Guided			Non-Guided			Total		Guided (Hours)		Non-Guided (Hours)		Total (Hours)
Year	Number	%	HPUE[a]	Number	%	HPUE[a]	Number	HPUE[a]	Number	%	Number	%	Number
1981	2,530	47.9	0.069	2,755	52.1	0.024	5,285	0.035	36,727	24.6	112,569	75.4	149,296
1982	2,397	49.8	0.047	2,413	50.2	0.016	4,810	0.024	50,828	25.7	146,947	74.3	197,775
1983	5,110	55.7	0.100	4,064	44.3	0.021	9,174	0.037	51,195	20.6	197,324	79.4	248,519
1984	2,928	39.7	0.064	4,448	60.3	0.015	7,376	0.021	45,664	13.1	302,915	86.9	348,579
1985	3,045	37.8	0.066	5,010	62.2	0.020	8,055	0.027	45,936	15.6	248,517	84.4	294,453
1986	3,546	39.4	0.067	5,458	60.6	0.028	9,004	0.037	52,843	21.6	191,597	78.4	244,440
1987	5,966	48.4	0.075	6,361	51.6	0.027	12,327	0.040	79,329	25.5	231,511	74.5	310,840
1988	9,409	53.7	0.099	8,103	46.3	0.030	17,512	0.048	95,181	26.3	266,578	73.7	361,759
1989	5,328	58.4	0.054	3,799	41.6	0.016	9,127	0.028	97,966	29.8	231,085	70.2	329,051
1990	3,808	61.0	0.038 [b]	2,439	39.0	0.013 [b]	6,247	0.022 [b]	101,223	34.7	190,743	65.3	291,966
1991	3,864	56.4	0.047	2,985	43.6	0.020	6,849	0.030	82,706	36.0	147,293	64.0	229,999
1992	4,176	62.5	0.064 [b]	2,504	37.5	0.024 [b]	6,680	0.039 [b]	75,324	40.2	112,091	59.8	187,415
1993	7,866	51.5	0.085	7,413	48.5	0.037	15,279	0.052	92,213	31.4	201,695	68.6	293,908
1994	6,628	46.1	0.060	7,760	53.9	0.032	14,388	0.041	110,049	31.0	244,729	69.0	354,778
1995	5,211	51.5	0.042	4,914	48.5	0.025	10,125	0.031	123,585	38.1	200,397	61.9	323,982
1996	3,853	64.4	0.035	2,131	35.6	0.017	5,984	0.025	110,057	46.1	128,438	53.9	238,495
1997	5,854	56.6	0.046	4,481	43.4	0.033	10,335	0.039	126,418	48.0	137,225	52.0	263,643
Mean	4,795	51.8	0.062	4,532	48.2	0.023	9,327	0.034	81,014	29.9	193,627	70.1	274,641
1998	3,575	59.8	0.036	2,406	40.2	0.027	5,981	0.032	98,872	52.4	89,854	47.6	188,726

[a] Harvest per angler per hour.

[b] Harvest per angler per hour does not include periods open only to retention of trophy (greater than 52 inches) chinook salmon.

Appendix A16.-Late-run Kenai River chinook salmon population data, 1985-1998.

Year	Deep Creek [a] Marine Harvest	Eastside Set Net Harvest	Drift Gill Net Harvest	Personal Use	Subsistence and Educational	Kenai River Sport Harvest	Hook-and-Release Mortality	Spawning Escapement	Total Return
1984	835	6,165	1,377			7,376		31,796	47,549
1985	1,731	17,723	2,046			8,055		21,708	51,263
1986	630	19,810	1,834			9,004	522	48,037	79,837
1987	1,097	20,588	4,551			12,237	368	35,518	74,359
1988	1,262	12,870	2,216			17,512	472	34,024	68,356
1989	1,294	10,919	0 [b]	4	22	9,127	327	19,581	41,274
1990	1,318	4,139	621	91	13	6,247	141	27,086	39,656
1991	2,019	4,891	241	130	288	6,849	103	27,662	42,183
1992	2,502	10,718	543	50	402	6,680	308	23,326	44,529
1993	3,344	14,002	751	129	27	15,279	363	34,032	67,927
1994	2,301	15,885	460	13	392	14,388	344	38,549	72,332
1995	3,216	12,032	523	36	648	10,125	312	33,899	60,791
1996	1,996	11,521	365	45	294	5,816 [c]	64 [c]	33,476 [c,d]	53,577 [c,d]
1997	2,895	10,577	489	339	26	10,336	183	29,104 [d]	53,949
1998	Unknown [e]	4,990	332	51	222	5,981	326	28,573	40,475

[a] Determined by creel survey, 1984-1986 (Hammarstrom et al. 1985 and 1987, Hammarstrom and Larson 1986); by Statewide Harvest Survey (SWHS) 1987-1997 (Mills 1988-1994, Howe et al. 1995-1998). Includes Cook Inlet from Anchor Point to Ninilchik. Late-run harvest 1987-1990 from Sonnichsen and Alexandersdottir 1991. Harvest for 1991-1995 was apportioned 70.5% to the early run and 29.5% to the late run, based on estimates from onsite creel surveys from 1972-1986 (Hammarstrom 1975-1981; Hammarstrom and Larson 1982-1984, 1986; and Hammarstrom et al. 1985). Harvest was estimated separately for the two runs in the 1996 and 1997 SWHS.

[b] No commercial drift net fishery conducted in 1989 due to *Exxon Valdez* oil spill.

[c] Does not include an estimated 304 fish harvested below the sonar counter, and 11 hook-and-release mortalities below the counter.

[d] Sonar counts for 1996 and 1997 were 49,755 and 49,933, respectively (Bosch and Burwen *In prep*). Inriver abundance estimates from radio-telemetry in 1996 and 1997 were 39,356 and 39,080, respectively (Hammarstrom and Hasbrouck 1998 and *In prep*). The more accurate estimate is radio-telemetry. Escapement and total return estimates calculated using radiotelemetry data.

[e] Marine harvest estimate available in 1999.

Appendix A17.-Historical summary of angler effort, harvest rate, harvest, and escapement; Russian River late-run sockeye salmon, 1963-1998.

Year	Days Effort	Hours Effort	Harvest/ Hour	Harvest	Escapement		Local Return
					Above Weir	Below Weir	
1963	2,170	Unknown		1,390	51,120	Unknown	52,510
1964	1,350	5,070	0.483	2,450	46,930	Unknown	49,380
1965	1,970	8,280	0.261	2,160	21,820	Unknown	23,980
1966	6,310	28,700	0.254	7,290	34,430	Unknown	41,720
1967	5,500	29,490	0.194	5,720	49,480	Unknown	55,200
1968	5,500	28,250	0.206	5,820	48,880	4,200	58,900
1969	2,640	12,230	0.094	1,150	28,870	1,100	31,120
1970	1,000	2,240	0.268	600	26,200	220	27,020
1971	8,870	37,390	0.287	10,730	54,420	10,000	75,150
1972	13,360	55,920	0.287	16,050	79,115	6,000	101,165
1973	15,470	81,930	0.109	8,930	25,070	6,680	40,680
1974	10,030	45,210	0.188	8,500	24,900	2,210	35,610
1975	11,300	52,770	0.159	8,390	31,960	690	41,040
1976	17,380	74,000	0.185	13,700	31,940	3,470	49,110
1977	31,310	140,780	0.195	27,440	21,360	17,090	65,890
1978	17,950	98,830	0.248	24,530	34,340	18,330	77,200
1979	29,330	124,010	0.216	26,840	87,850	3,920	118,610
1980	24,900	117,100	0.286	33,500	83,980	3,220	120,700
1981	26,250	109,250	0.217	23,720	44,520	4,160	72,400
1982	12,480	59,130	0.175	10,320	30,800	45,000	86,120
1983	13,300	66,650	0.240	16,000	33,730	44,000	93,730
1984	20,320	94,850	0.232	21,970	92,660	3,000	117,630
1985	34,630	159,160	0.367	58,410	136,970	8,650	204,030
1986	22,400	89,780	0.343	30,810	40,280	15,230	86,320
1987	32,650	132,570	0.306	40,580	53,930	76,530	171,040
1988	25,430	94,840	0.206	19,540	42,480	30,360	92,380
1989	39,770	154,510	0.357	55,210	138,380	28,480	222,070
1990	39,970	159,890	0.351	56,180	83,430	11,760	151,370
1991	21,090	78,849	0.399	31,450	78,180	22,270	131,900
1992	23,015	87,918	0.297	26,101	63,478	4,980	94,559
1993	23,491	96,312	0.278	26,772	99,259	12,258	138,289
1994	21,712	91,192	0.289	26,375	122,277	15,366	164,018
1995	17,166	72,099	0.164	11,805	61,982	12,479	86,266
1996	17,322	77,951	0.258	20,142	34,691	31,601	86,434
1997 [a]				17,635	65,905	11,337	94,877
Mean	17,570	75,500	0.255	19,950	57,300	12,990	90,240
1998 [a]					113,477	19,593	133,070

[a] Creel survey not conducted.

