

Fishery Management Report No. 02-01

**Area Management Report for the Recreational
Fisheries of the Northern Kenai Peninsula, 1998-
1999**

by

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March 2002

Alaska Department of Fish and Game

Division of Sport Fish



Symbols and Abbreviations

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Weights and measures (metric)		General		Mathematics, statistics, fisheries	
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis	H _A
deciliter	dL	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
gram	g	and	&	catch per unit effort	CPUE
hectare	ha	at	@	coefficient of variation	CV
kilogram	kg	Compass directions:		common test statistics	F, t, χ^2 , etc.
kilometer	km	east	E	confidence interval	C.I.
liter	L	north	N	correlation coefficient	R (multiple)
meter	m	south	S	correlation coefficient	r (simple)
metric ton	mt	west	W	covariance	cov
milliliter	ml	Copyright	©	degree (angular or temperature)	°
millimeter	mm	Corporate suffixes:		degrees of freedom	df
Weights and measures (English)		Company	Co.	divided by	÷ or / (in equations)
cubic feet per second	ft ³ /s	Corporation	Corp.	equals	=
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	fork length	FL
inch	in	et alii (and other people)	et al.	greater than	>
mile	mi	et cetera (and so forth)	etc.	greater than or equal to	≥
ounce	oz	exempli gratia (for example)	e.g.,	harvest per unit effort	HPUE
pound	lb	id est (that is)	i.e.,	less than	<
quart	qt	latitude or longitude	lat. or long.	less than or equal to	≤
yard	yd	monetary symbols (U.S.)	\$, ¢	logarithm (natural)	ln
Spell out acre and ton.		months (tables and figures): first three letters	Jan, ..., Dec	logarithm (base 10)	log
Time and temperature		number (before a number)	# (e.g., #10)	logarithm (specify base)	log ₂ , etc.
day	d	number (after a number)	# (e.g., 10#)	mid-eye-to-fork	MEF
degrees Celsius	°C	registered trademark	®	minute (angular)	'
degrees Fahrenheit	°F	trademark	™	multiplied by	x
hour (spell out for 24-hour clock)	h	United States (adjective)	U.S.	not significant	NS
minute	min	United States of America (noun)	USA	null hypothesis	H ₀
second	s	U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	percent	%
Spell out year, month, and week.				probability	P
Physics and chemistry				probability of a type I error (rejection of the null hypothesis when true)	α
all atomic symbols				probability of a type II error (acceptance of the null hypothesis when false)	β
alternating current	AC			second (angular)	"
ampere	A			standard deviation	SD
calorie	cal			standard error	SE
direct current	DC			standard length	SL
hertz	Hz			total length	TL
horsepower	hp			variance	Var
hydrogen ion activity	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

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March 2002

Development of this manuscript was partially financed by the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777-K) under Project F-10-14, Job Numbers H-8, R-2-11, S-2-5, and S-2-14; and Project F-10-15, Job Numbers H-8, R-2-11, S-2-5, S-2-7, and S-2-14.

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This document should be cited as:

Bethe, M. L., L. E. Marsh, P. Berkahn, and S. Sonnichsen. 2002. Area management report for the recreational fisheries of the Northern Kenai Peninsula, 1998-1999. Alaska Department of Fish and Game, Fishery Management Report No. 02-01, Anchorage.

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TABLE OF CONTENTS

	Page
LIST OF TABLES	vi
LIST OF FIGURES	viii
INTRODUCTION	1
SECTION I: MANAGEMENT AREA OVERVIEW	1
Management Area Description	1
Alaska Board of Fisheries Process.....	3
Fisheries Resources	4
Management Plans Affecting Fisheries	5
Recreational Angler Effort	6
Other User Groups Affecting Fisheries	7
Economic Value of Recreational Fisheries	16
Major Ongoing Research Activities	18
Major Issues.....	20
Access Programs	23
SECTION II: FISHERIES OVERVIEW	24
KASILOF RIVER EARLY-RUN CHINOOK SALMON RECREATIONAL FISHERY	24
Fishery Objectives	24
Inseason Management Approach.....	24
Historical Perspective.....	24
Board of Fisheries Actions	26
Recent Fishery Performance	26
Outlook.....	30
Current Issues.....	30
Recommended Research & Management.....	30
KASILOF RIVER LATE-RUN CHINOOK SALMON FISHERY	30
Fishery Objective	30
Inseason Management Approach.....	31
Historical Perspective.....	31
Board of Fisheries Actions	31
Recent Fishery Performance	31
Outlook.....	32
Current Issues.....	32
Recommended Research & Management.....	32
RUSSIAN RIVER EARLY-RUN SOCKEYE SALMON RECREATIONAL FISHERY	32
Fishery Objective	32
Inseason Management Approach.....	32
Historical Perspective.....	38
Board of Fisheries Actions	39

TABLE OF CONTENTS (Continued)

	Page
Recent Fishery Performance	39
Current Issues	41
Recommended Research & Management.....	42
KENAI RIVER EARLY-RUN CHINOOK SALMON RECREATIONAL FISHERY	43
Fishery Objective	43
Inseason Management Approach.....	43
Historical Perspective.....	44
Board of Fisheries Actions	47
Recent Fishery Performance	48
Outlook	55
Current Issues	57
Recommended Research & Management.....	57
KENAI RIVER LATE-RUN CHINOOK SALMON RECREATIONAL FISHERY	58
Fishery Objectives	58
Inseason Management Approach.....	58
Historical Perspective.....	59
Board of Fisheries Actions	63
Recent Fishery Performance	65
Outlook	72
Current Issues	72
Recommended Research & Management.....	73
RUSSIAN RIVER LATE-RUN SOCKEYE SALMON RECREATIONAL FISHERY	73
Fishery Objectives	73
Inseason Management Approach.....	77
Historical Perspective.....	77
Board of Fisheries Actions	79
Recent Fishery Performance	79
Current Issues	82
Recommended Research & Management.....	87
KENAI RIVER LATE-RUN SOCKEYE SALMON RECREATIONAL FISHERY	87
Fishery Objectives	87
Inseason Management Approach.....	89
Historical Perspective.....	90
Board of Fisheries Actions	94
Recent Fishery Performance	95
Outlook	98
Current Issues	98
Recommended Research & Management.....	99
KASILOF RIVER/CROOKED CREEK EARLY-RUN COHO SALMON RECREATIONAL FISHERY	99
Fishery Objectives	99
Inseason Management Approach.....	99
Historical Perspective.....	101
Board of Fisheries Actions	103

TABLE OF CONTENTS (Continued)

	Page
Recent Fishery Performance	103
Outlook	103
Current Issues	103
Recommended Research & Management.....	103
SWANSON RIVER COHO SALMON RECREATIONAL FISHERY	105
Fishery Objective	105
Inseason Management Approach.....	105
Historical Perspective.....	106
Board of Fisheries Actions	107
Recent Fishery Performance	107
Outlook	107
Current Issues	107
Recommended Research & Management.....	108
KENAI RIVER COHO SALMON RECREATIONAL FISHERY	110
Fishery Objective	110
Inseason Management Approach.....	110
Historical Perspective.....	111
Board of Fisheries Actions	116
Recent Fishery Performance	117
Outlook	123
Current Issues	123
Recommended Research & Management.....	123
KENAI RIVER PINK SALMON FISHERY	124
Fishery Objective	124
Inseason Management Approach.....	124
Historical Perspective.....	124
Board of Fisheries Actions	124
Recent Fishery Performance	125
Outlook	125
Current Issues	127
Recommended Research & Management.....	127
KENAI RIVER RAINBOW TROUT FISHERY	127
Fishery Objective	127
Inseason Management Approach.....	128
Historical Perspective.....	128
Board of Fisheries Actions	133
Recent Fishery Performance	134
Outlook	137
Current Issues	137
Recommended Research and Management.....	139
SWANSON RIVER AND SWAN LAKE CANOE ROUTES RAINBOW TROUT FISHERY.....	139
Fishery Objective	139
Inseason Management Approach.....	139

TABLE OF CONTENTS (Continued)

	Page
Historical Perspective.....	139
Board of Fisheries Actions.....	141
Recent Fishery Performance	141
Outlook.....	141
Current Issues.....	141
Recommended Research & Management.....	141
KASILOF RIVER/CROOKED CREEK STEELHEAD RECREATIONAL FISHERY	143
Fishery Objective.....	143
Inseason Management Approach.....	143
Historical Perspective.....	143
Board of Fisheries Actions.....	145
Recent Fishery Performance	146
Outlook.....	146
Current Issues.....	146
Recommended Research & Management.....	146
KENAI RIVER DOLLY VARDEN FISHERY	147
Fishery Objective.....	147
Inseason Management Approach.....	147
Historical Perspective.....	147
Board of Fisheries Actions.....	149
Recent Fishery Performance	150
Outlook.....	150
Current Issues.....	150
Recommended Research & Management.....	154
LAKE TROUT RECREATIONAL FISHERY	154
Fishery Objective.....	154
Inseason Management Approach.....	154
Historical Perspective.....	154
Board of Fisheries Actions.....	156
Recent Fishery Performance	156
Outlook.....	156
Current Issues.....	158
Recommended Research & Management.....	158
KENAI PENINSULA STOCKED LAKES	158
Fishery Objectives	158
Inseason Management Approach.....	158
Historical Perspective.....	158
Board of Fisheries Actions.....	160
Recent Fishery Performance	160
Current Issues.....	160
Recommended Research & Management.....	160
NORTHERN PIKE RECREATIONAL FISHERY.....	165
Fishery Objective.....	165

TABLE OF CONTENTS (Continued)

	Page
Inseason Management Approach.....	165
Historical Perspective.....	165
Board of Fisheries Actions.....	167
Recent Fishery Performance	167
Outlook.....	167
Current Issues.....	168
Recommended Research & Management.....	168
KENAI RIVER SOCKEYE SALMON DIP NET FISHERY	169
Fishery Objective.....	169
Inseason Management Approach.....	169
Historical Perspective.....	169
Recent Board of Fisheries Actions.....	173
Recent Fishery Performance	174
Outlook.....	174
Current Issues.....	175
Recommended Research & Management.....	175
KASIOF RIVER PERSONAL USE DIP NET AND GILLNET FISHERIES	176
Fishery Objective.....	176
Inseason Management Approach.....	176
Historical Perspective.....	176
Recent Board of Fisheries Actions.....	181
Recent Fishery Performance	182
Outlook.....	183
Current Issues.....	183
Recommended Research & Management.....	183
KENAITZE TRIBAL TRADITIONAL COUNCIL EDUCATIONAL FISHERIES	183
Fishery Objective.....	183
Inseason Management Approach.....	183
Historical Perspective.....	183
Board of Fisheries Actions.....	185
Recent Fishery Performance	185
Outlook.....	188
Current Issues.....	188
Recommended Research & Management.....	190
LITERATURE CITED	191

LIST OF TABLES

Table	Page
1. Angler-days of effort expended by recreational anglers fishing Kenai Peninsula Management Area waters, 1977-1999.	8
2. Angler-days of sport fishing effort for the Kenai River, by section, 1977-1999.	10
3. Kenai River sport fish harvest by species, 1977-1999.	11
4. Angler-days of sport fishing effort for other Northern Kenai Peninsula Management Area drainages, by fishery, 1977-1999.	12
5. Sport fish harvest from other systems in the Northern Kenai Peninsula Management Area, 1977-1999.	13
6. Angler-days of effort for Kenai River and Kasilof River personal use fisheries, 1981-1999.	14
7. Kenai Peninsula personal use dip net harvest, by species, 1983-1999.	15
8. Upper Cook Inlet commercial salmon harvest, by species, 1990-1999.	16
9. Economic value (thousands of dollars) of Kenai Peninsula Management Area recreational fisheries during 1986.	17
10. Summary of Northern Kenai Peninsula emergency orders, 1998-1999.	25
11. Historical summary of Kasilof River drainage early-run chinook salmon sport fishery and return, 1978-2000.	27
12. Kasilof River personal use and subsistence gillnet harvest of chinook salmon, 1984-1999.	29
13. Historical summary of escapement, harvest, angler effort, and harvest rate, Russian River early-run sockeye salmon, 1963-1999.	34
14. Daily escapement of early-run sockeye salmon at Russian River weir in 1998, and historic mean daily escapement proportions, 1978-1997.	35
15. Daily escapement of early-run sockeye salmon at Russian River weir in 1999 and historic mean daily escapement proportions, 1978-1998.	36
16. Estimated age and sex composition and length-at-age of early-run sockeye salmon at Russian River weir, 1998.	41
17. Estimated age and sex composition and length-at-age of early-run sockeye salmon at Russian River weir, 1999.	42
18. Early-run Kenai River chinook salmon population data, 1986-1999.	51
19. Harvest, angler effort and harvest rate estimated by onsite creel survey downstream of the Soldotna Bridge, Kenai River early-run chinook salmon fishery, 1976-1999.	53
20. Number of Kenai River fishing guides registered with ADNR, 1982-1999.	55
21. Guided vs. nonguided angler harvest, effort, and success rate, estimated by onsite creel survey downstream of the Soldotna Bridge, early-run Kenai River chinook salmon fishery, 1981-1999.	56
22. Harvest, angler effort and harvest rate, estimated by onsite creel survey downstream of the Soldotna Bridge, late-run Kenai River chinook salmon fishery, 1976-1999.	67
23. Guided vs. nonguided angler harvest, effort, and success rate, estimated by onsite creel survey downstream of the Soldotna Bridge, late-run Kenai River chinook salmon fishery, 1981-1999.	69
24. Late-run Kenai River chinook salmon population data, 1986-1999.	70
25. Angler effort, harvest rate, harvest and escapement, Russian River late-run sockeye salmon, 1963-1999.	75
26. Daily escapement of late-run sockeye salmon at Russian River weir in 1998, and historic mean daily escapement proportion, 1978-1997.	80
27. Estimated age and sex composition and length-at-age of late-run sockeye salmon enumerated at Russian River weir, 1998.	82
28. 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, 1968-1999.	83
29. Late-run Russian River sockeye salmon harvest, escapement, and returning jacks, 1969-1999.	84
30. Daily escapement of late-run sockeye salmon at Russian River weir in 1999 and historic mean daily escapement proportion, 1978-1998.	85

LIST OF TABLES (Continued)

Table	Page
31. Estimated age and sex composition and length-at-age of late-run sockeye salmon enumerated at Russian River weir, 1999.	86
32. Kenai River drainage sockeye salmon escapements and inriver harvest, 1981-2000.	91
33. Kenai River recreational harvest of sockeye salmon by river section as determined by Statewide Harvest Survey, 1981-1999.	92
34. Kasilof River and Crooked Creek coho salmon sport harvest and escapement, 1981-1999.	102
35. Coho salmon harvest in Swanson River and Swanson River and Swan Lake Canoe Routes, as estimated by the Statewide Harvest Survey, 1983-1999.	108
36. Cook Inlet commercial coho salmon harvest, and harvest of Kenai River coho salmon, 1993-1999.	113
37. Personal use and subsistence coho salmon harvest from Northern and Central districts setnet and Kenai River dip net fisheries, 1981-1999.	115
38. Estimated sport harvest of Kenai River coho salmon by river section, 1977-1999.	119
39. Guided vs. nonguided harvest, Kenai River coho salmon fishery, 1986-1999.	121
40. Sport catch and harvest of pink salmon in the Kenai River, 1977-1999.	125
41. Kenai River rainbow trout, number caught and number retained by river section, 1984-1999.	129
42. Rainbow trout harvest and catch, and effort for all species, Quartz Creek, Ptarmigan Creek, Kenai Lake, Russian River and Skilak Lake, 1984-1999.	138
43. Swanson River and Swanson River and Swan Lake Canoe Route rainbow trout (RT) and Dolly Varden (DV) fisheries data, 1977-1999.	140
44. Return, harvest and catch of steelhead trout in the Kasilof River and Crooked Creek steelhead trout fishery, 1986-1999.	145
45. Kenai River Dolly Varden harvest and catch by river section as determined by Statewide Harvest Survey, 1984-1999.	148
46. Dolly Varden harvest and catch and effort for all species for Quartz Creek, Ptarmigan Creek, Kenai Lake, Russian River and Skilak Lake, 1984-1999.	153
47. Kenai Peninsula lake trout harvest as determined by Statewide Harvest Survey, 1977-1999.	155
48. Kenai Peninsula lake stocking summary for nonanadromous fish, 1998 and 1999.	159
49. Kenai Peninsula stocked lakes harvest and effort as estimated by Statewide Harvest Survey, 1983-1999.	161
50. Kenai Peninsula stocked lakes total harvest and effort, 1983-1999.	165
51. Kenai Peninsula northern pike harvest, 1981-1999.	168
52. Kenai River personal use sockeye salmon dip net fishery summary, 1981-1999.	171
53. Effort and harvest in Kenai River personal use dip net fishery, 1996-2000.	175
54. Effort and harvest in Kasilof River personal use dip net fishery, 1996-2000.	177
55. Kasilof River personal use dip net fishery summary, 1981-1999.	179
56. Kasilof personal use gillnet harvest, 1982-2000.	182
57. Harvest in the Kenaitze Tribal Educational Fishery, 1989-1999.	187

LIST OF FIGURES

Figure	Page
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	2
2. Recreational angler participation in the Kenai Peninsula Management Area, 1977-1999.	9
3. Kasilof River early-run chinook salmon fishery.	28
4. Location of the Russian River on the Kenai Peninsula, Alaska.	33
5. Map of the Russian River drainage.	37
6. Map of the boundaries of the chinook salmon fishery in the Kenai River drainage.	46
7. Total return, Kenai River early-run chinook salmon fishery, 1986-1999.	52
8. Early-run chinook salmon harvest and angler effort estimated by onsite creel survey downstream of Soldotna bridge, 1976-1999.	54
9. Map of the boundaries of the chinook salmon fishery in the Kenai River drainage.	61
10. Late-run chinook salmon harvest and angler effort estimated by onsite creel survey downstream of the Soldotna Bridge, 1976-1999.	68
11. Total return, Kenai River late-run chinook salmon, 1986-1999.	71
12. Location of the Russian River on the Kenai Peninsula, Alaska.	74
13. Late-run Russian River sockeye salmon harvest and total spawning escapement, including lower river spawners, 1968-1999.	76
14. The Russian River drainage, Kenai Peninsula, Alaska.	78
15. Map of the Kenai River drainage. Late-run sockeye salmon fishery occurs from Cook Inlet to Kenai Lake.	88
16. Total harvest and effort, Kenai River late-run sockeye salmon fishery, as determined by Statewide Harvest Survey, 1981-1999.	93
17. Harvest of Kenai River late-run sockeye salmon by river section, estimated by the Statewide Harvest Survey, 1981-1999.	97
18. Map of the Kasilof River early-run coho salmon fishery.	100
19. Kasilof River drainage total early-run coho salmon harvest, as determined by Statewide Harvest Survey, 1988-1999.	104
20. Swanson River drainage coho salmon harvest, 1983-1999.	109
21. Map of the Kenai River drainage.	112
22. Harvest of Kenai River coho salmon stocks, 1993-1999.	114
23. Sport harvest of Kenai River coho salmon stocks by river section, 1986-1999.	120
24. Commercial setnet harvests, by date, from Ninilchik and Coho beaches, 1997-1999.	122
25. Pink salmon harvest and catch from Kenai River recreational fishery, 1977-1999.	126
26. Total number of rainbow trout caught, showing number released and number retained, Kenai River sport fishery, 1984-1999.	130
27. Map of the Kenai River drainage and rainbow trout study sites.	132
28. Catch of rainbow trout, by river section, Kenai River sport fishery, 1984-1999.	135
29. Number of rainbow trout retained by river section, Kenai River sport fishery 1984-1999.	136
30. Swanson River and Swan Lake canoe routes rainbow trout harvest and angler effort, 1977-1999.	142
31. Map of the Kasilof River and Crooked Creek steelhead trout fishery area.	144
32. Dolly Varden harvest by river section, Kenai River sport fishery, 1984-1999.	151
33. Dolly Varden catch by river section, Kenai River sport fishery, 1990-1999.	152
34. Kenai Peninsula lake trout harvest, 1977-1999.	157
35. Kenai Peninsula stocked lakes harvest and effort (angler-days), 1983-1999.	166
36. The Kenai River sockeye salmon dip net fishery.	170
37. The Kasilof River personal use sockeye salmon dip net fishery.	178
38. Total salmon harvest in the Kenaitze Tribal Council Educational Fishery, 1989-1999.	189

INTRODUCTION

This management report is subdivided into two sections. The first section presents an overview of the Northern Kenai Peninsula Management Area (NKPMA). This overview consists of a geographic description of the management area and the available fish resources. The first section also includes a discussion of the Alaska Board of Fisheries (BOF) process with a brief summary of the management plans governing area fisheries as well as a historical perspective of the recreational angler effort, catch and harvest within the management area. The economic value of the area's recreational fisheries is also presented with general descriptions of ongoing research, management and educational activities with outlines of the important biological and social issues in the Upper Kenai Peninsula Management Area.

Section II provides a more detailed description of the major fisheries in the NKPMA. Included in this section are descriptions of each major fishery with relevant historical data providing a perspective on changes in the fishery. This section also provides information concerning the management objectives for individual fisheries, summary of recent BOF actions, current biological and social issues as well as ongoing/recommended research related to specific fisheries.

SECTION I: MANAGEMENT AREA OVERVIEW

MANAGEMENT AREA DESCRIPTION

The Northern Kenai Peninsula Management Area (NKPMA) includes all freshwater drainages of the Kenai Peninsula that flow into Turnagain Arm and Cook Inlet from the east bank of Ingram Creek southward to the Kasilof River. Marine waters of the NKPMA are on the east side of Cook Inlet from the latitude of the East Forelands south to the latitude of the Kasilof River (Figure 1).

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 land use zoning on property 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 NKPMA are Kenai and Soldotna. Smaller communities are Hope, Cooper Landing, Moose Pass, Sterling and Nikiski. The NKPMA is linked to the state's highway system via the Sterling and Seward highways. These highways provide sport anglers access to many of the area's major fisheries. Remote areas of the NKPMA (Western Cook Inlet and off-road Kenai Peninsula fisheries) are typically accessed via wheel or float-equipped aircraft, boat or by hiking.

Management of sport fisheries in these areas is 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.

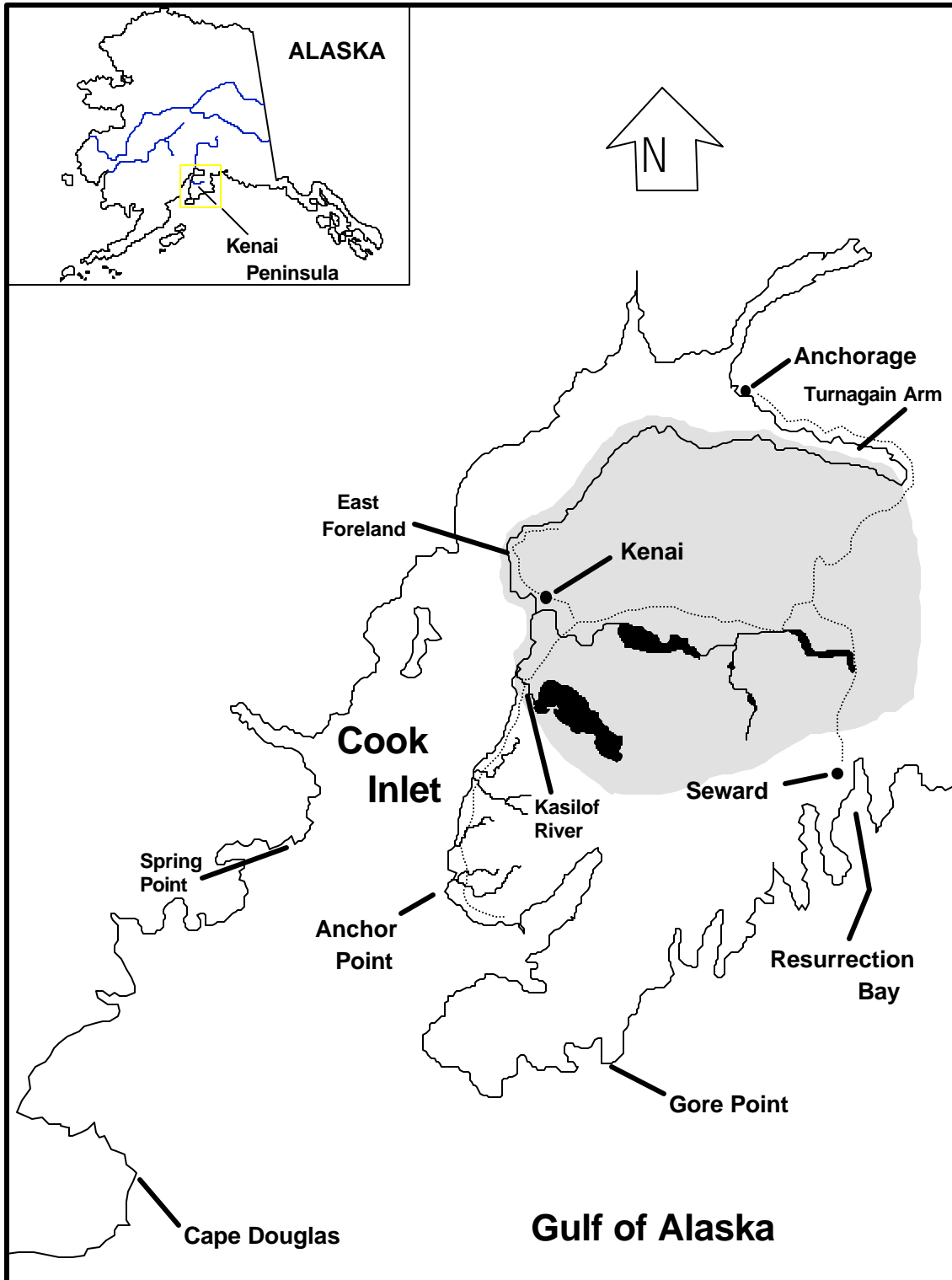


Figure 1.-The Northern Kenai Peninsula Management Area (shaded) includes all freshwater drainages and saltwater fisheries from the Kasilof River north to Turnagain Arm on the Kenai Peninsula.

The NKPMA includes portions of two survey areas for the purposes of participation and harvest reporting in the Statewide Harvest Survey (SWHS, Howe et al. 2001 b). These survey areas are:

1. 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
2. That portion of the West Cook Inlet-West Susitna River Drainages Area (Area N) including all freshwater drainages which flow into Cook Inlet from the West Foreland south to Spring Point.

The NKPMA of the Division of Sport Fish has an annual budget of approximately 1.4 million dollars. 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 have been stationed in Soldotna since the 1960s. Currently, Division of Sport Fish staff stationed at Soldotna are:

1. One Area Management Biologist (Mike Bethe, Fishery Biologist III).
2. One Assistant Area Management Biologist (Larry Marsh, Fishery Biologist II).
3. Three senior Fishery Biologist III Research Biologists (Bruce King, Tim McKinley, Debbie Burwen).
4. Three Fishery Biologist II Research Project Leaders (Jay Carlon, Mary King, Jim Miller).
5. Four Fishery Biologist I Research Crew Leaders (Jeff Breakfield, Wes Jones, Rob Massengill, Patti Berkhahn).

Approximately 55 seasonal fishery technicians whose length of employment ranges from 2 to 11 months assist these staff. A permanent Fish and Game Program Technician (Mary Gaiser) and one seasonal clerical position (Vacant) provide administrative support for the Soldotna staff. A permanent full-time maintenance person (Mark Hatfield) provides maintenance and fabrication support for Soldotna research and management projects at the Crooked Creek maintenance facility.

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 identifying fisheries and wildlife issues and proposed regulatory changes. Most active committees meet several times each year, and more frequently prior to scheduled BOF meetings. Personnel from the Division of Sport Fish as well as other divisions are often invited to attend advisory committee meetings. In this way, advisory committee meetings allow for direct public interaction with staff regarding resource issues of local concern. Within the NKPMA there are two local 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 from the NKPMA typically serves as an advisor to the local advisory committees in and outside of the management area.

The Board of Fisheries addresses NKPMA fisheries on a 3-year cycle. The last regularly scheduled NKPMA board meeting was in February 1999. Proposals regarding the NKPMA coho salmon fisheries were last heard during February of 2000. The next regularly scheduled meeting will occur in February 2002.

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 water and, to a much lesser degree, in the salt waters of Cook Inlet. Anglers can also target salmon and trout stocked by the department into various landlocked lakes. Popular fisheries also occur on the area's anadromous stocks of Dolly Varden *Salvelinus malma*, steelhead trout *O. mykiss*, and eulachon *Thaleichthys pacificus*. Resident stocks of rainbow trout *O. mykiss* and lake trout *Salvelinus namaycush* also support popular sport fisheries. Fisheries occur on resident stocks of Arctic grayling *Thymallus arcticus* and introduced stocks of northern pike *Esox lucius* as well.

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 *Chionoectes 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 coho salmon sport fisheries. Additional fishing opportunity for coho salmon is provided through a program of stocking landlocked lakes on the Kenai Peninsula.

The Russian River supports an early and late sockeye salmon return. These wild stocks support the second largest recreational sockeye salmon fishery in the state. As a result of changes to the management of Kenai River sockeye salmon and increased escapement goals, the Kenai River recreational sport fishery for sockeye salmon has grown into the largest recreational fishery for this species in Alaska.

The NKPMA also supports personal use sockeye salmon dip net fisheries at the mouths of the Kenai and Kasilof rivers and a personal use gillnet fishery at the mouth of the Kasilof River. Prior to 1996, the dip net fisheries were opened by emergency order when specific escapement levels were projected to be achieved. These escapement levels were established in management plans adopted by the Alaska Board of Fisheries. The personal use fisheries on both the Kenai and Kasilof rivers are now managed with established seasons and provide significant harvest opportunities for statewide participants.

Pink salmon return in large numbers to NKPMA drainages during even-numbered years. A significant recreational fishery for this species occurs on the Kenai River. Harvests in the Kenai River have increased during even years because of liberalized bag and possession limits

(6 daily). Chum salmon *O. keta* returns to NKPMA streams on the east side of Cook Inlet are quite small and do not support a significant sport fishery.

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 also support Dolly Varden, thus providing additional recreational angling opportunity at roadside as well as more remote locations.

Rainbow trout occur in numerous lakes and streams throughout the NKPMA. Flowing waters that support major rainbow trout fisheries include 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 alternative fishing opportunities, several landlocked lakes are also stocked with this species.

Steelhead trout currently provide limited recreational fishing opportunity in Kasilof River. A stocked return of this species was developed in the 1980s using wild stocks from Crooked Creek. The stocking program was discontinued in 1995 due to straying of hatchery trout into the Kenai River system. Since 1995, steelhead trout production in Crooked Creek has resulted from natural production.

MANAGEMENT PLANS AFFECTING FISHERIES

Upper Cook Inlet fisheries (commercial, sport, personal use and subsistence) have been the focus of intensive, allocative debates for many years. These controversial issues have prompted the Board of Fisheries (BOF) to establish management plans and regulatory policies that allocate the area's fisheries resources among the various user groups. These plans provide for the sustained yield of fishery resources and establish 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 long-term management direction for Upper Cook Inlet salmon stocks. It establishes mandatory criteria that the board must consider when adopting management plans for specific stocks and or species, and establishes a set of guiding principles for the adoption of regulations governing fisheries in Upper Cook Inlet. The plan was adopted by the Board as policy in 1977 and was 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 Board adopted the plan 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 Board adopted the plan 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 Board adopted the plan 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 Board adopted the plan in 1988.

6. Kasilof River Sockeye Salmon Special Harvest Area 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. The Board adopted the plan in 1986.

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

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

8. 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 later adopted as regulation by the Board in 1982. The Plan has undergone several amendments since that time.

9. Riparian Habitat Management Plan (5 AAC 56.065)

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

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

This plan establishes management actions and guidelines for Kenai River coho salmon stocks. The Kenai River Coho Salmon Management Plan was originally adopted into regulation in 1997. It was revised as a conservation management plan in 2000.

RECREATIONAL ANGLER EFFORT

This section provides generalized participation trends in the NKPMA. Data are available through 1999. As a result of reorganization of the management area in 1996, data from the Lower Kenai Peninsula Management Area (LKPMA) are excluded after 1995.

Since 1977, recreational angler effort has been estimated using a mail survey (Mills 1979-1994, Howe et al. 1995, 1996, 2001 a-d). 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 (harvest plus release) on a site by site basis. Harvest and catch are estimated for individual species. It is not designed to provide estimates of participation directed towards a single species.

Additionally, creel surveys have been selectively implemented for fisheries that require more timely inseason information for management purposes or to validate the mail survey for fisheries of interest. The following summary of recreational angler effort in the NKPMA is based on estimates produced from the mail survey (Mills 1979-1994, Howe et al. 1995, 1996, 2001 a-d). Estimates of catch, harvest and effort from the years of 1996 through 1998 were revised during 1999-2000. Data presented herein reflects the revised estimates for those years.

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 NKPMA supports some of the highest angler participation levels in Alaska. From 1996 through 1999, the NKPMA accounted for approximately 19% of the total statewide recreational effort (Table 1). In 1999, participation approximated 475,000 angler days in NKPMA waters. Angler participation between 1996 and 1999 remained fairly stable in the range of 346,000 to 475,000 angler days (Figure 2). This plateau in fishing effort may be a response to the full utilization of existing fish stocks and the resulting social issues such as crowding and available access.

The Kenai River accounts for the largest recreational fishery in the NKPMA. From 1996-1999, this river has accounted for about 63.5% of the area's total recreational angling effort, or about 259,500 angler-days annually (Table 1). Historically, most of this effort occurs downstream from the Soldotna Bridge to Cook Inlet with salmon, rainbow trout and Dolly Varden being the most abundant species harvested (Tables 2 and 3).

Other fresh waters of the Kenai Peninsula support major recreational fisheries (Tables 4 and 5) as well. Of these, the Russian River supports the largest fishery, with the most participation directed towards early- and late-run sockeye salmon. The Kasilof River supports a major fishery directed at stocked early-run chinook salmon. Also of significance is the sport fishery in the Swanson River that is primarily directed at coho salmon and rainbow trout.

Personal use salmon dip net fisheries at the mouths of the Kenai and Kasilof rivers have become extremely popular with the public. During the past 4 years, an average of 11,517 and 2,356 angler-days of effort were expended in the Kenai and Kasilof rivers personal use fisheries, respectively (Table 6). The mean harvest from personal use dip net fisheries in the NKPMA from 1996 to 1999 was 147,000 salmon with sockeye salmon being the most abundant species harvested (Table 7).

OTHER USER GROUPS AFFECTING FISHERIES

Fisheries resources of the NKPMA also support commercial, personal use, and scientific/educational fisheries. Commercial drift and set gillnet fisheries occur in Central and Northern Cook Inlet. From 1990 through 1999, commercial harvests of all salmon species averaged 4,710,866 salmon (Table 8). This average is composed of 15,326 chinook, 3,812,903 sockeye, 348,941 coho, 295,035 pink and 238,660 chum salmon. The primary species targeted in the commercial fishery is sockeye salmon.

Division of the salmon resources in the NKPMA between sport and commercial interests is an ever-present source of contention. 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 the fisheries is addressed in the appropriate chapters of Section II of this report.

Table 1.-Angler days of effort expended by recreational anglers fishing Kenai Peninsula Management Area waters, 1977-1999.

Year	Kenai River		Other Kenai Peninsula		Kenai Peninsula Dipnet ^a		Kenai Area Total	Percent of State	Alaska Total
	Effort	%NKPMA	Effort	%NKPMA	Effort	%NKPMA			
1977	122,138	34	233,626	66			355,764	30	1,198,486
1978	164,264	37	274,129	63			438,393	34	1,286,063
1979	178,485	39	282,943	61			461,428	34	1,364,739
1980	171,803	38	277,573	62			449,376	30	1,488,962
1981	178,716	41	253,238	58	5,370	1	437,324	31	1,420,772
1982	231,948	47	263,516	53	2,580	1	498,044	31	1,623,090
1983	229,228	43	282,428	53	9,576	2	521,232	30	1,732,528
1984	270,422	46	296,641	51	7,227	1	574,290	31	1,866,837
1985	322,230	49	319,601	48	10,647	2	652,478	34	1,943,069
1986	335,051	46	364,681	50	15,856	2	715,588	35	2,071,412
1987	289,165	37	450,768	58	32,473	4	772,406	36	2,152,886
1988	374,259	45	408,226	49	37,304	4	819,789	35	2,311,291
1989	376,902	49	341,981	45	33,054	4	751,937	33	2,264,079
1990	342,662	43	443,175	56	2,184	0	788,021	32	2,463,284
1991	323,368	41	434,795	55	12,040	2	770,203	31	2,456,328
1992	332,573	40	467,185	57	12,131	1	811,889	32	2,540,374
1993	324,120	39	479,614	58	16,525	2	820,259	32	2,559,408
1994	340,904	35	595,784	62	14,785	2	951,473	35	2,719,911
1995	^a 377,710	41	505,047	55	17,124	2	899,881	32	2,787,670
1996	^a 265,986	65	123,015	30	11,803	3	400,804	20	2,006,528
1997	^a 247,898	63	125,333	32	12,114	3	385,345	19	2,079,514
1998	^a 216,650	62	114,792	33	14,223	4	345,665	19	1,856,976
1999	^a 307,446	64	150,640	31	17,349	4	475,435	19	2,499,152
Mean	274,953	46	325,597	52	14,967	2	615,517	30	2,030,146

^a Does not include Lower Cook Inlet.

^b 1981-1995 from Statewide Harvest Survey (Mills 1982-1994; Howe et al. 1995, 1996). 1996-1997 total reported harvest from returned permits. 1998, 1999 expanded harvest from returned permits.

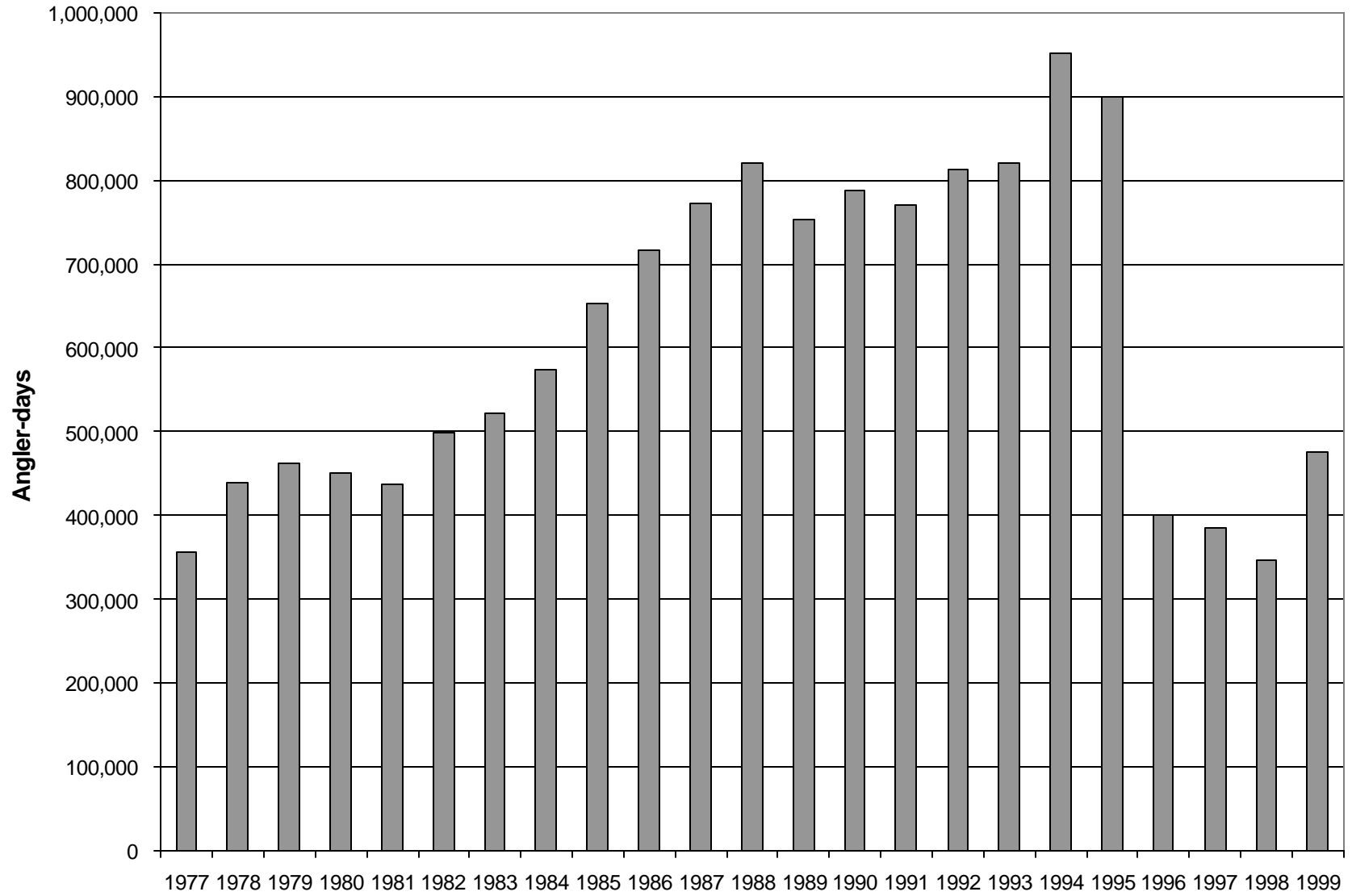


Figure 2.-Recreational angler participation in the Kenai Peninsula Management Area, 1977-1999.

Table 2.-Angler-days of sport fishing effort for the Kenai River, by section, 1977-1999.

Year	Cook Inlet to Soldotna Bridge	Soldotna Bridge to Moose River	Moose River to Skilak Outlet	Skilak Inlet to Kenai Lake	Kenai River Total
1977					122,138
1978					164,264
1979					178,485
1980					171,803
1981	91,763	35,877	33,701	17,375	178,716
1982	119,164	49,372	39,170	24,242	231,948
1983	109,067	52,266	41,442	26,453	229,228
1984	150,824	42,644	40,976	35,978	270,422
1985	163,690	66,100	55,904	36,536	322,230
1986	181,035	63,876	51,171	38,969	335,051
1987	141,203	66,807	41,128	40,027	289,165
1988	203,728	79,727	55,334	35,470	374,259
1989	198,697	93,508	53,135	31,562	376,902
1990	169,818	82,331	43,401	47,112	342,662
1991	151,592	82,552	45,067	44,157	323,368
1992	150,249	81,378	49,774	51,172	332,573
1993	162,171	70,353	38,583	53,013	324,120
1994	170,944	71,440	39,222	59,298	340,904
1995	206,127	81,280	43,432	46,871	377,710
1996	131,751	61,059	32,465	40,711	265,986
1997	120,873	58,618	32,645	35,762	247,898
1998	95,378	56,342	36,218	28,712	216,650
1999	157,493	69,331	41,573	39,049	307,446
Mean	151,346	66,572	42,860	38,551	274,953

In 1992, the Board of Fisheries designated Cook Inlet as a "non-subsistence area." An exception was provided for subsistence fisheries that occur in areas adjacent to the villages of Tyonek in northwestern Cook Inlet and Port Graham and English Bay in Kachemak Bay. In the fall of 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 yet 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. 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 through 1999.

Table 3.-Kenai River sport fish harvest by species, 1977-1999.

Year	Chinook Salmon	Coho Salmon	Sockeye Salmon	Pink Salmon	Chum Salmon	Rainbow Trout	Arctic Grayling	Dolly Varden	Smelt	Other	Total
1977	7,585	9,537	23,196	163	0	4,438	187	7,423	56,550	179	109,258
1978	7,130	10,823	33,619	26,579	0	9,272	90	17,140	15,832	1,357	121,842
1979	8,843	15,276	16,887	127	0	14,644	127	34,687	10,690	377	101,658
1980	4,942	26,838	25,468	18,580	0	9,807	17	26,794	150,554	353	263,353
1981	9,634	22,324	19,721	86	0	18,685	65	34,862	41,126	43	146,546
1982	10,418	39,415	50,103	25,572	0	12,673	188	16,484	49,355	10	204,218
1983	15,316	22,678	71,267	1,825	0	13,658	126	9,556	85,126	0	219,552
1984	12,321	59,644	15,702	28,560	0	15,687	51	31,407	47,455	418	211,245
1985	13,965	44,535	57,213	1,306	186	14,981	104	26,235	26,460	104	185,089
1986	18,119	60,110	72,398	19,924	563	2,425	120	5,775	33,124	0	212,558
1987	24,978	33,210	240,819	941	144	2,185	156	7,630	53,773	31	363,867
1988	32,415	48,694	152,751	15,777	849	2,133	692	10,977	18,223	0	282,511
1989	17,160	55,259	277,225	1,421	520	1,917	151	10,064	31,398	0	395,115
1990	7,684	60,325	120,788	27,185	312	3,535	51	11,982	36,563	48	268,473
1991	9,174	76,156	161,602	2,416	0	3,319	0	14,504	6,334	496	274,001
1992	9,753	52,310	242,492	10,029	0	1,977	0	14,462	14,971	109	346,103
1993	30,312	50,538	137,180	1,003	0	2,574	0	12,698	6,619	18	240,942
1994	27,708	86,711	93,616	8,701	0	1,576	0	8,486	3,391	183	230,372
1995	23,168	46,183	125,425	991	0	2,150	0	9,523	987	71	208,498
1996	15,740	42,293	186,291	15,406	464	1,560	123	7,484	7,366	151	276,878
1997	15,177	16,164	177,133	1,371	154	1,910	131	6,957	8,874	134	228,005
1998	7,450	26,967	164,536	8,926	79	2,015	25	6,079	8,175	558	224,810
1999	17,145	31,637	200,574	1,895	333	3,784	64	7,568	4,942	4	267,946
Mean	15,049	40,766	115,913	9,512	157	6,387	107	14,729	31,213	202	234,037

Table 4.-Angler-days of sport fishing effort for other Northern Kenai Peninsula Area drainages, by fishery, 1977-1999.

Year	Salt Water	Russian River	Swanson River	Quartz Creek	Kasilof River	Skilak Lake	Hidden Lake	Tustemena Lake	Other	Total
1977	79,045	54,220					7,462		92,899	233,626
1978	93,807	67,237					4,028		109,057	274,129
1979	100,010	58,133					5,974		118,826	282,943
1980	89,065	78,983					5,783		103,742	277,573
1981	93,432	54,642			8,311		4,761		92,092	253,238
1982	91,033	70,372			13,238		6,278		82,595	263,516
1983	136,566	35,018	2,124	691	16,675	422	6,761	253	83,918	282,428
1984	127,635	55,861	5,671 ^b	3,413	25,697	67	4,835	351	73,111	296,641
1985	122,243	80,054	4,058 ^b	451	24,103	121	3,676	1,734	83,161	319,601
1986	143,160	70,729	7,599 ^b	4,146	36,115	413	6,254	291	95,974	364,681
1987	186,525	91,600	7,353 ^b	5,361	42,703	4,129	12,532	1,576	98,989	450,768
1988	183,254	76,180	10,368	3,965	43,965	3,838	4,820	1,419	80,417	408,226
1989	163,717	53,598	5,484	4,893	39,318	2,810	1,152	923	70,086	341,981
1990	218,622	68,861	6,091	5,655	40,437	2,817	4,188	2,200	94,304	443,175
1991	204,216	76,433	5,830	5,354	46,208	4,120	4,426	1,596	86,612	434,795
1992	225,442	67,443	4,897	7,906	49,774	3,820	4,172	1,600	102,131	467,185
1993	232,298	61,018	5,690	9,152	57,127	3,289	5,030	1,055	104,955	479,614
1994	344,512	65,996	5,039	7,241	50,821	1,805	3,014	1,587	115,769	595,784
1995	278,461	58,090	4,637	5,179	50,012	2,957	4,443	1,332	99,936	505,047
1996	^a 2,247	50,122	3,907	3,018	33,585	1,780	2,305	910	25,141	123,015
1997	^a 1,188	46,914	3,495	3,401	32,287	2,346	2,575	1,699	31,428	125,333
1998	^a 890	47,942	3,422	3,166	26,487	1,645	1,576	985	28,679	114,792
1999	^a 2,074	64,536	3,606	4,708	40,263	1,182	2,017	599	31,655	150,640
Mean	135,628	63,217	5,251	4,571	35,638	2,209	4,698	1,183	82,847	325,597

^a Does not include Lower Kenai Peninsula Management area.

^b Includes the Swanson River canoe route.

Table 5.-Sport fish harvest from other systems in the Northern Kenai Peninsula Management Area, 1977-1999.

Year	Chinook Salmon	Coho Salmon	Sockeye Salmon	Pink Salmon	Chum Salmon	Rainbow Trout	Arctic Grayling	Dolly Varden	Smelt	Other	Total
1977	8,110	9,509	51,174	10,637	162	18,663	1,400	26,960	29,561	31,262	187,438
1978	10,225	9,856	68,689	12,273	390	16,373	2,197	38,192	39,418	21,282	218,895
1979	9,496	10,484	40,321	8,654	127	19,717	1,391	51,041	12,135	10,848	164,214
1980	3,887	8,925	59,375	9,729	215	22,655	2,109	36,892	23,958	5,077	172,822
1981	7,819	10,206	36,082	9,947	173	23,456	1,826	40,325	85,968	3,985	219,787
1982	10,406	10,028	49,964	6,302	180	18,459	2,015	26,657	5,851	3,370	133,232
1983	11,108	9,004	32,726	6,063	923	18,729	1,455	45,513	101,439	6,209	233,169
1984	12,468	11,696	65,027	7,244	211	13,240	998	23,357	1,348	1,844	137,433
1985	11,197	10,723	74,781	7,223	260	14,322	1,248	19,279	1,400	6,502	146,935
1986	13,958	11,735	72,195	4,466	118	14,498	1,758	19,863	3,446	15,067	157,104
1987	13,747	18,676	186,222	4,272	216	8,310	850	14,395	93	9,514	256,295
1988	21,167	20,918	89,388	11,203	671	8,180	581	12,530	62	19,596	184,296
1989	14,527	29,583	77,132	9,100	709	5,876	982	12,013	48	14,957	164,927
1990	17,048	17,433	64,505	7,679	372	11,346	862	15,874	2,359	36,270	173,748
1991	19,962	25,645	107,839	5,150	308	9,222	1,472	12,990	565	6,570	189,723
1992	26,163	20,634	68,675	10,074	284	14,379	775	15,293	5,344	6,926	168,547
1993	42,974	32,097	62,865	6,426	736	12,078	1,268	16,658	1,541	3,680	180,323
1994	35,306	33,442	81,431	5,928	273	12,485	1,636	13,542	4,012	2,742	190,797
1995	32,265	27,692	45,128	5,955	291	12,203	1,863	10,550	2,514	3,050	141,511
1996 ^a	6,428	12,813	62,418	4,053	188	8,331	778	4,385	0	92	99,486
1997 ^a	6,959	8,550	56,049	2,409	244	14,247	1,178	7,581	1,621	217	99,055
1998 ^a	4,921	10,505	73,301	8,180	321	11,060	838	4,020	2,552	258	115,956
1999 ^a	8,710	10,587	74,101	1,104	246	14,494	1,040	3,615	352	44	114,293
Mean	15,167	16,119	69,539	7,134	331	14,014	1,327	20,501	14,156	9,103	167,391

^a Does not include Lower Kenai Peninsula Management area.

Table 6.-Angler-days of effort for Kenai River and Kasilof River personal use fisheries, 1981-1999.

Year ^c	Kenai River Dip Net	Kasilof River Dip Net	Total
1981	No Fishery	5,370	5,370
1982	Unknown	2,580	2,580
1983	3,203	4,417	7,620
1984	No Fishery	5,956	5,956
1985	No Fishery	9,260	9,260
1986	No Fishery	13,929	13,929
1987	22,547	8,910	31,457
1988	29,013	6,930	35,943
1989	31,312	No Fishery	31,312
1990	No Fishery	No Fishery	0
1991	No Fishery ^a	No Fishery ^a	0
1992	10,371	No Fishery ^a	10,371
1993	14,896	No Fishery	14,896
1994	10,360 ^a	2,361	12,721
1995	11,122	2,845	13,967
1996	10,503	1,300	11,803
1997	11,023	1,091	12,114
1998	10,802	3,421	14,223
1999	13,738	3,611	17,349
Mean	9,415	3,788	13,204

Source: 1983-1995 from Statewide Harvest Survey (Mills 1984-1994; Howe et al. 1995, 1996).

1996-1997 total reported harvest from returned permits.

1998, 1999 from expanding the known return to include permits not returned.

^a Subsistence Fishery only.

Table 7.-Kenai Peninsula personal use dip net harvest, by species, 1983-1999.

