

**Anchor River Chinook Salmon Stock Status and  
Action Plan, 2001**

**By**

**Cook Inlet Staff**

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November 2001

Alaska Department of Fish and Game

Division of Sport Fish



## Symbols and Abbreviations

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<b>Weights and measures (metric)</b>		<b>General</b>		<b>Mathematics, statistics, fisheries</b>	
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, $\chi^2$ , 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
<b>Weights and measures (English)</b>		Company	Co.	divided by	÷ or / (in equations)
cubic feet per second	ft <sup>3</sup> /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
<b>Time and temperature</b>		number (before a number)	# (e.g., #10)	logarithm (specify base)	log <sub>2</sub> , etc.
day	d	pounds (after a number)	# (e.g., 10#)	mideye-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
<b>Physics and chemistry</b>				probability of a type I error (rejection of the null hypothesis when true)	$\alpha$
all atomic symbols				probability of a type II error (acceptance of the null hypothesis when false)	$\beta$
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				

***REPORT TO THE ALASKA BOARD OF FISHERIES***

**ANCHOR RIVER CHINOOK SALMON STOCK STATUS AND ACTION  
PLAN, 2001**

by

Cook Inlet Staff

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

November 2001

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# EXECUTIVE SUMMARY

## SYNOPSIS

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

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

## STOCK ASSESSMENT

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

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

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

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

### **OUTLOOK AND FISH HABITAT ASSESSMENT**

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

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

### **ALASKA BOARD OF FISHERIES ACTION**

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

# **ESCAPEMENT GOAL EVALUATION**

## **ESCAPEMENT GOAL HISTORY**

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

## **SPAWNER DATA AND SEG ANALYSIS**

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

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

## **ESCAPEMENT GOAL RECOMMENDATION**

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

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

## **ANCHOR RIVER CHINOOK SALMON MANAGEMENT PLAN REVIEW/DEVELOPMENT**

### **Current Stock Status**

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

### **C&T Use Finding and the Amount Necessary**

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

### **Habitat Factors Adversely Affecting the Stock**

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

### **Do New or Expanding Fisheries on this Stock Exist?**

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

### **Existing Management Plans**

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

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

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

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

And in particular:

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

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

**Identify Research Needed on Stock and Habitat**

See the Research Plan on pages 8-10.

## **ACTION PLAN DEVELOPMENT**

### **ANCHOR RIVER CHINOOK SALMON ACTION PLAN GOAL**

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

### **ACTION PLAN ALTERNATIVES**

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

#### **Objective**

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

#### **Background**

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

#### **Specific Action Recommended to Implement the Objective**

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

#### **Cost/Benefit Analysis**

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

#### **Subsistence Issues/Considerations**

None.

#### **Performance Measures**

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

#### **Sport Fish Research Plan to Address Stock of Concern**

See Research Plan on page 9.

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

### **Objective**

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

### **Background**

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

### **Specific Action Recommended to Implement the Objective**

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

### **Cost/Benefit Analysis**

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

**Subsistence Issues/Considerations**

None.

**Performance Measures**

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

**Habitat Research Plan to Address Stock of Concern**

See Research Plan on Page 10.