Appendix A18.-Daily escapement of late-run sockeye salmon at Russian River weir in 1998 and historic mean daily escapement proportion, 1978-1997.

Date	Daily Count	Total Count	Historic Proportion By Day	Date	Daily Count	Total Count	Historic Proportion By Day
15-Jul	128	128	0.003	18-Aug	1,910	98,264	0.840
16-Jul	452	580	0.003	19-Aug	1,456	99,720	0.854
17-Jul	362	942	0.003	20-Aug	1,279	100,999	0.869
18-Jul	633	1,575	0.004	21-Aug	1,312	102,311	0.882
19-Jul	198	1,773	0.007	22-Aug	1,069	103,380	0.892
20-Jul	433	2,206	0.013	23-Aug	579	103,959	0.902
21-Jul	129	2,335	0.025	24-Aug	1,027	104,986	0.915
22-Jul	398	2,733	0.039	25-Aug	947	105,933	0.923
23-Jul	268	3,001	0.049	26-Aug	914	106,847	0.934
24-Jul	388	3,389	0.070	27-Aug	1,073	107,920	0.942
25-Jul	1,184	4,573	0.089	28-Aug	644	108,564	0.949
26-Jul	4,791	9,364	0.117	29-Aug	1,227	109,791	0.957
27-Jul	2,289	11,653	0.159	30-Aug	714	110,505	0.963
28-Jul	2,269	13,922	0.195	31-Aug	1,034	111,539	0.970
29-Jul	2,551	16,473	0.222	1-Sep	387	111,926	0.975
30-Jul	4,959	21,432	0.257	2-Sep	295	112,221	0.980
31-Jul	3,810	25,242	0.281	3-Sep	248	112,469	0.983
1-Aug	4,426	29,668	0.327	4-Sep	107	112,576	0.986
2-Aug	3,580	33,248	0.355	5-Sep	137	112,713	0.988
3-Aug	5,436	38,684	0.393	6-Sep	70	112,783	0.990
4-Aug	4,788	43,472	0.438	7-Sep	82	112,865	0.993
5-Aug	5,074	48,546	0.489	8-Sep	72	112,937	0.995
6-Aug	5,387	53,933	0.528	9-Sep	33	112,970	0.997
7-Aug	6,022	59,955	0.558	10-Sep	92	113,062	0.998
8-Aug	5,420	65,375	0.600	11-Sep	51	113,113	0.999
9-Aug	5,323	70,698	0.637	12-Sep	35	113,148	0.999
10-Aug	3,850	74,548	0.666	13-Sep	73	113,221	0.999
11-Aug	3,565	78,113	0.689	14-Sep	52	113,273	1.000
12-Aug	4,568	82,681	0.715	15-Sep	68	113,341	1.000
13-Aug	3,650	86,331	0.740	16-Sep	57	113,398	1.000
14-Aug	3,172	89,503	0.762	17-Sep	20	113,418	1.000
15-Aug	2,862	92,365	0.786	18-Sep	16	113,434	1.000
16-Aug	2,117	94,482	0.807	19-Sep	0	113,434	1.000
17-Aug	1,872	96,354	0.823	20-Sep	46 [a]	113,480	1.000

[a] Includes 23 late-run sockeye salmon that passed the weir from September 21 through September 27.

Appendix A19.-Kenai River sockeye salmon sonar counts, local late-run Russian River sockeye salmon return and percent of the Kenai River sockeye salmon escapement to enter Russian River, 1968-1998.

Year	Kenai River Sockeye Salmon Sonar Estimate	Late Run Russian River Local Return[a]	Percent of Kenai Sonar Estimate that returned to Russian River
1968	88,000	58,900	66.9
1969	53,000	31,120	58.7
1970	73,000	27,020	37.0
1971 [b]		75,160	
1972	318,000	101,165	31.8
1973	367,000	40,680	11.1
1974	161,000	35,610	22.1
1975	142,000	41,040	28.9
1976	380,000	49,110	12.9
1977	708,000	65,890	9.3
1978	399,000	77,200	19.3
1979	285,000	118,610	41.6
1980	464,000	120,700	26.0
1981	408,000	72,400	17.7
1982	620,000	86,120	13.9
1983	630,000	93,730	14.9
1984	345,000	117,630	34.1
1985	503,000	204,030	40.6
1986	501,000	86,320	17.2
1987	1,597,000	171,040	10.7
1988	1,021,500	92,380	9.0
1989	1,600,000	222,070	13.9
1990	659,500	151,370	23.0
1991	645,000	131,890	20.4
1992	994,760	94,559	9.5
1993	813,617	138,289	17.0
1994	1,003,446	164,018	16.3
1995	630,447	86,266	13.7
1996	797,847	86,434	10.8
1997	1,064,818	94,877	8.9
Mean	595,620	97,850	22.7
1998	767,558	[c]	[c]

[a] Late-run Russian River local return includes escapement above and below the weir plus sport harvest.

[b] Sonar data from 1971 not available due to equipment malfunction.

[c] Harvest unavailable pending Statewide Harvest Survey results; available in August 1999.

Appendix A20.-Late-run Russian River sockeye salmon harvest, escapement, and returning jacks, 1969-1998.

Year	Sport Harvest	Above Weir Escapement	Jacks Observed[a]	Percent of Escapement
1969	1,150	28,870	352	1.2
1970	600	26,200	2,542	9.7
1971	10,730	54,420	1,429	2.6
1972	16,050	79,115	160	0.2
1973	8,930	25,070	332	1.3
1974	8,500	24,900	1,008	4.0
1975	8,390	31,960	1,788	5.6
1976	13,700	31,940	1,204	3.8
1977	27,440	21,360	537	2.5
1978	24,530	34,340	2,874	8.4
1979	26,840	87,850	1,476	1.7
1980	33,500	83,980	1,533	1.8
1981	23,720	44,520	2,634	5.9
1982	10,320	30,800	1,777	5.8
1983	16,000	33,730	4,360	12.9
1984	21,970	92,660	3,450	3.7
1985	58,410	136,970	1,905	1.4
1986	30,810	40,280	1,812	4.5
1987	40,580	53,930	332	0.6
1988	19,540	42,480	12,589	29.6
1989	55,210	138,380	13,721	9.9
1990	52,980	83,430	6,713	8.0
1991	31,450	78,180	5,196	6.6
1992	26,101	63,478	4,213	6.6
1993	26,772	99,259	34,536	34.8
1994	26,375	122,277	6,730	5.5
1995	11,805	61,982	9,606	15.5
1996	20,142	34,691	7,388	21.3
1997	17,635	65,905	4,549	6.9
Mean	23,110	60,450	4,720	7.7
1998	[b]	113,477	31,242	27.5

[a] Fish that have returned after just 1 ocean year. These are visual counts of small fish at the weir, not based on scale pattern analysis.

[b] Creel survey not conducted. Harvest unavailable pending Statewide Harvest Survey results; available in August 1999.

Appendix A21.-Estimated age and sex composition and length-at-age of late-run sockeye salmon enumerated at Russian River weir, 1998.