Year ^a	Chinook Salmon	Coho Salmon	Sockeye Salmon	Pink Salmon	Chum Salmon	Rainbow Trout	Arctic Grayling	Dolly Varden	Smelt	Other	Total
1983	0	0	24,152	0	0	0	0	0	0	0	24,152
1984	0	0	14,565	0	0	0	0	0	0	0	14,565
1985	0	248	19,282	62	0	0	0	0	0	0	19,592
1986	0	1,422	40,489	1,315	0	0	0	109	0	66	43,401
1987	362	2,862	43,771	471	181	36	0	127	0	0	47,810
1988	0	5,275	22,337	2,019	345	36	0	564	0	0	30,576
1989	0	3,804	54,392	1,212	240	70	0	26	0	117	59,861
1990	0	0	5,835	68	178	0	0	0	0	16	6,097
1991	0	450	65,082	33	0	0	0	0	0	0	65,565
1992	0	1,409	15,657	1,126	106	0	0	0	0	173	18,471
1993	0	1,474	37,727	538	0	0	0	0	0	45	39,784
1994	0	3,120	31,133	1,882	78	0	0	0	0	76	36,289
1995	0	1,839	33,269	526	27	0	0	99	0	136	35,896
1996	345	2,266	114,018	2,507	192	0	0	0	0	0	119,328
1997	399	649	124,356	638	77	0	0	0	0	0	126,119
1998	388	1,742	149,008	1,642	159	0	0	0	0	0	152,939
1999	615	1,295	186,680	1,930	154	0	0	0	0	0	190,674
Mean	124	1,639	57,750	939	102	8	0	54	0	37	60,654

^a 1983-1995 from Statewide Harvest Survey (Mills 1984-1994; Howe et al. 1995, 1996, 2001 a-d). 1996-1997 total reported harvest from returned permits. 1998, 1999 from expanding the known return to include permits not returned

Table 8.-Upper Cook Inlet commercial salmon harvest, by species, 1990-1999.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1990	16,105	3,604,064	500,634	603,630	351,197	5,075,630
1991	13,535	2,177,576	425,724	14,663	280,223	2,911,721
1992	17,171	9,108,340	468,911	695,859	274,303	10,564,584
1993	18,719	4,754,698	306,822	100,918	122,767	5,303,924
1994	20,260	3,567,392	580,567	520,481	299,300	4,988,000
1995	17,857	2,951,827	446,954	133,575	529,422	4,079,635
1996	14,248	3,888,778	321,411	242,911	156,457	4,623,805
1997	13,235	4,176,696	152,404	70,928	103,036	4,516,299
1998	7,997	1,218,956	160,644	551,260	95,654	2,034,511
1999	14,128	2,680,707	125,343	16,129	174,243	3,010,550
Average	15,326	3,812,903	348,941	295,035	238,660	4,710,866

Source: Fox and Shields 2000, Appendix A6.

Personal use fishing in Cook Inlet has also developed into a focus of contention as harvest levels have increased and the fishery participants, in turn, have established themselves as a major harvester of salmon (primarily sockeye salmon) stocks.

In October of 1999, the Federal Subsistence Board ruled the entire Kenai Peninsula rural, thus qualifying all residents for participation in federal subsistence fisheries. To date, no federal subsistence fisheries have been established. U.S. Fish and Wildlife subsistence staff are currently assessing the customary and traditional uses (C&T) of salmon stocks on the Kenai Peninsula. Pending finalization of these C&T determinations and the resolution of current legal challenges to the rural determination ruling for the Kenai Peninsula, subsistence fisheries on the Kenai Peninsula will not likely be implemented for several years.

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. This permit establishes a season, and sets allowable salmon harvests by species. The current harvest quota in this fishery is 5,000 salmon. Although controversial at its inception, allocative issues surrounding this fishery have declined in recent years.

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 9). 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

Table 9.-Economic value (thousands of dollars) of Kenai Peninsula Management Area 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.

additional \$163 million to ensure the continued availability of KPMA sport fisheries. Unlike 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 9). 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. This 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 re-allocating an additional 200,000 late-run Kenai River sockeye salmon from the commercial fishery 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 mid-level, re-allocating 200,000 Kenai River sockeye salmon from the commercial fishery to the inriver recreational fishery resulted in a net economic loss to the commercial fishing industry of an estimated \$1.7 million. Correspondingly, the economic gain to the sport fishing industry was estimated at \$1.3 million. The economic impact 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 losses 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. Based upon the deliberations of the economic study results as well as stock status analyses, the BOF allocated additional sockeye salmon to the inriver sport fishery during this meeting (see section: Kenai River Late-run Sockeye Salmon Fishery).

MAJOR ONGOING RESEARCH ACTIVITIES

There are currently seven major NKPM research programs.

1. Annual stock assessment of early- and late-run chinook salmon returns to the Kenai River. This program has three study components. A creel survey estimates chinook salmon harvest, catch and fishing effort during the early- and late-run recreational chinook salmon fisheries. Age and size composition of the chinook stocks are determined by sampling the early and late returns in the lower area of the river. A sonar counter estimates abundance of early- and late-run chinook salmon entering the Kenai River. The creel survey and sonar are required

for inseason management actions to ensure that the escapement goals, as provided by the Kenai River chinook salmon management plans are achieved. The data provided by this research program are also used to construct brood tables necessary to assess spawner-recruit relationships and evaluate escapement goals.

2. Assessment of early and late sockeye salmon returns to the Russian River. Through 1996, a creel survey assessed the number of sockeye salmon harvested during the early- and late-run recreational sockeye salmon fisheries. This study element was discontinued in 1997. Harvest statistics from the recreational fisheries are currently estimated from the Statewide Harvest Survey (SWHS). A weir is used to determine the early- and late-run spawning escapement. Scale samples to determine age and size composition of the sockeye salmon stocks were collected in the fishery and at the weir through the 1996 season. Beginning in 1997, sampling has been conducted only at the weir. The fishery is managed inseason using a mean run timing model predicated on historical escapement data. The data are also used to assess spawner-recruit relationships and evaluate escapement goals.
3. Kenai River coho salmon stock assessment. Begun in 1992, the program's research goal is to estimate total annual returns of coho salmon to the Kenai River. This requires estimation of all the major components of the annual returns, including the sport, commercial, and personal use harvests as well as the spawning escapement.

The current Kenai River coho program has four study elements. The first is a project to mark and tag 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 tagged fish. The fourth component is a mark-recapture experiment to estimate spawning escapement and inriver exploitation rates. This component was initiated in 1998 and is a continuing program element. Results from this project have not been fully analyzed. Continuation and future direction will depend upon research findings.

4. Kenai River riparian habitat study. The Kenai River sockeye salmon sport fishery is the largest recreational fishery in the State of Alaska and continues to be an expanding fishery. Virtually all participants fish from shore or nearshore areas and access the fishery from the banks of the river. When large numbers of anglers concentrate in a given area, habitat degradation occurs. 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 provides, in part, that the Commissioner of Fish and Game may close the fishery adjacent to riparian habitat areas if fishing activity in a specific location will result in habitat loss. Approximately 15 miles of river bank have been closed on the Kenai River in accordance with this plan.

The BOF has linked habitat loss with sockeye salmon allocation to the inriver sport fishery. In February 1996, the BOF amended the Kenai River Late-run Sockeye Salmon Management Plan (5 AAC 21.360). The number of sockeye salmon allocated to the inriver recreational fishery was increased. The amended plan further provides that this allocation could be reduced if a net loss of habitat occurred and this loss was attributable to the sockeye salmon

sport fishery. The ongoing Habitat Study is designed to assess the relationships between angler effort and the resulting impacts to the riparian habitat of the Kenai River.

5. Kenai River Dolly Varden study. Harvest data as well as information received from the public strongly suggest that 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 Dolly Varden use of the upper Kenai River drainage, document areas of Dolly Varden concentration, identify spawning areas and radio-tag fish to elucidate migratory patterns. This project was continued during 1998-99 with research efforts directed towards marking and tracking of radiotagged fish. The data from this project have not been fully analyzed.
6. Upper and middle Kenai River rainbow trout population abundance estimates. Harvest and effort data provided by the SWHS in conjunction with public information have indicated the need to reassess the population status of rainbow trout in the upper and middle reaches of the Kenai River. In 1997, a program was initiated to study this population. Objectives during the first field season were to describe rainbow trout use of the upper Kenai River drainage, document areas of rainbow trout concentration, identify spawning areas and radio-tag fish to elucidate migratory patterns. This project was continued during 1998-99 with research efforts directed towards marking and tracking of radiotagged fish. The data from this project have not yet been fully analyzed.
7. Lake stocking evaluation. The final research program currently ongoing in the NKPMA is directed towards evaluating lakes stocked with hatchery-produced trout and salmon. There are currently 28 lakes that are stocked with rainbow trout and coho salmon. The objective of the stocking program is to provide 10,000 days of recreational opportunity for anglers in the NKPMA (ADF&G 1999). There are two principal elements of the stocked lakes evaluation: (1) estimation of harvest and effort from the SWHS, and (2) assessment of fish growth and survival through periodic sampling. This information is also used to examine current stocking levels and make recommendations for future changes.

MAJOR ISSUES

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

1. Subsistence: On October 1, 1999, the federal government assumed control of management for subsistence hunting and fishing on federal lands within the State of Alaska. In the spring of 2000, the Federal Subsistence Board, at the request of the Kenaitze Indian Tribe, reconsidered rural designations for communities on the Kenai Peninsula. Final action by the Federal Subsistence Board ruled that the entire Kenai Peninsula was designated rural, making all residents qualified for subsistence hunting and fishing. This action was contrary to recommendations of USF&WS staff. In recognition that all major fish stocks on the Kenai Peninsula are fully allocated, this ruling may disrupt or displace many of the current recreational, commercial and personal use fisheries on the Kenai Peninsula and particularly within the NKPMA. Potential subsistence fisheries include: early and late returning Kenai River chinook salmon stocks, early and late returning sockeye salmon stocks in the Kenai River and Russian River, and early and late returning coho salmon stocks in the Kenai River. Other subsistence fisheries could be established on the Kasilof and Swanson rivers as well. Current legal challenges to the rural decision have mandated a review of the classification of

the Kenai Peninsula as a rural area. Should the Kenai Peninsula remain designated a rural area then federal officials will implement actions necessary to establish findings for customary and traditional use of various salmon stocks. The final step in this process would be to establish subsistence fisheries for those salmon stocks with recognized customary and traditional uses. This controversy will most likely continue to be a critical issue affecting recreational fisheries into the foreseeable future.

2. Kenai River Coho Salmon: The return of coho salmon to the Kenai River in 1998 appeared to rebound above the very poor run experienced in 1997. However, coho returns during 1999 appeared once again to be very weak. As a result of the continued concern regarding the status of Cook Inlet and Kenai River coho stocks, the Alaska Board of Fisheries adopted conservation measures intended to further reduce commercial harvests of Kenai River-bound coho salmon, and placed restrictions on the inriver sport fisheries as well. The Board implemented these measures during the spring of 2000. Population assessment research is currently underway to estimate the total return of coho salmon to the Kenai River including commercial and recreational harvests and spawning escapement. Results from this research should be available for presentation at the next regularly-scheduled Alaska Board of Fisheries meeting in 2002. However, given the continuing allocative disputes over salmon resources in Cook Inlet and the lack of critical biological information for most stocks of coho salmon, management of early and late runs of coho salmon to the Kenai River will continue to be a major issue.
3. Conflicting Management Plans for Kenai River Sockeye and Coho Salmon: In 1999, the Alaska Board of Fisheries revised the Kenai River Late-run Sockeye Salmon Management Plan to allow for three, inriver optimum escapement goal ranges based upon projected return abundance. In years with higher projected returns, the department will adjust management of the commercial fishery to provide higher inriver escapement.

In the spring of 2000, the Alaska Board of Fisheries adopted coho salmon conservation measures that reduced commercial fishing opportunity during early August. These measures included an earlier closure date for the eastside setnet fishery in the Central District and a reduction in the number of permissible emergency order fishing periods. Loss of commercial harvest opportunity for sockeye salmon during the month of August will likely increase the pressure on commercial managers to harvest sockeye salmon more intensively in July in order to remain within the proscribed escapement ranges established by the BOF in 1999. The necessity for commercial fishery managers to increase exploitation rates on sockeye salmon in July greatly increases during years of larger sockeye returns (greater than 4 million). Of major concern is the risk of overexploiting less abundant species, particularly late-run chinook and early-run coho salmon, when returns of sockeye salmon are large. It is incumbent upon the Alaska Board of Fisheries to amend the specific management plans such that they better reflect the departments' ability to manage sockeye salmon escapements into the Kenai River while not endangering the sustainability of less abundant species.

4. Declining Abundance of Trophy-Sized Kenai River Chinook Salmon: The relative abundance of trophy-sized chinook salmon has declined since the inception of the Kenai River chinook salmon sport fishery during the mid-1980s. It is unknown whether this decline is the result of natural variability or a result of selective harvest pressures within the recreational fisheries. Because of restrictive bag limits, it is common for recreational fishermen to select large fish for retention. This situation has been exacerbated by the overall

growth in participation of anglers in the sport fishery and the resultant pressure to harvest trophy-sized fish. Public awareness of this apparent decline in chinook salmon in the Kenai River is increasing, with several civic and industry organizations expressing generalized concern. Directed research is needed to determine whether observed declines in the abundance of trophy-sized chinook salmon are significant between years, to identify potential causes, and to develop strategies to help reduce the decline. The relative abundance of trophy-sized chinook salmon and current management strategies that permit selection of trophy-sized fish for retention will continue to be an issue until these questions are resolved.

5. Kenai River Riparian Habitat Regulation: Alteration of the riparian habitat of the major river drainages in the NKPMA is a major issue. Urban development, boat wakes and the large number of anglers fishing from stream banks are all contributing factors. Although the Kenai Peninsula Borough has taken tentative steps towards controlling residential and commercial development along the Kenai River, additional zoning restrictions to development will likely be necessary to provide adequate long-term protection for shoreline habitat. Riparian habitat degradation has also been an issue at the Russian River where bank anglers have affected streamside habitat. Habitat changes as a result of boat wakes and bank anglers have least affected the Kasilof River, but residential development in that area is becoming a concern. The loss of riparian habitat is a vital issue for this may ultimately affect the productivity of the freshwater environment and in turn, the viability of the region's fishery resources.
6. Introduction and Spread of Non-Native Fish Species: During 1998 and 1999, persistent rumors of the presence of yellow perch *Perca flavescens* in the NKPMA were circulated by members of the public. These rumors were confirmed in the spring of 2000 with the identification of the lake containing yellow perch in the North Kenai area. The spread of northern pike *Esox lucius* into another Kenai Peninsula lake was also confirmed as a result of renewed stocked lake evaluation studies in 2000. Pike were introduced into the Kenai River system in the mid to late 1970s and have been incrementally gaining access to more freshwater environs since that time. The potential introduction and continued spread of nonnative fish species in the Kenai River and surrounding drainages will continue to be an issue of vital concern in the NKPMA.
7. Complexity of Sport Fishing Regulations: Many staff as well as participants in the region's sport fisheries are concerned that the sport fishing regulations in the NKPMA are too complex for the average angler to readily comprehend. Regulatory complexity is very likely a result of the BOF's efforts to maximize opportunity while attempting to address the complex biological and allocative issues associated with the salmon and trout resources of Cook Inlet. Given the recent decline in sales of resident sport fishing licenses and a general belief that regulatory complexity is a contributing factor, additional efforts by the department and the Alaska Board of Fisheries to simplify existing regulations while still providing adequate opportunity is necessary.
8. Enforcement of Sport Fishing Regulations: Enforcement of sport fishing regulations is primarily the responsibility of the Division of Fish and Wildlife Protection within the Department of Public Safety. The Division of Parks and Outdoor Recreation within the Department of Natural Resources (DNR, DPOR) and the Division of Sport Fish staff within the Department of Fish and Game also share responsibility to enforce regulations. Federal agencies enforce state regulations on federal lands. However, during the peak of the fishing season, enforcement activity is generally viewed by the enforcement agencies, as well as the

angling public, as inadequate. Lack of adequate enforcement erodes the public's confidence in the department's ability to adequately manage as well as protect the fishery resources of the NKPMA.

ACCESS PROGRAMS

Access to fisheries of the NKPMA is an integral part of this area's program. Historically, boating access and nonboating access projects have been funded. Most recent purchases and development have been centered upon the Kenai River. A boat launch and parking area 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). The "Pillars" boat launch area (River Mile 12.5) was also completed in 1997 and provides access to the popular lower Kenai River.

Prior access projects continue to provide reasonable access to major NKPMA fisheries. Lack of access has not been a recent issue in this management area and there are no current requests to purchase additional access areas.

SECTION II: FISHERIES OVERVIEW

Section II is a summary of all recreational fisheries within the NKPMA. The section begins with a listing of the emergency orders issued to manage the area's sport and personal use fisheries from 1998-1999 (Table 10). Each individual fishery chapter is subdivided into sections that provide the reader with a listing of the fishery objectives, the general management approach, a historical perspective of the fishery, and a review of recent Board of Fisheries actions. Following these sections is a review of recent fishery performance, the outlook for the future and a review of current issues relevant to the fishery. Each chapter concludes with recommendations for future research and management.

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 origin and supplemented by natural production in Crooked Creek. The fishery objectives are:

Objective 1: To produce a return of approximately 8,000 early-run 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 chinook salmon in the Kasilof River.

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

Observation and data indicate that these objectives are being achieved. Although total return information is unavailable for 2000, the 1999 total return was estimated at 11,403 early-run chinook salmon (Table 11). During 1998 and 1999, the fishery was prosecuted without restriction. Total participation in Kasilof River sport fisheries was 26,487 and 40,263 angler-days of effort for 1998 and 1999, respectively (Table 4). This total includes guided and unguided shore and boat anglers (Howe et al. 2001 c, d). The majority of the participation in Kasilof River sport fisheries is assumed to occur during the early-run chinook salmon fishery.

INSEASON MANAGEMENT APPROACH

Harvest in this fishery is primarily stocked fish and therefore no inseason regulation of the fishery has historically 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 to convey the general status of the fishery to the news media and public.

HISTORICAL PERSPECTIVE

The hatchery stocks of early-run chinook salmon that return to the Kasilof River were originally developed from the wild fish present in Crooked Creek, a tributary to the Kasilof River, approximately 6 miles upstream from Cook Inlet (Figure 3).

Table 10.-Summary of Northern Kenai Peninsula emergency orders, 1998-1999.

Emergency Order Number	Effective Date	Action/Justification
2-KS-1-07-98	06/05/1998 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	06/20/1998 12:00 noon	Open sanctuary at Russian River.
2-KS-1-11-98	07/01/1998 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	07/01/1998 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	07/23/1998 12:01 a.m.	No bait in Kenai River king fishery; treble hooks o.k.
2-PU-1-18-98	07/24/1998 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	07/24/1998 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	07/25/1998 12:01 a.m.	Closed bank fishing at Soldotna Creek Park from July 25 - August 31.
2-KS-1-23-98	07/28/1998 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	07/28/1998 12:01 a.m.	Closed Kenai River sockeye fishery from RM 19 downstream to Cook Inlet.
2-PU-1-21-98	07/28/1998 12:01 a.m.	Closed the personal use fishery at mouth of the Kenai River.
2-RS-1-22-98	07/28/1998 12:01 a.m.	Closed Kenaitze educational fishery.
2-RS-1-25-98	08/03/1998 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	08/03/1998 12:01 a.m.	Re-open the Kenaitze educational fishery.
2-RS-1-28-98	08/03/1998 12:01 a.m.	Increased bag and possession limits at Russian River to 6 fish.

-continued-

Table 10.-Page 2 of 2.

Emergency Order Number	Effective Date	Action/Justification
2-KS-1-04-99	06/16/1999 12:01 a.m.	Permit usage of bait and multiple hooks in Kenai River downstream from Skilak lake.
2-RS-1-06-99	06/20/1999 06:00 a.m.	Open sanctuary at Russian River.
2-RS-1-14-99	07/13/1999 12:01 a.m.	Close approximately 0.4 miles of Kenai River riverbank to fishing.
2-KS-1-16-99	08/01/1999 12:01 a.m.	Extend king salmon season in Kenai River downstream of Eagle Rock through 8/7.
2-RS-1-17-99	08/05/1999 12:01 a.m.	Increase bag and possession limit in the Russian/Kenai River "fly-fishing-only area" to 6 sockeye salmon.

The recreational fishery for early-run chinook salmon in the Kasilof River occurs from late May through early July. In the late 1970s and early 1980s virtually all fishing was conducted from the shoreline of the Kasilof River within the one-half mile area immediately downstream from its confluence with Crooked Creek. In recent years, an increasing number of drift boats have been used in the fishery. The growth of drift boat fishing has increased to such an extent in recent years that most of the boat effort in this fishery occurs from drift boats.

The timing of the early run precedes the commercial set gillnet fishery on the eastside beaches 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 12).

BOARD OF FISHERIES ACTIONS

The BOF did not alter regulation of this fishery in 1990, 1992, 1995/96 or in 1998. In 1999, the board-adopted regulations that prohibited guided fishing on Sundays during the month of July. This regulation will not become effective until the year 2000. The Board will again address proposals regarding this fishery in February 2002.

RECENT FISHERY PERFORMANCE

Harvest of early-run chinook salmon from the Kasilof River was 4,839 in 1998 and 8,255 in 1999 (Table 11). In 1998, 47% of the harvest was taken by bank anglers, with the majority of the total harvest nonguided (55%). In 1999, 45% of the harvest was taken by bank anglers, again with the majority of the total harvest taken by nonguided anglers (57%, Howe et al. 2001 c, d).

Natural spawning escapement upstream from the hatchery from 1994-96 ranged from 640-764, with total return ranging from 8,352-9,637. In 1997 and 1998, the weir was not operational. In 1998, Division of Sport Fish staff from the Soldotna ADF&G office reassumed operation of the weir. The number of fish allowed upstream of the weir to spawn was increased from

Table 11.-Historical summary of Kasilof River drainage early-run chinook salmon sport fishery and return, 1978-2000.

Year	Kasilof River ^a Harvest		Crooked Creek ^b Egg Take	Sold or Destroyed by Hatchery	Crooked Creek ^c Escapement	Total Return	Catch Per ^d 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	2,775	700	8,749	0.086
1989	3,767	55.6	263	1,998	750	6,778	0.099
1990	2,852	55.6	379	1,125	771	5,127	0.098
1991	5,055	71.5	258	1,055	700	7,068	^e
1992	6,049	65.3	267	2,196	750	9,262	^e
1993	9,724	87.9	376	113	848	11,061	^e
1994	7,217	80.1	134	1,016	640	9,007	^e
1995	6,681	69.3	0	2,206	750	9,637	^e
1996	6,128	73.4	0	1,460	764	8,352	^e
1997	6,728		0	0	^f		^e
1998	4,839		0	0	^f		^e
1999	8,255	72.4	228	167	2,753	11,403	^e
Mean	4,454	52.3	224	1,176	2,082	7,355	0.037
2000			218	124	3,215		^e

^a Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995, 1996, 2001 a-d).

Includes an unknown small number of late-run fish. One-ocean jacks not included 1978-1997.

^b 1978-1988 from Kyle and Litchfield 1989, Table 1.

^c Escapement is weir counts, minus egg take and those sold or destroyed.

^d Data from FRED Division Kasilof River creel survey. 1978-1988 Kyle and Litchfield 1989, Figure 4.

^e No survey conducted.

^f Hatchery closed; weir not in place.

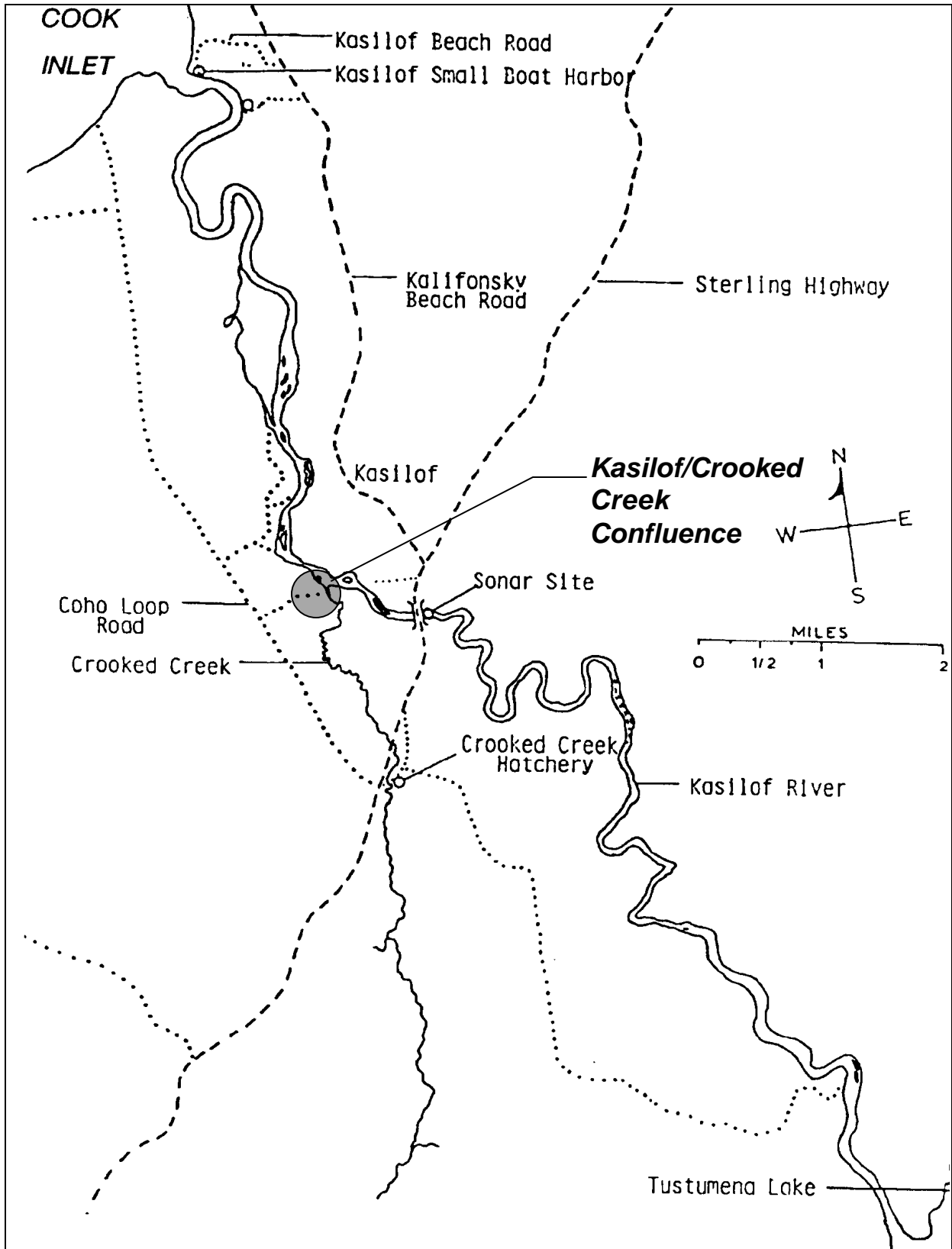


Figure 3.-Kasilof River early-run chinook salmon fishery.

Table 12.-Kasilof River personal use and subsistence gillnet harvest of chinook salmon, 1984-1999.

Year	Chinook Harvest
1984	165
1985	203
1986	168
1987	184
1988	118
1989	186
1990	133
1991	34
1992	no fishery
1993	47
1994	Subsistence only
1995	695 ^a
1996	46
1997	65
1998	126
1999	442

^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.

Sources: 1984-1998 from Ruesch and Fox 1995, Appendix A16

1995 from Ruesch and Fox 1996, Table 15

1994 from Brannian and Fox 1996, Table 7

1996-1999 summaries of returned permits, expanded to include harvest of permits not returned

approximately 700 chinook salmon to approximately 2,700 fish. This action was taken to evaluate the potential returns from naturally-spawning chinook salmon as a means to compensate for a proposed reduction in stocking levels from 210,000 smolts to 105,000 smolts beginning in 2000. The reduction of stocking levels is in response to department concerns about straying of early-run hatchery fish into the Kenai River drainage. The straying issue has also provided the incentive to tag 100% of the released smolt with a coded-wire-tag to better facilitate evaluation of straying into other drainages. Evaluation of possible straying of Crooked Creek chinook salmon will continue during the next several years.

OUTLOOK

Total annual return of stocked early-run chinook salmon to this fishery has been relatively consistent. It is hoped that increased levels of natural spawning will compensate for reduced stocking levels during future years. Future adult returns will depend upon the success of natural production to sustain current levels of the total return.

CURRENT ISSUES

The Kasilof River early-run chinook salmon fishery is essentially a product of enhancement efforts by the ADF&G, Division of Sport Fish. This early-run chinook salmon fishery has developed into a valuable and important recreational fishery in the NKPMA. However, the straying of hatchery-reared chinook salmon into Slikok Creek and other tributaries of the Kenai River is a serious concern. In response to this concern, stocking levels will be reduced by half and 100% of the released chinook salmon smolt will be marked to advance evaluation of straying. The reduction of stocking levels brings about the issue of whether increased natural spawning will be sufficient to compensate for the loss of hatchery production. The future of this fishery is dependent upon the evaluation of straying levels in neighboring watersheds as well as an evaluation of the overall production from Crooked Creek.

In the early years of this fishery, social issues were related to limited parking, habitat degradation and angler congestion. The parking issue was resolved when the state purchased and developed parking facilities that provide access to this fishery. Additional improvements (graveled paths and sanitary facilities) were also added at several locations. These amenities are administered by the Division of Parks. The creation of dedicated trails and bathrooms has decreased the level of habitat degradation and provided for a more aesthetically pleasing experience. Crowded conditions on the stream may once again become an issue should this fishery continue to grow in popularity. Chinook salmon generally school or congregate within the half-mile area below the confluence of Crooked Creek and the Kasilof River. Anglers therefore, tend to direct their efforts in this area as it offers the highest probability of success.

RECOMMENDED RESEARCH & MANAGEMENT

Stocked chinook salmon will continue to be 100% marked. Chinook salmon in the Kenai River will be monitored for adipose clips (indicating Kasilof origin) during research activities and creel surveys, and during a fall carcass survey in the lower Kenai River. No additional research directed at this fishery is recommended at this time. As there are no formal inseason monitoring programs for this fishery, it is recommended that management staff develop a greater level of monitoring to better reflect changes in harvest and angler success during the season.

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 an 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 downstream from the Sterling Highway Bridge only.

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 thought to be generally confined to that area extending from the Sterling Highway Bridge upstream to Tustumena Lake, with a significant number of the spawning population concentrated in the "slackwater" area at the outlet of Tustumena Lake. Here, late-run spawning fish have been captured and used to provide the brood stock for the department's late-run chinook salmon stocking program in other Kenai Peninsula waters. None of these late-run hatchery-produced fish have been returned to the Kasilof River. A population estimate of late-run Kasilof River chinook salmon has never been attempted.

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

The Kasilof River chinook salmon sport fishery is limited by regulation to January 1 through July 31. During the early run (late May through June 30) 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 spawning fish. The early run is harvested by both shore and boat anglers. Observation indicates that late-run fish are harvested primarily by anglers employing drift boats. The Kasilof River is too shallow to be easily negotiated with conventional power boats. However, small numbers of jet-driven boats have been observed. Harvest estimates for the combination of early- and late-run Kasilof River chinook salmon fisheries are determined from the Statewide Harvest Survey.

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 population size and the lack of specific information regarding the population's biological parameters. Similar proposals were before the board in November 1996, and they were not adopted for essentially the same reasons. In 1999, the Board adopted regulations that prohibited guided fishing on Sundays during the month of July. This action was taken in response to increased interest in the late-run chinook salmon fishery and a lack of biological information regarding stock status. This regulation will not become effective until the year 2000. The Board will again address proposals regarding this fishery in February 2002.

RECENT FISHERY PERFORMANCE

The late-run fishery is not formally monitored. Observations and anecdotal information from anglers indicate a total harvest of less than 2,000 chinook salmon. Available information suggests that the harvest and success rates during 1998 were average to slightly below average.

In 1999, observations and reports from guides and other anglers suggest that harvest and success rates were well in excess of an average fishery.

OUTLOOK

Northern Kenai Peninsula late-run (July-August) chinook salmon sport fisheries are limited to the Kenai and Kasilof rivers. The Kenai River supports the larger recreational fishery with many more anglers participating. However, during years when the Kenai River has been restricted for resource conservation, increased numbers of displaced participants have migrated to the Kasilof River. Participation is expected to grow in this fishery, especially during those years in which the Kenai River late-run fishery may be restricted for resource conservation.

CURRENT ISSUES

A late-run chinook salmon population of unknown size is providing for a sport harvest that may approximate several thousand fish during some years. This stock also contributes to a marine sport and commercial fishery. Although there are no identified conservation concerns at this time, there is a significant potential to overharvest this resource in the absence of detailed understanding of the population status of the late-run stocks.

RECOMMENDED RESEARCH & MANAGEMENT

It is recommended that the department initiate a study of this population. Objectives of the 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 this fishery occur. July 1 may not be the appropriate demarcation timeframe between the early- and late-run Kasilof River chinook salmon. Relative maturation of harvested fish in the sport fishery could provide information from which a date separating early- and late-run stocks might be better approximated.

RUSSIAN RIVER EARLY-RUN SOCKEYE SALMON RECREATIONAL FISHERY

The Russian River is a clearwater tributary to the Kenai River, located approximately midway between Kenai and Skilak lakes (Figure 4). The drainage includes two large clearwater lakes, Upper and Lower Russian lakes.

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. This goal, originally established at 9,000 fish when the plan was adopted in 1978, was increased to 16,000 fish in 1990. The escapement goal has been achieved in all years since 1977, except 1989 (Table 13).

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.

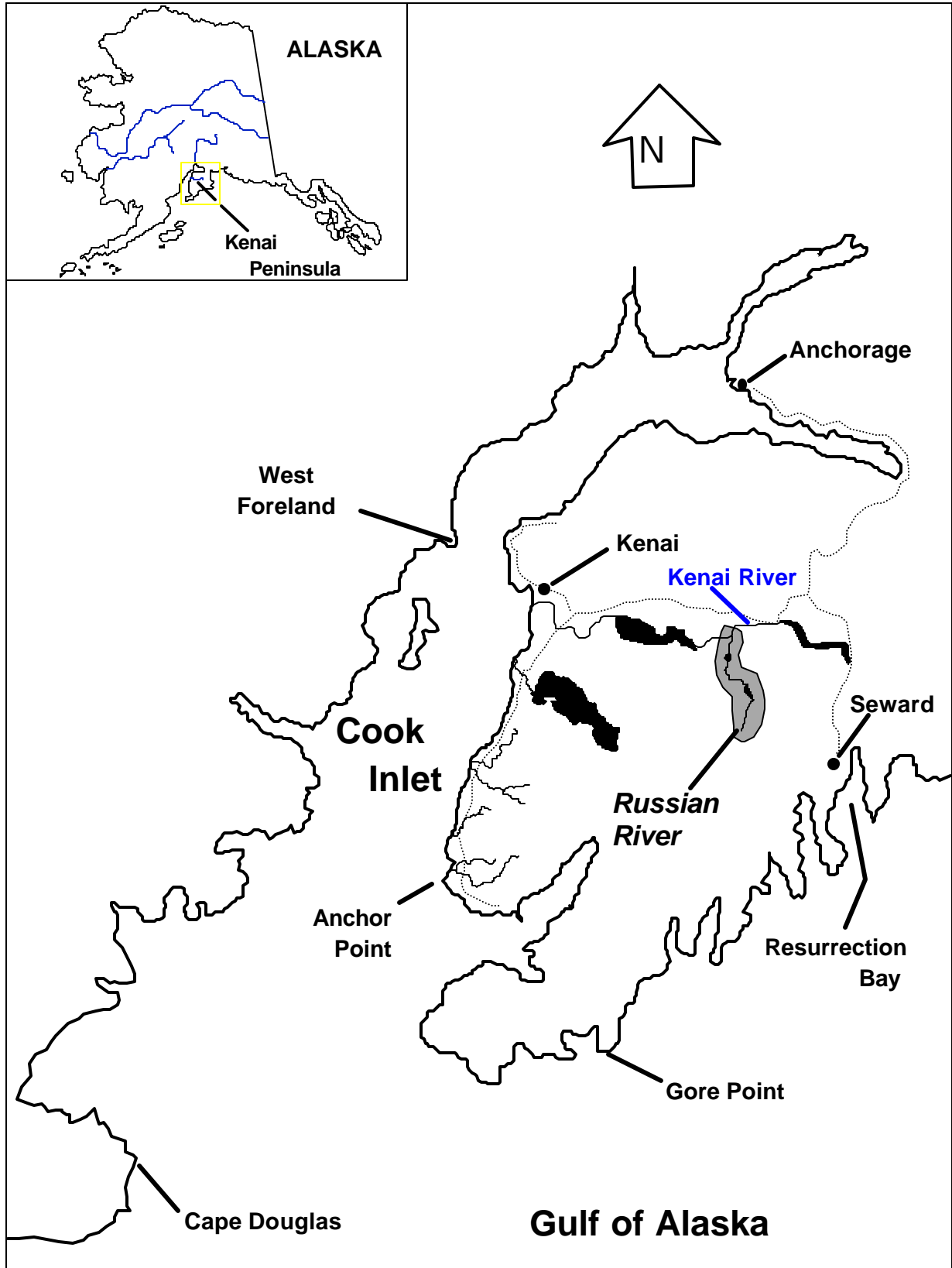


Figure 4.-Location of the Russian River on the Kenai Peninsula, Alaska.

Table 13.-Historical summary of escapement, harvest, angler effort, and harvest rate, Russian River early-run sockeye salmon, 1963-1999.

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	0.173	39,075	52,905	91,980
1997 ^d				36,788	36,280	73,068
1998 ^d				42,711	34,143	76,854
1999 ^d				34,283	36,607	70,890
Mean	26,260	108,900	0.181	24,960	25,590	50,550

^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.

Run strength is determined 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 (Tables 14 and 15). A determination of run strength can generally be made a few days prior to the historic mid-point (June 30) 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 fish present downstream from the weir, including the area between the weir and the falls, the falls area, lower Russian River, and the sanctuary area (Figure 5). In addition, observed fishery performance downstream from the sanctuary area is considered to be an indicator of run strength. If inseason restrictions become necessary in order to achieve the escapement goal, the department generally considers the following options: bag limit reductions, closing the clear 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.

Table 14.-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	0.748
10-Jun	0	1	0.004	06-Jul	1,947	27,217	0.787
11-Jun	19	20	0.008	07-Jul	1,711	28,928	0.822
12-Jun	28	48	0.016	08-Jul	1,407	30,335	0.852
13-Jun	464	512	0.021	09-Jul	1,017	31,352	0.884
14-Jun	243	755	0.029	10-Jul	801	32,153	0.908
15-Jun	133	888	0.038	11-Jul	1,008	33,161	0.932
16-Jun	1,383	2,271	0.047	12-Jul	115	33,276	0.945
17-Jun	2,049	4,320	0.061	13-Jul	350	33,626	0.957
18-Jun	2,409	6,729	0.080	14-Jul	226	33,852	0.965
19-Jun	758	7,487	0.096	15-Jul	56	33,908	0.971
20-Jun	2,298	9,785	0.123	16-Jul	67	33,975	0.978
21-Jun	1,930	11,715	0.149	17-Jul	59	34,034	0.985
22-Jun	1,279	12,994	0.177	18-Jul	54	34,088	0.988
23-Jun	934	13,928	0.203	19-Jul	3	34,091	0.991
24-Jun	1,367	15,295	0.245	20-Jul	35	34,126	0.993
25-Jun	313	15,608	0.288	21-Jul	5	34,131	0.994
26-Jun	444	16,052	0.334	22-Jul	12	34,143	0.995
27-Jun	300	16,352	0.380	23-Jul	0	34,143	0.996
28-Jun	1,258	17,610	0.421	24-Jul	0	34,143	0.997
29-Jun	1,392	19,002	0.466	25-Jul	0	34,143	0.997
30-Jun	1,315	20,317	0.507	26-Jul	0	34,143	0.998
01-Jul	587	20,904	0.547	27-Jul	0	34,143	0.999
02-Jul	404	21,308	0.612	28-Jul	0	34,143	0.999
03-Jul	1,300	22,608	0.666	29-Jul	0	34,143	0.999
04-Jul	845	23,453	0.708	30-Jul	0	34,143	1.000

Table 15.-Daily escapement of early-run sockeye salmon at Russian River weir in 1999 and historic mean daily escapement proportions, 1978-1998.

Date	Daily Count	Total Count	Historic Proportion By Day	Date	Daily Count	Total Count	Historic Proportion By Day
08-Jun		0	0.000	05-Jul	1,578	28,137	0.747
09-Jun		0	0.001	06-Jul	1,146	29,283	0.788
10-Jun		0	0.004	07-Jul	1,010	30,293	0.823
11-Jun		0	0.008	08-Jul	952	31,245	0.854
12-Jun	255	255	0.015	09-Jul	351	31,596	0.886
13-Jun	464	719	0.020	10-Jul	267	31,863	0.909
14-Jun	379	1,098	0.029	11-Jul	556	32,419	0.934
15-Jun	321	1,419	0.037	12-Jul	668	33,087	0.946
16-Jun	354	1,773	0.048	13-Jul	530	33,617	0.959
17-Jun	1,598	3,371	0.064	14-Jul	299	33,916	0.966
18-Jun	4,092	7,463	0.085	15-Jul	179	34,095	0.972
19-Jun	3,770	11,233	0.102	16-Jul	141	34,236	0.979
20-Jun	3,323	14,556	0.130	17-Jul	125	34,361	0.985
21-Jun	1,925	16,481	0.158	18-Jul	126	34,487	0.989
22-Jun	985	17,466	0.187	19-Jul	0	34,487	0.992
23-Jun	656	18,122	0.213	20-Jul	164	34,651	0.994
24-Jun	528	18,650	0.255	21-Jul	743	35,394	0.995
25-Jun	312	18,962	0.296	22-Jul	124	35,518	0.995
26-Jun	272	19,234	0.341	23-Jul	112	35,630	0.996
27-Jun	134	19,368	0.385	24-Jul	76	35,706	0.997
28-Jun	63	19,431	0.426	25-Jul	120	35,826	0.997
29-Jun	140	19,571	0.470	26-Jul	428	36,254	0.998
30-Jun	1,634	21,205	0.511	27-Jul	122	36,376	0.999
01-Jul	1,546	22,751	0.550	28-Jul	56	36,432	0.999
02-Jul	1,383	24,134	0.612	29-Jul	73	36,505	0.999
03-Jul	968	25,102	0.666	30-Jul	54	36,559	1.000
04-Jul	1,457	26,559	0.707	31-Jul	48	36,607	1.000

Early-run sockeye salmon have been at high levels in recent years and the fishery has been liberalized inseason rather than restricted. The liberalization of the fishery is generally implemented by opening the 700-yard sanctuary area at the confluence of the Kenai and Russian rivers to fishing. This area is opened when information indicates the minimum escapement goal of 16,000 will be achieved. Secondly, if the run is projected to exceed the minimum escapement goal, bag limits may be liberalized from 3 to 6 fish daily. The sanctuary area is opened by emergency order. Experience has proved that a noon opening facilitates orderly transition in the fishery. Late evening, midnight or early morning openings are avoided.

CONFLUENCE OF KENAI and RUSSIAN RIVERS

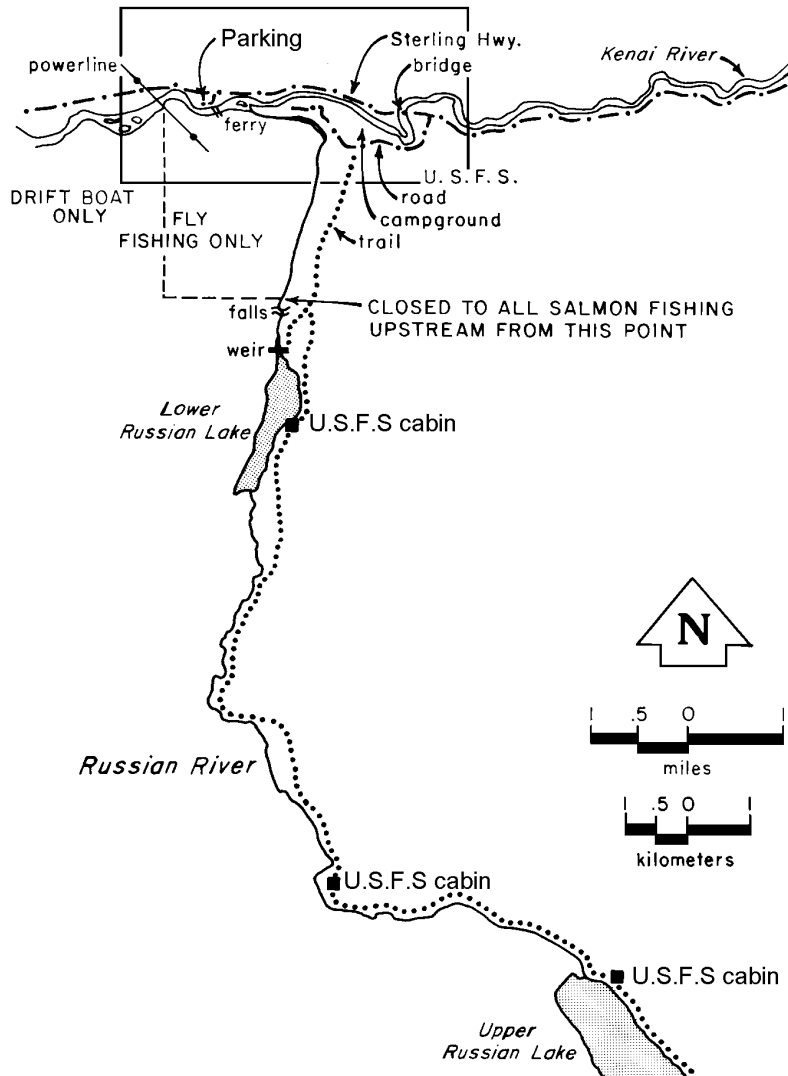
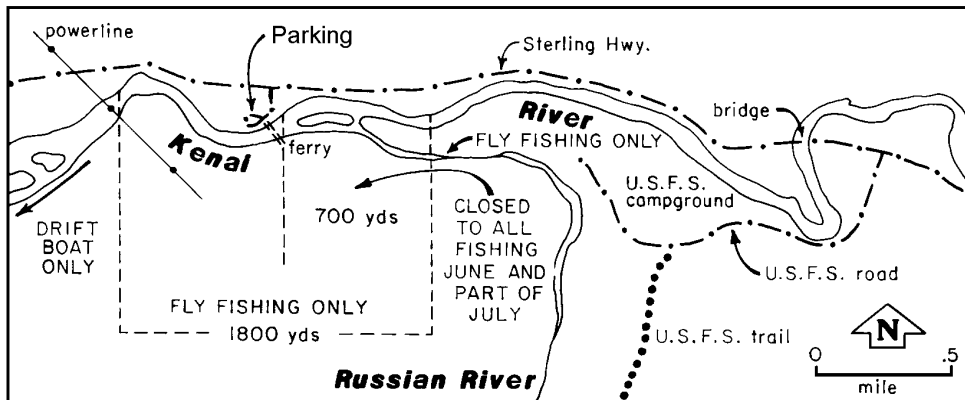


Figure 5.-Map of the Russian River drainage.

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 (Figures 4 and 5). Lands bordering this river are federally managed. Public access is via a ferry-boat crossing on the Kenai River operated by a private concessionaire. The ferry is located at the Kenai National Wildlife Refuge parking area on the north shore of the Kenai River just downstream from the confluence with the Russian 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 and provides one of the largest freshwater sport fisheries for sockeye salmon in Alaska. In addition, coho, chinook and pink salmon spawn in the Russian River system as do resident populations of Dolly Varden and rainbow trout. The drainage is closed to fishing for chinook salmon but supports recreational 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 this early season run timing, these fish are not harvested in the upper Cook Inlet commercial salmon fisheries. The primary harvest of these fish occurs in the inriver sport fishery. Early-run fish typically congregate at the confluence of the Russian and Kenai rivers for about 2 weeks prior to moving into the clear waters of the Russian River. 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 25,000 fish and angler effort has averaged about 109,000 angler-hours since 1964 (Table 13). At times, more than 1,000 anglers simultaneously fish this 4-mile area. 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 that adjoins Fish and Wildlife Service lands along the north shore of the Kenai River directly across 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. This purchase was made possible with monies primarily from Federal Dingell-Johnson (D-J) funds. The primary reason for the purchase was to provide a launching and take-out area for boat anglers fishing the Kenai River. A secondary benefit 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 this property has helped to alleviate the problem of inadequate parking during the peak of the fishery.

Historically, as angler effort has increased in this fishery, 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 as a fly-fishing-only area. 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 lessen the angler's ability to illegally snag fish. This affords the fish an increased measure of protection as they near their spawning destinations. In order to protect "schooled" fish which hold in the confluence area of the Kenai and Russian rivers (termed the "sanctuary") 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 fish was established as a minimum goal by the Department in the early 1970s. This goal was incorporated into the Russian River Sockeye Salmon Management Plan by the Board in 1978. The spawning escapement goal was based upon an estimate of the available spawning habitat area in upper Russian Creek, the only known area of early-run spawning. During that time, this approach was the best methodology available for determining the escapement goal because insufficient stock productivity data were available.

Later 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. The Russian River downstream from Lower Russian Lake was closed during the same time period. The purpose of these closures 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 1998, this regulation was amended to allow fishing for all species in flowing waters of the upper Kenai River beginning on June 11. This change went into effect in the 1999 season. This regulation was enacted to provide additional opportunity to harvest early-run Russian River sockeye salmon. The regulatory season in the clear waters of the Russian River (from its confluence with the Kenai River upstream to a marker approximately 1,800 yards below the Russian River Falls) remains unchanged (June 15-August 20). The board will again consider regulatory changes to this fishery at its regularly-scheduled meeting in 2002.

RECENT FISHERY PERFORMANCE

In 1998, the Russian River early-run sockeye salmon sport fishery opened by regulation on June 15. Notable numbers of fish arrived at the confluence area of the Kenai and Russian rivers on or about June 11. Through June 18, escapement at the weir was approximately 6,700 sockeye

salmon with an additional 5,000 fish estimated in the Russian River upstream of the upper limit of the fishery and immediately downstream from the weir. With an estimated total of approximately 12,000 to 13,000 sockeye salmon above the sport fishery, and a historic mean escapement of only 8% through the weir at this date (Table 14), the minimum escapement of 16,000 early-run sockeye salmon was virtually assured. As a result, the “sanctuary area” was opened by emergency order effective noon, June 20.

The 1998 early run concluded in mid July. Spawning escapement and harvest of early-run sockeye salmon were estimated to be 34,143 and 42,711 fish, respectively. The 1998 spawning escapement was well above the historical 1963-1997 average (25,033) and the established minimum escapement goal of 16,000 fish. Sport harvest was slightly above the historical 1963-1997 average harvest of 24,183 sockeye salmon. Biological sampling of the fish migrating through the weir was conducted to determine age, sex, and size of the spawning escapement during the first and second half of the migration through the weir. Marsh (1996) describes data collection and analysis procedures in detail. No significant differences between the two strata were found which allowed the samples to be pooled. Males accounted for 47.6% and females 52.4% of the early-run escapement. Age 2.3 fish comprised the bulk (77.2%) of the escapement (Table 16).

In 1999, the early-run sockeye salmon sport fishery opened on June 11 and closed by regulation on August 20. The fishery was prosecuted without restriction. The weir was operational on June 12. Through June 18, the cumulative escapement was 7,463 sockeye salmon with approximately 6,000 fish below the weir and just upstream from the upper limit of the fishery. The historic mean escapement by June 18 is approximately 8% of the total escapement. With a total of nearly 13,500 fish safely above the fishery, the minimum escapement of 16,000 early-run sockeye salmon was virtually assured. As a result, the “sanctuary area” was opened by emergency order to sport fishing on June 20. The minimum escapement goal of 16,000 sockeye salmon was achieved on June 21 (16,481).

During early July, the projected escapement remained in the range of 35,000-40,000 fish, and some consideration was given to liberalizing the bag limit from 3 to 6 fish. This action would have brought the Russian River bag limit into conformity with the bag limit in the Kenai River. This option was rejected because of concerns expressed by campground operators and observations of local staff members. The principal limiting factor governing access to these fish stocks is available parking and camping space. Past experience with liberalizing bag limits has led to long lines and frustration on the part of the public as well as campground operators. The end result was slower public turnover at these sites and less total fish harvested. Under such circumstances, liberalization of bag limits may not have increased exploitation rates or provided additional fishing opportunity.

The 1999 early run concluded in late July. Spawning escapement and harvest of early-run sockeye salmon were estimated to be 36,607 and 34,283 fish, respectively. The 1999 spawning escapement was well above the historical 1963-1998 mean escapement (25,286) and the established minimum escapement goal of 16,000 fish. Sport harvest was also well in excess of the historical 1963-1998 mean harvest of 24,697 sockeye salmon. Sampling to determine age, sex, and size of the escapement was conducted during the first and second half of the migration through the weir. Marsh (1996) describes data collection and analysis procedures in detail. No significant differences were detected in the collected samples which allowed the samples to be

pooled. Males and females each accounted for 50.0% of the early-run escapement. Age 1.3 fish comprised the bulk (55.0%) of the escapement (Table 17).