## **RESEARCH PLAN**

### **CURRENT RESEARCH PROJECTS – SPORT FISH DIVISION**

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

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

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

### **PROPOSED RESEARCH PROJECTS – SPORT FISH DIVISION**

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

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

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

## **CURRENT RESEARCH PROJECTS – HABITAT AND RESTORATION DIVISION**

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

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

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

### **PROPOSED RESEARCH PROJECTS – HABITAT AND RESTORATION DIVISION**

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

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

### **LITERATURE CITED**

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

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

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

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

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

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

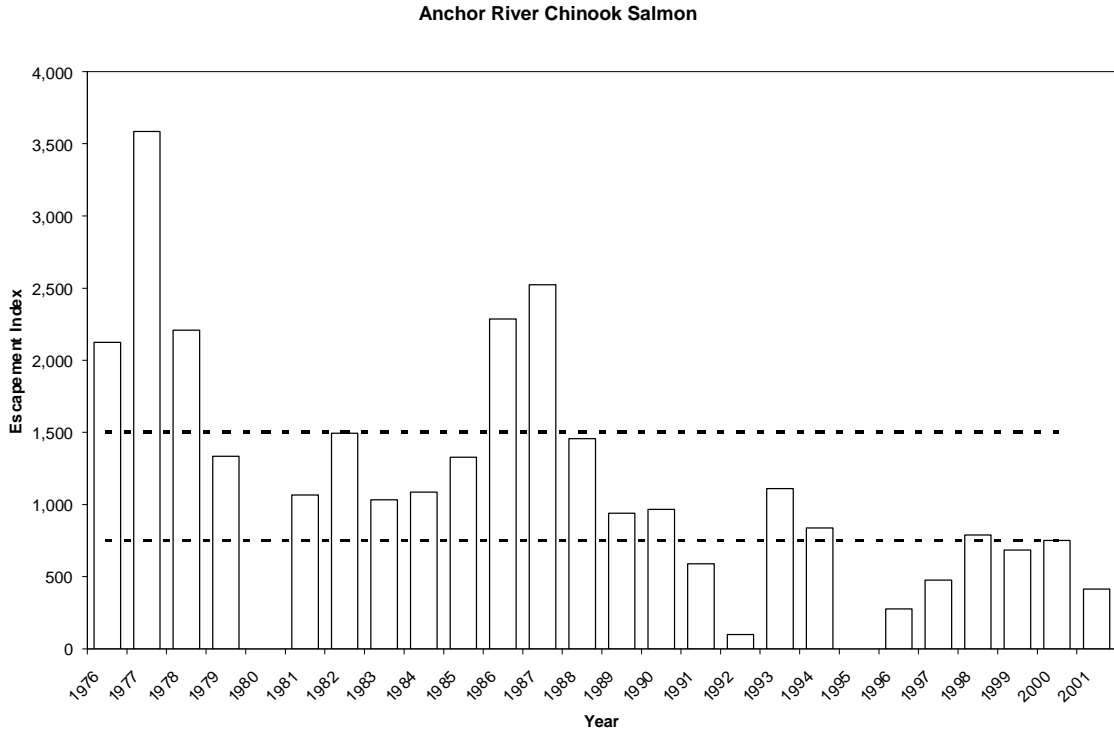


Figure 1. Escapement index of chinook salmon in the Anchor River (bars) relative to the current SEG range of 750-1,500 fish (dotted lines), 1976-2001.

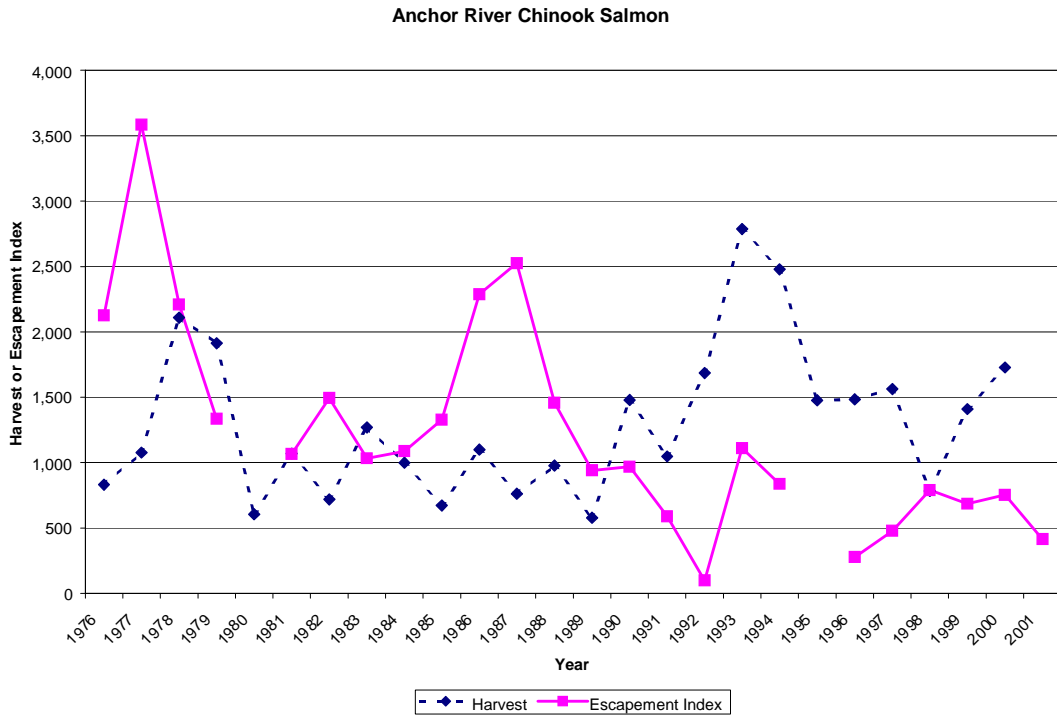


Figure 2. Freshwater harvest (dotted line) and escapement index (solid line) of chinook salmon in the Anchor River, 1976-2001.