	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	TOTAL
Female									
Sample Size	7	8	0	84	36	0	2	0	137
Percent	1.2	1.7	0.0	18.6	8.4	0.0	0.4	0.0	30.3
SE (Percent)	0.5	0.6	0.0	1.8	1.4	0.0	0.2	0.0	2.1
Escapement	1,403	1,953	0	21,082	9,535	0	401	0	34,375
SE (Escapment)	519	703	0	2,098	1,554	0	283	0	2,435
Mean Length (mm)	496	579		514	560		512		529
SE	10.7	10.7		2.1	3.4		2.5		2.7
Male									
Sample Size	8	11	153	83	40	3	3	1	302
Percent	1.8	2.8	35.9	18.7	9.0	0.6	0.5	0.3	69.7
SE (Percent)	0.6	0.8	2.0	1.9	1.4	0.4	0.3	0.3	2.1
Escapement	2,041	3,168	40,749	21,275	10,207	732	601	332	79,105
SE (Escapment)	737	958	2,253	2,140	1,567	420	345	332	2,435
Mean Length (mm)	499	560	399	488	561	395	530	554	455
SE	6.2	9.7	1.3	5.6	3.6	4.2	3.8		4.1
Combined									
Sample Size	15	19	153	167	76	3	5	1	439
Percent	3.0	4.5	35.9	37.3	17.4	0.6	0.9	0.3	100.0
SE (Escapment)	0.8	1.0	2.0	2.3	1.8	0.4	0.4	0.3	
Escapement	3,444	5,121	40,749	42,357	19,742	732	1,002	332	113,480
SE (Escapment)	893	1,176	2,253	2,559	2,072	420	442	332	
Mean Length (mm)	497	568	399	501	560	395	523	554	478
SE	5.8	7.3	1.3	3.2	2.5	4.2	5.1		3.3

Appendix A22.-Kenai River sockeye salmon escapements and sport harvest, 1977-1998.

Year	Total Kenai River Effort [b] (Angler Days)	Kenai River Inriver Escapement [c]	Sport Harvest [a]			
			Above Soldotna Bridge	Percent [d] of Inriver Escapement	Below Soldotna Bridge	Total
1977	122,140	708,000				23,200
1978	164,260	398,900				33,600
1979	178,490	285,000				16,900
1980	171,800	464,000				24,500
1981	178,720	407,600	14,450	3.5	5,270	19,720
1982	231,950	619,800	38,400	6.2	11,710	50,110
1983	229,230	630,300	48,310	7.7	22,960	71,270
1984	270,420	344,600	11,280	3.3	4,420	15,700
1985	322,230	502,800	42,270	8.4	14,940	57,210
1986	335,050	501,200	51,220	10.2	21,180	72,400
1987	289,170	1,596,900	155,800	9.8	85,020	240,820
1988	374,260	1,021,500	103,120	10.1	49,630	152,750
1989	376,900	1,598,000	165,340	10.3	111,890	277,230
1990	342,660	659,500	87,580	13.3	33,210	120,790
1991	323,370	645,000	108,240	16.8	53,330	161,570
1992	332,570	994,800	161,960	16.3	80,540	242,500
1993	324,120	813,600	90,300	11.1	46,870	137,170
1994	340,900	1,003,400	63,250	6.3	30,360	93,610
1995	377,710	630,400	75,620	12.0	49,810	125,430
1996	357,130	797,800	140,270	17.6	78,810	219,080
1997	321,240	1,064,800	105,050	9.9	78,680	183,730
Mean	284,020	747,040	86,030	10.2	45,800	111,390
1998		767,600	122,800 [e]	[e]	[e]	[e]

[a] Sport harvest data from Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995-1998).

[b] Angler effort directed toward all species. Data from Statewide Harvest Survey.

[c] Number of sockeye salmon enumerated by sonar.

[d] Percent of the sockeye salmon enumerated by sonar harvested upstream from the Soldotna Bridge.

[e] Preliminary, harvest unavailable pending Statewide Harvest Survey results; available in August 1999.

Appendix A23.-Kenai River recreational harvest of sockeye salmon by river section as determined by Statewide Harvest Survey, 1981-1997.

	Cook Inlet to Soldotna Bridge		Soldotna Bridge to Moose River		Moose River to Skilak Lake		Skilak Lake to Kenai Lake	
Year	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1981	5,270	26.7	5,340	27.1	4,270	21.6	4,850	24.6
1982	11,710	23.4	14,830	29.6	12,140	24.2	11,430	22.8
1983	22,960	32.2	22,450	31.5	15,180	21.3	10,670	15.0
1984	4,420	28.2	2,180	13.9	2,300	14.6	6,800	43.3
1985	14,940	26.1	13,020	22.8	13,300	23.2	15,950	27.9
1986	21,180	29.3	13,850	19.1	13,530	18.7	23,840	32.9
1987	85,020	35.3	65,840	27.3	39,930	16.6	50,030	20.8
1988	49,630	32.5	43,490	28.5	29,180	19.1	30,450	19.9
1989	111,890	40.4	90,550	32.7	45,850	16.5	28,940	10.4
1990	33,210	27.5	37,210	30.8	22,080	18.3	28,290	23.4
1991	53,330	33.0	56,050	34.7	24,740	15.3	27,440	17.0
1992	80,540	33.2	85,940	35.4	40,620	16.8	35,400	14.6
1993	46,870	34.2	41,470	30.2	18,720	13.6	30,120	22.0
1994	30,360	32.4	24,310	26.0	12,370	13.2	26,570	28.4
1995	49,810	39.7	38,600	30.8	17,610	14.0	19,410	15.5
1996	78,810	36.0	58,690	26.8	31,400	14.3	50,190	22.9
Mean	43,750	31.9	38,360	27.9	21,450	17.6	25,020	22.6
1997	78,680	42.8	57,290	31.2	22,520	12.3	25,240	13.7

Source: Mills 1982-1994, Howe et al. 1995-1998.

Appendix A24.-Summary of the Kasilof River and Crooked Creek coho salmon fishery, 1981-1998.

Year	Harvest [a] Tustumena Lake	Kasilof River	Crooked Creek	Total	Brood Stock	Crooked [b] Creek Escapement	Surplus [c]	Approximate [d] Enhanced Return
1981		335						
1982		325						
1983		409						
1984		1,085						
1985		560						
1986 [e]		1,783	497	2,280	515	3,667		5,571
1987	36	3,785			143	531	1,764	4,331
1988	200	2,928	291	3,419	212	212	2,204	4,383
1989	111	4,222	1,952	6,285	177	1,250	3,162	8,652
1990	236	1,590	486	2,312	185	317	1,368	3,151
1991	52	4,754	265	5,071	180	1,293	2,582	6,697
1992	32	3,304	251	3,587	130	1,558	0	3,591
1993	258	3,698	867	4,823	185	1,250	1,050	5,201
1994	30	4,457	1,026	5,513	0 [f]	1,303	250	4,808
1995	218	5,349	98	5,665	0	1,509	300	4,582
1996 [g]	149	2,681	519	3,349	0	259	0	0
1997 [g]	385	1,423	0	1,808	0	[h]	0	0
Mean	155	2,511	568	4,010	144	1,195	1,153	4,247
1998	[a]	[a]	[a]	[a]	0	[h]	0	

[a] All harvest estimates from Statewide Harvest Survey (Mills 1982-1994, Howe et al. 1995-1998); data not available until season following harvest.

[b] Upstream from hatchery.

[c] Sold to processor, killed, given to public, or not allowed above hatchery.

[d] Assumes 50% of Kasilof River harvest are of Crooked Creek hatchery origin.

[e] First year of hatchery returns.

[f] Enhancement program discontinued; no egg take conducted.

[g] Fishery after 1995 supported entirely by wild stocks.

[h] Hatchery closed; weir not in place.

Appendix A25.-Coho salmon harvest in Swanson River and Swanson River and Swan Lake Canoe Routes, 1983-1997.

Year	Swanson River	Swanson River/ Swan Lake Canoe Routes	Total Swanson River Drainage
1983	525		525
1984	1,484		1,484
1985		187	187
1986		969	969
1987		1,485	1,485
1988	5,603	546	6,149
1989	6,379	127	6,506
1990	1,501	0	1,501
1991	811	81	892
1992	1,984	49	2,033
1993	3,477	10	3,487
1994	1,876	0	1,876
1995	1,132	57	1,189
1996	2,005	99	2,104
Mean	2,434	301	2,171
1997	1,269	0	1,269

Appendix A26.-Harvest, catch, and participation for the Kustatan River coho salmon sport fishery, 1984-1997.

Year	Harvest	Catch	Participation (Days)
1984	1,656		1,673
1985			
1986	3,239		2,737
1987	5,723		3,622
1988	6,221		3,674
1989	5,413		3,522
1990	4,584		3,724
1991	5,768		6,674
1992	4,494	6,227	4,150
1993	6,457	11,136	5,403
1994	5,259	6,611	3,972
1995	4,237	6,237	3,684
1996	5,304	7,991	3,512
1997	3,570	5,269	3,442
Mean	4,763	7,245	3,830

Source: Mills 1985-1994, Howe et al. 1995-1998.

Appendix A27.-Harvest, catch, and participation for the Silver Salmon Creek coho salmon sport fishery, 1983-1997.