CURRENT ISSUES

There are no biological issues associated with this fishery. Social issues focus on congestion, and riparian habitat degradation. However, there is no evidence indicating angler-caused habitat alteration has affected the productivity of the sockeye salmon stocks of either the Kenai or Russian rivers. Less certain are the effects of habitat alteration on the productivity of both Dolly Varden and rainbow trout. Affected lands are under federal oversight within the direction of the United States Forest Service and the U.S. Fish and Wildlife Service.

Table 16.-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
<u>Female</u>						
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 (Escapement)	116	594	378	969		995
Mean Length (mm)	508	568	531	570	0	566
SE		4.1	6.6	1.9		1.9
<u>Male</u>						
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 (Escapement)		501	257	970	116	995
Mean Length (mm)		566	519	574	590	571
SE		4.1	6.2	2.0		2.0
<u>Combined</u>						
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 (Escapement)	116	742	452	835	116	
Mean Length (mm)	508	567	527	572	590	569
SE		2.9	5.0	1.4		1.4

Table 17.-Estimated age and sex composition and length-at-age of early-run sockeye salmon at Russian River weir, 1999.

	1.3	1.4	2.2	2.3	2.4	3.3	TOTAL
Female							
Sample Size	81	-	23	46	1	1	152
Percent	27.1	-	7.1	15.1	0.3	0.4	50.0
SE (Percent)	2.6	-	1.4	2.1	0.3	0.4	2.9
Escapement	9,925	-	2,598	5,539	112	132	18,306
SE (Escapement)	947	-	505	757	112	132	1,050
Mean Length (mm)	591		524	581	610	585	578
SE	2.6		3.2	3.7			2.6
Male							
Sample Size	82	2	6	55	2	1	148
Percent	27.9	0.7	1.8	18.7	0.7	0.3	50.0
SE (Percent)	2.6	0.5	0.7	2.3	0.5	0.3	2.9
Escapement	10,198	244	672	6,830	244	112	18,301
SE (Escapement)	950	173	270	830	173	112	1,050
Mean Length (mm)	603	605	539	589	598	590	595
SE	2.5	25.0	7.7	3.1	7.5		2.2
Combined							
Sample Size	163	2	29	101	3	2	300
Percent	55.0	0.7	8.9	33.8	1.0	0.7	100.0
SE (Percent)	2.9	0.5	1.5	2.8	0.6	0.5	
Escapement	20,123	244	3,270	12,368	356	244	36,607
SE (Escapement)	1,045	173	553	1,007	206	173	
Mean Length (mm)	597	605	527	585	602	588	586
SE	1.9	25.0	3.1	2.4	6.0	2.5	1.8

The greatest amount of habitat degradation has occurred along the east bank of the Russian River between the campgrounds and the confluence. The Forest Service has closed off access to sections of the trail immediately adjacent to the river and has rerouted the trail away from the bank. Anglers are directed out into the river channel at specific access points in an effort to reduce degradation. A bank rehabilitation project was initiated at the Russian River beginning in 1996 by the U.S. Forest Service in conjunction with several volunteer organizations and is currently ongoing.

RECOMMENDED RESEARCH & MANAGEMENT

Early-run Russian River sockeye salmon are at high levels of abundance. Spawning escapement goals have been consistently achieved and often exceeded. Given the large spawning escapements as well as harvests during recent years, it is recommended that further analysis be directed towards reevaluation of the biological escapement goal for the early run of sockeye salmon. Pending the results from these analyses, no change in management strategy is recommended.

KENAI RIVER EARLY-RUN CHINOOK SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVE

This fishery is managed according to provisions of the Kenai River Early-run Chinook Salmon Management Plan (5 AAC 56.070). Early-run Kenai River chinook salmon stocks are not exploited by any directed commercial fisheries in Cook Inlet. During the spring of 1999, the Alaska Board of Fisheries amended the management plan. The most significant change was a revision of the biological escapement goals (BEG) and the available management actions provided to meet the BEG objective. The current management objective, as outlined in the plan, is to achieve a biological escapement goal within the range of 7,200 to 14,400 chinook salmon. The plan outlines management options and allowable alternatives to assure achievement of the escapement objective.

The fishery begins without the use of bait and is limited to the use of only one, single hook artificial lure. Fishing from guide vessels is not allowed on Sundays, and fishing from all vessels is not allowed on Mondays, with the exception of Memorial Day. If the final escapement is projected to be greater than 14,400 fish, the department shall establish a period, by emergency order, during which bait and multiple hooks may be used in the Kenai River downstream from Skilak Lake. In addition, there is an optional provision that permits the opening of some portion of the Kenai River downstream from Skilak Lake to fishing from boats on Mondays. If the spawning escapement is projected to be less than 7,200 early-run chinook salmon, the department can either implement trophy fishing provisions that prohibit the retention of chinook salmon less than 52 inches in length, or close the Kenai River to retention of all chinook salmon. Additionally, there are provisions to protect spawning early-run chinook salmon in the mainstem of the Kenai River.

INSEASON MANAGEMENT APPROACH

The primary objective of inseason management is to achieve a spawning escapement goal within the range of 7,200 to 14,400 early-run chinook salmon. Achievement of this escapement objective requires information of the number of early-run chinook salmon entering the river; an estimate of the harvest; and the ability to project the total inriver return, probable harvest and the resulting final spawning escapement.

The number of fish entering the river is estimated by the chinook salmon sonar in the lower, mainstem Kenai River near River Mile 8.0. The sonar is typically operational on or about mid-May. The early run ends by regulation June 30. Estimates of the number of chinook salmon passing the sonar are generated daily throughout the duration of the fishery. The estimated chinook passage into the Kenai River for a given day is typically available to management staff by early afternoon of the following day.

Harvest is estimated by an onsite creel survey. The survey also begins on or about mid-May, or as soon as water levels rise sufficiently to permit anglers and department staff to safely use boats on the river downstream from Soldotna. The early-run survey concludes June 30, the regulatory end of the fishery. Harvest estimates are typically generated on a weekly basis, but daily estimates can be made available if management action in the fishery appears imminent.

A preliminary estimate of spawning escapement is projected inseason using a mean run timing model. This estimate is based upon 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 be made on or about June 10. However, in years of exceptionally strong or weak returns, projections can be made earlier. Depending upon the projection, restrictions or liberalization of the fishery are made in accordance with directives contained within the management plan.

The early-run sport fishery is one of the largest recreational fisheries for chinook salmon in Alaska. Interaction with the user groups affected by management decisions is crucial to the successful implementation of any inseason management action.

In order to expedite the dissemination of information regarding the fishery to the public, the Soldotna office has two recorded message phone lines. One line provides a general weekly fishing forecast and the other phone line offers a brief summary of the weir and sonar counts for major Kenai Peninsula fisheries. A brief summary of the early-run fishery status is provided daily on this message phone as well. This message phone may receive over 1,000 calls daily during the peak of the fishery. The message phone gives the public reliable access to fishery information, and also increases the efficiency of the Soldotna staff by freeing them from the routine of constantly providing information directly to individual anglers.

Public interaction is also achieved through formal news releases and information provided to the print, radio, and TV news media. News releases and requests from the broadcast media are given a priority because they provide a public forum to distribute relevant information regarding the status of the fishery as well as review the management plan regulating the fishery and possible management actions.

Restrictive management actions in this fishery are socially and economically disruptive. Informing the public in a timely and efficient manner can help to mitigate the potential for disruption. Continuous updates regarding the status of the fishery are provided in all available forums for several days prior to the likely date of any specific management action. Staff strive to issue formal announcements (news releases) regarding emergency orders that change the management of the fishery generally 24 hours before a given action becomes effective.

HISTORICAL PERSPECTIVE

The Kenai River chinook salmon fishery began in the early 1970s when fishing techniques were adopted from the Pacific Northwest that spurred the harvest of chinook salmon from the 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 planni trolling” and “back-bouncing” proved to be successful fishing methods as well.

Chinook salmon return to the Kenai River in two distinct runs, early and late. The first run usually begins arriving in “fishable” numbers by mid-May with the return peaking in mid-June, and the majority of the stocks have passed through the fishery by late June. Late-run fish are present in July and early August. The majority of the early-run fish spawn in tributary systems to the Kenai River with most of the fish in two main tributaries, the Killey and Funny rivers. Late-run fish are primarily mainstem Kenai River spawners.

The recreational fishery for chinook salmon in the Kenai River is widely popular. Large numbers of anglers participate every year. The magnitude of the chinook salmon return is quite small relative to the historical dimensions of chinook salmon returns in the Pacific Northwest; therefore, the fishery is strictly 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. By regulation, the early run ends June 30. The daily bag and possession limit is 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 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 of Alaska. Guided anglers are more intensively regulated than nonguided anglers. This is due, in part, to the guided fishermen's greater harvest rates and the general concern regarding harvest parity between guided and nonguided anglers.

Most of the river area available to chinook salmon fishing is managed as a state park by the Department of Natural Resources, Division of Parks and Outdoor Recreation (DPOR). In 1986, DPOR reduced the maximum size of outboard motors that could be legally used on the river to 50 horsepower. In 1987, the maximum, legal horsepower was further reduced to 35 horsepower. The public has generally favored the restriction to smaller outboards. There is no evidence which indicates that the use of smaller motors has reduced angler efficiency.

Under current Board of Fisheries policy, the early run has been allocated almost exclusively to the inriver recreational angler. 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. In addition, there are small numbers of early-run chinook salmon harvested in the Kenaitze Indian Tribal Association's educational fishery.

The department's management and research efforts in this fishery began in 1974 with the start-up 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 research project used drift gillnets to capture and tag chinook salmon in the lower Kenai River. The tagged chinook salmon were later recovered in the sport fishery through the creel survey. The tagging program provided inseason catch per unit effort (CPUE) data from the netting efforts and a postseason estimate of early- and late-run stock abundance.

In 1984, the department also implemented an experimental sonar program to count the chinook salmon stocks in the Kenai River. From 1984-1994, the sonar counter used dual-beam transducer technology. Beginning in 1995 to the present, the sonar program adopted split-beam technology as a means to further improve the estimation of chinook salmon returning to the Kenai River. Estimation uncertainty, due in large part, to the problem of differentiating between the various salmon species migrating together into the Kenai River has necessitated that the sonar program employ several different methods as a means to better separate chinook salmon and the more numerous sockeye salmon in the final estimates (Bosh and Burwen 2000). The principal tools utilized during the past several years to separate the different salmon species have been based upon a target-strength filter and a distance or range filter. Sockeye salmon were believed to migrate near the bank and to have a smaller target strength than chinook salmon which preferred the mid-channel section of the river. However, even with these filters, during periods of high sockeye immigration the system continues to experience difficulty with accurately estimating the number of chinook salmon entering the river. Nonetheless, estimates

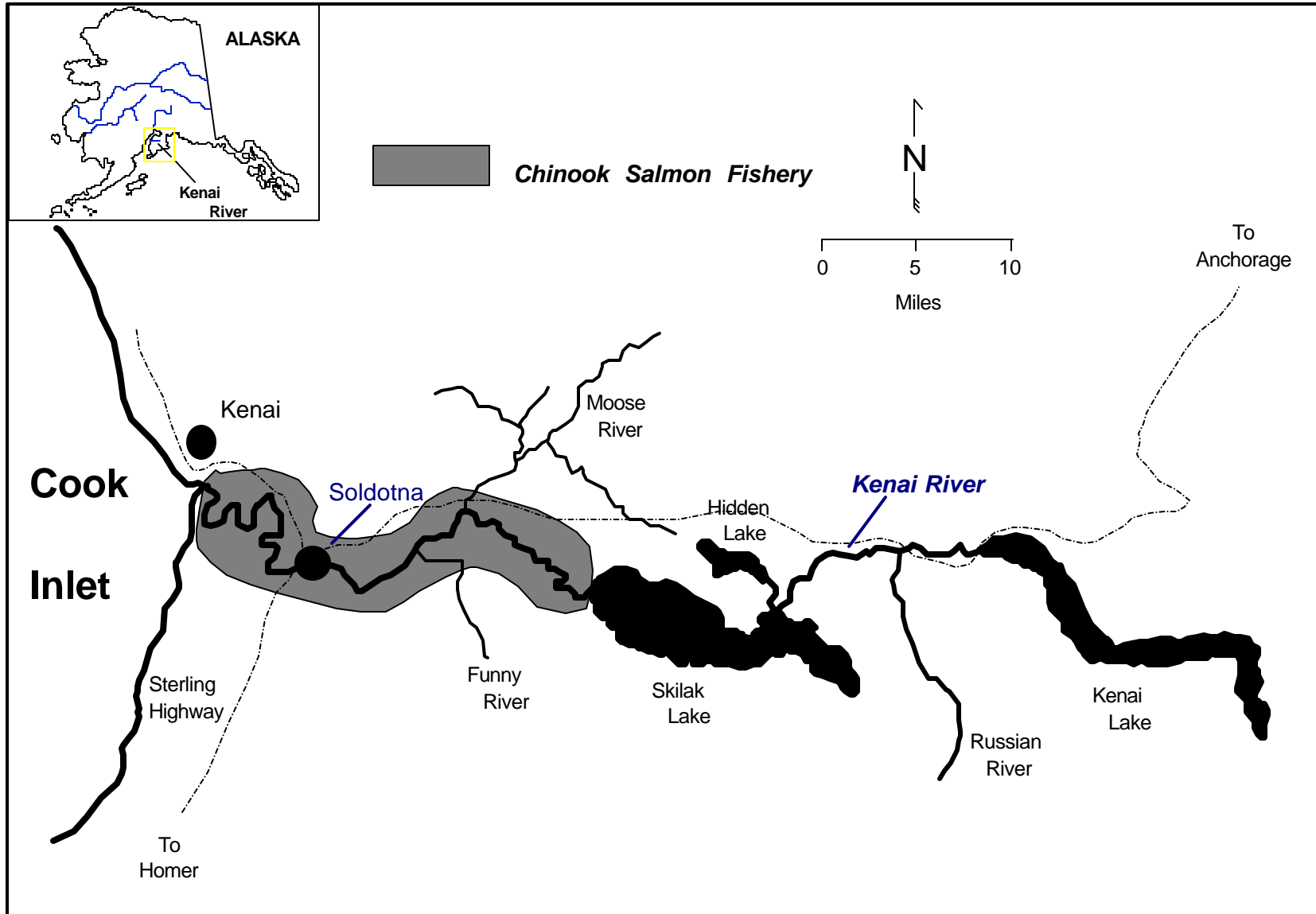


Figure 6.-Map of the boundaries of the chinook salmon fishery in the Kenai River drainage.

of inriver abundance were first realized from the sonar in 1987 and sonar has been the principle tool used to estimate the total inriver abundance of early-run chinook salmon since 1988. In 1996 and 1997, radiotelemetry tagging studies were used to estimate the magnitude of bias in the chinook salmon counts during periods of high sockeye salmon passage. These studies were designed to provide an independent and accurate estimate of inriver chinook abundance during the late run when the potential to misclassify sockeye is greatest. Use of radiotelemetry technology also avoided certain biases introduced in previous mark-recapture estimates. In both 1996 and 1997, late-run sonar estimates were estimated to be 21% higher than telemetry estimates (Hammarstrom and Hasbrouk 1998, 1999); however, the bias for the early run is not expected to be as great.

In 1988, the Board of Fisheries adopted the management plan for early-run Kenai River chinook salmon. This plan established minimum (5,300 fish) and optimum (9,000 fish) escapement goals and identified the possible management actions that could be implemented at given escapement levels. The original plan directed that the fishery be prosecuted without bait to reduce angler efficiency. Bait was permitted, by emergency order, when the optimum escapement goal could be projected. The escapement goals were changed to an optimum escapement range (7,200-14,400) in 1999. The strategy of restricting bait in the fishery until a given escapement level could be projected has remained an integral component to the management of this fishery. However, since adoption of this management practice, anglers have honed their skills at catching and harvesting chinook salmon without the aid of bait or artificial scent.

BOARD OF FISHERIES ACTIONS

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

The Board also adopted a regulation that allowed fishermen, after retaining a chinook salmon greater than 16 inches from that area of the river downstream from Skilak Lake, to continue fishing from a boat upstream from Skilak Lake that same day. Currently, 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 significantly alter the Kenai River Early Chinook Salmon Management Plan at its November 1992 meeting. However, it did adopt a department proposal closing the confluence areas of Slikok Creek and Funny River to all chinook salmon fishing from January 1 through July 14. Chinook salmon remain in the vicinity of these confluence areas for an extended period of time and require additional protection to assure their migration into the spawning streams. The intent of the regulation is to increase the spawning escapement into these tributaries.

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 additional 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 additional 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. This provides additional protection to early-run chinook salmon that spawn in the lower area of the Funny River.
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 additional protection to early-run chinook salmon of Killey River origin.

Prior to 1999, the escapement goal was established as an optimum escapement goal (OEG) of 9,000 chinook salmon with a minimum escapement goal of 5,300 fish. Management directives were centered on projected escapement levels of less than 5,300 fish, 5,300 to 9,000 fish and greater than 9,000 chinook salmon.

In 1999, the Board of Fisheries adopted the following changes to the management plan:

1. The BEG was established as a range from 7,200 to 14,400 chinook salmon. This range was based upon historical production estimates as well as a better understanding of the department's ability to effectively manage the recreational fishery in order to achieve a final escapement goal. Additionally, the lowering of the inriver action point from 9,000 to 7,200 chinook salmon reduces the likelihood of restrictive inseason management actions by the department.
2. The Department was directed to restrict the fishery to catch-and-release only if the projected spawning escapement is less than 7,200 chinook salmon.
3. The management plan restricts the fishery to the use of single-hook, artificial lures only. This provision was maintained in order to reduce angler efficiency and the likelihood of inseason restrictions.
4. A management option was added allowing the use of single hook or multiple hooks if the spawning escapement is projected to be greater than 14,400 chinook salmon.
5. Beginning in the year 2000, trophy fishing provisions (retention of chinook salmon 52 inches or greater in length) will no longer be allowed as an alternative management strategy during times of conservation.

RECENT FISHERY PERFORMANCE

In 1998, the fishery opened without the use of bait, as it has since 1989. In response to public concerns that high numbers of early-run chinook salmon were migrating past the River Mile 8.5 sonar site prior to the traditional mid-May startup, the sonar was placed into operation on May 7. This was the earliest, practical date due to ice floes and floating debris resulting from spring breakup. The inriver creel survey generally begins on the same date when the sonar project becomes operational. Therefore, the creel survey was also activated early (May 5) due to public concerns that significant numbers of early-run chinook salmon are harvested prior to mid-May.

As previously mentioned, the sonar project has experienced problems estimating chinook salmon numbers when sockeye salmon migrate in the mid-channel of the river or the overall number of sockeye salmon entering the Kenai River is quite large. When the technical advantages of the

sonar are overwhelmed by large numbers of sockeye salmon in mid-channel waters, chinook salmon counts are likely inflated (Hammarstrom and Hasbrouck 1998, 1999.) This situation occurred during the late-run in 1996 and again during the late-run in 1997. The presence of large numbers of sockeye salmon during the early-run is a much rarer event and the problems with this type of estimation error is less likely. However, it should be noted that this problem is not inconceivable during the early-run. During the 1998 season, the department revised the inseason management strategy to make use of all available indicators of run strength. These included daily sonar passage rates as the primary indicator, harvest per unit of effort (HPUE) derived from the creel survey and a newly developed, standardized test netting program at the River Mile 8.5 sonar site. In view of the uncertainties when large numbers of sockeye salmon are present in mid-channel waters, it was determined that a conservative approach to management during the 1998 season was warranted.

Through June 1, the sonar estimated an inriver return of approximately 1,100 early-run chinook salmon. Based upon the historical run-timing models and the inriver harvest to date, the projected final escapement was approximately 4,800 fish. This estimate was well below the minimum escapement goal of 5,300 fish. As a result of this projection, an emergency order was issued June 1, effective June 5, restricting the fishery to "catch-and-release" fishing only. Gear was restricted to single-hook artificial lures and retention of chinook salmon 52 inches or greater was permitted. The June 5 restriction was the earliest date that this fishery had ever been restricted and reflects the conservative management approach developed for the 1998 season.

By June 11, large numbers of early-run Russian River sockeye salmon were present in the lower Kenai River. Daily sonar estimates of chinook salmon increased from several hundred fish per day to more than 1,000 fish per day. These estimates were accompanied by dramatic increases in the presence of sockeye salmon in mid-channel waters. The mid-channel distribution of sockeye salmon was sufficient to indicate that the sonar estimates were being inflated by sockeye salmon. However, chinook salmon numbers were also increasing as evidenced by test netting catches. In view of the uncertainties presented by large numbers of sockeye salmon in mid-channel waters, the daily sonar estimates subsequent to June 11 were likely compromised. This forced the department to rely upon other assessment techniques for the duration of the season.

As a means to rectify the estimation error posed by the large numbers of sockeye salmon in the chinook salmon estimates, Division of Sport Fish staff developed three independent projections for the final escapement by the last part of June 1998 (Bosh and Burwen 2000). The standard assessment technique of using unadjusted sonar estimates yielded an end-of-season projected escapement of approximately 12,000 early-run chinook salmon. However, this "raw" estimate was viewed as inflated by the presence of sockeye salmon. Chinook salmon counts from the left bank at the sonar site are rarely inflated by sockeye salmon. However, sockeye salmon migrating along the right river bank, with its slower water velocities and gradual slope, are able to spread further out into the mid-channel of the river and thus inflate the right-bank chinook salmon counts. Evidence indicates that in 1998 the daily right-bank sonar estimates were inflated by sockeye salmon starting on approximately June 3. A second estimate of chinook salmon escapement used the relationship between left- and right-bank counts before June 3 to estimate right bank counts from June 3 to 30. This procedure yielded a conservative escapement estimate of approximately 6,000 early-run chinook salmon.

A third estimate was developed using the relationship between the sonar estimates and a radiotelemetry tagging study completed in 1996-97 (Hammarstrom and Hasbrouck 1998, 1999).

The tagging study determined the exploitation rates of chinook salmon in the inriver recreational fishery. These exploitation rates were later used to adjust daily sonar estimates for those days when the presence of sockeye salmon introduced error into the chinook salmon estimates. This method yielded an end-of-season total escapement estimate of approximately 10,000 fish.

The unadjusted sonar estimate was viewed as being too high and therefore was rejected by staff. Other estimation techniques yielded a potential escapement range of 6,000 to 10,000 early-run chinook salmon. With an optimum escapement goal of 9,000 fish, the most optimistic projection indicated only 1,000 fish were available for harvest. Recognizing the potential for a significant exploitation of early-run chinook salmon stocks in late June, catch-and-release restrictions were not lifted during the remainder of the season (through June 30). In addition, catch-and-release restrictions were maintained through July 10 upstream of the Soldotna Bridge to provide additional protection for early-run chinook salmon entering the spawning tributaries of Soldotna Creek, Funny River and the Killey River. This restriction did not affect the startup of the late-run chinook salmon fishery below the Soldotna Bridge on July 1.

The total return of Kenai River early-run chinook salmon in 1998 was estimated at approximately 9,000 fish (Table 18, Figure 7). The fishery harvested approximately 1,400 chinook salmon (including catch-and-release mortality), the lowest on record since 1985. Total spawning escapement was estimated at 7,760 early-run fish, exceeding the minimum escapement of 7,760 but less than the optimum escapement of 9,000 chinook salmon. In view of the magnitude of the total return and the resulting restrictions to the inriver sport fishery, angler harvest below the Soldotna Bridge was the lowest on record since 1976 (Table 19, Figure 8). Also reflective of the season, angler effort was the lowest experienced since 1991. The number of guides registered with DNR, DPOR to fish on the Kenai River declined slightly between 1997 (472) and 1998 (463, Table 20). However, as in all years since 1982, guided anglers harvested the majority (75.8%) of the chinook salmon harvested in the recreational fishery (Table 21).

The early-run fishery in 1999 commenced without the use of bait per the management plan. The sonar project was operational on May 16. Similar to 1998, the department's inseason management strategy called for using multiple assessment techniques. Inseason estimates of effort, catch, and harvest were provided by the creel survey in the lower Kenai River below the Soldotna Bridge. Inseason estimates of catch and harvest from the middle Kenai River (downstream from Skilak Lake to the Soldotna Bridge) were extrapolated from current season harvest estimates from the lower river creel survey and the exploitation rates based upon historical estimates of effort and harvest from the SWHS. Projected inriver return was estimated by using the historic, mean run-timing model. Test net data were used to monitor and qualitatively assess potential sockeye salmon contamination of daily sonar counts at River Mile 8.5.

During 1999, the fishery was prosecuted without management restrictions. Contamination of the daily sonar estimates by sockeye salmon was judged insignificant during 1999 (Bosch et al. *In prep*). Beginning May 23, projected escapement exceeded the lower end of the BEG range. By June 1, the projected escapement exceeded the upper end of the BEG range. On June 14, an emergency order was issued that permitted the use of bait and multiple hooks in the Kenai River downstream from the outlet of Skilak Lake. This emergency order became effective 12:01 a.m., Wednesday June 16, and remained in effect through June 30, the regulatory conclusion of the early-run chinook salmon season.

Table 18.-Early-run Kenai River chinook salmon population data, 1986-1999.

Year	Deep Creek Marine Harvest	Eastside Set Net Harvest	Drift Gill Net Harvest	Commercial Personal Use	Kenaitze Educational Fishery	Kenai River Sport Harvest ^a	Hook-and- Release Mortality	Spawning Escapement	Total Return
1986	Unknown	Closed	Closed			8,156	242	18,682	27,080
1987	Unknown	Closed	Closed			13,557	306	11,780	25,643
1988	Unknown	Closed	Closed			15,209	340	5,331	20,880
1989	Unknown	Closed	Closed		73	8,394	149	9,449	18,065
1990	Unknown	Closed	Closed		40	1,807	378	8,494	10,719
1991	Unknown	Closed	Closed		2	1,945	152	8,834	10,933
1992	Unknown	Closed	Closed		73	2,241	236	7,610	10,160
1993	Unknown	Closed	Closed		118	9,342	286	10,293	20,039
1994	Unknown	Closed	Closed		56	8,171	285	9,947	18,459
1995	Unknown	Closed	Closed		37	10,217	357	11,310	21,921
1996	Unknown	Closed	Closed		104	6,623	287	16,595	23,609
1997	Unknown	Closed	Closed		122	6,429	349	8,185	15,085
1998	Unknown	Closed	Closed		131	1,170	254	7,760	9,315
1999	Unknown	Closed	Closed		114	8,129	261	16,267	24,771

^a Source 1986-1998 Hammarstrom and Timmons (2001a). 1999 James Hasbrouck, ADF&G, Division of Sport Fish, personal communication and Howe 2001d. Includes creel survey estimates for the area from Cook Inlet to the Soldotna Bridge and estimates from the Statewide Harvest Survey for Soldotna Bridge to the outlet of Kenai Lake.

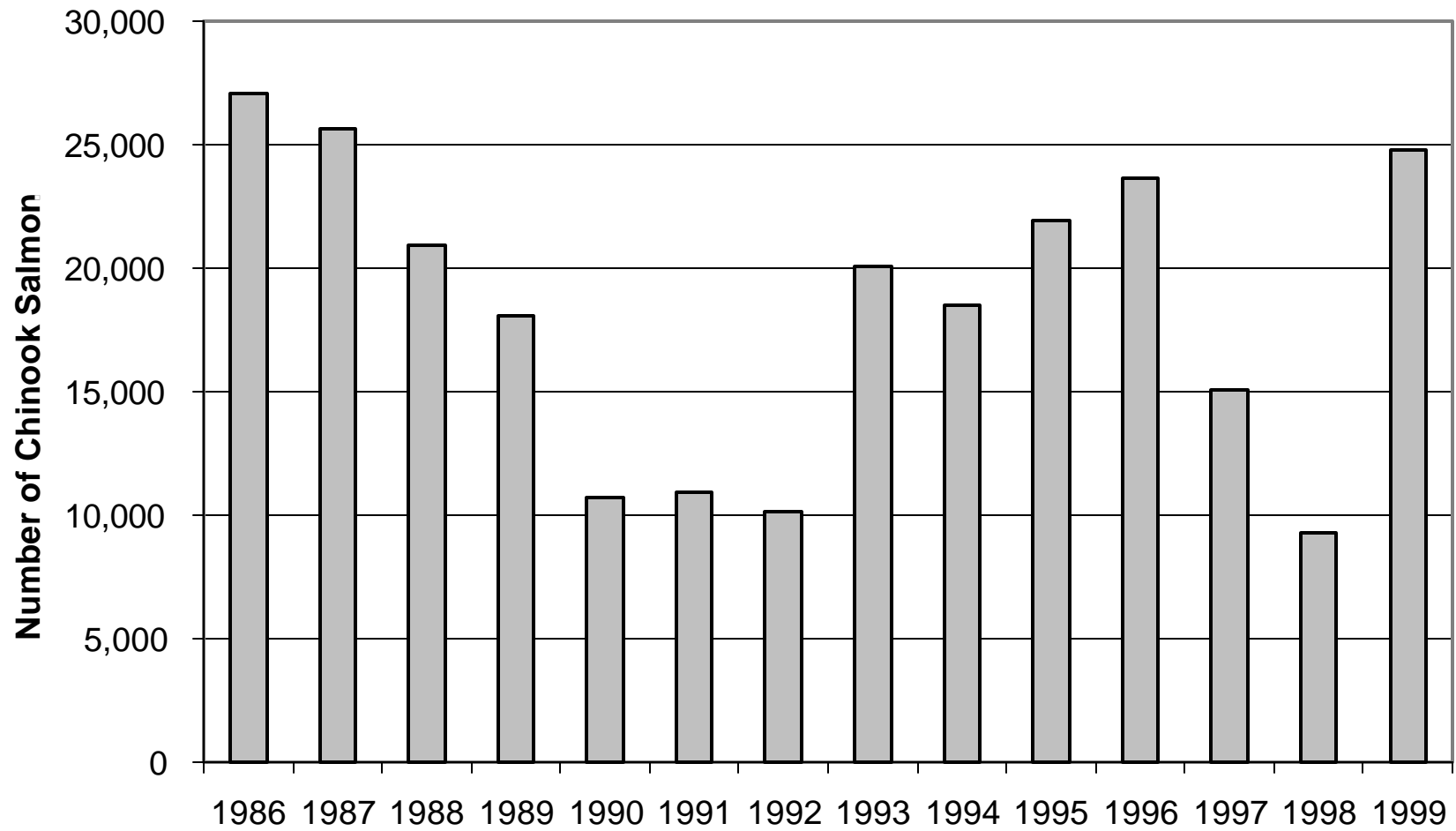


Figure 7.-Total return, Kenai River early-run chinook salmon fishery, 1986-1999

Table 19.-Harvest, angler effort and harvest rate estimated by onsite creel survey downstream of the Soldotna Bridge, Kenai River early-run chinook salmon fishery, 1976-1999.

Year	Harvest ^a (angler-hour)	Hours Effort ^a	HPUE ^a (angler-hour)
1976	721		
1977	1,083	49,704	0.022
1978	646	38,800	0.017
1979	2,156	94,366	0.023
1980	1,070	61,356	0.017
1981	3,464	67,770	0.051
1982	3,941	99,128	0.040
1983	5,255	108,474	0.048
1984	3,906	130,159	0.030
1985	6,765	137,538	0.049
1986	6,337	142,095	0.045
1987	11,224	170,954	0.066
1988	11,949	201,443	0.059
1989	6,711	198,629	0.034
1990	723	72,799	0.024 ^b
1991	891	47,599	0.031 ^b
1992	1,365	54,330	0.043 ^b
1993	6,846	123,273	0.056
1994	4,722	134,199	0.035
1995	7,733	165,990	0.047
1996	4,166	130,180	0.032
1997	4,942	102,243	0.048
1998	648	56,137	0.012 ^b
1999	5,534	110,788	0.050
Mean	4,283	108,607	0.038

^a From creel surveys. Sources: Hammarstrom and Larson 1986; Conrad and Hammarstrom 1987; Hammarstrom 1988-1991, 1992-1994; King 1995-1997; Marsh 1999, 2000; James Hasbrouck, ADF&G, Division of Sport Fish, personal communication.

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

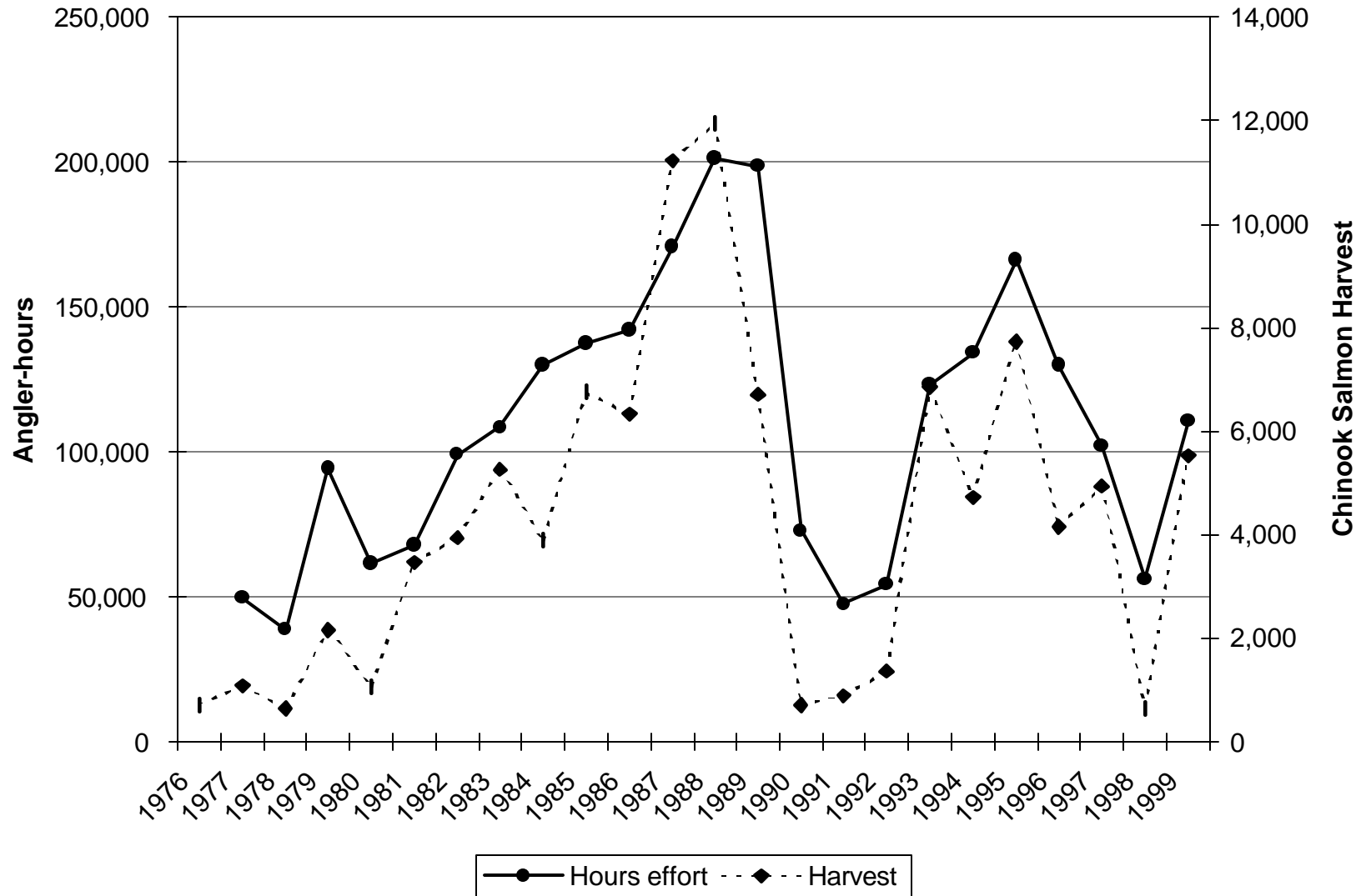


Figure 8.-Early-run chinook salmon harvest and angler effort estimated by onsite creel survey downstream of Soldotna bridge, 1976-1999.

Table 20.-Number of Kenai River fishing guides registered with ADNR, 1982-1999.

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
1999	^a	329	286 ^b	140	426

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

^a Data not available.

^b Includes 25 motorized rafts/drift boats.

Total return of early-run chinook salmon to the Kenai River during 1999 was approximately 25,000 fish (Table 18, Figure 7). The fishery harvested approximately 8,400 chinook salmon (including catch-and-release mortality), the highest on record since 1995. Spawning escapement was estimated at 16,267 early-run fish, significantly greater than the upper end of the escapement range of 14,400 chinook salmon. Angler harvest below the Soldotna Bridge was the greatest on record since 1995 (Table 19, Figure 8). The number of guides registered with DNR, DPOR to fish on the Kenai River again decreased slightly between 1998 (463) and 1999 (426, Table 20). Once again, guided anglers harvested the greatest proportion (82.1%) of chinook salmon from the fishery (Table 21).

OUTLOOK

Regulatory changes to Kenai Peninsula sport fisheries will be considered by the board in February 2002. Basic regulation of the fishery will therefore be unchanged during the 2000-2001 season. The primary management objective will be to achieve the desired spawning escapement of 7,200 to 14,400 early-run chinook salmon.

Table 21.-Guided vs. nonguided angler harvest, effort, and success rate, estimated by onsite creel survey downstream of the Soldotna Bridge, early-run Kenai River chinook salmon fishery, 1981-1999.

Year	HARVEST								EFFORT				
	Guided			Non-Guided			Total	HPUE ^a	Guided (Hours)		Non-Guided (Hours)		Total (Hours)
	Number	%	HPUE ^a	Number	%	HPUE ^a	Number		HPUE ^a	Number	%	Number	%
1981	1,846	53.3	0.093	1,618	46.7	0.034	3,464	0.051	19,857	29.3	47,913	70.7	67,770
1982	1,797	45.6	0.079	2,144	54.4	0.028	3,941	0.040	22,799	23.0	76,329	77.0	99,128
1983	3,526	67.1	0.080	1,729	32.9	0.027	5,255	0.048	43,823	40.4	64,651	59.6	108,474
1984	2,211	56.6	0.054	1,695	43.4	0.019	3,906	0.030	40,610	31.2	89,549	68.8	130,159
1985	4,181	61.8	0.083	2,591	38.3	0.030	6,765	0.049	50,339	36.6	87,199	63.4	137,538
1986	3,379	53.3	0.081	2,958	46.7	0.029	6,337	0.045	41,724	29.4	100,371	70.6	142,095
1987	5,418	48.3	0.113	5,806	51.7	0.047	11,224	0.066	48,078	28.1	122,876	71.9	170,954
1988	6,348	53.1	0.095	5,601	46.9	0.042	11,949	0.059	66,636	33.1	134,807	66.9	201,443
1989	4,878	72.7	0.052	1,833	27.3	0.018	6,711	0.034	93,927	47.3	104,702	52.7	198,629
1990	570	78.8	0.038 ^b	153	21.2	0.010 ^b	723	0.024 ^b	38,992	53.6	33,807	46.4	72,799
1991	593	66.6	0.043 ^b	298	33.4	0.020 ^b	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 ^b	1,365	0.043 ^b	26,113	48.1	28,217	51.9	54,330
1993	4,062	59.3	0.087	2,784	40.7	0.036	6,846	0.056	46,773	37.9	76,500	62.1	123,273
1994	3,198	67.7	0.052	1,524	32.3	0.021	4,722	0.035	61,766	46.0	72,433	54.0	134,199
1995	4,724	61.1	0.062	3,009	38.9	0.033	7,733	0.047	75,917	45.7	90,073	54.3	165,990
1996	3,185	76.5	0.044	981	23.5	0.017	4,166	0.032	71,629	55.0	58,551	45.0	130,180
1997	3,660	74.1	0.057	1,282	25.9	0.034	4,942	0.048	64,451	63.0	37,792	37.0	102,243
1998	491	75.8	0.013	157	24.2	0.009	648	0.012	38,631	68.8	17,506	31.2	56,137
1999	4,541	82.1	0.065	993	17.9	0.024	5,534	0.050	69,972	63.2	40,816	36.8	110,788
Mean	3,122	63.5	0.065	1,990	36.5	0.027	5,112	0.042	49,753	43.6	68,864	56.4	118,617

Source: Hammarstrom and Larson 1986; Conrad and Hammarstrom 1987; Hammarstrom 1988-1991, 1992-1994; King 1995-1997; Marsh 1999, 2000; James Hasbrouck, ADF&G, Division of Sport Fish, personal communication.

^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.

CURRENT ISSUES

Chinook salmon sonar estimation errors introduced by large numbers of sockeye salmon will continue to be an important issue with respect to management of this fishery until these technical issues can be resolved. Sonar development within the NKPMA will remain a high priority into the foreseeable future. It will be an important challenge for Division of Sport Fish staff to effectively communicate to the public exactly how sonar is used in the assessment of this fishery. Such public messages must include the technical limitations of the current sonar technology and further explanations of how the department uses alternative assessment tools when significant sockeye salmon contamination occurs.

The relative abundance of trophy-sized chinook salmon as sampled in the recreational harvest as well as the inriver netting project have both evidenced a gradual decline in the relative proportion of larger chinook salmon within the return. We don't know if this decline is a result of natural processes or the result of selection pressures upon larger fish by anglers in the recreational fishery. Because of a restrictive bag limit and the desire of many anglers to harvest a large fish, it is common for fishermen to keep the largest fish and release smaller chinook salmon. This situation has been exacerbated by the overall growth in the numbers and success of guided anglers and the pressure on guides to harvest trophy-sized fish for their clients. Public awareness of this apparent decline in trophy-sized chinook salmon is increasing, with several civic and industry organizations expressing concern.

Social concerns as a result of crowding remain an issue in the long-term development of this valuable sport fishery. Such issues play a role in the controversy between guided and nonguided anglers and, in some years, the increased probability of inseason restrictions for stock conservation purposes. Inseason restrictions are disruptive to guided anglers, nonguided anglers, and businesses that derive income from this fishery. Such concerns will likely remain an issue affecting management of this resource into the foreseeable future.

RECOMMENDED RESEARCH & MANAGEMENT

The fishery's research and management activities are interrelated. Research is required for both inseason management decisions as well as postseason evaluation of management actions and the current regulatory structure. 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 provides the basis for inseason projection of total return and spawning escapement. These data are the cornerstone for inseason management decisions. An active management program employing formal news releases and 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 continue to use alternative stock assessment techniques, sonar will remain an integral tool for assessing run strength and timing during the near future.

Directed research is needed to determine whether observed declines in the abundance of trophy-sized chinook salmon are significant, identify potential causative factors, and make recommendations regarding strategies to reduce selective harvests. The relative abundance of trophy-sized chinook salmon and current management strategies that permit selection of trophy-sized fish for retention will continue to be an issue until the basis for the decline is better understood.

KENAI RIVER LATE-RUN CHINOOK SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVES

This fishery is managed according to provisions of the Kenai River Late-run Chinook Salmon Management Plan (5 AAC 21.359). Late-run stocks of Kenai River chinook salmon are exploited by the commercial drift gillnet fishery and the commercial set gillnet fishery along the east side of Cook Inlet, both of which target sockeye salmon. Commercial fisheries that intercept late-run Kenai River chinook salmon are managed under provisions of the Kenai River Late-run Sockeye Salmon Management Plan (5 AAC 21.360). Incidental commercial harvests of these stocks have been the subject of intense allocational conflict among recreational and commercial user groups since the early 1980s. As a result, the Kenai River Late-run Sockeye Salmon Management Plan contains provisions that are intended to reduce incidental harvests of Kenai River-bound chinook salmon.

During the spring of 1999, the Alaska Board of Fisheries amended both of these plans. The most significant change was the revision of the biological escapement goal (BEG) and the management actions associated with these objectives. Under the previous Late-run Kenai River Chinook Salmon Management Plan, the BEG was established as an optimum goal of 22,300 chinook salmon with management directives centered around projected escapement levels of less than 15,500, 15,500 to 19,000 and greater than 22,300. Under the revised management plan the BEG was established as a range of 17,800 to 35,700 chinook salmon. Management directives were also established that more closely linked inseason regulatory actions with the abundance of sockeye salmon. The current management objective, as outlined in the plan, is to achieve a biological escapement goal from 17,800 to 35,700 chinook salmon.

INSEASON MANAGEMENT APPROACH

The primary objective of inseason management is to achieve the optimum spawning escapement goal of 17,800 to 35,700 late-run chinook salmon. Achieving this objective requires an estimate of the number of late-run chinook salmon entering the river; an estimate of the harvest; and the ability to project the final return, harvest and spawning escapement.

The inriver return of late-run chinook salmon is estimated by sonar at River Mile 8.5. Late-run sonar estimates begin when the late-run fishery opens by regulation (July 1) and concludes on approximately August 10. Estimates of inriver return are generated daily and the estimate for any given day is typically 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 is closed by regulation on July 31. However, the duration 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 available should imminent management action be likely.

The final spawning escapement is projected inseason using a historical, run-timing model. Final spawning escapement is the inriver return (from sonar) less the projected sport harvest (from creel survey). The projected sport harvest includes estimated mortality associated with

catch and-release fishing practices. During most years, the spawning escapement can be projected with reasonable accuracy by July 20.

Similar to the early-run of chinook salmon, contamination of sonar estimates by sockeye salmon can be an issue during the late run. Consequently, alternative techniques for estimating escapement are also used. Such techniques include estimates based on historical exploitation rates in the recreational fishery and historical exploitation rates in the commercial setnet fishery.

The recreational fishery for late-run chinook salmon in the Kenai River is one of the largest and likely the most controversial fishery 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 counts and sonar estimates for major Kenai Peninsula fisheries. It is on the latter message phone that a brief summary of this sport 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. Informing the public of potential restrictions to the fishery through the aforementioned use of the recorded message phone and news media contacts can mitigate disruption. Efforts are made to issue announcements pertaining to emergency regulation of the fishery at least 24 hour prior to any management action.

HISTORICAL PERSPECTIVE

The Kenai River chinook salmon fishery began in the early 1970s when methods, adopted from the Pacific Northwest, were introduced that allowed the harvest of chinook salmon from glacially turbid waters, such as the Kenai 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 within the Kenai River.

Because of the popularity of the sport fishery as well as the magnitude of the chinook salmon stocks that support it, the fishery is conservatively regulated. Chinook salmon fishing is limited to a 50-mile area downstream from Skilak Lake (Figure 9). 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 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, Division of Parks and Outdoor Recreation. 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 has been favorably received by much of the angling public. There is no evidence to indicate use of smaller motors has reduced angler efficiency.

Kenai River late-run chinook salmon are harvested by both commercial and sport fishermen. Allocation of the late-run stocks 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 incidental harvest of late-run chinook salmon. The commercial harvest of late-run chinook salmon has, in some years, been approximately twice that of the inriver sport catch. As a result, the recreational user has maintained that the current scheme of allocation, as outlined in the management plans, 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 also implemented an experimental sonar program to count the chinook salmon stocks in the Kenai River. From 1984-1994, the sonar counter used dual-beam transducer technology. Beginning in 1995 to the present, the sonar program adopted split-beam technology as a means to further improve the estimation of chinook salmon returning to the Kenai River. Estimation uncertainty, due in large part to the problem of differentiating between the various salmon species migrating together into the Kenai River, has necessitated that the sonar program employ several different methods as a means to better separate chinook salmon and the more numerous sockeye salmon in the final estimates (Bosh and Burwen 2000). The principal tools utilized during the past several years to separate the different salmon species have been based upon a target-strength filter and a distance or range filter. Sockeye salmon were believed to migrate near the bank and to have a smaller target strength than chinook salmon which preferred the mid-channel section of the river. However, even with these filters, during periods of high sockeye immigration the system continues to experience difficulty with

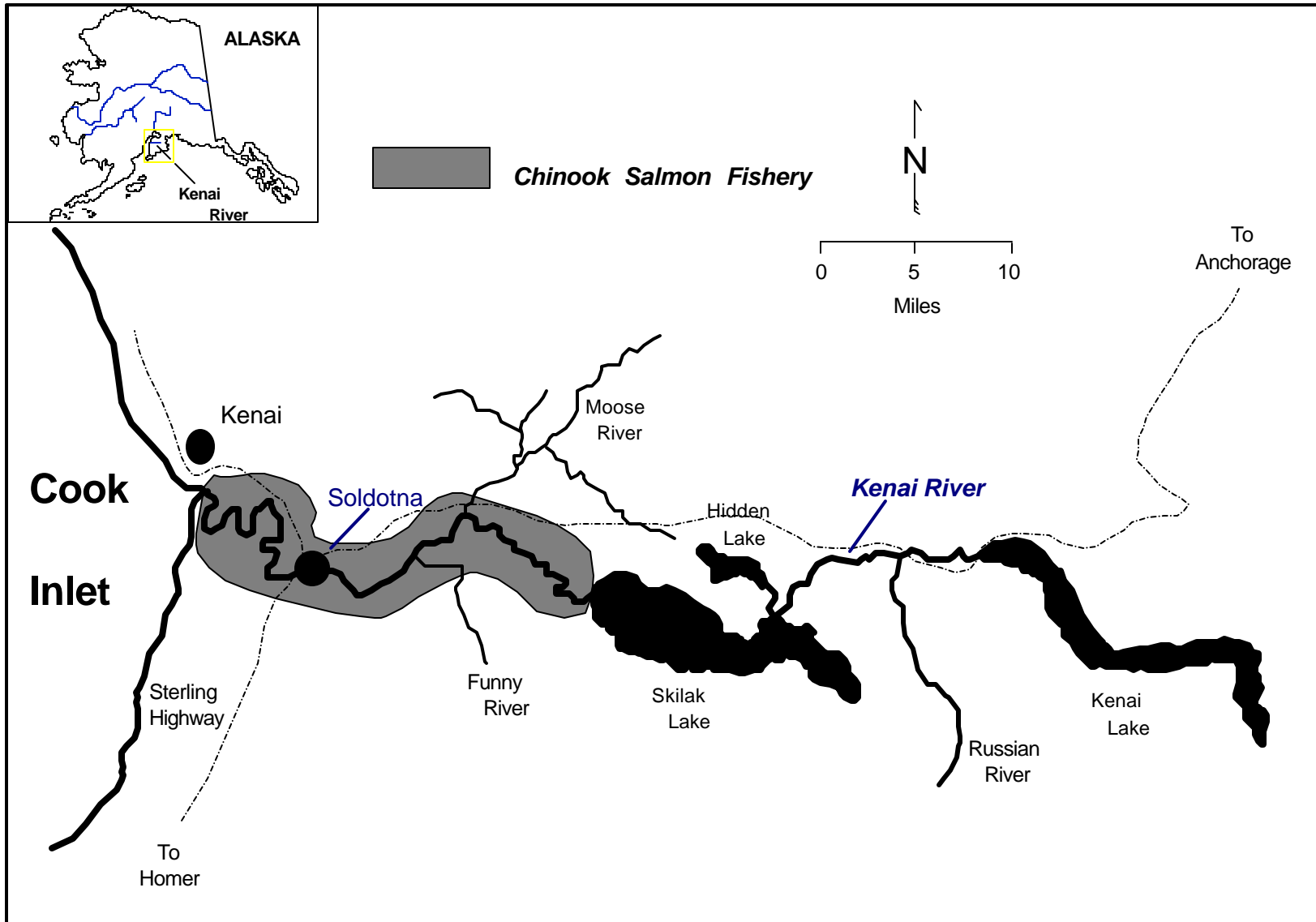


Figure 9.-Map of the boundaries of the chinook salmon fishery in the Kenai River drainage.

accurately estimating the number of chinook salmon entering the river. Nonetheless, estimates of inriver abundance were first realized from the sonar in 1987 and sonar has been the principle tool used to estimate the total inriver abundance of early-run chinook salmon since 1988.

Chinook salmon counts from the left bank at the sonar site are rarely inflated by sockeye salmon. However, sockeye salmon migrating along the right river bank, with its slower water velocities and gradual slope are able to spread further out into the mid-channel of the river and thus inflate the right-bank chinook salmon counts. Evidence indicates that in 1998 the daily right-bank sonar estimates were inflated by sockeye salmon starting on approximately June 3. A second estimate of chinook salmon escapement used the relationship between left- and right-bank counts before June 3 to estimate right bank counts from June 3 to 30. This procedure yielded a conservative escapement estimate of approximately 6,000 early-run chinook salmon.

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 July 28-31.
- 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 July 24-29 with single-hook artificial lures and retention of chinook salmon 52 inches or larger permitted.
No additional fishing time in the Eastside Setnet (ESSN) commercial fishery on July 25 or 26.
- 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.

1998 Fishery restricted to catch-and-release upstream of the Soldotna Bridge from July 1 through July 10 to protect early-run spawners.

Use of bait prohibited effective July 23.

Fishery restricted to catch-and-release July 28-31 with retention of chinook salmon 52 inches or larger permitted.

1999 Fishery extended downstream from Eagle Rock through August 7.

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. This provides additional protection to early-run chinook salmon that spawn in the lower area of the Funny River.

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 additional protection to early-run chinook salmon of Killey River origin.

In 1999, the Board adopted major revisions to the Kenai River Late-run Chinook Salmon Management Plan (5 AAC 21.359). Changes included the adoption of a new biological escapement goal (BEG) of 17,800 to 35,700 chinook salmon and a regime of management actions associated with various levels of projected abundance. Specific management actions contained in the plan are:

1. If the projected spawning escapement of late-run Kenai River chinook salmon is projected to be less than 17,800, then the department shall:
 - a. Close the sport fisheries for chinook salmon in the Kenai River and in the salt waters of Cook Inlet north of Bluff Point and;
 - b. Close the commercial drift gillnet fishery within 1 mile of the Kenai Peninsula shoreline north of the Kenai River and within 1 1/2 miles of the Kenai Peninsula shoreline south of the Kenai River and;
 - c. Close the commercial set gillnet fishery in the Upper Subdistrict of the Central District.
2. From July 20 through July 31:
 - a. If the total inriver return is projected to be less than 40,000 chinook salmon and the total return of late-run sockeye salmon stocks is projected to be greater than 4 million fish, then the commercial set gillnet fisheries in the Kenai and East Foreland sections may not be opened for 24 hours beginning on Friday at 12:00 noon. (This was enacted to provide a migration window for late-run chinook salmon stocks bound for the Kenai River prior to and during the weekend timeframe during years of large returns of sockeye salmon when commercial fishing is most likely to be intensely prosecuted. This regulation is intended to provide protection for Kenai River chinook salmon stocks while allowing recreational anglers a reasonable opportunity to harvest late-run chinook salmon during the weekend.)
 - b. If the total inriver return is projected to be less than 40,000 chinook salmon and the inriver sport fishery harvest is projected to result in a spawning escapement below 17,800 chinook salmon, the Department may restrict the inriver sport fishery.
 - c. If the inriver sport fishery is restricted under the above provision, and the late run of sockeye salmon bound for the Kenai River is projected to exceed 2 million, commercial set gillnetting in the Kenai and East Foreland Section may not be opened for an additional 24-hour period per week beyond regularly scheduled commercial opening on Mondays and Thursdays. (This regulation was enacted to restrict additional commercial eastside setnet openings during returns of Kenai River sockeye salmon in the 2-4 million fish range, and when there are conservation concerns for late-run Kenai River chinook salmon.)

- d. If the Kenai River sport fishery is closed for conservation purposes, the commercial set gillnet fishery in the Upper Subdistrict of Cook Inlet shall be closed. (This regulation was enacted to protect late-run Kenai River chinook salmon stocks and provide for a sharing of the burden of conservation among both user groups.)
- e. If the projected spawning escapement of late-run Kenai River chinook salmon is more than 35,700 and the projected inriver return of late-run Kenai River sockeye salmon is projected to be greater than 1.1 million, there will be no restrictions to the Upper Subdistrict commercial set gillnet fishery. (This regulation was adopted to permit commercial fishing effort during large returns of sockeye salmon to the Kenai River.)
- f. If the spawning escapement of late-run Kenai River chinook salmon is projected to exceed 35,700, the sport fishing season for chinook salmon may be extended in the Kenai River below Eagle Rock from August 1 through August 7. (This regulation was previously in effect and is intended to permit additional recreational fishing opportunity while minimizing the harvest of spawning chinook salmon.)

Other regulatory changes affecting the late-run chinook salmon fishery adopted by the Board in 1999 include:

- 1. Tackle was restricted to the use of only one single hook during the late-run Kenai River chinook salmon fishery. This regulation was adopted to decrease angler efficiency and thereby reduce the likelihood of inseason restrictions to the recreational fishery.
- 2. Nonguided anglers may use nonmotorized boats on Mondays. This was adopted in an effort to provide additional parity between guided and nonguided anglers. This regulation will also provide an opportunity for the department and the board to gauge public acceptance of a drift boat fishery.
- 3. Beginning in the year 2000, guides will be restricted to only four clients per boat during July. This regulation was adopted to address harvest parity between guided and nonguided anglers. As well, this regulation was considered in view of the issue of vessel loading as it pertains to the creation of boat wakes.
- 4. The Board clarified regulatory language that prohibits an angler from fishing with a guide from a vessel if the guide and the vessel are not registered with both the Alaska Department of Fish and Game and the Department of Natural Resources, Division of Parks and Outdoor Recreation.
- 5. The Board added language that makes it unlawful for a third party to arrange or contract for guiding when the guide is not in compliance with registration requirements as stipulated in 5 AAC 56.036, Kenai River Guiding and Guided Fishing Requirements.

RECENT FISHERY PERFORMANCE

During 1998, the fishery was managed to achieve an optimum spawning escapement goal of 22,300 late-run chinook salmon. The fishery commenced on July 1 downstream of the Soldotna Bridge. Upstream of the bridge, the fishery was restricted to catch-and-release fishing with only the retention of chinook salmon greater than 52 inches in length permitted through July 10. The

restrictive closure above the Soldotna Bridge through July 10 was to ensure additional protection for early-run spawners.

Similar to the early run during 1998, all indicators of run strength were used in the assessment of the fishery. These assessment tools included test net data and projections based on sonar estimates (historical mean run timing model), projections based on the creel survey in the sport fishery (mean exploitation rate model) and projections based on commercial catches in the eastside setnet fishery (mean exploitation rate model). As in the past, the mean run timing model based on sonar estimates is used as the primary assessment tool. The alternative assessment tools outlined above are employed when there is significant contamination of sonar estimates by sockeye salmon migrating in midstream waters at the sonar site (River Mile 8.5). During 1998, there was insignificant contamination, and as a result, the mean run timing model based on sonar estimates was used throughout the season.

Through July 23, the mean run timing model projected a final spawning escapement of approximately 20,500 late-run chinook salmon, well below the optimum goal of 22,300. As a result, an emergency order was issued restricting the use of bait in the fishery effective July 23. Through July 26, the mean run timing model projected a final spawning escapement of approximately 19,500 late-run chinook salmon. Due to the decreasing trend in projections, the fishery was further restricted to catch-and-release fishing (retention of chinook salmon 52 inches or larger permitted) effective July 28. This restriction remained in place through the regulatory closure of the fishery on July 30.

During 1998, the fishery below the Soldotna Bridge harvested an estimated 5,981 chinook salmon (including catch-and-release mortality), the lowest on record since 1990 (Table 22). Although HPUE (0.034) approximated the long-term average (1977-1997) of 0.037 fish per hour, total effort expended during this fishery was the lowest since 1992 (Figure 10). Guided anglers harvested the greatest proportion (59.8%) of chinook salmon from the fishery (Table 23), continuing a trend that has occurred since 1988. The eastside setnet commercial harvest (5,039, Table 24) was the lowest harvest since 1991. The low harvest in the commercial setnet fishery is a function of low numbers of late-run chinook salmon and extensive closures to this fishery (July 18 through July 31). Total return (Figure 11) and spawning escapement for the late-run of chinook salmon into the Kenai River were estimated to be 42,340 and 26,768 fish, respectively.

In 1999, the fishery was managed to achieve a biological escapement goal (BEG) within the range of 17,800-35,700 late-run chinook salmon established in the newly adopted management plan. The fishery opened by regulation on July 1. The sonar was operational on May 15 and concluded operations on August 10. Sonar operations are suspended when the daily passage rate of late-run chinook salmon falls to less than 5% of the inriver return for 3 consecutive days. Similar stock assessment procedures were used in 1999 as were adopted during 1998. These assessment tools included test netting data, projections based on sonar estimates (historical mean run timing model), projections based on the creel survey in the sport fishery (mean exploitation rate model), and projections based on commercial catches in the eastside setnet fishery (mean exploitation rate model). As in the past, the mean run timing model based on sonar estimates is the primary assessment tool. The alternative assessment tools outlined above are employed when there is significant contamination of sonar estimates by migrating sockeye salmon at the sonar site (River Mile 8.5). There were no significant contamination problems encountered in 1999, and as a result, the mean run timing model based on sonar estimates was used throughout the season.

Table 22.-Harvest, angler effort and harvest rate, estimated by onsite creel survey downstream of the Soldotna Bridge, late-run Kenai River chinook salmon fishery, 1976-1999.

Year	Harvest	Hours Effort	HPUE ^a
1976	3,370		
1977	4,046	88,312	0.046
1978	4,429	137,120	0.032
1979	3,819	143,256	0.027
1980	2,483	90,200	0.028
1981	4,150	96,660	0.043
1982	4,340	127,828	0.034
1983	8,324	164,928	0.050
1984	6,502	250,371	0.026
1985	7,100	211,507	0.034
1986	8,053	207,322	0.039
1987	10,767	263,252	0.041
1988	16,435	323,374	0.051
1989	8,008	272,889	0.029
1990	5,813	246,548	0.024 ^b
1991	6,849	229,999	0.030
1992	6,680	187,415	0.040 ^b
1993	15,279	293,908	0.052
1994	14,388	354,778	0.041
1995	10,125	323,982	0.031
1996	5,984	238,495	0.025
1997	10,336	263,642	0.039
1998	5,981	188,726	0.034 ^b
1999	12,027	252,460	0.048
Mean	7,720	215,521	0.037

^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 in length) chinook salmon.

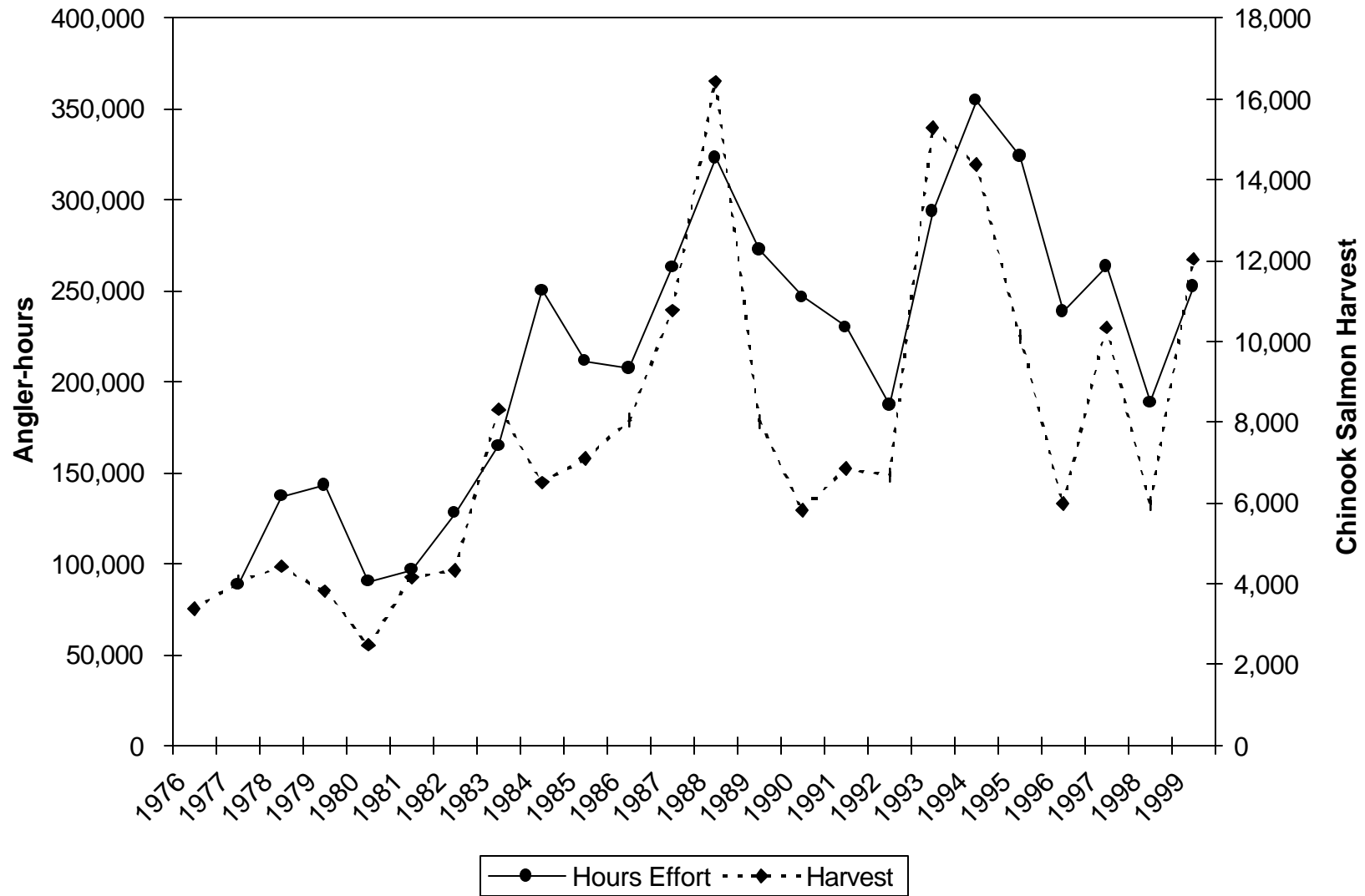


Figure 10.-Late-run chinook salmon harvest and angler effort estimated by onsite creel survey downstream of the Soldotna Bridge, 1976-1999.

Table 23.-Guided vs. nonguided angler harvest, effort, and success rate, estimated by onsite creel survey downstream of the Soldotna Bridge, late-run Kenai River chinook salmon fishery, 1981-1999.

Year	HARVEST								EFFORT				
	Guided			Non-Guided			Total		Guided (Hours)		Non-Guided (Hours)		Total (Hours)
	Number	%	HPUE ^a	Number	%	HPUE ^a	Number	HPUE ^a	Number	%	Number	%	Number
1981	2,162	52.1	0.071	1,988	47.9	0.030	4,150	0.043	30,351	31.4	66,309	68.6	96,660
1982	2,257	52.0	0.065	2,083	48.0	0.022	4,340	0.034	34,897	27.3	92,931	72.7	127,828
1983	4,919	59.1	0.090	3,405	40.9	0.031	8,324	0.050	54,756	33.2	110,172	66.8	164,928
1984	2,614	40.2	0.062	3,888	59.8	0.019	6,502	0.026	42,062	16.8	208,309	83.2	250,371
1985	2,705	38.1	0.067	4,395	61.9	0.026	7,100	0.034	40,398	19.1	171,109	80.9	211,507
1986	3,198	39.7	0.067	4,855	60.3	0.030	8,053	0.039	47,379	22.9	159,943	77.1	207,322
1987	5,194	48.2	0.075	5,573	51.8	0.029	10,767	0.041	69,622	26.4	193,630	73.6	263,252
1988	8,393	51.1	0.095	8,042	48.9	0.034	16,435	0.051	88,331	27.3	235,043	72.7	323,374
1989	4,727	59.0	0.055	3,281	41.0	0.018	8,008	0.029	86,507	31.7	186,382	68.3	272,889
1990	3,544	61.0	0.042 ^b	2,269	39.0	0.014 ^b	5,813	0.024 ^b	85,477	34.7	161,071	65.3	246,548
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	0.040 ^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	5,856	56.7	0.046	4,480	43.3	0.033	10,336	0.039	126,416	47.9	137,226	52.1	263,642
1998	3,575	59.8	0.041 ^b	2,406	40.2	0.028 ^b	5,981	0.034 ^b	98,872	52.4	89,854	47.6	188,726
1999	7,605	63.2	0.064	4,422	36.8	0.033	12,027	0.048	118,196	46.8	134,264	53.2	252,460
Mean	4,650	53.3	0.062	4,147	46.7	0.026	8,797	0.037	79,853	33.7	156,889	66.3	236,741

^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 24.-Late-run Kenai River chinook salmon population data, 1986-1999.

Year	Deep Creek ^a		Eastside ^a		Drift ^a		Commercial ^b			Kenai River ^a		Hook-and- ^a		Total
	Marine	Set Net	Gill Net	Personal	Kenatize	Personal ^e	Inriver ^a	Sport	Release	Spawning	Escapement	Return		
	Harvest	Harvest	Harvest	Use	Educational	Subsistence ^d	Use	Return	Harvest	Mortality				
1986	630	19,810	1,834					57,563	9,872	316	47,375	79,837		
1987	1,218	20,588	4,551				235	48,123	13,100	123	34,900	74,715		
1988	1,487	12,870	2,217				0	52,008	19,695	176	32,137	68,582		
1989	1,368	10,919	0 ^c	4			0	29,035	9,691	88	19,256	41,326		
1990	1,605	4,139	621	91				33,474	6,897	69	26,508	39,930		
1991	1,705	4,891	241	130			413	34,614	7,903	16	26,695	41,994		
1992	2,115	10,718	543	50			621	30,314	7,556	234	22,524	44,361		
1993	2,834	13,977	751	129			0	51,991	17,775	478	33,738	69,682		
1994	1,869	15,885	460	13	1		797	53,474	17,837	572	35,065	72,499		
1995	2,069	12,032	523	36	3		753	44,336	12,609	472	31,255	60,524		
1996	2,038	11,521	365	43	1		295	39,356 ^f	8,112	337	30,907	53,619		
1997	2,931	11,281	489	44	20		364	39,622 ^f	12,755	570	26,297	54,751		
1998	1,784	5,039	332	51	2		254	34,878	7,515	595	26,768	42,340		
1999	1,036	9,317	561	73	4		488	48,069	13,595	682	33,792	59,548		

^a Source: Hammarstrom and Timmons 2001b. Sport harvest includes creel survey estimates for the area from Cook Inlet to the Soldotna Bridge and estimates from the Statewide Harvest Survey for Soldotna Bridge to the outlet of Kenai Lake.

^b Eastside set net personal use.

^c No commercial drift net fishery conducted in 1989 due to *Exxon Valdez* oil spill.

^d Source: Brannian and Fox 1996.

^e Source: 1986-1993 Brannian and Fox 1996; 1995 Ruesch and Fox 1996; 1996-99 are estimates from returned permits.

^f Sonar counts for 1996 and 1997 were 49,755 and 49,933, respectively (Burwen and Bosch 1998, Bosch and Burwen 1999). Escapement and total return estimates are calculated using radiotelemetry tagging estimates shown here (Hammarstrom and Timmons 2001b).

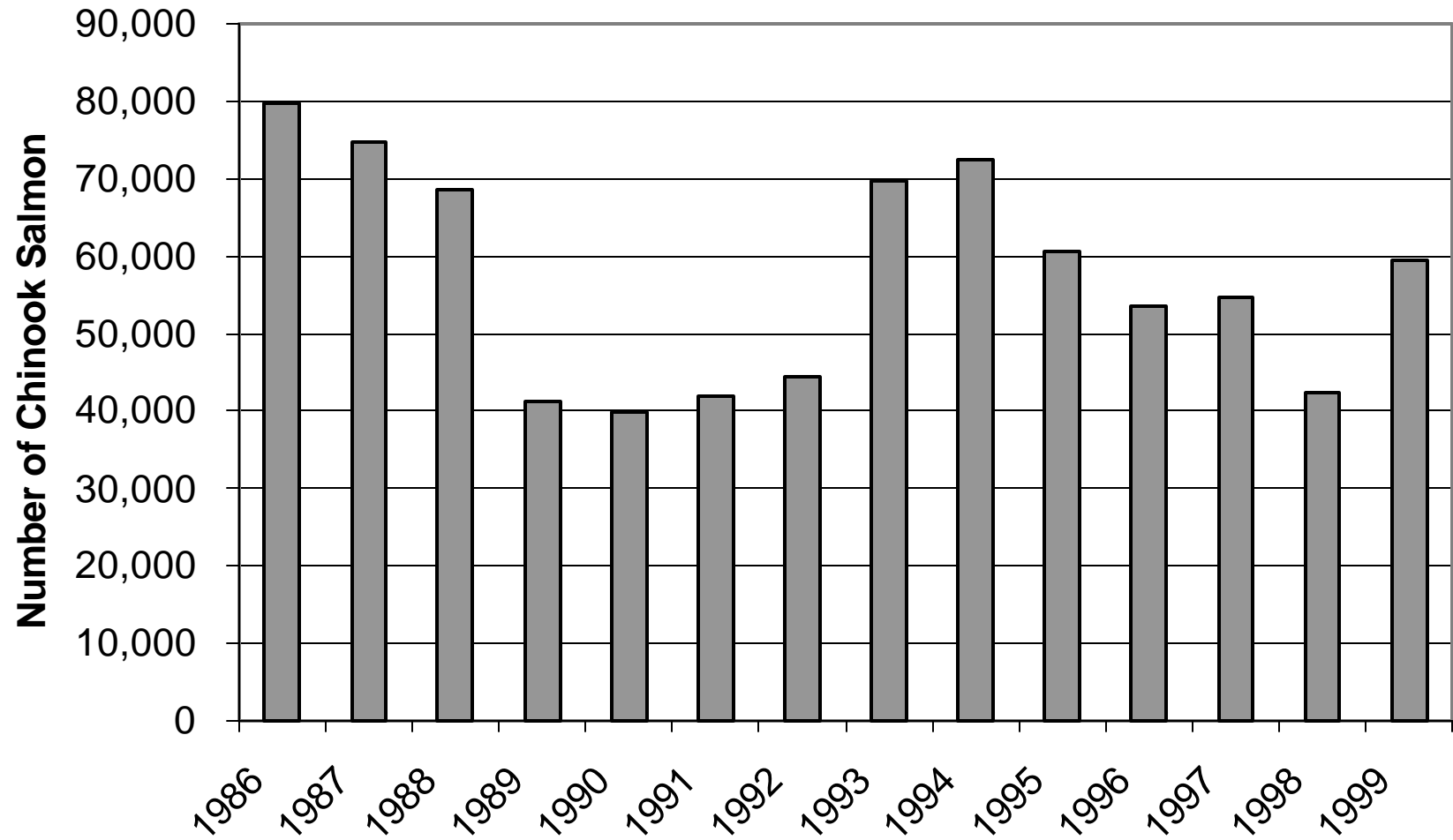


Figure 11.-Total return, Kenai River late-run chinook salmon, 1986-1999.

The inriver recreational fishery was prosecuted without management restrictions in 1999. Early projections of total return indicated a fairly large run in the neighborhood of 40,000 chinook salmon. Excellent catch rates early in the recreational fishery tended to support this possibility. Although the projected escapement fell to approximately 25,000 chinook salmon on July 16, it increased to approximately 35,000 by July 21, just slightly below the upper range of the BEG (35,700). From Sunday, July 25 to Wednesday, July 28, approximately 7,500 chinook salmon passed the sonar. Preliminary estimates from the creel survey indicated excellent catch rates in the lower river. Projected escapement rose from approximately 36,300 on July 25 to 38,500 on July 28, well above the upper range of the BEG. Based upon excellent recreational catches and sustained passage rates in excess of 1,000 chinook salmon per day, the season was extended by emergency order from August 1 through August 7 (issued July 28) in that section of the Kenai River below Eagle Rock.

During 1999, the fishery downstream of the Soldotna Bridge harvested an estimated 12,027 chinook salmon (including catch-and-release mortality), greater than 20 of the previous 23 years (Table 22 and Figure 10). Harvest per unit of effort (0.048), was better than any previous year's (1976-1998), except 1993 (0.052). Total angler-hours of effort (252,460) was greater than the long-term average (1974-1998) of 215,521 angler-hours (Table 22). Guided anglers harvested a larger proportion of late-run chinook salmon (63.2%) than during any year except 1996 (64.4%, Table 23). The eastside setnet commercial harvest (9,317) was significantly below the long-term average (1986-1998) of 11,821 chinook salmon (Table 24). Total return was estimated to be 59,548 late-run chinook salmon (Figure 11), which compares well with the long-term average (1986-1998) of 57,104. The spawning escapement was estimated to be 33,788 fish, well within the BEG range of 17,800-35,700 late-run chinook salmon.

OUTLOOK

Regulatory changes to Kenai Peninsula sport finfish fisheries will be considered by the Board in February 2002. Basic regulation of the fishery will therefore be unchanged during the 2000 and 2001 season. The primary objective of management will continue to be to achieve a biological escapement goal within the range of 17,800-35,700 late-run chinook salmon.

CURRENT ISSUES

Some members of the staff and public have questioned the accuracy of the sonar counter. At issue is the perception that the counter is 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. However, early-run estimates appear to accurately represent run strength. Questions regarding the accuracy of the sonar counter will continue to be an issue in managing this fishery. Department staff will continue efforts to improve current methods of sonar estimation 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). In addition, new sonar equipment is slated for deployment in the year 2000.

Sonar development within the NKPMA will remain a high priority into the foreseeable future. It will be an important challenge for Division of Sport Fish staff to effectively communicate to the public how sonar is used in the assessment of this fishery. This message must include the limitations inherent to current sonar technology and further explanations of how the department uses alternative assessment tools when sockeye salmon contamination is significant.

Social concerns as a result of crowding remain an issue in the long-term development of this valuable sport fishery. Such issues play a role in the controversy between guided and nonguided anglers over the harvestable surplus and, in some years, the increased probability of inseason restrictions for stock conservation purposes. Inseason restrictions are disruptive to guided anglers, nonguided anglers and businesses that derive income from this fishery. Such concerns will likely remain an issue affecting management of this resource into the foreseeable future.

RECOMMENDED RESEARCH & MANAGEMENT

The fishery's research and management activities are interrelated. Research is required for both inseason management decisions as well as postseason evaluation of management actions and the current regulatory structure. 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 provides the basis for inseason projection of total return and spawning escapement. These data are the cornerstone for inseason management decisions. An active management program employing formal news releases and 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 continue to use alternative stock assessment techniques, sonar will remain an integral tool for assessing run strength and timing during the near future.

Using test netting data to correlate with the daily or hourly sonar estimates to adjust the sonar estimates whenever sockeye salmon numbers have inflated the chinook salmon estimates has been problematic. Multiple years of these data are now available for detailed analysis. We recommend that a detailed analysis be conducted with the goal to establish a statistical model that will permit adjustments to daily sonar estimates during times when sockeye salmon contamination is apparent.

RUSSIAN RIVER LATE-RUN SOCKEYE SALMON RECREATIONAL FISHERY

The Russian River is a clearwater tributary to the Kenai River, located approximately midway between Kenai and Skilak lakes (Figure 12). The drainage includes two large clearwater lakes, Upper and Lower Russian lakes.

FISHERY OBJECTIVES

Management of the Russian River late-run sockeye salmon 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. This goal has been achieved or exceeded in all years since the plan was adopted in 1978 (Table 25, Figure 13).

The Russian River Sockeye Salmon Management Plan recognizes that commercial users as well as mainstem Kenai and Russian River recreational anglers harvest late-run sockeye salmon stocks bound for the Russian River drainage. It stipulates how the burden of conservation shall be distributed between commercial and recreational users. In the event that conservation measures are required to achieve the minimum escapement goal, the department shall restrict Kenai River drainage sport fisheries. Restrictions to the commercial fishery shall be limited to

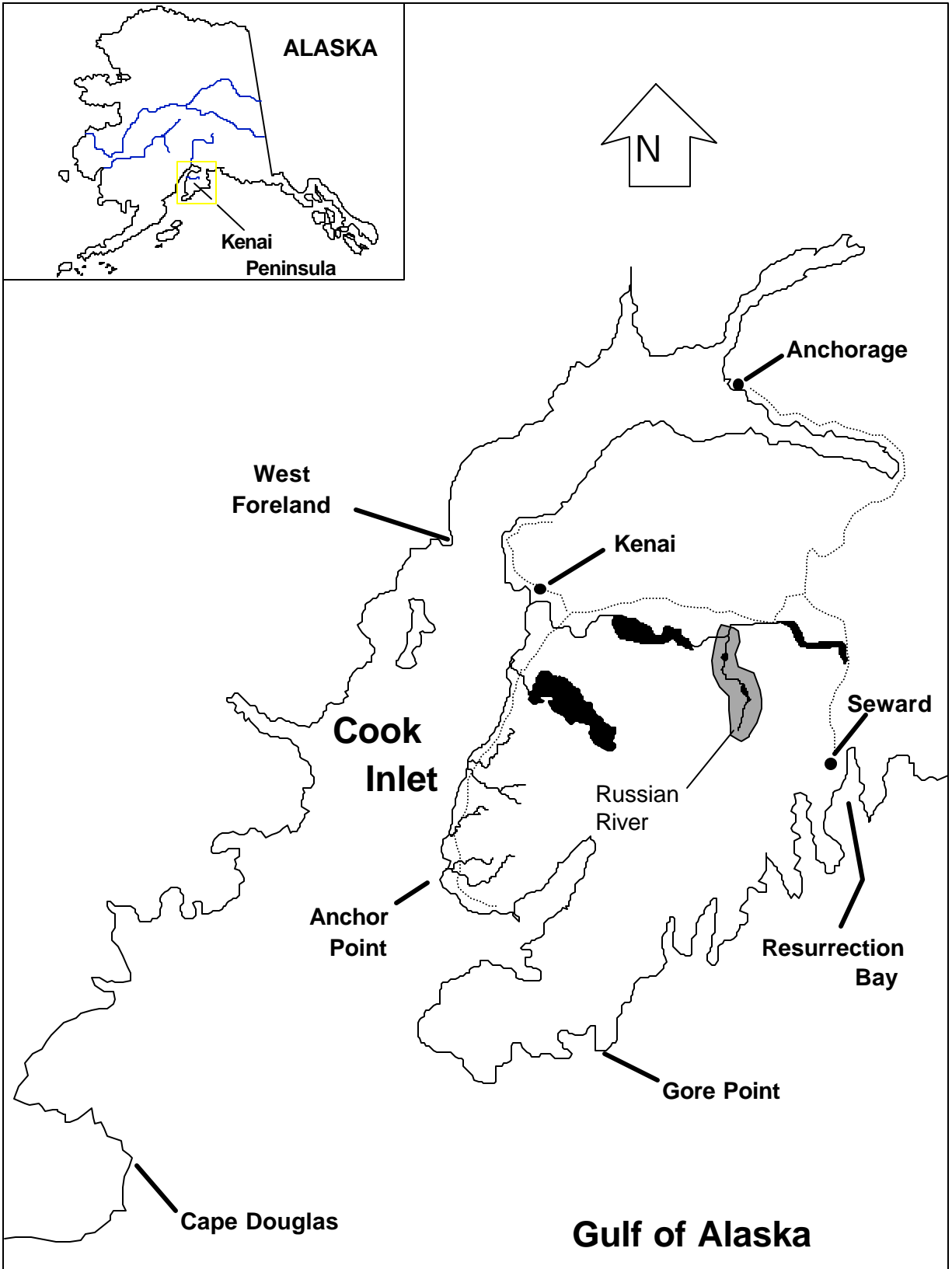


Figure 12.-Location of the Russian River on the Kenai Peninsula, Alaska.

Table 25.-Angler effort, harvest rate, harvest and escapement, Russian River late-run sockeye salmon, 1963-1999.

Year	Days Effort	Hours Effort	Harvest/ Hour	Harvest	Spawning Escapement			Local ^b Return
					Above Weir	Below Weir	Total	
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	53,080	58,900
1969	2,640	12,230	0.094	1,150	28,870	1,100	29,970	31,120
1970	1,000	2,240	0.268	600	26,200	220	26,420	27,020
1971	8,870	37,390	0.287	10,730	54,420	10,000	64,420	75,150
1972	13,360	55,920	0.287	16,050	79,115	6,000	85,115	101,165
1973	15,470	81,930	0.109	8,930	25,070	6,680	31,750	40,680
1974	10,030	45,210	0.188	8,500	24,900	2,210	27,110	35,610
1975	11,300	52,770	0.159	8,390	31,960	690	32,650	41,040
1976	17,380	74,000	0.185	13,700	31,940	3,470	35,410	49,110
1977	31,310	140,780	0.195	27,440	21,360	17,090	38,450	65,890
1978	17,950	98,830	0.248	24,530	34,340	18,330	52,670	77,200
1979	29,330	124,010	0.216	26,840	87,850	3,920	91,770	118,610
1980	24,900	117,100	0.286	33,500	83,980	3,220	87,200	120,700
1981	26,250	109,250	0.217	23,720	44,520	4,160	48,680	72,400
1982	12,480	59,130	0.175	10,320	30,800	45,000	75,800	86,120
1983	13,300	66,650	0.240	16,000	33,730	44,000	77,730	93,730
1984	20,320	94,850	0.232	21,970	92,660	3,000	95,660	117,630
1985	34,630	159,160	0.367	58,410	136,970	8,650	145,620	204,030
1986	22,400	89,780	0.343	30,810	40,280	15,230	55,510	86,320
1987	32,650	132,570	0.306	40,580	53,930	76,530	130,460	171,040
1988	25,430	94,840	0.206	19,540	42,480	30,360	72,840	92,380
1989	39,770	154,510	0.357	55,210	138,380	28,480	166,860	222,070
1990	39,970	159,890	0.351	56,180	83,430	11,760	95,190	151,370
1991	21,090	78,849	0.399	31,450	78,180	22,270	100,450	131,900
1992	23,015	87,918	0.297	26,101	63,478	4,980	68,458	94,559
1993	23,491	96,312	0.278	26,772	99,259	12,258	111,517	138,289
1994	21,712	91,192	0.289	26,375	122,277	15,211	137,488	163,863
1995	17,166	72,099	0.164	11,805	61,982	12,479	74,461	86,266
1996	17,322	77,951	0.245	19,136	34,691	31,601	66,292	85,428
1997				12,910 ^a	65,905	11,337	77,242	90,152
1998				25,110 ^a	113,480	19,593	133,073	158,183
1999				32,335 ^a	139,863	19,514	159,377	191,712
Mean	17,570	75,500	0.254	20,270	61,050	13,340	74,390	94,660

^a Estimate of late-run harvest from Statewide Harvest Survey, unpublished data.

^b Escapement below and above weir plus harvest.

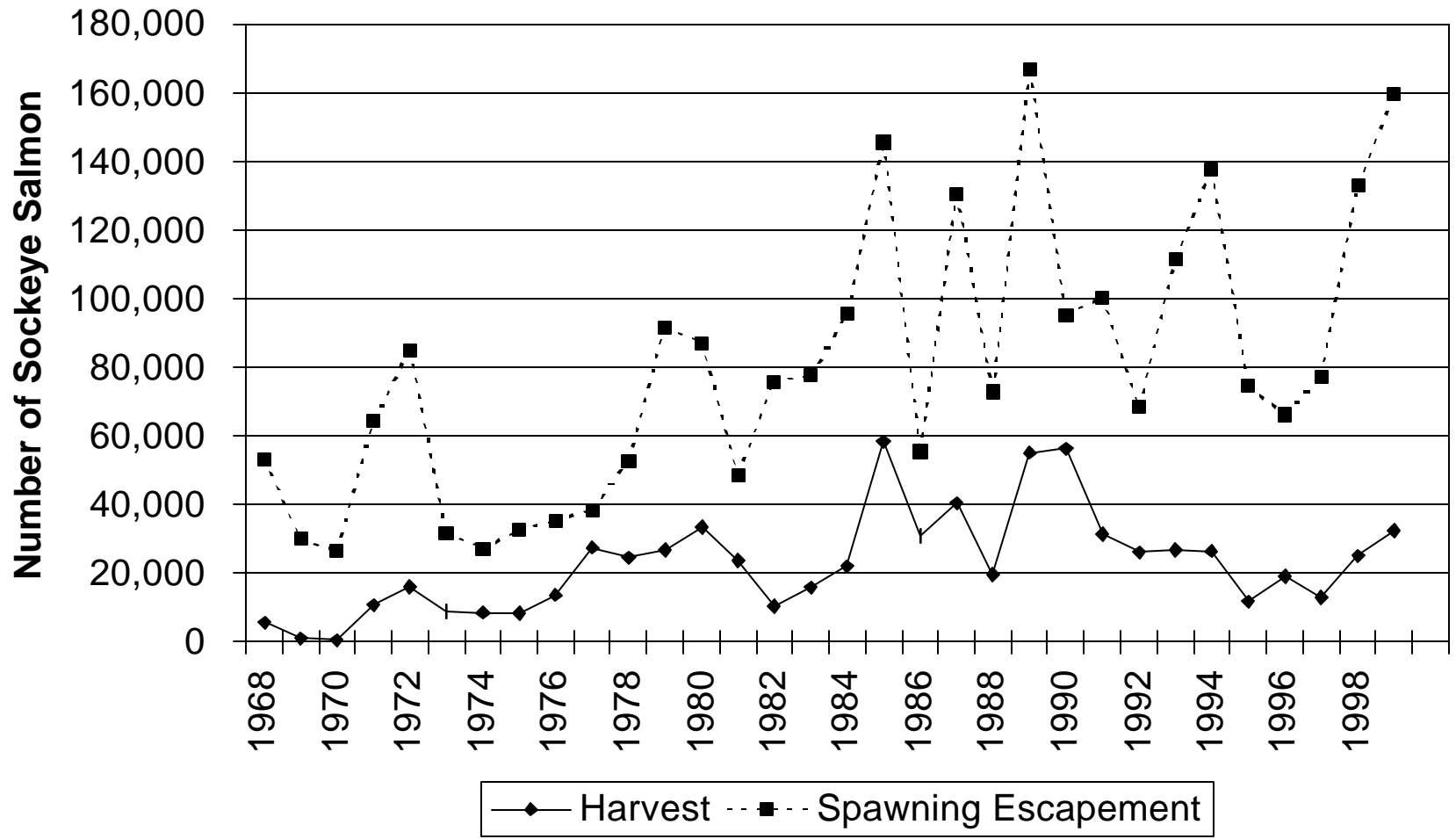


Figure 13.-Late-run Russian River sockeye salmon harvest and total spawning escapement, including lower river spawners, 1968-1999.

meeting the inriver escapement goal for Kenai River late-run sockeye salmon as outlined in the Kenai River Late-run Sockeye Salmon Management Plan (5 AAC 21.360).

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 escapement data provides the percentage of the run that is expected to have passed the weir by a given date (mean run timing model). A determination of run strength can typically be made a few days prior to the historic midpoint of the run (August 5). Weir counts are supplemented by onsite enumeration of the number of fish present downstream from the weir including lower Russian River, the falls area, and the area between the falls and the weir (Figure 14). In addition, observed fishery performance is considered a valuable indicator of run strength. Should inseason restrictions be necessary to achieve the escapement goal, the management plan allows for reductions in bag limits and closures by area and time in the Russian River and in the mainstem of the Kenai River. Typically, such inseason restrictions remain in place until the minimum spawning escapement can be projected.

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 12). Lands bordering the stream are federally managed, with public access provided at the boat launch and parking facility at the river's confluence with the Kenai River, and at the Chugach National Forest campground on the Russian River (Figure 14).

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 population component that spawns in the lower reaches of the river is more closely related (genetically) to the mainstem Kenai River sockeye salmon stocks than to the population component spawning above the weir. 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.

CONFLUENCE OF KENAI and RUSSIAN RIVERS

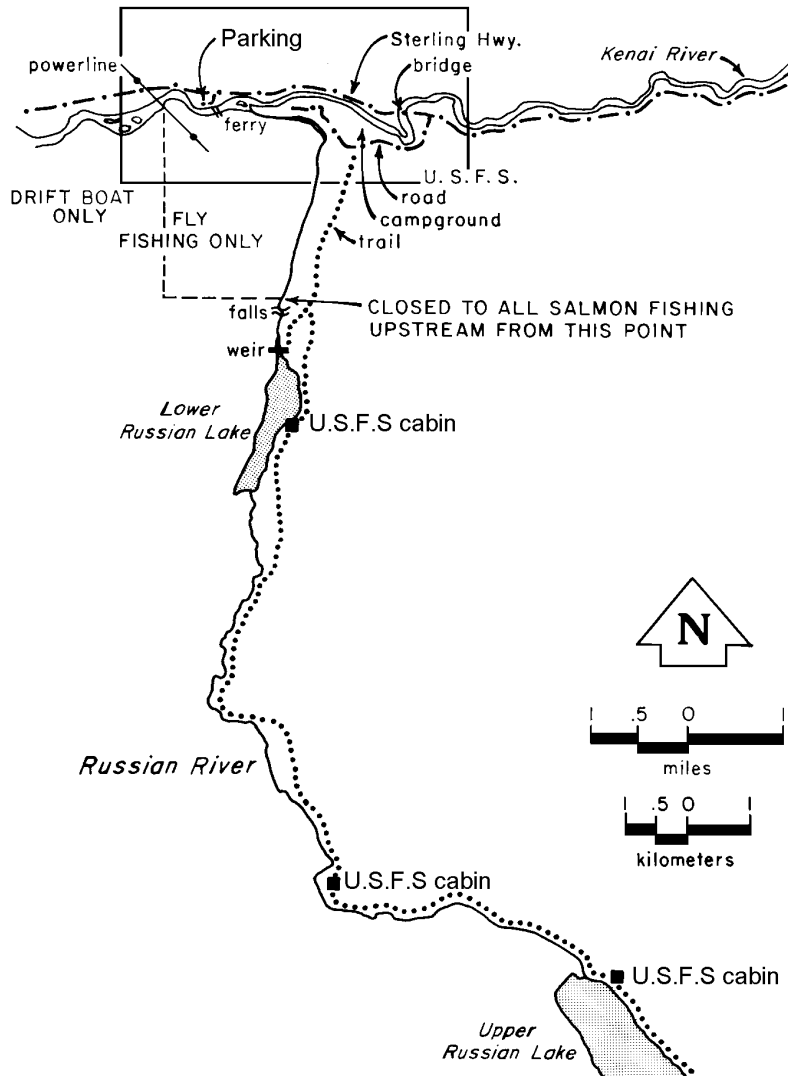
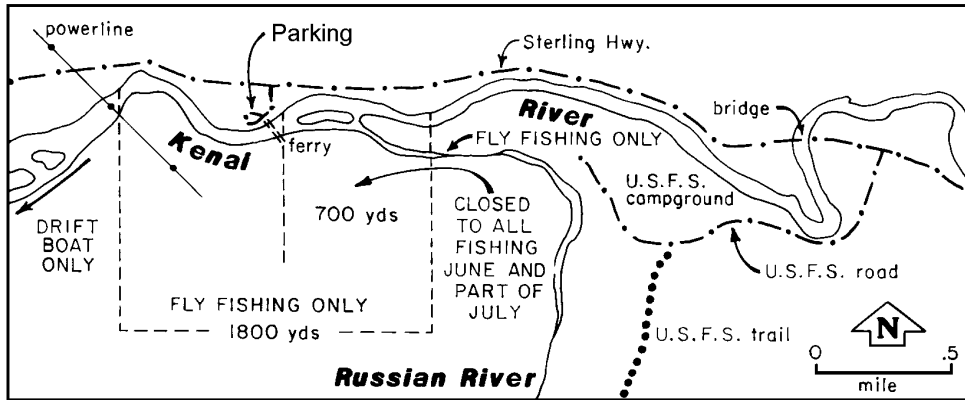


Figure 14.-The Russian River drainage, Kenai Peninsula, Alaska.

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 in these sections of the respective rivers. 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 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 and subsequent improvements completed in 2000 have partially alleviated parking issues 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 as 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 minimum early-run escapement is projected. Late-run migration through this area is more rapid and increased protection is not required. Only the lower 3 miles of the Russian River drainage are open to salmon fishing. The upstream portion of the drainage 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, 1996 or 1999 Board of Fisheries meetings. The board will next consider regulatory changes to this fishery in February 2002.

RECENT FISHERY PERFORMANCE

In 1998, the fishery was managed to achieve a minimum escapement goal of 30,000 late-run sockeye salmon. Significant numbers of late-run sockeye salmon began to appear at the confluence area on or about July 24 (Table 26). By July 31, the total count through the weir was more than 25,000 sockeye salmon with significant numbers of fish downstream from the weir, in the falls area and in the mainstem of the lower Russian River. Given these rapidly increasing escapement counts, the minimum escapement goal was assured. As a result, an emergency order

Table 26.-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	01-Sep	387	111,926	0.975
30-Jul	4,959	21,432	0.257	02-Sep	295	112,221	0.980
31-Jul	3,810	25,242	0.281	03-Sep	248	112,469	0.983
01-Aug	4,426	29,668	0.327	04-Sep	107	112,576	0.986
02-Aug	3,580	33,248	0.355	05-Sep	137	112,713	0.988
03-Aug	5,436	38,684	0.393	06-Sep	70	112,783	0.990
04-Aug	4,788	43,472	0.438	07-Sep	82	112,865	0.993
05-Aug	5,074	48,546	0.489	08-Sep	72	112,937	0.995
06-Aug	5,387	53,933	0.528	09-Sep	33	112,970	0.997
07-Aug	6,022	59,955	0.558	10-Sep	92	113,062	0.998
08-Aug	5,420	65,375	0.600	11-Sep	51	113,113	0.999
09-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.

was issued that liberalized bag limits from 3 to 6 sockeye salmon per day in the fly-fishing-only waters of the Kenai and Russian rivers. This emergency order was effective at 12:01 a.m., August 3.

The late-run Russian River sockeye salmon fishery closed on August 20 by regulation. Recreational harvest was estimated to be 25,110 late-run sockeye salmon (Table 25, Figure 13). No estimate of effort is available, as no creel survey has been conducted since 1996. However, the harvest appears to have been driven by sockeye salmon bound for the upper reaches of the Russian River drainage. The final escapement above the weir through September 20 was 113,480 sockeye salmon. An additional 19,593 sockeye salmon were enumerated below the weir in the mainstem of the Russian River. This total escapement of 133,073 is the largest escapement achieved since 1994 and is greater than all but three of the escapements during the preceding 30 years (Table 25, Figure 13).

Sampling to determine age, sex and size at age of the escapement was conducted during the first and again during the second half of the migration. Marsh (1996) describes data collection and analysis procedures in detail. No significant differences were found between the two strata allowing the samples to be combined. Males accounted for approximately 70% of the return (Table 27). The majority of the return was nearly equally comprised of age 2.1 (35.9%) and age 2.2 (37.3%) sockeye salmon.

In 1998, the total local return (escapement plus harvest) amounted to 20.6% of the Kenai River sockeye salmon sonar estimate (Table 28). This percentage is greater than any year since 1990 (23%) and well above the 1988-1997 10-year average (14.2%). Of the fish enumerated at the weir, approximately 28% were 16 inches or less (jacks) (Table 29).

In 1999, the fishery was managed to achieve a minimum escapement goal of 30,000 late-run sockeye salmon. Significant numbers of late-run sockeye salmon began to arrive at the confluence area on or about July 26 (Table 30). Through August 3, the total count through the weir was approximately 26,000 sockeye salmon (Table 30) with approximately 10,000 fish downstream from the weir, in the falls area and in the mainstem of the lower Russian River. Given these rapidly increasing escapement counts, the minimum escapement goal of 30,000 late-run sockeye salmon was assured. As a result, an emergency order was issued that liberalized bag limits from 3 to 6 sockeye salmon per day in the fly-fishing-only waters of the Kenai and Russian rivers. This emergency order was effective at 12:01 a.m., August 5.

Recreational harvest in 1999 was estimated to be 32,335 late-run sockeye salmon (Table 25, Figure 13) and was larger than any recorded since 1990 (56,180). No estimate of effort is available, as no creel survey has been conducted since 1996. The harvest was clearly driven by sockeye salmon bound for the upper reaches of the Russian River drainage. The final escapement above the weir through September 20 was 139,863 sockeye salmon (Table 30). An additional 19,514 sockeye salmon were enumerated below the weir in the mainstem of the Russian River. This total spawning escapement of 159,377 sockeye salmon is the second largest escapement achieved during the history of the fishery (Table 25, Figure 13).

Sampling to determine age, sex and size at age of the escapement was conducted during the first and again during the second half of the migration. Marsh (1996) describes data collection and analysis procedures in detail. No significant differences were found between the two strata, allowing the samples to be combined. Males (50.2%) and females (49.8%) accounted for

Table 27.-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

approximately equal proportions of the return (Table 31). The majority of the return (74.4%) was composed of age 2.2 sockeye salmon.

In 1999, the total local return (escapement plus harvest) amounted to 23.9% of the Kenai River sockeye salmon sonar estimate (Table 28). This percentage is higher than any percentage since 1985 (40.6%) and well above the 1989-1998 average (15.4%). Of the fish enumerated at the weir, only 5% were less than 16 inches (jacks) (Table 29).

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 the U.S. Fish and Wildlife Service.

Table 28.-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, 1968-1999.

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		75,150	
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	131,900	20.4
1992	994,760	94,559	9.5
1993	813,617	138,289	17.0
1994	1,003,446	163,863	16.3
1995	630,447	86,266	13.7
1996	797,847	85,428	10.7
1997	1,064,818	90,152	8.5
1998	767,558	158,183	20.6
1999	803,379	191,712	23.9
Mean	607,870	102,490	22.6

^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.

Table 29.-Late-run Russian River sockeye salmon harvest, escapement, and returning jacks, 1969-1999.

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	56,180	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	19,136	34,691	7,388	21.3
1997	12,910	65,905	4,549	6.9
1998	25,110	113,480	31,242	27.5
1999	32,335	139,863	6,527	4.7
Mean	23,390	64,720	5,630	8.2

^a Fish that are 16 inches or less. These are visual counts of small fish at the weir, not based on scale pattern analysis.

Table 30.-Daily escapement of late-run sockeye salmon at Russian River weir in 1999 and historic mean daily escapement proportion, 1978-1998.

Date	Daily Count	Total Count	Historic Proportion By Day	Date	Daily Count	Total Count	Historic Proportion By Day
15-Jul	0	0	0.003	18-Aug	6,071	104,664	0.841
16-Jul	0	0	0.003	19-Aug	4,160	108,824	0.855
17-Jul	0	0	0.003	20-Aug	3,376	112,200	0.870
18-Jul	0	0	0.005	21-Aug	2,374	114,574	0.883
19-Jul	0	0	0.007	22-Aug	2,990	117,564	0.893
20-Jul	0	0	0.013	23-Aug	2,415	119,979	0.902
21-Jul	0	0	0.025	24-Aug	3,254	123,233	0.916
22-Jul	0	0	0.039	25-Aug	2,063	125,296	0.923
23-Jul	0	0	0.048	26-Aug	2,727	128,023	0.935
24-Jul	0	0	0.068	27-Aug	1,927	129,950	0.942
25-Jul	77	77	0.086	28-Aug	1,745	131,695	0.950
26-Jul	1,152	1,229	0.116	29-Aug	1,460	133,155	0.958
27-Jul	1,381	2,610	0.156	30-Aug	1,133	134,288	0.964
28-Jul	2,058	4,668	0.191	31-Aug	846	135,134	0.971
29-Jul	3,618	8,286	0.218	01-Sep	963	136,097	0.975
30-Jul	2,776	11,062	0.253	02-Sep	644	136,741	0.980
31-Jul	2,632	13,694	0.278	03-Sep	603	137,344	0.984
01-Aug	2,091	15,785	0.324	04-Sep	616	137,960	0.986
02-Aug	4,846	20,631	0.352	05-Sep	498	138,458	0.988
03-Aug	5,565	26,196	0.391	06-Sep	360	138,818	0.990
04-Aug	9,946	36,142	0.435	07-Sep	270	139,088	0.993
05-Aug	6,179	42,321	0.486	08-Sep	191	139,279	0.995
06-Aug	4,158	46,479	0.526	09-Sep	154	139,433	0.997
07-Aug	4,411	50,890	0.556	10-Sep	40	139,473	0.998
08-Aug	1,304	52,194	0.598	11-Sep	83	139,556	0.999
09-Aug	2,255	54,449	0.637	12-Sep	86	139,642	0.999
10-Aug	6,083	60,532	0.666	13-Sep	89	139,731	0.999
11-Aug	4,927	65,459	0.689	14-Sep	41	139,772	1.000
12-Aug	4,304	69,763	0.716	15-Sep	36	139,808	1.000
13-Aug	3,174	72,937	0.741	16-Sep	17	139,825	1.000
14-Aug	6,199	79,136	0.764	17-Sep	5	139,830	1.000
15-Aug	4,009	83,145	0.787	18-Sep	0	139,830	1.000
16-Aug	8,431	91,576	0.808	19-Sep	9	139,839	1.000
17-Aug	7,017	98,593	0.825	20-Sep	24 ^a	139,863	1.000

^a Includes 24 late-run sockeye salmon that passed the weir from September 21 through September 28.

Table 31.-Estimated age and sex composition and length-at-age of late-run sockeye salmon enumerated at Russian River weir, 1999.

	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	TOTAL
Female									
Sample Size	1	5	0	207	28	0	6	2	249
Percent	0.2	0.9	0.0	42.0	5.0	0.0	1.3	0.4	49.8
SE (Percent)	0.2	0.4	0.0	2.2	0.9	0.0	0.5	0.3	2.3
Escapement	222	1,326	0	58,764	7,016	0	1,762	544	69,634
SE (Escapement)	222	599	0	3,058	1,277	0	719	383	3,148
Mean Length (mm)	537	577		512	557		513	558	519
SE		2.5		1.6	3.4		4.2	7.5	1.8
Male									
Sample Size	0	2	28	166	51	3	4	1	255
Percent	0.0	0.3	6.5	32.4	9.4	0.6	0.8	0.2	50.2
SE (Percent)	0.0	0.2	1.1	2.1	1.2	0.4	0.4	0.2	2.3
Escapement	0	444	9,041	45,287	13,135	897	1,153	272	70,229
SE (Escapement)	0	313	1,606	2,943	1,690	525	577	272	3,148
Mean Length (mm)		583	381	508	562	403	524	575	505
SE		7.0	3.9	2.1	2.7	12.0	10.7		3.5
Combined									
Sample Size	1	7	28	373	79	3	10	3	504
Percent	0.2	1.2	6.5	74.4	14.4	0.6	2.1	0.6	100.0
SE (Escapement)	0.2	0.5	1.1	1.9	1.4	0.4	0.7	0.3	
Escapement	222	1,770	9,041	104,051	20,150	897	2,915	815	139,863
SE (Escapement)	222	674	1,606	2,698	1,974	525	915	468	
Mean Length (mm)	537	579	381	510	560	403	518	563	512
SE		2.6	3.9	1.3	2.1	12.0	4.9	7.3	2.0

The greatest amount of habitat degradation has occurred along the eastern bank of the Russian River between the campgrounds and the 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 and has continued through 1999.