Year	Harvest	Catch	Participation (Days)
1983	1,872		
1984	661		
1985			
1986	302		
1987	706		
1988			
1989	735		1,285
1990	320		915
1991	1,120		1,112
1992	494	842	597
1993	1,080	1,280	853
1994	329	689	270
1995	1,715	2,831	1,851
1996	2,094	3,440	1,850
1997	453	1,036	1,179
Mean	914	1,686	1,101

Source: Mills 1984-1994, Howe et al. 1995-1998.

Appendix A28.-Cook Inlet commercial coho salmon harvest, and harvest of Kenai River coho salmon, 1993-1998.

Year	Commercial Drift Fishery Total Harvest	Commercial ESSN[a] Fishery Total Harvest	Drift Fishery Harvest of Kenai River Coho	ESSN Harvest of Kenai River Coho	Total Kenai River Sport Harvest[b]	Personal Use and Subsistence	Educational	Total Harvest of Kenai River Coho	% Kenai Coho Harvest in Commercial Fishery
1993	121,785	43,075	930	6,806	50,538	1,597[c]	427	60,348	12.8
1994	303,935	69,281	11,732	14,673	86,711	2,535[c]	829	116,480	22.7
1995	234,126	44,750	6,956	13,165	46,183	1,556[d]	868	68,728	29.3
1996	171,361	40,548	2,671	11,856	42,066	1,849[c]	592	59,034	24.6
1997	71,517	20,575	1,236	2,093	17,431	520[c]	191	20,760	16
1998	83,337	18,662							
Mean	164,344	39,482	4,705	9,719	48,586			65,070	21

From: Carlon and Hasbrouck 1996, 1997, 1998; Mills 1994; Howe et al. 1995-1997; Brannian and Fox 1996.

[a] East Side Setnet commercial fishery.

[b] Combined early- and late-run harvest.

[c] Personal Use.

[d] Subsistence.

Appendix A29.-Harvest, angler effort, and harvest rate in the Kenai River early-run coho salmon fishery, downstream of the Soldotna Bridge, 1986-1998.

Year	Harvest	Days Effort[a]	Hours Effort	Guided Harvest/hour	Nonguided Harvest/hour	Combined Harvest/hour
1986	26,375	43,765	162,804	0.279	0.139	0.162
1987	15,348	26,301	104,942	0.195	0.134	0.146
1988	22,398	37,417	156,405	0.147	0.143	0.143
1989	24,278	33,850	141,155	0.217	0.156	0.172
1990	26,789	51,816	216,074	0.181	0.104	0.124
1991	41,660	45,030	161,208	0.542	0.201	0.258
1992	20,817	40,919	176,554	0.192	0.098	0.118
1993	21,628	24,577	101,176	0.363	0.167	0.214
1994 [b]	30,898		No Creel Survey			
1995 [b]	20,031		No Creel Survey			
1996 [b]	16,088		No Creel Survey			
1997 [c]	13,206		No Creel Survey			
1998	10,387	15,294	73,107	0.132	0.147	0.142
Mean	22,300	35,441	99,494	0.250	0.143	0.164

[a] Days of effort were calculated from creel survey data by dividing hours of effort by the average trip length of interviewed anglers.

[b] Data from Statewide Harvest Survey (Mills 1987-1994; Howe et al. 1995-1997).

[c] A creel survey was conducted in 1997, but estimates are for the season from August 6 through September 9, not for early and late run. Total estimated harvest was 2,783 coho, with 26,856 hours of effort and 9,236 days of effort (L. Marsh, Alaska Department of Fish and Game, Soldotna, personal communication).

Appendix A30.-Estimated harvest of early- and late-run Kenai River coho salmon by river section, 1977-1997.

Year	Lower Section[a] Early Run	Lower Section[a] Late Run	Lower Section[a] Total	Mid Section[b] Early Run	Mid Section[b] Late Run	Mid Section[b] Total	Upper Section[c] Early Run	Upper Section[c] Late Run	Upper Section[c] Total	Inter-Lake[d] Early Run	Inter-Lake[d] Late Run	Inter-Lake[d] Total	All Sections Early Run	All Sections Late Run	All Sections Total
1977															9,537
1978															10,823
1979															15,276
1980															26,838
1981			12,280			3,326			6,178			540			22,324
1982			26,582			3,904			7,200			1,729			39,415
1983			12,231			4,007			4,867			1,573			22,678
1984			40,173			7,596			8,065			3,810			59,644
1985			22,579			6,781			12,774			2,401			44,535
1986	25,686	12,652	38,338	6,925	3,411	10,336	5,593	2,755	8,348	2,069	1,019	3,088	40,274	19,836	60,110
1987	13,140	6,472	19,612	4,169	2,053	6,222	2,732	1,345	4,077	2,210	1,089	3,299	22,251	10,959	33,210
1988	23,242	11,448	34,690	3,258	1,605	4,863	3,828	1,886	5,714	2,296	1,131	3,427	32,625	16,069	48,694
1989	24,568	12,100	36,668	5,307	2,614	7,921	5,518	2,718	8,236	1,631	803	2,434	37,024	18,235	55,259
1990	27,180	13,387	40,567	5,659	2,787	8,446	4,878	2,403	7,281	2,701	1,330	4,031	40,418	19,907	60,325
1991	33,164	16,335	49,499	9,003	4,435	13,438	6,378	3,142	9,520	2,478	1,221	3,699	51,025	25,131	76,156
1992	22,227	10,948	33,175	5,078	2,501	7,579	5,056	2,491	7,547	2,686	1,323	4,009	35,048	17,262	52,310
1993	19,520	9,615	29,135	6,484	3,193	9,677	4,537	2,234	6,771	3,320	1,635	4,955	33,860	16,678	50,538
1994	31,051	15,294	46,345	10,217	5,032	15,249	8,232	4,054	12,286	8,597	4,234	12,831	58,096	28,615	86,711
1995	20,031	11,808	31,839	4,842	1,131	5,973	2,785	2,794	5,579	2,065	727	2,792	29,723	16,460	46,183
1996	16,088	5,352	21,440	7,993	2,647	10,640	4,752	1,579	6,331	2,757	918	3,675	31,590	10,496	42,086
1997	6,433	1,117	7,550	3,386	1,226	4,612	1,881	1,498	3,379	1,506	384	1,890	13,206	4,225	17,431
Mean	21,861	10,544	29,571	6,027	2,720	7,681	4,681	2,408	7,303	2,860	1,318	3,540	35,428	16,990	41,909

Note: All data from Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995-1998). For 1986-1994 early- and late-run harvest apportioned as 2/3 early run, 1/3 late run.

[a] Cook Inlet to Soldotna Bridge.

[b] Soldotna Bridge to Moose River.

[c] Moose River to Skilak Lake.

[d] Skilak Lake to Kenai Lake.

Appendix A31.-Summary of guided vs. nonguided harvest, early-run Kenai River coho salmon fishery, 1984-1997.

Year	Guided Harvest[a]	%	Nonguided Harvest[a]	%	Total Early-run Harvest
1984	2,920	7.8	34,491	92.2	37,411
1985	2,684	9.0	27,154	91.0	29,838
1986	9,302	23.1	30,972	76.9	40,274
1987	3,334	15.0	18,917	85.0	22,251
1988	2,986	9.2	29,639	90.8	32,625
1989	10,609	28.7	26,414	71.3	37,024
1990	10,234	25.3	30,184	74.7	40,418
1991	20,629	40.4	30,396	59.6	51,025
1992	13,932	39.8	21,116	60.2	35,048
1993	15,908	47.0	17,953	53.0	33,860
1994	27,584	47.5	30,512	52.5	58,096
1995	17,073	57.4	12,650	42.6	29,723
1996	10,632	33.7	20,958	66.3	31,590
1997	2,782	21.1	10,424	78.9	13,206
Mean	10,758	29	24,413	71	35,171

[a] Data from Statewide Harvest Survey (Mills 1985-1994, Howe et al. 1995-1998).

Appendix A32.-Summary of guided vs. nonguided harvest, early- and late-run Kenai River coho salmon fishery, 1984-1997.