Members of the Cooper Landing community responded favorably to increased bag limits in 1998 and 1999. The impact of the commercial fisheries on Russian River stocks will remain an issue into the foreseeable future. Possible subsistence fisheries directed at late-run Russian River stocks may also become an issue during future years.

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 River sonar site.

Perhaps of more importance is the potential interaction of rearing fry in Upper Russian Lake. Given the very large escapements into this system during recent years, a better understanding of carrying capacity and other factors affecting overall production in this lake is needed.

KENAI RIVER LATE-RUN SOCKEYE SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVES

Kenai River late-run sockeye salmon are managed under provisions of the Kenai River Late-run Sockeye Salmon Management Plan (5 AAC 21.360). The Division of Sport Fish manages the inriver sport fishery. Late-run Kenai River sockeye salmon are a component of the harvest of the upper Cook Inlet commercial fishery managed by Commercial Fisheries Division. During the February 1999 meeting of the Alaska Board of Fisheries, the Kenai River Late-run Sockeye Salmon Management Plan was significantly altered. Under the previous plan, the escapement goal was established as a sonar estimate range from 550,000 to 850,000 sockeye salmon with an after sport harvest biological escapement goal (BEG) range of 330,000 to 600,000 fish. Under the revised management plan, escapement goals were established to distribute yearly escapements within an optimum escapement goal (OEG) range of 500,000 to 1,000,000 sockeye salmon with management directives more closely associated with projected sockeye salmon abundance. The abundance ranges and associated inriver (sonar) escapement goals outlined in the plan are:

- | | |
|---|-------------------|
| 1. Sonar counts of less than 2 million: | 600,000-850,000 |
| 2. Sonar counts from 2-4 million: | 750,000-950,000 |
| 3. Sonar counts greater than 4 million: | 850,000-1,100,000 |

This plan, as amended by the Board in 1999, stipulates two different escapement objectives. The first goal is an inriver range associated with the three levels of total projected return to the Kenai River described above. This inriver escapement goal is derived from sonar estimates at River Mile 19 (Figure 15) of the Kenai River. Commercial Fisheries Division operates this sonar and is responsible for managing UCI commercial fisheries to achieve the inriver goal range. The second escapement goal is an optimum escapement goal (OEG) and is established as a range (500,000 to 1,000,000 sockeye salmon). This goal represents the actual spawning escapement (inriver sonar estimate less inriver sport harvest above the Soldotna Bridge). It is the responsibility of the Division of Sport Fish to assess inriver harvests and take necessary steps to ensure that a final spawning escapement within the range established by the OEG is achieved.

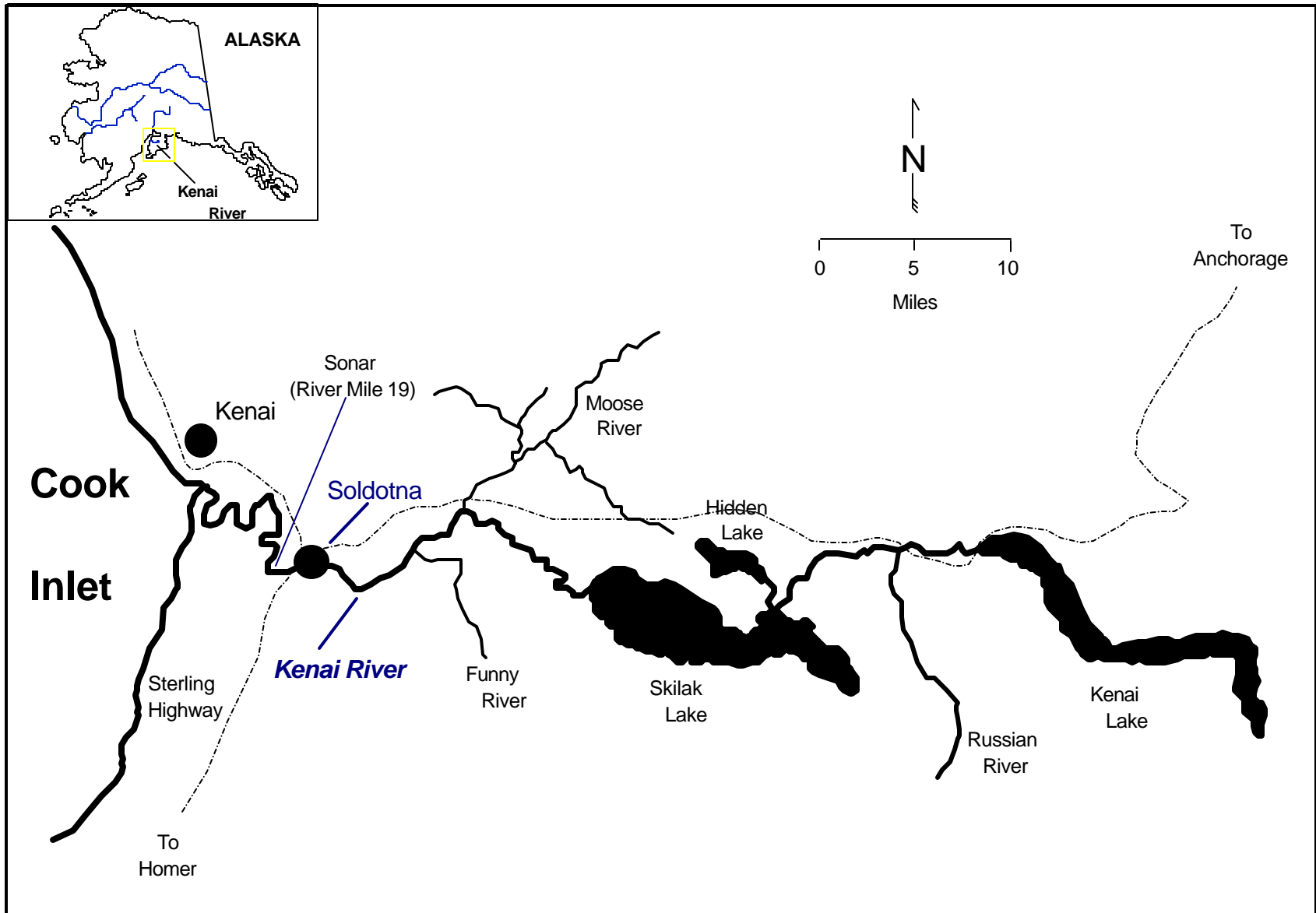


Figure 15.-Map of the Kenai River drainage. Late-run sockeye salmon fishery occurs from Cook Inlet to Kenai Lake.

Both the pre-1999 and 1999 management plans have a buffer between the lower end of the inriver goal (sonar) and the lower end of the spawning escapement goal (OEG/BEG). The pre-1999 management plan provided a buffer of 220,000 fish (550,000 less 330,000) at the lower end of the biological escapement goal (BEG). The newly adopted 1999 plan allowed for a buffer of only 100,000 fish during returns of less than 2 million, and increased to 250,000 fish then 350,000 sockeye salmon for total returns of 2-4 million and returns greater than 4 million sockeye salmon, respectively. The purpose of these buffers is to allow for recreational harvests of sockeye salmon in the Kenai River without jeopardizing achievement of the optimum spawning escapement goals.

INSEASON MANAGEMENT APPROACH

Historically, management of this fishery has changed in concert with changes in the Kenai River Late-run Sockeye Salmon Management Plan. Prior to the late 1980s, management of the sockeye salmon recreational fishery was accomplished through changes to bag and possession limits. Sport harvests were not large enough to significantly impact spawning escapements. Growth in this fishery during the late 1980s and early 1990s witnessed significantly greater inriver harvests. As a result of this expansion of the sport fishery, limits were placed on recreational harvests of sockeye salmon by the Board of Fisheries.

In 1993, changes were adopted into the management plan by the Board of Fisheries that restricted the total sport harvest to less than 10% of the sonar estimate when the inriver sonar estimate was within the range of 400,000 to 700,000 sockeye salmon. Based upon the pre-season forecast in 1993, the bag and possession limits were reduced to 2 sockeye salmon per day and sport fishing was prohibited each day during the hours of 11:00 p.m. to 6:00 a.m.

In 1994, Commissioner Rosier determined that the provision limiting sport harvests to less than 10% of the sonar estimate, within the range of 400,000 to 700,000 fish, was a guideline harvest level rather than a harvest cap. Based upon this decision, the 1994 season commenced with bag and possession limits of 3 sockeye salmon per day and 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, the bag and possession limits were increased to 6 sockeye salmon. The 1995 recreational fishery was prosecuted without management intervention. The bag and possession limits were not increased, as the sonar count did not exceed 700,000 fish.

In 1996, the Board again amended the management plan to incrementally increase the inriver escapement goals. The inriver goal during the 1996 season was established at 550,000-800,000 fish, increasing to 550,000-825,000 in 1997 and 550,000-850,000 sockeye salmon in 1998. The 1996 and 1997 recreational fisheries were prosecuted in a normal manner with no inseason management actions implemented.

Throughout this time period, management of the inriver recreational fishery relied on sonar estimates of inriver escapement and postseason assessment of the sport harvest from the Statewide Harvest Survey (SWHS). There was not a pressing need to assess the recreational harvest of sockeye salmon inseason, provided the inriver escapement goal could be met. This situation existed due to the escapement gap between the inriver escapement goal (sonar estimate) and the lower limit of the BEG range. This gap between the lower limit of the BEG and the inriver sonar goal was intended to provide for inriver recreational harvests. If the inriver escapement goal (sonar estimate) is achieved, the recreational fishery could be prosecuted without restriction. This management strategy for the Kenai River recreational sockeye salmon

fishery depended heavily upon the successful management of the commercial salmon fishery in UCI to achieve the inriver sonar goal.

In 1998, inseason assessment of the sport harvest in the Kenai River and the Russian River was necessitated by a poorer than expected return and later run-timing of sockeye salmon stocks into the Kenai River. Inseason assessment of sockeye salmon harvest consisted of estimating the contribution of Russian River and Hidden Lake stocks to the total inriver return and applying historical exploitation rates from the mainstem of the Kenai River and at the Russian River to estimate harvest. Emergency regulation of the sport, personal use and commercial fisheries during 1998 was based, in part, upon this analysis. Reliance upon postseason assessment of recreational harvests using the SWHS was recognized as an operational weakness by management staff from both fishery divisions. Consequently, during the winter and spring of 1998-1999, a model was developed by the Division of Sport Fish to provide inseason estimates of personal use and sport harvests of late-run sockeye salmon. This model is based upon historic exploitation rates derived from the SWHS. Management staff employed this model (mean exploitation rate) during 1999.

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 highway road system making it the most accessible of Alaska's major salmon producing rivers (Figure 15).

Historically, snagging was the traditional harvest method for taking sockeye (red) salmon in the Kenai River. It was generally believed 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 sport anglers was relatively small, snagging posed neither a biological nor a social problem. However, as the population of Southcentral Alaska expanded and the Kenai River sport fishery increased in popularity, anglers began to oppose the practice as an unethical harvest method. Antisnagging measures, first adopted 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 alternative terminal tackle in an attempt to legally harvest sockeye salmon in the Kenai River. Initial efforts were moderately successful with annual harvests averaging 23,584 sockeye salmon from 1977 through 1981 (Mills 1979-1982).

Between 1982 and 1985 the average harvest increased to 48,570. 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. The change in fishing technique, coupled with relatively clear water in 1982 and 1983, played a large role in the increased harvests. The greater harvests were further influenced by the magnitude of the returns, which exceeded 600,000 sockeye in both 1982 and 1983 (Table 32). A return of only 344,600 reduced the 1984 sport harvest (15,700). Harvests from 1985-1999 ranged from 57,210-277,230 (Table 33, Figure 16).

Table 32.-Kenai River drainage sockeye salmon escapements and inriver harvest, 1981-2000.

Year	In River Personal Use and Subsistence Dip Net, and Educational Harvest ^b		Sport Harvest Below Sonar ^{a,c}	Kenai River Sonar Count ^d	Total Inriver Return	Harvests above Sonar ^a						Spawning Escapement
	Kenai R Sonar to Soldotna Bridge	Kenai R Above Soldotna Bridge				Skilak Lake	Late Run Russian River	Hidden Lake Personal Use & Sport	Total Harvest above Sonar			
1981	0	3,116	407,600	410,716	2,154	14,460		23,720	0	40,334	367,266	
1982	0	6,924	619,800	626,724	4,786	38,400		10,320		53,506	566,294	
1983	7,562	13,577	630,300	651,439	9,383	48,300	0	16,000	0	73,683	556,617	
1984	0	2,614	344,600	347,214	1,806	11,280	0	21,970	17	35,073	309,527	
1985	0	8,834	502,800	511,634	6,106	42,270	0	58,410	149	106,935	395,865	
1986	0	12,524	501,200	513,724	8,656	51,220	13	30,810	0	90,699	410,501	
1987	24,086	50,274	1,596,900	1,671,260	34,746	155,800	2,029	40,580	689	233,844	1,363,056	
1988	16,880	29,347	1,021,500	1,067,727	20,283	103,120	382	19,540	583	143,908	877,592	
1989	51,188	66,163	1,600,000	1,717,351	45,727	165,340	1,654	55,210	331	268,262	1,331,738	
1990	3,477	19,638	659,500	682,615	13,572	87,580	670	56,180	107	158,109	501,391	
1991	13,433	31,535	648,000	692,968	21,795	108,230	2,411	31,450	65,209	229,095	418,905	
1992	30,394	47,625	994,800	1,072,819	32,915	161,960	1,044	26,101	468	222,488	772,312	
1993	35,000	27,715	813,600	876,315	19,155	90,310	825	26,772	133	137,195	676,405	
1994	15,755	15,085	1,003,400	1,034,240	15,275	63,250	213	26,375	102	105,215	898,185	
1995	15,850	34,158	630,400	680,408	15,652	75,620	177	11,805	83	103,337	527,063	
1996	105,063	39,810	797,800	942,673	27,514	118,967	307	19,136	225	166,149	631,651	
1997	117,029	43,642	1,064,800	1,225,471	30,163	103,328	312	12,910	274	146,987	917,813	
1998	106,468	33,980	767,600	908,048	23,484	107,072	158	25,110	81	155,905	611,695	
1999	100,206	46,043	803,400	949,649	31,822	122,659	0	32,335	859	187,675	615,725	
2000 ^e	100,350	57,548	625,200	783,098	39,774	133,290	307	30,208	191	203,770	421,430	
Mean	37,140	29,510	801,660	868,300	20,240	90,120	580	28,750	3,660	143,110	658,550	

^a Sport harvest and 1991 Hidden Lake personal use from Statewide Harvest Survey (Mills 1979-1994; Howe et al. 1995, 1996, 2001a-d).

^b Personal use harvest not known in 1982; 1983-1995 from Statewide Harvest Survey (Mills 1984-1994; Howe et al. 1995, 1996). 1996-2000 total reported harvest from returned permits, expanded to include permits not returned. Subsistence dip net harvest 1991, 1992, and 1994 from Brannian and Fox 1996. Educational is total annual Kenaitze educational permit harvest.

^c In 1994 and 1995 a creel survey was conducted to estimate harvest below the sonar. In 1994, 49.7% of the below Soldotna Bridge harvest was taken below the sonar. In 1995, 68.6 % was taken below the sonar. The average of these two percentages is applied to all other years' below-Bridge harvest to estimate the harvest below the sonar.

^d Estimated escapement at sonar site (Davis 2000b); 2000 data preliminary estimate from Division of Commercial Fisheries, Soldotna.

^e Sport harvest estimates for 2000 are preliminary.

Table 33.-Kenai River recreational harvest of sockeye salmon by river section as determined by Statewide Harvest Survey, 1981-1999.

Year	Cook Inlet to Soldotna Bridge		Soldotna Bridge to Moose River		Moose River to Skilak Lake		Skilak Lake to Kenai Lake		Total	Total Effort for all Species (Angler- days)
	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	19,730	178,720
1982	11,710	23.4	14,830	29.6	12,140	24.2	11,430	22.8	50,110	231,950
1983	22,960	32.2	22,450	31.5	15,180	21.3	10,670	15.0	71,260	229,230
1984	4,420	28.2	2,180	13.9	2,300	14.6	6,800	43.3	15,700	270,420
1985	14,940	26.1	13,020	22.8	13,300	23.2	15,950	27.9	57,210	322,230
1986	21,180	29.3	13,850	19.1	13,530	18.7	23,840	32.9	72,400	335,050
1987	85,020	35.3	65,840	27.3	39,930	16.6	50,030	20.8	240,820	289,170
1988	49,630	32.5	43,490	28.5	29,180	19.1	30,450	19.9	152,750	374,260
1989	111,890	40.4	90,550	32.7	45,850	16.5	28,940	10.4	277,230	376,900
1990	33,210	27.5	37,210	30.8	22,080	18.3	28,290	23.4	120,790	342,660
1991	53,330	33.0	56,050	34.7	24,740	15.3	27,440	17.0	161,560	323,370
1992	80,540	33.2	85,940	35.4	40,620	16.8	35,400	14.6	242,500	332,570
1993	46,870	34.2	41,470	30.2	18,720	13.6	30,120	22.0	137,180	324,120
1994	30,360	32.4	24,310	26.0	12,370	13.2	26,570	28.4	93,610	340,900
1995	49,810	39.7	38,600	30.8	17,610	14.0	19,410	15.5	125,430	377,710
1996	67,324	36.1	51,866	27.8	29,391	15.8	37,710	20.2	186,291	265,986
1997	73,805	41.7	56,784	32.1	23,626	13.3	22,918	12.9	177,133	247,898
1998	57,464	34.9	61,763	37.5	24,315	14.8	20,994	12.8	164,536	216,650
Mean	45,540	32.6	40,310	28.8	21,620	17.3	23,990	21.4	131,460	298,880
1999	77,865	38.8	61,344	30.6	27,569	13.7	33,746	16.8	200,524	307,446

Source: Mills 1982-1994, Howe et al. 1995 and 1996, 2001 a-d.

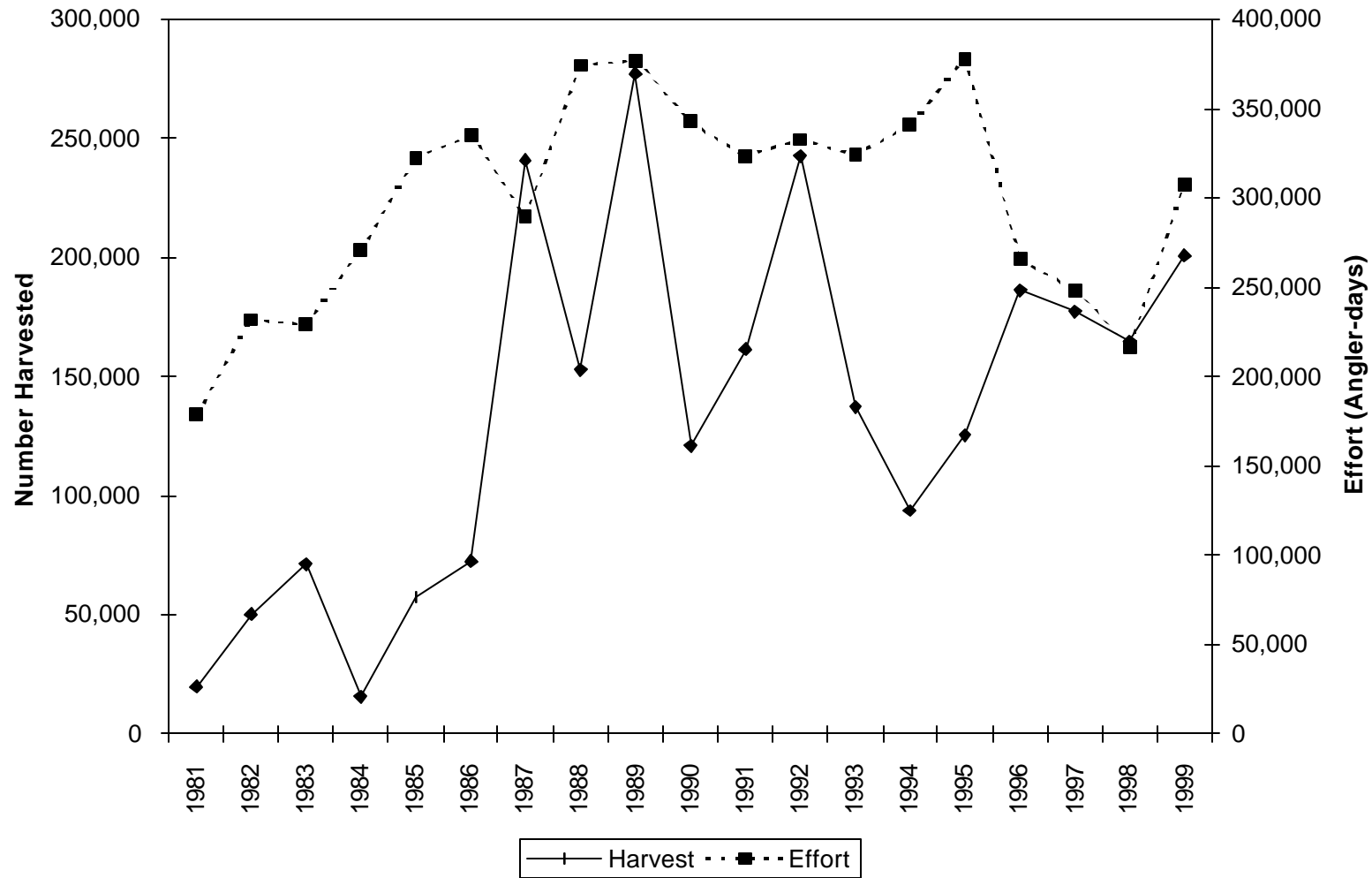


Figure 16.-Total harvest and effort, Kenai River late-run sockeye salmon fishery, as determined by Statewide Harvest Survey, 1981-1999.

The recreational fishery for sockeye salmon in the Kenai River is characterized by:

1. Large numbers of sockeye salmon must be present to provide acceptable harvest rates.
2. The fishery is of short duration, usually from July 16 to August 5, or approximately 20 days.
3. The fishery is affected by water clarity, i.e. turbid water generally decreases angler efficiency and clear water serves to increase catch rates.
4. Only a percentage of the total angler effort is directed toward sockeye salmon, irrespective of run strength or fishing conditions. This is a result of 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. Angler participation in the chinook salmon sport fishery, coho salmon sport fishery and during even years, the sport fishery for pink salmon, as well as angler effort directed at resident rainbow trout and Dolly Varden, account for the remainder of total angler participation.

BOARD OF FISHERIES ACTIONS

The board did not alter the Kenai River Sockeye Salmon Management Plan in 1990. In November of 1992, the Board considered a number of proposals ranging from additional restrictions to liberalization of the plan. The Board rejected all proposals and the management plan 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, conservative action outlined in the plan was implemented in 1993 to comply with Board intent. As noted, the 1994 fishery was prosecuted without inseason management action.

The inherent, allocative divide between the various users of the Kenai River sockeye salmon resource 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 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 estimate 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 effective during the 1998 season. 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. The Board’s actions stabilized the fishery and increased the allocation to the recreational user group.

In 1999, the Board again amended the Kenai River Sockeye Salmon Management Plan. It established new escapement goals intended to distribute yearly escapements within an optimum escapement goal range (OEG) from 500,000 to 1,000,000 fish. It established new management directives and inriver escapement goals that were closely associated with projected sockeye salmon abundance during any given year. Specifically, returns of less than 2 million fish are mandated to achieve an inriver sonar escapement goal range from 600,000-850,000; projected returns from 2 to 4 million fish are to be managed for an inriver goal of 750,000 to 950,000; and projected returns greater than 4 million are managed for an inriver sonar goal of 950,000 to 1,100,000 late-run sockeye salmon.

The plan, as amended during 1999, stipulates that the department will perform preseason and inseason projections of abundance, and changes the regularly-scheduled fishing periods from Monday and Friday to Monday and Thursday. Regularly-scheduled periods were modified to allow a Friday window for escapements of sockeye salmon and chinook salmon into the Kenai River prior to the weekend. At run strengths of less than 2 million sockeye, no additional windows for escapement were provided. The assumption was that the reduced abundance of returning sockeye salmon would create sufficient time (natural) windows necessary to provide adequate escapements into the Kenai River to support the sport fishery. At run strengths of 2 to 4 million fish, a 24-hour window was provided by mandating a closure of the Upper Subdistrict set gillnet fishery north of the Blanchard Line beginning at 12:00 noon on Fridays after July 20. At run strengths greater than 4 million sockeye salmon, no windows for additional escapement were provided. The assumption being, during projected, high levels of abundance greater than 4 million sockeye salmon, the inriver sport fishery would experience sufficient numbers of fish without mandatory windows for additional escapement. Other changes to the plan included a closure to personal use fishing of the north bank of the Kenai River between the Kenai City Dock and a regulatory marker located near the southern end of Main Street. This regulation was adopted to protect the steep bluff area adjacent to the city of Kenai and the retirement center from erosion resulting from unrestricted public access.

Significant changes to the Upper Cook Inlet Salmon Management Plan (AAC 21.363) were also adopted. In 1999, all instructions relating to allocation of Upper Cook Inlet salmon stocks were removed from the plan and placed into the individual, respective management plans covering specific stocks or species. Provisions that the board must consider when adopting management plans for the Upper Cook Inlet area were incorporated into this plan. Provisions are: the need for sustainable fisheries, habitat protection, and the needs and demands of various user groups.

RECENT FISHERY PERFORMANCE

During 1998, late run timing of Kenai River sockeye salmon stocks was observed (Davis 2000a). Commercial Fisheries managers expressed concerns about achieving the minimum inriver sonar goal (550,000) on July 23. At this time, the inriver sonar estimate was approximately 200,000 sockeye salmon. Division of Sport Fish staff provided an inseason analysis that indicated that slightly less than 550,000 sockeye salmon inriver were necessary in order to achieve the minimum BEG of 330,000 fish. The inriver sport harvest was estimated using the historical

exploitation rates in the mainstem Kenai River and Russian River sport fisheries. Genetic samples were taken at the sonar site (River Mile 19, see Figure 15) to determine stock composition of the mainstem return and estimate the Russian River and Hidden Lake contribution to the total return. Based upon these analyses, the personal use and sport fisheries in the Kenai River were restricted on July 23. These restrictions included reducing the allowable fishing time (sport and PU) with a fishing closure in effect from 11:00 p.m. to 6:00 a.m. A further reduction in the bag and possession limits from 6 to 3 fish per day was also implemented.

After July 23, Commercial Fisheries and Sport Fish Division staff monitored escapements into the Kenai River closely. If escapement estimates did not increase sufficiently, management staff had the option of further restricting the sport and commercial fisheries. On Tuesday, July 28, sonar counts began to increase. However, in order to ensure adequate escapement, the commercial fishery was again restricted during its regularly-scheduled period on Friday, July 31. Dramatically increased sonar estimates continued through the evening of July 31 and commercial managers implemented emergency fishing periods on Saturday and Sunday (August 1-2). Given a projected sonar escapement that indicated the inriver escapement goal would be met, restrictions to the sport fishery were rescinded effective Monday, August 3. The personal use fishery closed by regulation on July 31, and therefore was not reopened.

In 1998, the inriver escapement (sonar estimate) of late-run Kenai River sockeye salmon was estimated to be 767,600 fish (Ruesch and Fox 1999). This exceeded the lower end of both the inriver escapement goal (550,000-850,000) and the BEG (330,000-600,000) for late-run stocks. Based upon this final sonar estimate, inriver restrictions were not necessary in 1998. The sonar at River Mile 19 discontinued operation on August 13. The commercial harvest of sockeye salmon in the Upper Cook Inlet commercial fishery totaled just over 1.2 million, the poorest in nearly 20 years. Harvest was approximately half of the preseason forecast of 2.5 million and was valued at approximately \$8.8 million.

The 1998 recreational harvest of 164,536 sockeye salmon was slightly below the most recent 10-year average (1988-1997, 167,447). Angler effort (216,650) was significantly below the recent 10-year average of 330,637 angler-days (Table 33). Relative to 1997, overall harvests of sockeye salmon significantly decreased below the Soldotna Bridge and increased slightly in that section of the Kenai River upstream from the Soldotna Bridge to the Moose River (Table 33, Figure 17).

In 1999 late-run Kenai River sockeye salmon stocks were managed to achieve an inriver-spawning escapement of 500,000-1,000,000 fish. The preseason forecast called for a total return to the Kenai River of approximately 1,650,000 sockeye salmon. As result, the commercial fishery was initially managed for an inriver escapement goal (sonar estimate) of 600,000 to 850,000 fish. This corresponds to an abundance range of less than 2 million sockeye salmon as outlined in the management plan.

Through the third week in July, there were strong indications that the final return of sockeye salmon to the Kenai River would slightly exceed the 2 million fish threshold that called for an increase of the inriver (sonar) escapement goal. However, because of technical limitations inherent with the available assessment programs, commercial managers were reluctant to officially revise the inriver escapement goal upwards to the 750,000-950,000 range associated with a projected abundance of 2 to 4 million Kenai River sockeye salmon (Fox and Shields 2000). Instead, commercial managers elected to manage for an inriver escapement goal that

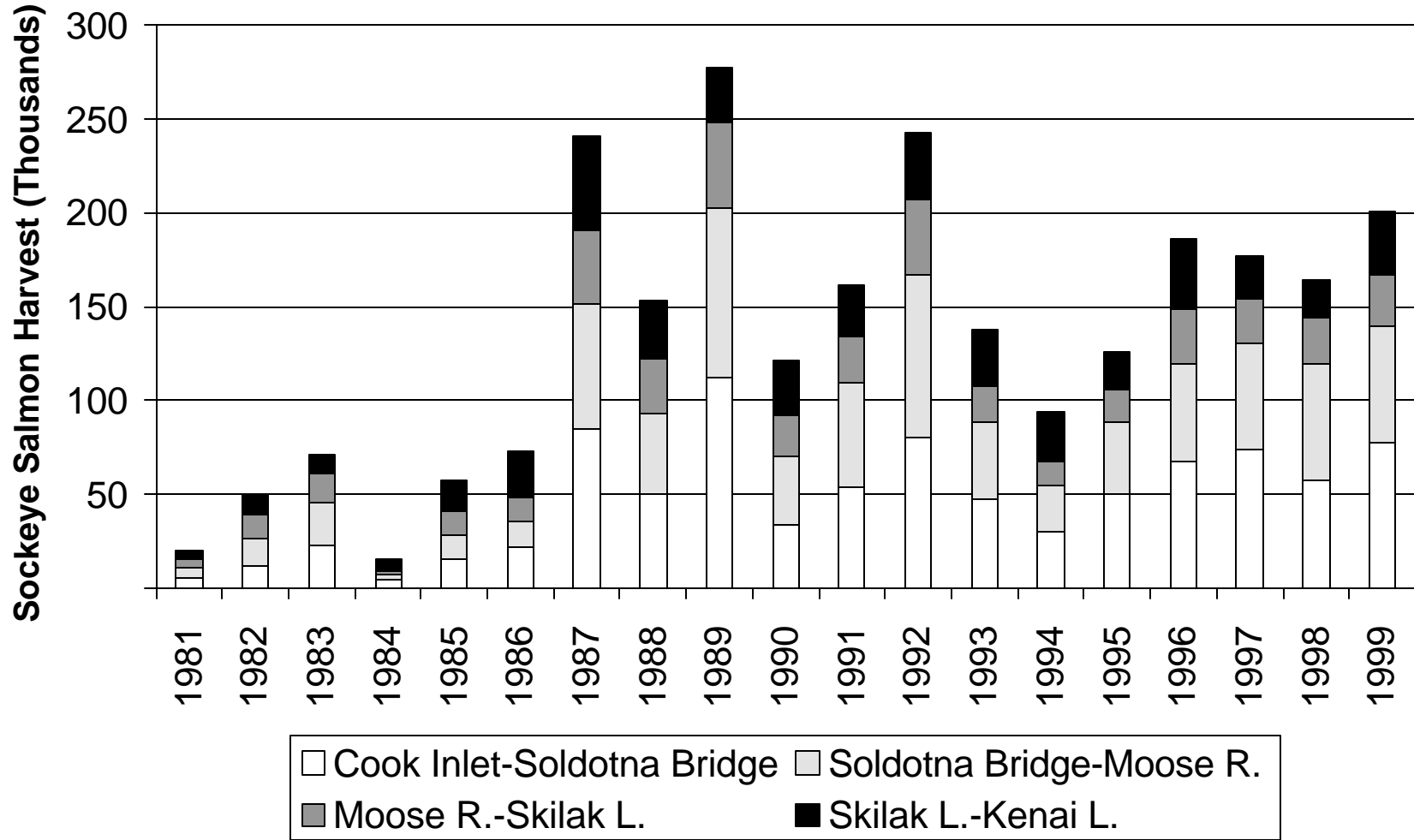


Figure 17.-Harvest of Kenai River late-run sockeye salmon by river section, estimated by the Statewide Harvest Survey, 1981-1999.

would satisfy each of the abundance ranges; i.e. manage for the overlap in escapement goals associated with each of the two abundance ranges (750,000-850,000 late-run sockeye salmon). This management strategy required that commercial managers implement the 24-hour closures on Fridays after July 20. The final inriver escapement was estimated to be 803,400, or approximately mid way between the targeted range. The commercial harvest of sockeye salmon in the Upper Cook Inlet commercial fishery during 1999 totaled just over 2.7 million fish and was valued at approximately \$20.1 million.

During 1999 the inriver recreational fishery was prosecuted without inseason management action. Daily bag and possession limits of 6 fish remained in effect throughout the season. The total harvest of late-run sockeye amounted to approximately 200,500 fish (Table 33, Figure 16), well above the 1987-1998 average of 168,600 fish. Angler effort (307,446) was less than the 1988-1998 average of 314,876 angler-days (Table 33, Figure 16). Anglers characterized the 1999 fishery as good to excellent. Much of this success can be attributed to a relatively flat entry pattern of late-run stocks into the Kenai River. This entry pattern likely provided a higher threshold of available fish than would have otherwise been available.

OUTLOOK

Management during 2000 will continue to be directed under provisions of the Late-run Kenai River Sockeye Salmon Management Plan. The management objective during 2000 will be to achieve an OEG from 500,000-1,000,000 fish. The preseason forecast projects a total return to the Kenai River of approximately 2.5 million sockeye salmon. The current management plan requires that the late-run sockeye salmon will therefore be initially managed for an inriver goal of 750,00 to 950,000 fish (for run strengths of 2 to 4 million).

The Cook Inlet commercial fishery will continue to be managed to ensure that the inriver return of late-run Kenai River sockeye salmon stocks is within a desired escapement range commensurate with the projected return. The management plan does not contain provisions for liberalization of the recreational fishery. Restrictions will be imposed only if the minimum OEG (500,000) cannot be projected.

CURRENT ISSUES

An issue that sparked internal and public controversy during the 1999 season was the requirement that the Department establish, inseason, the projected total return of late-run sockeye salmon to the Kenai River. This provision is contained in the Kenai River Late-run Sockeye Salmon Management Plan and is the responsibility of Commercial Fisheries Division. There is no language in the management plan that stipulates the frequency, date(s) or time schedule for revising inseason projections. During 1999, the total return of Kenai River stocks was projected at approximately 2 million fish. This transition point is the lower threshold for runs from 2 to 4 million sockeye salmon. The management plan requires different escapement objectives and specifies different management directives depending upon the levels of abundance. At issue are the inherent limitations of the assessment techniques used to make the projections and the associated levels of accuracy and precision they afford. Even though point estimates indicated a total return just slightly in excess of 2 million late-run sockeye salmon to the Kenai River, there was a reluctance to officially revise the projected total return mid-season. The difficulties of providing inseason projection estimates should be addressed either within the department or by the Board of Fisheries in order to avoid future controversy and possible public confusion regarding the implementation of the management plan.

The contentious issue of stream bank degradation caused by large numbers of anglers concentrated in confined shoreline areas during this brief but intense fishery was a focus during the 1999 season as well. Bank and riparian habitat degradation is an issue of biological concern. This issue has allocative overtones as well and has been addressed by the Board of Fisheries on several occasions. However, the potential habitat loss resulting from an intense shorebased fishery will very likely continue to be an issue into the foreseeable future.

RECOMMENDED RESEARCH & MANAGEMENT

Because of the technical issues associated with projecting total sockeye salmon abundance to Upper Cook Inlet and the total return to the Kenai River (inseason) we recommend that research be directed at:

1. Identifying and developing potential refinements to the existing Offshore Test Fish program, and the procedures used to make such projections based upon the historical data set within that program.
2. Identifying and developing possible alternative methods of projecting the total Kenai River sockeye salmon return inseason.

Implicit in the management plan is the directive that the Division of Sport Fish provide inseason assessment of the sport harvest to estimate the final spawning escapement. We recommend that further research be directed at:

3. Identifying and developing alternative methods of estimating inseason harvest of sockeye salmon, and/or
4. Identifying and developing potential refinements to the existing mean exploitation model currently employed.

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. Wild stocks originating in Crooked Creek and Tustumena Lake tributaries currently support the recreational fishery.

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

This fishery occurs in the mainstem Kasilof River, Crooked Creek and near several tributary streams of Tustumena Lake (Figure 18). Wild and stocked early-run coho salmon supported the fishery from 1986 through 1995. Wild stocks have supported the fishery exclusively beginning in 1996. A formal program to evaluate the contribution of wild and hatchery fish to the fishery was never implemented during the years of enhanced returns.

The spawning escapement goal of 1,250 fish upstream from the hatchery was established in 1991, and was consistently achieved during years of stocked returns. This escapement level was

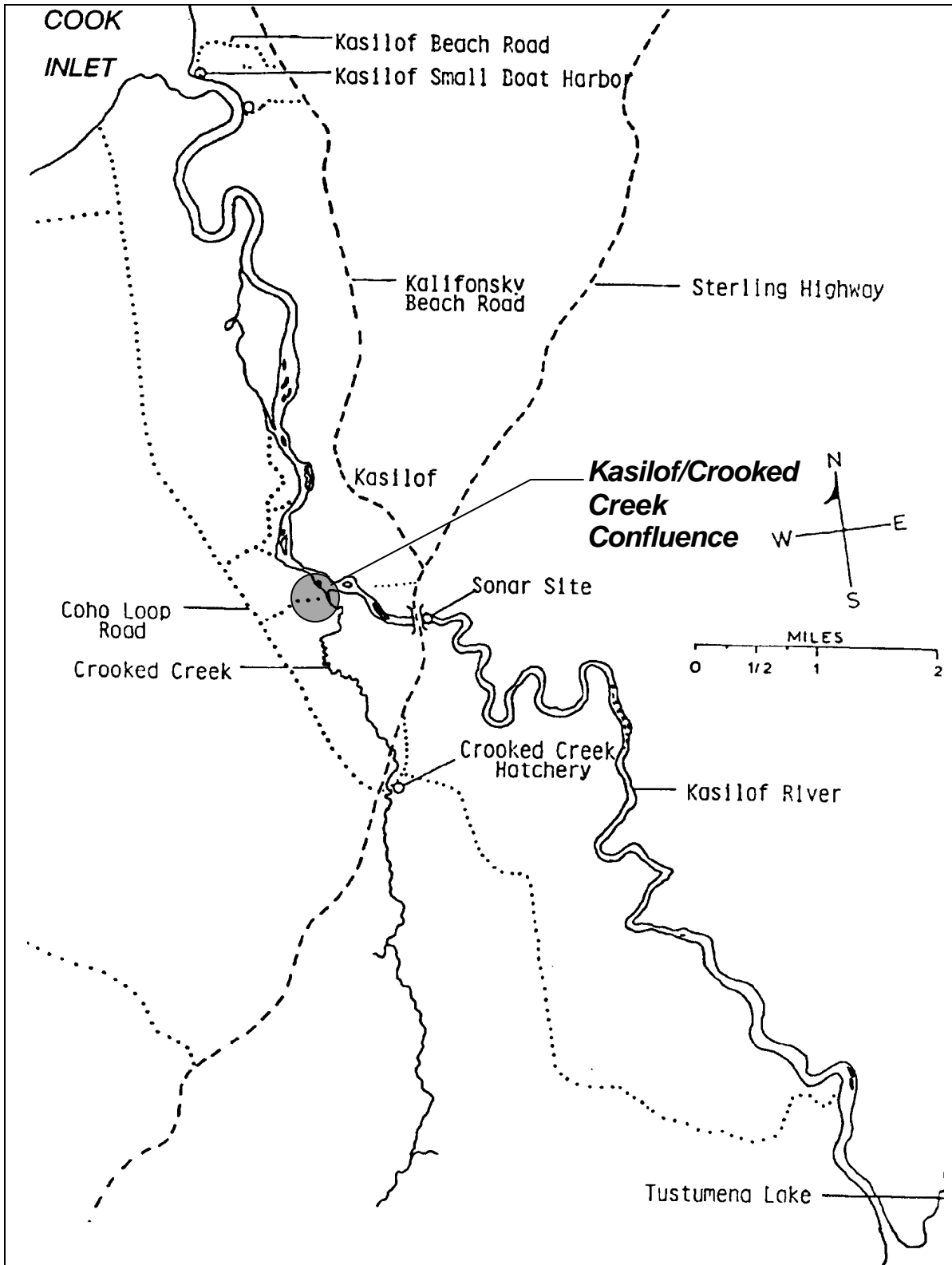


Figure 18.-Map of the Kasilof River early-run coho salmon fishery.

not achieved in 1996, the first year the fishery was supported exclusively by wild stocks. However, the weir has not been in place throughout a season to estimate the total return after 1996 (Table 34). No spawning escapement goal has been established for fish that spawn downstream of the hatchery nor for coho salmon that spawn in Tustumena Lake tributaries.

Prior to 1997, there was 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 eastside 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 and bait was not permitted. These restrictions applied to Kasilof River as well and were in effect from August 9 through the remainder of the 1997 season.

During 1998 and 1999, the sport fishery was prosecuted without restriction. No inseason management actions were taken.

HISTORICAL PERSPECTIVE

The Kasilof River and its major tributary, Crooked Creek (Figure 18), 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 34). No harvest estimate is available for Crooked Creek prior to stocking. Stocking increased the harvest in the Kasilof River to a high of 5,349 in 1995. Harvest in Crooked Creek during the years of stocked returns ranged from 98 fish to 1,952 fish.

On July 1, 1993 the state-operated Crooked Creek Hatchery was transferred to Cook Inlet Aquaculture Association. At that time, the decision was made to discontinue the coho salmon stocking program at Crooked Creek. This decision was predicated on cost as well as prioritization of available rearing space in state hatcheries. The final return of stocked coho salmon to Crooked Creek was in 1995.

On July 1, 1997 the hatchery reverted to state ownership. The facility was mothballed and equipment surplused with facility oversight again taken over by the Alaska Department of Fish and Game in 1999. The facility is no longer used as an incubation or rearing facility.

Table 34.-Kasilof River and Crooked Creek coho salmon sport harvest and escapement, 1981-1999.

Year	Harvest ^a				Brood Stock	Crooked Creek ^b Escapement	Surplus ^c	Approximate ^d Enhanced Return
	Tustumena Lake	Kasilof River	Crooked Creek	Total				
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	144	2,612	471	3,227	0	259	0	0
1997 ^g	345	1,286	0	1,631	0	^h	0	0
1998 ^g	81	2,107	0	2,188	0	^h	0	0
1999 ^g	48	3,269	0	3,317	0	24 ⁱ	22	0
Mean	138	2,519	477	3,794	216	1,098	977	5,097

^a All harvest estimates from Statewide Harvest Survey (Mills 1982-1994, Howe et al. 1995, 1996, 2001 a-d).

^b Upstream from hatchery.

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

^d Assumes 50% of Kasilof River harvest is 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.

ⁱ Weir removed 8/27; remainder of coho run passed through uncounted.

Stocking increased the numbers of fish available to recreational anglers and provided for an increased harvest. The greater numbers of available fish attracted more fishermen to the Kasilof River and Crooked Creek. To date, discontinuing stocking has not reduced angler interest or participation in this fishery.

BOARD OF FISHERIES ACTIONS

The Board addressed this fishery in February 1996. Actions were taken to minimize harvests of early-run coho salmon in Crooked Creek and in the Kasilof River. 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 all fishing from January 1 through July 31.

Prohibiting bait after September 1 reduces harvest potential in these coho salmon fisheries. Bait is generally the preferred terminal gear in many coho fisheries and eliminating that use was intended to reduce harvest by approximately 50% after September 1.

RECENT FISHERY PERFORMANCE

Harvest is determined by the Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995, 1996, 2001 and). Total harvest from the Kasilof River drainage, including Crooked Creek, was 1,631 in 1997, 2,188 in 1998 and 3,317 coho salmon in 1999 (Table 34, Figure 19). Harvests during 1998 and 1999 are down approximately 50% relative to 1994-1995 when stocked fish still comprised some portion of the total return. Decreased harvest during 1997 is likely due to sport fishing restrictions during that year. In Crooked Creek, sport harvests dropped to zero in 1997 and have remained at that level to present.

OUTLOOK

There are no plans to reinstate the coho salmon stocking program. Future harvests will be supported exclusively by wild coho salmon 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 throughout the duration of the run and there is no formal assessment of the stream's spawning escapement. There is no assessment of spawning escapement in Tustumena Lake tributaries, nor have spawning escapement goals been established for the drainage, either in whole or in part.

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

RECOMMENDED RESEARCH & MANAGEMENT

We recommend that a stock assessment program for the 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 commercial and recreational fisheries.

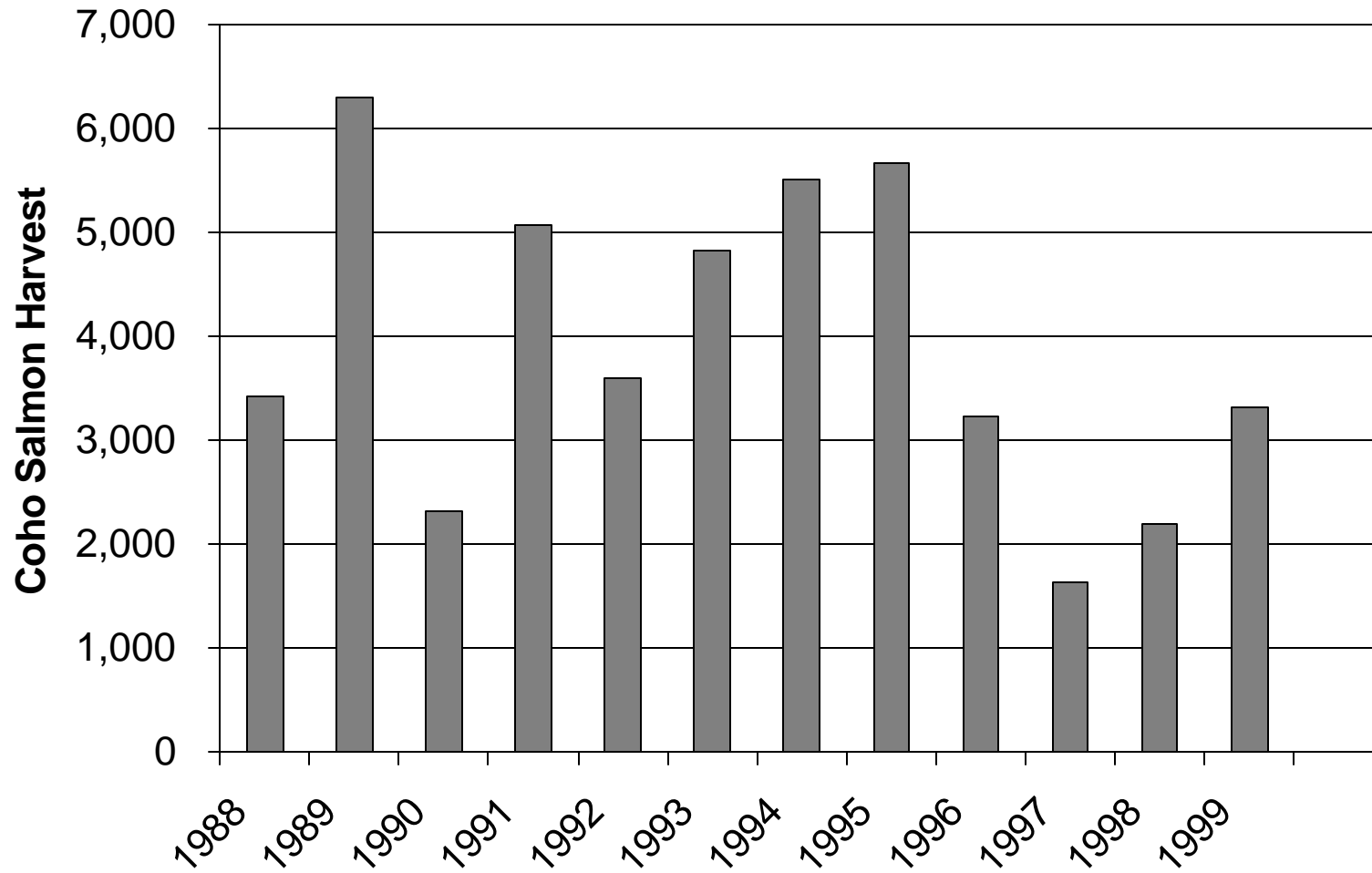


Figure 19.-Kasilof River drainage total early-run coho salmon harvest, as determined by Statewide Harvest Survey, 1988-1999.

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 (Mills 1979-1994, et al. 1995, 1996, 2001 a-d). With allowances for annual variation, notably in 1988-1989, this survey indicates a stable fishery. Assuming a stable fishery equates to a stable population with sufficient numbers of coho salmon in the spawning escapement to ensure sustained yield.

Because of limited access, this fishery is 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. This tributary flows through a culvert beneath Swan Lake Road. This small stream has been closed to salmon fishing since 1989.

With the exception of 1997, this sport fishery has been managed exclusively by regulations enacted by the Alaska Board of Fisheries.

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 eastside 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 and bait was not permitted. These restrictions applied to Swanson River as well and were in effect from August 9 through the remainder of the 1997 season.

During 1998 and 1999, the sport fishery was prosecuted without restriction. No inseason management actions were taken.

HISTORICAL PERSPECTIVE

The Swanson River is tributary to Cook Inlet, entering salt water approximately 30 miles north of the Kenai River entrance. 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 and is administered by the Kenai National Wildlife Refuge. The river downstream from the oil field for a distance of about 10 miles is a meandering stream 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 swampy areas that border the slow flowing main channel. Very little gravel suitable for spawning is available 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 chooses to travel the length of the Swanson River downstream to the Kenai Spur Road. Access to the canoe route is at Mile 12 of the Swan Lake Road. This road is reached via Swanson River Road intersecting the Sterling Highway at Mile 83.4.

The Sport Fish Division in the 1960s conducted initial surveys of this stream. In 1967-1968 a weir was installed in the river near the oil field to capture coho salmon for enhancement purposes. Three tributary streams (Airport Creek, Canoe Creek, and Sucker Creek) were established as index 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 widely 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*. Abundance of these species, particularly salmon, was not known prior to 1988. In 1988 the U.S. 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. Migration peaked in mid to late August and continued through September. Sockeye salmon initially entered the stream in late June and peaked in late July. Migration was essentially complete by mid-August. Small numbers of chinook salmon were enumerated in late June. Pink salmon migration occurring during the month of August, essentially mirroring the run timing of pink salmon in the Kenai River.

The weir was again operated in 1989. It was installed on July 28 and was rendered inoperable by high water on August 27. During 1989, 20,841 coho salmon were counted. Data from that year's weir operation does not indicate the presence of other salmon species.

Based on this information, chinook salmon are early-run fish and sockeye salmon are late-run fish. 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 less numerous returns.

During some years, Swanson River coho salmon stocks support a relatively large sport harvest. Harvest data are available from the Statewide Harvest Survey since 1983. In 1983 and 1984 the survey indicated harvest occurred only in the mainstem of the Swanson River. From 1985 through 1987, this survey indicates that harvest occurred only in canoe route lakes and streams. 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 the Kenai Spur Highway at Mile 38.6 transects it. This is approximately 0.5 mile upstream from Cook Inlet. Total harvest in 1988 from the Swanson River drainage was 6,149 and in 1989, 6,506 coho salmon. Thereafter harvests declined ranging from a low of 892 to a high of 3,487 (Table 35, Figure 20).

BOARD OF FISHERIES ACTIONS

During February of 2000, the Alaska Board of Fisheries reduced the bag and possession limit for all upper Cook Inlet wild coho salmon fisheries from 3 to 2 daily and in possession. Prior to this action, no regulatory changes have occurred during recent years. The fishery will next be reviewed during the February 2002 meeting for Cook Inlet finfish.