Year	Guided Harvest[a]	%	Nonguided Harvest[a]	%	Total Harvest
1984	4,358	7.8	51,480	92.2	55,838
1985	4,006	9.0	40,529	91.0	44,535
1986	13,883	23.1	46,227	76.9	60,110
1987	4,976	15.0	28,234	85.0	33,210
1988	4,456	9.2	44,238	90.8	48,694
1989	15,835	28.7	39,424	71.3	55,259
1990	15,274	25.3	45,051	74.7	60,325
1991	30,789	40.4	45,367	59.6	76,156
1992	20,794	39.8	31,516	60.2	52,310
1993	23,743	47.0	26,795	53.0	50,538
1994	41,170	47.5	45,541	52.5	86,711
1995	23,587	51.1	22,596	48.9	46,183
1996	14,161	33.6	27,925	66.4	42,086
1997	3,593	20.6	13,838	79.4	17,431
Mean	15,759	28	36,340	72	54,766

[a] Data from Statewide Harvest Survey (Mills 1985-1994, Howe et al. 1995-1998).

Appendix A33.-Harvest of coho salmon in Cook Inlet personal use and subsistence fisheries, 1981-1997.

Year	Personal Use Harvest	Subsistence Harvest	Kenai River Early-Run Harvest	Kenai River Late-Run Harvest	Total Harvest	Number Permits Issued
1981	12,713 [a]			12,713	12,713	[b]
1982		No history of the fishery available				
1983	712			712	712	295
1984	2,261			2,261	2,261	309
1985		11,265		11,265	11,265	998
1986	2,422 [c]			2,422	2,422	892
1987	2,213 [c]			2,213	2,213	486
1988	2,662 [c]			2,662	2,662	449
1989	2,376 [c]			2,376	2,376	365
1990	2,290 [c]			2,290	2,290	420
1991 [d]	2,703	3,520	3,520	2,703	6,223	360
1992		10,320 [e]			10,320 [e]	9,500
1993	1,168			1,168	1,168	535
1994		12,181 [f]			12,181 [f]	12,181
1995	11,122 [g]				11,122 [g]	9,300
1996	4,604		4,604		4,604 [h]	14,576
1997	776		776		776 [h]	14,919
Mean	3,234	8,674	2,967	2,262	5,332	4,372

[a] Fishery designated "non-commercial" by court order.

[b] Unknown.

[c] Fishery managed under a 2,500 quota.

[d] A subsistence fishery harvested 3,520 coho; 7,065 permits were issued in Central Cook Inlet. The fall personal use fishery harvested 2,703 fish; 360 permits issued for this fishery.

[e] Total Upper Cook Inlet subsistence harvest; 1,475 taken in Kenai River dip net fishery.

[f] Total Upper Cook Inlet subsistence harvest.

[g] Total Upper Cook Inlet personal use harvest.

[h] Total harvest in Kasilof gillnet; Kenai, Kasilof and Fish Creek dip net fisheries.

Appendix A34.-Harvest, angler effort, and harvest rate in the Kenai River late-run (after and including September 1) coho salmon fishery, downstream of the Soldotna Bridge, 1986-1998.

Year	Harvest	Days Effort[a]	Hours Effort	Guided Harvest/hour	Non-guided Harvest/hour	Combined Harvest/hour
1986	12,631	21,002	78,127	0.235	0.145	0.162
1987	6,774	13,035	52,141	0.164	0.12	0.130
1988	9,434	21,154	88,423	0.154	0.111	0.107
1989	13,125	15,909	66,342	0.273	0.184	0.198
1990	15,849	23,415	97,639	0.202	0.162	0.162
1991	23,340	22,611	80,947	0.413	0.302	0.288
1992	12,794	13,510	65,520	0.274	0.179	0.195
1993	7,444	9,973	46,342	0.247	0.135	0.161
1994 [b]	15,447			No creel survey		
1995 [b]	11,808			No creel survey		
1996 [b]	5,352			No creel survey		
1997 [b,c]	4,225			No creel survey		
1998	4,281	5,900	26,797	0.161	0.140	0.160
Mean	10,962	16,279	66,920	0.245	0.167	0.174

[a] Days of effort were calculated from creel survey data by dividing hours of effort by the average trip length of interviewed anglers.

[b] Data from Statewide Harvest Survey (Mills 1987-1994; Howe et al. 1995-1998).

[c] A creel survey was conducted in 1997, but estimates are for the season from August 6 through September 9, not for early and late run. Total estimated harvest was 2,783 coho, with 26,856 hours of effort and 9,236 days of effort (L. Marsh, Alaska Department of Fish and Game, Soldotna, personal communication).

Appendix A35.-Summary of guided vs. nonguided harvest, late-run Kenai River coho salmon fishery, 1984-1997.

Year	Guided Harvest[a]	%	Nonguided Harvest[a]	%	Total Late-Run Harvest
1984	1,438	7.8	16,988	92.2	18,426
1985	1,322	9.0	13,375	91.0	14,697
1986	4,581	23.1	15,255	76.9	19,836
1987	1,642	15.0	9,317	85.0	10,959
1988	1,470	9.2	14,599	90.8	16,069
1989	5,226	28.7	13,010	71.3	18,235
1990	5,040	25.3	14,867	74.7	19,907
1991	10,160	40.4	14,971	59.6	25,131
1992	6,862	39.8	10,400	60.2	17,262
1993	7,835	47.0	8,842	53.0	16,678
1994	13,586	47.5	15,029	52.5	28,615
1995	6,514	39.6	9,946	60.4	16,460
1996	3,529	33.6	6,967	66.4	10,496
1997	811	19.2	3,414	80.8	4,225
Mean	5,001	28	11,927	72	16,928

[a] Data from Statewide Harvest Survey (Mills 1985-1994; Howe et al. 1995-1998).

Appendix A36.-Sport catch and harvest of pink salmon in the Kenai River, 1977-1997.

Odd Years	Catch	Harvest	Even Years	Catch	Harvest
1977		163	1978		26,579
1979		127	1980		18,580
1981		86	1982		25,572
1983		1,825	1984		28,560
1985		1,306	1986		19,924
1987		941	1988		15,777
1989		1,421	1990	126,251	27,185
1991	5,192	2,416	1992	74,021	10,029
1993	3,001	1,003	1994	42,357	8,701
1995	2,724	991	1996	64,565	14,834
1997	4,667	1,453			
Mean	3,896	1,067		76,799	19,574

From: Mills 1979-1994; Howe et al. 1995, 1998.

Appendix A37.-Kenai River rainbow trout, number caught and number retained by river section as determined by Statewide Harvest Survey, 1984-1997.

Year	Cook Inlet to Soldotna Bridge			Soldotna Bridge to Moose River			Moose River to Skilak Outlet			Skilak Inlet to Kenai Lake (Trophy Trout Area)		
	Number Caught[a]	Number Retained	Percent Retained	Number Caught[a]	Number Retained	Percent Retained	Number Caught[a]	Number Retained	Percent Retained	Number Caught[a]	Number Retained	Percent Retained
1984[b]	3,460	710	20.5	2,910	1,250	43.0	5,110	580	11.4	4,200	930	22.1
1985[b]	3,400	880	25.9	2,650	850	32.1	5,410	1,500	27.7	3,520	710	20.2
1986	2,570	620	24.1	2,380	170	7.1	1,750	900	51.4	2,020	730	36.1
1987	2,220	520	23.4	3,450	670	19.4	6,430	630	9.8	3,870	360	9.3
1988	2,780	290	10.4	1,560	220	14.1	5,880	1,060	18.0	7,580	560	7.4
1989	2,020	480	23.8	2,230	350	15.7	6,470	830	12.8	6,870	250	3.6
1990	2,620	510	19.5	3,570	940	26.3	5,370	940	17.5	12,000	1,150	9.6
1991	3,670	520	14.2	3,840	1,120	29.2	7,930	940	11.9	18,110	740	4.1
1992	4,450	430	9.7	3,880	410	10.6	15,130	740	4.9	28,700	400	1.4
1993	6,190	1,150	18.6	5,560	580	10.4	12,650	650	5.1	37,780	190	0.5
1994	3,800	510	13.4	3,980	360	9.0	10,970	540	4.9	35,090	160	0.5
1995	4,520	620	13.7	4,090	440	10.8	13,070	780	6.0	33,480	310	0.9
1996	5,920	310	5.2	4,790	640	13.4	9,150	430	4.7	39,200	330	0.8
Mean	3,660	580	17.1	3,450	620	18.5	8,100	810	14.3	17,880	520	9.0
1997	6,550	660	10.1	5,820	480	8.2	13,480	550	4.1	33,480	0	0.0

[a] Catch estimates for 1984-1989 are unpublished estimates from the Statewide Harvest Survey (M. J. Mills, Alaska Department of Fish and Game, Anchorage, personal communication.)