RECENT FISHERY PERFORMANCE

Neither harvests nor escapements of coho salmon into the Swanson River are monitored inseason. Harvest estimates are derived from the Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995, 1996, 2001 a-d). Anecdotal information suggests that from 1990 through 1992 total returns were less abundant than in either 1988 or 1989. As in prior years, it is assumed that the majority of the harvest occurred in the lower section of the river and in close proximity to the Kenai Spur Highway. Limited road access precludes a significant harvest in the upstream areas. Exceptions to this are anglers accessing the drainage via canoe in the mainstem of the Swanson River and/or on the canoe trail system. Harvest ranged from 892 to 3,487 coho salmon from 1990-1993.

Total harvests have remained relatively stable since the peak years of 1988-1989 (Table 35, Figure 20). Total harvest during 1997 (1,153) was likely depressed due to the restrictive 1 fish bag limit and the prohibition against using bait. In 1998, total harvest from the Swanson River drainage increased to approximately 2,500 coho salmon. This figure is more in line with recent historical harvests since 1992. In 1999, harvest declined slightly to approximately 2,000 coho salmon.

OUTLOOK

Harvest in this fishery is very likely proportionate to abundance as demonstrated by the 1988-1989 record harvest. These harvests roughly correspond to weir counts of approximately 20,000 coho salmon. Given that abundance remains below the record returns of the late 1980s and harvest approximates the most recent 10-year average (1,938 from 1990-1999) future annual harvests are expected to be within the range of 2,000-3,000 fish annually.

CURRENT ISSUES

In February of 2000, the Alaska Board of Fisheries reduced the allowable bag and possession limit for all upper Cook Inlet wild coho salmon fisheries from 3 to 2 fish daily. This action was taken by the BOF in response to coho salmon conservation concerns expressed by members of the public and Governor Knowles, who directed that the board convene an out-of-cycle meeting

to address the perceived coho conservation issue. Available information suggests a relatively stable recreational fishery in the Swanson River. Several members of the public have suggested that this reduction in bag limit for the Swanson River may have been overly conservative. However, in the absence of inseason assessment programs for either harvest or escapement, current regulations may be viewed as a reflection of conservative management strategies.

RECOMMENDED RESEARCH & MANAGEMENT

It has been a decade since a weir was installed on the Swanson River for the enumeration of salmon species. We recommend that a weir be placed on this system to reassess annual escapement levels to assist development of fishery and management objectives for this fishery.

Table 35.-Coho salmon harvest in Swanson River and Swanson River and Swan Lake Canoe Routes, as estimated by the Statewide Harvest Survey, 1983-1999.

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	2,578	123	2,701
1997	1,153	0	1,153
1998	2,371	123	2,494
Mean	2,375	268	2,164
1999	2,054	0	2,054

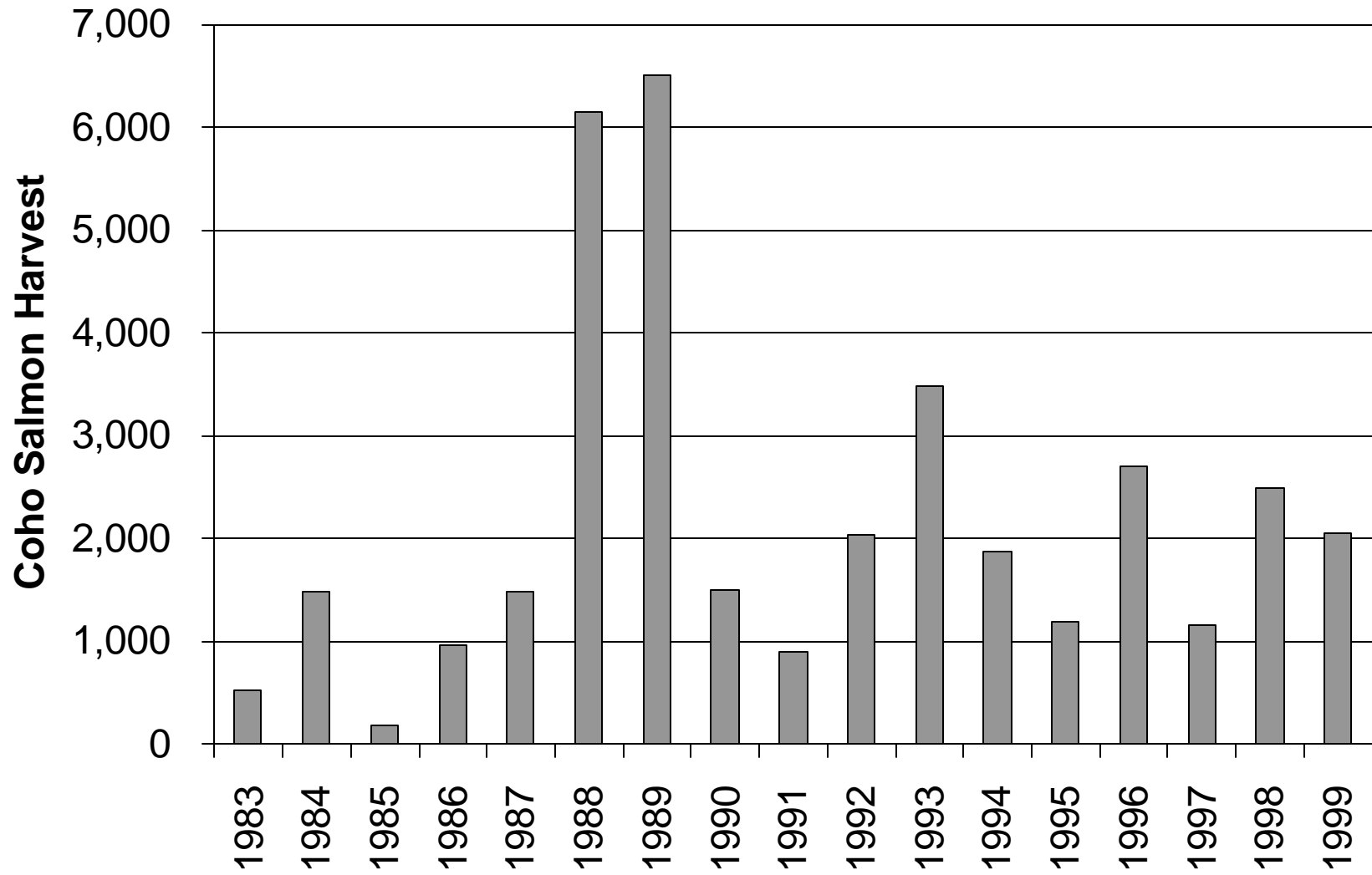


Figure 20.-Swanson River drainage coho salmon harvest, 1983-1999.

KENAI RIVER COHO SALMON RECREATIONAL FISHERY

FISHERY OBJECTIVE

Prior to the February-March meeting of the Alaska Board of Fisheries in 1999, early-run Kenai River coho salmon were addressed in the Upper Cook Inlet Salmon Management Plan (5 AAC 21.363). This Board-adopted management plan directed the department to minimize the harvest of this species in the Cook Inlet commercial salmon fishery. In 1999, the Board amended this plan. All instructions pertaining to the allocation of Upper Cook Inlet salmon stocks were removed from this plan and placed into the respective, individual management plans covering specific stocks or species. Provisions that the board must consider when adopting management plans for the Upper Cook Inlet area were incorporated into this plan. Provisions are the need for sustainable fisheries, habitat protection, and the needs and demands of various user groups.

In March 1997 the Board adopted the Kenai River Coho Salmon Management Plan (5 AAC 21.357). This plan contained regulations that reduced the total (combined sport and commercial) harvest by approximately 20%. In the spring of 2000, the Board amended this plan again and adopted it as the Kenai River Coho Salmon Conservation Management Plan. It contains management directives and outlines the burden of conservation between various user groups in the NKPMA. It directs the department to minimize the incidental take of Kenai River coho salmon stocks in the commercial fishery. It also directs the department to manage Kenai River coho salmon stocks primarily for sport and guided sport uses in order to provide fishermen with reasonable opportunity to harvest these stocks over the entire run, as measured by the frequency of restrictions.

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 is currently no cost effective method available to estimate the inriver coho salmon return. Due to the lack of quantitative data to assess stock status, an escapement goal has not been established. With the exception of 1997, there has been no inseason management of this fishery.

Inseason fishery performance is gauged by information provided by anglers and through direct observation by research and management staff.

The Statewide Harvest Survey is currently used to assess fishery performance postseason (Mills 1979-1994, Howe et al. 1995, 1996, 2001 a-d). Results from this survey are typically available during the year following the season. A comprehensive CWT project estimates annual smolt outmigration from the Moose River drainage annually. These estimates are used under the assumption that there is a correlation between the magnitude of smolt outmigration and the magnitude of total return. Although the department lacks an estimate for marine survival of Kenai River coho salmon stocks, this information is used as an indicator of potential return of coho salmon stocks.

HISTORICAL PERSPECTIVE

Run timing of coho salmon bound for the Kenai River and other Kenai Peninsula systems is slightly later than many Northern District systems. There is anecdotal evidence to suggest that there are two runs of coho salmon that migrate up the Kenai River, but the department cannot separately assess and manage for two runs that are not distinct. Creel surveys conducted during 1991-1993 and 1998 indicate that two distinct runs are not readily discernable from harvest rate data (Clark et al. 2000). Recoveries during the adult return of coho salmon marked as smolt in the Kenai River indicate that time of entry and time of spawning are independent of time of marking as smolt (Clark et al. 2000). As a result, coho salmon in the Kenai River are managed with harvest information and smolt abundance that represent a single stock.

Coho salmon typically begin entering the Kenai River in late July and continue through early September, and at reduced levels until December. It is assumed that the Kenai River has the only significant late coho salmon run in Cook Inlet. Recreational effort is targeted at coho salmon immediately after the termination of the chinook salmon season at the end of July or during the first week in August. The inriver sport fishery occurs downstream from Kenai Lake to the river's terminus at Cook Inlet (Figure 21). Unlike the highly mobile chinook salmon fishery, the coho salmon fishery takes place from anchored boats and from shore. Current regulations permit the use of bait. Beginning in the year 2000, bag and possession limits were reduced to 2 fish per day and in possession. Additionally, a 3-day closure was adopted to provide a temporal break between the intensely targeted chinook salmon fishery at the end of July and the traditional start of directed coho salmon fishing during the first week in August.

Kenai River coho salmon stocks are subject to commercial exploitation in Upper Cook Inlet (Table 36, Figure 22). Data from a comprehensive CWT program indicates that Kenai River coho salmon stocks are principally harvested in the Central District Eastside Setnet (ESSN) fishery. Although Kenai River coho salmon stocks are harvested along the entire coastline of the Kenai Peninsula, most of this harvest is taken from the setnet fisheries on Coho and Niniilchik beaches (south of the Kasilof River). Although significant numbers of Kenai River coho salmon are harvested in the commercial fisheries, the bulk of the overall harvest of these stocks occurs in the recreational fisheries of the Kenai River (Table 36, Figure 22).

Kenai River coho salmon are also harvested in personal use and subsistence fisheries. In 1981, 1983 through 1992, and 1993 there was a fall personal use or subsistence set gillnet fishery for coho salmon on the eastside beaches that are open to commercial setnetting (Table 37). This fishery was open in September, so harvested late-running coho salmon. In 1985 and 1991-1994 there was also a subsistence set gillnet fishery on all Central and Northern District beaches that are open to commercial setnetting. This fishery was generally open on scheduled days from May through September, with the open periods concentrated in July (Brannian and Fox 1996).

Kenai River coho salmon are also harvested in the Kenai inriver personal use dip net fishery (Table 37). This fishery has existed in various forms in most years since 1981 and targets sockeye salmon running into the Kenai River in late July and early August. It is described in more detail in the Kenai River Sockeye Salmon Dip Net Fishery section of this report. In March 1997 the Board changed the closing date of this fishery from August 5 to July 31 to reduce the harvest of coho salmon.

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

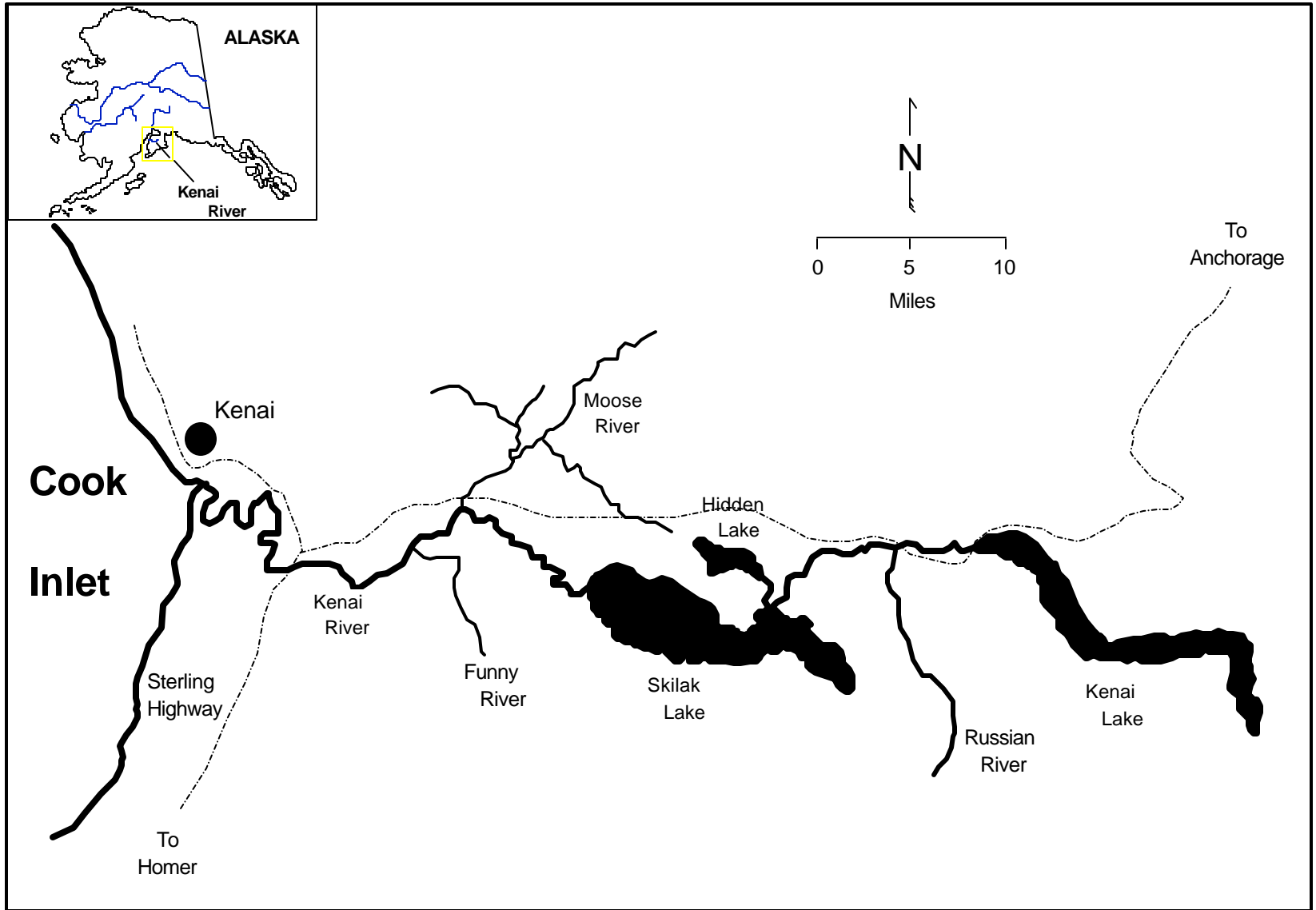


Figure 21.-Map of the Kenai River drainage.

Table 36.-Cook Inlet commercial coho salmon harvest, and harvest of Kenai River coho salmon, 1993-1999.

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	Kenai River Sport Harvest	Russian River Coho	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	2,240	1,597 ^b	427	62,538	12.4
1994	303,935	69,281	11,732	14,673	86,711	4,607	2,535 ^c	829	121,087	21.8
1995	234,126	44,750	6,956	13,152	46,183	4,077	1,556 ^b	868	72,792	27.6
1996	171,361	40,548	2,671	11,856	42,293	4,599	1,932 ^b	592	63,943	22.7
1997	79,094	19,668	1,236	2,093	16,164	4,586	559 ^b	191	24,829	13.4
1998	83,337	18,662	1,958	8,072	26,967	4,612	1,011 ^b	638	43,258	23.2
1999	64,529	11,679	818	2,905	31,637	3,910	1,009 ^b	530	40,809	9.1
Mean	151,167	35,380	3,757	8,508	42,928	4,090	1,457	582	61,322	19

From: Carlon and Hasbrouck 1996-1998; Carlon 2000; Mills 1994; Howe et al. 1995, 1996, 2001 a-d; Brannian and Fox 1996.

^a Eastside setnet commercial fishery.

^b Personal Use.

^c Subsistence.

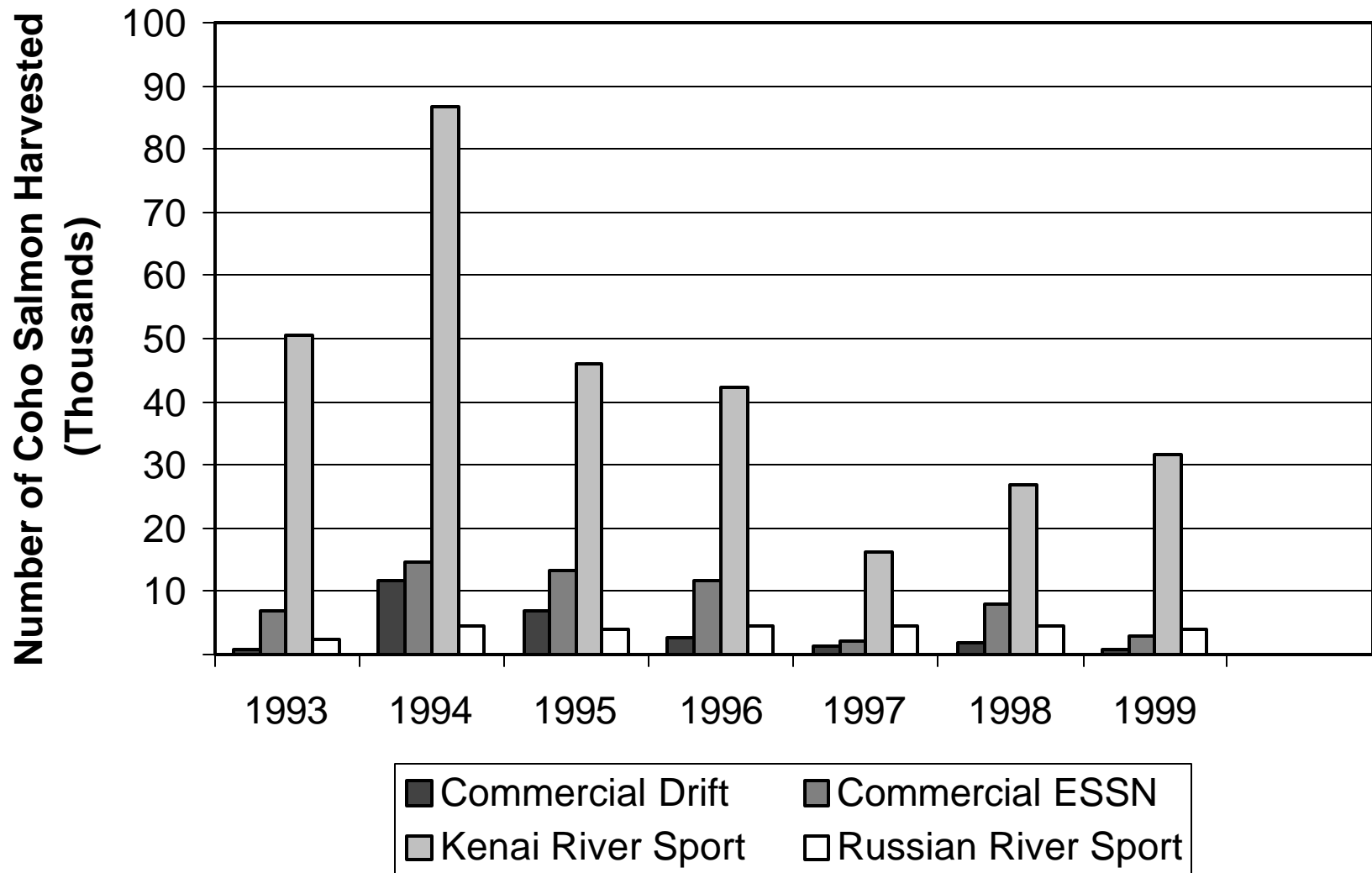


Figure 22.-Harvest of Kenai River coho salmon stocks, 1993-1999.

Table 37.-Personal use and subsistence coho salmon harvest from Northern and Central districts setnet and Kenai River dip net fisheries, 1981-1999.

Year	Non-Commercial Setnet	Fall Coho Personal Use Setnet	Upper Subdistrict Subsistence Setnet	Northern/Central Districts Subsistence Setnet	Kenai River Personal Use Dip Net	Kenai River Subsistence Dip Net
1981	12,713					
1982					Unknown	
1983		712			0	
1984		2,261				
1985			11,265	1,427		
1986		2,422				
1987		2,213			2,228	
1988		2,662			3,929	
1989		2,376			3,804	
1990		2,290				
1991		2,703		3,520		146
1992				10,320	972	1,475
1993		1,168		12,181	1,597	
1994				11,186		2,535
1995					1,261	
1996					1,932	
1997					559	
1998					1,011	
1999					1,009	

Source: All setnet harvests from Fox and Shields 2001; personal use dip net harvests 1983-1994 from Statewide Harvest Survey (Mills 1984-1994, Howe et al. 1995); 1995 from Brannian and Fox 1996; 1996-1999 are known harvests from returned permits expanded to include an estimate of harvest from permits not returned; subsistence dip net harvests from Brannian and Fox 1996.

for this area of the river. These data were used postseason to track the relative status of the fishery and were not intended for inseason management of the fishery. Assuming 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. The creel survey was found cost ineffective and was terminated at the conclusion of the 1993 season. There was no onsite creel survey from 1994-96. The survey was reinstated in 1997 and 1998.

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 fisheries could not be sustained.

The Division of Sport Fish began a stock assessment program in 1992 based upon the estimation of annual smolt production as an indicator of future abundance (Carlson and Hasbrouck 1998). Data from this program indicated a decline in smolt abundance from approximately 1,000,000 in 1992-1993 to less than 500,000 in 1995. Because this decline in smolt abundance was likely to result in reduced adult returns to the Kenai River, the Board addressed this fishery in March 1997.

In 1998, the Division of Sport Fish began an adult coho salmon tagging program to yield estimates of the number of adult coho salmon returning to the Kenai River and the spawning escapement. In the first 2 years coho salmon adults were captured with fish wheels and tagged with radio tags and spaghetti tags at River Mile 19, below the Soldotna Bridge. Of the fish radio-tagged in 1999, 40% did not migrate upstream, indicating an unacceptable level of handling stress and mortality. In 2000 the fish were instead marked at fish wheels near River Mile 27. The dropout rate (% of marked fish that did not migrate upstream) was reduced. In 1998, recaptures were made in the tributaries, but very few fish were recaptured. Now recaptures are made in the mainstem, using fish wheels and drift nets from the Funny River upstream to the Moose River. With these years of refinement, this program is now able to estimate the number of adult coho salmon returning at the Soldotna Bridge. From this estimate, the sport harvest above the bridge can be subtracted to yield an estimate of the spawning escapement. These estimates, coupled with the smolt abundance estimates, can give estimates of smolt to adult survival.

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.

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 (5 AAC 21.357) was adopted at this meeting. Primary provisions of the plan are:

1. Closed the commercial ESSN fishery on first regularly-scheduled period on or after August 10.
2. Sport fishing for coho salmon in the Kenai River drainage is prohibited from October 1 through June 30.
3. From October 1 through June 30 only unbaited artificial lures may be used in the Kenai River drainage unless provided for by emergency order.
4. 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 all sport 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 from a guide vessel is prohibited on Mondays.
5. Closed the Kenai River personal use dip net fishery after 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 cannot 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.

In 1999, the board again addressed this fishery. The daily bag limit in the Russian River (a tributary of the mainstem Kenai River) and in that area of the Kenai River downstream from the confluence of the Russian and Kenai rivers to the ferry crossing was reduced from 3 salmon (except chinook salmon) to 1 coho salmon per day. This conservation measure was in response to the increasingly popular clearwater fishery at the Russian River, where stocks are subject to higher exploitation rates.

Also in 1999, the Board lifted restrictions that prohibited catch-and-release fishing for coho salmon in that section of the Kenai River downstream from the outlet of Kenai Lake to within ¼ mile of the outlet of the Kenai River in Skilak Lake. The Board eased this restriction because mortality resulting from hook-and-release in not a significant problem in this area. Coho salmon are most vulnerable to catch-and-release mortality in bait fisheries and during the transitional period shortly after entering fresh water from the marine environment.

The Board also substantially altered the Upper Cook Inlet Salmon Management Plan. Prior to 1999, this plan contained allocative criteria and long-term instructions to the department on how salmon fisheries were to be managed in Upper Cook Inlet (including Kenai River coho salmon stocks). During the 1999 meeting, all instructions pertaining to allocation of Upper Cook Inlet salmon stocks were removed from this plan and placed into the respective (step down) management plans covering specific stocks and or species. Provisions that the board must consider when adopting management plans for the Upper Cook Inlet area were incorporated into this revised plan. Provisions are the need for sustainable fisheries, habitat protection, and the needs and demands of various user groups.

RECENT FISHERY PERFORMANCE

A creel census program was conducted on the Kenai River during 1997 and 1998. It was discontinued for budgetary reasons prior to the 1999 season. No inseason information regarding catch and escapement was available during 1999. Consequently, inseason run strength and fishing success were gauged by reports volunteered by guides and individual anglers. Final harvest estimates are provided by the SWHS. This information typically becomes available during the spring of the following year.

In 1997, coho salmon returns to Upper Cook Inlet (that area north of Anchor Point) were significantly below historic levels. This was determined by low harvest rates in the commercial

fishery, poor fishing success as reported by anglers, and onsite enumeration of coho salmon at weir sites in northern Cook Inlet.

Both the sport and commercial fisheries were restricted during 1997 for coho salmon conservation purposes. The UCI commercial fishery closed on August 7. Early closure reduced the ESSN season by two fishing periods (August 8 and 11) and the commercial drift season by one fishing period (August 8). The sport bag and possession limits in salt water were reduced to 1 coho salmon daily.

Angler success rate in the Kenai River, as determined by creel survey, 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 coho salmon stocks as an aggregate unit. 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 allowed. These regulations applied to the Kenai River and were in effect from August 11 through the regulatory close of the season, September 30.

Given little indication of increased smolt production leading into 1998 and poor commercial harvests during 1997, the department was aware of the potential for a weak return during 1998. During 1998, the commercial drift net and eastside setnet (ESSN) fishery of Upper Cook Inlet harvested approximately 83,000 and 19,000 coho salmon, respectively (Table 36). The harvest is slightly greater than occurred during 1997, yet significantly less than was harvested during the years of 1993-1996. No restrictions to the commercial fisheries were imposed during 1998 for coho salmon conservation.

In 1998, a creel survey was used to estimate sport fishery performance during August and September below the Soldotna Bridge in the Kenai River. This survey estimated a sport harvest below the Soldotna Bridge of approximately 10,000 coho salmon in August and 4,000 in September, but results were not available inseason. The fishery was prosecuted in a normal fashion; no restrictions to this fishery were made during the season. Information from the Kenai River creel survey indicated excellent success rates and by this measure, the highest observed since 1994. The inseason estimates compared favorably with postseason estimates from the Statewide Harvest Survey (Table 38).

A total of approximately 27,000 coho salmon were harvested in the sport fishery during 1998 (Table 38). Most of this harvest occurred downstream from the Soldotna Bridge (Figure 23). Nonguided anglers took the greatest proportion of this harvest (80.7%, Table 39).

Estimates of Kenai River coho salmon smolt obtained during 1998 indicated resurgence in smolt production from the Moose River relative to the 2 previous years. Although the department lacks a reliable estimate for marine survival of Kenai River coho salmon and is unable to discriminate between early- and late-run smolt, this information suggested the potential for increased adult abundance during 1999. However, given the relatively low commercial harvests during 1997 and 1998, management staff were aware of the potential for weak coho salmon returns during 1999.

During 1999, commercial coho salmon harvests in Upper Cook Inlet and in the eastside setnet fishery (Table 36) were the lowest observed during the past 20 years. These low commercial harvests of coho salmon were cause of concern by fisheries managers as early as the third week

Table 38.-Estimated sport harvest of Kenai River coho salmon by river section, 1977-1999.

Year	Lower Section ^a			Mid Section ^b			Upper Section ^c			Inter-Lake ^d			All Sections		
	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															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			38,338			10,336			8,348			3,088			60,110
1987			19,612			6,222			4,077			3,299			33,210
1988			34,690			4,863			5,714			3,427			48,694
1989			36,668			7,921			8,236			2,434			55,259
1990			40,567			8,446			7,281			4,031			60,325
1991			49,499			13,438			9,520			3,699			76,156
1992			33,175			7,579			7,547			4,009			52,310
1993			29,135			9,677			6,771			4,955			50,538
1994			46,345			15,249			12,286			12,831			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	17,551	5,010	22,561	8,347	2,076	10,423	4,371	1,682	6,053	2,457	799	3,256	32,726	9,567	42,293
1997	5,570	1,293	6,863	2,858	1,319	4,177	1,752	1,330	3,082	1,587	455	2,042	11,767	4,397	16,164
1998	9,955	5,506	15,461	3,667	1,430	5,097	2,373	1,833	4,206	1,764	439	2,203	17,759	9,208	26,967
1999	14,413	6,029	20,442	4,732	654	5,386	1,268	1,812	3,080	1,951	778	2,729	22,364	9,273	31,637
Mean	13,504	5,929	30,371	4,889	1,322	8,199	2,510	1,890	6,556	1,965	640	3,914	22,868	9,781	49,040

Source: All data from Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995, 1996, 2001 a-d).

^a Cook Inlet to Soldotna Bridge.

^b Soldotna Bridge to Moose River

^c Moose River to Skilak Lake.

^d Skilak Lake to Kenai Lake.

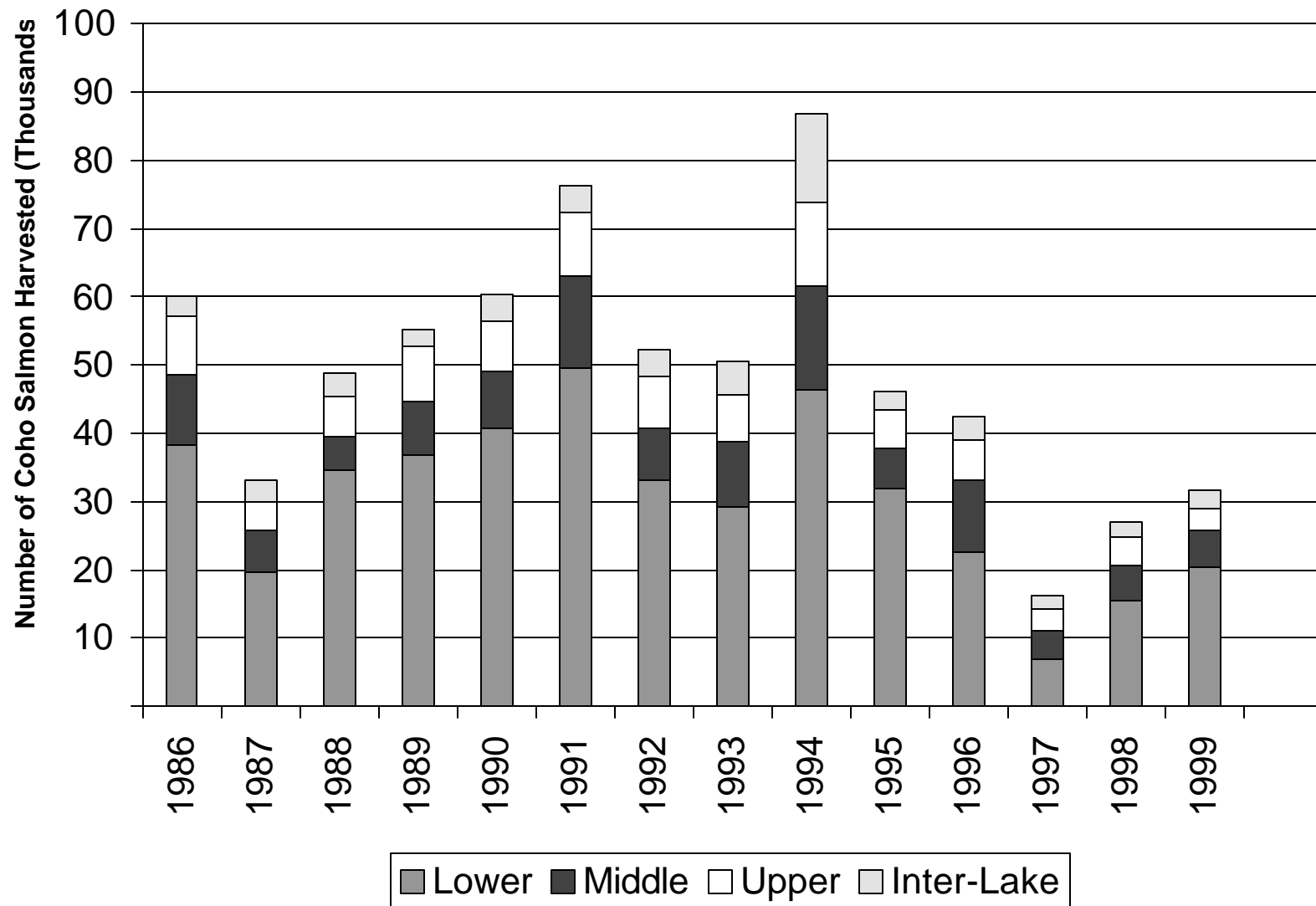


Figure 23.-Sport harvest of Kenai River coho salmon stocks by river section, 1986-1999.

in July. By the end of July commercial harvests from the ESSN fishery on Coho and Ninilchik beaches were lagging significantly behind those that occurred in 1997 (Figure 24).

In 1999, the creel survey was discontinued. Despite indications of a potentially poor return of coho salmon to the Kenai River, coho salmon run strength and sport fishing success were reported to be from average to slightly below average during much of the season. Inriver timing appeared to be 5-7 days later than recent historic timing trends. Overall, sport fishing effort seemed to have declined relative to 1997 and 1998. This may have been a result of heavy rains and generally poor weather conditions during much of the fishery. Some anglers were enjoying excellent catch rates with some guides reporting boat limits during week 2 and 3 of August. Based on reports of average to slightly below average sport fishing success and indications of decreased relative fishing effort, no inseason management actions were taken to restrict the early-run coho salmon fishery in the Kenai River during 1999.

A total of approximately 31,600 coho salmon were harvested in the early-run recreational fishery during 1999 (Table 38). This harvest is approximately double the harvest attained during 1997 and approximately 4,700 more than was harvested in 1998. Most of this harvest occurred downstream from the Soldotna Bridge (Figure 23). Nonguided anglers took the greatest proportion of this harvest (74.4%, Table 39).

Table 39.-Guided vs. nonguided harvest, Kenai River coho salmon fishery, 1986-1999.

Year	Guided		Nonguided		Total Harvest
	Harvest ^a	%	Harvest ^a	%	
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	13,728	32.5	28,565	67.5	42,293
1997	3,101	19.2	13,063	80.8	16,164
1998	5,217	19.3	21,750	80.7	26,967
1999	8,087	25.6	23,550	74.4	31,637
Mean	16,046	30	32,994	70	49,040

^a Data from Statewide Harvest Survey (Mills 1987-1994, Howe et al. 1995, 1996, 2001 a-d).

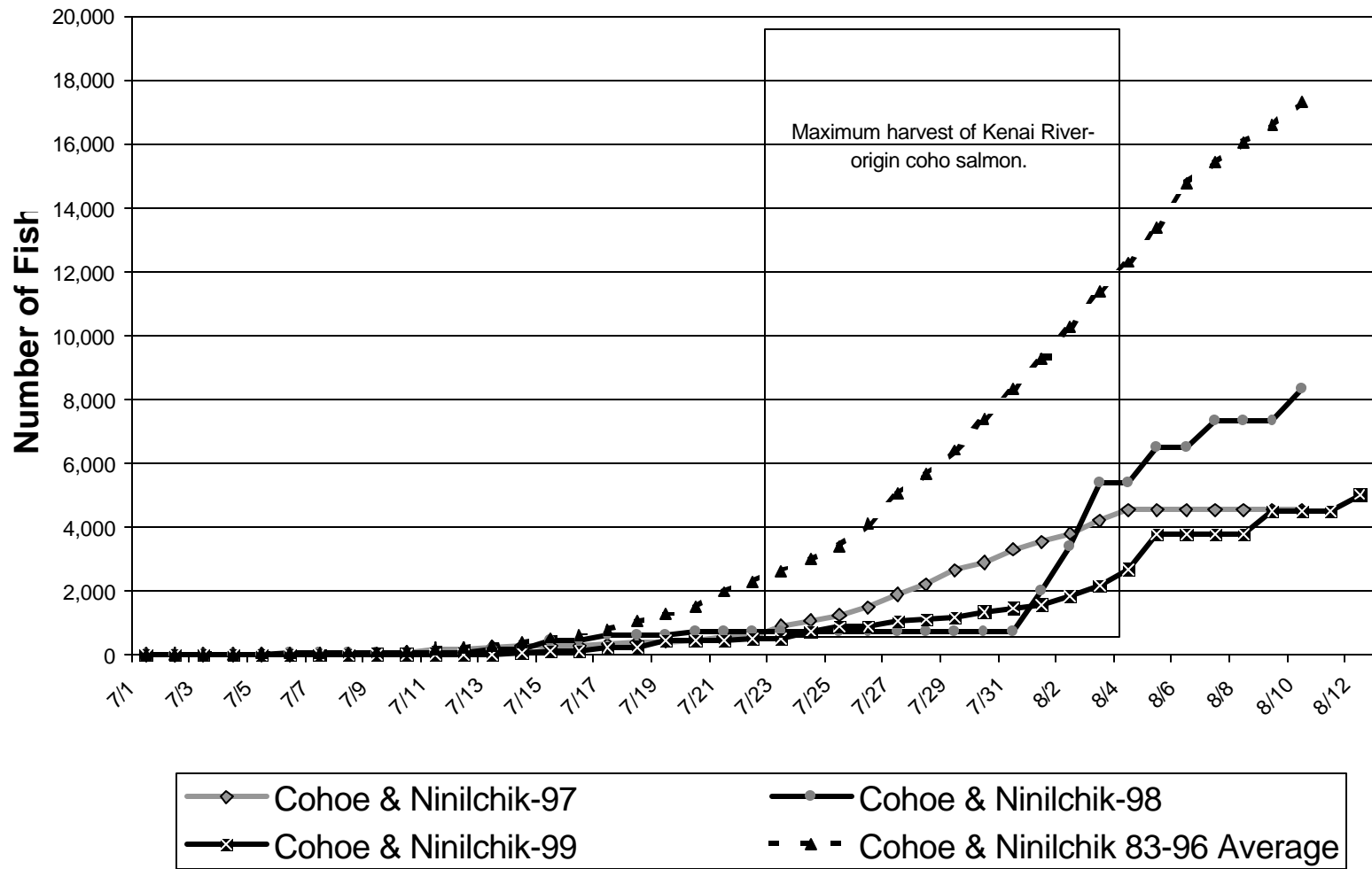


Figure 24.-Commercial setnet harvests, by date, from Ninilchik and Coho beaches, 1997-1999.

OUTLOOK

Assuming a correlation between harvest and abundance, annual returns of early-run Kenai coho salmon have been in decline at least since 1996 (Figures 22, 23). We do not have sufficient information to link changes in smolt production to future returns. The 2000 return can therefore not be forecast with any degree of certainty. However, recent increases in smolt production are encouraging and may signify early stages of recovery.

CURRENT ISSUES

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

1. Although intensive research has been underway since 1997 to develop techniques to estimate escapements of Kenai River coho salmon, there is presently no reliable methodology capable of accomplishing this important objective.
2. Since escapements of coho salmon cannot presently be estimated in the Kenai River, establishing quantitative escapement or fishery objectives is not possible.
3. Lacking a method to estimate escapement and the lack of quantitative management or fishery objectives, inseason management actions will likely occur only in extreme situations. This increases the possibility that harvest will exceed sustainable limits.
4. Also at issue is the division of the harvestable surplus of Kenai River coho salmon stocks between commercial and sport fishermen. This allocation issue will be exacerbated as angler effort increases.

Record low harvests of Kenai River coho salmon stocks in the Upper Cook Inlet commercial fishery during 1997 and 1999 are cause for serious concern that current management strategies and provisions contained in the controlling management plans may be inadequate to ensure sustained yield. Given that coho salmon stocks throughout the Upper Cook Inlet basin have been in decline for the past several years, the question presented managers of sport and commercial fisheries is whether observed declines in abundance are a result of natural causes or a result of overharvest. Members of the public and various user groups are concerned that current commercial management strategies tend to overharvest coho salmon stocks bound for North Cook Inlet drainages. Also of vital concern to recreational users are the intensely focused harvests directed at late-run sockeye salmon in late July and early August, which tend to disproportionately harvest early segments of returns of coho salmon stocks bound for the Kenai River.

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 that 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. We recommend that this research effort should continue.

A program designed to estimate coho salmon escapement, based on mark-recapture methodology, in the Kenai River was begun in 1998 and has continued each year thereafter. Other objectives of this research include estimating sport fishing exploitation rates and ultimately

development of quantifiable management objectives for this stock. Once a reliable method is at hand to provide such information, regulations can be crafted to tailor harvests to prevailing exploitation rates. Alternatively, given a sufficient body of historical harvest and escapement data, combined with timely estimates of inriver escapement and harvest, escapement objectives can be established for this fishery and harvest adjusted inseason to ensure sustainable levels of escapement. We recommend that this ongoing research continue with high priority.

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. Harvests are estimated by Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995, 1996, 2001 a-d).

HISTORICAL PERSPECTIVE

Pink salmon in waters of the Kenai Peninsula are generally considered a commercial species. Commercial harvest has averaged 694,259 fish since 1954. The 1990-1999 average harvest was 295,035 pink salmon (Fox and Shields 2000). This species is abundant only on even-numbered years. Stocks in the commercial harvest originate primarily in the Kenai River and Susitna River 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 incidentally 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 (Table 40). As with the commercial fishery, the Kenai River sport harvest is significant only on even years.

Pink salmon mature rapidly on entering fresh water and are readily caught with artificial lures. These fish are 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.

Table 40.-Sport catch and harvest of pink salmon in the Kenai River, 1977-1999.

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	84,974	15,406
1997	4,339	1,371	1998	81,776	8,926
1999	6,806	1,895			
Mean	4,412	1,129		81,876	18,658

From: Mills 1979-1994; Howe et al. 1995, 1996, 2001 a-d.

RECENT FISHERY PERFORMANCE

Few pink salmon return to the Kenai River in odd-numbered years; relatively large numbers return in even-numbered years (Table 40, Figure 25). Pink salmon were therefore abundant in 1994, 1996 and 1998. The 1999 return was odd year return and was therefore quite small. The Statewide Harvest Survey estimated pink salmon harvest from the Kenai River to be 8,926 fish in 1998 and 1,895 fish in 1999. The 1998 harvest was one of the lowest even-year harvests on record; the 1999 harvest was one of the largest odd-year harvests on record. Harvest appears to be a function of voluntary retention rather than actual numbers of fish caught by an angler. It is clear from this information that many anglers choose not to retain pink salmon in the sport fishery. Since 1990, an average of only 26% of pink salmon caught each year have been retained.

OUTLOOK

Pink salmon mature rapidly on entering the Kenai River and are not desirable to many (especially local) anglers. The fishery is 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. In fact, the number of fish harvested has generally declined since 1990. The outlook is therefore for a continuation of a stable fishery with a significant harvest occurring only during even-numbered years.

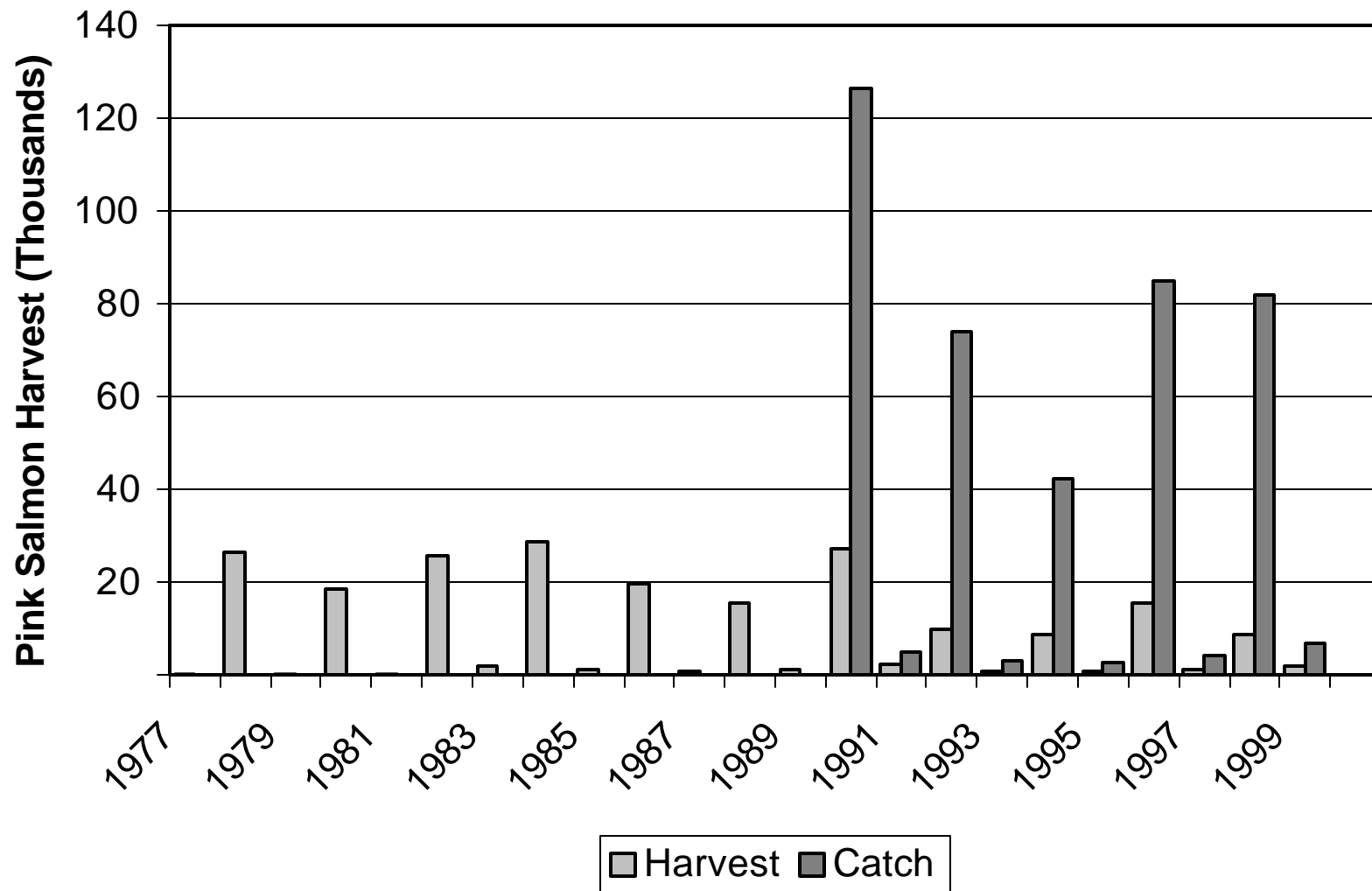


Figure 25.-Pink salmon harvest and catch from the Kenai River sport fishery, 1977-1999.

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 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 per day.

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 accomplished through regulation.

HISTORICAL PERSPECTIVE

The Kenai River is the most heavily utilized river for freshwater sport fishing in Alaska and one of the largest rainbow trout fisheries in the United States. Although most of the anglers participate in the river's salmon fisheries, the Kenai River drainage also supports a major rainbow trout fishery with catches ranging from 8,720 to nearly 102,000 fish, annually (Table 41, Figure 26).

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.

Table 41.-Kenai River rainbow trout, number caught and number retained by river section, 1984-1999.

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
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
1996	5,513	304	5.5	4,777	646	13.5	8,650	373	4.3	45,471	237	0.5	64,411	1,560	2.4
1997	7,411	739	10.0	6,641	539	8.1	20,047	632	3.2	61,053	0	0.0	95,152	1,910	2.0
1998	5,502	608	11.1	5,380	670	12.5	12,158	737	6.1	42,224	0	0.0	65,264	2,015	3.1
Mean	4,010	590	16.2	3,790	610	17.5	9,140	790	13.0	22,800	450	7.8	39,730	2,440	10.7
1999	11,415	1,516	13.3	8,325	695	8.3	32,050	1,573	4.9	50,189	0	0.0	101,979	3,784	3.7

Source: Statewide Harvest Survey (Mills 1985-1994; Howe et al. 1995 and 1996, 2001a-d)

^a Catch estimates for 1984-1989 are unpublished estimates from the Statewide Harvest Survey (M. Mills, Alaska Department of Fish and Game, Division of Sport Fish, Research and Technical Services, Anchorage.

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

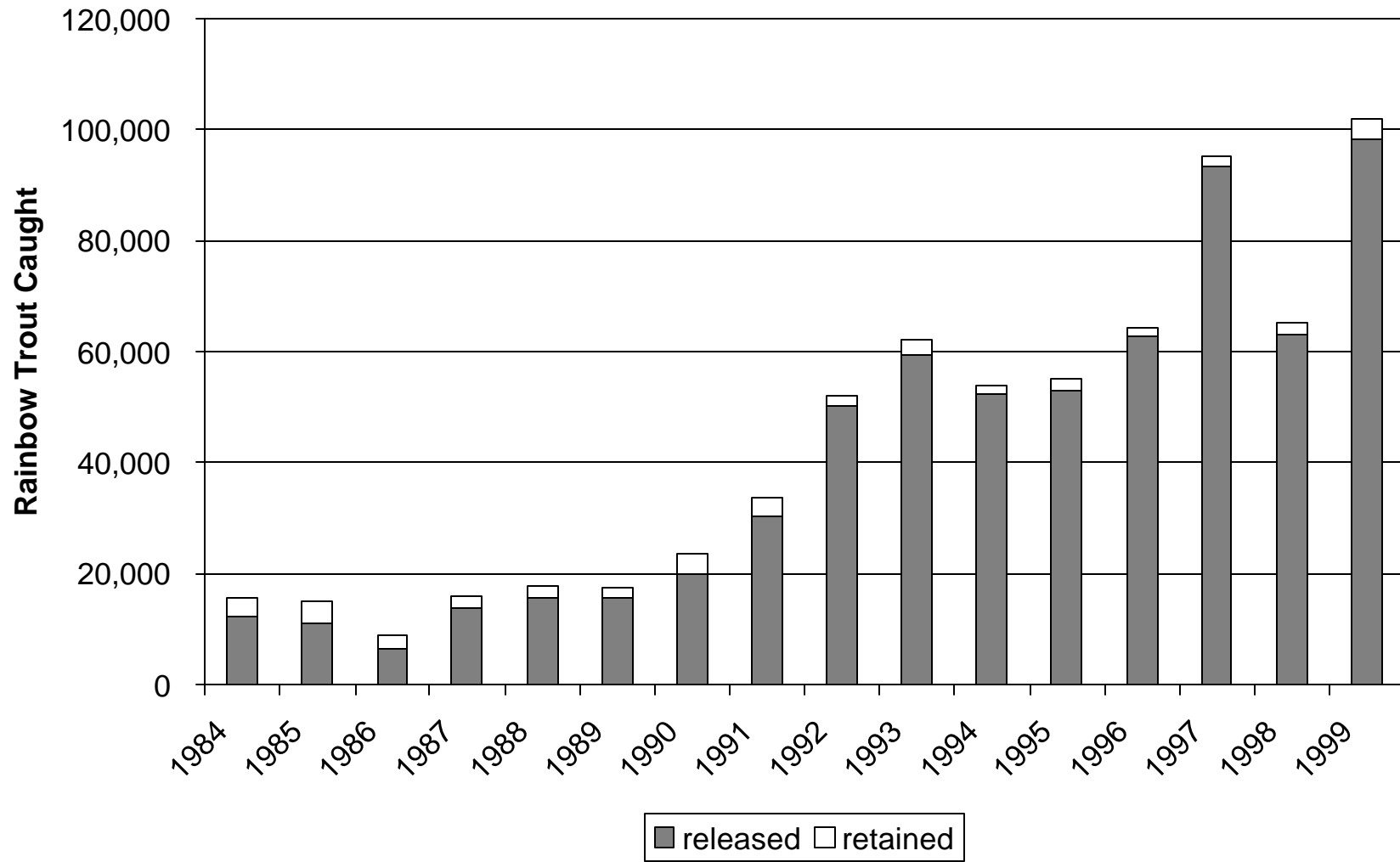


Figure 26.-Total number of rainbow trout caught, showing number released and number retained, Kenai River sport fishery, 1984-1999.