[b] In 1984 and 1985, catch estimates were mistakenly reported as harvest in Mills 1985 and Mills 1986. Numbers for harvest presented here are correct.

Appendix A38.-Rainbow trout harvest and catch and effort for all species for Quartz Creek, Ptarmigan Creek, Kenai Lake, Russian River and Skilak Lake, 1984-1997.

	Ptarmigan Creek			Quartz Creek			Kenai Lake		
	Rainbow Trout			Rainbow Trout			Rainbow Trout		
Year	Effort[a]	Harvest	Catch	Effort[a]	Harvest	Catch	Effort[a]	Harvest	Catch
1984	1,857	237		2,530	87		502	25	
1985	988	295		451	69		607		
1986	1,483	474		4,146	122		NA[b]	15	
1987	942	18		5,361	54		580	36	
1988	1,946	18		3,965	54		855	36	
1989	790	29		4,893	67		377	20	
1990	2,041	260	906	5,655	198	500	1,042	42	73
1991	1,200	115	700	5,354	94	648	1,064	115	1,400
1992	1,750	24	499	7,906	237	1,314	1,536	87	135
1993	1,742	415	1,709	9,152	174	2,182	2,586	615	1,306
1994	1,425	311	912	7,241	268	2,088	2,524	356	1,189
1995	1,914	131	574	5,179	66	780	3,240	233	654
1996	613	36	497	4,070	59	1,124	1,242	86	86
1997	1,004	-	1,278	4,459	-	1,528	2,283	137	435

	Russian River		Skilak Lake	
	Rainbow Trout		Rainbow Trout	
Year	Harvest	Catch	Harvest	Catch
1984	324		12	
1985	0		0	
1986	0		0	
1987	91		145	
1988	91		72	
1989	96		67	
1990	198	4,789	115	458
1991	230	7,221	125	637
1992	253	8,312	95	522
1993	284	12,377	68	857
1994	134	11,744	35	614
1995	151	15,381	56	1,335
1996	130	12,887	24	1,716
1997	113	18,417	13	559

From: Mills 1985-1994, Howe et al. 1995-1998; except Kenai Lake 1984-1988, M. Mills, Alaska Department of Fish and Game, Division of Sport Fish, Research and Technical Services, Anchorage, personal communication.

[a] Effort directed toward all species.

[b] NA = not available.

Appendix A39.-Swanson River and Swanson River and Swan Lake Canoe Route rainbow trout (RT) and Dolly Varden (DV) fisheries data, 1977-1997.

	Swanson River		Swanson River Canoe Route		Swan Lake Canoe Route		Total Harvest		Total [a] Participation
Year	RT	DV	RT	DV	RT	DV	RT	DV	
1977							5,860	1,090	6,380
1978							4,390	1,160	5,770
1979							4,010	450	5,780
1980							6,900	1,300	6,700
1981							6,180	1,110	5,240
1982							6,440	1,150	6,330
1983							6,700	2,970	9,140
1984	3,490	320							
1985			3,070 [b]	280 [b]	3,160	450	6,230	730	7,060
1986			4,940 [b]	370 [b]	1,250	350	6,190	720	13,440
1987			1,940 [b]	240 [b]	2,260	890	4,200	1,130	12,330
1988	930	40	1,370	210	1,310	220	3,610	470	16,970
1989	550	90	1,190	90	860	160	2,600	340	11,240
1990	1,520	40	1,510	270	1,720	350	4,750	660	10,980
1991	1,118	131	1,233	104	1,703	183	4,054	418	11,259
1992	1,100	16	2,462	418	2,699	98	6,261	532	11,228
1993	424	88	1,588	419	1,608	331	3,620	838	10,840
1994	585	81	1,331	655	640	233	2,556	969	8,832
1995	747	272	1,576	95	688	172	3,011	539	9,127
1996	247	426	1,217	421	579	0	2,043	847	10,503
Mean	1,071	150	1,952	298	1,540	286	4,716	917	9,429
1997	359	0	1,077	412	727	183	2,163	595	10,039

From: Mills 1979-1994, Howe et al. 1995-1998.

[a] Days fished for all species.

[b] Includes Swanson River harvest.

Appendix A40.-Return, harvest and catch of steelhead in the Kasilof River and Crooked Creek steelhead trout fishery, 1986-1998.

Year	Harvest[a]	Catch[a]	Return to Hatchery
1986	92		
1987	185		142
1988	36		228
1989	48		420
1990	145		236
1991	12	179	
1992	520	1,746	805
1993	2,065	6,862	2,960
1994	1,262	6,156	511
1995	692	3,835	583
1996	[b]	765	108
1997	[b]	776	[c]
1998	[b]		[c]

[a] Catch and harvest are a combination of harvest and catch from the Kasilof River and Crooked Creek (Mills 1987-1994, Howe et al. 1995-1998.

[b] Fishery regulated as catch and release beginning in 1996.

[c] Weir operation terminated about January 1, 1997. No estimate of return available.

Appendix A41.-Kenai River Dolly Varden harvest and catch by river section as determined by Statewide Harvest Survey, 1984-1997.

	Harvest									Catch								
	Cook Inlet to Soldotna Bridge		Soldotna Bridge to Moose River		Moose River to Skilak Outlet		Skilak Inlet to Kenai Lake		Total	Cook Inlet to Soldotna Bridge		Soldotna Bridge to Moose River		Moose River to Skilak Outlet		Skilak Inlet to Kenai Lake		Total
Year	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number
1984	7,506	23.9	1,966	6.3	11,211	35.7	10,724	34.1	31,407									
1985	7,560	28.8	3,277	12.5	8,930	34.0	6,468	24.7	26,235									
1986	1,249	21.6	771	13.4	1,928	33.4	1,827	31.6	5,775									
1987	2,429	31.8	1,671	21.9	2,139	28.0	1,391	18.2	7,630									
1988	3,531	32.2	1,266	11.5	3,527	32.1	2,653	24.2	10,977									
1989	3,414	33.9	1,371	13.6	3,649	36.3	1,630	16.2	10,064									
1990	2,738	22.9	2,424	20.2	2,741	22.9	4,079	34.0	11,982	7,795	22.5	5,094	14.7	7,537	21.8	14,151	40.9	34,577
1991	4,211	29.0	3,285	22.6	4,268	29.4	2,740	18.9	14,504	10,665	15.5	8,116	11.8	19,363	28.2	30,601	44.5	68,745
1992	3,777	26.1	2,516	17.4	4,900	33.9	3,269	22.6	14,462	11,822	15.0	5,899	7.5	26,348	33.4	34,754	44.1	78,823
1993	4,599	36.2	1,539	12.1	3,503	27.6	3,057	24.1	12,698	13,019	17.1	6,079	8.0	20,778	27.2	36,451	47.8	76,327
1994	3,276	38.6	1,107	13.0	2,051	24.2	2,052	24.2	8,486	8,752	14.2	5,185	8.4	14,584	23.6	33,168	53.8	61,689
1995	4,069	42.7	1,732	18.2	2,113	22.2	1,609	16.9	9,523	10,146	18.4	5,399	9.8	12,447	22.6	27,103	49.2	55,095
1996	1,998	32.3	1,456	23.5	1,635	26.4	1,100	17.8	6,189	8,006	17.9	4,842	10.9	10,019	22.5	21,742	48.7	44,609
Mean	3,870	30.8	1,880	15.9	4,050	29.7	3,280	23.7	13,070	10,030	17.2	5,800	10.1	15,870	25.6	28,280	47.0	59,980
1997	2,438	37.6	1,041	16.0	2,491	38.4	520	8.0	6,490	9,718	14.4	5,270	7.8	16,148	23.9	36,558	54.0	67,694

From: Mills 1985-1994, Howe et al. 1995-1998.

Appendix A42.-Dolly Varden harvest and catch and effort for all species for Quartz Creek, Ptarmigan Creek, Kenai Lake, Russian River and Skilak Lake, 1984-1997.