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 all 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 27). The population estimates for section 004 were 3,663 and 4,947 in 1986 and 1987. In 1987 the study was expanded to include two sections of the river below Skilak Lake, 002 and 003 (Lafferty 1989) (Figure 27).

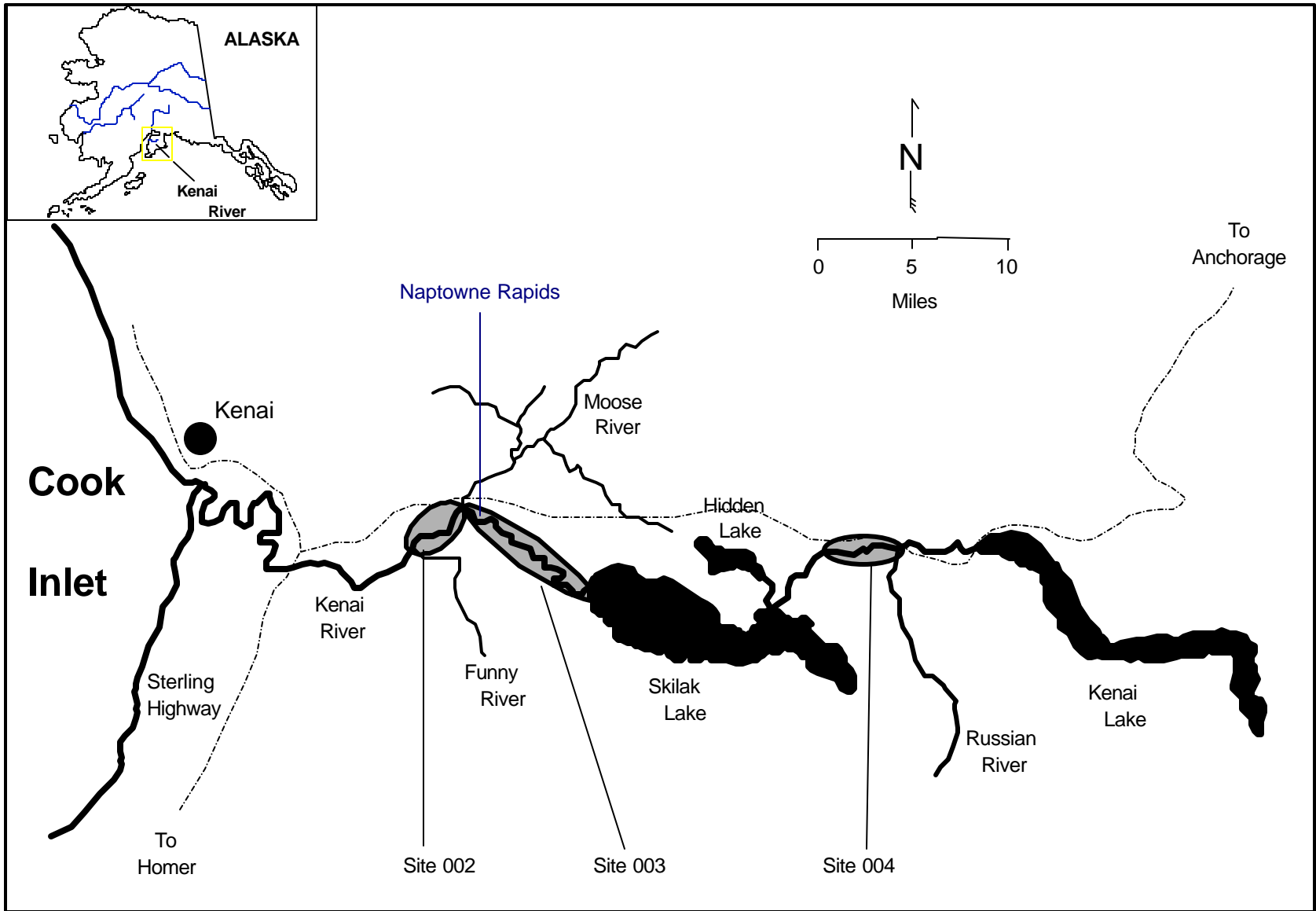


Figure 27.-Map of the Kenai River drainage and rainbow trout study sites.

This study concluded that the best estimates of trout 150 mm (6 inches) or greater in length for the two river sections was 610 and 1,750, respectively. He also concluded that these estimates were 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 were 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.

In 1998, additional research was instituted to reassess the population of rainbow trout in the Kenai River drainage. This study is a multi-year study and will address multiple sections of the river. Analysis of these data is not yet complete; however, results will be available prior to the 2002 Alaska Board of Fisheries meeting.

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.

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 flowing waters of the Kenai River drainage except the Crescent

Creek drainage is now June 15 through April 15. The season in the Crescent Creek drainage is July 1-April 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.

During the October 1998 meeting of the Alaska Board of Fisheries, rainbow trout fisheries in the Kenai River drainage were again addressed. To provide for regulatory consistency and previous Board intent, the fishing season for rainbow trout in all lakes of the Kenai River drainage except Crescent, Skilak and Russian lakes was established as January 1 through December 31. These changes were adopted in order to provide additional fishing opportunity in lakes during the spring. Streams (all flowing waters) remain closed from April 15 through June 14 to protect spawning rainbow trout. To correct a regulatory error, and provide for previous Board intent, the fishing season for rainbow trout in Slikok Creek was established as August 16 through April 14. This regulation change closed waters of Slikok Creek to rainbow trout fishing from April 15 through June 14 to protect spawning fish. From June 15 through August 15, all fishing is prohibited in Slikok Creek to protect chinook salmon.

No regulations directed at the Kenai River sport rainbow trout fishery were adopted during the regularly-scheduled meeting of the board in February-March of 1999. Regulations pertaining to this fishery will again be addressed during the next scheduled meeting of the board in February 2002.

RECENT FISHERY PERFORMANCE

Sport harvest and catch for the Kenai River rainbow trout fishery is determined by the Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995, 1996, 2001 a-d). Total catches of rainbow trout from the Kenai River have, with minor exception, been steadily increasing since the mid-1980s. From 1996 to 1997, catch increased dramatically from approximately 65,000 to a record catch of slightly more than 95,000 rainbow trout (Table 41, Figure 28). From 1997 to 1999, catch again increased to nearly 102,000 fish. This catch is the highest on record since the inception of this fishery more than 20 years ago. Although angler participation cannot be ascertained from the Statewide Harvest Survey, much of the recent growth in this fishery has occurred in the upper section of the Kenai River between Moose River and the outlet of Skilak Lake and in waters between Kenai and Skilak lakes (Table 41, Figure 28). Catches of rainbow trout in the upper section of the Kenai River totaled 8,650 in 1996, then increased to 20,047 in 1997 and increased again to approximately 32,000 in 1999.

Retention of rainbow trout by anglers showed a general trend of decline since the mid to late 1980s (Table 41, Figure 29). Retention of fish in the Catch-and-Release fishery between Kenai and Skilak lakes has been prohibited since the 1997 season. During 1998 and 1999 the percent of the total catch retained by anglers was significantly lower for each of the remaining river sections than the long-term average between 1984 and 1998. These low rates of retention indicate that anglers have readily adapted to a more resource sensitive catch-and-release philosophy throughout the drainage.

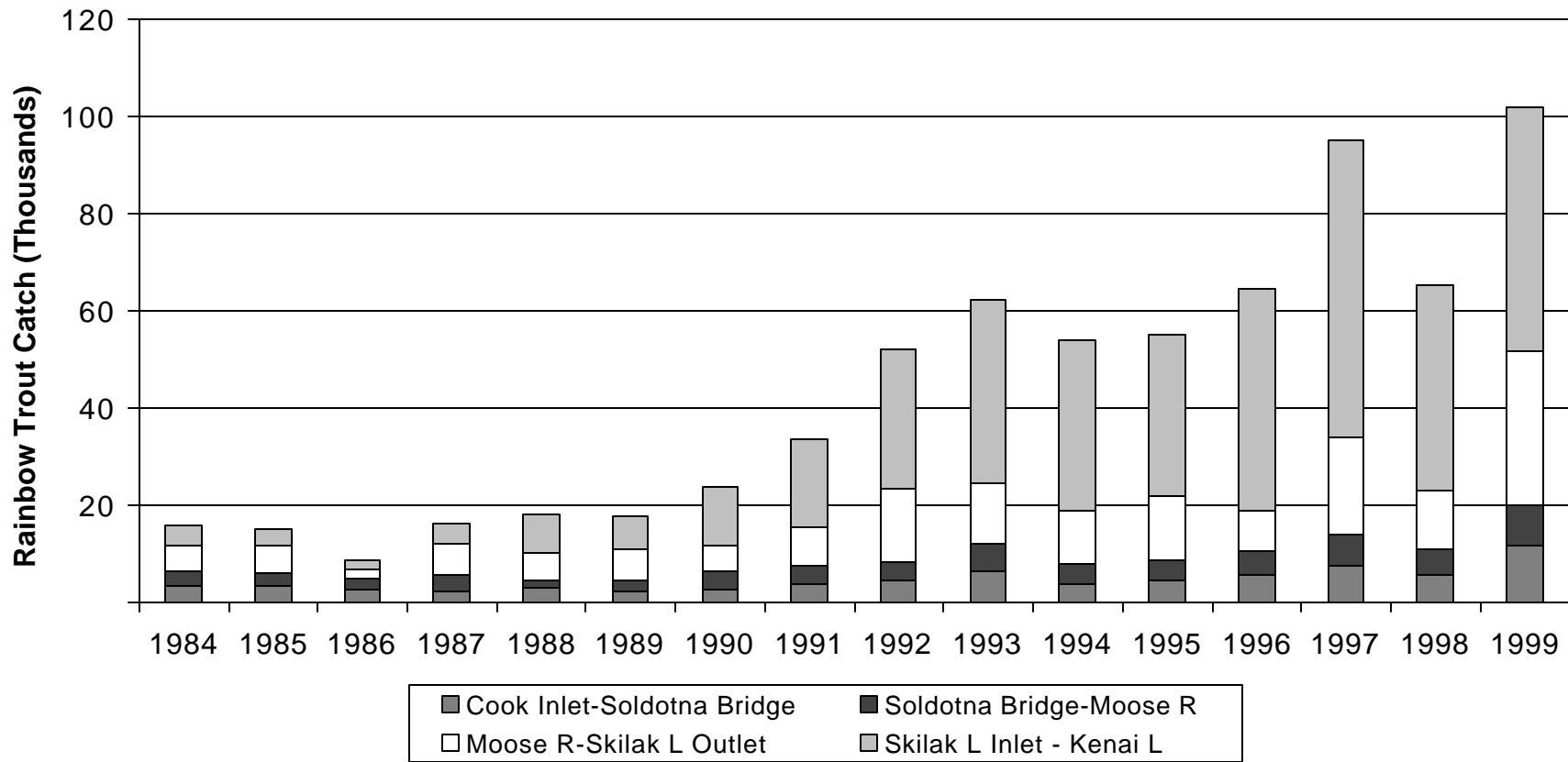


Figure 28.-Catch of rainbow trout, by river section, Kenai River sport fishery, 1984-1999.

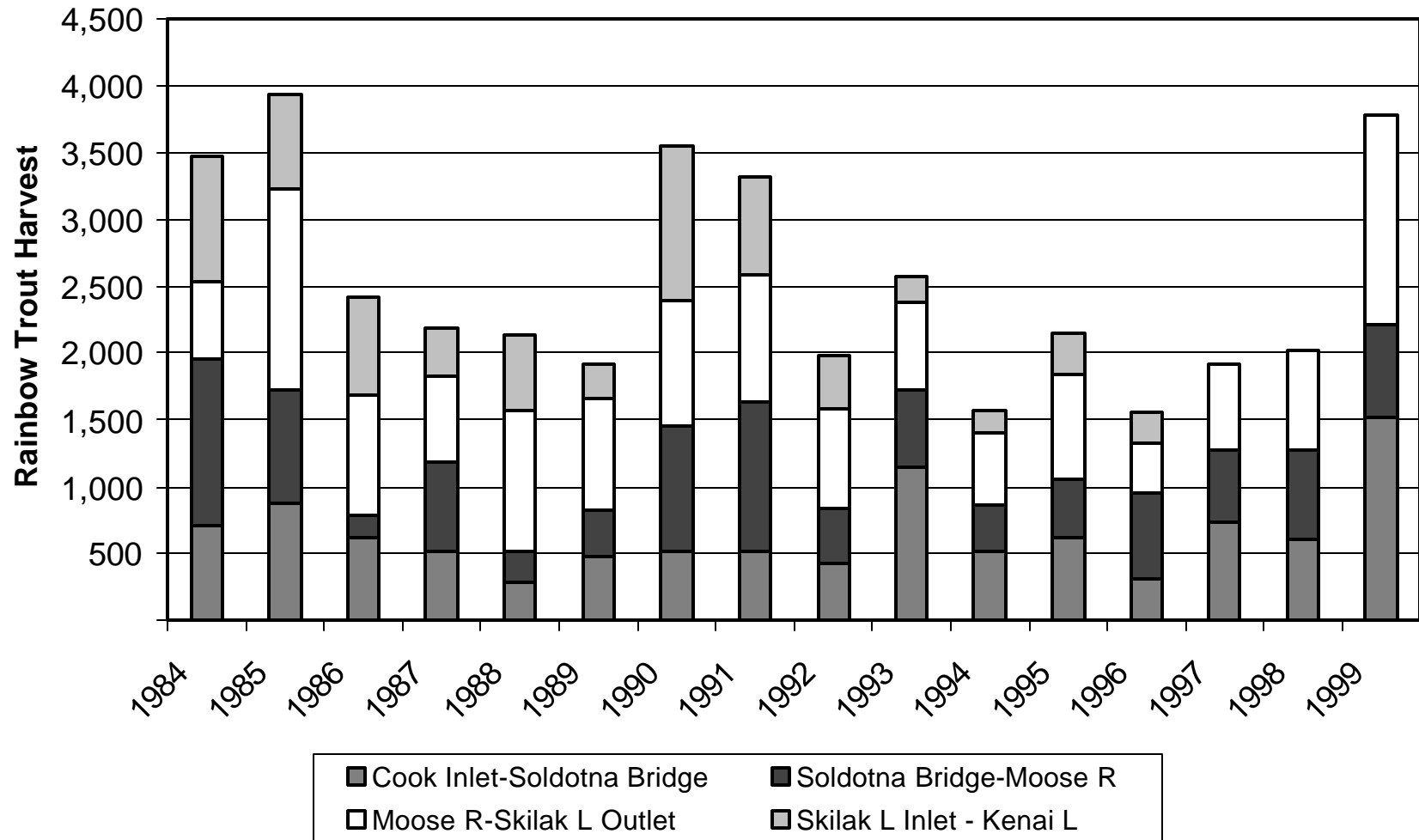


Figure 29.-Number of rainbow trout retained by river section, Kenai River sport fishery 1984-1999.

Historical catch and harvest for Ptarmigan Creek, Quartz Creek, Kenai Lake, Russian River and Skilak Lake are presented in Table 42. Retention of rainbow trout is prohibited in Ptarmigan and Quartz creeks. Declining catches in these streams through 1996 was, in part, the reason that the Board adopted these restrictive regulations. Catches in Kenai Lake have also declined in recent years, most notably since 1993-1994; however, catches of rainbow trout increased dramatically in 1999 to approximately 1,800 fish. The significance of this increase is unknown. Catch in the Russian River during 1999 was the highest on record since 1990. Catches of rainbow trout also improved dramatically in Skilak Lake between 1998 (625) and 1999 (1,904). Again, the significance of this increase is unknown; however, an increase in such magnitude is most likely to signify increased overall abundance throughout the Upper Kenai River drainage.

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%. Harvest in allowable areas (the middle and lower river) is increasing annually. If participation in this fishery and catch and harvest increase at current rates, further restrictions may be necessary.

No conservation issue has been identified for the trout resource of Skilak Lake or the river downstream from the lake. Current bag limits 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. 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 spawning periods. The upper Kenai River is now managed as a catch-and-release fishery and bag limits are reasonably restrictive in the remainder of the Kenai River. Conservation of the resource should therefore not be an issue. However, observations by anglers and department staff indicates an alarming and rapid increase in participation in the Catch-and-Release trout fishing area between Kenai and Skilak lakes. The Statewide Harvest Survey does not provide estimates of angler effort. Without this type of information, managers are unable to quantitatively assess growth in participation or characterize the large catches that have occurred since 1997. Current research designed to estimate the population of rainbow trout in various reaches of the river will assist in determining acceptable levels of catch and harvest; however, a creel survey would be most beneficial in monitoring this potentially explosive growth.

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. At issue is the timing and duration of spawning by rainbow trout in the Kenai River. Investigations are currently underway to determine the timing of rainbow spawning and identify external morphological characteristics of rainbow trout that will assist in monitoring spawning activities. This information will be available during the next regularly-scheduled board meeting in the spring of 2002.

Table 42.-Rainbow trout harvest and catch, and effort for all species, Quartz Creek, Ptarmigan Creek, Kenai Lake, Russian River and Skilak Lake, 1984-1999.

Year	Ptarmigan Creek			Quartz Creek			Kenai Lake			Russian River			Skilak Lake		
	Effort ^a	Harvest	Catch	Effort ^a	Harvest	Catch	Effort ^a	Harvest	Catch	Effort ^a	Harvest	Catch	Effort ^a	Harvest	Catch
1984	1,857	237		2,530	87		502	25			324			12	
1985	988	295		451	69		607				0			0	
1986	1,483	474		4,146	122		NA ^b	15			0			0	
1987	942	18		5,361	54		580	36			91			145	
1988	1,946	18		3,965	54		855	36			91			72	
1989	790	29		4,893	67		377	20			96			67	
1990	2,041	260	906	5,655	198	500	1,042	42	73		198	4,789		115	458
1991	1,200	115	700	5,354	94	648	1,064	115	1,400		230	7,221		125	637
1992	1,750	24	499	7,906	237	1,314	1,536	87	135		253	8,312		95	522
1993	1,742	415	1,709	9,152	174	2,182	2,586	615	1,306		284	12,377		68	857
1994	1,425	311	912	7,241	268	2,088	2,524	356	1,189		134	11,744		35	614
1995	1,914	131	574	5,179	66	780	3,240	233	654		151	15,381		56	1,335
1996	336	40	464	3,018	53	914	878	90	90		127	23,041		21	1,536
1997	758	-	1,461	3,401	-	1,539	1,734	152	504		130	30,852		14	3,042
1998	701	-	2,053	3,166	-	2,252	520	43	183		351	20,088		209	625
Mean	1,325	158	1,031	4,761	103	1,357	1,289	133	615		164	14,867		69	1,070
1999	883	-	3,382	4,708	-	2,132	1,462	93	1,753		83	37,764		119	1,904

From: Mills 1985-1994, Howe et al. 1995, 1996, 2001 a-d; 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.

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.

Management staff highly recommends implementation of a creel survey to monitor potential growth in participation in the Kenai River Catch-and-Release Area (between Kenai and Skilak lakes).

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, aircraft and "wheeled devices" 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 43).

Harvest estimates from 1977 through 1983 were combined for the two canoe routes and the Swanson River. Total rainbow trout harvest through 1987 was relatively consistent, ranging between 4,000 and 6,900 trout. Harvest in 1997 was approximately 2,500 rainbow trout and was

Table 43.-Swanson River and Swanson River and Swan Lake Canoe Route rainbow trout (RT) and Dolly Varden (DV) fisheries data, 1977-1999.

Year	Swanson River		Swanson River Canoe Route		Swan Lake Canoe Route		Total Harvest		Total ^a Participation
	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	221	509	1,107	519	542	0	1,870	1,028	7,655
1997	411	0	1,271	533	850	216	2,532	749	8,020
1998	535	40	1,248	248	547	254	2,330	542	6,608
Mean	969	136	1,845	318	1,417	279	4,490	900	9,092
1999	267	0	1,759	348	757	165	2,783	513	8,907

From: Mills 1979-1994, Howe et al. 1995, 1996, 2001 a-d.

^a Days fished for all species.

^b Includes Swanson River harvest.

2,800 in 1999. The 1999 harvest was well below the long-term average harvest of almost 5,000 fish (Table 43, Figure 30).

Participation prior to 1986 was less than 10,000 angler-days (Table 43, Figure 30). From 1986-1993 the number of angler-days exceeded 10,000 annually with an historical peak effort occurring in 1988 (16,970). From 1994 through 1999, annual angler effort ranged from a low of about 6,600 angler-days (1998) to a high of 9,125 in 1995. Participation during 1999 was 8,907 angler-days. This compares well with the long-term historical average of approximately 9,100 days of effort.

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 rainbow 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 February 2002 Cook Inlet meeting 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 43). Total harvest in 1998 and 1999 was 2,330 and 2,783 rainbow trout, respectively. Total harvests of rainbow trout in 1998 and 1999 were well below the historic average (4,490). Reasons for this reduced harvest are not known; however, it is likely due to decreased abundance. Angler effort during 1998 and 1999 were 6,608 and 8,907 angler-days, respectively. Angler effort during 1999 approximated the long-term average for this fishery (9,092). Very few comments were received from the public during the past years.

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 49). 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 currently no biological or social issues associated with this fishery.

RECOMMENDED RESEARCH & MANAGEMENT

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

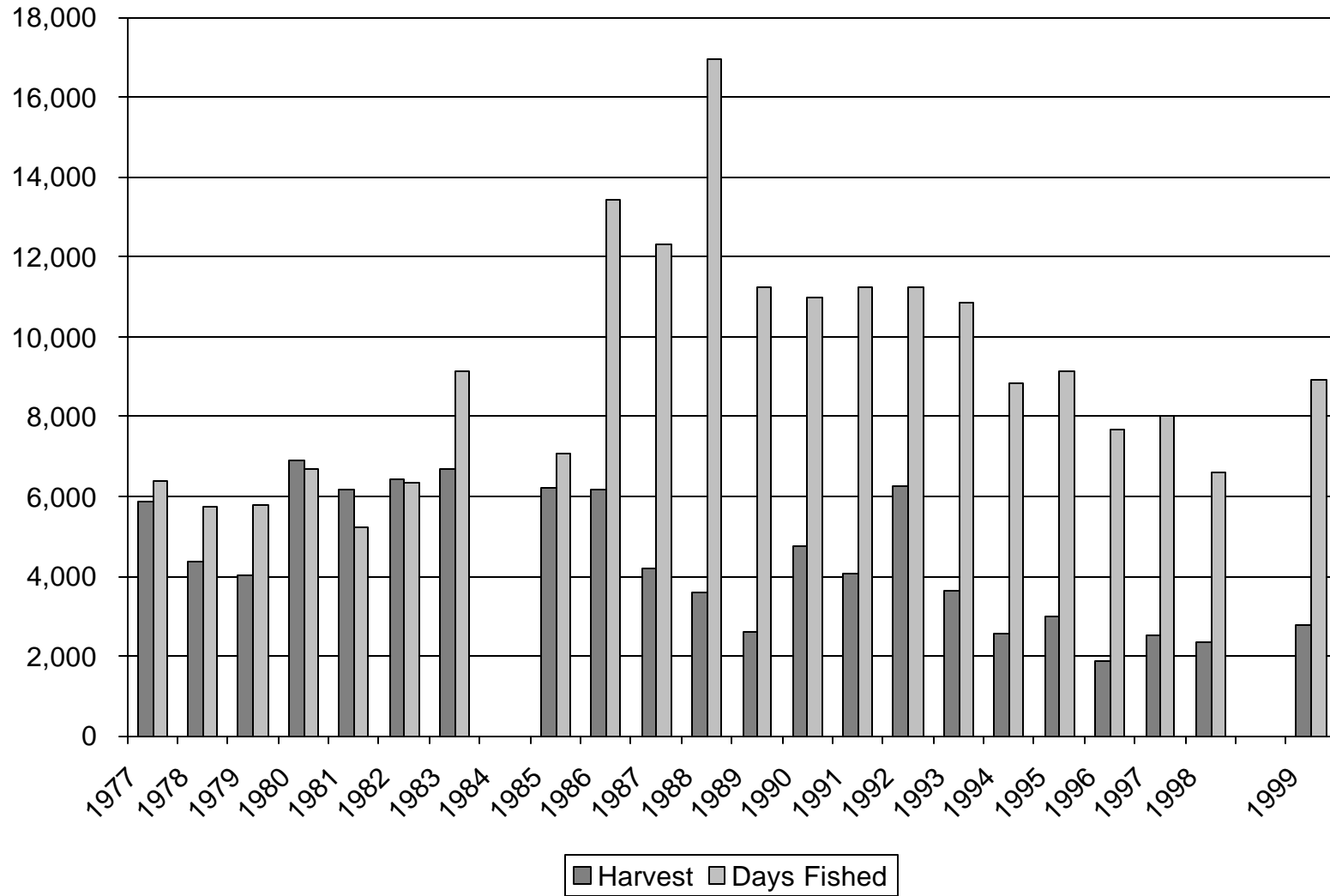


Figure 30.-Swanson River and Swan Lake canoe routes rainbow trout harvest and angler effort, 1977-1999.

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 31) 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 smolt stocked and 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 1,320 (Table 44). 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.

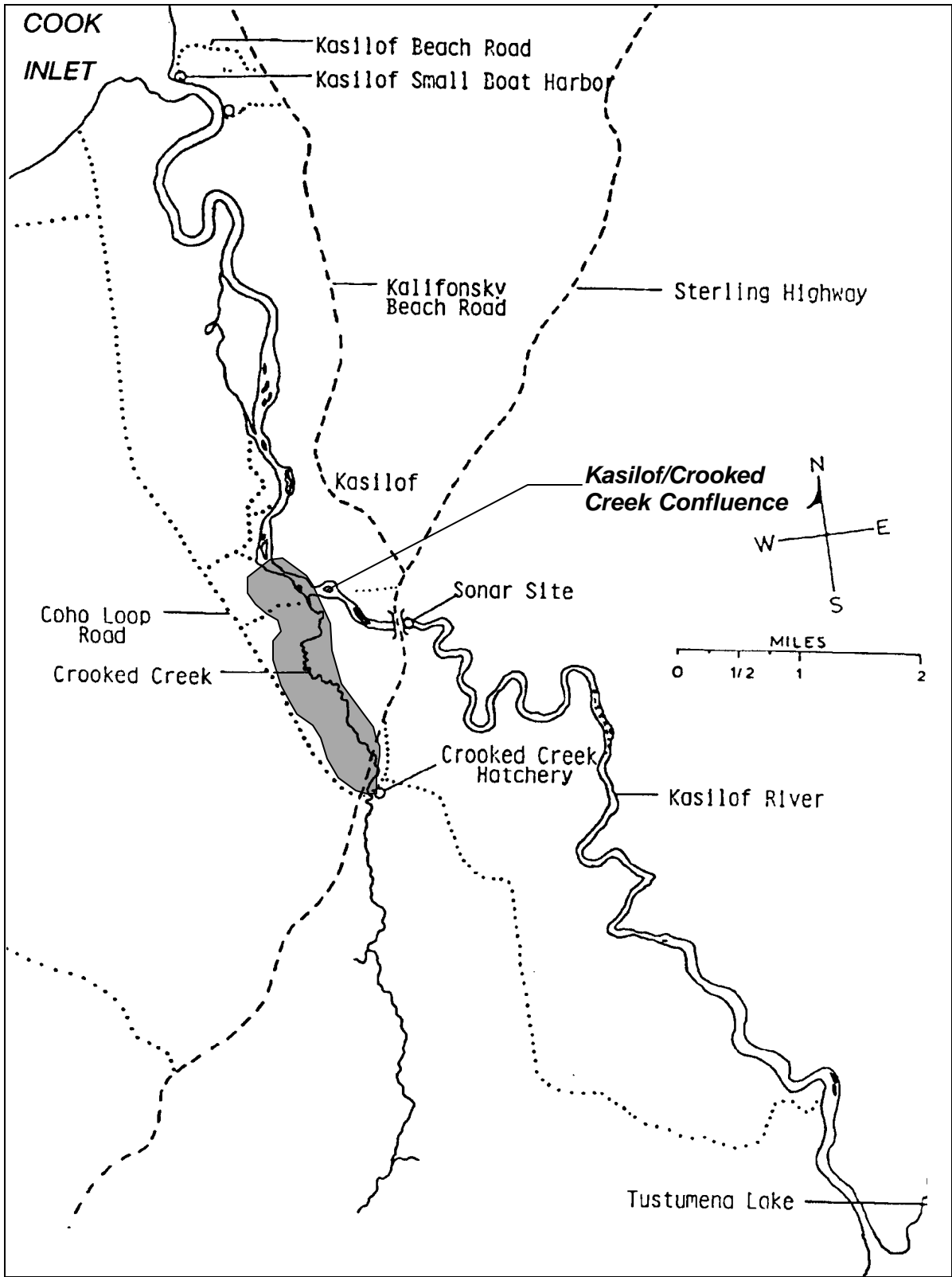


Figure 31.-Map of the Kasilof River and Crooked Creek steelhead trout fishery area.

Table 44.-Return, harvest and catch of steelhead trout in the Kasilof River and Crooked Creek steelhead trout fishery, 1986-1999.

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	1,320	108
1997	^b	552	^c
1998	^b	223	^c
1999	^b	764	17 ^d

^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, 1996, 2001 a-d).

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

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

^d Weir not installed until June 1, 1999.

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 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.

The Board during its 1999 meeting adopted no changes to this fishery. This fishery will next be addressed at the regularly-scheduled meeting of the Alaska Board of Fisheries in February 2002.

RECENT FISHERY PERFORMANCE

Prior to 1997, Cook Inlet Aquaculture Association operated the Crooked Creek Hatchery and weir. The Association ceased operations at the hatchery about January 1, 1997. The weir was not operational in 1997 or 1998 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. Operations of the hatchery reverted to the state July 1, 1997. The Alaska Department of Fish and Game has taken ownership of this facility and will operate the weir for chinook salmon egg take purposes. In 1999, the weir was not installed until June 1. Seventeen steelhead trout were enumerated. Current plans are to install the weir at an earlier date during 2000. Catch estimates for the 1998 and 1999 season are 223 and 764 steelhead trout, respectively (Table 44).

OUTLOOK

The progeny of naturally spawning fish now support the Kasilof River and Crooked Creek steelhead trout fishery. 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.

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.

The Crooked Creek Hatchery and the associated property is now owned by the Alaska Department of Fish and Game. The weir is now operational only during the chinook salmon run, but could be used for steelhead, Dolly Varden, and coho salmon research if warranted by increasing harvests of those species.

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. In 1996, the limit for all Kenai Peninsula flowing waters was reduced to 2. Harvest and catch of this species is determined by the Statewide Harvest Survey (Table 45).

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 45 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 locations.

Methods used to locate staging areas include deploying various trapping devices and conducting visual observations. The United States Fish and Wildlife Service is conducting a concurrent Dolly Varden radiotelemetry study. 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.

Table 45.-Kenai River Dolly Varden harvest and catch by river section as determined by Statewide Harvest Survey, 1984-1999.

Year	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
	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	2,411	32.2	1,797	24.0	1,995	26.7	1,281	17.1	7,484	9,787	17.3	5,973	10.6	14,506	25.7	26,245	46.4	56,511
1997	2,518	36.2	1,042	15.0	2,824	40.6	573	8.2	6,957	9,955	11.0	5,268	5.8	22,266	24.5	53,317	58.7	90,806
1998	1,977	32.5	1,787	29.4	1,847	30.4	468	7.7	6,079	7,560	12.4	5,961	9.8	11,732	19.3	35,659	58.5	60,912
Mean	3,680	31.3	1,840	16.7	3,840	30.5	2,920	21.5	12,280	9,940	15.9	5,890	9.6	16,620	25.1	32,380	49.3	64,830
1999	3,867	51.1	1,086	14.3	1,932	25.5	683	9.0	7,568	14,752	20.2	6,316	8.7	20,053	27.5	31,826	43.6	72,947

From: Mills 1985-1994, Howe et al. 1995, 1996, 2001 a-d.

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, Summit, and Cooper creeks and the Snow River; Quartz Creek and its associated tributaries is 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, unless otherwise restricted, 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 per day and in possession.

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. The public, department and Board therefore deemed a conservative management approach appropriate.

During the 1999 meeting of the Alaska Board of Fisheries, no regulations affecting this fishery were adopted or modified. Regulations governing this fishery will next be addressed by the board at its next regularly scheduled meeting in February 2002.

RECENT FISHERY PERFORMANCE

This fishery is not creel surveyed or monitored in season. Harvest estimates are derived from the Statewide Harvest Survey. Catch for this species was first estimated by the Statewide Harvest Survey in 1990. Estimates in Table 45 (Figure 32) 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 fish. Harvests from 1994 through 1999 declined to the 6,000-9,000 fish range.

Catches of Dolly Varden peaked in 1997 at 90,808 fish (Table 45, Figure 33). Catches of Dolly Varden have been consistently higher in the interlake area of the Kenai River between Skilak and Kenai lakes. Increased catches since 1996 likely indicate increased abundance resulting from more restrictive regulations.

Table 46 presents Dolly Varden catch and harvest for Ptarmigan Creek, Quartz Creek, Kenai Lake, Russian River and Skilak Lake. In Ptarmigan Creek catches appear to have increased relative to the middle 1990s. Although the catch from 1999 declined significantly relative to 1998, catches from Quartz Creek appear to have done the same. Catches of Dolly Varden from Kenai Lake remain depressed. The reason for sharply declining catches in Skilak Lake since 1997 are unknown; however, this decline is likely due to more restrictive regulations that became effective during the 1997 season. Catches from the Russian River increased sharply during 1999, nearly doubling from approximately 6,000 in 1998 to nearly 12,000 in 1999. Large escapements of sockeye salmon into the Russian River system may have attracted large numbers of Dolly Varden.

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.

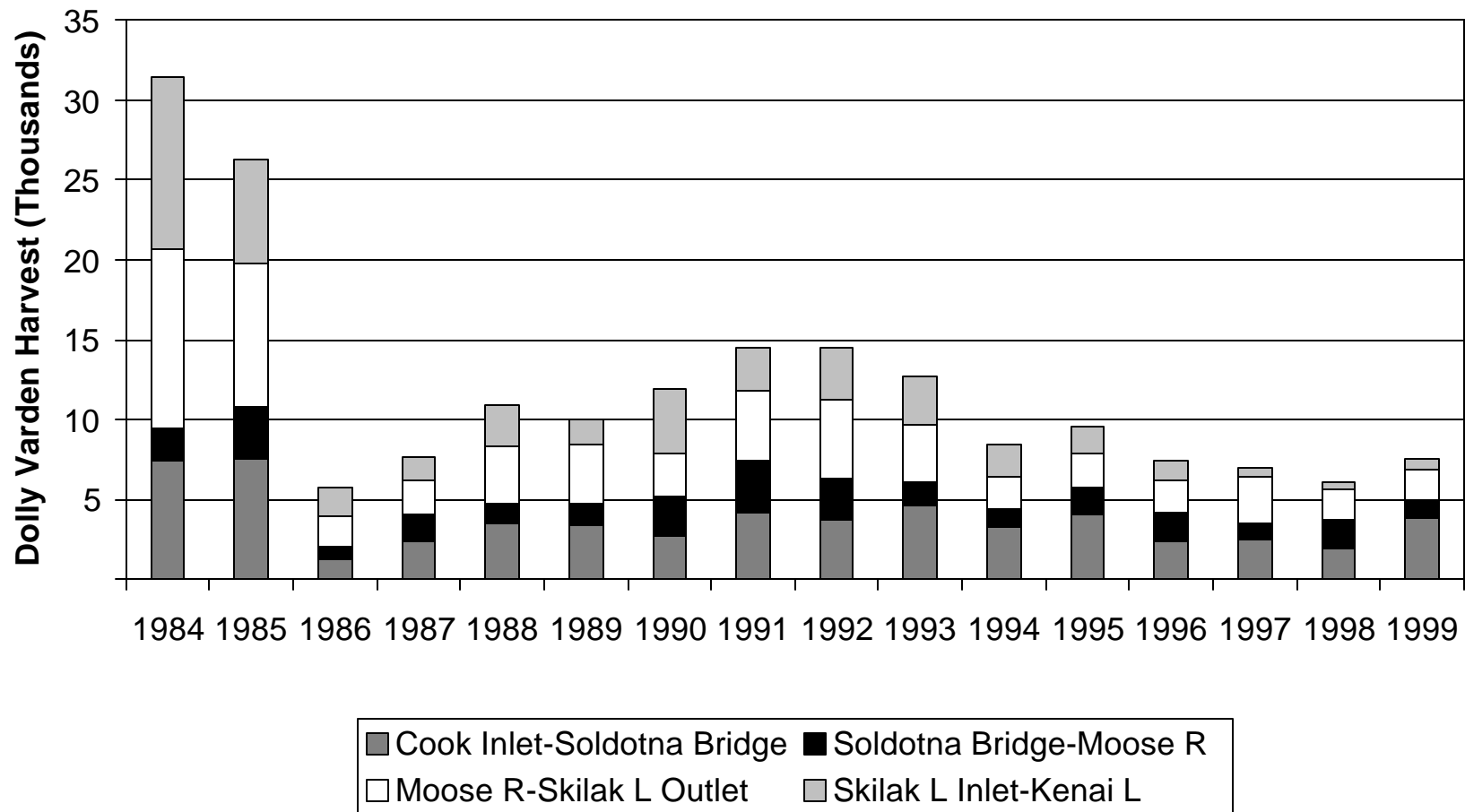


Figure 32.-Dolly Varden harvest by river section, Kenai River sport fishery, 1984-1999.

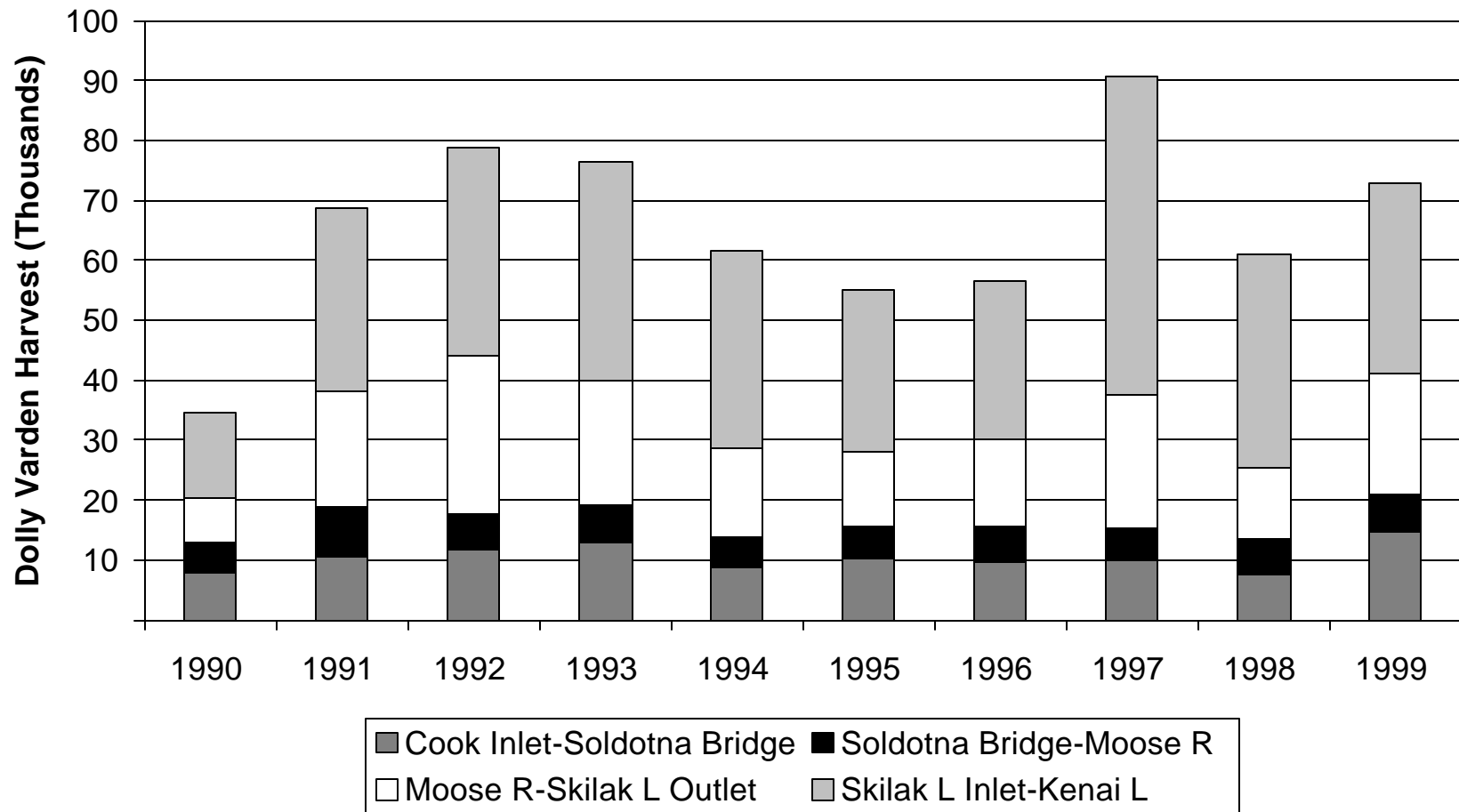


Figure 33.-Dolly Varden catch by river section, Kenai River sport fishery, 1990-1999.

Table 46.-Dolly Varden harvest and catch and effort for all species for Quartz Creek, Ptarmigan Creek, Kenai Lake, Russian River and Skilak Lake, 1984-1999.

Year	Ptarmigan Creek			Quartz Creek			Kenai Lake			Russian River			Skilak Lake		
	Effort ^a	Harvest	Catch	Effort ^a	Harvest	Catch	Effort ^a	Harvest	Catch	Effort ^a	Harvest	Catch	Effort ^a	Harvest	Catch
1984	1,857	2,120		2,530	3,791		502	224			1,072			0	
1985	988	1,387		451	121		607	69			399			0	
1986	1,483	2,508		4,146	1,605		NA ^b	76			826			0	
1987	942	417		5,361	181		580	109			72			91	
1988	1,946	527		3,965	1,292		855	546			473			110	
1989	790	628		4,893	2,399		377	134			361			438	
1990	2,041	1,041	4,081	5,655	2,842	8,672	1,042	302	926		760	2,290		187	583
1991	1,200	705	3,445	5,354	1,905	14,329	1,064	326	757		1,148	6,134		378	1,240
1992	1,750	1,188	4,342	7,906	2,441	9,864	1,536	98	236		664	3,629		172	1,352
1993	1,742	1,057	8,202	9,152	4,317	21,473	2,586	764	1,656		1,001	4,141		145	653
1994	1,425	296	1,877	7,241	2,175	11,702	2,524	443	1,017		595	4,443		233	772
1995	1,914	801	1,642	5,179	1,004	4,659	3,240	606	2,730		554	6,430		224	1,031
1996	336	0	231	3,018	339	3,186	878	48	230		135	5,983		146	1,311
1997	758	54	2,128	3,401	350	13,766	1,734	160	362		376	6,564		327	5,878
1998	701	185	4,195	3,166	396	16,990	520	25	67		73	5,957		17	214
1999	883	77	3,191	4,708	223	8,051	1,462	88	611		196	11,791		110	782

From: Mills 1985-1994, Howe et al. 1995, 1996, 2001 a-d; 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.

RECOMMENDED RESEARCH & MANAGEMENT

We recommend that the stock assessment project continues and that results to date be published. Continued research should focus on that area of the river between Kenai and Skilak lakes, as this area is experiencing a rapid growth in angler participation.

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.

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. Harvest information is obtained annually from the Statewide Harvest Survey (Table 47).

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.

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.

Table 47.-Kenai Peninsula lake trout harvest as determined by Statewide Harvest Survey, 1977-1999.

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
1996	1,199	0	11	1,131	325	157	385	332	3,540
1997	130	204	54	524	504	70	299	431	2,216
1998	117	66	361	550	355	239	181	546	2,415
Mean	492	98	120	1,279	379	171	366	887	3,323
1999	293	284	27	545	621	81	623	446	2,920

From: Mills 1979-1994, Howe et al. 1995, 1996, 2001 a-d.

^a Access restricted due to campground construction.

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 USF&WS creel surveys in 1992 and 1993, this translates to a potential maximum sustained harvest of 3,986 lake trout/year from Hidden Lake, much higher than the current average harvest of 1,279 lake trout/year.

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.

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.

A small number of anglers who fished Hidden Lake lake trout claimed they were burbot *Lota lota* 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 Kenai Peninsula fisheries is presented in Table 47. Total harvest from Northern Kenai Peninsula lake trout sport fisheries has remained relatively constant since 1997 (Figure 34). Harvests of lake trout from the Kenai River in 1998 (117) and 1999 (284) remain below the historic mean (492). Harvests of lake trout from the Kasilof River have been highly variable between years, with a historic mean harvest of approximately 1,000 fish. In 1998 and 1999, sport harvests of lake trout were 66 and 284, respectively. Lake trout harvests from Skilak Lake have ranged between a low of 74 in 1994 to a high of 710 in 1987, with a historic mean harvest of approximately 380 fish. In 1998 and 1999, harvests were 355 (approximately average) and 621, respectively. The 1999 harvest of lake trout from Skilak Lake during 1999 was the second largest on record since 1987. The mean harvest from Tustumena Lake is approximately half that of Kenai Lake. The 1998 harvest of lake trout from Tustumena Lake (239) was the second largest on record since 1988 (470). The 1999 harvest from Kenai Lake (623) was the largest on record since 1993 and is nearly double the historic average. Harvests from Hidden Lake remain quite variable, with recent harvests (1997-1999) exhibiting a marked decline.

It is on one hand encouraging to note that, based on the THV model, Hidden Lake harvests during 1998 and 1999 represented approximately 13.8% and 13.7% of maximum sustained yield. However, these harvests are significantly below the historic average and remain a concern to management staff.

OUTLOOK

Salmon fisheries on the Kenai Peninsula are becoming increasingly congested. Anglers are expected to seek alternate fisheries that 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.

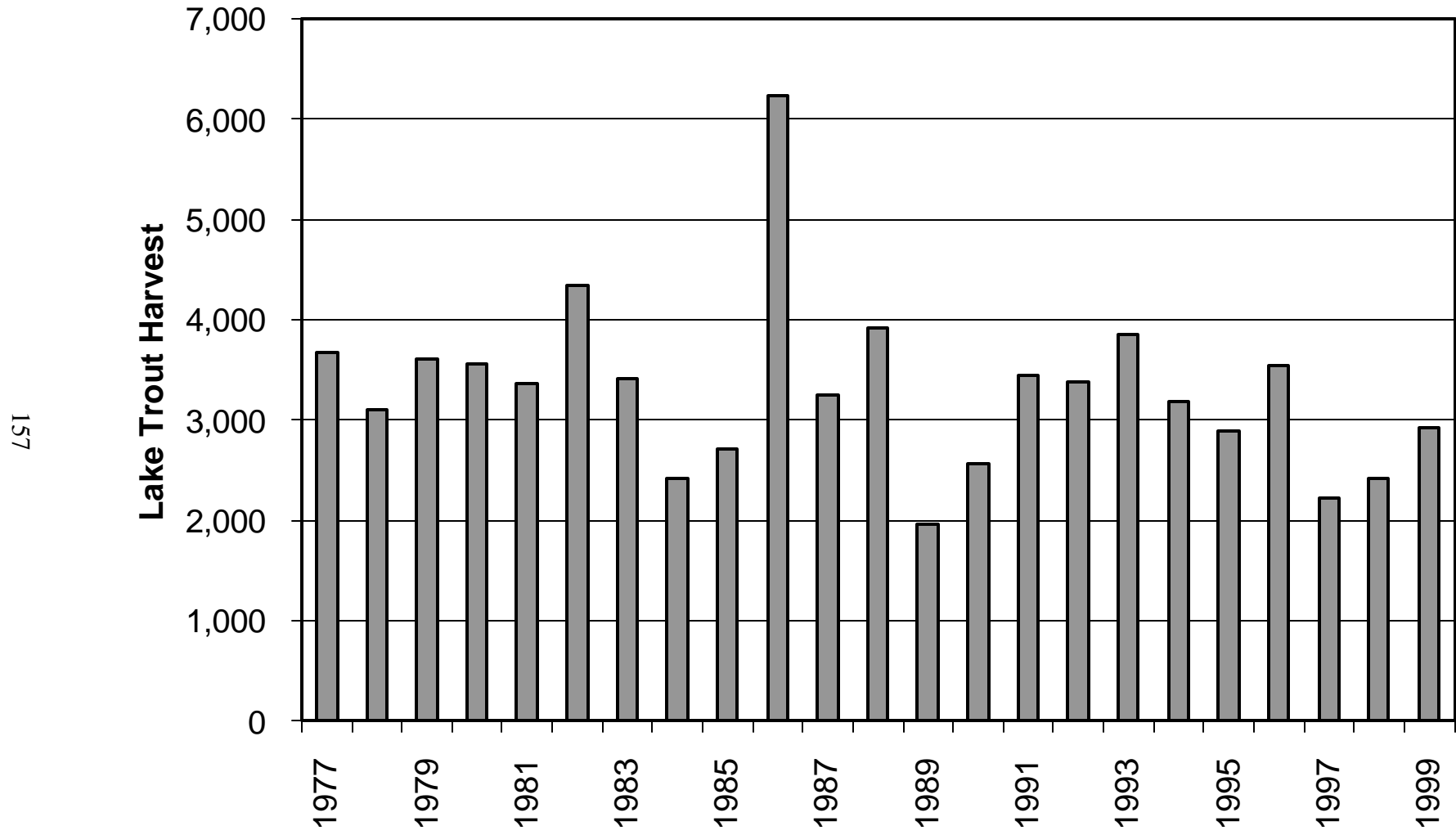


Figure 34.-Kenai Peninsula lake trout harvest, 1977-1999.

CURRENT ISSUES

Given November 1996 action by the Board to reduce lake trout harvests in Hidden Lake, there are currently 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

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. Although there are several promising sites, 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 48). 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 that 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

Table 48.-Kenai Peninsula lake stocking summary for nonanadromous fish, 1998 and 1999.

Lake	Nearest Community	Size (Acres)	Species Stocked	Stocking Schedule	Number Stocked
Arc	Soldotna	16	Coho	Annual	3,200
Aurora ^a	Sterling	8	Coho	Annual	2,000
Barbara	Nikiski	45	Rainbow	Even Years	11,000
Cabin	Nikiski	57	Rainbow	Annual	11,400
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	4,000
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	8,500
			Rainbow ^b	Annual	8,500
Long	Seward	15	Rainbow	Odd Years	4,000
Longmare	Soldotna	172	Coho ^c	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	9,000
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 Stocked with catchables.

^c Coho were first stocked in Longmare Lake in 1997; 34,000 rainbow trout were stocked previously.

large popular lakes that are also stocked with rainbow trout. Success of these stockings is evaluated through the Statewide Harvest Survey (Table 49).

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. This regulation impacts Carter, Jerome, Meridian, Long and Vagt lakes that are located within the drainage. They are, however, barriered to prevent egress and do not contain naturally-reproducing populations of rainbow trout.

RECENT FISHERY PERFORMANCE

Mean harvest and effort for the years 1998-1999 was 6,810 fish and 5,869 angler-days. Mean annual harvest and effort since 1983 has averaged 3,937 fish and 4,502 angler-days (Table 50, Figure 35). The largest reported harvest was in 1997 when 9,759 fish were harvested during 6,018 angler-days of fishing. There is wide variability in harvest and effort estimates for individual lakes from year to year due to the extremely small number of survey respondents used to make the estimates (three-quarters of the estimates are based on only one or two responses). 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.

Given reduced budgets during recent years, the viability of the stocked lakes program is in need of review. The entire program has provided for a harvest of only 3,900 fish annually and has produced only 4,500 angler-days of effort. Given the costs associated with this project, a comprehensive review may find the entire stocked lakes program cost ineffective.

RECOMMENDED RESEARCH & MANAGEMENT

Harvest and effort information will continue to be used to provide a minimal evaluation of the effectiveness of the lake stocking program. However, annual sampling of each lake would provide the necessary basis for scientific evaluation of survival and growth and in turn assist in revising stocking levels to match potential lake production and carrying capacity. Such a program is viewed as essential by area management staff and this research is planned to begin in 2002.

The stocked lake 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.

Table 49.-Kenai Peninsula stocked lakes harvest and effort as estimated by Statewide Harvest Survey, 1983-1999.