Year	Ptarmigan Creek			Quartz Creek			Kenai Lake		
	Effort[a]	Harvest	Catch	Effort[a]	Harvest	Catch	Effort[a]	Harvest	Catch
1984	1,857	2,120		2,530	3,791		502	224	
1985	988	1,387		451	121		607	69	
1986	1,483	2,508		4,146	1,605		NA[b]	76	
1987	942	417		5,361	181		580	109	
1988	1,946	527		3,965	1,292		855	546	
1989	790	628		4,893	2,399		377	134	
1990	2,041	1,041	4,081	5,655	2,842	8,672	1,042	302	926
1991	1,200	705	3,445	5,354	1,905	14,329	1,064	326	757
1992	1,750	1,188	4,342	7,906	2,441	9,864	1,536	98	236
1993	1,742	1,057	8,202	9,152	4,317	21,473	2,586	764	1,656
1994	1,425	296	1,877	7,241	2,175	11,702	2,524	443	1,017
1995	1,914	801	1,642	5,179	1,004	4,659	3,240	606	2,730
1996	613	0	189	4,070	283	2,637	1,242	40	192
1997	1,004	46	1,836	4,459	311	8,730	2,283	138	309

Year	Russian River		Skilak Lake	
	Harvest	Catch	Harvest	Catch
1984	1,072		0	
1985	399		0	
1986	826		0	
1987	72		91	
1988	473		110	
1989	361		438	
1990	760	2,290	187	583
1991	1,148	6,134	378	1,240
1992	664	3,629	172	1,352
1993	1,001	4,141	145	653
1994	595	4,443	233	772
1995	554	6,430	224	1,031
1996	112	3,178	120	1,093
1997	345	6,246	277	1,578

From: Mills 1985-1994, Howe et al. 1995-1998; except Kenai Lake 1984-1988, M. Mills, Alaska Department of Fish and Game, Division of Sport Fish, Research and Technical Services, Anchorage, personal communication.

[a] Effort directed toward all species.

[b] NA = not available.

Appendix A43.-Kenai Peninsula lake trout harvest as determined by Statewide Harvest Survey, 1977-1997.

Year	Kenai River	Kasilof River	Other Rivers	Hidden Lake	Skilak Lake	Tustumena Lake	Kenai Lake	Other Lakes
1977	250		540	1,540				1,350
1978	520		60	850				1,680
1979	410		540	1,110				1,550
1980	110		160	1,860				1,430
1981	720	150	160	1,070				1,260
1982	630	40	10	2,120				1,540
1983	650	0	0	1,440				1,330
1984	540	30	0	1,050				810
1985	950	40	40	1,400				290
1986	970	90	0	3,760				1,420
1987	320	140	0	1,050	710	180		850
1988	890	150	90	1,180	550	470		600
1989	290	50	250	620 [a]	90	50	100	510
1990	260	90	0	1,260	260	270	170	260
1991	500	80	0	1,494	363	162	485	362
1992	450	371	23	995	455	231	185	670
1993	335	71	57	1,449	233	92	816	809
1994	401	155	275	822	74	110	489	860
1995	178	30	0	852	626	22	552	627
1996	148	0	9	778	279	138	193	266
Mean	476	93	111	1,335	364	173	400	924
1997	111	216	49	462	309	60	192	1,380

From: Mills 1979-1994; Howe et al. 1995-1998.

[a] Access restricted due to campground construction.

Appendix A44.-Kenai Peninsula lake stocking summary for nonanadromous fish, 1995-1998.

Lake	Nearest Community	Size (Acres)	Species Stocked	Stocking Schedule	Number Stocked
Arc	Soldotna	16	Coho	Annual	5,000
Aurora [a]	Sterling	8	Coho	Annual	2,000
Barbara	Nikiski	45	Rainbow	Even Years	11,000
Cabin	Nikiski	57	Rainbow	Annual	15,000
Carter	Moose Pass	48	Rainbow	Even Years	10,000
Cecille	Nikiski	10	Rainbow	Odd Years	2,000
Centennial	Kasilof	25	Coho	Annual	5,000
Chugach Estates	Nikiski	18	Rainbow	Even Years	6,000
Douglas	Nikiski	90	Rainbow	Odd Years	18,000
Elephant	Soldotna	340	Coho	Annual	34,000
			Rainbow	Odd Years	34,000
Encelewski	Kasilof	101	Rainbow	Even Years	20,000
Island	Nikiski	268	Rainbow	Annual	54,000
Jerome	Moose Pass	16	Rainbow	Annual	3,000
Johnson	Kasilof	85	Rainbow	Annual	17,000
Long	Seward	15	Rainbow	Odd Years	4,000
Longmare	Soldotna	172	Coho [b]	Annual	17,000
			Rainbow	Annual	17,000
Loon	Soldotna	18	Coho	Annual	4,000
Meridian	Seward	15	Rainbow	Odd Years	4,000
Quintin	Kasilof	15	Rainbow	Odd Years	3,000
Rainbow	Cooper Landing	15	Rainbow	Even Years	5,000
Roque	Kasilof	5	Coho	Annual	2,000
Scout	Sterling	95	Coho	Annual	19,000
Sport	Soldotna	72	Rainbow	Annual	15,000
Thetis	Nikiski	45	Rainbow	Even Years	15,000
Tirmore	Nikiski	52	Rainbow	Even Years	12,000
Troop	Seward	27	Rainbow	Odd Years	5,000
Upper Summit	Moose Pass	258	Rainbow	Odd Years	64,000
Vagt	Moose Pass	43	Rainbow	Annual	9,000

[a] Aurora was stocked in 1987; stocking reinitiated in 1997.

[b] Coho were first stocked in Longmare Lake in 1997; 34,000 rainbow trout were stocked previously.

Appendix A45.-Kenai Peninsula stocked lakes harvest and effort as estimated by Statewide Harvest Survey, 1985-1997.

Lake	1997			1996			1995			1994			1993		
	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow
Arc	47						43			25			368	671	
Aurora															
Barbara	79			301		218	243		85	64	82	94	202		138
Cabin	63		60	59		82	43		0	548		278	83		30
Carter	220		60	226		99	153		168	374		159	218		129
Cecille															
Centennial	53	72													
Chugach Estates															
Douglas	94		100	55		118	210		300	757		358	36		30
Elephant	2,059	2,574	1,218	1,197	1,287	564	1,303	369	100	847	1,186	554	13		
Encelewski															
Island	125		80	690		365	69		111	303		191	390		322
Jerome	94		151	15			198		120	467		286	93		79
Johnson	2,197		1,504	2,789		1,739	3,033		1,485	2,564		2,190	1,505		648
Loon															
Long															
Longmare	450		144	190		12	1,445		1,210	851		99	127		79
Meridian															
Quintin															
Rainbow	95		93	291		71	447		311	519	27	393	593		647
Roque															
Scout	831	693		575	248		261	178		1,250	636		728	1,599	
Sport	502		592	427		482	412		197	959		403	330		287
Thetis															
Tirmore															
Troop															
Upper Summit	895			486			445			537			446		
Vagt	125		291	88			41		20	356		327	232		208
Total	7,929	3,339	4,293	7,389	1,535	3,750	8,346	547	4,107	10,421	1,931	5,332	5,364	2,270	2,597
Total Harvest			7,632			5,285			4,654			7,263			4,867

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Lake	1992 Days Fished	1992 Coho	1992 Rainbow	1991 Days Fished	1991 Coho	1991 Rainbow	1990 Days Fished	1990 Coho	1990 Rainbow	1989 Days Fished	1989 Coho	1989 Rainbow	1988 Days Fished	1988 Coho	1988 Rainbow
Arc										16	10				
Aurora															
Barbara	160		325	340		84	16								
Cabin	117		198							190		143	31		18
Carter	310		158	147		31	181		104				31		
Cecille															
Centennial	245	622								219	105	10			
Chugach Estates															
Douglas	416		245												
Elephant															
Encelewski															
Island				238			181			209		67	291		509
Jerome	181		32	98		10	234		83	48			93		18
Johnson	1,152		689	1,573		491	1,786		1,156	314		67	2,729		545
Loon															
Long															
Longmare	597		364				66		156	114			309	364	55
Meridian															
Quintin															
Rainbow	373		277	49			33			63		20	546		55
Roque															
Scout	523	1,568		181	869		164	198		724	352		55	327	
Sport	758		641	272		178	33						91		73
Thetis															
Tirmore															
Troop															
Upper Summit	619			344	22		659						164		
Vagt	299		103	521		523	393		833	171		20	93		36
Total	5,750	2,190	3,032	3,763	891	1,317	3,746	198	2,332	2,068	467	327	4,433	691	1,309
			5,222			2,208			2,530			794			2,000

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Lake	1987 Days Fished	1987 Coho	1987 Rainbow	1986 Days Fished	1986 Coho	1986 Rainbow	1985 Days Fished	1985 Coho	1985 Rainbow
Arc									
Aurora									
Barbara									
Cabin	54		72				121		277
Carter	36		36	61		31	104		139
Cecille									
Centennial									
Chugach Estates									
Douglas									
Elephant									
Encelewski									
Island	91		36	183		107			
Jerome	471		36						
Johnson	677		109	496		367	711		434
Loon									
Long									
Longmare	199		308	153		92			
Meridian									
Quintin									
Rainbow				146		153	52		
Roque									
Scout									
Sport	217		54	428		336			
Thetis									
Tirmore									
Troop									
Upper Summit	217			292			87		
Vagt	92		18	657		352	381		329
Total	2,054	0	669	2,416	0	1,438	1,456	0	1,179
			669			1,438			1,179

Note: Harvest estimates for stocked lakes are generally based on very few responses to the Statewide Harvest Survey and are therefore not published in the Statewide Harvest Survey report. These estimates are from M. Mills, Alaska Department of Fish and Game, Division of Sport Fish, Research and Technical Services, Anchorage, personal communication.

Appendix A46.-Kenai Peninsula northern pike harvest as determined by Statewide Harvest Survey, 1981-1997.

Year	Lakes	Kenai River	Total
1981	30		30
1982	100		100
1983	290		290
1984	190		190
1985	50	70	120
1986	0	0	0
1987	0	10	10
1988	40	0	40
1989	50	20	70
1990	30	10	40
1991	86	0	86
1992	239	0	239
1993	216	26	242
1994	36	0	36
1995	219	29	248
1996	0	0	0
Mean	99	14	109
1997	31	10	41

From: Mills 1982-1994, Howe et al. 1995-1998.

Appendix A47.-Kenai River personal use dip net fishery summary, 1981-1998.

Year	Date and Time Opened	Date and Time Closed	Total Days	Sockeye Available During Dip Net Fishery [a]	Sockeye Harvest [b]	% of Available Fish Harvested	Total Sockeye Salmon Escapement	Percent of Escapement Harvested	% of Escapement Available to Fishery	Participation (Days Fished) [e]
1981	No Fishery			No fishery			407,600			
1982	7/26 18:00	8/ 5 24:00	9.25	172,072	Unknown		619,800		27.8	
1983	7/20 18:00	8/ 5 24:00	15.25	251,272	7,562	3.0	630,000	1.2	39.9	3,203
1984	No Fishery									
1985	No Fishery									
1986	No Fishery									
1987	7/23 12:00	8/ 5 24:00	13.50	755,500	24,086	3.2	1,600,000	1.5	47.2	22,550
1988	7/22 18:00	8/ 5 24:00	14.25	260,000	16,880	6.5	1,000,000	1.7	26.0	29,010
1989	7/21 00:01	8/ 5 24:00	15.0	812,800	48,976	6.0	1,598,000	3.1	50.9	31,310
1990	No Fishery									
1991	Subsistence Fishery only									
1992 [c]	7/27 12:00	8/5 24:00	6.5 [d]	144,756	12,189	8.4	994,760	1.2	14.6	10,371
1993	7/17 14:00	7/31 24:00	14.4	392,477	33,467	8.5	813,617	4.1	48.2	14,896
1994	Subsistence Fishery only									
1995	7/25 06:00	7/31 24:00	4.75 [d]	79,300	14,352	18.1	630,447	2.3	12.6	11,122
1996	7/10 00:01	8/5 24:00	27.0	710,441	98,429	13.9	797,847	12.3	89.0	9,948
1997	7/10 00:01	7/31 24:00	22.0	666,928	107,577	16.1	1,064,818	10.1	62.6	10,364
Mean			14.19	385,960	36,350	9.3	923,350	4.2	41.9	15,864
1998	7/10 00:01	7/28 00:01	18.0	335,985	93,226	27.7	767,558	12.1	43.8	9,817

[a] Total number of fish passing sonar counters during fishery, plus harvest.

[b] Harvest not known in 1982; 1983-1995 from Statewide Harvest Survey (Mills 1984-1994, Howe et al. 1995, 1996). 1996-1998 total reported harvest from returned permits.

[c] A subsistence dip net fishery also occurred in 1992.

[d] Fishery closed on Wednesday and Saturday to avoid conflict with concurrent subsistence permit fishery. Total days reflects this closure.

[e] 1981-1995 is individual days fished. 1996-1998 is household days fished. Each household day fished may include fishing effort by more than one household member named on the household's permit.

Appendix A48.-Kasilof River personal use dip net fishery summary, 1981-1998.

Year	Date and Time Opened	Date and Time Closed	Total Days	Sockeye Available During Dip Net Fishery [a]	Sockeye [b] Harvest	% of Available Fish Harvested	Total Sockeye Salmon Escapement	Percent of Escapement Harvested	% of Escapement Available to Fishery	Participation (Days Fished) [e]
1981	7/4 12:00	7/31 24:00	27.50	122,080	10,300	8.4	256,630	4.0	47.6	5,370
1982	7/21 12:00	8/5 24:00	15.50	36,930	1,800	4.9	180,240	1.0	20.5	2,580
1983	7/15 24:00	8/5 24:00	21.00	96,500	11,124	11.5	210,270	5.3	45.9	4,420
1984	7/16 12:00	8/5 24:00	20.50	126,930	12,771	10.1	231,690	5.5	54.8	5,960
1985	7/15 18:00	8/5 24:00	21.25	363,590	16,284	4.5	505,050	3.2	72.0	9,260
1986	7/15 06:00	8/5 24:00	21.75	138,500	38,674	27.9	275,960	14.0	50.2	13,930
1987 [c]	7/10 12:00	8/5 24:00	25.50	135,560	18,454	13.6	249,250	7.4	54.4	8,910
1988	7/22 18:00	8/5 24:00	14.25	12,950	3,547	27.4	200,000	1.8	6.5	6,930
1989	No Fishery						157,739			
1990	No Fishery						144,140			
1991	Subsistence Fishery						238,000			
1992	Subsistence Fishery						183,178			
1993	No Fishery						150,329			
1994	7/22 12:00	8/5 23:59	10.50 [d]	35,464	3,679	10.4	204,525	1.8	17.3	2,361
1995	7/17 18:00	7/31 24:00	10.25 [d]	44,700	4,160	9.3	204,935	2.0	21.8	2,845
1996	7/10 00:01	8/5 24:00	27.0	117,954	10,736	9.1	249,944	4.3	47.2	1,236
1997	7/10 00:01	8/5 24:00	27.0	78,237	9,082	11.6	266,025	3.4	29.4	1,027
81-97 Mean			20.17	109,120	11,720	12.4	229,880	4.5	39.0	5,402
1998	7/10 00:01	8/5 24:00	27.0	157,368	44,066 [f]	28	273,151	16.1	57.6	3,373

[a] Total number of fish passing sonar counters during fishery, plus harvest.

[b] Harvest and participation during first 2 years of fishery are field creel survey estimates. 1983-1995 data are from Statewide Harvest Survey (Mills 1984-1994, Howe et al. 1995, 1996). 1996-1998 data are summary of returned permits.

[c] The fishery was closed from 6:00 a.m. 7/14 - 6:00 p.m. 7/15 as a precautionary measure due to possible oil contamination.

[d] Fishery closed on Wednesday and Saturday due to subsistence/personal use permit fishery. Total days reflect this closure.

[e] 1981-1995 is individual days fished. 1996-1998 is household days fished. Each household day fished may include fishing effort by more than one household member named on the household's permit.

[f] Preliminary data with 83% of the permits returned.

Appendix A49.-Harvest in the Kenaitze Tribal Educational Fishery, 1989-1998.

Year	Early-Run Chinook	Late-Run Chinook	Early-Run Sockeye	Late-Run Sockeye	Early-Run Coho	Late-Run Coho	Pink Salmon
1989							
1990							
1991							
1992							
1993							
1994	56	1	436	1,471	346	483	134
1995	37	3	130	1,368	275	593	35
1996	104	1	953	1,289	261	331	211
1997	122	20	922	1,488	28	163	5
1998 [a]	131	2	971	1,650	252	386	58

[a] Preliminary data.

Appendix A50.-Harvest in the Ninilchik Traditional Council Educational Fishery, 1994-1997.

Year	Early-Run Chinook	Late-Run Chinook	Early-Run Sockeye	Late-Run Sockeye	Early-Run Coho	Late-Run Coho	Pink Salmon	Total Salmon
1994	7	0	3	159	119	0	16	304
1995	65	12	6	223	85	0	23	414
1996	82	19	98	812	52	4	8	1,075
1997	69	25	233	241	99	0	55	722