Lake	1999			1998			1997			1996			1995		
	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow
Arc	15	77					35	0					43	0	
Aurora															
Barbara															
Cabin							60		72	46		74	43		0
Carter	275		230	159		160	167		72	182		90	153		168
Cecille															
Centennial	91	15		28	0		47	59		182	485		101		
Chugach Estates															
Douglas	259		23	154		76	70		120	45		105	210		300
Elephant	674	356	537	1,013	3,744	534	1,559	2,174	1,234	931	2,207	505	1,303	369	100
Encelewski	15		35												
Island	75		23	851		212	120		96	540		329	69		111
Jerome	149		70	354		480	70		179	13			198		120
Johnson	1,712		2,525	1,264		2,217	1,672		1,747	1,822		1,637	3,033		1,485
Loon															
Long															
Longmare	298		187	725		203	343		758	153		11	1,445		1,210
Meridian				9		0									
Quintin															
Rainbow	172		0	184		282	90		106	272		68	447		311
Roque															
Scout	100	39		285	179		637	843		436	473		261	178	
Sport	674		245	420		358	381		663	330		431	412		197
Thetis	272		210												
Tirmore															
Troop				41		0									
Upper Summit	124		58	991		277	673		1,289	360		189	445		0
Vagt	246		93	110		176	94		347	68			41		20
Total	5,151	487	4,236	6,588	3,923	4,975	6,018	3,076	6,683	5,380	3,165	3,439	8,204	547	4,022
Total Coho and Rainbow Trout Harvest			4,723			8,898			9,759			6,604			4,569

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Table 49.-Page 2 of 4.

Lake	1994			1993			1992			1991			1990		
	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow
Arc	25	0		368	671										
Aurora															
Barbara															
Cabin	548		278	83		30	117		198						
Carter	374		159	218		129	310		158	147		31	181		104
Cecille															
Centennial	158	182		318	457		245	822							
Chugach Estates															
Douglas	757		358	36		30	416		245						
Elephant	847	1,186	554	13	0	0									
Encelewski															
Island	303		191	390		322				238			181		
Jerome	467		286	93		79	181		32	98		10	234		83
Johnson	2,564		2,190	1,505		648	1,152		689	1,573		491	1,786		1,156
Loon															
Long															
Longmare	851		99	127		79	597		364				66		156
Meridian															
Quintin															
Rainbow	519		393	593		647	373		277	49		0	33		0
Roque															
Scout	1,250	636		728	1,599		523	1,568		181	869		164	198	
Sport	959		403	330		287	758		641	272		178	33		0
Thetis															
Tirmore															
Troop															
Upper Summit	537		0	446		0	619		0	344		0	659		0
Vagt	356		327	232		208	299		103	521		523	393		833
Total	10,515	2,004	5,238	5,480	2,727	2,459	5,590	2,390	2,707	3,423	869	1,233	3,730	198	2,332
Total Coho and Rainbow Trout Harvest			7,242			5,186			5,097			2,102			2,530

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Table 49.-Page 3 of 4.

Lake	1989			1988			1987			1986			1985		
	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow
Arc	16	10													
Aurora															
Barbara															
Cabin	190		143	31		18	54		72				121		277
Carter				31		0	36		36	61		31	104		139
Cecille															
Centennial	219	105	10							122	34		17	87	
Chugach Estates															
Douglas															
Elephant															
Encelewski															
Island	209		67	291		509	91		36	183		107			
Jerome	48		0	93		18	471		36						
Johnson	314		67	2,729		545	677		109	496		367	711		434
Loon															
Long															
Longmare	114		10	309	364	55	199		308	153		92			
Meridian															
Quintin															
Rainbow	63		20	546		55				146		153	52		0
Roque															
Scout	724	352		55	327										
Sport				91		73	217		54	428		336			
Thetis															
Tirmore															
Troop															
Upper Summit				164			217			292			87		
Vagt	171		20	93		36	92		18	657		352	381		329
Total	2,068	467	337	4,433	691	1,309	2,054	0	669	2,538	34	1,438	1,473	87	1,179
Total Coho and Rainbow Trout Harvest			804			2,000			669			1,472			1,266

-continued-

Table 49.-Page 4 of 4.

Lake	1984			1983		
	Days Fished	Coho	Rainbow	Days Fished	Coho	Rainbow
Arc				51	63	
Aurora						
Barbara						
Cabin						
Carter	151		62	118		52
Cecille						
Centennial				17		
Chugach Estates						
Douglas						
Elephant						
Encelewski						
Island				337		
Jerome	117		87	169		199
Johnson	167		25	1,399		3,073
Loon						
Long						
Longmare						
Meridian						
Quintin						
Rainbow	84		125	84		105
Roque						
Scout	100			34		
Sport	17		62	84		63
Thetis						
Tirmore						
Troop						
Upper Summit	134			422		
Vagt	100		25	303		63
Total	870	0	386	3,018	63	3,555
Total Coho and Rainbow Trout Harvest			386			3,618

Note: These estimates are based on very few responses to the Statewide Harvest Survey (75% are based on only one or two responses), and are therefore not published in the Statewide Harvest Survey report. These estimates are from the SWHS database, Alaska Department of Fish and Game, Division of Sport Fish, Research and Technical Services, Anchorage.

Table 50.-Kenai Peninsula stocked lakes total harvest and effort, 1983-1999.

Year	Harvest	Effort (Angler-Days)
1983	3,618	3,018
1984	386	870
1985	1,266	1,473
1986	1,472	2,538
1987	669	2,054
1988	2,000	4,433
1989	804	2,068
1990	2,530	3,730
1991	2,102	3,423
1992	5,097	5,590
1993	5,186	5,480
1994	7,242	10,515
1995	4,569	8,204
1996	6,604	5,380
1997	9,759	6,018
1998	8,898	6,588
1999	4,723	5,151
Mean	3,937	4,502

NORTHERN PIKE RECREATIONAL FISHERY

FISHERY OBJECTIVE

This fishery is not specifically addressed in any management plan adopted by the Board of Fisheries. Northern pike were illegally introduced 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.

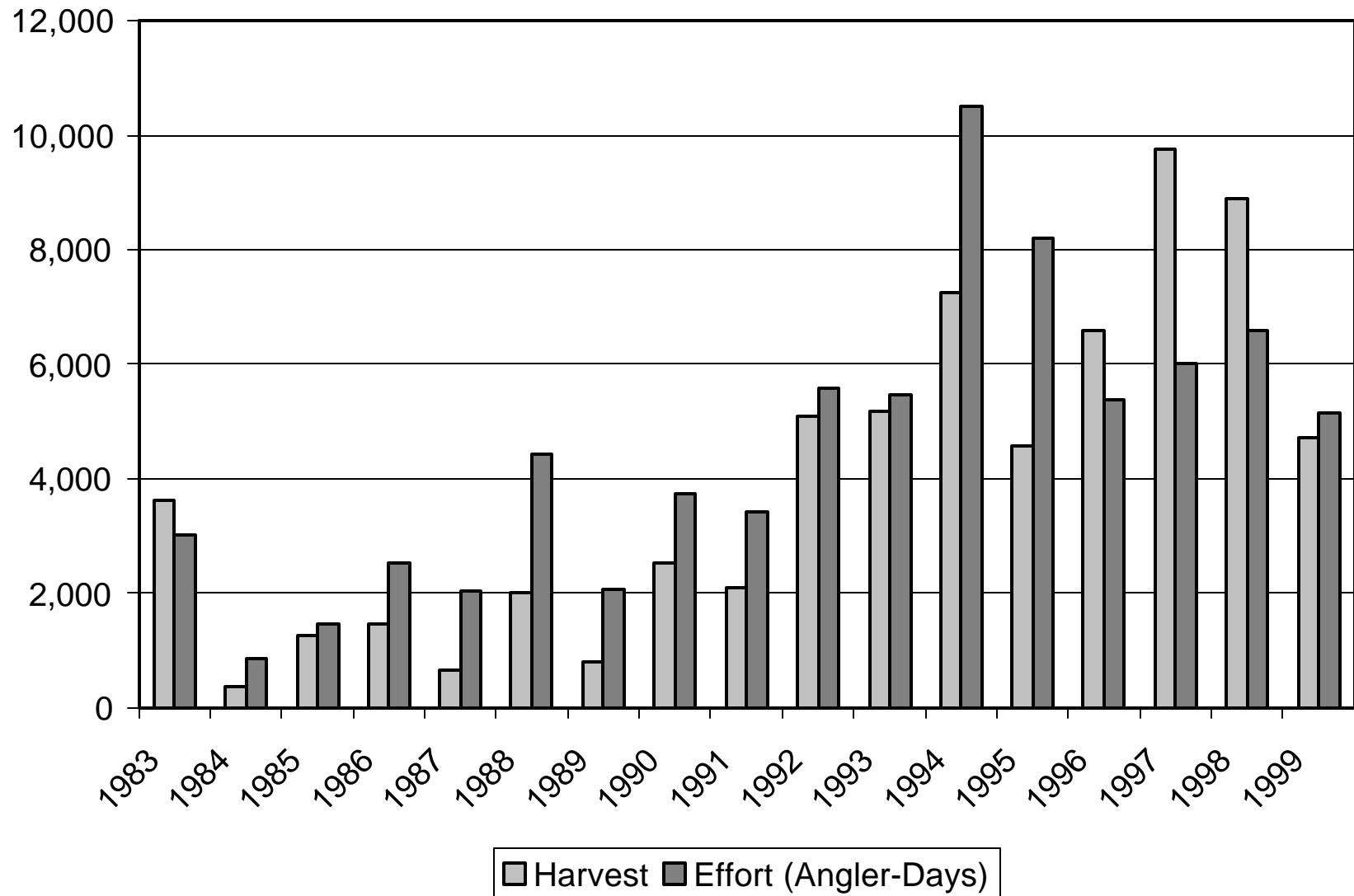


Figure 35.-Kenai Peninsula stocked lakes harvest and effort (angler-days), 1983-1999.

Pike are 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 51), 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.

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 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 51).

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 local residents introduced the pike. These lakes are fortunately 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 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 during recent board meetings.

RECENT FISHERY PERFORMANCE

The harvest estimate for pike in lakes during 1998 and 1999 was 114 and 329, respectively. According to the Statewide Harvest Survey, no pike were harvested in the Kenai River during either of these years; however, it is known that small numbers of pike were harvested during each of these years (Table 51). The large number of pike harvested from lakes during 1999 likely occurred in the Mackeys lakes. Local groups have promoted a growing privately organized derby for these fish on this system.

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 to date. Angler participation in this fishery is limited and with the exception of privately promoted fishing derbies, it 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.

Table 51.-Kenai Peninsula northern pike harvest, 1981-1999.

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	32	92	124
1997	21	7	28
1998	114	0	114
Mean	97	19	112
1999	329	0	329

From: Mills 1982-1994, Howe et al. 1995, 1996, 2001 a-d.

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 during earlier years, there were tentative plans to eradicate them with rotenone. Before this plan could be implemented, they had spread throughout the Soldotna Creek drainage. This drainage is extensive and is a tributary to the Kenai River; therefore chemical extermination 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

Because the Statewide Harvest Survey is unlikely to detect the true extent of distribution or abundance of pike in the Kenai River drainage, research directed at determining presence or absence and distribution of this species is recommended. Should pike become well established in the Moose River system, a system that to all good appearances would provide excellent habitat and abundant prey, overall production of coho salmon in the Kenai River drainage could be

severely impacted. It is currently the belief of the department that a significant portion of overall production of early and late stocks of coho salmon rears in this system. Given recent concern regarding the stock status of coho salmon stocks, it seems prudent to evaluate the status of pike in the Moose River drainage on a periodic basis. Although eradication of pike might not be possible, mitigating measures to contain the size and possibly the distribution of this species are feasible.

KENAI RIVER SOCKEYE SALMON DIP NET FISHERY

FISHERY OBJECTIVE

This fishery is managed under provisions of the Kenai River Late-run Sockeye Salmon Management Plan and the Upper Cook Inlet Personal Use Salmon Fishery Management Plan (5 AAC 77.545). The fishery objective is to implement provisions contained in the respective management plans. The fishery primarily targets sockeye salmon.

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 that estimates 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 event the minimum inriver escapement goal for sockeye salmon could not be projected.

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. This plan provided for a personal use dip net fishery in the Kenai and Kasilof rivers that targeted sockeye salmon and a personal use gillnet fishery in the marine waters at the mouth of the Kasilof River. 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; no other permits were required. The daily bag and possession limits were 6 sockeye salmon that were not in addition to other marine and freshwater sport fishing limits. Legal gear was confined to a dip net. Regulations restricted the fishery in the Kenai River to the lower section of the river downstream from the Warren Ames Bridge near the City of Kenai (Figure 36).

Prior to 1987, the Kenai River personal use dip net fishery occurred only in 1982 and 1983. Harvest is unknown in 1982, and only 7,562 sockeye were taken in 1983 (Table 52). 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

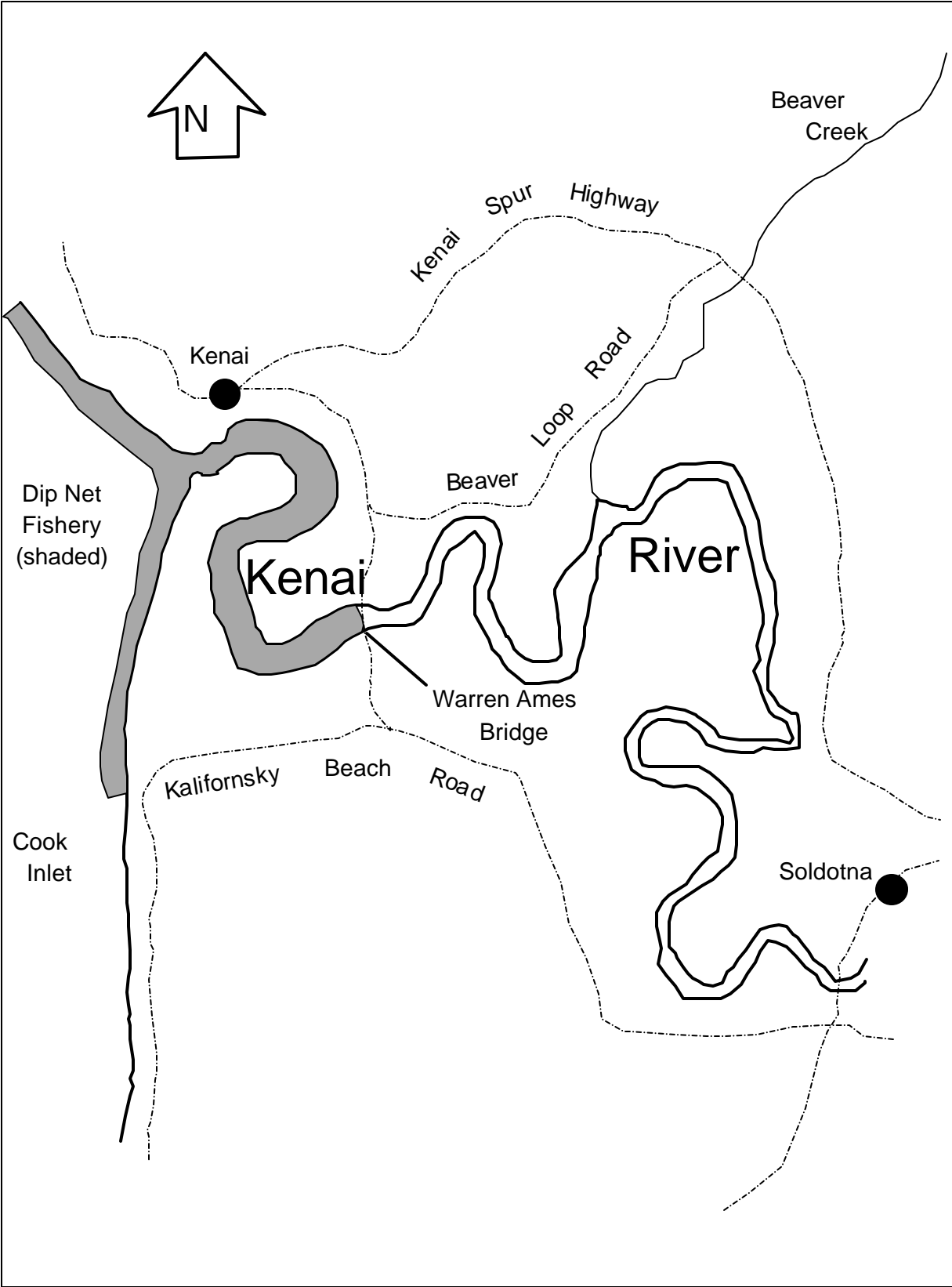


Figure 36.-The Kenai River sockeye salmon dip net fishery.

Table 52.-Kenai River personal use sockeye salmon dip net fishery summary, 1981-1999.

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	22,547
1988	7/22 18:00	8/ 5 24:00	14.25	260,000	16,880	6.5	1,000,000	1.7	26.0	29,013
1989	7/21 00:01	8/ 5 24:00	15.0	812,800	48,976	6.0	1,598,000	3.1	50.9	31,312
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	102,821	14.5	797,847	12.9	89.0	10,503
1997	7/10 00:01	7/31 24:00	22.0	666,928	114,619	16.1	1,064,818	10.8	62.6	11,023
1998	7/10 00:01	7/28 00:01	18.0	335,985	103,847	27.7	767,558	13.5	43.8	10,802
1999	7/10 00:01	7/31 24:00	22.0	569,941	149,504	27.7	803,379	18.6	70.9	13,738

^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). 1996-1999 reported harvest from returned permits, expanded to include permits not returned.

^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. 1996-1999 is household days fished. Each household day fished may include fishing effort by more than one household member named on the household's permit.

escapement exceeded 700,000 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 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 sockeye salmon 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 52). 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 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 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 52).

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. The full court vacated this stay 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 limits were 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 the 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 nonpermitted 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 that had permits but did not return them. The Statewide Harvest Survey (Howe et al. 1996) 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. People 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.

Regulations required that personal use dip net permits be returned to the department after the end of the season. 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.

During the February-March 1999 meeting of the Alaska Board of Fisheries, the north shore of the Kenai River from a department marker located at the end of Main Street in Kenai was closed to dipnetting from shore. This measure was adopted in response to increased erosion and habitat concerns in the “dunes” area encompassed by this regulation. In addition, the Board adopted a definition of “immediately” as to when personal use fish must be recorded on the harvest record. Under this definition, “immediately” means before concealing the salmon from plain view or transporting the salmon from the fishing site.

RECENT FISHERY PERFORMANCE

Participants in this personal use fishery are required to get a permit, and are required to return the permit to Fish and Game, regardless of whether they fished. Persons who do not comply with the reporting requirement are sent reminder letters to prompt their response. Since 1996, harvest and effort in the Kenai River personal use dip net fishery has been estimated from reported harvest on returned permits. All responses prior to the second reminder letter are treated as a census of “compliant” permits. Responses to the second (and up to fourth in some years) reminder letters are considered to be a sample of the “noncompliant” permits. Estimates of mean harvest and effort from the noncompliant permits are expanded by the known total number of noncompliant permits to generate the estimate of total noncompliant harvest and effort. This estimate is then added to the sum of the harvest and effort from the compliant permits to generate the estimate of total harvest for the fishery.

Total harvest of sockeye salmon during 1998 and 1999 was approximately 104,000 and 150,000, respectively (Table 53). Sockeye salmon harvest during 1999 was the largest personal use dip net harvest on record. Participation during 1998 and 1999 was approximately 10,800 and 13,700 household-days fished.

OUTLOOK

The board will next review this fishery at its February 2002 meeting. Harvest in 2000 is expected to approximate 1999 harvest. Participation is expected to display small, incremental growth.

Table 53.-Effort and harvest in Kenai River personal use dip net fishery, 1996-2000.

	All Upper Cook Inlet Personal Use Salmon Fisheries ^a			Kenai River					
	Permits Issued	Permits Returned	Did Not Fish	Household	Sockeye	Chinook	Coho	Pink	Chum
				Days Fished					
1996	14,576	13,452	4,408	10,503	102,821	295	1,932	2,404	175
1997	14,919	13,756	6,248	11,023	114,619	364	559	619	58
1998	15,535	13,190	5,539	10,802	103,847	254	1,011	1,032	85
1999	17,197	14,216	5,643	13,738	149,504	488	1,009	1,666	102
2000	16,107	13,582	5,745	12,354	98,262	410	1,449	1,457	193

^a One permit is issued for all four Upper Cook Inlet personal use salmon fisheries (Kenai River dip net, Kasilof River dip net, Kasilof River gillnet, and Fish Creek dip net).

CURRENT ISSUES

This fishery now opens and closes on dates specified in regulation. Opening the fishery by date rather than by sonar count has given the fishery a measure of predictability and consistency that was previously lacking. Allocation of the harvestable surplus of sockeye salmon remains an issue between commercial and personal use fishermen. Success rates in the personal use fishery generally decline during or immediately after commercial fishing periods in the eastside 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 are 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 City of Kenai owns the area on the north bank. Litter, fish waste and parking are problems here and on the south bank. 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 was threatening both property and structures. Much of this was addressed by the board during 1999 and is reflected in new regulations that closed approximately 1 mile of shoreline to dipnetting. These regulations became effective during the 1999 season.

RECOMMENDED RESEARCH & MANAGEMENT

No research or revised management strategies are recommended.

KASILOF RIVER PERSONAL USE DIP NET AND GILLNET FISHERIES

FISHERY OBJECTIVE

Regulation and management of this fishery are governed by the Upper Cook Inlet Personal Use Salmon Fishery Management Plan (5 AAC 77.545). The fishery objective is 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 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 coho 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 and parking spaces. 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.

A personal use gillnet fishery also occurs at the mouth of the Kasilof River, targeting sockeye salmon in June (Table 54). This fishery began in 1982. Since 1996 it has opened on June 16 and closed by emergency order issued by Commercial Fisheries Division when approximately 10,000-20,000 fish have been taken. The fishery usually lasts about 9 days, but may close earlier. The gillnet fishery is included in the Upper Cook Inlet personal use fishery management plan. Harvest in the gillnet fishery counts towards the permit holder's total allowable harvest in all four upper Cook Inlet personal use fisheries (Kenai dip net, Kasilof dip net, Fish Creek dip net, and Kasilof gillnet). In the gillnet fishery, participants are allowed to keep all the chinook salmon that they catch. The fishery is monitored inseason by Commercial Fisheries Division and is discussed in the Commercial Fisheries Division annual management report (Fox and Shields 2001). Final estimates of harvest and effort since 1996 have been made by expanding known returned permits to include permits not returned.

Table 54.-Effort and harvest in Kasilof River personal use dip net fishery, 1996-2000.

	All Upper Cook Inlet Personal Use Salmon Fisheries ^a			Kasilof River Dip Net Fishery					
	Permits Issued	Permits Returned	Did Not Fish	Household Days Fished	Sockeye	Chinook	Coho	Pink	Chum
1996	14,576	13,452	4,408	1,300	11,197	50	334	103	17
1997	14,919	13,756	6,248	1,091	9,737	35	90	19	19
1998	15,535	13,190	5,539	3,421	45,161	134	731	610	74
1999	17,197	14,216	5,643	3,611	37,176	127	286	264	52
2000	16,107	13,582	5,745	2,622	23,877	134	1,004	841	34

Note: One permit is issued for all four Upper Cook Inlet personal use salmon fisheries (Kenai River dip net, Kasilof River dip net, Kasilof River gill net, and Fish Creek dip net).

In 1981 and 1982 harvest and angler participation in the dip net fishery were determined by creel census. Because the fishery is managed by monitoring sonar counts above the fishery, the creel survey was deemed unnecessary and was discontinued. Harvest and estimates of angler participation were determined by the Statewide Harvest Survey through 1995 (Mills 1982-1994, Howe et al. 1995, 1996) and by returned permits in 1996 through 1999.

From 1981 through 1988 the Kasilof River dip net fishery (Figure 37) 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 open time period. Of the total number of sockeye salmon to enter the river during the years 1981 to 1988, this personal use fishery harvested 1% to 14%, averaging 5.3% annually. Approximately 44% of the sockeye salmon to enter the river were available to personal use dip net fishermen (Table 55).

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 during 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. The allowable days and times subsistence dipnetting occurred was provided for by 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. The Board therefore amended the Cook Inlet Personal

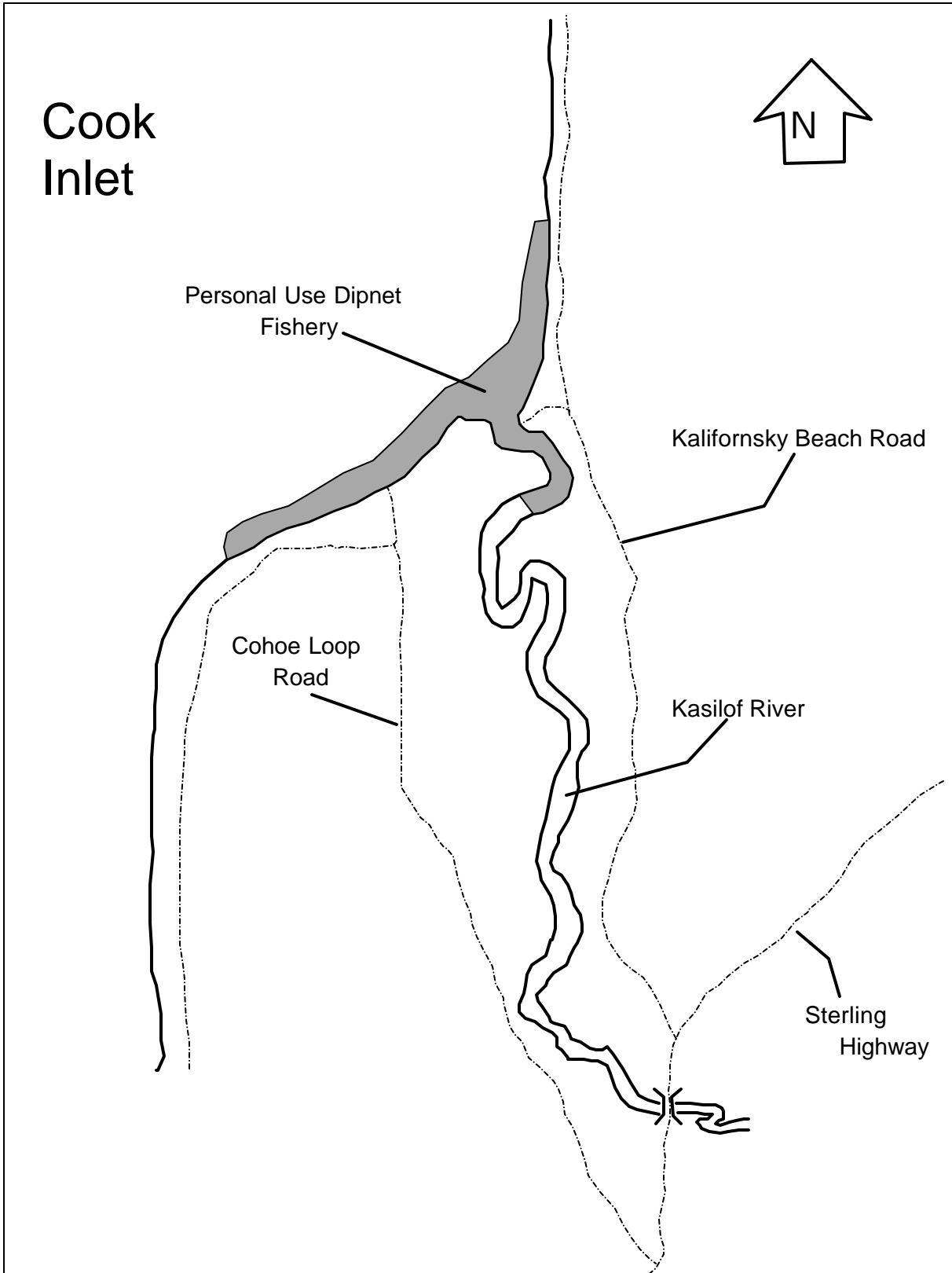


Figure 37.-The Kasilof River personal use sockeye salmon dip net fishery.

Table 55.-Kasilof River personal use dip net fishery summary, 1981-1999.

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) ^c
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	4,417
1984	7/16 12:00	8/ 5 24:00	20.50	126,930	12,771	10.1	231,690	5.5	54.8	5,956
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	13,929
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	11,197	9.5	249,944	4.5	47.2	1,300
1997	7/10 00:01	8/5 24:00	27.0	78,237	9,737	12.4	266,025	3.7	29.4	1,091
1998	7/10 00:01	8/5 24:00	27.0	157,368	45,161	28.7	273,151	16.5	57.6	3,421
1999	7/10 00:01	8/5 24:00	27.0	174,948	37,176	21.2	312,587	11.9	56.0	3,611
Mean			21.14	117,270	16,000	14.3	236,510	5.9	41.5	5,142

^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). 1996-1999 total reported harvest from returned permits, expanded to include permits not returned.

^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. 1996-2000 is household days fished. Each household day fished may include fishing effort by more than one household member named on the household's permit.

Use Salmon Dip Net Fishery Management Plan. The revised plan stated 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, reopening 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 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 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 1. By this late date there were insufficient sockeye salmon entering the river to prosecute a successful dip net fishery, and as a result, 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. The full court vacated this stay 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 limits were 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. The department adopted a trigger sonar count of 150,000 for the 1994 fishery. This was apparently an administrative error; the intent was to use the same 250,000 trigger as in 1992. 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 dip netting 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 55).

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 nonpermitted fishery closed July 31, with a total fishing time of 10.25 days (Table 55).

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 nonpermitted) 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. 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 department permit was required and the seasonal limit described above was applicable. The area open was identical to prior years (from the commercial fishing regulatory markers in Cook Inlet upstream for 1 mile). 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.

Regulations required that permits 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 through 1999 fisheries.

RECENT FISHERY PERFORMANCE

Participants in this personal use fishery are required to get a permit, and are required to return the permit to Fish and Game, regardless of whether they fished. Persons who do not comply with the reporting requirement are sent reminder letters to prompt their response. Since 1996, harvest and effort in the Kenai River personal use dip net and gillnet fishery have been estimated from reported harvest on returned permits. All responses prior to the second reminder letter are treated as a census of “compliant” permits. Responses to the second (and up to fourth in some years) reminder letters are considered to be a sample of the “noncompliant” permits. Estimates of mean harvest and effort from the noncompliant permits are expanded by the known total number of noncompliant permits to generate the estimate of total noncompliant harvest and effort. This estimate is then added to the sum of the harvest and effort from the compliant permits to generate the estimate of total harvest for each fishery.

Harvest and effort during 1998 and 1999 were estimated from returned permits (Tables 54 and 56). Total dip net harvest of sockeye salmon during 1998 and 1999 was approximately 45,000 and 37,000 fish, respectively. Sockeye salmon harvest during 1998 was the largest personal use

Table 56.-Kasilof personal use gillnet harvest, 1982-2000.

Year	Sockeye	Chinook	Coho	Pink	Chum	Household Days Fished
1982	7,543	372	24	17	0	0
1983	8,846	307	0	0	0	0
1984	12,926	165	0	0	0	0
1985	10,746	203	0	0	0	0
1986	9,609	168	0	0	0	0
1987	9,375	184	0	0	0	0
1988	9,803	118	0	0	0	0
1989	9,928	186	0	0	0	0
1990	7,123	133	0	0	0	0
1991	8,380	34	0	0	0	0
1992						
1993	7,942	47	0	0	0	0
1994						
1995						
1996	9,506	46	0	8	1	582
1997	17,997	65	1	102	3	815
1998	15,975	126	0	15	12	1,075
1999	12,832	442	25	10	10	1,287
2000	14,774	514	9	17	10	1,252

Note: From 1982-1993 the fishery opened June 21 and was closed by emergency order when 5,000-10,000 fish were harvested. Harvest was estimated from daily counts of nets, combined with daily on-site interviews to determine average catch per net for sockeye and chinook salmon (Ruesch and Fox 1992; Fox and Shields 2001, Appendix A15). From 1996-present the fishery opens June 16 and is closed by emergency order when 10,000-20,000 fish have been harvested. Harvest is estimated by expanding known harvest from returned permits to include permits not returned.

dip net harvest on record. Participation during 1998 and 1999 was approximately 3,400 and 3,200 man-days fished. These estimates approximately triple estimates of harvest during 1996 and 1997. Total gillnet harvest of sockeye salmon during 1998 and 1999 was approximately 16,000 and 13,000 fish, respectively.

OUTLOOK

The board will next review this fishery at its spring 2002 meeting. Regulation of the 2000 fishery will be identical to 1998 and 1999. Harvest in 2000 is expected to approximate the 1999 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 by count has given the fishery a measure of predictability and consistency that was previously lacking. 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 ESSN 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 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 led 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 Fisheries 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). This was done 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 "non-subsistence areas" provision was unconstitutional. The UCI Subsistence Salmon Management Plan was readopted in April 1994.
21. In early May of 1995 the Alaska Supreme Court ruled in Kenaitze vs. Alaska and reestablished the "non subsistence 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. The department, in cooperative negotiations, has developed regulations with the Kenaitze Tribe 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 57 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 57 by species and stock.

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.

Table 57.-Harvest in the Kenaitze Tribal Educational Fishery, 1989-1999.

Year	Early- Run Chinook	Percent of Total	Late- Run Chinook	Percent of Total	Early- Run Sockeye	Percent of Total	Late- Run Sockeye	Percent of Total	Early- Run Coho	Percent of Total	Late- Run Coho	Percent of Total	Pink Salmon	Percent of Total	Total Salmon
1989															4,121
1990															4,973
1991															4,948
1992															3,987
1993															2,156
1994	56	1.9	1	0.0	436	14.9	1,471	50.3	346	11.8	483	16.5	134	4.6	2,927
1995	37	1.5	3	0.1	130	5.3	1,368	56.0	275	11.3	593	24.3	35	1.4	2,441
1996	104	3.3	1	0.0	953	30.3	1,289	40.9	261	8.3	331	10.5	211	6.7	3,150
1997	122	4.4	20	0.7	922	33.6	1,488	54.1	28	1.0	163	5.9	5	0.2	2,748
1998	131	3.8	2	0.1	971	28.1	1,650	47.8	252	7.3	386	11.2	58	1.7	3,450
1999	114	4.4	4	0.2	455	17.5	1,489	57.3	258	9.9	272	10.5	5	0.2	2,597
Mean	94	3.2	5	0.2	645	21.6	1,459	51.1	237	8.3	371	13.1	75	2.5	3,409

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 57 by species and stock.

Permit stipulations in 1997 were the same as 1996 with an additional 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 57 by species and stock. The 1997 harvest was therefore the third lowest recorded in the 9-year history of the fishery (Table 57).

Permit stipulations in 1998 and 1999 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 reopened August 3. Seasonal harvest as reported by the Tribe in 1998 was 3,450 salmon (Table 57, Figure 38). The greatest proportion of this harvest was composed of early- (28%) and late-run (48%) sockeye salmon stocks (Table 57). In 1999, the total harvest was reported as 2,597 salmon. Again, the greatest proportion of this harvest was composed of early- (18%) and late-run (57%) sockeye salmon stocks. Coho salmon stocks comprised the third largest proportion during both years.

OUTLOOK

Total harvest of salmon from the Kenaitze Educational Tribal Council fishery has remained relatively constant during the past several years despite fluctuations in total sockeye salmon return. It is clear that effort in this fishery is directed at achieving a harvest commensurate with educational needs and is not associated with abundance. Therefore, harvest during subsequent years will likely remain similar unless these needs change.

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.

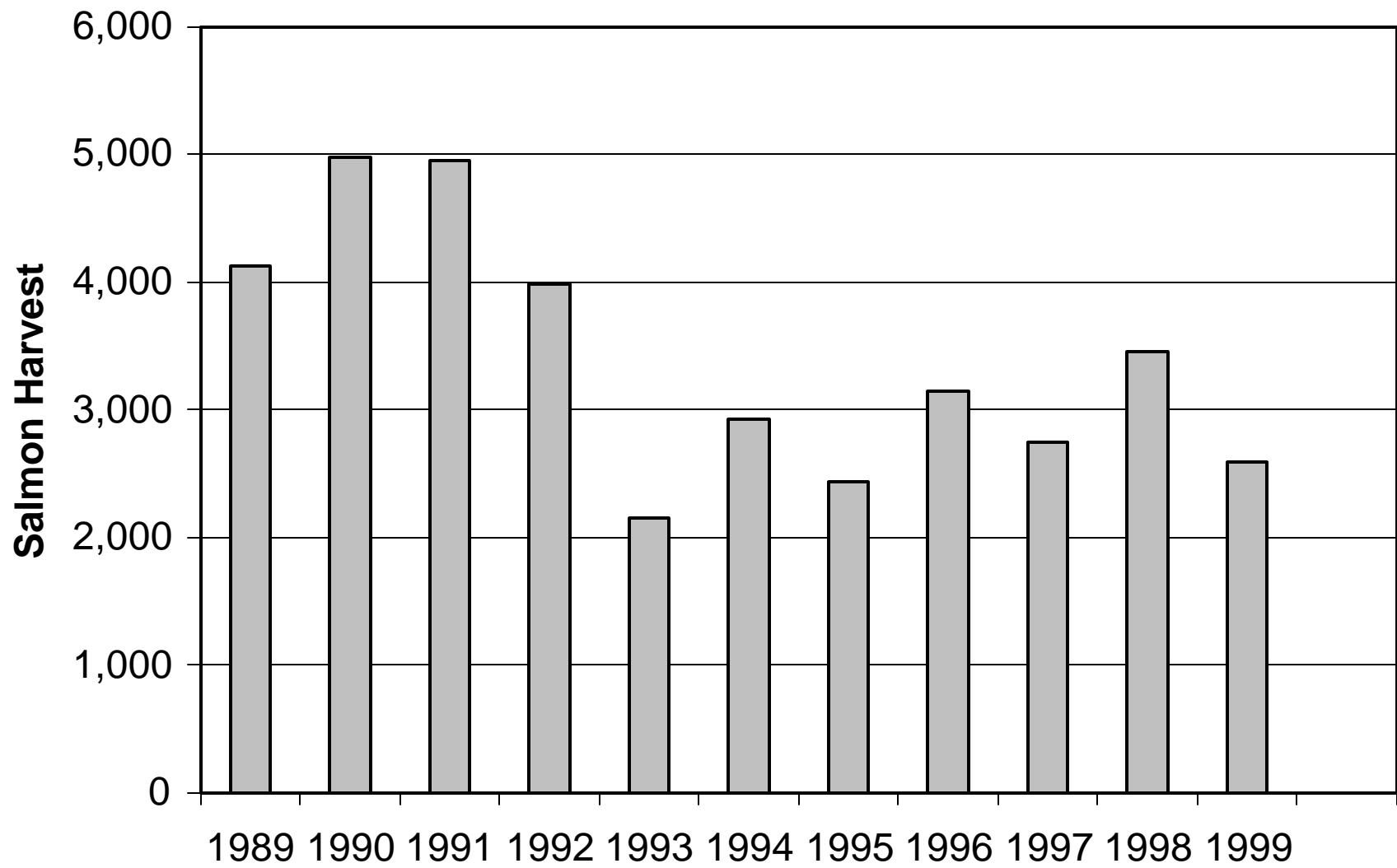


Figure 38.-Total salmon harvest in the Kenaitze Tribal Educational Fishery, 1989-1999.

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. To all apparent purposes, the general public has come to accept this fishery as an integral part of overall fisheries on the Kenai Peninsula. The future of federal management of subsistence fisheries will likely impact or eliminate this fishery if subsistence fisheries are implemented on the Kenai Peninsula.

RECOMMENDED RESEARCH & MANAGEMENT

No research or management activity specific to this fishery is recommended.

LITERATURE CITED

- ADF&G (Alaska Department of Fish and Game). 1986. Cook Inlet and Copper River Basin rainbow/steelhead trout management policy. Located at: Alaska Department of Fish and Game, Division of Sport Fish, 333 Raspberry Road, Anchorage.
- ADF&G (Alaska Department of Fish and Game). 1999. Statewide stocking plan for recreational fisheries, Anchorage. Located at: Alaska Department of Fish and Game, Division of Sport Fish, 333 Raspberry Road, Anchorage.
- Bosch, D. and D. Burwen. 1999. Estimates of chinook salmon abundance in the Kenai River using split-beam sonar, 1997. Alaska Department of Fish and Game, Fishery Data Series No. 99-3, Anchorage.
- Bosch, D. and D. Burwen. 2000. Estimates of chinook salmon abundance in the Kenai River using split-beam sonar, 1998. Alaska Department of Fish and Game, Fishery Data series No. 00-12, Anchorage.
- Bosch, D., D. Burwen, J. D. Miller. In prep. Estimates of chinook salmon abundance in the Kenai River using split-beam sonar, 1999. Fishery Data series, Anchorage.
- Brannian, L. and J. Fox. 1996. Upper Cook Inlet subsistence and personal use fisheries, report to the Alaska Board of Fisheries, 1996. Regional Information Report No. 2A96-03. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Anchorage.
- Burwen, D. and D. Bosch. 1998. Estimates of chinook salmon abundance in the Kenai River using split-beam sonar, 1996. Alaska Department of Fish and Game, Fishery Data Series No. 98-2, Anchorage.
- Burwen, D. L. and S. J. Fleischman. 1998. Evaluation of side-aspect target strength and pulse width as potential hydroacoustic discriminators of fish species in rivers. *Canadian Journal Fisheries and Aquatic Science* 55: 2492-2502.
- Carlson, J. A. 2000. Assessment of coho salmon from the Kenai River, Alaska, 1997. Alaska Department of Fish and Game, Fishery Data Series No. 00-15, Anchorage.
- Carlson, J. A. and J. J. Hasbrouck. 1996. Estimated harvest of coho salmon of Kenai River origin in commercial fisheries of Upper Cook Inlet, Alaska, 1993-1994. Alaska Department of Fish and Game, Fishery Data Series No. 96-7, Anchorage.
- Carlson, J. A. and J. J. Hasbrouck. 1997. Assessment of coho salmon from the Kenai River, Alaska, 1995. Alaska Department of Fish and Game, Fishery Data Series No. 97-7, Anchorage.
- Carlson, J. A. and J. J. Hasbrouck. 1998. Assessment of coho salmon from the Kenai River, Alaska, 1996. Alaska Department of Fish and Game, Fishery Data Series No. 98-4, Anchorage.
- Conrad, R. H. and S. L. Hammarstrom. 1987. Harvest of chinook salmon *Oncorhynchus tshawytscha* and coho salmon *O. kisutch* and angler effort by the lower Kenai River recreational fisheries, 1986. Alaska Department of Fish and Game, Fishery Data Series No. 6, Juneau.
- Clark, R., R. Lafferty, G. Sandone, P. Cyr, and J. Hasbrouck. 2000. Stock status of coho salmon in upper Cook Inlet. Report to the Alaska Board of Fisheries. Located at: Alaska Department of Fish and Game, Division of Sport Fish, 333 Raspberry Road, Anchorage.
- Davis, R. Z. 2000a. Upper Cook Inlet salmon escapement studies 1998. Alaska Department of Fish and Game, Commercial Fisheries Division, RIR No. 2A00-09, Anchorage.
- Davis, R. Z. 2000b. Upper Cook Inlet salmon escapement studies 1999. Alaska Department of Fish and Game, Commercial Fisheries Division, RIR No. 2A00-22, Anchorage.
- Fox, J. and P. Shields. 2000. Upper Cook Inlet commercial fisheries annual management report, 1999. Alaska Department of Fish and Game, Commercial Fisheries Division. Regional Information Report No. 2A00-29, Anchorage.

LITERATURE CITED (Continued)

- Fox, J. and P. Shields. 2001. Upper Cook Inlet commercial fisheries annual management report, 2000. Alaska Department of Fish and Game, Commercial Fisheries Division. Regional Information Report No. 2A01-02, Anchorage.
- Hammarstrom, S. L. 1988. Angler effort and harvest of chinook salmon *Oncorhynchus tshawytscha* and coho salmon *O. kisutch* by the recreational fisheries in the lower Kenai River, 1987. Alaska Department of Fish and Game, Fishery Data Series No. 50, Juneau.
- Hammarstrom, S. L. 1989. Angler effort and harvest of chinook salmon and coho salmon by the recreational fisheries in the lower Kenai River, 1988. Alaska Department of Fish and Game, Fishery Data Series No. 100, Juneau.
- Hammarstrom, S. L. 1990. Angler effort and harvest of chinook salmon and coho salmon by the recreational fisheries in the lower Kenai River, 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-22, Anchorage.
- Hammarstrom, S. L. 1991. Angler effort and harvest of chinook salmon and coho salmon by the recreational fisheries in the lower Kenai River, 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-44, Anchorage.
- Hammarstrom, S. L. 1992. Angler effort and harvest of chinook salmon and by the recreational fisheries in the lower Kenai River, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-25, Anchorage.
- Hammarstrom, S. L. 1993. Angler effort and harvest of chinook salmon by the recreational fisheries in the lower Kenai River, 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-40, Anchorage,
- Hammarstrom, S. L. 1994. Angler effort and harvest of chinook salmon by the recreational fisheries in the lower Kenai River, 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-7, Anchorage.
- Hammarstrom, S. L. and J. J. Hasbrouck. 1998. Estimation of the abundance of late-run chinook salmon in the Kenai River based on exploitation rate and harvest, 1996. Alaska Department of Fish and Game, Fishery Data Series No. 98-6, Anchorage.
- Hammarstrom, S. L. and J. J. Hasbrouck. 1999. Estimation of the abundance of late-run chinook salmon in the Kenai River based on exploitation rate and harvest, 1997. Alaska Department of Fish and Game, Fishery Data Series No. 99-8, Anchorage.
- Hammarstrom, S. L. and L. L. Larson. 1986. Cook Inlet chinook and coho salmon studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1985-1986, Project F-10-1, 27 (S-32-1,2,4,5), Juneau.
- Hammarstrom, S. L., and L. S. Timmons. 2001a. Stock assessment of early-run chinook salmon of the Kenai River, 1997 and 1998. Alaska Department of Fish and Game, Fishery Data Series No. 01-4, Anchorage.
- Hammarstrom, S. L., and L. S. Timmons. 2001b. Stock assessment of late-run chinook salmon of the Kenai River, 1997 and 1998. Alaska Department of Fish and Game, Fishery Data Series No. 01-5, Anchorage.
- Hayes, S. R. and J. J. Hasbrouck. 1996. Stock assessment of rainbow trout in the upper Kenai River, Alaska, in 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-43, Anchorage.
- Howe, A. L., G. Fidler, A. E. Bingham, and M. J. Mills. 1996. Harvest, catch and participation in Alaska sport fisheries during 1995. Alaska Department of Fish and Game, Fishery Data Series No 96-32, Anchorage.
- Howe, A. L., G. Fidler, and M. J. Mills. 1995. Harvest, catch, and participation in Alaska sport fisheries during 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-24, Anchorage.
- Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001a. Revised Edition: Harvest, catch, and participation in Alaska sport fisheries during 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-29 (revised), Anchorage.

LITERATURE CITED (Continued)

- Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001b. Revised Edition: Harvest, catch, and participation in Alaska sport fisheries during 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-25 (revised), Anchorage.
- Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001c. Revised Edition: Participation, catch, and harvest in Alaska sport fisheries during 1998. Alaska Department of Fish and Game, Fishery Data Series No. 99-41 (revised), Anchorage
- Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001d. Participation, catch, and harvest in Alaska sport fisheries during 1999. Alaska Department of Fish and Game, Fishery Data Series No. 01-8, Anchorage
- ISER (Institute of Social and Economic Research. 1996. Economic effects of management changes for Kenai River late-run sockeye. Prepared for Alaska Department of Fish and Game. University of Alaska, Anchorage.
- Jaenicke, M., D. Bosch, L. Coggins, L. Fair, and R. E. Minard. 1996. Evaluation of a thermal habitat volume model for estimation of sustained yield for lake trout in selected lakes of southwest Alaska, 1994-95. Alaska Department of Fish and Game, Fishery Data Series No. 96-40, Anchorage.
- Jones & Stokes Associates, Inc. 1987. Southcentral Alaska sport fishing economic study. Final research report. November 1987. (ISA86-0413.) Sacramento, CA. Prepared for Alaska Department of Fish and Game, Sport Fish Division, Research and Technical Services Section, Anchorage, AK.
- King, M. 1995. Angler effort and harvest of chinook salmon by the recreational fisheries in the lower Kenai River, 1994. Alaska Department of Fish and Game, Fishery Data Series, No. 95-12, Anchorage.
- King, M. 1996. Angler effort and harvest of chinook salmon by the recreational fisheries in the lower Kenai River, 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-22, Anchorage.
- King, M. 1997. Angler effort and harvest of chinook salmon by the recreational fisheries in the lower Kenai River, 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-9, Anchorage.
- Kyle, G. B., and D. S. Litchfield. 1989. Enhancement of Crooked Creek chinook salmon (*Oncorhynchus tshawytscha*) and development of a sport fishery on the Kasilof River. Alaska Department of Fish and Game, Division of Fisheries Rehabilitation, Enhancement and Development, Report Number 97, Juneau.
- Lafferty, R. 1989. Population dynamics of rainbow trout, Kenai River, Alaska. Master's thesis, University of Alaska, Juneau.
- Liepitz, G. S. 1994. An assessment of the cumulative impacts of development and human uses on fish habitat in the Kenai River. Technical Report 94-6. Alaska Department of Fish and Game, Habitat and Restoration Division, Anchorage.
- Marsh, L. E. 1996. Catch and effort statistics for the sockeye salmon sport fishery during the early run to the Russian River with estimates of escapement, 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-38.
- Marsh, L. E. 1999. Angler effort and harvest of chinook salmon by the recreational fisheries in the lower Kenai River, 1997. Alaska Department of Fish and Game, Fishery Data Series No. 99-4, Anchorage.
- Marsh, L. E. 2000. Angler effort and harvest of chinook salmon by the recreational fisheries in the lower Kenai River, 1998. Fishery Data Series No. 00-21, Anchorage.
- Mills, M. J. 1979. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1978-1979, Project F-9-11, 20 (SW-1-A). Juneau.
- Mills, M. J. 1980. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980, Project F-9-12, 21 (SW-1-A). Juneau.
- Mills, M. J. 1981a. Alaska statewide sport fish harvest studies (1979). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (SW-1-A). Juneau.

LITERATURE CITED (Continued)

- Mills, M. J. 1981b. Alaska statewide sport fish harvest studies (1980). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (SW-1-A). Juneau.
- Mills, M. J. 1982. Alaska statewide sport fish harvest studies (1981). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1981-1982, Project F-9-14, 23 (SW-1-A). Juneau.
- Mills, M. J. 1983. Alaska statewide sport fish harvest studies (1982). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24 (SW-1-A). Juneau.
- Mills, M. J. 1984. Alaska statewide sport fish harvest studies (1983). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1983-1984, Project F-9-16, 25 (SW-1-A). Juneau.
- Mills, M. J. 1985. Alaska statewide sport fish harvest studies (1984). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1984-1985, Project F-9-17, 26 (SW-1-A). Juneau.
- Mills, M. J. 1986. Alaska statewide sport fish harvest studies (1985). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1985-1986, Project F-10-1, 27 (RT-2). Juneau.
- Mills, M. J. 1987. Alaska statewide sport fisheries harvest report 1986. Alaska Department of Fish and Game, Fishery Data Series No. 2, Juneau.
- Mills, M. J. 1988. Alaska statewide sport fisheries harvest report 1987. Alaska Department of Fish and Game, Fishery Data Series No. 52, Juneau.
- Mills, M. J. 1989. Alaska statewide sport fisheries harvest report 1988. Alaska Department of Fish and Game, Fishery Data Series No. 122, Juneau.
- Mills, M. J. 1990. Harvest and participation in Alaska sport fisheries during 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-44, Anchorage.
- Mills, M. J. 1991. Harvest, catch, and participation in Alaska sport fisheries during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-5, Anchorage.
- Mills, M. J. 1992. Harvest, catch, and participation in Alaska sport fisheries during 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-40, Anchorage.
- Mills, M. J. 1993. Harvest, catch, and participation in Alaska sport fisheries during 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-42, Anchorage.
- Mills, M. J. 1994. Harvest, catch, and participation in Alaska sport fisheries during 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-28, Anchorage.
- Payne, N. R., R. M. Korver, D. S. MacLennan, S. J. Nepszy, B. J. Shiter, T. J. Stewart, and E. R. Thomas. 1990. The harvest potential and dynamics of lake trout populations in Ontario. Lake Trout Synthesis Population Dynamics Working Group, Ontario Ministry of Natural Resources.
- Ruesch, P. H. and J. Fox. 1992. Upper Cook Inlet commercial fisheries annual management report, 1991. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A92-03. Anchorage.
- Ruesch, P. H. and J. Fox. 1995. Upper Cook Inlet commercial fisheries annual management report, 1994. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report No. 2A95-26. Anchorage.
- Ruesch, P. H. and J. Fox. 1996. Upper Cook Inlet commercial fisheries annual management report, 1995. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report No. 2A96-27. Anchorage.
- Ruesch, P. H. and J. Fox. 1999. Upper Cook Inlet commercial fisheries annual management report, 1998. Alaska Department of Fish and Game, Commercial Fisheries Division. Regional Information Report No. 2A99-21, Anchorage.

LITERATURE CITED (Continued)

Vincent-Lang, D. and J. A. Carlon. 1991. Development and implementation of escapement goals for the early return of sockeye salmon to the Russian River, Alaska. Alaska Department of Fish and Game, Fishery Manuscript Series No. 91-1, Anchorage.